Quality Education for Minorities (QEM) Network

Empower the Educator

Enabling Current and Future Mathematics and Science Teachers of Minority Students to Offer More Challenging Courses to their Students

An Action Plan
February 1996
Quality Education for Minorities (QEM) Network

Goals for the Year 2000

Goal 1  Ensure that minority students start school prepared to learn.

Goal 2  Ensure that the academic achievement of minority youth is at a level that will enable them, upon graduation from high school, to enter the work force or college fully prepared to be successful and not in need of remedial assistance.

Goal 3  Significantly increase the participation of minority students in higher education, with a special emphasis on the study of mathematics, science, and engineering.

Goal 4  *Strengthen and increase the number of teachers of minority students.*

Goal 5  Strengthen the school-to-work transition so that minority students who do not choose college leave high school prepared with the skills necessary to participate productively in the world of work and with the foundation required to upgrade their skills and advance their careers.

Goal 6  Provide quality out-of-school educational experiences and opportunities to supplement the schooling of minority youth and adults.

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A N A C T I O N P L A N

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Minority children need teachers of the highest quality who hold high expectations of them and who will help nurture the desire to achieve in them. For these reasons, strengthening and increasing the number of teachers of minority students is one of the six goals of the QEM Action Plan for providing quality education for minority students (Education That Works: An Action Plan for the Education of Minorities, QEM Project, MIT, January 1990, page 8). As noted in Education That Works:

A fundamental problem facing minority children is that they are disproportionately taught by the least experienced and least qualified teachers. Not only is action needed to attract better prepared students into teaching, steps are urgently needed to address the poor quality of many current teachers of minority students.

At the very time minority enrollments in public schools are skyrocketing, the number of minority teachers is on a downward spiral. In 1970, for example, 12 percent of the teaching force in our public schools was Black; by 1985 it was 8 percent, and most experts believe it will fall below 5 percent in the next decade.

While experts continue to argue the causes—standardized tests for professional admission and certification, the declining participation of minorities in higher education, and greater opportunities for minorities in other professions—a full blown crisis is developing. Students, rarely seeing a minority teacher, may get the message that the authority, status, and accomplishment of learning are largely the province of Whites.

And many majority students who will enter a society and workforce with a rising proportion of minorities will be denied the insight and knowledge they might have acquired from minority teachers. This would be an unfortunate lesson for majority and minority Americans alike. We must expand the pool of minority teachers.

African American, Alaska Native, American Indian, Mexican American, and Puerto Rican children and youth continue to be disproportionately denied access to challenging pre-college courses, particularly in mathematics and science. The majority of these students continue to be enrolled in predominantly minority schools.
Most are taught by teachers who do not hold high expectations of them and who are not committed to helping them achieve academic excellence. Factors affecting their access to challenging courses and to qualified teachers are summarized in the following tables.

**ACCESS TO COURSES**

- Mathematics and reading in the elementary years, and mathematics and science, in the middle years are the critical filters that separate children into tracks, with low-income and minority youth disproportionately placed in low-level classes.

- The practice of tracking has a fundamental impact on what students study and thus what skills they have an opportunity to master, particularly in mathematics. Several recent research findings underscore this point, as outlined in the report: National Science Board (NSB) Science and Engineering Indicators, 1991 Tenth edition.

- Blacks, Hispanics, American Indians, and low socioeconomic status eighth grade students are twice as likely as white students to be in remedial mathematics classes.

- The access of minority students to high-track science and mathematics classes diminishes as the minority enrollment at their school increases.

- Even when minority students attend racially mixed schools they are more likely than their white peers to be placed in low-track classes.

- The proportion of high-ability classes increases significantly as the proportion of white students increases.

- Minorities tend to have less access to “gatekeeping” courses at their schools, that is, courses that are especially important in qualifying students for college-level work in science and mathematics.

- Eighth grade algebra, ninth grade geometry, and high school calculus courses are considered “gatekeepers” because of their importance in the science and mathematics curriculum.

- Students attending predominantly white schools have far greater opportunities to take gatekeeping courses.
This access is critical for researchers have found that the best determinant of future college attendance is enrollment in high school geometry. Among students who took geometry, Pelavin and Kane found that gaps in college attendance rates all but disappeared: 80 percent of Black students in this group attended college, along with 82 percent of Hispanic students and 83 percent of whites. Even for students at the poverty level, taking geometry halved the gap in college attendance.¹

ACCESS TO QUALIFIED TEACHERS

Low-income and minority students have less access than other students to the best qualified science and mathematics teachers.

In 1987, only 39 percent of the teachers who taught low-ability classes in low SES (socioeconomic status), minority, inner-city schools were certified to teach science and mathematics at the secondary level, compared with 84 percent of the teachers at high-wealth, predominantly white, suburban schools.²

Low-track students in the most advantaged schools (high SES, white, suburban) were more likely to have better qualified teachers of science and mathematics than high-track students in the least advantaged schools (low SES, high-minority, inner-city).³

Low-track students from middle school most often enroll in academically thin, general and vocational tracks in high school into which they are counseled.

Not surprisingly then, many minority and poor students do not perform well on standardized tests and are only marginally prepared when and if they complete high school.

If they continue in higher education, the majority will attend two-year colleges from which they will not likely transfer to four-year colleges.


³Ibid.
QEM’s Response

Since 1992, the QEM Network has launched four teacher-related initiatives probing issues of minority student access to challenging mathematics and science courses as well as to qualified teachers. These inquiries laid the groundwork for the development of a Teacher Education Action Plan to ensure quality mathematics and science instruction for minority K-12 students, particularly those attending predominantly minority schools.

The plan facilitates the achievement of QEM’s stated goal to strengthen and increase the number of teachers of minority students as well as an accompanying objective:

Quintuple the number of minority college students newly qualified to teach who enter teaching from about 6,000 in 1986 to 30,000 by the year 2000, with a special emphasis on mathematics and science teachers. (Education That Works, page 8).

The first initiative, the Annenberg/QEM Minority Teacher Leadership Corps, started in July 1992 with support from the Annenberg/CPB Math and Science Project and in collaboration with six universities and 50 schools in five states (AZ, MD, NC, NM, and VA). Approximately 100 minority mathematics and science teachers have been engaged in a range of activities to enable them to become more effective spokespersons for mathematics and science education reform to benefit their students and to better integrate the use of technology in their classroom instruction.

The Teacher Leaders plan and conduct workshops and conferences for their peers as well as other teachers in their state and region. They prepare newsletters; spearhead reform at the classroom and building level; and participate in electronic discussion groups. They lead efforts to make their buildings “Internet ready” and eagerly take advantage of other professional development opportunities available to them.

The second teacher-related QEM initiative was a working conference conducted in Fall 1993, with support from the National Science Foundation, entitled “Designing a Comprehensive and Collaborative Program to...
Increase the Number of Well-prepared Minority Mathematics and Science Teachers." Over a three-day period, 45 individuals discussed issues related to the recruitment and retention of minorities into the teaching profession, particularly in the areas of mathematics and science. The participants included educational and community leaders from Washington, DC and Chicago, Illinois and representatives from nine professional, scientific, and educational organizations. The Conference, viewed as the first step in developing a national action plan, resulted in a set of guidelines for a national strategy to recruit and retain more talented minorities as mathematics and science teachers.

The third initiative, a Teacher Preparation and Enhancement Conference conducted in Fall 1994 with support from the National Science Foundation (NSF), brought together key decision-makers from 30 predominantly minority institutions that are major producers of minority teachers. Participants included deans and department chairs of education, mathematics, chemistry, biology, and physics.

Among other issues, the more than 120 participants examined the status of mathematics and science teacher education programs at their institutions. The discussion focused on such concerns as preparing both pre-service and in-service teachers who can:

- meet national and state teacher certification requirements
- teach courses that meet national mathematics and science standards
- effectively use advanced tools of technology in their classes
- teach students with diverse mathematics and science backgrounds
- become master teachers in their fields
- assist their peers in understanding the implications for their students of the major education reform efforts

QEM is also currently engaged in a fourth initiative that has considerable relevance to the proposed teacher education action plan. Through its NSF-supported Technical Assistance Project, QEM is conducting a series
of state-wide mathematics, science, and engineering (MSE) conferences in the 19 states in which minority students are at least 25 percent of the high school graduates. These conferences bring together NSF grantees within those states as well as K-12 and university faculty, students, and administrators; business and community leaders; state legislators; and science and education policy makers.

Since Spring 1994, 17 MSE conferences, including two in California, have been held in 15 states and in Puerto Rico. Four additional conferences are planned for Spring 1996, three of which will focus on urban areas; the fourth will involve faculty and staff at Alaska Native/American Indian institutions. Teacher preparation and enhancement projects funded by NSF have been featured at each conference. Effective strategies and lessons learned through these projects are integral to the formulation of QEM's teacher education plan as well as to coordinated teacher-focused efforts at the state level.

The long-term goal in each state is the preparation of an action plan to enable the state to produce minority baccalaureate and doctoral MSE degree recipients commensurate with its minority college enrollment. The plan would build upon existing exemplary or promising strategies in the state. Quality preparation and enhancement of teachers of mathematics and science is expected to be a central goal of each plan.

The knowledge and insight gained through these diverse efforts form the basis of the teacher education action plan that QEM is proposing. The plan will involve minority and non-minority teacher education institutions as partners to increase significantly the quantity and quality of minority teachers of mathematics and science.

Such a collaboration will facilitate the sharing of information and resources among the participating institutions as well as the communication of lessons learned to other teacher education institutions. It will help to ensure that all mathematics and science teachers of minority students, not just minority teachers, are well-prepared.

This is QEM's goal.
A five-year collaborative action plan is proposed to ensure that mathematics and science teachers of minority students are able to offer challenging courses to their students. Teacher education institutions joining QEM in the proposed consortium will engage in a variety of strategies to achieve the five goals of the action plan:

**Goal 1: Expand the pool of well-qualified minority teachers, especially of mathematics and science**

To achieve this goal, the consortium will 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 and booster clubs

- Present teaching careers as attractive career options to undergraduate students, beginning with freshman advising

- Identify and target students majoring in mathematics and science for early recruitment into teaching

- Offer incentives to encourage current students to enroll in mathematics and science teacher education programs, including stipends, forgivable loans, and doctoral fellowships as well as scholarships for post-baccalaureate students seeking to meet special teacher certification requirements

- Facilitate the transition of individuals from other careers, such as the military or industry, into teaching by establishing special post-baccalaureate teacher education 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

Using a variety of mechanisms, including conferences, resource directories, and electronic databases accessible via the Internet, QEM will identify and disseminate successful models that encourage students to enter the teaching profession, particularly as teachers of mathematics and science.

**Goal 2: Strengthen the teacher education institutions that are major producers of minority teachers**

To achieve this goal, the consortium will develop initiatives that:

• Prepare teacher education graduates so that they can provide standards-based instruction in mathematics and science

• Provide courses that traditionally have not been part of the pre-service curriculum; for example, environmental sciences, the use of technology in instruction, and strategies for creating a positive and supportive school/classroom climate

• Provide pre-service secondary school teachers of mathematics, biology, and chemistry with substantive “hands-on” experiences so they can become proficient in both subject content and methodology

• Require elementary education majors to concentrate in an identified academic area in order to have greater content knowledge of the subjects they are going to teach

• Develop interdisciplinary courses in mathematics, biology, and chemistry to enable teacher education majors to be proficient in content areas without necessarily increasing the number of required courses

• Establish programs involving student and curriculum assessment consistent with the developing national assessment standards
• Place greater emphasis on courses involving proven instructional strategies to facilitate the development of effective teaching skills

• Provide adequate time for teacher education faculty to develop and assess appropriate curricula

• Emphasize effective teaching skills that focus on the use of technology, computer literacy and proficiency, critical thinking, and problem solving

• Develop mechanisms for bridging the gap between pedagogy and content by modeling effective teaching strategies in mathematics and science courses

QEM will provide technical assistance to its collaborating partners in the identification of potential funding sources for these initiatives and in the prior review of proposals seeking such support. In addition, as part of its Technical Assistance Project, QEM will work with minority institutions that have not had grants from the National Science Foundation in the last five years and that are also major producers of minority teachers. The focus will be on helping these institutions strengthen their mathematics and science teacher education programs.

Specifically, QEM will work closely with these institutions to facilitate the generation of competitive proposals by offering proposal development and evaluation guidance related to strengthening their mathematics and science teacher education programs. QEM will identify faculty from within its pool of volunteer proposal reviewers to provide feedback on proposals prepared by the participating institutions. They will be faculty who have directed teacher education projects or served on teacher education proposal review panels.
Goal 3: Provide quality professional development programs for teachers

To achieve this goal, the consortium will develop initiatives that:

- Structure — with local school districts — cooperative group activities to assist teachers in sharing information, exchanging ideas, and improving their instructional skills through the use of technology

- Develop — with local school districts — peer mentoring programs that enable teachers to observe and learn from each other

- Offer summer and weekend professional development opportunities for teachers, including institutes, short courses, and workshops at local universities, museums, and/or science centers with a special emphasis on providing "hands-on" experiences in the use of manipulatives and other materials that promote the learning and appreciation of mathematics and science

- Ensure that minority teachers are actively involved on educational policy and advisory boards at the local, state, and national levels

QEM will develop a resource directory and an electronically accessible database of successful professional development models. It will draw on exemplary and promising strategies featured at its various state-wide MSE conferences as well as on the Educational Resource Information Center (ERIC) and National Diffusion Network (NDN) resources. QEM will also encourage members of the Annenberg/QEM Teacher Leadership Corps to serve as mentors and resources for current and prospective teachers in their state and region.
Goal 4: Produce a culturally and ethnically diverse cadre of teachers representative of the community it serves

To achieve this goal, participating institutions will:

- Offer a course in multicultural education as a component of its teacher education program
- Target neighboring two-year colleges as potential sources of future teachers since the majority of minority students enrolled in higher education attend such institutions
- Develop articulation agreements with two-year colleges to help ensure that students take the required course work that will allow them to transfer into teacher education programs at four-year institutions as well as pursue mathematics, science, and engineering majors

QEM will provide technical assistance in drafting both multicultural education course syllabi and articulation agreements between two-year and four-year institutions.

Goal 5: Coordinate efforts and share resources across institutions

To achieve this goal, the consortium will:

- Provide for greater sharing of resources within and across institutions to maximize the use of equipment and other resources, reduce costs, avoid duplication, and replicate successful strategies
- Share information and insights on targets of opportunity, what works and why, and — in general — lessons learned in developing, implementing, and evaluating teacher education programs

QEM will establish and update a “listserv” of the participating institutions as one mechanism for disseminating information on model strategies and programs as well as for alerting consortium members of possible sources of support and of proposal deadlines for relevant programs.
**Other Strategies.** To help strengthen and increase the number of teachers of minority students, consortium members will engage in specific activities to facilitate greater parent, family, and community involvement in K-12 education. This will include efforts to inform them about current policy and reform issues in public education, teacher education, and higher education; provide a forum in which they can express their views and recommendations for improving K-12 education; and utilize them as resources for encouraging students to consider the teaching profession as a career.

QEM will work closely with such organizations as the Center on Families, Communities, Schools and Children’s Learning at Johns Hopkins University, and the Institute for Responsive Education at Boston University in order to draw on, and further disseminate, the expertise of these two exemplary family/school/community programs.

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**The Teacher Education Consortium**

The QEM Network will recruit a group of up to ten teacher education institutions located in or near low-income minority communities to join in a consortium to refine the proposed five-year action plan, including the establishment of benchmarks, a deliverables timetable, formative and summative evaluation measures, and the identification of a Consortium Steering Committee.

Consortium members should be institutions that (1) offer the undergraduate degree in at least three of the following disciplines: biology, chemistry, mathematics, and physics; (2) have a track record of attracting and graduating talented minority mathematics, science, and engineering (MSE) students; (3) require secondary teacher education graduates to major in a non-education field and elementary teacher education graduates to concentrate in a discipline; and (4) produce minority graduates who are able to successfully matriculate at selective graduate schools and/or obtain upwardly mobile positions in the workplace.
The roles of the consortium members include:

- Developing innovative recruitment efforts by working with community groups and initiating or expanding career awareness programs

- Offering appropriate incentives to students and faculty to enter and remain in mathematics and science teacher education programs

- Strengthening the curriculum, instruction, and assessment components of teacher preparation programs

- Expanding professional development programs in collaboration with school districts

- Incorporating multicultural education into teacher education programs

- Establishing articulation agreements with other colleges and universities, including two-year institutions

- Sharing financial, technical, and knowledge resources within and across institutions

- Establishing linkages within the community, particularly with parents and families
QEM's Role

As a member of the consortium, QEM will perform general facilitative and technical assistance roles that focus on *quantity and quality issues, barriers to be overcome, and strategies for overcoming barriers*. These roles include:

- Providing background informational services and support
- Establishing relevant databases
- Identifying, providing, and or helping to secure financial and technical resources
- Conducting seminars and workshops around key strategies for achieving each of the plan’s goals
- Involving its Teacher Leaders as mentors and resources for current and prospective teachers in their state and region
- Monitoring and assessing activities related to the plan’s implementation
- Reporting and disseminating information on the plan, its implementation, and its results in a variety of forms and forums

Each of these roles will assist in the implementation of this plan to ensure quality mathematics and science instruction for minority K-12 students by strengthening and increasing the number of their teachers.

As reflected throughout this plan, QEM seeks to ensure that minority students have access to a quality education from well-prepared minority and non-minority teachers who hold high expectations for all of their students and who are supportive of their students’ career aspirations whether in science, literature, the arts, or education. Implementing this plan will help to achieve this critical QEM goal. More importantly, it will help to ensure that minority students receive the quality education they need and deserve.
For more information on this Action Plan or on how to join the Teacher Education Consortium, contact:

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