

Encouraging Girls in Math, Science and Engineering

STEM (Science Technology Engineering and Math) Participation Barriers

- Negative Attitudes
- Lower performance levels than those of white males
- Limited exposure to extracurricular activities and failure to participate in advanced courses
- Lack of information about or interest in careers

Intervention Goals

- Improve attitudes towards STEM courses
- Increase STEM career awareness
- Increase confidence in doing STEM courses and activities
- Increase science and math content and process knowledge
- Increase use of science and math in daily life
- Improve test performance in math and science
- Increase enrollment in higher-level math and science classes
- Increase out-of-school math and science activities

Planning strategies to positively affect the attitudes and perceptions of female and minority students about science and mathematics is a necessary first step in developing an effective intervention approach.

Intervention Efforts to Affect Attitudes Should ...

- Begin before seventh grade
- Ensure that participants have access to skill enhancement
- Emphasize that minorities can excel in science and mathematics
- Expose participants early on to more STEM experiences, activities, and hobbies, both in and out of school
- Stress the usefulness of STEM in the present and future
- Involve role models and mentors who have favorable attitudes and experiences in math, science, and engineering
- Use of a variety of career awareness strategies
- Promote involvement in extracurricular math and science activities
- Develop mechanisms for providing a supportive environment through parents, teachers, and peers

References

- Brushi, B.A., & Anderson, B.T (1994). Racial/ethnic and gender differences in science achievement of 9-, 13-, and 17-year old students. *Journal of Women and Minorities in Science and Engineering*, 1(3), 226-236.
- Clewell, B.C., Anderson, B.T., & Thorpe, M.E. (1992). *Breaking the Barriers: Helping female and minority students succeed in mathematics and science*. San Francisco: Jossey-Bass.
- Matyas, M & Malcolm, S. (ed.) ((1991). *Investing in Human Potential: Science and Engineering at the Crossroads*. Washington, DC: American Association for the Advancement of Science

Strategies to Develop Math and Science Skills

- Building Confidence – to counteract learned helplessness through activities that . . .
 - Promote success for each child;
 - Provide tasks with many approaches;
 - Offer tasks with many right answers;
 - Allow opportunities for guessing and testing;
 - Support estimating
- Using Manipulatives
- Social Arrangements – to support girls’ ways of learning through
 - Independent work
 - Cooperative work
 - Single-sex and mixed sex groups
 - Game playing
- Sex-Role Awareness
 - Content relevance
 - Modeling new options

Activities for Sex-Fair Learning

Research and standardized tests have shown four problematic areas for girls.

1. Spatial Visuallization, including graphing
2. Problem solving, applications, and understanding numbers
3. Logical Reasoning
4. Scientific investigation

Factors Affecting Recruitment and Retention in Higher Education STEM

1. Academics
2. Student Attitudes and Experiences
3. Influence of Significant Others – teachers, parents, and peers
 - a. Parental education level
 - b. Parental socio-economic status
 - c. Attitudes, expectations and aspirations
 - d. Lack of role models
4. Institutional
 - a. Financial aid
 - b. Structure of science and engineering curricula
 - c. Classroom and campus climate

Sources:

Matyas, M and Malcolm, S. ((1991). *Investing in Human Potential: Science and Engineering at the Crossroads*. Washington, DC: American Association for the Advancement of Science

Skolnick, J., Langbort, C, and Day, L. (1982). *How to Encourage Girls in Math & Science*. Englewood Cliffs, NJ: Prentice-Hall.