DOCUMENT RESUME

ED 421 602 UD 032 456

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TITLE Sisters in Science: A Model Program. Spotlight on Student Success, No. 201.
INSTITUTION Mid-Atlantic Lab. for Student Success, Philadelphia, PA.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
PUB DATE 1998-00-00
NOTE 4p.
AVAILABLE FROM Mid-Atlantic Laboratory for Student Success, 1301 Cecil B. Moore Ave., Philadelphia, PA 19122-6091; phone: (800) 892-5550; World Wide Web: www.temple.edu/LSS
PUB TYPE Reports - Descriptive (141)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Constructivism (Learning); Elementary Education; *Elementary School Students; Elementary School Teachers; *Females; Grade 4; Parent Participation; Science Instruction; *Sciences; Student Attitudes; *Student Interests; Summer Programs; Undergraduate Students; Urban Schools; Volunteers
IDENTIFIERS *Philadelphia School District PA

ABSTRACT

In an effort to promote females' achievement in science, the Sisters in Science program was developed. Conducted in 2 schools in Philadelphia (Pennsylvania), the program's inaugural year involved 60 fourth-grade girls in 2 elementary schools, an intergenerational corps of 20 women volunteers, 150 undergraduate elementary education students, and 8 inservice teachers. The program seeks to improve girls' attitudes toward science and create a more positive learning environment for minority females and their families. To attain these goals, Sisters in Science has four major components: (1) an in-school constructivist and gender-sensitive science program; (2) an after-school environmental service learning program; (3) a "city rivers exploration" summer camp; and (4) a family education program. Participation in all Sisters in Science activities was quite high, in that 95% of the girls eligible for the program participated in the afterschool component, and 65% attended the summer camp. Findings to date show that the girls who participated in the project demonstrated more positive attitudes toward and enhanced interest and achievement in science and mathematics. Data also show a positive pattern of change in the females' science process and language skills as evidenced by their class participation and the writings in their science journals. (Contains three figures and two references.) (SLD)

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A Digest of Research from the Mid-Atlantic Laboratory for Student Success
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Sisters in Science: A Model Program

by
Penny L. Hammrich
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OVERVIEW

The findings of the 1976-1977 *NAEP Second Survey of Science* prompted researchers to begin investigating factors that have contributed to the "gender gap" that currently exists in science. During the past 20 years, intervention programs have been initiated to narrow the gender gap, but thus far they have produced minimal changes in girls' attitudes toward and achievement in science.

In the context of broadening the concept of teaching and learning for all students by uniting the active participation of parents and intergenerational role models with other factors that promote females' success in science, the *Sisters in Science* program was developed. Conducted at two schools located in inner-city Philadelphia, the program's inaugural year involved 60 4th-grade girls in two elementary schools, an intergenerational corps of 20 women volunteers, 150 undergraduate elementary education students, and 8 inservice teachers.

The program seeks to:

- Radically improve young females' attitudes toward and interest in science;
- Create a more positive learning environment for minority females and their families on academic and community/social levels; and
- Increase the knowledge base and understanding of the role of parental influence in promoting females' interest in science.

In order to attain these goals, *Sisters in Science* has four major components: (a) an in-school constructivist and gender-sensitive science program; (b) an after-school environmental service learning program; (c) a "city rivers exploration" summer camp; and (d) a family education program. The project also provides support for parents and professional development opportunities for in- and preservice teachers. As an intergenerational program, retired and currently working women from the fields of science, engineering, and mathematics, as well as female university students who are pursuing careers in science education, serve as role models for the girls and share life and work experiences. In addition to individual and small group mentoring, the role models also serve as resources for teachers on an ongoing basis and help in facilitating student and teacher understanding of how classroom experiences translate to experiences beyond educational settings and into urban environments. At the core of the design is a program of research on fostering young females' positive attitudes toward science through building connections among schools, parents, and the community.

GENDER GAP

There is increasing evidence that the gender gap in science may be better understood in terms of the perceived "masculinity of science" and the current methods of teaching science in schools. Research indicates that the organizational characteristics of science that favor an individualistic, competitive atmosphere play an important role in diminishing girls' science achievement. Further, the perception that science is a masculine domain discourages girls' interest in science and inhibits them from choosing science-related careers.

A nationwide poll by the American Association of University Women shows that an overwhelming majority of young students, both male and female, enjoy science, although-even at early ages-males' confidence in their own science competence is higher than that of females. Interest in science among males continues to increase through middle school, while females' interest in and positive attitudes toward science drop as they enter middle and high school, as indicated by a steady decline in females' grades and classroom performance in science. This is particularly true among females from economically and educationally disadvantaged families who have limited access to educational resources and are often forced to cope with stressful life experiences.

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Some females succeed academically in science despite adverse circumstances. Research has shown that when male and female high school seniors take the same amount and kind of science courses, females tend to outperform males. These data indicate that it is not that females lack the ability to succeed in science, but that obstacles arise in recruiting and retaining females in the science workforce.

DIFFERENT EXPERIENCES

Declining interest in science among females is affected by experiences both inside and outside of school. Research has reported that females and males have vastly different science-related experiences, including differences in playing with scientific games and toys; participating in science activities at home; taking science-related field trips; parents' stereotypic behavioral expectations; expectations for independence; and parents' educational and vocational aspirations. Many girls receive little or no reinforcement of their initial interest in science from their families or social environments.

It seems logical to expect that females' positive attitudes toward science can be fostered by instructional methods, role models, and peer and social factors inside and outside of the school. In fact, research has documented that these factors play a significant role in promoting success in science for females.

HIGHLIGHTS OF PROGRAM FINDINGS

Participation in all *Sisters in Science* activities was quite high: 95% of the girls eligible for the program participated in the after school component and 65% attended the summer camp. Those who attended the summer program came regularly and were extremely enthusiastic about their experience. Seventy-five percent of the parents of participating students attended family activities. Findings to date show that the girls who participated in the project demonstrated more positive attitudes toward and enhanced interest and achievement in science and mathematics (see Figures 1, 2, and 3). Data also show a positive pattern of change in the females' science process and language skills as evidenced by their class participation and the writings in their science journals.

Other noteworthy findings include parents' increased involvement in their daughters' science activities as shown by parental participation in the family science programs, after-school programs, and field trips. These findings are especially encouraging because both schools in the study are located in inner-city neighborhoods plagued by extreme poverty.

It is significant that much has been accomplished during the initial year of the program, suggesting that expanding the program could lead to even greater interest in and improved attitudes toward science among young females.

IMPLICATIONS

Several policy and practical implications can be drawn from the work of the *Sisters in Science* program:

- Intervntion programs must involve parents in their efforts to foster the success of females in science. Parents' behavioral expectations have important long-term implications for females' interest and achievement in science.
- The strong positive impact of interventions that are specifically designed to include role models must be recognized in developing programs which aim to foster females' achievement in science and identification with science as an accessible area for study or employment.
- Program interventions evolve in stages of development and change. In order to promote the sustained success of females in science, there must be a conscious effort to provide support for collaborations among schools, parents, and the community as ideas for useful strategies are developed, implemented, and evaluated.

* * * *

RELATED PUBLICATIONS

American Association of University Women. (1992). *How Schools Shortchange Girls.* Washington, DC: Author.

Hammrich, P.L. (1996). Yes, daughter, you can. *Science and Children, 34* (4), pp. 20-24.

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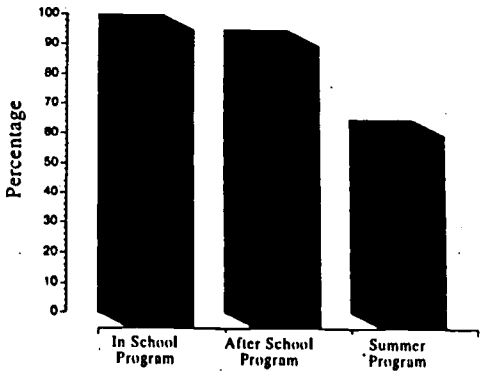

Figure 1. Participation

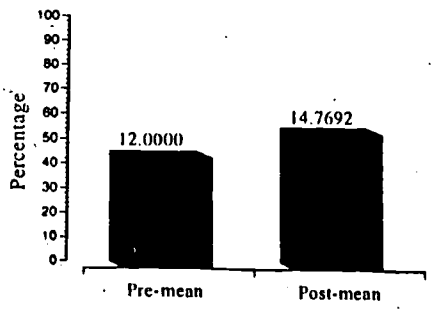

Figure 2. Science Skills Assessment

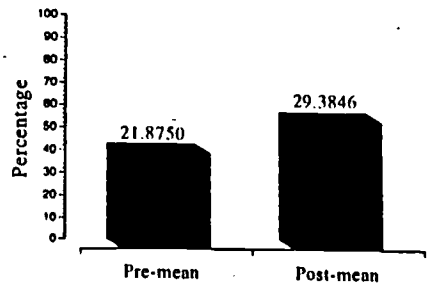

Figure 3. Math Skills Assessment

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