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# Science in cyberspace: science and engineering World Wide Web sites for girls

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In the absence of real-life role models, images of women scientists and engineers on the World Wide Web can be important sources of information about women in science, engineering, and technology. This study analyzed the content of 27 science and engineering Web sites for girls and examined recurring themes in 168 of the biographies of women scientists and engineers found on these sites. Most of the Web sites included information about scientific, engineering, and technological disciplines and presented occupational information—information shown to be important for increasing girls' interest in these areas. The biographies of women scientists and engineers found on these Web sites addressed issues concerning parental attitudes, acceptance by male colleagues, and family-friendly policies in workplaces—issues shown to be related to girls' future interest in careers in science, engineering, and technology. By providing detailed information about the experiences and personal lives of women scientists and engineers, the biographies on these Web sites may be useful in countering existing cultural stereotypes of women scientists and engineers and initiating changes in perceptions needed to narrow the gender gap in science, engineering, and technology.

## 1. Introduction

Stereotypes that portray science, engineering, and technology as male domains pervade the social and cultural environment in which girls live. In schools, teachers perpetuate this stereotype by giving preferential treatment to boys in science and computer science classes,[1] using teaching approaches that favor male intellectual styles,[2] holding stereotypical perceptions of girls' ability to succeed in science,[3] and using science textbooks that show few women scientists.[4] At home, parents reinforce these stereotypes by not providing encouragement or expecting their daughters to achieve in science and math and by discouraging their daughters from traveling to take advantage of research opportunities.[5] In the mass media, images of women scientists and engineers often accentuate stereotypes of scientists and engineers through unrealistic, limited, and unflattering portrayals.[6]

Stereotypes have a profound influence in shaping individual perceptions and identities. Children grow up in an environment filled with stereotypes, including gender stereotypes. Psychological theories of development suggest that children's knowledge of gender roles come from cues in their environment.[7] Gender schema theory explains that children raised in a society that emphasizes differences based on gender readily process and interpret

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information about their gender based on cultural definitions of gender-appropriate and gender-inappropriate behavior.[8] Children use gender schemata, "cognitive structures that organize an individual's gender-related knowledge, beliefs, attitudes, and preferences"[9] to internalize and identify with cultural representations of gender embedded in discourse and social practices.[10]

Adolescent girls appear to be acutely aware of cultural representations of gender in their world. During adolescence, girls seek out cultural cues to help them define their future personal, professional, life, and gender roles. As Lyn Mikel Brown and Carol Gilligan write in *Meeting at the Crossroads: Women's Psychology and Girls' Development*:

> Moving into a culture populated by images and models of young women, girls incorporate these images from reading magazines and books, from watching TV, and from listening in on the ways that other people, especially parents and teachers, look at and speak about them, their classmates, their acquaintances, their friends.[11]

Too often the images and models girls observe in their everyday lives perpetuate gender-based stereotypes that limit their potential. A survey of girls in grades 3 through 12 conducted for *Girls Incorporated* by Harris Interactive, Inc. reported that 60% of girls said they experience gender stereotypes that encourage girls to be kind and caring rather than strong and tough, speak softly and not cause trouble rather than be good leaders, and marry and have children rather than prepare for challenging professions and economic independence.[12] Stereotypes like these, along with other influences at home and in school, can shape girls' attitudes in ways that limit their educational and vocational aspirations during the early years of adolescence.[13] Eccles explains: "[A]similation of the culturally-defined gender-role schema can have such a powerful effect on one's view of the world that activities classified as part of the opposite sex's roles may be rejected without any serious evaluation or consideration."[14]

Stereotypical representations of scientists and engineers in the mass media can influence girls' perceptions of scientific, engineering, and technological careers. The mass media are a significant influence in the lives of children, especially during the early childhood and adolescent years when socialization is most pronounced.[15] Stereotypical images of scientists and engineers in the mass media are likely to have a strong impact on children, because most children have limited social contact with professionals in these fields. As Elizabeth M. Perse explains: "The pervasiveness of stereotypes in the mass media drives concerns for effects because these are the dominant, if not only, images in the media of certain groups; there may be few positive images to counter negative images."[16]

Research shows that images of male scientists and engineers dominate the mass media in the USA.[17] More recently, images of female scientists have been featured in television programming and in popular films.[18] The overall paucity of images of female scientists and engineers in the mass media, however, reinforces a cultural stereotype that defines science, engineering, and technology as masculine domains.

Media images that perpetuate the cultural myth of science and engineering as masculine pursuits, along with comments from parents and teachers about the incompatibility of these professions with women's lifestyles, can negatively affect girls' perceptions of these disciplines. In fact, studies show that girls do indeed hold a "masculine image of science,"[19] tend to think that most scientists are male,[20] and are less confident of their ability in science.[21] Studies also report that girls and young women have negative attitudes toward science, scientists, and scientific activities.[22]

Stereotypical images of scientists and engineers contribute, in part, to the existing gender gap in science, engineering, and technology. Despite recent increases in the

participation of women in these areas in the USA, statistics indicate that only 19.4% of the workforce in science, engineering, and technology are women, and women from all underrepresented minorities make up an even smaller percentage of the workforce in these fields.[23] Women make up 36.2% of the workforce in the life sciences, 27.3% of the workforce in computer science, 21.9% of the workforce in the physical sciences, and 9.1% of the workforce in engineering in the USA.[24] Surveys conducted by the National Science Foundation show that the percentage of female life scientists, physical scientists, and engineers remained the same between 1993 and 1997.[25]

The gender gap in science, engineering, and technology can be traced back to the educational choices made by girls and young women. Statistics show that while women earn a slightly higher number of degrees in the biological/agricultural sciences at the bachelor's level, they earn fewer degrees at the graduate level and fewer degrees at all levels in most other scientific fields in the USA. In 1996, women earned 50.2% of all bachelor's degrees, 49% of all master's degrees, and 39.9% of all doctoral degrees in the biological/agricultural sciences. In the physical sciences, women earned only 37% of all bachelor's degrees, 33.2 % of all master's degrees, and 21.9 % of all doctoral degrees.[26] In engineering, women earned only 17.9 % of all bachelor's degrees, 17.1 % of all master's degrees, and 12.3 % of all doctoral degrees.[27]

Young women's participation in science at the high-school level in the USA follows a similar trend. A 1997 study of the College-Level Advanced Placement examinations indicates an overall increase in the percentage of women who took the examination in mathematics and science from 1987 to 1997. However, a smaller percentage of women than men took the examinations in calculus, computer science, chemistry, and physics. For example, 63 % of men and 37 % of women took the Calculus BC examination; 83% of men and 17% of women took the computer science examination; 58% of men and 42% of women took the chemistry examination; and 77% of men and 23% of women took the physics examination.[28]

In recent years, many efforts have been made to increase girls' and young women's participation in science, engineering, and technology. A number of educational intervention programs have been developed to provide girls and young women with opportunities to interact with female role models whose lives and experiences as scientists and engineers counter existing cultural stereotypes. These programs include a "day of chemistry," where middle school-girls at an all-girls school conduct hands-on laboratory experiments with female undergraduate science majors from a local women's college.[29] Female high-school students participating in the GET SMART (Girls Entering Technology, Science, Math, and Research Training) program attend workshops on equity issues and science-related careers led by female scientists.[30] The MentorNet e-mail program links female undergraduate and graduate students in the sciences with successful graduates working at organizations like DuPont, Sun Microsystems, AT&T, and Intel.[31] During "All Girls' Mondays," part of the Boston's Computer Clubhouse project, inner city girls learn computer skills from female mentors.[32]

Opportunities like these are important because interviews with girls in grades 2, 5, 8, and 11 revealed that the girls had little or no association with women scientist role models; and the few who did mentioned an immediate family member.[33] Identification with positive role models is important in encouraging girls to pursue careers in science and science-related fields because these interactions can reverse negative stereotypes of women scientists and engineers.[34] The report *Balancing the Equation: Where are Women and Girls in Science, Engineering, and Technology* explains: "Supportive mentors, role models and networks have been shown to be helpful beginning at early educational levels and continuing

throughout a women's scientific career."[35] In a study that provided elementary school-aged children with opportunities to meet either a male or female scientist, 31% of female students in the class visited by a female scientist and 16% of female students in the class visited by a male scientist drew pictures of female scientists after meeting the scientists when they had all previously drawn pictures of male scientists.[36] Another study of early adolescents showed that those who were exposed to women scientist role models had more positive attitudes toward women in science.[37]

Despite the recent proliferation of educational intervention programs across the USA, many girls and young women still have few opportunities to interact with women scientists and engineers. In the absence of real-life role models, images of women scientists and engineers in the mass media become important sources of information. Girls and young women who have limited social contact with women scientists and engineers are likely to construct an understanding of the role of women in these areas based partly on media images. Research shows media models influence individual perceptions and attitudes when direct contact is missing. For example, a study of Japanese international students' exposure to television portrayals of African-American stereotypes found some evidence that "vicarious contact" influenced students' perceptions of African Americans.[38] Another study of girls from low socioeconomic backgrounds, who have had few opportunities to interact with real-world role models, found that the girls changed their professional aspirations after exposure to televised portrayals of women in non-traditional occupational roles.[39]

Media images of women scientists and engineers, however, present mixed messages about the role of women in scientific, engineering, and technological professions. Positive and negative images of women scientists have been documented in a range of media content, including historical biographies in popular magazines, news stories about female Nobel Prize winners, Saturday morning children's television programming, children's educational science television programming, historical and contemporary television documentaries about women scientists, newspaper science sections, and feature films.[40] These analyses reveal that media images of women scientists perpetuate negative cultural stereotypes by focusing on women's domestic abilities and feminine qualities, showing women in positions of lower status such as laboratory assistants, presenting science as a field that requires masculine traits and skills, emphasizing the difficulties of balancing the demands of a scientific career with marriage and motherhood, and emphasizing the problems with gender discrimination in the workplace.[41] Some of these studies, however, show that media images also dispel popular stereotypes by presenting women scientists in high status positions in scientific and technological professions, showing how women scientists successfully balance their professional and personal lives, and discussing strategies women scientists have used to gain credibility and equality in male-dominated professions.[42]

The World Wide Web is a relatively new source of cultural images of scientists and engineers. The Web may be an especially important alternative source of images of scientists and engineers for girls because of the expansive nature of the Web and its popularity among children and adolescents. Nielsen NetRatings reported that 58% of all Americans had Internet access and 39% had access to the Web in their homes in July 2001.[43] Researchers have noted the potential of the Internet as an instructional tool for children.[44] A study of online media use in 84 households found that children were online more than their parents.[45] In addition, many intervention programs use the Web to reach girls.

Few studies have examined science content on the Web, including the content of science and engineering Web sites for girls. The images of women scientists and engineers on these Web sites provide an opportunity for "vicarious contact"[46] with women scientists and engineers when girls are unable to interact directly with real-life models. It is important

to examine the content of science and engineering Web sites for girls and the images of women scientists and engineers on these sites because of their potential influence on girls' and young women's perceptions of these professionals and the potential influence on girls' occupational choices. The following research questions were posed for this analysis:

- How is knowledge about science, engineering, and technology conveyed in these sites? What techniques or formats are used to present information about science, engineering, and technology?
- What other kind of information is presented on these sites?
- How are women scientists and engineers portrayed on these Web sites for girls? Do these portrayals reinforce or counter cultural stereotypes of women scientists and engineers?

This study provides an analysis of the text and images of women scientists and engineers on science and engineering Web sites for girls. Although girls obtain information about the world of science and encounter images of women scientists and engineers from a variety of sources, one potential source is the Web. An analysis of the content of these Web sites is needed to examine the nature of the messages and images conveyed because of the popularity of using the Web as a way of encouraging girls' interest in science, engineering, and technology. This study examines the following features of these Web sites: sponsors or creators, primary audience (girls, parents, and teachers), scientific and engineering disciplines represented, types of knowledge-building activities, vocational information, and biographies of women scientists and engineers. In addition, this study takes an in-depth look at the recurring themes in the biographies of women scientists and engineers related to parental attitudes toward science and science-related disciplines, professional relationships with male colleagues, and work and family issues. Audience analyses that assess girls' use of and responses to these Web sites will be addressed in future research.

## 2. Methodology

### *Selection of Web sites*

To locate science and engineering Web sites for girls, searches were conducted using the 12 metasearch engines listed on the Search Engine Watch Web site (http://www.searchenginewatch.com). This site was used because it provides current listings of and information about Internet search engines. Metasearch engines were selected from Search Engine Watch in order to allow for as comprehensive a search as possible. Search Engine Watch listed the following 12 metasearch engines: Dogpile, Ixquick, MetaCrawler, QuickBrowse, Search.com, Inference Find, C4, InfoGrid, Profusion, SurfWax.com, TeRespondo, and Mamma. Two sites were eliminated from further searching because they did not allow for searching by using the keywords, "girls and science." Searches were conducted using the remaining 10 metasearch engines using "girls and science" as keywords. The number of results generated from these searches ranged from 30 to 245. The total number of results from the 10 selected metasearch engines was 1,204.

Each site listed in the search results was reviewed to determine its relevance to the focus of the study. Only those sites that featured information about science, engineering, or technology and focused on girls as the primary audience were included in the analysis. The search results listed numerous unrelated sites. The following types of Web sites were eliminated: listserv discussion listings; announcements or reports on conferences; science-related television shows, films, and books; scholarly or professional reports and publications; promotional information related to science programs, camps, museums, and schools;

tutoring programs; professional organizations that did not have a specific page or site for girls; sites about science that focused only on parents and teachers as the target audience; personal home pages and sites that were not about science. Web sites from science intervention programs for girls that provided science content for a general audience were included. Some additional Web sites were located by following the links provided on the sites generated by the searches. There were 27 Web sites that met these criteria (see Table 1).

*Selection of biographies of women scientists and engineers on Web sites*

Fourteen of the 27 Web sites included biographies of women working in science, engineering, and technology. These were analyzed further to assess the portrayals of women scientists and engineers on these sites. Only biographies featured in the 27 sites were included in the sample; links to biographies found at other Web sites were not included in order to prevent duplication. A total of 437 biographies were found on these Web sites. A subset of 168 of these biographies was selected for analysis. All of the biographies for Web sites with 25 or fewer biographies and a random sample of 20% of the biographies for the two Web sites that had a large number of biographies (Women of NASA, *N* 182; Role Model Project, *N* 157) were selected for analysis. The sample was selected in this way to prevent over-weighting by the two Web sites that featured large numbers of biographies. Both historical and contemporary biographies of female scientists and engineers were included in the analysis (see Table 2). Copies were made of all biographies.

*Coding procedure and qualitative analysis: Web sites*

Each of the 27 Web sites was reviewed and copies were made of relevant pages from each site. A coding sheet was prepared for each Web site and the following codes, if available, were recorded: name, Web site sponsor or creator, most recent date, primary audience (girls, parents, and teachers), scientific discipline(s) represented, types of knowledge-building activities, biographies of women scientists and engineers, and vocational information.

Several qualitative techniques were used in the analysis of the data for codes described earlier based on the guidelines established by Miles and Huberman.[47] First, the presence of all the content codes was noted and the number of instances of each code on every Web site was counted. Second, recurring patterns and themes were identified from the data for the following codes: types of knowledge-building activities, biographies of women scientists and engineers, and vocational information. The recurring patterns identified for types of knowledge-building activities were scientific experiments, factual information about science or technology, and links to other Web sites. The recurring patterns identified for vocational information were factual career information, biographies of women scientists and engineers, and online mentoring. The thematic analysis conducted for the biographies of women scientists is described in detail in the next section. Third, in addition to the thematic analysis described earlier, comparisons were made from the data for the code: biographies of women scientists and engineers.

*Coding and qualitative analysis: biographies of women scientists and engineers*

The 168 selected biographies were coded for recurring themes to assess the depiction of women scientists and engineers in biographies on science Web sites for girls. A coding sheet was prepared for each biography and the following information, if available, was recorded:

**Table 1.** List of science web sites for girls

| Web site name | URL |
|---|---|
| 1. Science is for Girls | http://www.hopper.com/scigirl.html |
| 2. Girls Ask Why | http://jfg.girlscouts.org/why/why.htm |
| 3. Girls and Women in Science Links | http://www.beloit.edu/~gwsci/gwslinks.html |
| 4. Rural and Urban Images: Voices of Girls in Science, Mathematics, and Technology | http://www.ael.org/nsf/voices/index.htm |
| 5. Portia WWW: The Gateway into SET for all women | http://www.portiaweb.org |
| 6. Tomorrow's Girl | http://www.tomorrows-girl.com |
| 7. Women Who Walk Through Time | http://www.mines.utah.edu/geo/video/GeoWomens.html |
| 8. Advocates for Women in Science, Engineering and Mathematics | http://awsem.com/witi.html |
| 9. Women of NASA | http://quest.arc.nasa.gov/women |
| 10. Against the Odds | http://nrgen.com/against_the_odds/index.html |
| 11. Girls Incorporated | http://www.girlsinc.org |
| 12. GirlTech | http://www.girltech.com/Tech_Trips/TT_menu_frame.html |
| 13. Engineer Girl | http://www.engineergirl.org/nae/cwe/egmain.nsf/?Opendatabase |
| 14. Plugged-In | http://www.plugged-in.org/indexFlash.html |
| 15. The Role Model Project for Girls | http://www.womenswork.org/girls/index.html |
| 16. The Girl Scientist (Brainpop) | http://www.girlscientist.org/new/ |
| 17. Inventive Women | http://www.inventivewomen.com/newindex.html |
| 18. Internet for Girls | http://www.sdsc.edu/~woodka/resources.html |
| 19. Girl Power Locker | http://www.health.org/gpower/girlarea |
| 20. Institute for Women in Trades, Technology, and Science | http://www.iwitts.com |
| 21. The Backyard Project | http://www.backyard.org |
| 22. Remarkable Careers in Oceanography | http://www.womenoceanographers.org |
| 23. Speak Out! | http://speakout.terc.edu/index |
| 24. Universe Girl | http://www.universegirl.com |
| 25. By Girls, For Girls | http://www.bygirlsforgirls.org/home.html |
| 26. Autodesk | http://www.autodesk.com/dyf/dyfmain2.html |
| 27. The Adventure of Josie True | http://www.josietrue.com |

**Table 2.** Science web sites for girls featuring biographies of women in science, engineering, and technology.

| Web site name | Biographies analyzed (*N*) |
|---|---|
| 1. Girls Ask Why | 7 |
| 2. Portia WWW: The Gateway into SET for all women | 3 |
| 3. Tomorrow's Girl | 8 |
| 4. Women Who Walk Through Time | 8 |
| 5. Women of NASA | 182 (36 selected for analysis) |
| 6. Against the Odds | 7 |
| 7. GirlTech | 7 |
| 8. Engineer Girl | 25 |
| 9. The Role Model Project for Girls | 157 (31 selected for analysis) |
| 10. The Backyard Project | 9 |
| 11. Remarkable Careers in Oceanography | 8 |
| 12. Speak Out! | 10 |
| 13. Universe Girl | 8 |
| 14. Autodesk | 1 |
| Total | 440 (168 selected for analysis) |

marital status, children, race, educational background, job description or career information, professional status, profession or area of study, and parental encouragement in science. In addition to these codes, three themes were identified from previous research that examined images of women scientists and engineers, in television documentaries.[48] These three themes were early parental encouragement in science, professional relationships with male colleagues, and work and family issues.

### *Inter-coder reliability*

Before assessing inter-coder reliability, a subset of the Web sites was used to train a student research assistant. The author used this subset of Web sites to show the research assistant examples of the coding categories, and the research assistant then practiced coding some other sample sites. During the coder training session, the author and research assistant discussed any discrepancies in coding. A different subset of Web sites and a subset of biographies of women in scientific careers were randomly selected and coded by the author and a research assistant to assess the inter-coder reliability. Cohen's $\kappa$ was used to calculate inter-coder reliability. The average reliability was 0.81, with reliabilities ranging from 0.62 to 1.00.

## 3. Results

The goals of this study were: (1) to generate descriptive data on the content provided on science and engineering Web sites for girls; and (2) to examine the images of women scientists and engineers portrayed in the biographies of women found on these sites. Science and engineering Web sites for girls were defined as those that addressed girls as the primary audience and included content on science, engineering, or technology. First the findings of the overall analysis of the Web sites will be presented. Second, the findings of the analysis of the biographies of women scientists and engineers depicted on these Web sites will be presented.

*General description of Web sites*

The analysis of the science Web sites examined in this study found a variety of organizations responsible for creating these sites, including professional scientific organizations, federal agencies, academic institutions, research institutes, foundations, nonprofit organizations and private companies. For example, the Girl Scouts, the National Aeronautics and Space Administration (NASA), National Academy of Engineering, National Science Foundation, Woods Hole Oceanographic Institution, Beloit College and UniverseGirl.com all maintain science Web sites for girls. Most of the Web sites have been developed within the past 4 years. The primary audience for these sites is elementary to high school-aged girls, but several of the sites also include information or educational materials for parents and teachers (see appendix A). The Web sites cover a range of science-related disciplines including astronomy, biology, chemistry, computing and technology, engineering, environmental science, geology, and health. Space, nature and the environment, health, and computers are the most popular topics addressed in the sites (see appendix B).

*Presenting information about science, engineering, and technology*

Twenty-one of the 27 Web sites analyzed provide educational material or information about science, engineering, and technology. Several sites provide fact sheets on various topics or use a question and answer format to teach girls factual information about these subject areas. For example, the "Plugged-In" site provides in-depth information about acid rain by explaining what acid rain is and its effects on the environment and gives instructions on how to test a chemical substance to determine if it is an acid or a base. The "Girls Incorporated," "Women Who Walk Through Time," "Engineer Girl," and "Plugged-In" sites all use fact boxes or fact pages to convey scientific information on various topics. The "By Girls, For Girls" site gives fact sheets written by girls about various health topics.

Fifteen of the 27 sites also present science content through links to other science-related sites on the Web. For example, the "Tomorrow's Girl's" list of "Neat Science Sites" includes links to the "Bill Nye, the Science Guy," the Exploratorium in San Francisco, the National Park Service, and Science Central Web sites. The "Women Who Walk Through Time" site encourages girls to learn more about earth science by following links to sites about volcanoes; earthquakes; dinosaurs; water, ice and rocks; minerals; and fossils. These links lead girls to photographs, video images, three-dimensional images, and simulations.

A number of the sites take a more hands-on approach in presenting information about science, engineering, or technology by encouraging girls to try science experiments at home. For example, the "Girls Ask Why" site gives instructions on how to "Build a structure," "Make plants drink by themselves," and "Make an electroscope." The "Engineer Girl" site features a project titled "Chocolate engineering." The "Rural and Urban Images: Voices of Girls in Science, Mathematics, and Technology" site not only provides hands-on science projects, but also teaches girls about the scientific method by encouraging them to conduct a survey on issues of concern to students in their schools.

Some sites use quizzes to teach girls about science, engineering, and technology. "Girl Power Locker" and "Girls Incorporated" both test girls' knowledge of scientific topics. The "Inventive Women" site features online interactive quizzes. "Science is for Girls" sends girls on an "Internet scavenger hunt" to find answers to questions about science.

Two of the sites, "Girls Ask Why" and "GirlTech," use diaries to convey information about science, engineering, and technology. In the "Girls Ask Why" site, girls can read the diary of Hannah, a Girl Scout sent on a trip to Antarctica. In the "GirlTech" site, girls can

read the diary of DD, a cartoon character, who keeps a diary about the scientists she meets on a visit to NASA.

Other Web sites take advantage of the interactive features of the Web to teach girls about science, engineering, and technology. "Girl Scientist" provides more than 100 short, animated movies on various topics related to science, health and technology. Girls are greeted personally, "Hey there. Welcome to health," as they enter the BrainPOP.com site that highlights a wide range of scientific topics from relativity to homeostasis to acne to plate tectonics. This site also features "brainsqueezers" and "brainbuzzz" games, jokes, and news briefs from NASA. Girls earn points and win prizes by answering questions after watching the BrainPOP movies.

Comic strips are another communication tool used in some of the Web sites. "Autodesk" features a monthly comic strip with interactive activities where girls can follow Jacqueline and Samantha through the trials and tribulations they face in middle school. In the comic strip, Jacqueline and Samantha discover they can draw cool pictures using computers and discuss issues related to self-esteem and peer pressure. Girls can play the "Drats, I'm dunked" game to guess a word related to the lesson featured in the comic strip. "The Adventure of Josie True" features an animated comic strip online. Josie True travels across time and space as she attempts to find her inventor/science teacher Ms. Trombone. During their travels with Josie and her cat, girls meet famous female historical figures and play interactive activities to help Josie find her teacher.

A number of Web sites provide bulletin boards, message boards, or chat rooms where girls can talk with one another. The message board on the "Girl Scientist" site features messages about the BrainPOP movies, school and popular music groups. The message board on the "Autodesk" site offers girls an opportunity to discuss the monthly theme of the comic strip featured on the site.

### *Presenting vocational information*

In addition to teaching girls about science, engineering, and technology, the Web sites analyzed in this study provide detailed information about careers in these areas. Many of the 27 Web sites give vocational information directly on the site. For example, "Girl Scientist" discusses the professional responsibilities, experience and education, and career preparation needed for careers in civil/structural engineering, oceanography, computer animation, zoology, Web design, and others. "Portia Web: the gateway into science, engineering and technology (SET) for all women" provides guidance in helping girls decide whether a career in SET is for them and in exploring career possibilities and employment opportunities in SET. The "Backyard project" provides a list of career possibilities in computer programming, computer animation, and software engineering. This site also describes the work environment in the computer industry (see appendix A).

Extensive vocational information also can be found in the biographies of women working in science, engineering, and technology. Fourteen of the 27 Web sites feature biographies of women scientists and engineers. A total of 440 biographies of women are featured on these sites. A few of the Web sites encourage girls to interact with scientists online through chat rooms and bulletin boards. "Engineer Girl" sponsors an "Ask an engineer" bulletin board and "Against the Odds" has a role model discussion board. "Women of NASA" and "Against the Odds" provide chat rooms for girls to "talk" online with scientists.

*Biographies of women scientists and engineers*

The biographies feature women working in a variety of disciplines who hold positions of varying levels of prestige. Several of the sites focus on women scientists and engineers from one specific field. For example, the "Women Who Walk Through Time" site features women working as geologists. Other sites like "The Role Model Project" and "UniverseGirl" present biographies of women from many different fields. Most of the women on the Web sites are research scientists or engineers. The biographies feature women who are: executives or managers of companies; administrators at scientific agencies; students; science teachers; research assistants or technicians; physicians, veterinarians, or other medical professionals. Many of the biographies provide job descriptions for the positions held by the women profiled. Some give only brief descriptions of the positions; others include detailed reports with monthly, weekly, daily, and even hourly descriptions. The biographies vary in the amount of detail they provide: they range in length from a paragraph ("Role Model Project") to 16 pages ("Remarkable Careers in Oceanography").

Of the 168 biographies selected, the race/ethnicity of women scientists and engineers could be identified in 92 biographies. In the 92 biographies where the race/ethnicity of women scientists and engineers could be identified, 74 (80.4%) of the women are white, 7 (7.6%) are African American, 5 (5.4%) are Asian, 4 (4.3%) are Hispanic, and 2 (2.2%) are Native American. Race/ethnicity could not be determined for the women in 76 of the 168 biographies (45.2%) because the race/ethnicity of the women was not given in the text of the biography or could not be determined from an accompanying photograph.

A number of the biographies include information on the educational training of the women working in science, engineering, and technology. A total of 132 (78.6%) of the 168 biographies give information about the educational backgrounds of the women working in these fields.

The biographies address a variety of topics related to the professional and personal lives of women scientists and engineers. Several of the women in these biographies acknowledge the influence of their parents in encouraging them to pursue educational and professional opportunities in science. More than 19% (11.3) of the women in the 168 biographies note the support and encouragement they received from parents. A few women report experiences with discrimination in the field. These mention problems with sexism, double standards, and other forms of discrimination from male teachers or colleagues. Several of the women discuss their family lives. Fifty-four (32.1%) of the women in the biographies refer to their children. A more detailed discussion of these issues is provided in the next section of this paper.

*Biographies of women scientists and engineers: thematic analysis*

A number of the biographies of women working in science, engineering, and technology note the importance of the encouragement they received from parents in the pursuit of their careers. Most of the women cite their fathers as the primary source of support. For example, Debby Ramsey, third engineer onboard the University of Washington Research Vessel, recalls her dad taking her to see slide shows of NASA missions to the moon.[49] Isabelle Boucher, founder of the Biotech company ISM Biopolymer Inc., explains her father encouraged her "often dangerous home science experiments," taught her how to take a car engine apart and supported her interest in becoming a scientist.[50]

Several of the women featured in the biographies note the role of their mothers in encouraging their interest in science, engineering, and technology. Carolyn Krumrey, a division chief engineer for NASA, writes: "When I was a young girl, my mother had the

biggest influence on me. She was my role model and my best friend."[51] Stacey Morrison, deputy chief information officer for the Space and Life Sciences Directorate at the Johnson Space Center, cites her mother and grandmothers as important role models in her life.[52] Kathryn Kelly, principal oceanographer at the Applied Physics Laboratory at the University of Washington, said she decided to take a science class in 8th grade because her mother had said math and chemistry were her favorite subjects in school.[53]

The biographies of women scientists and engineers present mixed messages about being a women working in male-dominated professions. Several of the women noted in their biographies the changes in their fields that have allowed for greater acceptance and equality. But still, other women discuss the challenges they now face or faced early in their careers. Margaret Leinen, Assistant Director of Geosciences for the National Science Foundation, describes the discrimination she faced. She notes that her chemistry classes were almost exclusively men and that the professor would move the women around every day "so that all of the guys would get a chance to sit next to a girl sometime in class."[54] She also mentions the challenges she faced early in her career dealing with "an advisor who wasn't paying attention to me because he was paying attention to all of the male students."[55]

Vicki Regenie, Acting Program Manager for the Flight Research Base R&T Program at NASA, writes about the problems she faced entering the workforce. She explains:

> As I started in engineering many years ago, I ran into more obstacles when I started working. I was turned down for jobs because I was a woman, and when I was hired I was told by my co-workers that I was only hired because I was a woman. I was able to change people's minds through proving my capabilities, but I found it difficult at times.[56]

She adds that today "the world has changed considerably," and writes that she "no longer hear[s] many comments about myself or new women coming into the field."[57]

Like Regenie, Heidi Bauer, a software engineer at Macromedia, notes how she needed to prove her abilities in order to be accepted by her male colleagues. This is explained in her biography: "As a young female, she was faced with the hurdle of entering a male-dominated workplace. However, she overcame this by proving that she could easily meet the high expectations of her company just as easily as her male co-workers."[58]

Karen Weil Markus, a materials engineer at MEMS Technology Applications Center, notes the discrimination she has experienced. She writes: "There have been negative challenges. Sexual harassment, gender bias/discrimination, and academic snobbery are three. But for every difficult person or limited-thinker I've had to endure, I've been rewarded with knowing and working with some wonderful people. I guess it all balances out."[59]

For some of the female scientists and engineers, discrimination comes from outside the scientific community. Kathleen Dudzinski, a marine biologist and cetacean behaviorist, explains that the discrimination she has experienced has not come from male colleagues, but from other men she encounters who are not used to relating to a woman who is leading an expedition. She writes: "I don't let a chauvinistic attitude bother me. In my opinion, that person is losing out in the end because of his or her short-sightedness."[60] Marine Seismologist Maya Tolstoy and Associate Professor of Geosciences Dawn Wright both mention that they encountered some people who think women should not be working at sea.

A number of the biographies of women scientists and engineers discuss work and family issues. Many of the women mention balancing work and family as the most significant challenge they face. Several discuss the specific strategies they use to help them balance these two important areas of their lives. These women cite supportive husbands,

understanding co-workers and employers, and family-friendly policies as essential for helping them succeed at work and at home.

Several of the women discuss work and family issues in terms of their right to have both a successful career and a family. Kathleen Conlon Hinge, mechanical engineer at the Xerox Corporation who is pictured in a photograph with her daughter, writes:

> Since having children, much of my focus has been on balancing work and family. I refuse to stop my career growth, but I also refuse to delegate wholesale my parenting experience. Right now, I insist on two things: that I do challenging work, and that I do it in balance with the rest of my life. My actions follow my priorities.[61]

Kwok Lau, Vice President of Software Engineering Operations at Apple Computers Inc., attributes careful planning to her success in balancing work and family. She explains that her decision to wait to have children until after she established her career was important. She explains: "Now, because of careful planning, I have two children and a wonderful job, both of which I love."[62]

The "Women Who Walk Through Time" Web site features detailed daily accounts of how several women scientists balance work and family commitments. Diane Doser, a professor of geophysics, describes her morning schedule that starts at 6:30 a.m. when her 3-year-old daughter announces it is time to get up and includes getting her 3- and 6-year-old children ready for the day, discussing a research pre-proposal with her husband, driving the kids to day care and summer camp—all before a 9 a.m. practice oral examination with a doctoral student. After providing details on her busy day as a professor of geophysics, Doser describes her evening schedule which includes picking up children at 5:15 p.m., fixing dinner, doing her half of the household chores, reading to her children, and getting them to bed by 8 p.m.[63]

Carol de Wet, professor of geosciences, describes how she splits one job with her husband at a liberal arts college. She explains: "One of the days I'm a scientist teaching my classes, working in my laboratory or out in the field, the other day, I'm a mom at home with my three children." She adds:

> I think I am a very fortunate woman because I can experience the joys and difficulties of a career I love and be part of raising my children, who I love dearly too! It's a combination that demands all I can give, and there are days when I feel pulled in too many directions at once. But I wouldn't trade it for anything; I am keeping my mind busy with new intellectual challenges at work, and my heart happy with family challenges at home.[64]

Some of the women caution that balancing work and family is not always an easy task. Ellen Martin, a professor of geology who shares childcare responsibilities with her husband, explains:

> As a working parent, I do not have the luxury of working 12 hour days to get through the multitude of projects I face at work. As someone once told me—this simply means I have to be more productive during the time I have.[65]

Kathryn Kelly is a principal oceanographer at the Applied Physics Laboratory at the University of Washington who shares the parenting of her two children with her husband. She explains:

> But certainly day-to-day when you are trying to do everything, it can be a real challenge. When anybody asks me whether they can be a scientist and have kids, it's not for the faint-hearted. It can be done, but nobody ever said it was going to be easy.[66]

Several of the women note the importance of supportive family leave and flex-time policies. Michelle Amos, an electronics engineer at the Kennedy Space Center, notes:

> As a wife, mother and engineer, I have to choose between family and work often. Because of government policies like Family Leave and Flex-time and co-workers who understand the importance of the family, I am still loved and needed at home and at work.[67]

Similarly, Berta Alfonso, a design engineer at the Kennedy Space Center and mother of two children aged 12 and 3 years, explains that these policies allowed her to take 6 months off and work half time at half pay for 6 months when her child was born.[68]

One engineer notes that while more support now is given to women who are trying to balance work and family, more can be done. Bernadette Luna, research engineer for NASA explains:

> My advice regarding families: You CAN have a career and a family and still be happy. Some women pursue both simultaneously; some take a break from their careers and raise a family and return to work afterwards. It's very individual, and the women who are NOW doing both are pioneering the way, pushing for flexible work options that someday will be commonplace. We're making slow progress.[69]

The biographies of most of the women who have children focus on the ways women scientists and engineers balance work and family. Doubts about the feasibility of balancing work and family are more likely to surface in the biographies of women who do not mention children. For example, Dr. K. Paige Carmichael, a veterinary pathologist, notes that what she likes least about her work is the long hours. She writes: "It's 7:02 p.m. as I write this, and I'll be here for at least another hour!"[70] A professor of astrophysics at Princeton University writes: "You need to really want to do it though; it's tremendous hard work to get there and to stay there – but this is true of anything worth doing."[71]

## 4. Discussion

Research on science intervention programs has identified specific strategies found to be effective in increasing girls' interest in science, engineering, and technology.[72] These strategies include: (1) increasing girls' knowledge of science, mathematics, engineering and technology; (2) providing information about careers in these fields; and (3) setting up opportunities to interact with professionals in these fields to act as role models and mentors.[73] This analysis of science and engineering Web sites for girls reveals that many of these sites are providing content related to the first two strategies identified by Mawasha and colleagues and a few are even using the interactive features of the Web related to the third strategy for increasing girls' interest in science, engineering, and technology.

This analysis suggests that science and engineering Web sites for girls may be a powerful communication tool in helping to narrow the gender gap in science, technology, and engineering. By providing information about science, engineering and technology, these Web sites may generate girls' interest in these subjects. By providing information about careers in these areas, these sites may provide guidance on how to pursue careers in these fields. By providing detailed information about the experiences and personal lives of women scientists and engineers, these Web sites may help counter existing cultural stereotypes of

women scientists and engineers, leading to changes in public perceptions needed to narrow the gender gap in science, engineering, and technology. Unlike conventional science intervention programs, however, the ubiquitous nature of the Web allows for more widespread access and contact. Easy access to information about science, scientific careers, and female role models in science and science-related disciplines may be especially important in encouraging more girls and young women to pursue educational and professional opportunities in these areas.

This analysis showed that many science and engineering Web sites for girls used a variety of creative techniques to attract girls' interest in and to teach girls about science, engineering, and technology. In addition to providing information about these subjects, a number of sites also encouraged hands-on participation by providing instructions for science experiments and projects for girls to try at home. Some of the sites used interactive activities like bulletin boards, chat rooms, three-dimensional photographs, animated movies, and animated comic strips. Little research has looked at the effectiveness of the Web in teaching girls about science and engineering and increasing their interest in these areas. However, research in science education indicates that hands-on science experiences and small-group instruction help girls learn about science.[74]

Vocational information about careers in science, engineering, and technology was often provided on the Web sites through facts sheets on specific careers, detailed biographies of professional women, and online mentoring conducted through chat rooms and bulletin boards. Studies show that young women look for information about the personal and professional lives of female role models and research has documented the importance of same-sex role models on girl's and young women's academic and professional success.[75] Interaction with women scientist role models has been singled out as one of the most important factors in fostering positive attitudes toward science and scientific careers among girls and young women.[76] Research also emphasizes the important role the mass media can play in providing positive role models of women scientists.[77] The biographies and online mentoring may be particularly effective techniques for reaching a large number of girls and young women and connecting them with women scientist role models. Eccles explains that role models serve to create awareness of occupational options. She writes: "These models may legitimize novel or non-traditional options, raising these options to the level of conscious consideration."[78]

In order to present positive portrayals of female role models that counter existing cultural stereotypes of women scientists and engineers, the mass media need to continue to show women in positions of high prestige in science and science-related fields. Overall, positive images of women scientists and engineers were featured on these Web sites. Women scientists and engineers were presented in positions of high status within these fields, and many of the women profiled in the biographies worked as consultants and administrators. These findings resemble those found in Steinke's study of Public Broadcasting Service (PBS) documentaries of women scientists, but differ from those found in Steinke and Long's study of children's television science programs, where most female characters were shown as pupils, laboratory assistants, or science reporters[79]

Despite the overwhelming number of positive images, a few negative images of women scientists and engineers emerged in the biographies that discussed the challenges of working in a profession that demanded long hours, the difficulties of balancing work and family responsibilities, and discrimination experienced by those working in a professional environment dominated by male co-workers. These images highlight the realities of working in a male-dominated professions. One study of high-achieving women working in science-

related fields noted the problems they faced with sexist attitudes, racism, and lack of role models.[80] Another study of women from a rural community in the Midwest found gender role beliefs had a particularly strong influence on the career decision-making process for these women and served as "filter through which all occupational decisions passed."[81] These findings are significant because a study of high-school students found that women are less likely to choose higher prestige occupations in the sciences because of doubts about balancing work and family responsibilities and the extra years of education required for these occupations.[82] While only a few biographies referred to these challenges, and although they truthfully reflect the experiences of these women, such images still may dissuade talented girls from pursuing careers in science, engineering, and technology.

The thematic analysis of the biographies provided a rich source of information on the portrayal of women scientists and engineers on science and engineering Web sites for girls. Many of the women profiled in the biographies commented on the role of their parents in encouraging their pursuit of careers in science. Research has pointed out the importance of parental support in fostering girls' and young women's interest in science. Eccles explains that parents serve as important role models: "Through their own occupations, parents provide salient information on available occupational options."[83] Other researchers have noted particularly that the positive influence of fathers can encourage young women to pursue "nontraditional" occupations.[84]

The biographies of the women working in science and science-related fields often acknowledged their experiences with discrimination, while many women also describe recent progress made towards acceptance and equality. Extensive research has focused the "chilly climate" women often face in science and science-related fields.[85] A National Science Foundation report notes the factors that hinder the advancement and retention of women in the workplace. These include the absence of female role models, mentors and colleagues, supervisors' stereotyping of women's abilities, difference in communication style, and exclusion from all-male networks.[86] While it is important that media images raise girls' and young women's awareness of the "chilly climate" that may exist in these areas, it is even more important for media images to show that the improvements made in producing more inclusive workplaces in science, engineering, and technology.

A number of the women in the biographies discussed the issue of balancing families with work in science, engineering or technology. A survey of women scientists and engineers who received the POWRE award from the National Science Foundation found that 70 % of women from both groups listed balancing work and family responsibilities as the most difficult issue they faced.[87] A recent National Science Foundation report emphasizes the need for family-friendly policies and calls for organizations "to encourage among their employees a healthy balance between their work and personal lives through flexible, functional workplace policies and attitudes."[88] Concerns about how to balance work and family appear to be a recurring issue in the research on the factors that keep girls and young women from pursuing scientific and engineering careers. Girls and young women often are told that a successful career in science and science-related fields requires complete commitment to their professional lives that then leaves little time for personal lives. The findings of a study of high-school graduates found that young women's anticipation of conflicts between family and career responsibilities rather than their actual experiences negatively affected their perceptions of science and science-related career. In order to encourage more girls and young women to pursue science-related careers, it is important for media images to show how women working in these fields successfully combine work and family.

## 5. Future research

One of the limitations of this study is that the frequency of visits to these Web sites by girls and what, if anything, girls actually learn from these Web sites cannot be determined through an analysis of media content. Little is known about the effectiveness of science Web sites for girls in countering existing cultural stereotypes, breaking down long-held gender schemas, and ultimately, narrowing the gender gap in science. Research needs to examine which Web sites girls visit most often, how they search the Web and search within individual Web sites, and how they process information from the Web. This will provide more information about how girls use these Web sites.

In order for these sites to have any impact on narrowing the gender gap, girls first need to be aware of and access these Web sites. Campaigns directed specifically at teachers and parents are one way to direct girls and young women to these sites. For example, teachers can be notified through established listservs and mailings can be sent home to parents of teenage daughters informing them about these sites. Further research needs to examine the most effective ways for informing girls and young women about these resources on the Web.

In order to determine the effectiveness of the information on a specific science Web site for girls, researchers and Web designers need more information on how girls search the Web and search individual sites. Audience studies need to assess girls' Web searching behavior to determine the most effective communication strategies for generating interest in information about science and scientific careers.

In addition, further research needs to look at the ways girls and young women cognitively process and use information from these sites. Carefully-controlled long-term studies and surveys need to assess the impact of this information on girls' interest in science and engineering, achievement in these areas, awareness of scientific and engineering careers, perceptions of scientists and engineers, and selection of careers.

Another limitation of this study is the focus on only Web sites about science and engineering for girls. The Web sites included in this study, no doubt, represent some of the best examples of sites that teach girls and young women about science and the lives of women scientists and engineers. Research also needs to examine Web sites created by museums, educational television programs, and other kinds of informal science programs.

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**Appendix A** General description of science web sites for girls

| Web site name (date) | Creator/sponsor | Audience |
|---|---|---|
| 1. Science is for Girls (1998) | Science is for Girls | Girls |
| 2. Girls Ask Why (2000) | Girl Scouts | Girls<br>Parents<br>Teachers |
| 3. Girls and Women in Science Links (1999) | Girls and Women in Science, Beloit College | Girls<br>Parents<br>Teachers |
| 4. Rural and Urban Images: Voices of Girls in Science, Mathematics, and Technology | Appalachia Educational Laboratory (AEL) | Girls<br>Parents<br>Teachers |

**Appendix A** continued

| Web site name (date) | Creator/sponsor | Audience |
|---|---|---|
| 5. Portia WWW:The Gateway into SET for all Women (1999) | The Portia Project, 71 Women's Organizations | Girls<br>Parents<br>Teachers |
| 6. Tomorrow's Girl (2001) | Cheryl Hershey | Girls<br>Parents<br>Teachers |
| 7. Women Who Walk Through Time (1998) | Dr. Paula N. Wilson, University of Utah, NSF | Girls<br>Parents<br>Teachers |
| 8. Advocates for Women in Science, Engineering, and Mathematics (1999) | AWSEM | Girls<br>Parents<br>Teachers |
| 9. Women of NASA (2001) | NASA | Girls<br>Teachers |
| 10. Against the Odds (2000) | Bigelow Currie Productions | Girls<br>Teachers |
| 11. Girls Incorporated (2000) | Girls Incorporated | Girls |
| 12. GirlTech (2001) | Cynthia Lanius, Rice University, NSF | Girls<br>Parents<br>Teachers |
| 13. Engineer Girl (2001) | National Academy of Science, National Academy of Engineering | Girls |
| 14. Plugged-In (2000) | Girl Scouts, Ottawa University, NSF | Girls<br>Parents<br>Teachers |
| 15. The Role Model Project for Girls (1999) | Women's Work | Girls |
| 16. The Girl Scientist (2000) | BrainPOP.com | Girls |
| 17. Inventive Women (2000) | Annie Wood | Girls<br>Parents<br>Teachers |
| 18. Internet for Girls (1998) | Kids WWW (Digital Library for K-12 students)<br>Donna Woodka | Girls<br>Parents<br>Teachers |
| 19. Girl Power Locker (2001) | gpower@health.org | Girls<br>Parents<br>Teachers |
| 20. Institute for Women in Trades, Technology, and Science (2000) | IWITTS (in progress) | Girls<br>Teachers |
| 21. The Backyard Project (1999) | Garnett Foundation | Girls |
| 22. Remarkable Careers in Oceanography (2000) | Deborah K. Smith, Lori A. Dolby, and Ed Schiele, Woods Hole, NSF | Girls<br>Parents<br>Teachers |
| 23. Speak Out! | NSF | Girls |
| 24. Universe Girl (2001) | UniverseGirl.com | Girls<br>Parents<br>Teachers |
| 25. By Girls, For Girls (2000) | Smith College<br>YMCA of Western MA | Girls |
| 26. Autodesk (2001) | Autodesk, Inc. | Girls |
| 27. The Adventure of Josie True (2001) | Mary Flanagan, NSF | Girls<br>Parents<br>Teachers |

**Appendix B** Description of Educational Information on Science Web sites for Girls

| Web site name (date) | Science experiments | Educational Information (other than experiments) | Links to Web sites |
|---|---|---|---|
| 1. Science is for Girls (1998) | | Yes | Science<br>Math<br>Technology |
| 2. Girls Ask Why | Yes | Yes | |
| 3. Girls and Women in Science Links (1999) | | | Careers<br>Women |
| 4. Rural and Urban Images: Voices of Girls in Science, Mathematics, and Technology | Yes | Yes | Careers<br>Women |
| 5. Portia WWW: The Gateway into SET for all Women | | Yes | Science<br>Careers<br>Women<br>Math |
| 6. Tomorrow's Girl (2001) | | Yes | Science<br>Girls<br>Math |
| 7. Women Who Walk Through Time | | Yes | Science<br>Girls<br>Career |
| 8. Advocates for Women in Science, Engineering, and Mathematics (1999) | Yes | Yes | Science<br>Career<br>Women<br>Girls<br>Math |
| 9. Women of NASA (2001) | | Yes | Science |
| 10. Against the Odds | | Yes | |
| 11. Girls Incorporated | | Yes | |
| 12. GirlTech (2001) | | Yes | Science<br>Math<br>Technology<br>Girls |
| 13. Engineer Girl | Yes | | Science<br>Women |
| 14. Plugged-In (2000) | Yes | Yes | |
| 15. The Role Model Project for Girls (1999) | | | Girls<br>Women |
| 16. The Girl Scientist (2000) | Yes | Yes | |
| 17. Inventive Women (2000) | | Yes | |
| 18. Internet for Girls (1998) | | Yes | Girls<br>Women<br>Science<br>Math |
| 19. Girl Power Locker (2001) | Yes | Yes | Science |
| 20. Institute for Women in Trades, Technology and Science (2000) | | | Career<br>(coming soon) |
| 21. The Backyard Project (1999) | | | Career<br>Education |
| 22. Remarkable Careers in Oceanography (2000) | | | Science<br>Education |
| 23. Speak Out! | | | Science<br>Girls |
| 24. Universe Girl (2001) | | | Science<br>Girls |
| 25. By Girls, For Girls | | Yes | |

**Appendix B** continued

| Web site name (date) | Science experiments | Educational Information (other than experiments) | Links to Web sites |
|---|---|---|---|
| 26. Autodesk (2001) | | Yes | Career<br>Education<br>Science<br>Math |
| 27. The Adventure of Josie True (2001) | | Yes | Science<br>Girls |

**Appendix C** Vocational information

| Web site name (date) | Career information | Biographies of women scientists | Mentoring online |
|---|---|---|---|
| 1. Science is for Girls (1998) | | | |
| 2. Girls Ask Why | | Yes | |
| 3. Girls and Women in Science Links (1999) | | | |
| 4. Rural and Urban Images: Voices of Girls in Science, Mathematics, and Technology | | | |
| 5. Portia WWW: The Gateway into SET for all Women | Yes | Yes | |
| 6. Tomorrow's Girl (2001) | Yes | Yes | |
| 7. Women Who Walk Through Time | Yes | Yes | |
| 8. Advocates for Women in Science, Engineering and Mathematics (1999) | Yes | | |
| 9. Women of NASA (2001) | | Yes | Yes |
| 10. Against the Odds | | Yes | Yes |
| 11. Girls Incorporated | Yes | | |
| 12. GirlTech (2001) | Yes | Yes | |
| 13. Engineer Girl | Yes | Yes | Yes |
| 14. Plugged-In (2000) | | | |
| 15. The Role Model Project for Girls (1999) | | Yes | |
| 16. The Girl Scientist (2000) | | | |
| 17. Inventive Women (2000) | | | |
| 18. Internet for Girls (1998) | | | |
| 19. Girl Power Locker (2001) | Yes | | |
| 20. Institute for Women in Trades, Technology and Science (2000) | | Yes | Coming soon |
| 21. The Backyard Project (1999) | Yes | Yes | |
| 22. Remarkable Careers in Oceanography (2000) | Yes | Yes | |
| 23. Speak Out! | Yes | | |
| 24. Universe Girl (2001) | Yes | Yes | |
| 25. By Girls, For Girls | | | |
| 26. Autodesk (2001) | Yes | Yes | |
| 27. The Adventure of Josie True (2001) | | | |

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