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Fostering Early Interest in Science

CHAPTER THREE · FOSTERING EARLY INTEREST IN SCIENCE

A FEMALE SCIENCE COORDINATOR WENT INTO A FIFTH-GRADE TEACHER'S CLASSROOM AND ASKED FOR FOUR STUDENTS TO PARTICIPATE IN THE SCIENCE DEMONSTRATION. MISS JONES, THE CLASSROOM TEACHER, SELECTED FOUR BOYS.

THIS HAPPENED NOT IN 1956 BUT IN 2006. IT'S HARD TO BELIEVE THAT IN THE 21ST CENTURY, OLD HABITS STILL DIE HARD AND SOME TEACHERS ARE STILL CONDITIONED, ON AN UNCONSCIOUS LEVEL, TO ASSOCIATE SCIENCE WITH BOYS. THE PROJECTS HIGHLIGHTED HERE DEMONSTRATE HOW RESEARCH AND NEW STRATEGIES HELP OVERCOME STEREOTYPICAL THINKING AND FOSTER EARLY INTEREST IN SCIENCE.

RECOGNIZING THAT PARENTS AND TEACHERS HAVE A SPECIAL ROLE TO PLAY IN NURTURING EARLY CURIOSITY IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS (STEM), SOME OF THESE PROJECTS TARGET THEM DIRECTLY. NEW CURRICULAR MODULES THAT INCORPORATE STATE STANDARDS BUT PRESENT THE MATERIAL IN A "GIRL FRIENDLY" FORMAT ARE ONE EXAMPLE. TEACHING PARENTS AND TEACHERS TO CHALLENGE THEIR OWN STEREOTYPES AND APPROACH SCIENCE AND MATH IN A WAY THAT ENCOURAGES GIRLS IS ANOTHER.

OTHER PROJECTS ARE DESIGNED SPECIFICALLY TO ENGAGE GIRLS EARLY ON IN HANDS-ON ACTIVITIES OR IN DIRECT MENTORING RELATIONSHIPS WITH SCIENTISTS. THE USE OF CUTTING-EDGE TECHNOLOGY AND POPULAR MEDIA OUTLETS ALSO ENCOURAGES GIRLS TO EXPLORE SCIENCE AND MATHEMATICS IN INFORMAL AS WELL AS FORMAL EDUCATIONAL SETTINGS. MANY OF THESE PROJECTS INVOLVE EITHER CONDUCTING RESEARCH OR DIRECTLY USING RESEARCH-PROVEN METHODS TO DESIGN INTERVENTIONS THAT BUILD ON GIRLS' COMPARATIVE STRENGTHS—IN READING, FOR EXAMPLE—WHILE ALSO ENHANCING THEIR SCIENCE AND MATH SKILLS.

OVERALL, THESE PROJECTS USE MYRIAD DELIVERY SYSTEMS AND DESIGNS WHILE COLLABORATING WITH AN UNUSUAL RANGE OF INSTITUTIONS, BOTH FORMAL AND INFORMAL. THEY EMPLOY INTERACTIVE WEB SITES TO SUPPORT AND EXTEND LEARNING. UNIQUE IN THEIR IMPLEMENTATIONS, THEY PROVIDE US WITH NEW WAYS OF LOOKING AT LEARNING. SPECIFICALLY, THEY PROVIDE EXPERIENCES THAT HELP GIRLS KNOW THAT THEY CAN BE SUCCESSFUL IN STEM AND HAVE CAREERS IN STEM.

BONNIE BROWNSTEIN, PRESIDENT, INSTITUTE FOR SCHOOLS OF THE FUTURE

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The Case of Missing Human Potential

THE CASE OF MISSING HUMAN POTENTIAL

WVIZ/PBS IDEASTREAM℠, A PUBLIC BROADCASTING ORGANIZATION IN CLEVELAND, OHIO, PRODUCED A ONE-HOUR TELEVISION PROGRAM, "THE CASE OF MISSING HUMAN POTENTIAL," TO RAISE AWARENESS OF THE UNDERREPRESENTATION OF WOMEN IN THE STEM WORKFORCE. AVAILABLE ON VIDEO, THE PROGRAM USES RESEARCH AND EXAMPLES TO SHOW PARENTS, CAREGIVERS, AND THE COMMUNITY WHAT THEY CAN NEED TO DO TO SOLVE THIS "CASE" AND INVOLVE GIRLS IN STEM FIELDS. THE PROBLEM IS PRESENTED AS A FAST-PACED MYSTERY, WITH TOP-SELLING NOVELIST LES ROBERTS HOSTING THE INVESTIGATION. MR. ROBERTS IS ASSISTED IN THIS QUEST BY DR. KATHRYN SULLIVAN, THE FIRST WOMAN TO WALK IN SPACE.

"The Case of Missing Human Potential" attributes the underrepresentation of women to schools, examining NSF's research on women in STEM and exploring how teaching methods can be either a window of opportunity to young women or a closed door. It explores efforts by schools, communities, and businesses to address the gender gap and concludes with suggestions on what parents, community members, businesses, and educators can do to help girls realize their potential in STEM.

An interactive Web site, http://www.missingpotential.org, provides a storehouse of links to science and math camps in Ohio and science sites offering at-home activities and experiments. It also includes biographies of famous women in STEM and links to research and other organizations of interest to girls and women in STEM fields.

GRADE LEVEL: MIDDLE SCHOOL, PROFESSIONAL DEVELOPMENT	
WVIZ/PBS IDEASTREAM℠ (OHIO)	
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HTTP://WWW.MISSINGPOTENTIAL.ORG	02-17109
KEYWORDS: DISSEMINATION PROJECT, RETENTION, GENDER-DIVERSITY AWARENESS, BARRIERS, INQUIRY-BASED, TELEVISION, AFTER-SCHOOL, INFORMAL EDUCATION, BIOGRAPHIES, CURRICULUM MATERIALS	

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Science on Patrol

SCIENCE ON PATROL

RESEARCH SHOWS THAT FROM KINDERGARTEN THROUGH COLLEGE, THE CULTURE AND FOCUS OF EDUCATION CONTRIBUTE TO THE UNDERREPRESENTATION OF GIRLS IN STEM. BUT STUDIES ALSO SHOW THAT THE FACTORS INITIALLY HOLDING GIRLS BACK CAN BE MITIGATED IN LATER YEARS OF THEIR EDUCATION.

The Institute for Schools of the Future, the Police Athletic League, and other partners, including detectives and police officers, are working together to continue Science on Patrol, a project aimed at motivating underrepresented minorities and middle and high school students, especially girls, to get involved in the sciences. In particular, the project encourages students to link science knowledge and skills with the real-world applications of forensic science. By allowing participants to use science to "solve crimes," this informal project helps them see how abstract concepts, when put to use, can be exciting. It also appeals to their interest in high-profile crimes covered in the news and on television programs.

In leading the project, an interdisciplinary team of educators, police detectives, instructional designers, and scientists have

- Developed, field-tested, and revised a minimum of 12 crime scenarios for students to solve
- Developed course materials, including a facilitators' guide, the Science on Patrol Web site, student activity kits with case folders for each "crime," and a manual for mentors and volunteers
- Helped participants apply science knowledge and processes to solve real-world problems
- Helped instructors foster gender-neutral academic environments that encourage collaboration and increase participation and achievement.

In its first year, Science on Patrol took place at Police Athletic League centers in the Bronx and, in its second year, at PAL centers throughout New York City. During the third year, a pilot project included five cities: Albany and Buffalo, New York; Portland, Oregon; Miami Beach, Florida; and Brick Township, New Jersey. During its fourth year, SOP conducted four workshops at the PAL national annual meeting, resulting in training sessions that included representatives from 20 cities. Along with training the adults, SOP has been introduced to students at their annual Youth Leadership Conference. SOP continues to scale up at PAL centers across the country.

Findings from the program have been disseminated widely as a model for other formal and informal science programs.

GRADE LEVEL: MIDDLE AND HIGH SCHOOL, INFORMAL EDUCATION	
Institute for Schools of the Future, Police Athletic League, New York City, and others	
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http://www.isof.org/sop/	02-17188
Keywords: demonstration project, self-confidence, self-efficacy, recruitment, engagement, skills (problem-solving, science), co-curricular, extracurricular, all-year, teacher training, peer groups, hands-on, engaged learning, project-based, activity-based, problem-based, exploration-based, cooperative learning, collaborative learning, teamwork approach, role models, mentoring, real-life applications, job shadow, experiential learning, outdoors, community-based site, minorities, forensics, industry partners, informal education, connections, school-to-work, curriculum materials, after-school, police	

GIRLS IN SCIENCE

TO ENCOURAGE YOUNG WOMEN FROM SOUTHEASTERN APPALACHIAN KENTUCKY TO PURSUE CAREERS IN STEM, THE UNIVERSITY OF KENTUCKY ESTABLISHED A PROGRAM CALLED GIRLS IN SCIENCE. IN 21 RURAL APPALACHIAN KENTUCKY COUNTIES, THIS PROGRAM REACHED A SELECT GROUP OF 120 GIRLS ENTERING SEVENTH GRADE. IT ALSO INVOLVED THESE GIRLS' PARENTS AND AT LEAST 30 MIDDLE SCHOOL TEACHERS FROM THE AREA.

The program included

- Weeklong summer institutes for the selected girls at the University of Kentucky campus, two summers in a row
- After-school and Saturday sessions over the course of the two academic school years
- Mentoring relationships with university scientists and local community members

To ensure that the girls got the most they could from the program, Girls in Science included professional development courses for their math and science teachers, designed to help these teachers give each girl individual attention. For parents of selected students, the program offered a series of workshops.

As part of this effort, the project team developed and disseminated a model middle school curriculum manual. Though girls and teachers enrolled in Girls in Science have benefited most from the program, its reach should ultimately extend to teachers, students, and their relatives throughout Appalachian Kentucky.

GRADE LEVEL: MIDDLE SCHOOL
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02-17196
Keywords: demonstration project, recruitment, engagement, skills (science), career awareness, advancement, achievement, transition points, summer, Saturday program, after-school, all-year, teacher training, peer groups, summer program, engaged learning, cooperative learning, mentoring, support system, dissemination plan, curriculum manual, school-based site, community-based site, rural, informal education, transition points

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Discovery Under the Hood

DISCOVERY UNDER THE HOOD

DISCOVERY UNDER THE HOOD INTRODUCED 24 FEMALE HIGH SCHOOL STUDENTS EACH SUMMER TO THE SCIENCE AND ENGINEERING OF AUTOMOBILES. OVER SEVEN DAYS IN A NONTHREATENING, PREDOMINANTLY FEMALE ENVIRONMENT, THESE YOUNG WOMEN FROM RURAL MADISON COUNTY, NEW YORK, FELT FREE TO EXPRESS THEIR CURIOSITY ABOUT A TRADITIONALLY MALE-DOMINATED FIELD. THEY EXPLORED THE SCIENCE OF INTERNAL COMBUSTION, THE MATHEMATICS OF FUEL ECONOMY, THE ENGINEERING OF THE POWER TRAIN, THE TECHNOLOGY OF COMPUTERIZED DIAGNOSTIC EQUIPMENT, AND HOW ALL THESE COMBINE INTO A WORKING AUTOMOBILE.

Students spent mornings at Morrisville State College, where the girls engaged in hands-on exploration of the automobile. Afternoons were spent at Colgate University, where they learned the scientific principles behind automotive operation and how those principles applied in other situations. Evening activities included college and career planning.

Female teachers largely ran the program. Female college students concentrating in science showed, by example, the diverse career paths open to women in STEM.

The girls' increased confidence that they could understand the science and technology of automobiles translated into the belief that they would succeed in other STEM fields and increased the likelihood they would later elect to take upper-level math and science courses.

GRADE LEVEL: HIGH SCHOOL	
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HTTP://DISCOVERYUNDERTHEHOOD.COM/	02-17146
KEYWORDS: DEMONSTRATION PROJECT, RURAL, INQUIRY-BASED, TRANSITION POINTS, ROLE MODEL, RESIDENTIAL CAMP, HANDS-ON, EXPLORATION-BASED, REAL-LIFE APPLICATIONS, EXPERIENTIAL LEARNING, PARTNERSHIPS BETWEEN UNIVERSITIES AND COMMUNITY OR TECHNICAL COLLEGES, CURRICULUM	

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Explanatoids and Click! The Urban Adventure

EXPLANATOIDS AND CLICK! THE URBAN ADVENTURE

RESEARCH SHOWS THAT ENGAGING GIRLS IN INFORMAL SCIENCE EDUCATION—MUSEUM VISITS, FOR EXAMPLE—INCREASES THEIR INTEREST IN STEM. YET RESEARCH ALSO SHOWS THAT FAMILIES WHO VISIT MUSEUMS ARE MORE LIKELY TO BRING THEIR SONS THAN THEIR DAUGHTERS. CARNEGIE MELLON UNIVERSITY AND THE UNIVERSITY OF PITTSBURGH ARE WORKING TOGETHER TO CONSTRUCT ENVIRONMENTS THAT INSPIRE GIRLS TO THINK AND ACT LIKE SCIENTISTS AND TO ENCOURAGE PARENTS TO TAKE THEM SERIOUSLY. EXPLANATOIDS AND CLICK! THE URBAN ADVENTURE ARE TWO WAYS THE PROJECT BRINGS STEM TO THE ATTENTION OF GIRLS AND THEIR FAMILIES.

Explanatoids

"Explanatoids" are signs posted in public spaces. Through a combination of text and graphics, explanatoids use children's direct experience of their surroundings to introduce scientific reasoning and concepts. A series of signs titled "The Scream Team," for example, was displayed at an amusement park near a roller coaster to explain the science behind the ride, proving that STEM has relevance in the most unexpected contexts.

The explanatoids Web site (http://www.explanatoids.com) provides support materials for parents and teachers in southwest Pennsylvania and for those who would like to replicate project activities elsewhere.

Click! the Urban Adventure

Click! the Urban Adventure invited 11 through 14-year-old girls to participate in a role-playing game in real and virtual space. Using Pittsburgh as their game board, the girls investigated a case of illegal water pollution.

In a five-week series of after-school training sessions, each team of four girls was provided with laptop computers and other technological gear to assist them in documenting, communicating, and problem solving. At the training sessions, each team met with one female science major from a local university, who led and encouraged the girls in STEM activities.

Click! culminated in an overnight adventure weekend at the Carnegie Science Center. Girls adopted their personas as Click! agents, and members of each team were provided with evidence to start them on their adventure. Players aimed to reconstruct the crime and presented their findings to a fictional environmental commission.

GRADE LEVEL: ELEMENTARY SCHOOL, MIDDLE SCHOOL	
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HTTP://WWW.EXPLANATOIDS.COM	02-17033
KEYWORDS: EDUCATION PROJECT, SELF-CONFIDENCE, SELF-EFFICACY, ENGAGEMENT, GENDER-DIVERSITY AWARENESS, SATURDAY PROGRAM, AFTER-SCHOOL, MENTOR TRAINING, FIELD TRIP, SCIENCE EXHIBITS, HANDS-ON, ENGAGED LEARNING, ACTIVITY-BASED, EXPLORATION-BASED, COLLABORATIVE LEARNING, TEAMWORK APPROACH, ROLE MODELS, MENTORING, REAL-LIFE APPLICATIONS, EXPERIENTIAL LEARNING, WEB SITE, POSTERS, COMMUNITY-BASED SITE, MINORITIES, UNDERPRIVILEGED, ENVIRONMENTAL SCIENCE, ECOLOGY, TECHNOLOGY, MUSEUM, ADVENTURE GAME, INFORMAL EDUCATION, CURRICULUM MATERIALS	

SCIGIRLS FROM DRAGONFLYTV

FOR THE PAST THREE TELEVISION SEASONS, PBS HAS BROADCAST DRAGONFLYTV, A WEEKLY PROGRAM THAT FEATURES THE WORK OF "KID SCIENTISTS" AGED 9 THROUGH 12. THE HALF-HOUR SHOW AIRS ON STATIONS COVERING 90 PERCENT OF THE UNITED STATES AND REACHES ALMOST A MILLION VIEWERS. OF THE KID SCIENTISTS ON DRAGONFLYTV, MORE THAN HALF ARE GIRLS, WITH NEARLY 200 PARTICIPATING IN THE SHOW'S FIRST THREE SEASONS. IN ADDITION TO ITS REGULAR WEEKLY BROADCASTS, DRAGONFLYTV OFFERS OUTREACH RESOURCES, INCLUDING EDUCATORS' GUIDES, CHILDREN'S SCIENCE JOURNALS, "FUN KITS," VIDEOTAPES, AND AN INTERACTIVE WEB SITE (HTTP://WWW.DRAGONFLYTV.ORG).

Since October 2004, Twin Cities Public Television, the PBS affiliate in St. Paul–Minneapolis, has been drawing on DragonflyTV's resources to develop a project aimed at encouraging girls to get involved in the sciences. The initiative is called SciGirls, and it involves a combination of video and print resources, supported by hands-on training.

PBS outreach professionals (trained by DragonflyTV staff) conduct training sessions with selected local partners across the country, including schools, after-school groups, libraries, and community youth organizations such as the YWCA, Girl Scouts, and Boys and Girls Clubs. These partners, along with their affiliated PBS station, also receive materials and financial resources from SciGirls.

This is the first effort by the PBS system to orchestrate a project designed specifically to involve girls in science.

GRADE LEVEL: ELEMENTARY SCHOOL, MIDDLE SCHOOL	
TWIN CITIES PUBLIC TELEVISION (MINNESOTA)	
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HTTP://WWW.DRAGONFLYTV.ORG	04-36260
KEYWORDS: DISSEMINATION PROJECT, SELF-CONFIDENCE, SELF-EFFICACY, SELF-AUTHORSHIP, SKILLS (ALL AREAS), GENDER-DIVERSITY AWARENESS, CAREER AWARENESS, ACHIEVEMENT, EXTRACURRICULAR, ALL-YEAR, TEACHER TRAINING, PEER GROUPS, FIELD TRIPS, SCIENCE CLUBS, HANDS-ON, ENGAGED LEARNING, INQUIRY-BASED, PROJECT-BASED, ACTIVITY-BASED, PROBLEM-BASED, EXPLORATION-BASED, EXPERIMENT-BASED, COOPERATIVE LEARNING, COLLABORATIVE LEARNING, TEAMWORK, ROLE MODELS, MENTORING, SUPPORT SYSTEM, INTERACTIVE, REAL-LIFE APPLICATIONS, COLLABORATIVE NETWORK, DISSEMINATION PLAN, EXPERIENTIAL LEARNING, WEB SITE, TELEVISION, VIDEO, PUBLICATIONS, OUTDOORS, COMMUNITY-BASED SITES, FIRSTHAND SCIENCE EXPLORATION, MINORITIES (GIRLS OF COLOR), INDUSTRY PARTNERS, GIRL SCOUTS, BOYS AND GIRLS CLUBS, INFORMAL EDUCATION, TOOLS, CURRICULUM MATERIALS, AFTER-SCHOOL	

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Bks[1]

Bringing Young Girls Into Science With Books and Inquiry

BRINGING YOUNG GIRLS INTO SCIENCE WITH BOOKS AND INQUIRY

TRADITIONAL INSTRUCTION IN THE SCIENCES RELIES HEAVILY ON TEXTBOOK LEARNING. MORE RECENT STANDARDS-BASED INSTRUCTION EMPHASIZES FIRSTHAND INVESTIGATION OF SCIENTIFIC PHENOMENA. IN JUSTIFYING THE LATTER APPROACH, EDUCATORS SAY THAT STUDENTS SHOULD LEARN ABOUT SCIENCE THROUGH THEIR OWN ACTIONS, NOT FROM A TEXT. THE POTENTIAL CONFLICT: GIRLS TEND TO BE STRONG READERS, AND AN OVEREMPHASIS ON INVESTIGATION MAY HURT THEIR CHANCES OF EXCELLING.

Directed toward the elementary grade levels, this project examined how texts might be combined with direct investigation to engage girls in science. The three-year study proceeded as follows:

- *Year one:* Researchers spent time in four third-grade classrooms to observe how science-related texts were used. These texts included supplemental reading, such as books found during library visits, in classroom reading centers, and at students' homes. Researchers collected additional data on the usefulness of science texts through interviews with students, teachers, librarians, and parents.
- *Year two:* In "design experiments" conducted in the classroom, researchers incorporated texts into inquiry-based instruction in their effort to maximize girls' interest in science. Working together with teachers, they created a design/instruction cycle that allowed research and teaching practice to influence each other.
- *Year three:* Researchers analyzed the results of the design experiments and compared the first and second years of the study. One early finding was that girls were often more interested in science books than their parents thought they would be. For example, girls showed enthusiasm for animal-related books and an interest in books in the "informational narrative" subgenre—a category that encourages learning and is often considered to be fun.

Researchers also prepared papers for submission to science and literacy-education journals and are developing a Web-based curriculum unit for use in teacher-education programs, including an NSF-sponsored education reform effort.

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KEYWORDS: RESEARCH PROJECT, ENGAGEMENT, SKILLS (SCIENCE), BARRIERS, CURRICULUM MATERIALS, GENDER DIFFERENCES, ENVIRONMENTAL FACTORS, CO-CURRICULAR, LONGITUDINAL STUDY, TEACHER TRAINING, STAFF TRAINING, ENGAGED LEARNING, INQUIRY-BASED, RESEARCH-BASED, EXPLORATION-BASED, EXPERIMENT-BASED, DISSEMINATION PLAN, DESIGN-BASED, BOOKS, SCHOOL-BASED, RESEARCH EXPERIENCE, DATA COLLECTION, ASSESSMENT TOOLS, PEDAGOGY

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Girls' Science Practices in Urban, High-Poverty Communities

GIRLS' SCIENCE PRACTICES IN URBAN, HIGH-POVERTY COMMUNITIES

RESEARCHERS AT TEACHERS COLLEGE, COLUMBIA UNIVERSITY, ARE INVESTIGATING THE WAYS IN WHICH GIRLS WHO ATTEND URBAN SCHOOLS WITH HIGH POVERTY RATES ACQUIRE SCIENCE LITERACY, AND HOW THEY INTEGRATE THIS KNOWLEDGE INTO THEIR UNDERSTANDINGS OF THEMSELVES AND THEIR COMMUNITY.

Using data gathered from four middle schools in Harlem and the South Bronx, the project is developing a framework to describe urban girls' "science practices" (that is, their manner of engaging in science and their motives for doing so) according to three interrelated categories: understanding of science concepts, development of scientific habits of mind, and participation in science activities.

With this framework, researchers aim to give a full picture of the way urban girls bring science into their lives—how, for example, do they use the science they've learned in school to choose a healthful diet, or conserve natural resources such as water and petroleum? Researchers are also interviewing girls to find out how they experience classroom science instruction. Do they feel like full members of their activity groups? If so, why? And if not, how can teachers modify their instruction to give urban girls a sense of full participation?

So far, researchers have observed that urban girls who participate successfully in science classes act from three basic motivations: they wish to support their teachers by following instructions to achieve an expected outcome; they wish to extend classroom activities beyond what teachers have planned by introducing new ideas and perspectives; and they wish to express their views to avoid feeling left out of the group.

This preliminary analysis is only the first stage of a three-year study that will lead to the formulation of pedagogical approaches specially suited to the needs of urban girls in high-poverty schools and will culminate in a campaign to disseminate the project's findings and recommendations nationwide.

GRADE LEVEL: ELEMENTARY SCHOOL, MIDDLE SCHOOL, HIGH SCHOOL	
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HTTP://ED-WEB3.EDUC.MSU.EDU/CALABRESEBARTON/URBAN.GIRLS.HTML	04-29109
KEYWORDS: RESEARCH PROJECT, SELF-CONFIDENCE, SELF-EFFICACY, ENGAGEMENT, GENDER IDENTITY, GENDER DYNAMICS, SYSTEMIC REFORM, ENVIRONMENTAL FACTORS, PEER GROUPS, RESEARCH-BASED, CONSTRUCTIVISM, REAL-LIFE APPLICATIONS, SCHOOL-BASED, MINORITIES, UNDERPRIVILEGED, URBAN, DATA COLLECTION, PEDAGOGY, SCIENCE BELIEFS AND PRACTICES	

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GO-GIRL

GO-GIRL

IN GO-GIRL (GAINING OPTIONS: GIRLS INVESTIGATE REAL LIFE), URBAN MIDDLE SCHOOL GIRLS FROM DIVERSE BACKGROUNDS IN FIVE SITES ARE FORMING SMALL RESEARCH GROUPS UNDER UNIVERSITY STUDENT-TEACHER GUIDANCE, DESIGNING AND CONDUCTING A SOCIAL SCIENCE RESEARCH PROJECT.

The GO-GIRL program helps girls develop mathematical and scientific reasoning by engaging them in research in an all-girl, technologically rich environment over 10 Saturdays. The mentors are enrolled in a university service-learning course in education, psychology, and women's studies.

GO-GIRL assumes that girls will be more interested in math if they learn it in the context of a social science question. Each week, participants meet in small groups to learn how to explore questions of interest to them with social science research methods. The girls develop their hypotheses and then construct their own survey, which is posted online. They use the statistical tools they have learned to analyze the data and draw conclusions. The program works in collaboration with curriculum and software developers at TERC, Inc. Participants use TERC's Tabletop 2, which includes both data-literacy tools for analysis and a Web-based component for data collection.

Major topics are introduced when the girls come together for whole-group discussions. Whole groups are used as a setting for visiting researchers and to work through major group questions (e.g., selection of general survey topics). With their mentors, the girls review basic math skills and statistical techniques.

GO-GIRL was successfully piloted by researchers at the University of Michigan and Wayne State University as a component of the Girls Explore Mathematics through Social Science program funded by NSF. More than 120 college students have mentored 240 seventh-grade girls. Evaluation data show the girls have higher confidence in their mathematical ability and greater interest in mathematics after completing the program, and follow-up data show the positive impact is long lasting. The mentors are more interested in pursuing teaching careers and in serving underrepresented groups and are more understanding of diversity. Those planning teaching careers said they feel better prepared to teach minority and female students. The GO-GIRL Urban Partnership expands GO-GIRL to Bloomington, Illinois (Illinois Wesleyan University), Philadelphia, Pennsylvania (University of Pennsylvania), Chicago, Illinois (Roosevelt University), and Washington, D.C. (Howard University).

GRADE LEVEL: MIDDLE SCHOOL, UNDERGRADUATE	
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HTTP://WWW.SMARTGIRL.ORG/ AND HTTP://WWW.GOGIRLS.WAYNE.EDU/	05-07902
KEYWORDS: EDUCATION PROJECT, PROFESSIONAL DEVELOPMENT, ENGAGEMENT, SKILLS, EXTRACURRICULAR, MENTOR TRAINING, PEER GROUPS, HANDS-ON, ENGAGED LEARNING, PROJECT-BASED, ACTIVITY-BASED, MENTORING, ROLE MODELS, SOFTWARE, SERVICE-LEARNING, ONLINE SURVEY, WEB SITE, RESEARCH PROJECT, MINORITIES, UNDERPRIVILEGED, URBAN, COMPUTER TECHNOLOGY, MATH, STATISTICS, POLICY, DATA COLLECTION, CURRICULUM MATERIALS, SOCIAL SCIENCE SKILLS	

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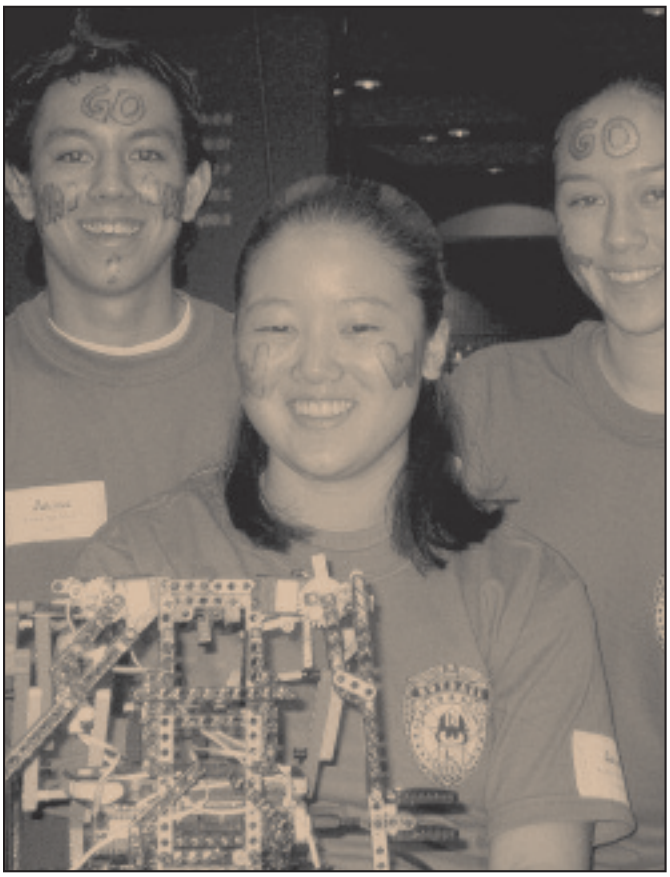
4 Schools for Women in Engineering

4 SCHOOLS FOR WOMEN IN ENGINEERING

RESEARCHERS AT TEACHERS COLLEGE, COLUMBIA UNIVERSITY, ARE INVESTIGATING THE WAYS IN WHICH GIRLS WHO ATTEND URBAN SCHOOLS WITH HIGH POVERTY RATES ACQUIRE SCIENCE LITERACY AND HOW THEY INTEGRATE THIS KNOWLEDGE INTO THEIR UNDERSTANDING OF THEMSELVES AND THEIR COMMUNITY.



The consortium deployed groups of specially trained, engineering-savvy women (called STEMTeams) into the classrooms of eight middle schools in the greater Boston area. STEMTeam members are mostly female and represent engineering faculty, practicing engineers, college engineering students, and middle school teachers—strong role models for girls.

Four STEMTeams, each associated with one university, developed and implemented gender-inclusive engineering activities to help teachers prepare their students for the engineering component of the compulsory Massachusetts Comprehensive Assessment System, which tests students' proficiency in the state-mandated Science and Technology/Engineering Curriculum Framework.

In one activity, titled "The Great Orange Juice Squeeze," students are challenged to provide good-tasting orange juice to Boston schools for 25 cents per glass by following the engineering design process: identifying and researching the problem; selecting the best of several proposed solutions; then constructing, testing, and refining a prototype.

The STEMTeams approach is replicable at a low cost. Training materials (including the STEMTeam manual and modules for activities like the one described above) are available at the program's Web site (http://www.STEMTeams.org).

GRADE LEVEL: MIDDLE SCHOOL	
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HTTP://WWW.STEMTEAMS.ORG	02-17110
KEYWORDS: DEMONSTRATION PROJECT, ROLE MODELS, COLLABORATION, EDUCATION PROGRAM, PROFESSIONAL DEVELOPMENT, CAREER AWARENESS, CO-CURRICULAR, TEACHER TRAINING, HANDS-ON, ENGAGED LEARNING, ACTIVITY-BASED, MENTORING, MANUAL, SCHOOL-BASED, URBAN, CURRICULUM MATERIALS, ENGINEERING SKILLS	

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Gender-Based Science Performance Models

GENDER-BASED SCIENCE PERFORMANCE MODELS

RONALD STEVENS, A MEDICAL PROFESSOR AT THE UNIVERSITY OF CALIFORNIA–LOS ANGELES (UCLA), DEVELOPED AN INTERACTIVE COMPUTER WEB SITE THAT EXPOSES STUDENTS OF ALL AGES TO ONLINE PROBLEM-SOLVING EXERCISES IN VARIOUS SUBJECTS. THE INNOVATIVE PROGRAM (CALLED IMMEX), NOW USED BY THOUSANDS OF STUDENTS ACROSS THE COUNTRY, ALSO HELPS TEACHERS UNDERSTAND HOW STUDENTS ADDRESS PROBLEMS AND THE STEPS THEY TAKE TO SOLVE THEM.

Now Stevens is leading a team of UCLA researchers to analyze students' problem-solving activities by gender. Working with students in chemistry courses, the researchers are investigating how females and males from middle school to the university level develop strategies for finding answers and how they retain knowledge over time. They will use their findings to identify how online, collaborative activities and environments can be organized to maximize male and female students' problem-solving strengths.

Thousands of students from two school districts and two universities are taking part, in all-female, all-male, and mixed-gender groupings. Supporting data will include pre- and post-tests of content knowledge, science attitudes, and teacher and student technology use, as well as overall academic performance, including standardized state test data. The project team includes researchers, educators, and students in California, South Carolina, Kentucky, and Italy.

Findings will be disseminated to teachers, the gender research community, basic science educators, and members of the intelligent tutoring and collaborative learning communities. The problem-solving tasks will be available online to other teachers and researchers worldwide, along with the results of the analysis and performance models.

GRADE LEVEL: MIDDLE SCHOOL, HIGH SCHOOL, UNDERGRADUATE	
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