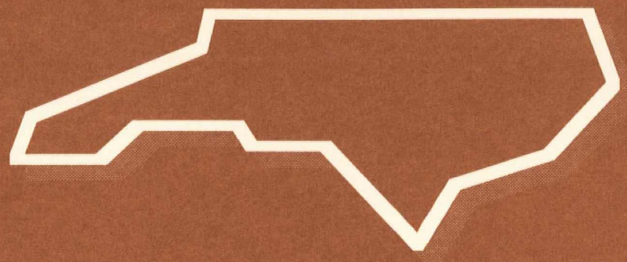

Meeting the Challenge in North Carolina:

An Action Plan to Increase Minority Participation in Mathematics, Science, and Engineering in North Carolina

February 1998

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Introduction

The overall goal of this plan is increased participation by African Americans, American Indians, and Hispanics in North Carolina in mathematics, science, and engineering (MSE), fields in which these groups have been historically and significantly underrepresented. The plan was developed by a state-wide Steering Committee under a grant from the National Science Foundation (NSF)[1] to the Quality Education for Minorities (QEM) Network.

This plan will enable the state of North Carolina to make its proportionate ("fair share") contribution to national baccalaureate and doctoral degree goals for underrepresented minorities in MSE fields, based upon the state's percentage of the total U.S. minority student enrollment in higher education.

The plan has the following four specific goals:

(1) To maintain or surpass the state's current level of production of underrepresented minority MSE baccalaureate degrees

(2) To increase the state's production of underrepresented minority MSE doctoral degree recipients to a level that represents the state's proportionate contribution

(3) To increase the state's production of underrepresented minority teachers, including mathematics and science teachers, to a level that represents the state's proportionate contribution

(4) To develop a clearly defined, multiple-entry pathway into mathematics and science study from pre-college to graduate school for minority students residing in low-wealth counties in North Carolina

1 See Appendix A for a description of the North Carolina Technical Assistance Project (NC-TAP) and Appendix B for a description of the Project's major study areas and related meetings.

Strategies to Achieve Goal One (Baccalaureate Degrees):

To maintain or surpass the state's current level of production of underrepresented minority MSE baccalaureate degrees

Strategy 1.1:

Enhance programs and replicate successes of higher education institutions that enroll significant numbers of underrepresented minorities.

Strategy 1.2:

Build on demonstrated interest, commitment, and success within the state.

Strategy 1.3:

Urge each MSE degree-granting institution in North Carolina to examine its "fair share" of the state's minority MSE degree proportionate contribution and provide evidence of top level commitment to meeting these goals.

Strategy 1.4:

Focus on key transition points along the educational pathway.

Strategy 1.5:

Ensure that undergraduate education in MSE fields in North Carolina fully prepares underrepresented students for work in industry, research, or graduate school.

Strategy 1.6:

Ensure that K-16 courses and programs are aligned/coordinated with state or national educational reform efforts.

Strategy 1.7:

Identify and make known "close-to-home" technical assistance available from (or needed by) higher education institutions to enable them to produce well-prepared MSE students.

Strategies to Achieve Goal Two (Doctoral Degrees):

To increase the state's production of underrepresented minority MSE doctoral degree recipients to a level that represents the state's proportionate contribution

Strategy 2.1:

Urge each doctoral degree-granting institution in North Carolina to develop a vision statement from the "top" that is backed by tangible actions and commitment of resources to address the serious underrepresentation of African Americans, American Indians, and Hispanics among MSE doctoral degree recipients.

Strategy 2.2:

Establish a formal undergraduate to graduate bridge program to facilitate the matriculation of underrepresented minority MSE students into MSE doctoral programs in North Carolina.

Strategy 2.3:

Hire a professional to monitor and coordinate the proposed undergraduate/graduate bridge partnerships between institutions in the state.

Strategy 2.4:

Encourage each undergraduate degree-granting institution in the state to emphasize pursuing MSE doctorates when advising underrepresented minority MSE majors.

Strategy 2.5:

Urge each baccalaureate degree-granting institution to provide mentored, research opportunities for all of its MSE majors.

Strategy 2.6:

Strongly encourage each baccalaureate degree-granting institution to provide and support research presentation opportunities for underrepresented students at national and regional meetings.

Strategy 2.7:

Initially target institutions that produce significant numbers of minority MSE baccalaureate degree recipients such as North Carolina A&T State University and North Carolina State University as a means of identifying a rich pool of potential minority MSE doctorates.

Strategy 2.8:

Recognize and reward institutions that produce minority MSE doctorates.

Strategies to Achieve Goal Three (Teachers):

To increase the state's production of underrepresented minority teachers, including mathematics and science teachers, to a level that represents the state's proportionate contribution

Strategy 3.1:

Establish a teacher cadet corps for high school students in the 30 school districts that enroll the highest number of minority students.

Strategy 3.2:

Intensify efforts to recruit minorities, including teachers' aides and other paraprofessionals in education, into pre-teaching and pre-science programs at community colleges and into teacher certification programs at four-year institutions.

Strategy 3.3:

Ensure that articulation and transfer agreements facilitate the entry of interested minority students into teacher education programs.

Strategy 3.4:

Encourage teacher education institutions to strengthen their efforts to retain minority students on the teaching track, including formal preparation for the PRAXIS examinations.

Strategy 3.5:

Establish a state-wide teacher preparation and enhancement collaborative among colleges and universities successfully producing minority mathematics and science teachers, other teacher education institutions, and community colleges.

Strategies to Achieve Goal Four (Seamless Pathway):

To develop a clearly defined, multiple-entry pathway into mathematics and science study from pre-college to graduate school for minority students residing in low-wealth counties in North Carolina

Strategy 4.1:

Establish a mentored, summer research opportunities program for talented and interested rising high school juniors and seniors in the 30 school districts with the highest minority enrollment.

Strategy 4.2:

Urge regular meetings of local superintendents with presidents of nearby two-year and four-year institutions (as well as their respective mathematics and science faculty) to ensure alignment of programs and curricula as well as student preparedness at each segment of the pathway.

Strategy 4.3:

Use technology to support and complement MSE efforts along the proposed pathway.

Strategy 4.4:

Create a registry of every eighth grade student in each of the targeted counties and identify a local group of citizens who will keep track of the educational progress of each of these students, particularly in mathematics and science.

Why Minority MSE Participation Is Important to the Nation and to the State of North Carolina

Data on MSE Baccalaureate and Doctoral Degrees

African Americans, American Indians, and Hispanics are the racial/ethnic groups whose participation in mathematics, science, and engineering is significantly lower than their representation in society. For example, while these groups together represent about 22 percent of the U.S. population, collectively they earned only 12 percent (44,682) of the 366,357 MSE baccalaureate degrees awarded to U.S. citizens and permanent residents in 1993 and 6.3 percent (1,029) of the 16,336 MSE doctoral degrees awarded to U.S. citizens and permanent residents that same year.

Parity for these groups in MSE degree attainment in 1993 would have required them to earn almost twice (80,598) as many baccalaureate degrees and more than three times (3,594) as many doctoral degrees.

The representation of these groups in 1993 among the 24,593 doctoral MSE degrees awarded to both U.S. citizens and non-U.S. citizens stood at four percent, in contrast to 33 percent for non-U.S. citizens. In 1996, non-Asian minority representation among all MSE doctoral degree recipients remained at four percent while the percentage earned by non-U.S. citizens climbed to 39 percent.

Details on MSE baccalaureate degrees awarded in 1993 and in 1995 to U.S. citizens, by racial/ethnic group are provided in the chart below. Data on MSE doctoral degrees awarded in 1993 and 1996 to U.S. citizens, by racial/ethnic group, and to non-U.S. citizens are shown in the next chart.

Racial/Ethnic Group	Percent of U.S. Population 1990	Number of MSE Baccalaureate Degrees Earned (% of Total) 1993	Number of MSE Baccalaureate Degrees Earned (% of Total) 1995
African Americans	12.1%	24,421 (6.7%)	27,528 (7.3%)
American Indians	0.8%	1,819 (0.5%)	2,126 (0.6%)
Hispanics	9.0%	18,442 (5.0%)	22,190 (5.9%)
Subtotal	**21.9%**	**44,682 (12.2%)**	**51,844 (13.8%)**
Asians	2.9%	24,504 (6.7%)	29,128 (7.8%)
Whites	80.3%	297,171 (81.1%)	294,773 (78.4%)
Total U.S. Citizens & Perm. Residents		366,357 (100.0%)	375,745 (100.0%)

Sources:
1993: *Science and Engineering Indicators, 1996* National Science Foundation, NSB-96-21

1995: Unpublished Data, Science Resources Studies, National Science Foundation

Racial/Ethnic Group	Percent of U.S. Population 1990	Number of MSE Doctorates Earned (% of Total) 1993	Number of MSE Doctorates Earned (% of Total) 1996
African Americans	12.1%	452 (2.8%)	525 (3.2%)
American Indians	0.8%	41 (0.3%)	81 (0.5%)
Hispanics	9.0%	536 (3.3%)	558 (3.4%)
Subtotal	**21.9%**	**1,029 (6.3%)**	**1,164 (7.2%)**
Asians	2.9%	1,602 (9.8%)	2,566 (15.8%)
Whites	80.3%	13,535 (82.9%)	12,293 (75.7%)
Other and Unknown	3.9%	170 (1.0%)	215 (1.3%)
Total U.S. Citizens & Perm. Residents		16,336 (100.0%)	16,238 (100.0%)
Total U.S. Citizens & Perm. Residents	NA	16,336 (66.4%)	16,238 (57.9%)
Non-U.S. Citizens	NA	8,087 (32.9%)	10,983 (39.2%)
Citizenship Unknown	NA	170 (0.7%)	828 (2.9%)
Total	**NA**	**24,593 (100.0%)**	**28,049 (100.0%)**

Sources:
1993: *Science and Engineering Indicators, 1996* National Science Foundation, NSB-96-21
1996: *The Chronicle of Higher Education,* November 21, 1997

Why the United States Should Make Investment in Science Education a Priority

- In a democracy, scientific knowledge should be broadly developed and shared. Such knowledge, its applications, and its use in the formation of policy will affect the quality of life of all citizens.
- Major changes in science, technology, and trade call for our country to invest more heavily in the science education of its citizens to improve their economic well-being and quality of life.
- The intellectual and scientific marketplace in the United States should reflect the aspirations, ideas, and perspectives of a broad spectrum of its citizens.
- This country should depend upon its citizens to provide a significant portion of its intellectual base, including the provision of advanced science education.

- This country's academic, research, and economic infrastructure needs to be strong. Achieving and maintaining this strength require access, participation, and sustained support from a broad spectrum of citizens.

- Our country's economic competitiveness and well-being require ready access to a sufficiently large, diverse, and highly trained cadre of citizens. A country's greatest assets are its human resources.

- A sustained investment in quality education, including science education, is a demonstrably effective way to avoid second-class citizenship and economic stratification.

- Investment in quality science education for this generation of Americans increases the likelihood that more of the next generation will pursue advanced degrees in mathematics, science, and engineering.

What Are the Implications for Minorities of the Country's Investment in Science Education?

- African Americans, American Indians, and Hispanics represent the most untapped national human resource for strengthening the country's technical infrastructure, for broadening the country's intellectual base, and for expanding scientific knowledge and informed civic participation among its citizenry.

- By broadly developing and sharing scientific knowledge, African Americans, American Indians, and Hispanics will be able to make greater contributions to the advancement of science and technology.

- Supporting and encouraging more African Americans, American Indians, and Hispanics to study mathematics, science, and engineering will enable America to maximize its economic edge in the 21st century.

- Enhanced minority MSE participation will foster economic development of minority communities, providing more of the needed resources for quality schools, community-based educational support organizations, and the development of more minority scientists, engineers, and educators.

- Greater support for the scientific education of minorities will further our national education goals and facilitate the achievement of higher standards, especially in mathematics and science, for all of America's children.

- Slow economic growth dominates in states with the highest minority populations. Such areas must become full partners in the country's economic growth through a greater investment in the development of this major portion of the their human resources.

- Investment in science education, especially for students in low-income communities, must begin at the elementary school level if these students are to have a strong foundation in science and mathematics and a realistic option to successfully pursue careers in mathematics, science, and engineering.

- Increasing minority representation among scientists and engineers will lead to a larger pool of better educated individuals who can serve as role models for today's youth and who can participate in a meaningful way in science-based policy discussions and decisions, especially those affecting minority communities.

Why North Carolina Should Invest More in the MSE Education of Its Minority Citizens

- The future economic viability of North Carolina will depend heavily upon the level of education attained by its citizens, especially in technology-related areas. To attract and sustain additional scientific and technical industries, the state must have available a large and diverse cadre of highly educated individuals who can provide the skills, goods, and services these industries will need.

- North Carolina is uniquely positioned to have a serious and immediate impact on closing the parity gap for underrepresented minorities in MSE higher education. It is the leading state in the nation in producing its "fair share" of MSE baccalaureate degrees earned by underrepresented minorities and, as such, has a ready-made pool of potential MSE doctorates each year.

- For economic, demographic, and infrastructure reasons as well as the state's obligation to support its residents' pursuit of higher education, North Carolina and its MSE doctoral degree-granting institutions should act now to attract a significant number of students from this pool into MSE graduate programs.

By building upon its success at the baccalaureate level to achieve its doctoral "fair share," North Carolina can become a model of success for the rest of the nation in the production of underrepresented minority MSE degree recipients at both the baccalaureate and doctoral levels.

Major Factors Affecting Minority Access to Quality MSE Education

- the lack of access to well-prepared teachers/advanced courses by minority students in predominantly minority K-12 schools

- the underrepresentation of minorities in the teaching profession

- the continued tracking of disadvantaged students into lower level classes at the K-12 level, often beginning as early as kindergarten

- the extension of the tracking of many minority students into "academically thin" general education programs in high school and into vocational education at the community college level

- the low transfer rate of underrepresented minority students from two- to four-year institutions[2]

- the low persistence of underrepresented minority students through graduation at both two- and four-year institutions

- low expectations and poor preparation of underrepresented minority students all along the educational continuum

- low socio-economic status of minorities relative to the rest of the U.S. population

- the correlation between socio-economic status[3] and such critical educational determinants as: access to certified teachers; enrollment in remedial classes; availability of advanced courses at the K-12 level; access to technology and to quality, technology-based instruction; performance on standardized tests; participation in out-of-school, reinforcing academic experiences; and rate of transfer from two- to four-year colleges

- underrepresentation at the baccalaureate and doctoral levels

[2] Only 12 percent of Hispanic and of African American students transfer to a four-year college or university, in comparison to 23 percent of white students ("1995 Transfer Assembly Study," Center for the Study of Community Colleges)

[3] Transfer rates between two- and four-year institutions are directly linked to students' socio-economic status (SES)—35 percent for high SES students, 21 percent for middle SES students, and 7 percent for low SES students—(*Condition of Education 1996)*

QEM's General Approach to MSE Underrepresentation

- Focus on the achievement of specific numerical goals for minority MSE degree recipients
- Target the 19 states in which minority students are at least 25 percent of each state's high school graduates
- Hold state-wide MSE conferences to identify model or promising minority-focused MSE strategies and form a state steering committee to develop an action plan for the state that incorporates "what works" in the state
- Determine the proportionate contributions of MSE degrees that the targeted states should be making, based upon their minority higher education enrollment
- Identify the most productive ("top ten") institutions within each state in terms of MSE degrees awarded to underrepresented minorities in the fields in which they are most underrepresented (mathematics, the physical sciences, and engineering)
- Identify the most "productive" state in meeting its proportionate share and focus on the development of an action plan to sustain or expand its current efforts to increase minority participation

National Numerical MSE Goals

To ensure the scientific health of the nation as well as a strong, inclusive academic and research infrastructure, the country could adopt racial/ethnic parity in science and engineering as a goal.

Instead of parity, the National Science Foundation (NSF) has established specific, national numerical goals for the number of underrepresented minorities receiving MSE baccalaureate and doctoral degrees by the year 2000. In addition, the Quality Education for Minorities (QEM) Network has adopted national minority MSE goals that include goals for teachers of mathematics and science.

NSF's goals for the country are to annually produce at least 50,000 minority MSE bachelor's degree recipients and 2,000 minority MSE doctoral degree recipients. QEM's annual teacher education goal for the turn of the century is 30,000 minority graduates newly qualified to teach, 30 percent (9,000) of whom would be prepared to teach mathematics and science at the secondary level.

These goals fall short of parity, which requires 80,598 baccalaureate and 5,410 doctoral degrees earned by underrepresented minorities. Nevertheless, they can serve as a national yardstick against which North Carolina and any other state can measure their individual progress as well as compare their respective contributions.

These goals are obtainable if each state achieves its proportionate share of the national minority MSE goals.

These goals can be achieved if each higher education institution within a state makes its proportionate contribution to the state's share of the national goals, based on the institution's percentage of the state's minority enrollment and on the level and type of degree programs available on its campus.

A Framework for Developing Strategies for a State's Action Plan

While the North Carolina Action Plan focuses on specific numerical achievements, its goals represent key elements of an overarching strategy for ending the underrepresentation of minorities in MSE teaching and research careers, whether at the local, state, regional, or national level. The Plan's strategies seek to enhance existing systemic change efforts so that minority students are prepared for success in MSE fields.

Strategies at the state level to address minority MSE underrepresentation should utilize the following framework/guiding principles:

- √ **Focus where there are significant concentrations of underrepresented minorities for it is there where the greatest needs and targets of opportunity for addressing MSE underrepresentation will be found.**
- √ **Build upon evidence of interest, commitment, and success in the state.**
- √ **Enhance the commitment and capacity of all educational institutions in the state to contribute their "fair share" of minority MSE degrees.**
- √ **Focus on key transition points along the education pathway and on preparation for success as students move from one segment of the educational continuum to the next.**
- √ **Align the Plan with current education reform initiatives but not be limited by them.**
- √ **Emphasize high expectations for all students and provide them with the foundation in mathematics and science that they need to keep their career options open.**
- √ **Include "close-to-home" technical assistance but identify areas where additional resources may be needed.**
- √ **Include specific roles and responsibilities for various stakeholders who can help ensure the successful implementation of the Plan.**

A Framework for Developing an Institution's Action Plan

In preparing its June 1997 report, *Weaving the Web of MSE Success for Minorities: Top Ten Colleges and Universities Report,* QEM distributed a survey to 160 higher education institutions in 17 states and Puerto Rico seeking information on possible factors and strategies contributing to their success in producing underrepresented minority MSE degree recipients. The 17 states are among the 19 states in which minority students represent at least 25 percent of each state's high school graduates.

The 104 institutions responding to the survey reported a number of activities and attributes that they believe help to explain their success. Services and programs were identified by the respondents that ranged from community outreach to summer bridge programs to accessible faculty.

Summary findings from the survey, from site visits to North Carolina's most productive institutions, and from a three-month, in-depth campus climate study (conducted by QEM with support from the U.S. Department of Health and Human Services) that describes the characteristics of "successful" institutions are reflected in the following chart.

- a national reputation that attracts high quality students and faculty
- a secure and attractive campus
- a bridge to college program
- a spirit of unity among students
- community service that is an integral part of the institution's mission
- small student-faculty ratio in the sciences
- good communications between faculty and students
- productive, accessible, and caring faculty
- one-to-one advising by faculty and peer tutoring
- accessible academic and personal support system
- scholarship support for MSE students starting in the freshman year
- student chapters of national MSE organizations
- a variety of pedagogical strategies, including the use of team projects and study groups
- electronic classrooms and computer centers campus-wide
- an honors program
- on- and off-campus summer research opportunities
- faculty and students actively engaged in research
- faculty who regularly present and publish their research findings
- student opportunities to attend professional meetings with faculty
- public notice/celebration of student achievement
- strong, visionary leadership in the sciences
- significant external MSE program/research support
- research support for junior faculty
- state-of-the-art science equipment and facilities

Institutions are strongly urged to take into account these observations about characteristics of "successful" institutions as they strengthen/develop their institutional action plans.

QEM's Approach to MSE Underrepresentation in North Carolina[4]

- Focus on North Carolina's approach to education and education reform to understand the lessons learned and progress made as well as on its "top ten" institutions to better understand the reasons for their success
- Identify a Steering Committee in North Carolina that, with technical assistance from QEM, will develop an action plan to achieve the state's proportionate contributions to national goals; establish a Board of Advisors to offer expert guidance and perspective beyond North Carolina
- Hold regional forums in the state to learn about existing strategies and to identify facilitating/inhibiting factors to minority MSE participation
- Study the following areas for possible models and targets of opportunity to be incorporated into the action plan:
  - campus climate
  - two-year to four-year articulation
  - teacher education programs
  - the use of technology in education
  - opportunities/needs for "close-to-home" technical assistance

About North Carolina

Demographics

According to 1990 U.S. Census data, North Carolina, with its approximately seven million residents, ranks 10th among the states in population. In the state, African Americans comprise 22 percent of the population; American Indians, 1.2 percent; and Hispanics, 1.2 percent.

The state has 100 counties and 119 school districts. K-12 education in the state is coordinated by the State Board of Education and its operating arm, the State Department of Public Instruction. In 1996-97, public school enrollment was 1,201,688; about 85,400 students were enrolled in home and private schools; and 35.3 percent of all K-12 students were non-white. Over the next ten years, North Carolina expects to gain an additional 110,000 students at the K-12 level, an enrollment jump of nearly 10 percent.

[4] See Appendix E for further details

North Carolina's higher education system consists of 121 colleges and universities, including 16 public four-year institutions, 42 private four-year institutions, 58 public two-year institutions, and 5 private two-year institutions. Public four-year institutions are coordinated statewide by the University of North Carolina Board of Governors General Administration, located in Chapel Hill. Public two-year institutions are coordinated statewide by the North Carolina Department of Community Colleges, located in Raleigh.

According to *The Chronicle of Higher Education 1997-1998 Almanac Issue*, in Fall 1995, the full-time equivalent enrollment at four-year institutions in North Carolina totaled 224,862, including 157,414 at public institutions and 67,448 at private institutions. Full-time equivalent enrollment at two-year institutions in the state totaled 147,168, including 145,685 at public institutions and 1,483 at private institutions. That year, minority students comprised about 24 percent of the total student enrollment in North Carolina higher education institutions, representing approximately three percent of the total minority higher education enrollment.

Higher Education Enrollment in North Carolina, Fall 1995

Enrollment:	
At public 4-year institutions	157,414
At public 2-year institutions	145,685
At private 4-year institutions	67,448
At private 2-year institutions	1,483
Undergraduate	329,893
Graduate	35,474
Professional	6,663
American Indian	3,789
Asian	7,074
Black	73,185
Hispanic	4,438
White	277,844
Foreign	5,700
Total	**372,030**
Enrollment highlights:	
Women	57.0%
Full-time	64.0%
Minority	24.2%
Foreign	1.5%
10-year change in total enrollment	Up 13.7%
Proportion of enrollment made up of minority students:	
At public 4-year institutions	24.4%
At public 2-year institutions	24.2%
At private 4-year institutions	23.8%
At private 2-year institutions	12.0%

Source: *The Chronicle of Higher Education*, Almanac Issue, August 29, 1997, p. 87

Teachers

- In 1996-97, the number of teachers in the public school system totaled 72,173, 16.2 percent of whom were non-white
- In 1995-96, the average teacher salary was $30,411 and the beginning teacher salary was $21,330
- North Carolina K-12 teacher salaries currently rank 42nd in the nation
- About a third of North Carolina teachers leave the profession after five years, and a significant number of teachers are hired each year who come from out of state
- North Carolina has more teachers (209 or 22.5 percent of the nation's total) who have been certified by the National Board for Professional Teaching Standards than any other state
- In North Carolina, 30 percent of teachers whose main assignment is mathematics do not have a major in mathematics. The comparable figure in science is 20 percent

Student Performance

- On the 1996 National Assessment of Educational Progress (NAEP) mathematics examination for grade eight, 28 percent of white students in North Carolina's public schools scored at or above the proficiency level, in contrast to five percent of African American and seven percent of Hispanic students
- North Carolina students rank 48th among the states in average SAT scores, although the average number of points gained by North Carolina students increased by 31 over the past ten years
- The average SAT score for African American students in North Carolina is 181 points below the average SAT score for white students in the state

School Expenditures

- The state provides approximately 70 percent of the funds for K-12 public schools with the remaining funds coming from local (local education agencies) and federal sources. In addition, the state provides supplemental funds to low-wealth and small county school systems
- State and local current expenditures per pupil in K-12 public schools totaled $4,682, as compared with the U.S. average of $5,623
- In 1996-97, the total local expenditure per pupil in the ten wealthiest counties in North Carolina was nearly four times that of the ten poorest counties in the state ($2,103 vs. $589)

Community Colleges

- The North Carolina Community College System serves 145,685 (FTE) students through 58 public institutions
- About 57,200 students in the Community College System are enrolled in college transfer programs, including about 11,900 minority students. Of this group of minority students, 1,532 (13 percent) are enrolled in pre-mathematics, pre-science, or pre-engineering programs, and 319 (3 percent) are enrolled in pre-teaching programs

Historically Black Colleges and Universities (HBCUs)

- North Carolina has more HBCUs (11) than any other state
- In 1992-93, six of the "top ten" producers of minority MSE baccalaureate degrees in North Carolina were HBCUs

University of North Carolina at Pembroke (UNC-Pembroke)

- UNC-Pembroke was founded in 1887 as a school for American Indians and, until 1953, was the only state-supported four-year college for American Indians in the nation
- In 1994-95, American Indians represented about 24 percent of the student body at UNC-Pembroke
- In 1994-95, UNC-Pembroke awarded 35 bachelor's degrees in MSE fields to American Indians, representing 32 percent of the total MSE degrees awarded by UNC-Pembroke that year

North Carolina's Minority MSE Contributions

The state's percentage of the total U.S. minority higher education enrollment varied from 2.6 percent in Fall 1992 to 3.0 percent in Fall 1995. Its resulting proportionate contributions toward NSF's national MSE goals are reflected in the following table:

YEAR	Percent of Minority Enrollment in North Carolina	Projected Contribution to National MSE Baccalaureate Goals	Projected Contribution to National MSE Doctoral Goals
Fall 1992	2.6%	1,300	52
Fall 1993	3.1%	1,550	62
Fall 1994	3.1%	1,550	62
Fall 1995	3.0%	1,500	60

Sources: *The Chronicle of Higher Education*: February 23, 1994; March 17, 1995; May 24, 1996; and May 23, 1997

North Carolina's actual production of minority baccalaureate MSE degrees during the 1992-93 academic year, the data year of the QEM "Top Ten" Report, was 1,480 or 114 percent of its proportionate share while its production of minority MSE doctoral degrees was 24, only 46 percent of its share. Despite these mixed results, North Carolina led the targeted states in meeting proportionate contributions at both the baccalaureate and doctoral levels.

Table 1: Baccalaureate Degrees Earned by Underrepresented Minorities in MSE Fields in North Carolina, 1992-97

FIELD	1992-93	1993-94*	1994-95*	1995-96	1996-97
Mathematics	93	113	113	113	101
Science	1,128	1,276	1,277	1,257	1,453
Engineering	259	256	256	300	399
TOTAL	**1,480**	**1,645**	**1,646**	**1,670**	**1,953**
% of Fair Share	**114%**	**106%**	**106%**	**111%**	NC Fall 1996 Minority Enrollment Data NA

Source: Unpublished Data, U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS)

Table 2: Doctoral Degrees Earned by Underrepresented Minorities in MSE Fields in North Carolina, 1992-97

FIELD	1992-93	1993-94*	1994-95*	1995-96	1996-97
Mathematics	2	0	0	0	0
Science	16	12	12	15	13
Engineering	6	1	1	6	3
TOTAL	**24**	**13**	**13**	**21**	**16**
% of Fair Share	**46%**	**21%**	**21%**	**35%**	NC Fall 1996 Minority Enrollment Data NA

Source: Unpublished Data, U.S. Department of Education, National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS)

* Note: While degree totals are the same in some years, this is a coincidence. The degree totals for specific institutions actually vary.

North Carolina continues to exceed its proportionate share at the undergraduate level as shown in Table 1 above. However, at the doctoral level, the state's "under-contribution" continues, with results fluctuating from 24 during 1992-93 to 13 during both 1993-94 and 1994-95, rebounding to 21 during 1995-96. This significant decline occurred as the state's percentage of total minority higher education enrollment was increasing from 2.6 percent to 3.1 percent.

Production of Minority Teachers

The state is facing a crisis in the production of minority mathematics and science teachers. During 1992-93, the state's proportionate share of the national goal for minority teachers was 780, including 234 mathematics and science teachers. That year, state institutions actually produced only 234 minority teachers in all fields.

By Fall 1995, its proportionate share of the minority teachers' goal increased to 900; however, during 1994-95, the state only produced 306 minority teachers in all fields. The following year, teacher education institutions in North Carolina only produced 296 minority teachers in all fields, just 33 percent of its share. Data were not available on the actual number of minority mathematics and science teachers produced each year.

Table 3 provides information on institutions awarding teacher education degrees to underrepresented minorites during 1995-96, ranked by number of such degrees awarded. Of the 296 degrees awarded to underrepresented minorites that year, 190 (64 percent) were awarded by Historically Black Colleges and Universities (HBCUs).

Table 3: Teacher Education Institutions in North Carolina, Ranked by Number of Baccalaureate Degrees Awarded in Education to Underrepresented Minorities, 1995-96

Institution	Number of Degrees Awarded	Number of Degrees Awarded to Underrepresented Minorities
Winston-Salem	59	53
North Carolina A&T State	39	39
North Carolina Central	31	29
Fayetteville State	60	24
UNC-Charlotte	138	23
Elizabeth City State	31	14
North Carolina State	101	12
UNC-Pembroke	45	12
East Carolina	213	9
Appalachian State	186	8
UNC-Wilmington	127	8
St. Augustine's	7	7
Johnson C. Smith	7	7
Shaw	7	7
UNC-Chapel Hill	86	6
UNC-Greensboro	77	6
Bennett	6	6
North Carolina Wesleyan	17	5
12 institutions awarding 1-4 degrees to underrep. minorities	299	21
11 institutions awarding no degrees to underrep. minorities	186	0
Total	1,722	196

Source: University of North Carolina, General Administration Website http://www.ga.unc.edu/planning

Meeting the Challenge in North Carolina

To help inform the Action Plan, several areas were studied to determine their importance to underrepresented minority students' progression toward, and ultimate success in, obtaining MSE degrees in North Carolina. Institutional climate on the "top ten" campuses,[5] the role of community colleges, teacher education programs, the use of technology in education, and opportunities/needs for "close-to-home" technical assistance were examined for common characteristics, lessons learned, possible models, and targets of opportunity for incorporation into the state's Action Plan. Summaries of key findings/observations in each of these areas follow.

Importance of Institutional Climate

Recruitment/Outreach Efforts

- At the University of North Carolina-Chapel Hill, programs have been underway to attract underrepresented minority students since 1966. These efforts are described in campus recruitment publications or appear in statements from the Chancellor's Committee.
- North Carolina State University acquired names of potential new minority students from lists of SAT-takers provided by The College Board.
- Elizabeth City State University uses its campus radio station to recruit students who reside within a 120-mile radius of the University.
- The University of North Carolina-Pembroke targets its recruitment efforts within a seven-county area surrounding the University, although it recruits students from other counties in the state as well as from outside North Carolina. Recruitment efforts have resulted in a significant population of minority students (for example, 24 percent American Indians and 14 percent African Americans in 1996).
- Several colleges have Dean's Scholarship Programs (or similar efforts) to attract outstanding minority students.

Southeastern Consortium for Minorities in Engineering (SECME)

SECME was established in 1975 by the deans of seven southeastern universities. Today, SECME is the largest pre-college alliance in the country, linking 38 universities; 65 industry/government agencies; 99 school systems; 21,299 students; and 685 K-12 schools.

In North Carolina, the local SECME program headquarters is at North Carolina A&T State University. SECME's goal is to increase the pool of underrepresented minorities who are prepared to enter and complete postsecondary studies in science, mathematics, engineering, and technology. At each participating school, a SECME team is formed to plan and initiate the program. A model team includes principals; counselors; media specialists; and mathematics, science, language arts, and other teachers.

5 See Appendix C for program descriptions of leading producers of underrepresented minority MSE baccalaureate degree recipients in North Carolina.

- Some institutions send letters to their current students and to alumni asking them to provide names of potential new minority students.
- All of the institutions sponsor a "Spend a Day on Campus" activity to allow prospective students and their families to have a first-hand view of campus academic programs, student activities, and support programs.
- The institutions conduct a variety of pre-college programs for minority middle and high school students to provide the students with early information and a support structure for future college attendance.
- North Carolina Central University offers scholarships for teacher education students from Chatham County who agree to return to teach in this small, rural county upon graduation. The scholarships are funded by the local Chatham County School Board and provide 50 percent of college costs for four years or 100 percent of costs for the junior and senior years.

Admissions

- Universities in the UNC System use the same selection criteria when reviewing applications from minority and non-minority students.
- In some universities, SAT/ACT scores for entering minority students are lower than the class average but still higher than the average scores in North Carolina or in the nation. Only students who have a high probability for success are accepted by the universities.
- The North Carolina Board of Governors has strengthened admissions requirements to state universities so that all entering students must have successfully completed Algebra 1 and 2, Geometry, and three years of science, including one year of biology.

The University of North Carolina Mathematics and Science Education Network (MSEN) Pre-College Program

The University of North Carolina Mathematics and Science Education Network (MSEN) Pre-College Program is designed to increase the number of historically underrepresented students who have sufficient interest and preparation to pursue mathematics and science fields at the university level and to move them into careers in science, mathematics, technology, engineering, and teaching. The Program is conducted at six university sites and provides students in grades 6-12 with rigorous academic enrichment activities aimed at improving their science, mathematics, and communication skills.

By the end of the 1995-96 school year, almost 2,600 students from across the state were participating in the Pre-College Program, representing more than 25 school districts and 114 schools. A follow-up survey conducted in Fall 1994 of graduates from the Pre-College Program in 1991, 1992, 1993, and 1994 showed that 98 percent were enrolled in college, 60 percent of whom were majoring in a mathematics- or science-related field.

Financial Aid

- A 1996 North Carolina State University study of student attrition and persistence behaviors found that one of the most significant reasons for students leaving the University, regardless of race, was insufficient financial aid. The study found that about 18 percent of White students and about a third of African American students left the University because of financial reasons.

- In a 1996 Graduating Senior Survey at North Carolina State, nearly 90 percent of graduating seniors had at least one semester in which they carried less than 15 credits. Among these students, 42 percent of African Americans and 36 percent of Whites cited the need to work as their reason for taking a reduced course load. In the same survey, more than half of all respondents indicated that they were unable to obtain their degrees in eight semesters.

Retention

- North Carolina State has an African American Coordinator in each of its colleges who is the central point of contact for all minority students. During orientation, special activities target African Americans and American Indians.

- University of North Carolina-Chapel Hill has a peer counseling program in which 10 to 15 freshmen are assigned to an upperclassman who assists them in adjusting to college life.

- At Duke, all freshmen are assigned dormitory housing on the East Campus, while upperclassmen have a choice of housing elsewhere on- or off-campus. Duke administrators found that both minority and majority students are more satisfied with their housing during the freshman year (when they are assigned to East Campus) than they are in subsequent years when the choice of housing is theirs.

Faculty and Staff

- At each institution visited, there were professors with reputations for being particularly supportive of minority students. A consequence appears to be that minority students disproportionately pursue majors in MSE departments with supportive faculty.

- Since 1993, Duke has had an initiative to increase the number of African American faculty members in each department. While the institution has seen some success, it has not achieved its goal relative to African American faculty in MSE disciplines.

Advising

- Advising seems to be most strongly structured in the Colleges of Engineering in the UNC System.

- At North Carolina State, formal advising of new minority students is the same as for all entering freshmen.

- Minority students at North Carolina State receive parallel informal advising and counseling from personnel in the Minority Engineering Program (MEP) and from upper-class minority students. MEP personnel monitor the grades of all minority students each semester and intervene as needed. This intervention may take the form of tutoring, individual student counseling regarding external factors that may be distracting the student, and increased contact with upper-class mentors.

- In addition, North Carolina State has a formal mentoring program for minority engineering students. Entering minority freshmen are assigned upper-level minority engineering mentors who are required to keep constant contact with the freshmen and to report any developing concerns. Also, the College of Engineering at North Carolina State hosts drop-in sessions for minority students to meet other minority engineering students and faculty.

Quality of Life

- UNC-Chapel Hill focuses on creating a positive living group experience in its retention efforts. The University views itself as competitive in attracting minority and non-minority students because of the quality nurturing it provides.

- At Duke, social life on campus is dominated by Greek-letter sororities and fraternities. Few minority students are involved with these groups.

- According to the 1996 North Carolina State University Senior Survey, the campus climate was generally seen as supportive of all groups. However, significant differences among racial/ethnic groups existed. About 40 percent of African American respondents perceived the campus climate as being mildly to strongly discriminatory. Also, African Americans perceived low support for other minority and international students.

- Some African Americans at North Carolina State perceived significantly more campus racial conflict and significantly less commitment by the university to minority success. They felt there was a lack of faculty sensitivity to minority issues, and little faculty interest in minority students' academic problems. Also, they noted that they had only minor contact with faculty outside regular office hours.

- About 75 percent of African American respondents said they would choose to attend North Carolina State again, although only 61 percent said they would choose the same major.

Support Programs

- UNC-Chapel Hill noted that its support programs for minority students begin before students arrive on campus. Also, the University provides orientation materials to parents that include a description of the support available to students.

- Within North Carolina State University's College of Engineering, the Minority Engineering Program (MEP) serves as a conduit for special scholarships, internships, summer employment, and permanent job placement activities. The MEP has formal responsibility for developing support programs for minority students.

- The College of Engineering at North Carolina State University runs a tutorial and writing assistance program for all students. Also, it offers a mandatory, introductory engineering course for entering freshmen. A variation of the basic course is specifically designed to help minority students become acclimated to the University's engineering environment. An optional second semester follow-on course is taken by 30-40 percent of the minority engineering students.

- The NSF-supported North Carolina Alliance for Minority Participation (NCAMP) project is supporting minority students at universities across the state and is having a significant impact on the state's production of minorities with bachelor's degrees in MSE disciplines.

- Student organizations at North Carolina State University affiliated with national professional societies lend support to minority students' social and/or academic development. These include the National Society of Black Engineers (NSBE), the Society for Hispanic Professional Engineers (SHPE), and the American Indian Science and Engineering Society (AISES).

Undergraduate Research Opportunities

- North Carolina State has a University-wide requirement for undergraduate research. A full semester of research also is required in the honors program, and a symposium on undergraduate research is held annually.

- In North Carolina State University's College of Engineering, several research centers and faculty offer research opportunities for State's undergraduates. Also, students from other North Carolina institutions are provided an opportunity to conduct research projects at North Carolina State University.

- At UNC-Chapel Hill, undergraduate research/internship opportunities are widely available. Also, high school students have an opportunity to work with researchers in medical school laboratories. A special effort is underway to increase the number of minority students who participate in these activities.

The Importance of Community Colleges to Minority MSE Participation

Given the significant percentage of minority students enrolled in the state's two-year institutions, it is important that efforts be re-doubled to address their disproportionate enrollment in non-transferable courses and their low transfer rates. Some facts about North Carolina's two-year colleges follow as well as several community college-oriented recommendations designed to increase transfer rates at this key transition point en route to the MSE baccalaureate/doctoral degree.

Some Facts About North Carolina's Community Colleges

- In Fall 1995, 33,463 (41 percent) of the 81,412 underrepresented minority students enrolled in higher education institutions in North Carolina were enrolled in community colleges
- In Fall 1996, 31,292 (43 percent) of the 73,192 African Americans enrolled in North Carolina's institutions of higher education were enrolled in community colleges
- In Fall 1996, 1,803 (49 percent) of the 3,655 American Indians enrolled in North Carolina's institutions of higher education were enrolled in community colleges
- In Fall 1996, African American students were at least 25 percent of the total enrollment at 21 (36 percent) of the 58 community colleges in North Carolina
- In Fall 1996, African American student enrollment was at least 40 percent at eight community colleges, and greater than 50 percent at two community colleges (Edgecombe and Roanoke-Chowan)

All public community colleges were mandated by the General Assembly to come up with common course descriptions by June 1, 1997. Specific guidelines were issued by the Assembly:

- Create an advisory committee to develop a credit transfer plan
- Put all community colleges on a semester system
- Develop a three-letter, three-number course coding system
- Establish a Common Course Library for 700 courses, including 170 that would be transferable to UNC System institutions
- Identify a General Education Transfer Core, made up of a 44-hour block of courses, that would be transferable to the UNC System: 6 hours of English, 12 hours of Social and Behavioral Sciences, 12 hours of Humanities/Fine Arts, and 14 hours of Natural Sciences/Mathematics

Expanding and upgrading the role of community colleges is viewed as a clear, cost-effective pathway for students to receive a quality education in their first two years without paying the higher tuition and other costs associated with the first two years at a four-year institution.

What Two-year Institutions in North Carolina Can Do

- A "bridge to teaching" should be established at community colleges that would focus on teachers' aides, public housing residents who have completed or want to complete GED programs, and on current community college students interested in entering the teaching profession.

- Community college faculty, through partnerships with schools/departments of education at institutions providing the state with most of its teachers, should offer training on the instructional uses of technology for: (1) pre-service teachers; and (2) undergraduate faculty who help to prepare teachers.

- Community college faculty should collaborate with faculty at four-year institutions around transfer courses—ensuring compatibility of content and availability of information to students about these courses.

- Community colleges should put into practice the findings of a 1995 Center for the Study of Community Colleges study of policies and programs that affect transfer. In a study of 14 community colleges in seven states (half with transfer rates greater than 25 percent and half with transfer rates below 15 percent), it was found that transfer rates were highest where:

  (1) Students have adequate high school preparation (students have sufficient reading and mathematics skills and are not in need of remedial assistance)

  (2) College personnel make transfer a priority (an organized faculty advising program is in place)

  (3) Clear articulation agreements are in place (articulation agreements as well as common course numbering to help ensure proper credit is given to courses taken in community colleges)

  (4) The college emphasizes liberal arts (the main goal is transfer, with less emphasis on occupational, developmental, and community service)

  (5) Concurrent enrollment is feasible (it facilitates transfer and minimizes transfer shock[6]—a phenomenon defined as the shock experienced by transfer students caused by a dip in grade point average that is so severe the student drops out

  (6) Transfer resource centers are available

  Possible approaches to facilitating transfer include: mentors; peer advising; dual advising; faculty collaboration across institutions; campus tours; transfer day activities; and clear, accessible information on which courses are transferable.

[6] Factors offered to explain transfer shock include: differences in environments at two- and four-year institutions (community college classrooms resemble high schools more than lecture halls in universities); differences in course content and requirements; differences in faculty expectations; student/faculty ratios; and lack of information about what is transferable.

The Bridges Program (Community College to Four-Year College)

The Bridges Program is an effort of the North Carolina Community College System to increase the number of African American, Hispanic, and American Indian students participating in B.A. and B.S. degree programs in MSE fields after the completion of an Associate's degree at a North Carolina community college. The Program, funded by a grant from the National Institutes of Health and now in its third year, provides opportunities for students to work in a university setting with faculty mentors doing laboratory work and conducting research. This hands-on laboratory experience allows students to realize that research is not beyond their capacity.

- Faculty at two-year institutions should enhance their vision of the potential of their students.

  Mathematics and science faculty at two-year institutions should envision their students as being capable of acquiring certain skills, knowledge, and expertise in a range of areas. These include the skills necessary for performing well on standardized tests; the ability to approach new material with confidence and to manage quantitative data with ease; a degree of expertise in the use of the tools of technology; excellent written and oral communcation skills; and the capacity to make informed, discriminating choices.

  Students at two-year institutions ought to be expected to be responsible citizens of the world. As such, institutions should celebrate diversity and help their students to appreciate traditions of different cultures.

Campus resources should support the vision of a student's potential. Institutions should plant and cultivate seeds of interest in science in the surrounding neighborhoods through community outreach programs. The campus culture should assume that African Americans, Hispanic Americans, and American Indians are fully competent to succeed in any field of their choosing. Combinations of effective strategies should be in place to help all students at the institution to reach their goals.

Very importantly, the institution should provide a rigorous intellectual environment. By so doing, the institution can become a magnet for talented minority students, many of whom are likely to be among high school dropouts without appropriate interventions. High academic standards and high expectations of students should enable them to be competitive at four-year institutions and to avoid experiencing "transfer shock."

Observations from Site Visits and Meetings with Presidents of Two-year Institutions

- Professional development opportunities are available for local school teachers at several community colleges. For example, during the past summer, about 600 teachers from North Carolina school districts came to Wake County Community College to receive instruction on the use of technology in education. This activity was supported by a grant from the National Science Foundation through its Advanced Technological Education Program.

- Edgecombe County Community College has initiated a special program to help under-prepared high school students make a successful transition from high school to community college to the workforce or to a four-year institution. The program focuses on instruction in allied health and technical/engineering. These are areas in which entering students have the greatest need for assistance. Community college faculty work closely with high school teachers and are reaching approximately 230 students.

- Tech Prep, a cooperative effort involving Edgecombe County Community College, North Edgecombe High School, and Southwest Edgecombe High School, integrates technical education into the high school curriculum. The program targets high school freshmen and sophomores who are offered the opportunity to enroll in beginning electronics and automation courses at the Community College during their junior and senior years. It prepares these students to pursue careers in technology or engineering at a four-year college.

- At Wake County Community College, a free bus is provided to transport students from downtown Raleigh to the college campus. Ninety percent of the bus riders are minority students.

- The President of Wake County Community College reported having difficulty hiring minority faculty. He attributed this difficulty to the competition from businesses in the Research Triangle where salaries are generally much higher than the salaries of community college faculty. Also, he noted that community colleges in North Carolina do not offer faculty tenure or rank which has a negative impact on their ability to hire faculty.

- Durham Technical Community College (DTCC) has adopted two elementary schools and sends 50 faculty members (25 per school) to these schools once a week to assist students in reading, mathematics, and other academic areas.

- DTCC is in the process of establishing an institute to provide training in the use of technology in education for public school teachers.

- Approximately 70 percent of North Carolina teachers being trained in the use of technology in education are receiving their training from community colleges.

- Piedmont Community College has adopted a nearby middle school and is working with the school to get more students involved in and prepared for college-bound programs.

- Educational leaders from Robeson County Community College, Robeson County Public Schools, and the University of North Carolina-Pembroke meet on a regular basis to discuss and coordinate education improvement efforts.

- Wake County Technical and Community College in Raleigh, through support from the National Science Foundation and Glaxo Wellcome, Inc., has developed a database that provides the names of scientists who are willing to work as volunteers in K-12 classrooms.

- Factors identified as inhibiting the participation of minority community college students in MSE programs included: the belief among students that MSE programs are very difficult and uninteresting; the poor preparation of students in elementary mathematics and science; a lack of positive parental involvement in the students' early exposure to mathematics and science; a perception that science courses along with their laboratory requirements take too much time; and students' mixed priorities about the value of a formal education.

Teacher Education

According to a report by the North Carolina Association of Educators (NCAE), "Minority Educators, An Endangered Species: The Trend Continues in North Carolina's Public Schools," the minority teacher population in North Carolina declined from about 22 percent in 1974-75 to just under 17 percent in 1993-94. However, over this same period, the proportion of minority students has grown steadily, increasing from approximately 30 percent to 34 percent.

The proportion of minority science teachers declined from 19 percent in 1982-83 to 13 percent in 1992-93. During the same period, the proportion of minority mathematics teachers declined from 16 percent to 13 percent.

During 1996-97, approximately 72,000 teachers taught in North Carolina Public Schools, including about 11,500 (16 percent) minority teachers. It is projected that during the decade 1996-2006, about 72,600 new teachers must be hired to meet the state's teacher workforce needs.

Current State-wide Efforts in Teacher Education

North Carolina has a number of state-wide efforts to recruit, retain, and graduate individuals who will teach in the state.

The Teaching Fellows Program

Now in its tenth year of operation, the North Carolina Teaching Fellows program seeks to:

- Give Fellows an academically and culturally enriched program in pre-service teacher education that goes beyond the regular college program
- Provide opportunities and experiences for Fellows that enhance their leadership potential
- Instill Fellows with a sense of mission, service, and professionalism
- Improve the image of teacher education programs at the participating institutions
- Recruit and retain greater numbers of male and minority teacher education candidates in North Carolina

The Program annually awards 400 scholarships to North Carolina high school students who plan to pursue teaching careers; in 1993-94, minority recipients were approximately 24 percent of the awardees. It provides Fellows with a $20,000 loan/scholarship over four years through a state-assisted loan forgiveness program. Recipients have seven years after graduation to repay their obligations by teaching at least four years in North Carolina public schools. A fourth ($5,000) of the loan is forgiven for each year the Fellow teaches.

Other Scholarship/Loan Awards

Students planning to teach in North Carolina's public schools may apply for the Prospective Teacher Scholarship Loan Award or the Teacher Assistant Scholarship Loan Award. During the five-year period, 1989-1994, the Prospective Teacher Scholarship Loan helped produce 186 "new" minority teachers and 1,016 "new" white teachers. According to the North Carolina Association of Educators, 64 percent of these graduates are teaching in North Carolina's public schools.

During the three-year period 1991-1994, the Teacher Assistant Scholarship Loan Award, initiated in 1990, helped 120 minority teacher assistants. More than 75 percent of these assistants are either in college or are currently teaching in North Carolina's public schools.

PROJECT NOVA

Project Nova, with support from the National Aeronautics and Space Administration, is developing and disseminating a national framework for enhancing science, mathematics, and technology literacy for teachers. The objectives of the Project, which operates through a consortium of three universities (University of Alabama, Fayetteville State University, and the University of Idaho), are to: develop and disseminate a national preservice model based on national standards; encourage collaborations between school of education and develop innovative approaches to teacher preparation; link all university sites together through a World Wide Web server; utilize interactive technologies in learning; and help teachers meet the new certification requirements regarding technology.

Excellent Schools Act

The Excellent Schools Act, passed by the North Carolina General Assembly during its 1997 Session, is a comprehensive effort to raise academic standards, teaching standards, and teacher pay. The legislation:

- Establishes new standards, including better preparation for entry-level teachers; higher standards and support for beginning teachers; tougher standards for tenure and tenure reform; and continuous evaluations for career teachers
- Provides higher pay for higher performance (teachers earning National Board Certification will receive a 12 percent pay increase)
- Raises the starting pay for new teachers (from the current $21,330 to $25,000 by the year 2000)
- Raises pay for teachers who meet tougher standards
- Raises pay for extra work (including special assignments such as mentoring new teachers, helping students who are falling behind, or engaging in professional development activities)
- Provides the highest pay for the most experienced and qualified teachers

The Role of Technology

The North Carolina Information Highway (NCIH) was implemented in August 1994 and by May 1996, 125 sites were participating (80 video, 4 data, and 41 with both video and data connections). In 1993, the North Carolina School Technology Commission (NCSTC) was created by the legislature to develop a school technology plan for improving classroom instruction.

The NCSTC conducted a study which showed that the use of technology in North Carolina schools was fragmented and inequitable. Only about 20 percent of schools had a comprehensive technology plan to support teaching and learning, and few schools had a technology infrastructure sufficient to support an effective range of technology tools and applications.

Other findings included the following:

- most teachers had very little access to technology and had not been trained effectively to use existing technology;

- teacher preparation programs were not adequately equipped or prepared to provide staff development and training in technology; and

- recent graduates of North Carolina schools of education were not prepared to integrate technology into the teaching process.

With the ultimate "goal" of teaching North Carolina's 70,000 teachers how to integrate technology into the curriculum in a way that would improve student learning, the NCSTC concluded that the state needed to assume a leadership role in putting technology into schools and fostering its effective use.

To accomplish this, the North Carolina Instructional Technology Plan (ITP) was developed by the NCSTC and subsequently approved by the State Board of Education in February 1995. The Plan outlines several major steps to address the technology problems facing North Carolina's public schools:

The Education Future Center

The Education Future Center is a collaborative effort among the North Carolina School of Science and Mathematics (NCSSM), the University of North Carolina-Chapel Hill, Appalachian State University, and several private sector companies. The Center consists of a central hub on the campus of NCSSM that is linked to seven cyber campuses via a fiber optics network, the North Carolina Information Highway (NCIH). The cyber campuses are distributed across seven economic zones in the state, and each campus receives innovative advanced curricula, enrichment opportunities, teacher training, and technology assistance through the Center.

- All local school districts must develop five-year technology plans based on state criteria
- The General Assembly should allocate up to 10 percent of each school district's state-appropriated funds for local plan development
- Schools across the state need to collaborate to secure reduced rates for equipment, services, and technical support personnel
- New models and networks for integrating technology into the teaching process need to be developed by the Department of Public Instruction. In addition, 20-30 percent of state technology funds should go towards staff development
- Exit competencies need to be developed and implemented for pre-service teachers to ensure demonstrated technology competencies
- State evaluation procedures must be developed to monitor implementation of the state ITP and to evaluate its impact on student achievement
- $381 million needs to be appropriated for educational technology initiatives in the state

Current Status

For the 1995-96 school year, the 118 school districts developed five-year plans and submitted them to (1) the State Board of Education for review of the curriculum and content aspects of the plans; and (2) the Information Resources Management Commission who reviewed the plans' technical aspects. All five-year district technology plans have been approved by both groups.

In October 1995, a School Technology Users Task Force (made up of representatives from K-12, community college, and university systems) identified the technology-related skills or "competencies" that in-service educators should master. Teacher re-certification now requires three-five credit hours (30-40 hours) in technology skills/competencies development.

In addition, the University of North Carolina System received a $2.25 million special appropriation ($1.5 million for equipment and $0.75 million for personnel/technology experts) to train future teachers how to use technology to enhance learning in the public schools.

In a report on the North Carolina Information Highway (NCIH), several key next steps were highlighted:

- Conduct in-depth analysis of the state technology plan focused on the (expected) impact on student learning, workforce readiness, and teacher productivity
- Resolve connectivity, cost, and capacity issues raised during the initial development of the NCIH

- Secure more funding from the state legislature and other sources in order to achieve full/continued implementation
- Implement various proposed strategies from the NCIH plan of action, including a strategy which involves a roll-out plan for connecting K-12 public schools and community colleges.

In addition, the state has begun a program to test eighth graders on cumulative technology skills learned in kindergarten through grade eight. The state-designed assessment, based on technology competencies identified in the state curriculum, requires students to perform tasks and solve problems that involve word processing, database, and spreadsheet skills. Beginning in 2001, all North Carolina public school students will be required to have passed the eighth-grade-level technology assessment to graduate from high school.

"Close-to-Home" Technical Assistance

An underlying assumption in the preparation of North Carolina's Action Plan to increase minority MSE participation has been that the availability of "close-to-home" technical assistance is central to the successful implementation of the Plan.

A questionnaire was sent to the provosts/chief academic officers of all higher education institutions in North Carolina to determine whether their respective institutions were willing to provide, or were in need of, technical assistance in the major areas undergirding the Action Plan. These areas include campus climate; articulation agreements between two-year and four-year institutions; the instructional use of technology; and teacher education.

Areas in which respondents were willing to provide or desired technical assistance included electronic tracking of transfer students, electronic library access, distance learning, the establishment of formal "two-year to four-year bridge" programs, teacher education transfer programs, and curriculum standards.

The Rural Schools Support Program

The Rural Schools Support Program, coordinated by North Carolina State University's Science House, works with science teachers throughout North Carolina's rural areas to improve awareness of and proficiency with technology and computer-based laboratory equipment. The Science House is a learning outreach project of the University's College of Physical and Mathematical Sciences. Annual cohorts of 15-16 teachers from rural school districts assemble at the Science House for four weeks during the summer to learn about new teaching technologies, including computers, laser disks, and microcomputer-based laboratory equipment. Also, the teachers participate in "hands-on" mathematics and science workshops. The primary targets of the program are teachers from rural and low-performing schools, many of which have high minority student enrollments. Once trained, the teachers take the information and knowledge gained and act as mentors for their peers.

The North Carolina Action Plan

Goal One: To maintain or surpass the state's current level of production of underrepresented minority MSE baccalaureate degrees.

North Carolina has consistently exceeded its "fair share" of minority MSE baccalaureate degrees in recent years. The task for educational leaders in the state, therefore, is not only to ensure that this success continues but to broaden the foundation for this achievement.

For example, in 1992-93, two institutions (North Carolina A&T State University and North Carolina State University) produced 74 percent of the baccalaureate degrees earned by minorities in mathematics, the physical sciences, and engineering (MPSE) at the state's "top ten" institutions (see Table 4 below). This phenomenal production occurred despite the fact that they enrolled only 35 percent of the underrepresented minority students at the "top ten" institutions (see Table 5).

Table 4: "Top Ten" Institutions in Underrepresented Minority MSE Baccalaureate Degrees Awarded, 1992-93, Ranked by Number of Degrees Awarded in Mathematics, the Physical Sciences, and Engineering (MPSE)

Institution	Number of Minority MPSE Degrees Awarded	Number of Minority Life Science Degrees Awarded	Number of Minority Social Science Degrees Awarded	**Total Number of Minority MSE Degrees Awarded**
North Carolina A&T State University	174	18	29	**221**
North Carolina State University	95	22	28	**145**
North Carolina Central University	24	30	142	**196**
Duke University	19	11	39	**69**
Elizabeth City State University	12	11	0	**23**
University of North Carolina - Chapel Hill	11	30	66	**107**
University of North Carolina - Pembroke	8	22	49	**79**
Saint Augustine's College	8	5	58	**71**
Johnson C. Smith University	7	8	0	**15**
Bennett College	7	4	0	**11**
Total for "Top Ten" Institutions	**365**	**161**	**411**	**937**

Source: Unpublished data, National Center for Education Statistics, U.S. Department of Education
Note: 39% of the MSE degrees awarded by these ten institutions were in MPSE fields while 44% were in the social sciences.

Table 5: Enrollment/Minority MPSE Degree Information
"Top Ten" Institutions, 1992-93

Institution	Total Enrollment	Number of Minorities (% of Total Enrollment)	% of Total Minority Enrollment at "Top Ten"	% of Total Minority MPSE Degrees Awarded by "Top Ten"
North Carolina A&T University	7,723	6,951 (90%)	28.5%	48%
North Carolina State University	27,766	2,915 (10.5%)	11.9%	26%
North Carolina Central University	5,681	4,783 (84.2%)	19.6%	7%
Duke University	11,426	1,097 (9.6%)	4.5%	5%
Elizabeth City State University	2,019	1,500 (74.3%)	6.1%	3%
University of North Carolina - Chapel Hill	23,977	2,494 (10.4%)	10.2%	3%
University of North Carolina - Pembroke	3,041	1,073 (35.3%)	4.4%	2%
Saint Augustine's College	1,918	1,740 (90.7%)	7.1%	2%
Johnson C. Smith University	1,278	1,274 (99.7%)	5.2%	2%
Bennett College	635	612 (96.4%)	2.5%	2%
Total for "Top Ten" Institutions	**85,464**	**24,439 (28.6%)**	**100%**	**100%**

Source: *The Chronicle of Higher Education*, February 23, 1994

Table 6 sets forth a "fair share" allocation for these institutions, based on their proportion of the state's Fall 1995 enrollment of minorities in higher education institutions, and it reflects their actual contributions during 1995-96. Once again, North Carolina A&T State University and North Carolina State University made disproportionate contributions to the production of underrepresented minority MPSE degrees, accounting for almost 75 percent of the minority MPSE degrees. Together, the "top ten" institutions accounted for 80 percent of the 524 minority MPSE degrees awarded by all higher education institutions in the state that year.

Table 6: Projected MSE and Actual Minority MSE and MPSE Baccalaureate Degrees Awarded by the "Top Ten" Institutions, 1995

"Top Ten" Institutions	Number of Minorities (% of State's Total Minority Four-year Enrollment)	Projected Contribution to State's Share of National MSE Goals	Minority MSE Degrees Awarded (% of Projected Contribution Achieved)	Minority MPSE Degrees Awarded (MPSE % of Minority MSE Degrees)
North Carolina A&T State University	6,922 (14.4%)	216	278 (129%)	215 (77%)
North Carolina State University	3,164 (6.6%)	99	147 (149%)	99 (67%)
North Carolina Central University	4,661 (9.7%)	146	180 (123%)	14 (8%)
Duke University	1,243 (2.6%)	39	133 (341%)	38 (29%)
Elizabeth City State University	1,492 (3.1%)	47	47 (100%)	6 (13%)
UNC - Chapel Hill	2,737 (5.7%)	86	116 (135%)	14 (12%)
UNC - Pembroke	1,170 (2.4%)	36	47 (131%)	10 (21%)
Saint Augustine's College	1,636 (3.4%)	51	62 (122%)	7 (11%)
Johnson C. Smith University	1,391 (2.9%)	44	42 (95%)	17 (41%)
Bennett College	611 (1.3%)	20	13 (65%)	1 (8%)
Total for "Top Ten" Institutions	**25,003 (52%)**	**784 (52%)**	**1,065 (136%)**	**421 (41%)**
Total for four-year institutions in North Carolina	47,949 (100%)	1,500 (100%)	1,677 (112%)	524 (100%)

Sources: *Chronicle of Higher Education*, May 23, 1997
Unpublished Data, U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS)

With the baseline goal for the state's proportionate share of national goals being met each year, the state should focus efforts on sustaining this success and on encouraging broader institutional participation in this achievement.

Demographic projections for the state indicate that the rate of its population growth will slow to align more closely with national growth and the minority proportion of that population will follow a similar pattern. While North Carolina's share of the total U.S. minority population is not likely to change significantly in the years ahead, its labor force projections reinforce the concern for minority MSE degree production.

With an economy undergirded by high technology industries and research enterprises, merely sustaining a "fair share" based on national goals will not meet the state's needs in the years ahead. While immigration into the state will provide some of these resources, it is essential that North Carolina address this underrepresentation from among those being prepared by the state's educational system.

Strategies to sustain and increase minority MSE baccalaureate degree production should not neglect a potential, but under-tapped resource—North Carolina's community colleges. Therefore, the following strategies are addressed to two-year and four-year institutions in the state, as appropriate for their respective roles in higher education.

Goal One: To maintain or surpass the state's current level of production of underrepresented minority MSE baccalaureate degrees.

Strategies for Achieving Goal One:

Strategy 1.1: Enhance programs and replicate successes of higher education institutions that enroll significant numbers of underrepresented minorities.

In 1996-97, 20 institutions in North Carolina accounted for 89 percent (38,582) of the underrepresented minority student enrollment in the state's four-year institutions, while 20 of its 58 community colleges enrolled 68 percent (22,625) of the underrepresented minorities attending two-year institutions. Outreach efforts and other environmental features at these institutions provide fertile models for attracting minority students, models that other North Carolina colleges and universities could replicate.

With this large representation of minority students enrolled, it is essential that programs at the respective set of four-year and two-year institutions provide cutting-edge instruction to both motivate and retain students through to graduation.

Strategy 1.2: Build on demonstrated interest, commitment, and success within the state.

Institutions and programs with noted success in graduating minorities in MSE fields need to be recognized, rewarded, and sustained in their efforts. *The significant leadership roles of North Carolina A&T State University and of North Carolina State University in the production of underrepresented minority MSE baccalaureate degrees ought to be acknowledged, emulated, celebrated, and financially supported.*

Environmental and programmatic features at these institutions should be supported and replicated at other North Carolina institutions. Programs that build on students' MSE interests and talents assist in retaining students through graduation and guiding them to MSE career options.

Institutions should encourage minority student participation and leadership in student chapters of MSE professional societies that already exist on campus as well as encourage the establishment of

Strategies to Achieve Goal One

- *Enhance and replicate successes at institutions with significant minority enrollments*
- *Build on demonstrated interest, commitment, and success*
- *Ensure that each institution contributes its "fair share"*
- *Focus on key transition points along the educational pathway*
- *Ensure that college graduates are fully prepared for success at work or in graduate school*
- *Ensure that courses and programs are aligned/coordinated with state or national educational reform efforts*
- *Provide "close-to-home" technical assistance*

student chapters of minority MSE professional organizations. Institutions also should provide and identify other apprenticeship and internship opportunities for students interested in MSE areas.

The North Carolina Department of Labor should assist in the development and promotion of such apprenticeships and internships, paying special attention to students from underrepresented groups in MSE fields.

Strategy 1.3: Urge each MSE degree-granting institution in North Carolina to examine its "fair share" of the state's minority MSE degree proportionate contribution and provide evidence of top level commitment to meeting these goals.

While institutions that are successful in graduating minorities with MSE degrees are the backbone of North Carolina's success in this area, a broader foundation for minority MSE degree production is required for the long term.

Each institution should develop a vision from the "top" that conveys the institution's commitment as well as its existing/planned course of action for addressing the underrepresentation of minorities in MSE fields.

Strategy 1.4: Focus on key transition points along the educational pathway.

A substantial body of research supports the efficacy of focusing on transition points when designing strategies to affect degree production. Key transition points particularly affecting baccalaureate degree production include:

- Third to fourth grade
- Middle/junior high to high school
- High school to two- or four-year college
- Freshman year to sophomore year in college
- Two-year to four-year institution

Early Nurturing. Every college could follow the lead of Durham Technical Community College by adopting local area elementary schools and sending faculty and students to these schools on a regular basis to assist students in reading, mathematics, and other academic areas. College faculty and students can assist elementary school teachers in cultivating early interest in their students in mathematics and science through hands-on science activities, mathematical games and puzzles, and electronic as well as actual field trips to science centers and/or museums.

Summer Research Program. A summer research apprenticeship program for high school students in North Carolina similar to the national NASA SHARP PLUS Program at North Carolina A&T State University would provide talented mathematics and science students an opportunity for a residential, mentored research apprenticeship on a college campus. Such hands-on experiences, shared with peers with similar interests and talent in a non-hostile campus setting, reinforce MSE interests and confidence in the student apprentices.

Freshman Advising. The approach to, and effectiveness of, freshman advising should be reviewed at each higher education institution with an eye toward strengthening advising for all students, including those interested in MSE fields. Advisors may require formal training and additional resources. North Carolina A&T State University's Advisors' Handbook, distributed to all new faculty, is designed to provide faculty with information they will need for success in this role.

Computer-based Instruction and Advising. Substantial use should be made of computer-based instructional modules to facilitate targeting specific instructional and/or advising needs of individual students.

Peer Mentoring. Peer mentors who are MSE majors should be used to provide such assistance as well as to reinforce their own MSE interest and understanding, thereby increasing the likelihood that they, too, will stay on the MSE track.

Gatekeeper Courses. Gatekeeper courses at the K-12 and undergraduate levels can provide significant barriers to students interested in MSE majors. NSF provides support to various institutions in North Carolina in the area of undergraduate curriculum reform, including North Carolina State University's work in restructuring engineering education and a national collaboration involving Duke University in which follow-up courses for students who have had "reformed" calculus are developed.

These projects can improve the quality of MSE instruction and affect the retention of more students in MSE fields. The lessons learned from such projects should be broadly shared with other institutions in the state.

Professional Development for Those Who Teach Gatekeeper Courses. Each K-12 and higher education institution in the state should ensure/provide professional development for faculty who teach MSE gatekeeper courses at the pre-college or college levels. The goal should be to ensure that such faculty are: (1) well-prepared in the subject area; and (2) able to offer quality instruction, using a variety of pedagogical strategies, including multimedia.

Support for First Generation College Students. First generation college students are a potential pool of students who, with encouragement, might pursue degrees in MSE or mathematics and science education. Efforts to address both students' and parents' concerns are essential to their retention in college. Bennett College recognizes this need with its Parents' Hotline, a straightforward, effective strategy for addressing parental concerns for first-time college students.

The Freshman-Sophomore Transition. The freshman-sophomore year transition serves as a critical barrier for many college students. North Carolina State University seeks to remove this obstacle with its First Year College Program, providing intensive support and non-academic counseling throughout the freshman year. This transition also can be eased by efforts to improve the quality of freshman course instruction such as assigning senior level faculty to teach these courses and rewarding faculty for teaching as well as research.

Formal training for teaching assistants also is quite important at institutions where teaching assistants are used. The Center for Research in Science and Mathematics Education at North Carolina State has developed a model program for training teaching assistants.

Winston-Salem/Forsyth County Schools Comprehensive Partnership for Mathematics and Science Achievement (CPMSA)

This project, supported under a grant from the National Science Foundation, seeks to eliminate the negative message that the failure of African American students in mathematics and science is acceptable.

CPMSA targets African American students residing in Winston-Salem's designated Enterprise Community. It offers mathematics and science content training for teachers; sensitivity training for teachers, counselors, and administrators; academic support systems for students; information and support for parents; and university and community involvement.

CPMSA's goals are to significantly increase: K-12 student participation in mathematics and science activities; enrollment in gatekeeper courses; and the number who go on to major in MSE fields. Collaborating partners are Winston-Salem State and Wake Forest Universities; SciWorks Environmental Park of Forsyth County; the National Urban League; and the YMCA.

Two-year to Four-year Transition for MSE Majors. Articulation agreements between two-year and four-year institutions should provide seamless transitions into MSE majors. The newly instituted articulation agreements between the North Carolina Community College System and the University of North Carolina System hold considerable promise for such a transition. They need to be monitored to assess their effectiveness in this regard, with a baseline established now to make future comparisons meaningful.

Student Preparedness All Along the Pathway. Strategies must be in place at each part of the education pathway to ensure that students are informed about and prepared for the choices and courses they will encounter at the next transition point.

Four-year colleges and universities should form partnerships with high schools and community colleges designed to ensure student preparation and understanding of basic mathematics and science concepts to facilitate their transfer to, and MSE success at, the four-year college level.

"Close-to-home" Technical Assistance. "Close-to-home" technical assistance between high schools and two-year colleges and between two-year colleges and four-year colleges can be both cost-effective and efficient. The two-year college/four-year college component of the partnership can significantly reduce the cost of an undergraduate education as well as the level of financial aid needed to complete the undergraduate degree. However, geographical distance between two- and four-year institutions should not become a barrier that limits opportunities for students in low-wealth counties.

Dual School-College Enrollment. Institutions should offer more opportunities for high school students with special talent and interest in MSE to obtain college credit for introductory MSE college-level courses offered on campus or through distance learning. Such dual enrollment will increase the likelihood that these students will go to college and remain on the MSE baccalaureate/ doctoral track.

Expansion of Opportunities in Low-wealth Counties. Community colleges with resources and MSE course offerings not available at other community colleges, especially those in low-wealth counties, should:

- provide technical assistance in their areas of strength to faculty at low- wealth community colleges;

- allow cross-registration of students in their region, on a space available basis; and

- make available regionally other college preparatory resources that may not be available at community colleges in low-wealth counties.

High School to College Transition. Each higher education institution should establish/maintain a learning resource center on campus to:

- address academic deficiencies/weaknesses among entering students in specific subject areas, particularly in mathematics and English; and

- strengthen skills needed for success in college (for example, problem-solving, analytical reasoning, oral and written communications, computer, and note taking skills).

In addition, each institution should offer a required freshman seminar on the use of technology as an educational and research tool.

Strategy 1.5: Ensure that undergraduate education in MSE fields in North Carolina fully prepares underrepresented students for work in industry, research, or graduate school.

Research experiences at the undergraduate level are an essential component of this preparation. Efforts such as Duke University's Engineering Research Center for Emerging Cardiovascular Technologies Outreach Program to students at five Historically Black Colleges and Universities should be replicated. Students from these institutions are provided quality, mentored research experiences in the Center's laboratories.

Each institution should require all students majoring in MSE fields as well as those preparing to enter mathematics and science teaching to participate in a laboratory-based research activity. Such research opportunities should be made available throughout a student's undergraduate years.

Students should be trained in the use of technology as an instructional aid to enhance their studies and prepare them for research opportunities in MSE.

Each institution should provide in-depth computer training for faculty so that they are not only able to use technology for instructional purposes, but are able to assist their students in acquiring the computer skills the students will need to be successful in MSE fields at the college level. Use of undergraduate computer science majors or others with strong computer skills to provide the proposed training should be strongly considered.

To facilitate students' consideration of and entry into graduate school, undergraduate institutions should provide MSE majors with admissions information and financial counseling.

Strategy 1.6: Ensure that K-16 courses and programs are aligned/coordinated with state or national educational reform efforts.

Faculty should consider whether freshman level MSE courses need to be re-designed in light of major course and curriculum reform efforts. Technology-assisted instruction,

including distance learning, should be explored. Data also must be gathered at the institutional level in order to fairly assess the "value-added" by the recently enacted articulation agreements.

Strategy 1.7: Identify and make known "close-to-home" technical assistance that is available or needed at each institution.

Electronic strategies such as those envisioned for the North Carolina School of Science and Mathematics-based Education Future Center and the Department of Public Instruction's Technology Technical Assistance Group should be adequately supported. This would help ensure the delivery of high quality mathematics and science instruction across North Carolina as well as stimulate early interest in teaching by students who benefit from such creative uses of technology.

Teachers needing technical assistance should be connected to appropriate experts from diverse racial and ethnic backgrounds.

A Clearinghouse should be created for pre-college mathematics- or science-oriented outreach programs offered by the colleges and other groups in the state to facilitate:

- sharing of effective strategies and lessons learned;
- the availability of assistance that is sequential or linked to mathematics/ science courses required at different grade levels in school;
- coordination of efforts and pooling of resources; and
- sharing successful MSE recruitment and retention strategies at the college level, especially those that are minority-focused.

The approach used in the Edgecombe Community College Tech Prep partnership with local high schools should be replicated at other community colleges in North Carolina. Such partnerships can ensure that high school students planning to enter MSE-related degree programs at the community college level have the pre-requisite knowledge and understanding of basic mathematical and scientific concepts as well as of how to apply these concepts in relevant ways.

North Carolina Alliance for Minority Participation (NCAMP)

North Carolina A&T State University is the lead institution in an eight-member institutional collaboration supported by the National Science Foundation. The primary goal of NCAMP is to significantly increase the number of minority students earning B.S. degrees and subsequently pursuing Ph.D. degrees in MSE disciplines. The NCAMP institutions support about 4,700 minority MSE majors.

During the 1996-97 academic year, 840 minority students from NCAMP institutions earned degrees in MSE disciplines. Due in no small part to their undergraduate research experiences, many of these graduates have entered graduate school to pursue M.S. and Ph.D. degrees.

NCAMP seeks to achieve its projections through: curriculum reform of gatekeeper courses in MSE disciplines; summer bridge programs for newly admitted students; undergraduate research; and an annual national forum at which students can present their research results.

Goal Two: To increase the state's production of underrepresented minority MSE doctoral degree recipients to a level that represents the state's proportionate contribution.

To achieve its proportionate contribution of the national goal for minority doctoral recipients in mathematics, science, or engineering by the year 2000, North Carolina would need to produce 60 underrepresented minority doctoral degree recipients annually, assuming its proportion of the total minority higher education enrollment remains around three percent.

Tables 7-9 below focus on the three North Carolina institutions that award the majority of doctoral degrees in non-social science MSE fields in the state, regardless of race/ethnicity. The tables provide data demonstrating the magnitude of the challenge. A table for North Carolina A&T State University (Table 10) also follows because this predominantly Black institution now offers doctoral degrees in two engineering fields (mechanical and electrical).

Table 7: Full-Time Graduate Enrollment in MSE Doctoral Degree-Granting Institutions in North Carolina by Race/Ethnicity, Gender, and Citizenship, 1996

DUKE UNIVERSITY

Field	Foreign		Black		American Indian		Asian		Hispanic		White		Grand Total by Gender		**Total**
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
ALL	429	205	83	90	4	5	97	62	33	30	1,270	1,010	1,916	1,402	**3,318**
Engineering	75	17	4	1	0	0	13	2	1	0	98	38	191	58	**249**
Bio/Life Sciences	33	30	6	6	1	0	15	13	2	2	157	144	214	195	**409**
Math	16	10	1	0	1	0	0	1	0	1	14	3	32	15	**47**
Phy sical Sciences	33	14	2	1	0	1	2	2	0	2	88	25	125	45	**170**
Total MSE (Gender)	157	71	13	8	2	1	30	18	3	5	357	210	562	313	**875**
Total MSE	228		21		3		48		8		567		875		
% of Total MSE	26.1%		2.4%		0.3%		5.5%		0.9%		64.8%		100.0%		

Source: Duke University, October 31, 1996

If Duke University is to be the source of a significant number of underrepresented minority non-social science MSE doctoral degree recipients, it must increase its efforts. Only 32 (4 first-time, 28 second-year and above) underrepresented minority students are among the 875 (181 first-time, 694 second-year and above) full-time MSE graduate students at Duke University.

The four first-time, full-time underrepresented minority graduate students are distributed among the first-time, full-time students and departments as follows: 1 Black out of 64 students in Engineering; 2 Blacks and 1 Hispanic out of 77 in biological/life sciences; 0 out of 7 in mathematics; and 0 out of 33 in the physical sciences.

Table 8: Full-Time Graduate Enrollment in MSE Doctoral Degree-Granting Institutions in North Carolina by Race/Ethnicity, Gender, and Citizenship, 1996

NORTH CAROLINA STATE UNIVERSITY

Field	Foreign		Black		American Indian		Asian		Hispanic		White		Grand Total by Gender		**Total**
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
ALL	374	155	75	123	5	3	79	51	20	19	1,380	1,054	1,933	1,405	**3,338**
Engineering	164	38	16	8	2	0	42	10	7	3	345	67	576	126	**702**
Life Sciences	27	32	3	7	0	1	8	6	3	3	152	104	193	153	**346**
Math	27	10	0	2	0	0	7	3	1	0	49	18	84	33	**117**
Physical Sciences	29	16	2	1	0	0	2	3	0	0	90	41	123	61	**184**
Total MSE (Gender)	247	96	21	18	2	1	59	22	11	6	636	230	976	373	**1,349**
Total MSE	343		39		3		81		17		866		1,349		
% of Total MSE	25.4%		2.9%		0.2%		6.0%		1.3%		64.2%		100.0%		

Source: University of North Carolina - General Administration Planning/OCR.ER009/28/OCT96

Unless a major recruitment effort is developed, North Carolina State University will not be the source of a significant number of underrepresented minority non-social science MSE doctoral degree recipients, despite its major contributions at the undergraduate level. The 1,349 (147 first-time, 1,202 second-year and above) full-time MSE graduate students at the institution include just 59 (3 first-time, 56 second-year and above) underrepresented minorities.

The 3 first-time, full-time underrepresented minority students are distributed among the 147 first-time, full-time graduate students and departments as follows: 0 out of 71 students in Engineering; 1 Black and 1 American Indian out of 37 in the life sciences; 1 Hispanic out of 5 in mathematics; and 0 out of 34 in the physical sciences.

Table 9: Full-Time Graduate Enrollment in MSE Doctoral Degree-Granting Institutions in North Carolina by Race/Ethnicity, Gender, and Citizenship, 1996

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

Field	Foreign		Black		American Indian		Asian		Hispanic		White		Grand Total by Gender		**Total**
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
ALL	152	103	41	95	4	3	29	33	15	20	809	968	1,050	1,222	**2,272**
Engineering	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**NA**
Life Sciences	34	30	5	22	1	0	9	12	2	3	125	130	176	197	**373**
Math	11	4	0	0	1	0	0	1	3	1	17	12	32	18	**50**
Physical Sciences	17	12	2	5	1	0	4	1	0	0	102	45	126	63	**189**
Total MSE (Gender)	62	46	7	27	3	0	13	14	5	4	244	187	334	278	**612**
Total MSE	108		34		3		27		9		431		612		
% of Total MSE	17.6%		5.6%		0.5%		4.4%		1.5%		70.4%		100.0%		

Source: University of North Carolina - General Administration Planning/OCR.ER009/28/OCT96

The University of North Carolina at Chapel Hill does not offer degrees in Engineering at either the undergraduate or graduate level. As Table 9 reveals, the University will not produce significant numbers of underrepresented minority non-social science MSE doctoral degree recipients without considerable intervention. The 612 MSE graduate students at Chapel Hill include only one underrepresented minority student among the 14 first-time, full-time MSE graduate students at the institution and only 45 underrepresented minority students among the 598 second-year and above MSE graduate students.

The one first-time, full-time underrepresented minority student among the 14 first-time, full-time graduate students was a Black student who was one of 10 students in the life sciences. Mathematics had only one first-time, full-time student and the physical sciences had only three.

Table 10: Full-Time Graduate Enrollment in MSE Doctoral Degree-Granting Institutions in North Carolina by Race/Ethnicity, Gender, and Citizenship, 1996

NORTH CAROLINA A&T STATE UNIVERSITY

Field	Foreign		Black		American Indian		Asian		Hispanic		White		Grand Total by Gender		**Total**
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
ALL	28	5	98	224	0	0	13	3	0	0	78	93	217	325	**542**
Engineering	24	3	24	13	0	0	9	0	0	0	13	5	70	21	**91**
Life Sciences	0	0	2	6	0	0	0	0	0	0	3	2	5	8	**13**
Math	1	0	1	2	0	0	0	0	0	0	0	0	2	2	**4**
Physical Sciences	1	0	2	4	0	0	0	0	0	0	0	0	3	4	**7**
Total MSE (Gender)	26	3	29	25	0	0	9	0	0	0	16	7	80	35	**115**
Total MSE	29		54		0		9		0		23		115		
% of Total MSE	25.2%		47.0%		0.0%		7.8%		0.0%		20.0%		100.0%		

Source: University of North Carolina - General Administration Planning/OCR.ER009/28/OCT96

North Carolina A&T State University's second of two doctoral degree programs was only recently approved. Therefore, it will take some time before the institution becomes a major source of underrepresented minority non-social science MSE doctoral degree recipients. The 115 full-time MSE graduate students at North Carolina A&T State include 4 underrepresented minorities among the 14 first-time, full-time MSE graduate students at the institution and 50 underrepresented minority students (45 percent) among the 111 second-year and above MSE graduate students.

The four first-time, full-time underrepresented minority graduate students among the 14 first-time, full-time graduate students at North Carolina A&T State University were two Blacks (out of ten first-time, full-time graduate students) in Engineering; none (out of two) in the life sciences; one Black (out of one) in mathematics; and one Black (out of one) in the physical sciences.

Table 11: Summary Table of Full-Time Graduate Enrollment by Nationality, Race/Ethnicity in Four MSE Doctoral Degree-Granting Institutions in North Carolina, Fall 1996

MSE Graduate Total	Foreign	Black	American Indian	Asian	Hispanic	White	Total
First-time	96	9	1	23	2	225	356
Second year & above	612	139	8	142	32	1,662	2,595
Total	708	148	9	165	34	1,887	2,951

Sources: Duke University, October 31, 1996
University of North Carolina - General Administration Planning/OCR.ER009/28/OCT96

As Table 11 indicates, in Fall 1996, only 191 underrepresented minority students (6.5 percent) were among the 2,951 full-time MSE graduate students enrolled at the four North Carolina institutions offering doctoral MSE degrees (Duke University, North Carolina State University, University of North Carolina at Chapel Hill, and most recently, North Carolina A&T State University). These 191 students were distributed as follows: 32 (17 percent) at Duke, 59 (31 percent) at North Carolina State, 46 (24 percent) at UNC-Chapel Hill, and 54 (28 percent) at North Carolina A&T State.

Only 12 underrepresented minorities (3.4 percent) were among the 356 first-time, full-time MSE graduate students enrolled at the four institutions. They represented only 6.9 percent (179) of the 2,595 second year and above full-time MSE graduate students at these institutions.

It would be from this meager pool of full-time underrepresented minority graduate students that each year the approximately 60 minority MSE doctoral degree recipients would have to come. **It is astonishing and disappointing that, out of a pool of the 1,670 underrepresented minority MSE baccalaureate degree recipients produced in North Carolina during 1995-96, only 12 entered an MSE graduate program in North Carolina on a full-time basis in Fall 1996.**

It is not unreasonable to challenge the four MSE doctoral degree-granting institutions, with additional support, to annually produce their proportionate share of the 60 MSE underrepresented minority doctorates needed for North Carolina to make its proportionate contribution to the national goal of 2,000.

Using the percentage distribution of the currently enrolled first-time underrepresented students at these four institutions cited above as a guide, Duke University's annual proportionate share would be 10 underrepresented minority MSE doctoral degree recipients (17 percent of 60); North Carolina State's would be 19; Chapel Hill's share would be 14; and North Carolina A&T State's would be 17.

While other institutions in the state award MSE doctoral degrees (for example, Wake Forest, UNC-Greensboro, and UNC-Charlotte), the numbers awarded are relatively small and underrepresented minorities are seldom among the recipients.

The doctoral challenge is clear. Strategies for meeting this challenge follow.

Strategies for Achieving Goal Two:

Strategy 2.1: Urge each doctoral degree-granting institution in North Carolina to develop a vision statement from the "top" that is backed by tangible actions and commitment of resources to address the serious underrepresentation of African Americans, American Indians, and Hispanics among MSE doctoral degree recipients.

The Governor of North Carolina, the President of the UNC System, and the Chancellors of North Carolina A&T State, North Carolina State, and UNC-Chapel Hill, along with the President of Duke University should each make a public statement about his/her office or institution's commitment to doing its share to meet the doctoral challenge. Their statements should outline concrete and specific actions and steps that will be taken to back their commitment.

Strategy 2.2: Establish a formal undergraduate to gra-duate bridge program to facilitate the matriculation of underrepresented minority MSE students into MSE doctoral programs in North Carolina.

Formal bridge programs should be developed between each undergraduate institution that produces a significant number of underrepresented minority MSE baccalaureate degree recipients (see Table 4) and one or more of the four MSE doctoral degree-granting institutions discussed above. Such programs should include mentored summer research opportunities, university fellowships, teaching and research assistantships, and other forms of non-loan financial assistance.

Strategies to Achieve Goal Two

- *Take tangible actions to increase the number of underrepresented minority MSE doctoral degree recipients*
- *Establish a formal undergraduate to graduate bridge program*
- *Hire a professional to monitor and coordinate undergraduate/graduate bridge partnerships*
- *Emphasize pursuing MSE doctorates when advising underrepresented minority MSE majors*
- *Provide mentored, research opportunities for all MSE majors*
- *Provide research presentation opportunities with peers and faculty as well as at national and regional meetings*
- *Target institutions that produce significant numbers of minority MSE baccalaureate degree recipients to identify a rich pool of potential minority MSE doctorates*
- *Recognize and reward institutions that produce minority MSE doctorates*

Strategy 2.3: Hire a professional to monitor and coordinate the proposed undergraduate/graduate bridge partnerships between various institutions in the state.

A full-time professional with a science or engineering background is needed to ensure that the proposed bridge partnerships are effective in easing the students' transition from undergraduate to graduate school. This individual would be essentially an ombudsperson for the graduate students. He/she would:

- meet with students individually to learn how they are adjusting to their new environments and whether they are having a positive experience

- help ensure that the graduate school environments are hospitable and supportive of the new students

- provide feedback as well as enhance communications between faculty across the institutions about individual students, curriculum compatibility, undergraduate preparation, and prerequisite courses/skills expected of entering graduate students

- assist in identifying external resources of support for multi-year fellowships to supplement university support for these students, assuming they are making satisfactory and steady progress toward the MSE doctoral degree

Strategy 2.4: Encourage each undergraduate degree-granting institution in the state to emphasize pursuing MSE doctorates when advising underrepresented minority MSE majors.

Strategy 2.5: Urge each baccalaureate degree-granting institution to provide mentored, research opportunities for all of its MSE majors.

Strategy 2.6: Strongly encourage each baccalaureate degree-granting institution to provide and support research presentation opportunities for underrepresented students at national and regional meetings.

An exemplary collaborative effort that provides undergraduate students such opportunities each year is the North Carolina Consortium on Undergraduate Research's Annual Conference. By rotating the Conference site among the geographically dispersed member campuses, the seven-member Consortium enables significant numbers of MSE and non-MSE students to become involved either as presenters or Conference participants.

Consortium members include five HBCUs (Elizabeth City State, Fayetteville State, North Carolina A&T State, North Carolina Central, and Winston-Salem State), an institution enrolling a significant number of American Indian students (UNC-Pembroke), and an institution with strong emphasis on undergraduate research (UNC-Asheville).

Strategy 2.7: Initially target institutions that produce significant numbers of minority MSE baccalaureate degree recipients such as North Carolina A&T State University and North Carolina State University as a means of identifying a rich pool of potential minority MSE doctorates.

During 1992-93, North Carolina A&T State University and North Carolina State University together produced 269 underrepresented minority MPSE degree recipients (74 percent of the MPSE degrees awarded that year to underrepresented minority students by the "top ten" institutions in North Carolina and 61 percent of all such degree recipients in the state).

These institutions have a long track record in producing high quality graduates. Each of these institutions would likely encourage its graduates to pursue graduate study at a different institution. However, it should be possible to establish a clear pathway into an MSE doctoral degree-granting institution in North Carolina for some of the graduates of these institutions.

The alignment of course requirements for undergraduate majors with first-year graduate program course work, by MSE discipline, could facilitate undergraduate to graduate school transition and persistence to the doctorate.

Strategy 2.8: Recognize and reward institutions that produce minority MSE doctorates.

Institutions and individuals need to be publicly acknowledged for their accomplishments. Such publicity could help build the momentum that is needed for the state to attract students in larger numbers so the state can make its doctoral contributions and produce "home-grown," high quality graduates to help meet its academic and research needs.

Bioscience Research Initiative for Doctoral Graduate Education (BRIDGE)

BRIDGE is a partnership involving five campuses in North Carolina. It supports graduate students in pursuit of the M.S. degree at three Historically Black Universities and promotes their entrance into biomedical and bioscience Ph.D. programs at North Carolina State University. The BRIDGE partners are North Carolina State, North Carolina A&T State, North Carolina Central, Fayetteville State, and UNC-Pembroke. Students receive financial assistance during their master's degree study at one of the Black University partners, and they are accepted into North Carolina State once they have completed their M.S. degrees. They are provided with special mentors and access to specialized equipment. Also, BRIDGE fosters research collaborations between faculty at North Carolina State University and faculty of the other partners, enhances the curricula of the partners through seminars and other professional activities, and offers specialized training in biotechnology for participating faculty and students.

Goal Three: To increase the state's production of underrepresented minority teachers, including mathematics and science teachers, to a level that represents the state's proportionate contribution.

To achieve its proportionate contribution of the national goal for minority teachers, assumed in 1997 to be 3.0 percent, North Carolina would have to produce 900 minority teachers annually by the year 2000, 30 percent (270) of whom should be mathematics and science teachers.

Strategies for Achieving Goal Three:

Strategy 3.1: Establish a Teacher Cadet Corps for high school students in the 30 school districts that enroll the highest number of minority students.

A long-term effort to address the state's minority teacher shortage should be focused on these districts because, together, they enroll more than 70 percent of all of the minority students at the K-12 level in North Carolina. Such an initiative should lead to a clear pathway from high school through the Master of Arts in Teaching degree.

The proposed Teacher Cadet Corps is one such long-term strategy. It would focus on minority high school rising juniors and seniors from the 30 targeted districts. Corps members would be given the opportunity to participate in academic year and summer experiences to increase their awareness of and interest in the teaching profession. These experiences would be offered through a collaboration of high schools and neighboring two-year and four-year colleges with significant minority student enrollments.

Strategy 3.2: Intensify efforts to recruit minorities, including teacher's aides and other paraprofessionals in education, into pre-teaching and pre-science programs at community colleges and into teacher certification programs at four-year institutions.

Teacher's" aides are already familiar with the school as a workplace and many have a very strong interest in working with students. With encouragement, counseling, financial support, and a clearly defined pathway into teacher education programs from their current positions, many of these individuals would be sufficiently motivated by their interest in working with students as well as by the opportunity to further their education and careers. Currently, there are 22,000 teacher's aides in the state; they represent a rich and largely untapped source of future teachers.

Strategies to Achieve Goal Three

- *Establish a Teacher Cadet Corps for high school students*
- *Intensify efforts to recruit minorities into teaching*
- *Ensure that articulation and transfer agreements facilitate entry into teacher education*
- *Strengthen institutional efforts to retain minority students on the teaching track*
- *Establish a statewide teacher preparation and enhancement collaborative*

Gardner-Webb University, in partnership with the Shelby City Schools, trains Shelby City School students who wish to become teacher's aides under an arrangement in which half of each trainee's tuition is paid. Replicating such training efforts at other community colleges could help to ensure that teacher assistants are prepared for success as para-professionals. As such, they are more likely to take advantage of future opportunities for further formal training and professional development.

Strategy 3.3: Ensure that articulation and transfer agreements facilitate the entry of interested minority students into teacher education programs.

Each of the 30 school districts is served by a community college which, in most cases, is one of the top 20 community colleges in terms of the number of minority students enrolled. Each of the 30 school districts is served by a community college offering an associate degree in one or more program areas that could prepare a student to successfully transfer into a teacher education program at a four-year institution.

To facilitate such transfer, specific articulation agreements will need to be developed to ensure that the pre-teacher education courses taken at the community college are all transferable. Such agreements should be developed under the umbrella of the statewide articulation agreement plan. The quality of pre-teaching programs at community colleges should match those offered for the first two years at four-year institutions.

Strategy 3.4: Encourage teacher education institutions to strengthen their efforts to retain minority students on the teaching track, including formal preparation for the PRAXIS examinations.

To enter a teacher education program, a student must earn a satisfactory score on Praxis I: Academic Skills Assessments. To qualify for teacher licensure, an applicant must have completed an approved teacher education program. Licensure also requires that the applicant satisfactorily completes the National Teachers Examination Core Battery Test of Professional Knowledge and one or more Praxis II: Subject Assessments or Specialty Area tests.

The general studies programs at teacher education institutions, especially those enrolling significant numbers of underrepresented minority students, should be strengthened so that more minority students will be able to perform satisfactorily on Praxis I. This might involve giving students more writing and reading assignments as well as more hands-on mathematics and science experiences to increase their understanding of basic concepts and applications.

Teacher education institutions should consider assigning education majors to career teachers who can serve as mentors and as potential partners in future student teaching assignments. They should institute mini-courses that address fundamental concepts in

disciplines found on Praxis to eliminate so-called "bottlenecks" that prevent success when students attempt to demonstrate their knowledge and understanding of more advanced concepts on Praxis II.

Strategy 3.5: Establish a statewide teacher preparation and enhancement collaborative among colleges and universities successfully producing minority mathematics and science teachers, other teacher education institutions, and community colleges

This recommendation is an outgrowth of a two-day teacher preparation and enhancement conference convened under the North Carolina Technical Assistance Project. The proposed collaborative would involve a lead institution with the responsibility of coordinating efforts to share best practices in teacher education across institutions. It would promote greater interaction and cooperation among faculty in mathematics and science and those in teacher education. North Carolina A&T State University has agreed to serve as the lead institution.

More specifically, the collaborating institutions would work to significantly increase the number of minority graduates and in-service teachers in North Carolina who are prepared to:

- Meet state and national teacher certification requirements
- Offer courses that meet national mathematics and science standards
- Use advanced technologies for instructional purposes
- Teach students with diverse mathematics and science backgrounds
- Become master teachers of mathematics and science through emphases on "hands-on" experiences, critical thinking, and problem-solving
- Assist their peers in understanding the implications of major efforts in mathematics and science education reform for minority students

The Greensboro Area Mathematics, Science, and Engineering Center (GAMSEC)

The Greensboro Area Mathematics, Science, and Engineering Center (GAMSEC), located at North Carolina A&T State University, serves 11 counties in the North Carolina Piedmont region and involves 20 school systems. GAMSEC provides summer study opportunities for 300-400 teachers, most of whom teach at the elementary level. One of its goals is to help ensure that teachers of mathematics and science in the participating school systems have an opportunity to get the necessary professional development for certification. Also, GAMSEC has a pre-college student component that includes support for academic enrichment, Saturday academies, summer scholars, and a program for parents called Parents Involved for Excellence. About 75 percent of GAMSEC students major in mathematics, science, and engineering after graduating from high school.

The collaborative should develop initiatives that:

- Work with local school districts to develop innovative recruitment programs for prospective teachers starting as early as the middle school
- Foster outreach efforts with community organizations through mentorship programs
- Present teaching careers as attractive career options to undergraduate students
- Identify and target students majoring in mathematics and science for early recruitment into teaching
- Offer incentives for current students to enroll in mathematics and science teacher education programs, including stipends and forgivable loans
- Target two-year colleges as potential sources of future teachers since a relatively high percentage (more than 40 percent) of minority students enrolled in higher education in the state are enrolled in such institutions
- Facilitate the transition of individuals from other careers, such as the military or industry, into teaching by establishing special post-baccalaureate programs
- Offer incentives for mathematics and science faculty to give higher priority to teacher education programs, including awards for excellence in undergraduate teaching and favorable consideration of teacher education work in tenure and promotion decisions
- Establish community linkages, particularly with parents and families

Also, the collaborative would provide professional development programs for in-service teachers that focus on:

- Peer mentoring to enable teachers to observe and learn from each other
- Summer and weekend opportunities, including institutes, short courses, and workshops at local universities, museums, and/or science centers

The collaborative should help ensure that minority teachers are actively involved on educational policy and advisory boards at the local, state, and national levels.

The UTOTES Program

The UTOTES (Using the Outdoors to Teach Experiential Science) program, which operates through the North Carolina Museum of Natural Science, helps teachers develop and use natural areas outside of their schools to teach science and integrate this teaching with other curriculum areas. UTOTES has reached 83 North Carolina schools and more than 1,600 teachers and principals. Increased student and teacher awareness of the elements of science and enhanced interest in and excitement about science are the goals.

Goal Four: To develop a clearly defined, multiple-entry pathway into mathematics and science study from pre-college to graduate school for minority students residing in low-wealth counties in the state

The future economic well-being of North Carolina is highly dependent on the quality of education it delivers to all its citizens. The state and the nation as a whole are becoming increasingly diverse as the needs of the workplace in the state, the nation, and the world are becoming highly technical in nature. Several groups, including underrepresented minorities and persons from low-wealth communities, continue to under-perform and under-participate in the very disciplines that would make them competitive in the workplace.

To address this reality, a clearly marked, multiple-entry pathway must be developed that allows individuals, especially those from low-income families, to move with minimum distraction and delay from one segment of the pipeline to the next.

Thirty North Carolina School Districts with the Highest Minority Enrollment

Columbus	Harnett County	Richmond County
Craven	Hoke County	Robeson County
Cumberland	Iredell-Statesville	Rockingham County
Duplin County	Johnston County	Rowan-Salisburg
Durham County	Lenior County	Scotland County
Edgecombe County	Mecklenburg County	Union County
Forsyth County	Nash-Rocky Mount	Vance County
Gaston County	New Hanover County	Wake County
Guilford County	Onslow County	Wayne County
Halifax County	Pitt County	Wilson County

Strategies for Achieving Goal Four:

Strategy 4.1: Establish a mentored, summer research opportunities program for talented and interested rising high school juniors and seniors in the 30 school districts with the highest minority enrollment.

The student participants would have demonstrated talent and interest in mathematics and science; however, they would come from schools in which little or no opportunity exists for enrollment in academically challenging mathematics and science courses beyond the introductory level. In this way, the Program would directly focus on assisting students with the greatest need. Selected students would reside during the summer on the campus of a college or university in North Carolina with a demonstrated commitment to, and a track record in, providing academic and personal support to students from low-income

families. By living on campus, the students would learn about this aspect of college life as well as gain a better understanding of the total college experience and what is required for success.

Under the guidance of mentors, the student apprentices would either engage in research at a campus-based or industry-based research laboratory, or conduct meaningful work in a technically-oriented workplace.

Special Saturday workshops for parents of participating students would be held and parents would be invited to hear formal presentations by students on their research or work experiences.

Strategy 4.2: Urge regular meetings of local superintendents with presidents of neighboring two-year and four-year institutions (as well as their respective mathematics and science faculty) to ensure alignment of programs and curricula as well as student preparedness at each segment of the pathway.

Strategies to Achieve Goal Four

- *Establish a summer research program for high school juniors and seniors*
- *Urge regular meetings of local superintendents and presidents of neighboring higher education institutions (and their science faculty) to ensure alignment of programs and curricula as well as student preparedness at each segment of the pathway*
- *Use technology to support and complement MSE efforts along the pathway*
- *Link eighth graders to local citizens who will track their academic progress, especially in mathematics and science*

Robeson County has taken a "seamless highway" approach to education to address past difficulties in getting administrators and faculty across the pipeline to communicate with each other. The focus on seamlessness has led to regular meetings of the superintendents and presidents/chancellors of neighboring two- and four-year institutions as well as of faculty from the three educational systems by content area taught. As a result, coordination of content and sequencing across the various educational levels are facilitated.

A second problem being addressed by the across-the-pipeline meetings is that a significant portion (one-fifth) of the budget of Robeson Community College (RCC) is devoted to remedial education. If area schools provide students with a quality education, then fewer students will need remedial assistance when they enter RCC, thereby freeing up resources needed to strengthen the College's non-remedial programs.

Strategy 4.3: Use technology to support and complement MSE efforts along the proposed pathway.

Technology holds considerable promise for addressing the growing disparity in the quality of education available to children in low-wealth counties (such as the 30 targeted in this plan) and to children in more affluent counties. Through computer-assisted instruction and the electronic delivery of information, residents in low-wealth counties can increase their knowledge of information systems; acquire basic literacy and communication skills as necessary; and develop other skills to help meet the educational needs of their children as well as to help prepare themselves for success in the workplace.

Students at the K-12 level in low-income communities and counties can receive homework assistance, tutoring, mentoring, and other enrichment activities to reinforce and/or supplement their classroom-based mathematics and science education. An initiative focusing on the use of technology to supplement instruction and to provide support to families in low-income communities could serve as a testbed and prototype that explores how technology can support the delivery of quality education to underserved communities and counties.

Strategy 4.4: Create a registry of eighth-grade students in each of the targeted counties and identify a local group of citizens who would keep track of the educational progress of each of these students, particularly in mathematics and science.

In each of the targeted counties, as each student enters eighth grade, his/her name would be added to a registry for which a local group of citizens each year would have "oversight" responsibility. The local group would be responsible for tracking the educational progress of every child in the registry. It would be composed of parents; representatives of the local parent-teacher organizations, community-based organizations, and local businesses; teachers of gatekeeper courses, counselors, and principals; and students and faculty from neighboring community or four-year colleges.

The progress of every student would be monitored. Each would be invited to participate in a range of educational enrichment activities; urged to take specific courses, especially in mathematics and science; and mentored by an older student or an adult. The intent is for every student to get the kind of academic and personal support he/she needs to keep career options open and to successfully enter and remain in college.

Roanoke River Valley Consortium

The Roanoke River Valley Consortium includes five predominantly African American low-wealth school districts in rural Northeastern North Carolina. The academic achievement of students in these districts is generally lower than that of students in more affluent school districts in the state. To decrease this gap in student achievement, the Consortium established the Partnerships to Enhance Student Achievement (PESA) program. This program provides staff development and student enrichment opportunities, including field trips, Saturday seminars, leadership conferences, career counseling, mentorships, and a summer enrichment institute.

Computerized Training for Teacher Enhancement, Action, and Motivation

Technology plays a significant role in Camden County Schools, a geographically isolated school district. Teachers in Camden County must travel 110 miles for graduate study, thus limiting opportunities for their continuing professional growth. Nevertheless, through the NSF-supported Computerized Training for Teacher Enhancement, Action, and Motivation Program, technology is helping overcome the geographic isolation for Camden County Schools and is the basis for all staff development. Teachers receive training electronically from distant sites. Partners in the Program are Elizabeth City State University, East Carolina University, the North Carolina Supercomputing Center, and the North Carolina Mathematics and Science Alliance.

Technology also has made it possible for the Camden County Schools to access the North Carolina Information Highway and to collaborate with the Langley NASA Center and the U.S. Coast Guard to expand learning opportunities for both its students and its teachers.

Roles and Responsibilities of Key Stakeholders

North Carolina's success in sustaining its "fair share" baccalaureate contribution and in meeting the Ph.D. challenge for minority MPSE degrees rests on a synergy based on commitments and contributions of many stakeholders as well as on the strong and visionary leadership of the North Carolina Steering Committee.

The Steering Committee will provide leadership, direction, and coordination for promotion, dissemination, and implementation of the Action Plan with the advice and counsel of an Advisory Council.

Stakeholders need to be engaged in a broad spectrum of activities and endeavors, appropriate to their constituencies, to support the overall goals of the Action Plan. Such activities should include, but not be limited to, promotion of the Action Plan; dissemination of the Plan among constituents; alignment of activities with the Plan's objectives; infor-mation exchange; advocacy for the Plan; commitment of resources to the success of the Plan; and constructive feedback and monitoring.

In addition, specific stakeholder groups could bring unique insight, expertise, and authority to specific Action Plan strategies as suggested below.

State Agencies and Departments

The Office of the Governor

The support and endorsement of Governor James Hunt and the North Carolina Education Cabinet are pivotal to the success of the Action Plan. The Governor's strong leadership in education, both in North Carolina and nation-wide, places him in a unique position to underscore the importance of full participation by underrepresented minority groups in MSE teaching and research careers.

The precedent-setting leadership of the Office of the Governor on major education initiatives in North Carolina makes the backing and support of the Office of the Governor critical to the successful implementation of this Action Plan focused on the MSE education of minorities.

The State Board of Education and The Department of Public Instruction

Goal Three of the Action Plan addresses the absence of a state plan for the recruitment, preparation, professional development, and retention of minority mathematics and science teachers. The large and growing disparity between the percentage of minority students represented in North Carolina's public school enrollment and the percentage of the teaching force that is minority calls for State Board of Education (SBE) and Department of Public Instruction (DPI) leadership.

While specific recommended strategies involve higher education institutions and local school superintendents, among others, SBE and DPI must play catalytic roles to forge and empower coordinated solutions.

Goal Four focuses on those 30 school districts with the highest minority enrollments in the state, many of which also are low-wealth districts. The Action Plan calls for the establishment of high school MSE apprenticeship programs and Teacher Cadet Corps for these districts and suggests that, especially in these districts, all partners in the education pathway (homes, communities, K-12 schools, community colleges, and four-year institutions) collaborate to ensure a seamless progression for students. SBE and DPI must play key roles in these strategies.

The Department of Labor

The North Carolina Department of Labor (DOL) and the Employment Security Commission have responsibility for labor force development in North Carolina and for maximizing employment opportunities for North Carolina's citizens. This agency needs to play a key role in establishing MSE apprenticeship programs for underrepresented minority students. Moreover, DOL must keep before citizens and policymakers in the state the urgency of preparing North Carolina students of all racial and ethnic backgrounds to meet the demands for a highly educated, technically skilled workforce.

Elected Representatives

The North Carolina General Assembly must be prepared to legislate and allocate funding for those institutions and programs proven successful in attracting and retaining underrepresented minorities in MSE education. Currently, North Carolina's success in meeting its "fair share" of baccalaureate degrees in MPSE rests primarily on the programs and initiatives of North Carolina A&T State University and North Carolina State University. Investments to sustain and broaden their efforts should be a funding priority.

The General Assembly should encourage and support the North Carolina Community College System, with its 41 percent minority enrollment, as a significant source of minority students interested in pursuing MSE or teaching careers.

The General Assembly should continue to provide funding, initiated under the Excellent Schools Act, to upgrade teacher salaries in North Carolina, provide support for professional development and mentoring, and encourage national certification. Upgrading the resources and programs of teacher education institutions to improve both pre-service and in-service instruction for teachers also is directly linked to the General Assembly's funding decisions.

Local School Districts

School Superintendents and Boards of Education, elected or appointed, share responsibilities for the day-to-day operation of local education agencies. Such individuals can do much to advance the recommendations of the Action Plan. Their help in ensuring a focus on the key transition points in the K-12 experiences, known to be predictors of MSE success, is essential to undergird the Plan's efforts.

Local school districts with significant minority student enrollment should be encouraged to review The ABC Plan's measures of progress in mathematics and science and to ensure that low performing classrooms and schools receive the additional resources they require. Administrators and school boards should pay particular attention to disparities in test scores among racial/ethnic groups that may be overlooked or neglected in focusing on a school's overall progress.

Superintendents and School Boards must lead the way in efforts to enhance respect for the teaching profession and to encourage their communities to welcome and support teachers. Superintendents must be instrumental in setting up the proposed Teacher Cadet Corps, and in encouraging dedicated and talented, non-teaching school personnel to consider a transition into teaching. They also must ensure that school teaching staffs reflect the racial and ethnic makeup of their communities.

The proposed collaborative dialogues in the targeted 30 school districts among superintendents and presidents/administrators of nearby community colleges and four-year institutions, as well as among their respective faculty, will happen only with the support and personal involvement of local school superintendents. The involvement of superintendents of the targeted districts is essential to providing a seamless pathway for talented MSE students from underrepresented groups.

Community Colleges

The North Carolina Community College System must resolve its historical reticence to focus on college transfer programs. While continuing to support workforce preparation, community colleges need to optimize choices and options for their students. Articulation and transfer agreements as well as common course contents should continue to be refined and data collected to document the effect of these changes on transfer students, especially on minority students, in mathematics and science.

The North Carolina Community College System, with its geographically-dispersed institutions and coordinated technology planning, is uniquely equipped to meet the technology training needs of North Carolina's teaching force. Each institution should examine its strengths and then develop a Technical Assistance Profile that makes known the services that it can provide to local educators.

Community colleges, especially those with high minority enrollments, should review their pre-teaching programs and develop courses of study that encourage individuals currently serving as child care providers, teacher's aides, and other support personnel to pursue professional careers in teaching.

Each community college should encourage its teaching and administrative staff, with specific contract adjustments, to collaborate with faculty of K-12 and four-year institutions in efforts to prepare a seamless education pathway for students as they move along the pipeline.

Four-year Colleges and Universities

The Board of Governors of the University of North Carolina (UNC) System and the UNC-General Administration must provide system-wide leadership to sustain North Carolina's contribution to its "fair share" of minority baccalaureate degrees in mathematics, the physical sciences, and engineering (MPSE). Resource allocation and program coordination should focus on strengthening programs at North Carolina A&T State and North Carolina State Universities that are critical to the state's high minority MPSE baccalaureate degree production.

Support should be provided to further develop the capacity of other UNC institutions to graduate more underrepresented minorities in MPSE. Strengthening MPSE programs at constituent institutions that have historically served minority students also requires involvement and support at the highest levels.

The UNC Mathematics, Science, and Engineering Network (MSEN) needs to continue its key role in offering pre-college programs, making research experiences possible for MSE students, and providing professional development for mathematics and science teachers. The UNC System's Board and its General Administration must continue to support and expand this important and effective network.

While the General Assembly has mandated the involvement of the UNC institutions in teacher development, further coordination among the institutions is needed. The UNC-General Administration should assume responsibility for developing and providing a more coordinated approach.

Each of the four-year institutions in North Carolina, private and public, should examine its "fair share" of North Carolina's contribution to minority MPSE degrees and make known the institution's commitment to meet or exceed its "fair share." Each institution must develop its own institutional action plan, augmented with "close-to-home" technical assistance from other institutions, as appropriate, to meet its "fair share."

Community outreach programs and collaborations with feeder schools should be key K-12 components for each action plan. Vigorous recruiting; provision of support services, especially for first-generation college students; course revitalization; and strong academic and personal advising are proven strategies for baccalaureate degree production.

With such commitment at the institutional level to increasing the number of minority doctoral degrees in MPSE, coupled with North Carolina's national leadership in annually producing its "fair share" of minority MPSE baccalaureate degrees, the state is in a unique position to lead the nation in reaching or exceeding its "fair share" of minority doctoral degrees.

North Carolina A&T State University and North Carolina State University remain the short-term source of potential doctoral degree students. Every effort should be made in support of and by these institutions to encourage their own students to pursue graduate studies and to recruit other minority students with MSE talent to join them. A shared staff position to monitor and coordinate undergraduate to graduate bridge programs should be established. Longer-term efforts also should be focused on UNC-Chapel Hill and Duke University.

The Private Sector

Citizens of North Carolina show strong concern and commitment to improving education in their state. North Carolina Citizens for Business and Industry (NCCBI) and its member Chambers of Commerce provide a pivotal connection between the education community and business and industry in North Carolina. These organizations can attest to the need for a highly skilled, technologically prepared workforce and the desirability of developing this talent from among the state's residents. NCCBI can assist with the identification and development of apprenticeships, research opportunities, and support, including financial support, for programs that increase minority MSE participation.

Professional scientific and engineering societies, the North Carolina Association of Educators, the North Carolina Council of Teachers of Mathematics, the North Carolina Science Teachers Association, and other educational organizations in the state can assist in the implementation of the Action Plan. They can make significant contributions by supporting degree production efforts, providing effective role models, developing mentoring programs, and encouraging MSE competitions and research presentation opportunities for K-12 and college students. These organizations have a vested interest in continuing and enhancing their respective MSE professions and, therefore, in supporting the Action Plan.

Community-based Organizations

While involvement and commitment of education leaders across the state is necessary to the Action Plan, grassroots involvement can make the difference between just another education initiative and a vital and energetic movement to better the lives of North Carolinians. These stakeholders need to become informed about the issues surrounding the Plan, their implications for specific constituencies, and their economic impact on the state. They need to hold policymakers in the state accountable for this Action Plan and elect political leaders who will support it.

Private and corporate foundations often augment resources for priority initiatives in North Carolina. It is important that these groups respond to the various strategies of the Action Plan with a commitment of resources that will allow for innovative and special programs that are beyond the capacity of other sponsoring agencies. This type of resource commitment can be leveraged for additional resources from other private, state, and federal sources.

Minority Communities

Organizations serving minority constituents such as the NAACP, the National Urban League, American Indian Associations, and tribal councils as well as groups serving Hispanics carry special responsibility to keep the Action Plan's issues before all North Carolina citizens. They must point out existing disparities in achievement and resources and muster the energies of the faith community, fraternities, and sororities to further the Action Plan. Minorities themselves must believe that increased minority MSE participation is important, and they must be willing to be vocal and informed advocates about these concerns.

The Federal Role

The U.S. Department of Education, the National Science Foundation (NSF), the National Institutes of Health (NIH), the National Aeronautics and Space Administration (NASA), and other federal agencies have expressed their commitment to increased minority participation in MSE teaching and research careers through various programs and initiatives. These agencies are instruments through which efforts in support of the national goals for minority MSE participation are being developed, promoted, and supported. Promising results, especially at the undergraduate level, of projects funded by these agencies must form the basis for an expanded effort at the doctoral level.

In assessing the seamless pathway for minority MSE success in North Carolina, it must be recognized that not all needs can be met from within the state and some external support is required. Eisenhower grants to higher education institutions; NSF and NASA grants and fellowships; and NIH initiatives should support and encourage the continued production of minority baccalaureate degrees and focus particularly on increasing doctoral degree production. North Carolina offers a unique opportunity for federal agencies to invest in proven success and to build for the future through a significant increase in minority doctoral degree production.

Next Steps

Dissemination

The Action Plan will be disseminated widely during the four-month period March 1 - June 30, 1998, so that its goals and recommendations are known throughout North Carolina. Specific strategies include:

- Meeting with key stakeholders to explain the details of the Action Plan and to obtain their support
- Informing various constituency groups about the details of the Plan and the roles they can play in its implementation
- Identifying professional meetings and gatherings in North Carolina where the Plan should be introduced
- Preparing information/training pieces necessary to effectively disseminate the Action Plan

Governance and Oversight

The 1997 State Steering Committee will review its membership and composition, and reconstitute itself for service for the three-year period July 1, 1998 - June 30, 2001.

The 1997 State Steering Committee will nominate and solicit members of an Advisory Council of key policy makers and prominent citizens to serve from July 1, 1998 - June 30, 2001 (See Appendix D for a description of the respective roles of the reconstituted Steering Committee and the newly proposed Advisory Council).

The 1997 State Steering Committee will determine its staffing needs for the initial three-year period, prepare position descriptions, and devise efforts to meet those needs, including shared staffing with appropriate North Carolina institutions and agencies.

Formative Evaluation

The projected "start-up" date for initiating action on the recommended strategies is July 1, 1998. Baseline data from which to measure the Action Plan's progress will be collected.

Performance measures will be drafted for each of the recommended strategies. These strategies will address the extent of activity taking place and the contribution that activity brings to the purpose of the strategy. An information system will be designed that includes criteria to decide when intervention is necessary.

Implementation of Initial Strategies

Strategies to Achieve Goal One (Baccalaureate Degrees)

Strategy 1.1: Enhance programs and replicate successes of higher education institutions that enroll significant numbers of underrepresented minorities.

Next steps:

- Prepare an inventory of minority-focused MSE programs
- Collect supporting evidence of each program's "success" at each institution
- Develop "templates" for replication
- Convene Project Directors of similar initiatives to share expertise
- Identify outcome measures for each "successful" strategy
- Publicize the programs' successes and outcome measures, and determine areas for enhancement
- Encourage each institution to compare its minority-focused efforts with the "successful" programs

Strategy 1.2: Build on demonstrated interest, commitment, and success within the state.

Next steps:

- Catalog specific successful programs at "top ten" institutions
- Support the expansion of the UNC MSEN Network to other geographically dispersed sites
- Design incentives for sharing technical assistance among institutions

Strategy 1.3: Urge each MSE degree-granting institution in North Carolina to examine its "fair share" of the state's minority MSE degree proportionate contribution and provide evidence of top-level commitment to meeting these goals.

Next steps:

- Meet with Presidents/Chancellors of each institution to explain the "fair share" concept at the state and institutional levels
- Provide each institution with an analysis by field, gender, and race
- Encourage each institution to commit to making its proportionate contribution to the state's "fair share" of the national MSE goals
- Seek formal endorsement of "fair share" commitment by trustees and governing boards of the institutions

Strategy 1.4: Focus on key transition points along the educational pathway.

Next steps:

- Prepare a brief report on issues, opportunities, and model strategies at key transition points for wide distribution
- Catalog successful programs by transition points
- Identify gaps where few programs exist and search for national models
- Invite discussion/comment and publicize events
- Work toward having at least one program in place at each transition point in each school district

Strategy 1.5: Ensure that undergraduate education in MSE fields in North Carolina fully prepares underrepresented students for work in industry, research, or graduate school.

Next steps:

- Conduct workshops at the district level for academic advisors/counselors to ensure that students and faculty are aware of all MSE career options
- Encourage apprenticeships, co-op experiences, research opportunities, and graduate school preparation for MSE students at each four-year institution
- Encourage faculty/industry exchanges
- Urge North Carolina's research laboratories to make research apprenticeships available for MSE-talented high school students

Strategy 1.6: Ensure that K-16 courses and programs are aligned/coordinated with state or national educational reform efforts.

Next steps:

- Widely publicize current reforms in Calculus, Physics, and Chemistry instruction and conduct discipline-specific workshops for faculty responsible for instruction in these areas
- Ensure that such revised courses are available to all students either at their own institution, nearby, or through distance learning

Strategy 1.7: Identify and make known "close-to-home" technical assistance available from (or needed by) higher education institutions to enable them to produce well-prepared MSE students.

Next steps:

- Design strategies for sharing of MSE skills and talents at North Carolina institutions
- Develop model technical assistance agreements that will facilitate this exchange
- Provide budgetary incentives for providing technical assistance to low-resource institutions
- Encourage "seamless pathway" meetings in local areas to facilitate communication among K-16 educators and administrators

Strategies to Achieve Goal Two (Doctoral Degrees):

Strategy 2.1: Urge each doctoral degree-granting institution in North Carolina to develop a vision statement from the "top" that is backed by tangible actions and commitment of resources to address the serious underrepresentation of African Americans, American Indians, and Hispanics among MSE doctoral degree recipients.

Next steps:

- Meet with each President/Chancellor to interpret doctoral degree data
- Seek a formal statement of endorsement from trustees
- Present issue to UNC Board of Governors
- Encourage each institution to develop its own action plan for achieving its "fair share"

Strategy 2.2: Establish a formal undergraduate to graduate bridge program to facilitate the matriculation of underrepresented minority MSE students into MSE doctoral programs in North Carolina.

Next steps:

- Expand the BRIDGE program coordinated by North Carolina State University and involving four HBCUs to include other fields and private institutions such as Duke and Wake Forest
- Ensure that master's level MSE programs in the state are of the highest quality and are aligned with course requirements at institutions in North Carolina offering MSE doctoral degrees

Strategy 2.3: Hire a professional to monitor and coordinate the proposed undergraduate/graduate bridge partnerships between various institutions in the state.

Next steps:

- Convene a working group to draft a BRIDGE partnership agreement
- Secure commitments from participating institutions
- Identify staffing needed to help monitor/coordinate program

Strategy 2.4: Encourage each undergraduate degree-granting institution in the state to emphasize pursuing MSE doctorates when advising underrepresented minority MSE majors.

Next steps:

- Develop an Advisory/Mentor Handbook and conduct workshops on "Advising for Graduate School"
- Provide opportunities for doctoral students to mentor undergraduates
- Identify research interests early and provide undergraduate experiences in field
- Ensure that all students receive financial counseling for graduate school

Strategy 2.5: Urge each baccalaureate degree-granting institution to provide mentored, research opportunities for all of its MSE majors.

Next steps:

- Provide models for mentored, research experiences
- Survey each institution to determine which institutions lack programs
- Encourage nearby institutions to form partnerships for research programs and mentoring

Strategy 2.6: Strongly encourage each baccalaureate degree-granting institution to provide and support research presentation opportunities for underrepresented students at regional and national meetings.

Next steps:

- Explore collaborations among North Carolina institutions to publish undergraduate research papers in a state-wide journal
- Provide opportunities for research presentations in the state as well as at regional and national MSE meetings
- Encourage local business/industry involvement through sponsorship of research presentations and symposia

Strategy 2.7: Initially target institutions that produce significant numbers of minority MSE baccalaureate degree recipients, such as North Carolina A&T State University and North Carolina State University, as a means of identifying a rich pool of potential minority MSE doctorates.

Next steps:

- Review the status of minority MSE students at these institutions and develop both financial and programmatic incentives to attract and retain them in MSE doctoral programs in North Carolina

Strategy 2.8: Recognize and reward institutions that produce minority MSE doctorates.

Next steps:

- Prepare and disseminate press releases and news articles that describe the achievements of North Carolina A&T State and North Carolina State in producing minority MPSE doctoral degrees
- Seek out opportunities in North Carolina and nationally with education and professional groups to feature these institutions and their success in this area

Strategies to Achieve Goal Three (Teachers):

Strategy 3.1: Establish a Teacher Cadet Corps for high school students in the 30 school districts that enroll the highest number of minority students.

Next steps:

- Convene a meeting of superintendents from these 30 districts, community college presidents, and leaders of teacher education institutions to draft a "template" for development of the Teacher Cadet Corps (TCC)
- Research promising models for TCC-type programs and assess their applicability to these 30 school districts

Strategy 3.2: Intensify efforts to recruit minorities, including teachers' aides and other para-professionals in education, into pre-teaching and pre-science programs at community colleges and into teacher certification programs at four-year institutions.

Next steps:

- Review and supplement survey data collected by QEM on such programs and prepare a summary of existing programs
- Research promising models in other states and determine their applicability to North Carolina

Strategy 3.3: Ensure that articulation and transfer agreements facilitate the entry of interested minority students into teacher education programs.

Next steps:

- Contact the North Carolina Community College System Transfer Advisory Committee to research the compatibility of these programs and prepare recommendations for strengthening these agreements in teacher education

Strategy 3.4: Encourage teacher education institutions to strengthen their efforts to retain minority students on the teaching track, including formal preparation for the PRAXIS examinations.

Next steps:

- Disseminate information about the goal for production of minority teachers, especially in mathematics and science, to each of the teacher education institutions
- Work with the North Carolina Teaching Fellows Program to ensure that institutions with successful records in graduating minorities in mathematics and science teaching are fully participating in the Teaching Fellows Program

- Form a partnership with the North Carolina Association of Educators as well as National Science Teachers Association and National Council of Teachers of Mathematics chapters to present the challenge and develop specific strategies to increase the number of minorities in mathematics and science teaching fields
- Work with teacher education institutions with significant numbers of minority students to develop PRAXIS preparation courses and programs to ensure that this test is not a barrier to their students

Strategy 3.5: Establish a state-wide teacher preparation and enhancement collaborative among colleges and universities successfully producing minority mathematics and science teachers, other teacher education institutions, and community colleges.

Institutional leadership for such an initiative was solicited in November 1997 as a follow-up to the NC-TAP Teacher Preparation and Enhancement Conference in Raleigh. In response, North Carolina A&T State University has agreed to serve as the lead institution for this effort.

Next steps:

- Identify collaborating partners and convene an initial meeting to begin the development of a collaborative proposal.

Strategies to Achieve Goal Four (Seamless Pathway):

The creation of a seamless, multiple-entry pathway into mathematics and science study from pre-college to graduate school is a far reaching goal to be sought for all students in the nation. In the long term, it is the foundation upon which goals for baccalaureate and doctoral degrees must rest.

The underrepresentation of African Americans, American Indians, and Hispanics in MPSE research and teaching careers calls for specific, targeted efforts. The Action Plan proposes to begin with 30 school districts that serve significant numbers of minority students and that collectively enroll almost 70 percent of all K-12 minority students in the state. Success in these districts can be adapted and replicated to assist all students in the state and provide a successful model for the nation.

Strategy 4.1: Establish a mentored, summer research opportunities program for talented and interested rising high school juniors and seniors in the 30 school districts with the highest minority enrollment.

Next steps:

- Review the national QEM/NASA SHARP PLUS Apprenticeship Program and adapt this model to North Carolina
- Review this proposal with education leaders in the 30 school districts selected and identify likely sponsors for support with a start-up date in June 1998

Strategy 4.2: Urge regular meetings of local superintendents with presidents of nearby two-year and four-year institutions (as well as their respective mathematics and science faculty) to ensure alignment of programs and curricula as well as student preparedness at each segment of the pathway.

Next steps:

- Survey the 30 school districts to ascertain the extent to which such meetings currently take place
- Convey the Robeson-Cumberland Counties model to these identified leaders, and prepare a model agenda for the initial meeting of these groups

Strategy 4.3: Use technology to support and complement MSE efforts along the proposed pathway.

The Action Plan recognizes that the effective use of educational technology, adequate resources for equipment, and access to the North Carolina Information Highway can offset disadvantages common to high minority districts. Assessment should be made of the technology resources within these 30 districts.

Next steps:

- Representatives of nearby community colleges, four-year institutions, and the North Carolina School of Science and Mathematics should be consulted to provide the identified access, equipment, and training needs
- Local business and industry should be invited to serve as partners in this effort to achieve technological parity

Strategy 4.4: Create a registry of eighth-grade students in each of the targeted counties and identify a local group of citizens who will keep track of the educational progress of each of these students, particularly in mathematics and science.

Next steps:

- Contact local school superintendents to discuss this strategy as part of the focused effort in these districts
- Seek community contacts to identify local citizens qualified and willing to provide this community service
- Develop a reporting methodology that respects student privacy but informs local mentors about student progress and connects those mentors with needed resources to address problems

THE CHALLENGE

The task before us is clear. America must put an end to the educational neglect of our children, because ending that neglect is part of the answer to America's larger problems. The road to the future must be paved with the achievements of our students. As a new century opens, we must all reclaim the distinctively American promise so well articulated [more than] half a century ago by Franklin D. Roosevelt: "We must seek to build an America where no one is left out." And we must do so not only because it is right, though that is reason enough, but because the future well-being of the nation—non-minority and minority—has placed that task so unmistakably before us.

Excerpt from *Education That Works: An Action Plan for the Education of Minorities.*
Quality Education for Minorities (QEM) Project, Cambridge, MA, 1990

APPENDIX A

Developing a Plan of Action to Increase the Participation of Minorities in North Carolina in Mathematics, Science, and Engineering (MSE) Teaching and Research Careers

Quality Education for Minorities (QEM) Network

March 1997

Under a grant[1] from the National Science Foundation (NSF), the QEM Network will conduct research and work in collaboration with individuals, organizations, and educational institutions in North Carolina to facilitate the development of a state action plan to increase the number of underrepresented minorities in North Carolina who receive baccalaureate and doctoral degrees in MSE fields.

Both NSF and QEM have established national numerical goals to increase the number of underrepresented minorities receiving baccalaureate and doctoral degrees in MSE fields. NSF's goals are, by the year 2000, to 1) produce annually at least 50,000 minority MSE bachelor's degree recipients; and to 2) produce annually at least 2,000 minority MSE doctoral degree recipients. The goals will be achieved if each state awards its proportionate share based on the state's enrollment of underrepresented minority college students. In addition, QEM has established a national numerical goal of 9,000 minority graduates newly qualified to teach mathematics and science at the secondary level by the year 2000.

During 1992-1993, North Carolina produced 1,480 minority baccalaureate MSE degree recipients, exceeding its proportionate share of the NSF goal of 1,300 such degree recipients. During the same year, at the doctoral level, North Carolina produced only 24 minority MSE degree recipients, less than half its proportionate share of 52 such degree recipients. Information is being sought on the number of minority mathematics and science graduates who were newly qualified to teach at the secondary level in North Carolina during the 1992-1993 academic year.

Through this project, QEM seeks to determine the reasons for North Carolina's success at the baccalaureate degree level. Technical assistance to North Carolina institutions of higher education will be offered so that they can produce the state's proportionate share of minority MSE doctoral degree recipients and of minority graduates who enter mathematics and science teaching careers.

Over the past three years, QEM has conducted a series of state-wide MSE conferences, under a grant from the NSF, that focused on issues and strategies regarding the participation of underrepresented minorities in MSE-related activities all along the education pipeline. The conferences involved participants from 17 of the 19[2] states in which the proportion of minority high school graduates in each state is at least 25 percent.

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[1] This project (REC 9612216) is funded by a grant to the Quality Education for Minorities (QEM) Network from the Division of Research, Education, and Communication (REC) of the National Science Foundation (NSF). QEM does not represent NSF, nor are NSF-funded projects required to participate in QEM-sponsored activities.

[2] These 19 states are Alabama, Alaska, Arizona, California, Delaware, Florida, Georgia, Hawaii, Illinois, Louisiana, Maryland, Mississippi, New Jersey, New Mexico, New York, North Carolina, South Carolina, Texas, and Virginia. Budgetary limitations prevented the holding of conferences in the states of Alaska and Hawaii; however, the Project did conduct an MSE conference in Seattle, Washington that focused on American Indians.

Also, QEM has conducted MSE conferences in the District of Columbia, Puerto Rico, and seven large urban areas (Boston, Cleveland, Denver, Detroit, Memphis, Milwaukee, and Philadelphia) that are outside the 19 states.

The North Carolina MSE Conference, held in Greensboro in May 1994, was co-convened by North Carolina A&T State University and QEM. An initial State Steering Committee was established at this conference to provide leadership to the development of a state action plan with multiple entry points that would enhance the participation of minorities in North Carolina in MSE fields.

Such a plan is to focus on campus climate, articulation agreements between two- and four-year institutions, the use of technology, and strengthening teacher education programs. An enlarged Steering Committee is expected to include representatives of the State Department of Education; directors of NSF projects in North Carolina; local and state political leaders; school board members; superintendents, principals, and teachers; parents and students; university faculty and administrators; and members of the business community.

To help inform the action plan, QEM will study the extent to which programs are in place at North Carolina institutions that encourage and prepare minority students to pursue degrees in mathematics, science, or engineering. Also, QEM will study teacher preparation and enhancement programs at teacher education institutions in North Carolina to determine the effect of these institutions on the number and quality of minority mathematics and science teachers in the state. The quality of these teachers will be gauged, for example, by certificates held, the number and nature of discipline specific courses taken, and course grades.

Another focus of the QEM study will be the gathering of information regarding the potential of two-year colleges in North Carolina as sources of minority MSE majors and future mathematics and science teachers. The results of these studies will serve as critical background information for the development of the state action plan by the State Steering Committee.

QEM will assist in the identification of institutions within North Carolina that can provide technical assistance to other institutions in designing and developing:

- Technology infrastructure plans
- Mathematics and science education curricula that focus on meeting national standards and the use of technology
- Proposals to support changes needed to enhance mathematics and science programs
- Science-oriented community outreach programs
- Summer research and academic enrichment programs for high school students
- Summer and academic year undergraduate and collaborative faculty research opportunities for students and faculty at collaborating institutions
- Faculty and staff resource groups across the institutions with whom other faculty and staff could consult on a variety of issues

QEM will work with the North Carolina State Steering Committee and collaborating institutions through existing state structures in activities designed to complement, rather than duplicate, state efforts.

Meetings of the State Steering Committee and others interested in this initiative will be held every two months at different institutions across the state, with electronic discussions taking place in between the meetings. In addition, a special information technology conference is being planned for presidents and technical staff at minority institutions in North Carolina. These institutions will be asked to share their technology plans as they relate to their academic and research infrastructures, including their science and teacher education programs.

The one-year grant is expected to result in the action plan described above as well as in several related papers that will form the basis for presentations at meetings and conferences so that others can benefit from what has been learned in North Carolina. Also, these papers will form the basis for periodic electronic summaries at QEM's Web site.

ROLE OF THE NORTH CAROLINA MATHEMATICS, SCIENCE, AND ENGINEERING (MSE) STEERING COMMITTEE

THE MSE Steering Committee in North Carolina seeks to accomplish the following goal:

Goal: The development, implementation, and monitoring of a state-wide plan for producing minority MSE graduates that includes a clearly defined, multiple entry, pathway from pre-college to college to graduate school. The end result and measure will be a significant increase in the participation of underrepresented minorities in mathematics, science, and engineering to a level comparable to the state's minority college population.

Role of the Committee: The Steering Committee is to build upon the state-wide MSE conference held in North Carolina by:

- Determining what the state's "fair share" contribution should be to the national minority MSE numerical goals, given state and K-12 demographics
- Identifying priority issues within the state that need to be addressed that relate to ensuring quality MSE education for minority students
- Identifying strategies at the pre-college, college, and graduate levels within the state that are effective with minority students
- Encouraging the coordination of MSE efforts within the state to avoid unnecessary duplication and to increase articulation across the various NSF-funded and other MSE initiatives and projects
- Recommending systemic changes to state education policy makers that will improve MSE education for minorities

Strategies: In developing and implementing the state plan, QEM and the Steering Committee will: (1) convene meetings on campuses, within communities, and with public and private sector organizations to obtain broad-based input and support; (2) identify potential partnerships within the state to help achieve the numerical goals; (3) identify and disseminate information state-wide on promising programs and strategies for possible replication within the state; and (4) determine the resources needed to implement the plan and to identify potential sources of support, with technical assistance from QEM.

Membership: The Steering Committee consists of representatives of K-12 and higher education and education policymakers. It includes K-12 teachers, principals, and superintendents; college professors and administrators; directors of NSF-funded projects; and representation from the Department of Public Instruction, the University of North Carolina General Administration, the North Carolina Community College System, and the North Carolina State Legislature.

ROLE AND RESPONSIBILITIES OF THE BOARD OF ADVISORS THE NORTH CAROLINA TECHNICAL ASSISTANCE PROJECT (NC-TAP)

The five-member Board of Advisors is to advise the NC-TAP staff as they plan and carry out the Project's major activities. Specifically, the Board will:

- help identify issues, programs, and strategies in mathematics, science, and engineering (MSE) of which the Project and its participating institutions should be aware
- assist the staff in formulating benchmarks for identifying successful MSE strategies at strategic points along the educational continuum
- advise the staff on the protocol for, and questions to be pursued during, (1) visits to study the campus ethos of institutions successfully producing minority MSE degree recipients; (2) the study of teacher education programs in the state; (3) the study of articulation agreements between two- and four-year institutions in the state; and (4) the review of state and institutional plans for the use of technology to close the educational gap in performance between minority and non-minority students in the state
- provide guidance to enhance the Project's effectiveness in identifying institutions that can provide "close to home" technical assistance to non-grantee minority institutions in the state
- assist in the Project's formative evaluation process
- provide advice to ensure that QEM/NC-TAP is on the cutting edge in its use of technology for dissemination, evaluation, and technical assistance efforts so that it serves as a model for the institutions participating in NC-TAP activities

The Board of Advisors will meet at least twice during the year. In addition, individual members will be asked to participate in specific Project activities during the grant period.

APPENDIX B

QEM/NORTH CAROLINA TECHNICAL ASSISTANCE PROJECT (NC-TAP)
MARCH 1997

STUDY/RESEARCH AREA: INSTITUTIONAL CLIMATE

Determine the extent to which the following exists:

- Clearly identified and consistently applied admissions policies to help reduce the stigma suffered by most minority students from the presumption that standards had to be lowered in order for them to be admitted.

- Pre-freshman summer programs to provide an opportunity for students to become familiar with the campus and the location of its various support resources as well as to review/ensure that they thoroughly understand the fundamental mathematical and scientific concepts needed for the freshman year; and have communication skills and study habits appropriate for a demanding college curriculum.

- A hospitable and supportive climate in both the living and learning environments.

- Faculty and students who hold positive attitudes and high expectations for minority students.

- A system that encourages minority students to take difficult courses, while providing a support structure that maximizes their chances for success.

- Undergraduate research opportunities in which minority students are encouraged to participate.

STUDY/RESEARCH AREA: TEACHER EDUCATION

Questions to be pursued include the following:

- Which institutions are the most productive (top three - five) in the state in terms of the number of teacher education graduates? What are their track records in producing minority teachers?

- How successful are the graduates of these institutions in meeting state and national teacher certification requirements (percent of those who meet them)?

- How much emphasis is being placed in the teacher education programs at these institutions on:

  - understanding the national mathematics and science standards and other major education reform efforts?

  - using technology for instructional purposes?

  - teaching strategies for use with students that have diverse mathematics and science backgrounds?

- Do they offer professional development opportunities that help current teachers to carry out the above as well as to meet the national professional teaching standards that are now in place?

- Do they offer special professional development opportunities for teachers of mathematics and science in urban school districts or in predominantly minority schools in the state, including in rural areas?

- What are the state's certification requirements in mathematics and science for elementary school teachers? For secondary mathematics and science teachers?

- What are the needs/numerical goals in the selected state for certified mathematics and science teachers and which school systems are in greatest need?

STUDY/RESEARCH AREA: TWO-YEAR COLLEGES

Questions to be pursued include the following:

- Which two-year colleges are most productive (top three-five) in terms of the number of their minority graduates who go on to four-year colleges and receive bachelor's degrees in mathematics, science, or engineering disciplines?

- Do formal articulation agreements exist between two- and four-year colleges in the state? If so, what is included in these agreements?

- How effective have the articulation agreements been in increasing the number of minority students who matriculate into and graduate from four-year colleges as mathematics, science, or engineering majors?

- How many minorities in the state actually graduate from two-year colleges, what are their courses of study, and what is the average time they spend before obtaining an associate's degree?

- How do the costs of attending two-year colleges in the state compare to the costs of attending four-year colleges in the state and what impact does this have on the enrollment of minorities?

STUDY/RESEARCH AREA: ROLE OF TECHNOLOGY

- What are the state's plans for the use of technology in education?
- What are the various educational uses of technology in the state?
- What types/forms of technology are used (e.g., radio, closed-circuit television, Internet, videotapes, independent classroom learning stations), to what extent, and where?
- What are the intended purposes (e.g., to create skills vs. knowledge); costs (equipment, maintenance and upgrade, software and/or other required peripherals, and level and amount of training required); and cost effectiveness (e.g., potential cost reductions; replicability; and "scalability").
- What are the similarities and differences, if any, in how technology is used in urban, suburban, and rural school settings in North Carolina?
- How do high achieving students (and their teachers) in North Carolina use technology?
- How do students and teachers in predominantly minority schools use technology?

STUDY AREA: "CLOSE TO HOME" TECHNICAL ASSISTANCE

Help to identify institutions in the state that can provide technical assistance to other institutions in the:

- Conduct of institutional needs assessments to enable the offering of quality academic programs in science fields desired by an institution
- Design of summer research and academic enrichment programs for high school students
- Design of curriculum and courses, including the use of technology
- Preparation of proposals to support changes needed to offer quality mathematics and science programs
- Development of technology plans
- Design and implementation of strong mathematics and science teacher preparation and enhancement programs
- Design and implementation of science-oriented community outreach programs
- Offering of summer and academic year undergraduate and collaborative faculty research opportunities to students and faculty at collaborating institutions
- Sponsorship of faculty and staff resource groups across the institutions with whom other faculty and staff could consult on a variety of issues

CALENDAR OF MEETINGS

North Carolina Technical Assistance Project (NC-TAP)

DATE	MEETING	LOCATION
	1997	
• March 18 (Tuesday)	NC Statewide Steering Committee Meeting	Raleigh
• April 18 (Friday)	NC-TAP Board of Advisors Meeting NC Central University	Durham
• May 19 (Monday) • May 20 (Tuesday)	Presidents' Technology Conference and NC-TAP Open Forum Fayetteville State University	Fayetteville
• June 10 (Tuesday)	NC-TAP Open Forum and NC Statewide Steering Committee Meeting Saint Augustine's College	Raleigh
• September 19 (Friday)	NC-TAP Open Forum Edgecombe Community College; NC Statewide Steering Committee Meeting Holiday Inn-Raleigh	Tarboro Raleigh
• September 23 (Tuesday)	Forum on the Status of American Indian Education in North Carolina University of NC - Pembroke	Pembroke
• October 3-4 (Friday-Saturday)	Special Proposal Workshop Winston-Salem State University	Winston-Salem
• October 17 (Friday)	NC-TAP Open Forum and Board of Advisors Meeting North Carolina A&T State University	Greensboro
• October 24-25 (Friday-Saturday)	Teacher Preparation and Enhancement Conference NC State at Raleigh	Raleigh
• December 5 (Friday)	NC-TAP Open Forum; NC Statewide Steering Committee and Board of Advisors Meeting Johnson C. Smith University	Charlotte
	1998	
• January 7 (Wednesday) • January 8 (Thursday)	Meeting with Presidents of North Carolina Community Colleges Durham Technical Community College NC Statewide Steering Committee Meeting Omni-Durham Hotel	Durham
• February 3 (Tuesday)	Release of NC Action Plan	Raleigh
• February 6 (Friday)	Tribute to North Carolina; National Release of NC Action Plan at QEM 's Seventh Annual MSE Network Conference	Washington, DC

PRESIDENTS' TECHNOLOGY CONFERENCE*
Fayetteville State University
May 19, 1997

Goals:

(1) to ensure that presidents of institutions serving significant numbers of minority students have first-hand knowledge of how information technology can be used to facilitate their decision-making; run their institutions more effectively and efficiently; and make their institutions more attractive to prospective students and faculty

(2) to show how technology can be used to (a) support the infrastructure required to offer quality mathematics, science, and engineering (MSE) programs; (b) link faculty and students across institutions; and (c) support MSE partnerships and collaborations among and between institutions

* In addition to the workshop held at Fayetteville State University in May 1997 for presidents of colleges in North Carolina and to the special sessions on technology for presidents at QEM's annual MSE Network Conference each February, technology conferences for college presidents have been held to date at the following sites:

- University of Wisconsin - Madison (August 1995)
- Massachusetts Institute of Technology (January 1996)
- University of Puerto Rico - Mayagüez (October 1996)
- Lawson State Community College, Birmingham (March 1997)
- Hostos Community College, Bronx (March 1997)

REGIONAL OPEN FORUMS

Fayetteville State University, May 20, 1997
Saint Augustine's College, June 10, 1997
Edgecombe Community College, September 19, 1997
University of North Carolina - Pembroke, September 23, 1997
North Carolina A&T State University, October 17, 1997
Johnson C. Smith University, December 5, 1997
Durham Technical Community College, January 7, 1998

Goals:

To share programs that encourage and prepare minority students to pursue careers in mathematics, science, or engineering (MSE) fields or in mathematics or science education

To identify points where greater program intervention and/or collaboration may be required to ensure a multiple-entry pathway and the smooth flow of minority students in North Carolina toward MSE careers

PROPOSAL DEVELOPMENT AND EVALUATION WORKSHOP
Winston-Salem State University
October 3-4, 1997

Overall Goal:

To strengthen the proposal development and evaluation skills of the faculty and staff participants and their ability to design, implement, monitor, and evaluate programs for attracting, preparing, and retaining minority students in mathematics, science, and engineering fields

TEACHER PREPARATION AND ENHANCEMENT CONFERENCE
with North Carolina State University at Raleigh
October 24-25, 1997

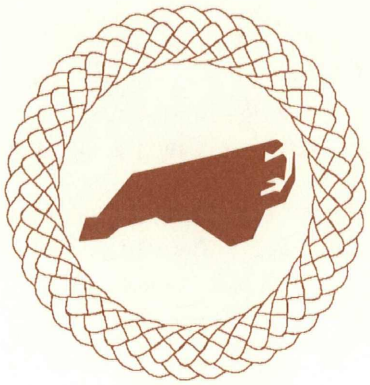
Conference Goals:

(1) To assess the status of mathematics and science teacher education programs at North Carolina institutions

(2) To discuss a possible collaborative strategy to enable these institutions to significantly increase the number of minority graduates and in-service teachers in North Carolina who are prepared to:

- meet state and national teacher certification requirements
- offer courses that meet national mathematics and science standards
- use advanced technologies for instructional purposes
- teach students with diverse mathematics and science backgrounds
- become master teachers of mathematics and science
- assist their peers in understanding the implications of major efforts in mathematics and science education reform for minority students

APPENDIX C



NORTH CAROLINA

(from QEM's *Weaving the Web of MSE Success for Minorities: Top Ten Colleges and Universities Report,* June 1997)

"TOP TEN" INSTITUTIONS IN NON-ASIAN MINORITY
MSE BACCALAUREATE DEGREES AWARDED, 1992-93
(Ranked by number of degrees awarded in Mathematics, the Physical Sciences, and Engineering)

Institution	Mathematics, Physical Sciences, and Engineering	Life Sciences	Social Sciences	Total MSE Baccalaureate Degrees Awarded
North Carolina A&T State University	174	18	29	221
North Carolina State University at Raleigh	95	22	28	145
North Carolina Central University	24	30	142	196
Duke University	19	11	39	69
Elizabeth City State College	12	11	0	23
University of North Carolina, Chapel Hill	11	30	66	107
Pembroke State University	8	22	49	79
Saint Augustine's College	8	5	58	71
Johnson C. Smith University	7	8	0	15
Bennett College	7	4	0	11

Source: Unpublished data from the National Center for Education Statistics, U.S. Department of Education

NORTH CAROLINA

Introduction

North Carolina, with a 1990 population of approximately 6.6 million, ranks 10th in the nation in size of population. It is home to approximately 3.0 percent of all non-Asian minorities nation-wide, and enrolls 2.6 percent of minorities at the college level.* Among the states chosen for QEM's survey[1], North Carolina ranks sixth in terms of African American enrollment and 10th in terms of American Indian enrollment.[2]

Table NC-I
North Carolina Population by Race/Ethnicity
(in thousands)

1990	Total	African Americans	American Indians	Asians	Hispanics	Whites	Non-Asian Minority Population
North Carolina Total Population	6,629	1,456	80	52	77	4,964	1,613
% of North Carolina Population	100.0	21.9	1.2	0.8	1.2	74.9	24.3

Source: 1990 U.S. Census Data.

MSE Degrees in North Carolina

In 1992-1993, MSE baccalaureate degrees earned by non-Asian minorities totaled 1,480, which is 114 percent of the 1,300 degrees projected as North Carolina's "fair share" of the NSF's goal. However, at the doctoral level, only 24 non-Asian minorities received Ph.D.'s in MSE fields, which represents 46.2 percent of the 52 degrees projected as North Carolina's "fair share" of NSF's goal for the nation. While non-Asian minorities accounted for 24 percent of the population in 1990, they earned only 6.2 percent of the total doctoral degrees in the state.

Table NC-II
MSE Degrees Awarded in North Carolina by Race/Ethnicity, 1992-93

	Bachelor's	Master's	Doctorates
African Americans	1,331	69	12
American Indians	82	8	0
Asians	276	57	20
Hispanics	67	9	12
Whites	6,976	773	340
Total	8,732	916	384
Total Earned by Non-Asian Minorities	1,480	86	24
% Earned by Non-Asian Minorities	16.9	9.4	6.3

Source:
Unpublished data from U.S. Department of Education, National Center for Education Statistics.

* "Statistical Profile of North Carolina," QEM Network, Washington, DC, 1996.
[1] AL, AZ, CA, DE, FL, GA, IL, LA, MD, MS, NJ, NM, NY, NC, SC, TX, and VA.
[2] Prepared using data from *The Chronicle of Higher Education*, January 26, 1994 and September 18, 1991 editions

North Carolina Institutional Responses

Seven out of 10 higher education institutions in the state that received survey questionnaires from QEM responded: Duke University, Elizabeth City State University, North Carolina A&T State University, North Carolina Central University, North Carolina State University, Pembroke State University, and the University of North Carolina at Chapel Hill. Summary information on these universities and their survey responses follow. Using the 1998 Higher Education Directory and the May 23, 1997 Edition of *The Chronicle of Higher Education*, contact information and enrollment figures have been updated. Changes appear in italics.

Duke University

Dr. John W. Strohbehn, Provost
Durham, NC 27706
Enrollment: 11,512
Highest Offering: Doctorate

tel: **919/684-8111**
fax: **919/684-3200**
homepage: **http://www.duke.edu**

About the Institution

Duke University was founded in 1924 by James Buchanan Duke as a memorial to his father, Washington Duke. The University was ranked fourth among the top 25 national universities by *U.S. News & World Report* in 1995. Duke offers a number of pre-college programs for minority students including: the Howard Hughes Pre-College Program, a six-week mentorship program for women and minorities in the biological sciences; the Talent Identification Program; and the Engineering Outreach Program. In an effort to increase minority student enrollment, the Office of Undergraduate Admissions has assigned an individual to cover Hispanic recruitment and another to cover African American and Native American recruitment. These individuals attend several college fairs and visit targeted high schools.

The Fly-In Program, another program sponsored by the University, brings about 20 top African American applicants to Duke in February at Duke's expense. In addition, each March the Black Student Alliance invites approximately 120 African American students who are likely to be admitted to spend four days on the campus. They are hosted by current Duke students and attend classes and other informational sessions. The Admissions Office administers minority phon-a-thons in which current minority students call accepted minority students and encourage them to attend Duke.

Support Services and College Environment

All incoming students are automatically considered for a variety of Duke scholarships. Duke has a need-blind admissions policy and the Financial Aid Office works to cover 100 percent of demonstrated need for each undergraduate student. Grants, loans, scholarships, and work-study assistance offered by Duke include: the Reginaldo Howard Memorial Scholarships, four-year scholarships annually awarded to incoming African American students who meet a required GPA; B.N. Duke Loan Replacement Program, a program that provides North and South Carolina students with up to $2,000 to replace loans; B.N. Duke Leadership Scholarship, a merit-based scholarship for North and South Carolina students that covers 75 percent of a student's tuition costs; A.B. Duke Scholarship, a scholarship that provides full tuition plus a summer stipend for study at Oxford; Trinity Scholarships that provide North Carolina residents with tuition, room, and board costs; and at least 100 outside scholarships.

In addition to financial assistance, Duke provides a variety of academic support services. The Computing Research Association pairs women undergraduates with faculty members for summer research opportunities and the Women in Science and Engineering (WISE) program schedules lunches and lectures on a variety of topics. The mathematics, biology, chemistry, and physics departments have help rooms and help sessions for students needing extra attention. The Academic Skills Center offers free peer tutoring in science and mathematics as well as workshops and one-on-one conferences for time management, study skills, and test preparation.

Duke provides various research and study options through the Summer Research Opportunity Program, a program which funds four minority students to work in the Duke University Medical Center Microbiology Laboratories. Other minority student opportunities include: the Ford Foundation Diversity Grant, which gives mini-grants to students for diversity projects; the Philip Morris Common Ground Grant which offers mini-grants to students, faculty, and staff to bridge gaps between communities; and the Minority International Research Training for Biological Sciences for 10 to 14 weeks in South America, Eastern Europe, and Africa. Duke University offers a wide range of graduate school and career opportunities. Fellowships are offered for graduate study that will lead to teaching certificates through the Fellowships for Minority Students Entering the Teaching Profession Program.

The National Society of Black Engineers campus organization publishes a resumé book for potential employers and sponsors meetings for employer presentations to students. The Pre-graduate Study and Undergraduate Research Advising Office provides information on summer research opportunities and graduate schools. The Career Development Center provides information on standardized tests, graduate schools, employment and summer internships, and resumé and cover-letter writing. The Cancer Center's "Summer on the Edge" places minority high school students in paid positions in medical laboratories.

The Spectrum House is a dormitory for students interested in minority cultures and provides educational and multicultural programs for its residents. Duke's Community Service Center offers 19 different community service programs in mathematics and science. The National Society of Black Engineers, for example, provides tutors for students in local high schools.

Elizabeth City State University

Dr. Albert L. Walker
Vice Chancellor for Academic Affairs
1704 Weeksville Road
Elizabeth City, NC 27909
Enrollment: 1,981
Highest Offering: Baccalaureate

tel: 919/335-3230
fax: 919/335-3731
homepage: http://www.ecsu.edu

About the Institution

Elizabeth City State University, established in 1891, is located in the northeastern region of North Carolina. The University offers degrees at the baccalaureate level in the basic art and sciences and in selected professional and pre-professional areas. The University also provides pre-college programs through the Mathematics and Computer Science Department. The Department offers two major programs through the Saturday Academy (September-May) and the Summer Scholars Program (July-August), both of which target students in grades 6 through 12. In the recruitment effort personal letters of invitation are sent to all interested students. The University also maintains articulation agreements with local community colleges.

Support Services and College Environment

The Science and the Mathematics and Computer Science Departments offer financial aid to students through research assistantships and internships. Supported by external funding, as well as scholarships, the Science Department provides opportunities for undergraduate research on and off campus during the academic year and summer. Mathematics and computer science students are involved in undergraduate research, teaching, and tutoring. Both departments have informal study groups, and tutoring is offered through the respective departments and through Student Services. The Science Department and the Mathematics and Computer Science Department provide a database of summer research and internship opportunities for students.

Students participate in on-campus biological science organizations and present research results at regional and national science meetings. The Mathematics and Computer Science Department faculty members support students through counseling and academic advisement. The Mathematics and Computer Science Club also provides extracurricular activities for students. The Science Department offers mini-workshops for local 4-H clubs in conjunction with the local Agriculture Extension Agency in an effort to reach out to the community.

North Carolina A&T State University

Dr. Harold L. Martin
Vice Chancellor for Academic Affairs
1601 East Market Street
Greensboro, NC 27411
Enrollment: 7,947
Highest Offering: Doctorate

tel: 910/334-7500
fax: 910/334-7136
homepage: http://www.ncat.edu

About the Institution

North Carolina A&T State University is a land-grant institution that was established in 1891. The University offers bachelor's, master's and doctoral degrees through the Schools of Agriculture, Business and Economics, Education, Nursing, and Technology; the Graduate School; and the Colleges of Engineering and Arts and Sciences.

The University is a national leader in research and development programs and ranks third in the state in the production of sponsored research. North Carolina A&T generates grants and contracts with major companies, foundations, and federal agencies to enhance its academic programs and provide student scholarships.

Support Services and College Environment

The University provides student counseling, testing, and guidance through its Counseling Services Program. The Office of Career Services offers career assistance to alumni and provides a wide range of programs, services, and resources to assist students in early career exploration.

The faculty is nurturing, supportive, dedicated, and accessible to students. Each department offers tutorial sessions for students in need of assistance. The University promotes scholarship through a special Honors Program and has other programs to help prepare students for advanced study or research. To help students make the transition into the workplace or graduate school, the University provides internships, practicums, seminars, and access to computer and biotechnology laboratories.

North Carolina Central University

Dr. Patsy B. Perry, Interim Provost
and Vice Chancellor for Academic Affairs
Durham, NC 27707
Enrollment: 5,555
Highest Offering: First Professional

tel: 919/560-6100
fax: 919/560-6413
homepage: *www.nccu.edu*

About the Institution

North Carolina Central University (NCCU) was founded in 1909. In 1925, NCCU became the first state-supported liberal arts college for Blacks in North Carolina. The University has an enrollment of nearly 5,500 undergraduate and graduate students. NCCU and the North Carolina Technical College System have an articulation agreement to facilitate student recruitment and transfer of credits.

Support Services and College Environment

Scholarships are available to students on a competitive basis. Special scholarships are available for mathematics, science, and engineering (MSE) majors. NCCU has a well-established program called the University Undergraduate Research Program that places MSE students with faculty members engaged in research. In addition, MSE students are hired to work as tutors in the Math Learning Center. MSE faculty members also serve as mentors and advisors to students. MSE students learn about job openings and information via bulletin boards, announcements in classes, and special programs offered by MSE departments. The Summer Ventures and Bridge Programs are two pre-college programs supported by NCCU. These summer programs target high school students who are interested in a MSE career.

The MSE departments have student clubs that organize problem seminars. At an annual event, student presenters give solutions to challenging problems, host seminars, and give presentations on their work. Senior MSE students conduct large scale research projects and often work as a team to complete a project. NCCU is trying to organize student chapters of the Mathematical Association of America (MAA), the Association for Computing Machinery (ACM), and the American Statistical Association (ASA) to further assist the MSE majors in academic excellence.

North Carolina State University

Dr. Phillip J. Stiles, Provost
and Vice Chancellor
Raleigh, NC 27695
Enrollment: 28,250
Highest Offering: Doctorate

tel: 919/515-2011
fax: 919/515-2556
homepage: http://www.ncsu.edu

About the Institution

North Carolina State University, founded in 1887, is in its second century of service as a national center for research, teaching, and extension in science, technology, humanities, and a wide range of professional programs. The University offers degrees at the baccalaureate, master's, intermediate, first professional, and doctoral levels in 125 fields of study. The Director of Student Services recruits students through outreach visits, mailings, and on-campus visits. The College of Education and Psychology sponsors the Mathematics and Science Education Network (MSEN) pre-college program as a strategy to attract minorities to mathematics and science. The program provides academic enrichment classes, Saturday, and summer programs for students, and workshops and seminars for parents and teachers.

Support Services and College Environment

The University offers scholarships and financial support to students in all teaching fields through the College of Education and Psychology. The University also provides students with mentors by assigning them a faculty member and utilizing the students in the Teaching Fellows program. Teaching Fellows offer tutoring in the public schools, area communities, and the University. Mathematics and science tutoring is offered by the College of Physical and Mathematical Sciences.

The University offers extracurricular activities for students to engage their imaginations and intelligence through TECA (Technical Education Clubs of America) and other mathematical and science education organizations. The Director of Student Services counsels students on summer, career, and graduate school opportunities. In order to reach out to the community, the University sends mailings to local churches and schools encouraging prospective students to visit the campus.

University of North Carolina at Pembroke (formerly Pembroke State)

Dr. Charles R. Jenkins, Provost
and Vice Chancellor for Academic Affairs
One University Drive
Pembroke, NC 28372
Enrollment: 3,000
Highest Offering: Master's

tel: **910/521-6000**
fax: **910/521-3877**
homepage: **http://www.pembroke.edu**

About the Institution

UNC Pembroke (formerly Pembroke State University) was established in 1887 as a school for Native Americans. Located in the southeastern region of North Carolina, Pembroke is about 30 miles south of Fayetteville and has a student to teacher ratio of 15:1. The first diploma was awarded by the institution in 1905. The school gained university status in 1969 and has built a reputation throughout the eastern United States as a school offering a top quality education. UNC Pembroke is a comprehensive university offering degree programs at the baccalaureate level as well as a Master of Arts in Education. These degree programs cover eight different certification areas. Both formal and informal articulation agreements exist between Pembroke and community colleges that enroll a large number of minority students.

The University has several on-campus, pre-college programs, especially in mathematics and science. They include TRIO programs and others that target 11th and 12th grade students. The University actively seeks to recruit and enroll a greater number of African American and American Indian students.

Support Services and College Environment

The state of North Carolina provides Pembroke with Minority Presence Scholarships for African Americans and Incentive Scholarships for Native Americans.

Students majoring in mathematics, science, and engineering (MSE) fields receive advice from the science departments on an individual basis. Each department has extracurricular activities for students, and departmental study groups are organized both formally and informally. Tutorial sessions for students needing extra help in mathematics or science are offered by the departments and by Student Services. Research and tutoring opportunities, such as TRIO or Special Services programs within each academic department are in place. There are several MSE-oriented student organizations on campus.

UNC Pembroke also has a formal mechanism for providing information and counseling students on summer, career and graduate school opportunities, including agreements with other institutions and business and industry for summer work. The University plans to expand its services and programs to attract, retain, and graduate more minority students in MSE fields.

University of North Carolina at Chapel Hill

Dr. Richard J. Richardson, ***Provost***
Chapel Hill, NC 27599
Enrollment: 24,439
Highest Offering: Doctorate

tel: **919/962-2211**
fax: **919/962-5604**
homepage: **http://www.unc.edu**

About the Institution

The University of North Carolina (UNC) at Chapel Hill was established in 1793 and is the only public university in the nation to have awarded degrees in the 18th Century. The University has been recognized for the quality of its graduate programs in every national survey conducted in the past third of this century. *U.S. News and World Report's Survey of American Colleges and Universities* consistently ranks the University among the best colleges in the nation and among the top research universities. The University offers 95 baccalaureate, 175 master's, and 109 doctoral programs as well as professional degrees in dentistry, medicine, pharmacy, law, and library science.

UNC-Chapel Hill participates in one large pre-college program called the Summer Bridge Program. This program enrolls African American and Native American students whose academic profiles suggest they might experience difficulty with their transition from high school to the University. Students are targeted from rural and urban high schools whose graduates experienced some academic difficulty. Summer Bridge provides students an opportunity to enhance their learning skills, experience the university environment first hand, and increase the likelihood of obtaining the equivalent academic success they enjoyed during high school.

Students majoring in any field of study are accepted into the Summer Bridge Program. Students who do not participate in this program may have access to any of the programs in which they qualify. All services and programs offered attempt to be responsive to students' individual needs so that students can gain the confidence essential for academic success. Other programs offered by the University include Upward Bound, Project Uplift, and the National Achievement Recruitment Program.

Support Services and College Environment

The University offers a comprehensive program of financial aid which includes grants, loans, and work study to assist students in need. Also it has established competitive scholarships to attract the most talented students to the University. The Joseph E. Pogue Scholarships are awarded on the basis of outstanding accomplishment in high school, the potential for success at the university level, and leadership qualities. Twenty-two scholars are selected each year and receive stipends to cover tuition, fees, room, and board. The University offers non-financial assistance as well as special services and tutorials.

The Learning Center offers Supplemental Instruction (SI) in several large lecture courses in the sciences, social sciences, and humanities. SI identifies high-risk courses instead of high-risk students. It is voluntary and accessible to all students in selected courses. The Learning Center offers approximately 10 courses with SI each semester. The Chemistry Tutorial Program supplements in-class instruction for students experiencing problems in first-year general chemistry courses. The Math Tutorial Program is designed to strengthen the fundamental mathematical skills for students experiencing difficulty in freshman level mathematics. The Peer Tutoring Program is a student initiative that provides help in a broad array of introductory courses that may differ slightly from semester to semester. Tutors teach and model good study skills and strategies and provide assistance with course content.

APPENDIX D

PROPOSED ROLE OF THE NORTH CAROLINA MINORITIES IN MATHEMATICS, SCIENCE, AND ENGINEERING STEERING COMMITTEE

January 1998

The Steering Committee for Minorities in Mathematics, Science, and Engineering in North Carolina is to provide leadership to the promotion, dissemination, implementation, documentation, and evaluation of its action plan to increase the number of baccalaureate and doctoral degrees earned in the state by members of underrepresented minority groups in mathematics, the physical sciences, and engineering (MPSE). The Steering Committee will receive advice and counsel from the Minorities in Mathematics, Science, and Engineering Advisory Council on matters related to the promotion, funding, implementation, and evaluation of the state action plan.

The end result and measure will be the state's ability through its institutions of higher education to annually produce its proportionate share of national MSE goals for minority baccalaureate and doctoral degree recipients.

Background: North Carolina's significant minority population and its sustained success at the baccalaureate level in exceeding its "fair share" contribution to the pool of the nation's minority MSE degree holders led to the creation of the State-wide Steering Committee to address the state's inability to produce its proportionate share of minority MSE doctoral degree recipients and of minority mathematics and science teachers. The Committee assumed responsibility for the development of *An Action Plan to Increase the Participation and Representation of Minority Students in North Carolina in Mathematics, Science, and Engineering.*

The Action Plan was prepared under a project funded by the National Science Foundation and with technical assistance from the Quality Education for Minorities (QEM) Network. It focuses on: ensuring that low-wealth counties/school districts serving high minority populations have sufficient resources to adequately prepare K-12 students in mathematics and science so that pursuing an MSE career is a realistic option; and increasing the number of higher education institutions in the state that contribute their respective "fair" shares of minority MPSE baccalaureate and doctoral degree recipients as well as of minority mathematics and science teachers, newly certified to teach.

Role of the Steering Committee:

- Promote the Action Plan with various constituencies and entities throughout the state
- Identify priority issues within the state that need to be addressed that affect the implementation of the Action Plan
- Promote strategies at the pre-college, college, and graduate levels, identified in the Action Plan, as well as emerging or promising strategies
- Encourage the coordination of MSE efforts within the state to avoid unnecessary duplication and to increase articulation across various state, federal, and privately-funded MSE initiatives and projects
- Recommend systemic changes to state education policy makers that will improve MSE education for minorities
- Develop a plan for updating, monitoring, and evaluating the Action Plan, including establishing baseline measures, measurable outcomes, accountability plans, and timetables

Committee Strategies:

In promoting and implementing the Action Plan, the Steering Committee will seek the guidance and counsel of the Advisory Council. In addition, the Committee will:

(1) convene meetings on campuses, within communities, and with public and private sector organizations to obtain broad-based input and support;
(2) identify potential partnerships within the state and beyond to help achieve the numerical goals;
(3) consult with state education policymakers to ensure alignment of the Action Plan with state reform initiatives;
(4) identify and disseminate information state-wide on promising programs and strategies for possible replication within the state;
(5) determine the resources needed to implement the plan and identify potential sources of support; and
(6) design a process for periodic monitoring, evaluating, and revisions to the Action Plan.

Membership:

The Steering Committee's current membership of 25 will be expanded or modified as necessary to ensure the inclusion of individuals from groups such as:

State K-12 and higher education officials	Schools and school districts
State legislators	State /local government agencies
School administrators, teachers, students, and parents	Community-based organizations
College administrators, faculty, and students	MSE Professional organizations
Community, business, and religious leaders	Industry

ROLE OF THE NORTH CAROLINA MINORITIES IN MATHEMATICS, SCIENCE, AND ENGINEERING ADVISORY COUNCIL

January 1998

The Advisory Council for Minorities in Mathematics, Science, and Engineering in North Carolina is to provide overall guidance and counsel in the implementation of an action plan to increase the number of baccalaureate and doctoral degrees earned in the state by members of underrepresented minority groups in mathematics, the physical sciences, and engineering (MPSE). The Council is to advise the Steering Committee responsible for the development of the action plan on matters related to the promotion, funding, implementation, and evaluation of the state action plan.

The end result and measure will be the state's ability through its institutions of higher education to annually produce its proportionate share of national MSE goals for minority baccalaureate and doctoral degree recipients.

Background:

North Carolina's significant minority population and its sustained success at the baccalaureate level in exceeding its "fair share" contribution to the pool of the nation's minority MSE degree holders led to the creation of a State-wide Steering Committee to address the state's inability to produce its proportionate share of minority MSE doctoral degree recipients and of minority mathematics and science teachers. The Committee assumed responsibility for the development of *An Action Plan to Increase the Participation and Representation of Minority Students in North Carolina in Mathematics, Science, and Engineering*.

The Action Plan was prepared under a project funded by the National Science Foundation and with technical assistance from the Quality Education for Minorities (QEM) Network. It focuses on: ensuring that low-wealth counties/school districts serving high minority populations have sufficient resources to adequately prepare K-12 students in mathematics and science so that pursuing an MSE career is a realistic option; and increasing the number of higher education institutions in the state that contribute their respective "fair" shares of minority MPSE baccalaureate and doctoral degree recipients as well as of minority mathematics and science teachers, newly certified to teach.

Role of the Advisory Council:

The Advisory Council is to convene state and national education policymakers, leaders in education research, elected/appointed government representatives, community and private sector leaders and others to help ensure their full understanding of the Action Plan and to garner their support for the Plan's implementation.

The Council also will advise the Steering Committee on matters related to the promotion, dissemination, implementation, monitoring, and periodic revision of the Action Plan. In addition, it will: (1) meet with the Committee at least twice each year to review proposed plans and activities; (2) design a consultative process that provides the Committee with timely information on developing priorities, reform initiatives, and cutting edge educational research; (3) facilitate the coordination of major MSE efforts within the state; (4) advocate for policy and legislative changes deemed necessary by the Steering Committee; and (5) ensure that a process for periodic reporting, monitoring, and evaluation of the Action Plan is in place.

Membership:

The Advisory Council is to consist of 12-15 individuals from groups such as:

State K-12 and higher education officials	Schools and school districts
State legislators	Federal/state government agencies
School officials, teachers, parents, and students	Churches
College officials, faculty, and students	Community-based organizations
Community, business, and religious leaders	Major state laboratories and centers
Community foundations	Accrediting groups and agencies
Industry	MSE Professional organizations

APPENDIX E

Study Methodologies, Forms of Technical Assistance, and Data Collection and Analysis

Several approaches were used to gather information and involve a broad spectrum of North Carolinians in the process. The study methodology included the use of questionnaires, on-site and telephone interviews, downloading of relevant data from the Internet, electronic listservs, and regional open forums held across the state focused on education issues and strategies for improvement.

Technical assistance was provided through a technology workshop for college presidents, a proposal development and evaluation workshop for college faculty, a special conference on teacher preparation and enhancement, five meetings of the Statewide Steering Committee, and three meetings of the Board of Advisors.

Quantitative data and other information were collected and analyzed from documents developed by several North Carolina groups, including: the State Board of Education, the Department of Public Instruction, North Carolina Citizens for Business and Industry, the North Carolina School of Science and Mathematics, the University of North Carolina General Administration Office, the North Carolina Community College System, the Public School Forum of North Carolina, and the North Carolina State Museum of Natural Sciences. Additional information was obtained from the catalogues of North Carolina institutions of higher education.

Site Visits

QEM staff members made site visits to the "Top-Ten" institutions in North Carolina. Selection of the "Top-Ten" was based on the number of their minority students who earned bachelor's degrees in mathematics, the physical sciences, and engineering in 1992-93. These visits focused primarily on institutional climate.

The institutions visited were Duke University, North Carolina Central University, North Carolina State University, the University of North Carolina at Chapel Hill, the University of North Carolina at Pembroke, Elizabeth City State University, North Carolina A&T State University, Bennett College, St. Augustine's College, and Johnson C. Smith University.

Site visits focused on teacher education were made to East Carolina University (the leading producer of new teachers in North Carolina) and to Winston-Salem State University (the leading producer of minority teachers in the state in 1992-93). Other teacher education-focused site visits were made to North Carolina Central University and to the Public School Forum of North Carolina in Raleigh.

At each of the institutional sites, QEM staff interviewed administrators or faculty with responsibilities in areas such as recruitment, admissions, retention, financial aid, student academic support services, and institutional research.

Site visits to gather first-hand information on community colleges and K-12 systems and individual schools were made to the North Carolina Community College System Office and Wake County Community College in Raleigh, the North Carolina School of Science and Mathematics in Durham, Cumberland County Schools (Office of the Superintendent), and Cape Fear High School in Fayetteville. In November 1997, QEM staff met with the Executive Committee of the North Carolina Association of Community College Presidents to provide a project briefing and receive additional input.

Regional Open Forums

Regional Open Forums provided an opportunity for the participants to discuss programs in their part of the state that work to improve the mathematics and science education of minorities in North Carolina at various levels of the education pipeline. Also, participants shared strategies for broadening the awareness and use of these programs across the state. Some of the work discussed was supported by grants from the National Science Foundation and other Federal agencies.

Six Regional Open Forums were held, all in 1997: at Fayetteville State University on May 19; at St. Augustine's College in Raleigh on June 10; at Edgecombe Community College in Tarboro on September 19; at the University of North Carolina at Pembroke on September 23; at North Carolina A&T State University on October 17; and at Johnson C. Smith University in Charlotte on December 5.

Questionnaires on Education Outreach Activities of North Carolina Institutions and an Assessment of Their Technical Assistance Strengths/Needs

Questionnaires were sent to provosts/chief academic officers at all higher education institutions in North Carolina to obtain information regarding their K-12 educational outreach activities and the areas in which they were willing to give (or needed) technical assistance. Responses to the outreach questionnaire assisted the Steering Committee and QEM staff in identifying programs, services, and other institutional activities that support the Action Plan's K-12 component. The technical assistance questionnaire helped identify which institutions would like to offer or receive "close to home" technical assistance.

Newsletters

The Fall edition of the project newsletter (*News On NC-TAP*) was published and widely disseminated in September 1997. The newsletter included a description of the project, statistical information on MSE education in North Carolina, and other articles of interest and relevance to the project, including a list of the members of the NC-TAP Statewide Steering Committee. A Winter edition of *News On NC-TAP*, focusing on the regional forums and the planned release of the Action Plan, will be distributed.

Proposal Development and Evaluation Workshop

On October 3-4, QEM conducted a proposal development and evaluation workshop at Winston-Salem State University. This workshop included faculty from institutions in North Carolina with at least 25 percent minority enrollment.

Twenty-nine (29) participants attended the workshop, including representatives from Bennett College, Fayetteville State University, North Carolina A&T State University, University of North Carolina at Pembroke, Roanoke-Chowan Community College, Shaw University, Southeastern Community College, and Winston-Salem State University. Participants worked in institutional teams and prepared proposal drafts to various NSF education programs. All of the teams indicated that they intend to submit full proposals to NSF, in accordance with published deadlines and other requirements. Two NSF staff members in the Teacher Enhancement Program participated throughout the two-day workshop.

Teacher Preparation and Enhancement (TPE) Conference

QEM, in collaboration with North Carolina State University, conducted a statewide conference on Teacher Preparation and Enhancement (TPE) in Raleigh on October 24-25. A total of 44 persons attended the conference, representing 17 schools and colleges and seven education-related organizations.

Several issues were raised and discussed at the Conference regarding pre-service and in-service teachers, including the following:

- How should we recruit, educate, and retain teachers, especially minority teachers of mathematics and science?
- What is the most effective way to produce high-quality teachers and school administrators while aligning their pre-service and ongoing in-service professional development activities with state education standards and priorities?
- Should science be explicitly mentioned, in addition to the three Rs, in policy statements embedded in the ABC Plan and other legislative mandates regarding education?
- How can technology be used to improve student learning of mathematics and science and how can teachers acquire the knowledge and skills necessary for the effective use of technology in the classroom?

A number of strategies for addressing these issues were discussed by presenters and participants during the Conference.

Data Collection and Analysis

QEM staff gathered quantitative data from published and unpublished sources both within and outside North Carolina to gain more detailed information regarding the condition of education for minorities in the state at various points along the education pipeline. For example, data were collected and analyzed that identify the public school districts, community colleges, and four-year institutions in North Carolina with the highest enrollment of minority students.

This information assisted in the development of strategies in the Action Plan for establishing stronger "close to home" collaborations among educational institutions at all academic levels to support high quality MSE education for minority students throughout the state.

QEM staff collected and analyzed data that give the number of baccalaureate and doctoral degrees awarded to minorities by North Carolina institutions in MSE disciplines to ascertain which institutions have been successful and to seek additional information from them to understand the reasons for their success.

Data were examined regarding the financial support to North Carolina school districts with relatively high percentages of minority students to see whether there are funding equity concerns that should be discussed as a part of the Action Plan.

Minority achievement in North Carolina schools was examined through the use of data from the SAT and NAEP examinations. It is well-known that minority students generally score lower than whites on these tests, but the reasons for this difference should be better understood in order to develop appropriate short and long-term improvement strategies.

One approach to understanding "why" would be to compare the educational experiences and resources, including teachers and guidance counselors, of predominantly minority and non-minority school districts at various segments of the pipeline (e.g., K-5, 6-8, and 9-12). Using this approach, it should be possible to learn more about the differences in performance, including the possibility that some students are being tested on skills and concepts they were never taught.

QEM staff gathered data on how and by whom technology is used to improve education in the state. This information is critically important to the Action Plan since technology holds the promise of helping to "level the educational playing field" for students from low-income families and resource-poor schools.

Data were collected on the number and location of minority teachers in North Carolina and on which colleges have been the most successful, relative to other teacher education institutions in the state, in the production of minority mathematics and science teachers. The QEM staff examined why these colleges have been successful and how their success might be replicated at other institutions in the state.

Data were examined regarding the 58 community colleges in North Carolina to find out which of these colleges have pre-science, pre-engineering, or pre-teacher education programs and which have been most successful in transferring minority students to four-year institutions who graduate in MSE disciplines. This information allowed for the identification of model programs that might be shared with community colleges throughout the state.

Other data were collected on the number and location of minority graduate students in North Carolina institutions. This provided the QEM staff and the Steering Committee with a better understanding of what needs to be done and by whom to achieve North Carolina's proportionate share of the NSF goal for the production of minorities with doctoral degrees in MSE disciplines. This area is of particular importance, given the severe underrepresentation of minority MSE doctoral degree recipients in North Carolina and across the United States.

These data provide information relevant to:

- The determination of locations in the state where educational improvement efforts might be concentrated to result in optimal benefits for minority students

- The role that community colleges might play and with whom in the preparation of future minority mathematicians, scientists, engineers, and mathematics and science teachers in North Carolina

- How school districts, community colleges, and four-year institutions might share their resources to help insure that all students throughout the state have the opportunity to receive a high quality education in MSE disciplines

- How opportunities for MSE graduate education in the state might be changed to ensure that the state achieves its proportionate share of NSF's goal for the production of minorities with doctoral degrees by the Year 2000.

NOTES

About the QEM Network

The Quality Education for Minorities (QEM) Network is a Washington, DC based non-profit organization, dedicated to improving the education of minorities throughout the nation. It serves as a focal point for the implementation of strategies to help realize the vision and goals set forth in the 1990 QEM Project report: *Education That Works: An Action Plan for the Education of Minorities.*

The QEM Network serves as a national resource and catalyst to help unite and strengthen educational restructuring efforts to the benefit of minority children, youth, and adults, while advancing minority participation and leadership in the national debate on how best to ensure access to a quality education for all citizens. It seeks to put into practice the recommendations in the QEM Action Plan by working with minority and non-minority individuals, organizations, and agencies around the country to help coordinate and energize efforts to improve the education of minorities.

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MPSE PERCENTAGE OF INSTITUTION'S MINORITY MSE DEGREES AWARDED IN 1995 BY NORTH CAROLINA'S "TOP TEN" INSTITUTIONS