

UNDER THE MICROSCOPE

A decade of
gender equity
projects in the
sciences



AAUW
EDUCATIONAL
FOUNDATION

Published by the American Association of University Women Educational Foundation
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Washington, DC 20036
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Printed in the United States

First printing: March 2004
Editor: Susan K. Dyer
Graphic designer: Kenneth Krattenmaker

Library of Congress Control Number: 2004101327
ISBN: 1-879922-33-9

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Foreword

In the past decade, increasing attention has been paid to the issue of gender equity in the science, technology, engineering, and mathematics (STEM) fields. Research publications, including the American Association of University Women Educational Foundation's *Tech Savvy* (2000) and *Women at Work* (2003), have documented the troubling shortage of girls and women preparing to work in these fields. In response to this "shrinking pipeline" of girls and women in STEM, a wide array of programs and strategies has been promoted and funded by governmental and nongovernmental organizations.

The AAUW Educational Foundation and the National Science Foundation are among the top supporters of gender equity projects in the STEM fields. In the last decade alone, these two foundations have invested nearly \$90 million to fund more than 400 projects specifically aimed at increasing the participation of girls and women in STEM fields. This body of projects presented a unique opportunity to explore the nature of gender equity intervention projects in STEM. Until now, no comparable survey of gender equity intervention projects in STEM has been done.

The research for this report, led by Yasmin Kafai and a team of researchers at the University of California, Los Angeles, was guided by several overarching questions: What types of projects have been funded within and across the various STEM disciplines? Are there areas where we have concentrated our efforts, and areas we have overlooked? What patterns emerge among the project types and disciplines?

The findings document impressive efforts in preparing girls and women for science, technology, engineering, and mathematics studies and careers and demonstrate a rich and diverse body of gender equity intervention projects within all STEM disciplines. About two-thirds of the projects involved extracurricular informal learning activities such as museum visits and field trips. Equally important were mentoring activities in many forms, ranging from traditional one-to-one to large-scale online versions, and professional development activities, such as course taking and network building, that were successfully integrated into projects.

At the same time, the findings reveal some troubling trends. Many projects focused predominantly on career advice without providing access to necessary skill and content development. A majority of projects occurred outside the school curriculum. While such extracurricular projects can be effective and valuable, the overall lack of integration into the school curriculum suggests that gender equity remains on the margins of teaching and learning in the STEM fields. Finally, an absence of data on participant demographics and a lack of project evaluation make it difficult to determine who is being served and if and how project outcomes are being measured.

Perhaps most notably, the findings reveal hundreds of excellent and dynamic projects but no consolidated collective strategy to advance gender equity in STEM. The recommendations in this report reflect this problem, suggesting among others the need for more integrated efforts inside and outside of school, more interdisciplinary and cross-age connections, and consistent documentation and evaluation across disciplines and project types.

The efforts of AAUW and NSF over the last decade have played a role in advancing the status and presence of girls and women in STEM, yet inequities persist and much work is needed. This report serves not as an evaluation of what works and what doesn't but as a synthesis of what projects AAUW and NSF have initiated and supported during a decade. As such, it provides an opportunity to examine what has been done and what has been missed so that in the future we can create, promote, and fund a body of projects that will have an even greater impact.

We hope this report stimulates a renewed interest in supporting gender equity in the STEM fields. AAUW remains committed to this goal and offers sincere thanks to those involved in developing this research report and in advancing the opportunities and potential for women and girls in the sciences.

A handwritten signature in cursive script that reads "Mary Ellen Smyth".

Mary Ellen Smyth
President, AAUW Educational Foundation
February 2004

Acknowledgments

This project was conducted by a team of researchers led by Yasmin B. Kafai, associate professor at the University of California, Los Angeles, Graduate School of Education and Information Studies, together with Pamela Aschbacher, director of the California Institute of Technology Precollege Science Initiative (CAPSI), and Sherry Hsi, director of research, Center for Learning and Teaching at the Exploratorium. The team also included UCLA doctoral students Debbie LaTorre, Althea Scott Nixon, and Nina Neulight and CAPSI staff members Cameron McPhee and Brooke Cutler. Additional support was provided by Daniel Battey and Linda Kao from UCLA. Ruta Sevo, senior program director at the National Science Foundation, provided valuable support and encouragement throughout the project.

The following members of the research project advisory board offered valuable guidance and expertise:

- Dorothy Bennett, senior project director, Education Development Center's Center for Children and Technology
- Cathy Kessel, mathematics education consultant
- Natalie Rusk, project researcher and developer, Computer Clubhouse Network, Massachusetts Institute of Technology Media Lab
- Linda Sax, associate professor-in-residence, University of California, Los Angeles, Graduate School of Education and Information Studies
- Jennie P. Yeh, vice president, Aerospace Corporation

The research for this report was generously sponsored by a grant from the National Science Foundation (PGE-0220556). The ideas expressed in this report do not necessarily reflect the positions of the supporting agency.

The AAUW Educational Foundation gratefully acknowledges the generous support and contributions of these institutions and individuals as well as the staff at AAUW who participated in the planning and development of the project.

Introduction



More than a decade has passed since the publication of the American Association of University Women Educational Foundation's groundbreaking report *How Schools Shortchange Girls* (1992). This report highlighted a noticeable absence of concern for girls in the educational debate and noted systematic disparities across all school levels, in classrooms, in testing procedures, and in curriculum design. For many, these disparities have served as one explanation for the "shrinking pipeline" in science, technology, engineering, and mathematics (STEM) fields and studies from kindergarten through high school, where girls feel disenfranchised, to universities, where fewer women pursue degrees and careers in these fields.

While some fields such as biology have made progress in bringing more women into the field, others such as computer science and physics have remained at a constant low. To encourage more girls and women to pursue STEM fields, research and demonstration projects have been implemented in a variety of settings during the past decade. These projects range from after-school programs to K-12 mentoring initiatives and lectures in higher education.

This report presents a synthesis of a large body of these projects to help STEM practitioners, researchers, and funders understand the efforts of

previous years and support and develop coordinated efforts for the future. The foundation for the synthesis was 416 research and intervention projects sponsored between 1993 and 2001 by the National Science Foundation (NSF) and the American Association of University Women (AAUW), two key foundations spearheading gender equity projects in the United States.

No attempt was made to evaluate effectiveness: Darke, Clewell, and Sevo (2002) already conducted such a study. Instead, the goal of this synthesis was to identify programmatic patterns, including strengths and weaknesses, during a decade. Such a synthesis not only reveals the focus of intervention projects but also provides a useful road map for the next decade of STEM gender equity projects.

At least two aspects make this synthesis stand apart from previous efforts: the integration of research and demonstration projects and the range of disciplines and ages covered. While most previous efforts focused on research and evaluation studies alone, leaving aside the large number of practitioner-initiated efforts to create gender equity intervention projects, this synthesis included efforts of both types. It also included all STEM disciplines and combinations thereof (rather than focusing on a single discipline) and examined projects ranging from kindergarten to graduate school.

Projects were analyzed by project setting, targeted participants, STEM disciplines, project approaches, and goals. Trends were then identified and are presented within this report by STEM discipline and project approach.

The findings from this synthesis reveal significant patterns in the last decade of STEM gender equity projects. These patterns illustrate the progress of gender equity in STEM and identify some critical areas of need. Most striking is the richness of project ideas and approaches. The synthesis reveals a wide range of projects that showcase an abundance of ideas for changing and enriching instruction, creating innovative learning opportunities inside and outside schools, and developing creative support systems. These projects demonstrate what K–12 and higher education teaching can look like, going beyond the traditional textbook and lecture hall to provide access to the world in which science, technology, engineering, and mathematics are explored and practiced every day.

While including a list of all the different approaches is not possible, short descriptions of sample projects are highlighted throughout the report. For more details, see information about AAUW projects at www.aauw.org/community_programs/scp_database.cfm and NSF projects in *New Formulas for America's Workforce: Girls in Science and Engineering* (2003a), which can be found at <http://www.nsf.gov/pubs/2003/nsf03207/start.htm>.

This synthesis identified other key patterns:

Extracurricular connections. Most of the gender equity intervention projects featured at least one extracurricular component, such as a visit to a science museum or manufacturing plant, a trip to a

nature reserve, or a meeting with professionals or experts in one or more of the STEM fields (see Appendix B, Table 5). Such projects recognized (but not always realized) the potential value of informal learning activities. Outside of these projects, such informal learning opportunities are, unfortunately, rare, and few systemic curricular efforts incorporate gender equity ideas. While informal learning efforts are important precursors to achieving gender equity, gender equity efforts also need to be integrated within existing state and national curriculum standards and implemented within classrooms.

Benefits for both genders. Contrary to common belief that gender equity interventions and research projects are for girls only, more than 40 percent of the projects also included boys (see Appendix B, Table 1). Project evaluations indicated that both girls and boys enjoyed and benefited from participating in proposed STEM activities with explicit gender equity goals. While some projects restricted access to girls only, gender equity projects in STEM have not been solely slated for girls.

A dearth of demographic data. The vast majority of projects noted the participation of boys and girls, however most projects did not report the participation of underrepresented students nor did they specify whether underrepresented students were specifically targeted. Underrepresented populations mentioned most often included Black/African American, Latino/Hispanic, and Native American Indian students. Reports also mentioned English language learners, Asian American students, White/European American students, and students with disabilities (see Appendix B, Table 3). In general, however, inadequate information prevented an examination of the distribution of projects for these students in any systematic way.

Inadequate information also affected the examination of the distribution of projects in suburban, rural, and urban areas. About 40 percent of the projects did not specify this demographic (see Appendix B, Table 4).

A network of support. Most projects engaged the additional support and assistance of teachers, parents, or other school or community members. These projects recognized that adults play a key role in changing girls' and boys' attitudes and made it a point to involve adults in various ways. Nearly half of the projects made use of human resources in their communities, including scientists from local universities or industries. About one-fifth included school principals—a practice that seems particularly important for any intervention project that hopes to become part of established schooling. Two kinds of participants, school counselors (who might help institutionalize intervention

projects) and college students (who might serve as mentors and tutors), were incorporated into only a few projects (see Appendix B, Table 6).

This collection of gender equity intervention projects represents an impressive diversity of enterprises. It is the combination and integration of these efforts rather than an abundance of discrete projects, however, that will lead to systemic and lasting change. How can we move beyond the model of isolated one-time efforts and create a network of strategic approaches to achieving gender equity in STEM? The first step is to understand what has been done and which approaches have been favored and ignored. The following sections of this report provide an overview of the projects by STEM discipline and project approach and provide recommendations to create a sustainable infrastructure of STEM gender equity intervention projects for the next decade and beyond.