

# Twelve Recommendations for Strengthening Mathematics and Science Programs Serving a Diverse Population<sup>1</sup>

*By Joyce S. Kaser, Ed.D., University of Pittsburgh*

Based on the data gathered and the interviews with administrators<sup>2</sup>, the author makes the following suggestions. These twelve recommendations are targeted primarily toward educators wanting to strengthen their own mathematics and science offerings, possibly by establishing a school-within-a school or launching a charter school. The recommendations are listed in the order in which they should occur:

1. Conduct a market study before developing a plan. What is the need and interest in a mathematics and science specialty school in your area? Who is your target audience? What is the purpose of this new program or school? What will students be prepared for when they graduate? What resources exist for establishing and supporting such a program or school, and are these sufficient? Who will staff this program or school? Are these people available? How much community support exists for this new venture? What are the pitfalls, and how can they be overcome?
2. Have a broad-based planning group. Your planning committee for a specialty mathematics and science program should include educators, parents, students, community members, and representatives from business and industry and colleges and universities. Many of these individuals should be experts in fields related to your endeavor, e.g., finance, curriculum, architecture, human resource development, and post-secondary education. Such a group can provide you with the information you need to make wise decisions about your venture.
3. Develop a business plan. Although you are planning an expanded program or even perhaps a new school, you can profit from a business plan. Following a business plan will help keep you focused, as there likely will be requests that could pull you off track. And remember to start small, e.g., adding a class of students a year.
4. Make explicit your desire to have a diverse student body. Define diversity. Does it include racial and ethnic minorities, both males and females, persons with disabilities, and individuals from different geographic regions? Are you also looking for diversity of thought (religion, political perspective, cultural background)? Place your statement of commitment to diversity on all recruiting and marketing information so that it is prominently displayed. Use it as a frame of reference for making decisions about every aspect of your new venture.
5. Make an informed decision regarding open versus standard enrollment. Which admissions procedure will most likely produce the desired student body? Review the literature on open versus standard enrollment. Talk to schools that rely on open admissions. What is their track record in admissions and graduation rates? What does your community have to say about this issue?
6. Hire a principal who can deal effectively with a diverse student body and community. Not all principals are good candidates for heading up a mathematics and science specialty school. Your principal must be an outstanding role model for students, staff, and the community. Effective principals need to be comfortable in interacting with students, parents, and community members of different racial/ethnic groups and socio-economic levels. They need to be flexible, able to switch gears quickly if a plan is not working. They need to be able to detect the pulse of their student body and detect problems before they develop. They need to understand and be committed to mathematics and science but not to the exclusion of other subjects and extracurricular activities. The goal of such a specialty school is to provide students with an outstanding education with an emphasis on mathematics and science. It is not to produce scientists or mathematicians. With good preparation, students are well prepared to make

the choices that are best for them. High school is a time of exploration as well as preparation.

7. Hire a diverse staff committed to your vision and mission. The success of your venture depends heavily on your staff. Do they reflect the diversity of your student body? Are they strong content specialists able to inspire students? Are they able to work with students of different ability levels and learning styles? Are they sensitive to cultural differences among students? Are they open to new ideas and new instructional approaches? Do they value other subject areas — not just mathematics and science? Are they committed to holding students to high standards while providing them with the support necessary for them to achieve? Can they appreciate the role of extracurricular activities in students' lives? Are they collegial, willing to work with one another to develop a strong program?

8. Develop support programs and services that address the diversity within your school. Effectively meeting the needs of a diverse student body cannot be left to chance. Action needs to be deliberate on your part. There needs to be a number of programs and services that help students enroll and satisfactorily complete their program of study. Most likely these programs and services will help all students, but they will be designed specifically for students who may not be well prepared for a challenging mathematics and science curriculum.

9. Sponsor pre-programs at lower grade levels to interest students in mathematics and science careers. As this report indicates, some of these programs and services may need to start in elementary and middle school if students are to develop a strong base in mathematics and science and an interest in attending a specialty school by the time they reach high school. Sponsoring summer, Saturday, or after-school programs should guarantee a specialty school a steady supply of well-qualified applicants.

10. Develop a systematic approach to planning and implementing support programs for students. Rarely do schools systematically assess the nature of students' learning difficulties, which may be related to a myriad of factors, and then design interventions specifically designed to address the

difficulty. Usually support programs are fragmented and uncoordinated. Would a particular student profit best from peer tutoring, teacher tutoring, participation in AVID, or other programs or services? How does a teacher or counselor know? Schools can contribute to students' success by having procedures in place to diagnose the nature of learning difficulties and then having a coordinated set of programs and services in place that can remedy these problems.

11. Develop your curriculum based on the requirements of post-secondary institutions, the expectations of the business and industrial community, and the interests of the students. Obviously, you want your students to be well prepared for college admission. You also want students not headed for four-year institutions to be well prepared for community college or the on-the-job training they may receive from employers in your area. At the same time, you want your courses to appeal to the interests of the students. Forensics, game theory, fractals and chaos, evolution, robotics, research projects, and a variety of courses related to marine science are likely to attract students based on their interests and their geography. Students may also be interested in taking Advanced Placement courses, courses for college credit, and/or courses leading to an International Baccalaureate Degree.

12. Gather data on the effectiveness of your programs and services, and make sure that the data are disaggregated on the basis of the diversity represented in your student body. What is the effect of participating in AVID? Do students get better grades? Do students who participate in a summer program prior to starting your program do better than those who do not? What students are using the various tutoring programs, and how are they benefiting? Are racial and ethnic minority students participating in extra-curricular activities? If so, which ones? What is the graduation rate for each group? What are the two- and four-year college completion rates for your students? What careers do your students eventually go into? Having such data will allow you to assess the entire range of programs that you offer and make adjustments accordingly. They also provide you with data on the overall effectiveness of your school.

## Footnotes

<sup>1</sup>From Kaser, J. S. *Mathematics and Science Specialty High Schools Serving a Diverse Student Body: What's Different? System-Wide Change for All Learners and Educators (SCALE)*, pp. 14-16, Learning Research and Development Center Institute for Learning, University of Pittsburgh, March 2006. Dr. Kaser's work was supported as part of a grant from the SCALE National Science Foundation (EHR 0227016). All opinions, findings, or conclusions are those of the author and do not necessarily reflect the views of the supporting agency. The complete report is available at: [scalemsp.wceruw.org/files/research/Products/msstudy02.22.06.pdf](http://scalemsp.wceruw.org/files/research/Products/msstudy02.22.06.pdf)

<sup>2</sup>Research was done at the following schools:  
Academy of Math, Science and Engineering (AMES), Salt Lake City UT  
Center for Advanced Studies at Wheeler HS, Marietta, GA  
The Charter School of Wilmington, DE  
Granada Hills Charter HS/CSUN Math, Science and Technology Magnet, Granada Hills, CA  
Illinois Mathematics and Science Academy (IMSA), Aurora, IL  
Manhasset HS, Manhasset, NY  
Mathematics and Science Academy at Ocean Lakes HS, Virginia Beach, VA  
North Carolina School of Science and Mathematics (NCSSM), Durham, NC