Abstract:

Girls' view and use of technology is dependent on developmental issues and social messages. Amazingly, they are still uninformed about technology's impact upon their futures. Consequently, there is a significant need for effective interventions that will empower girls and reframe their technology use. The paper describes the elements for success in helping girls to use technology to empower themselves, and provides concrete examples of effective initiatives in school and community settings. It details the role that caring adults play in identifying appropriate resources and providing positive experiences which engage girls in deeper technology skills and applications. It also calls for adults to change their own mindsets in relation to technology, and to leverage girls' developmental needs. Girls benefit from school-based and out-of-school learning activities that link current interests to community and career opportunities.

In the 21st century it may seem absurd to address gender equity in the realm of technology. The majority of telecommunicators are now female; girls use the Internet more for education and communication than boys, while boys use it more for entertainment (Fallows, 2005; Kaiser Family Foundation, 2005; U.S. Dept. of Commerce, 2004). Nevertheless, many girls do not like the computer culture, and do not see technology as part of their career future (AAUW, 2000; Green, 2000; Kim, 2000; Koszalka, 2002). As a result, they are disadvantaged in life – and society does not benefit from their full potential. This paper explores the realities of 21st century teenage girls, and offers ways for adults to empower them through technology.

What's the Problem?

Even though more girls than boys use email and create web pages, the world of technology remains largely a male domain (AAUW, 2000; Gee, 2003). Such is the perspective of girls – and they show little interest in joining that testosterone bastion. The 2000 report of the American Association of University Women on girls and technology found that girls were not techno-phobic; rather, they did not like the computer *culture*. They found

programming to be boring, they didn't like the nature of most computer games, and they saw few positive adult female role models (Dilevko & Harris, 1997; Green, 2000; Gressard & Loyd, 1986; Rosa, 1999). Girls' problematic attitudes about technology become critical in the adolescent years, although it starts earlier (AAAS, 1999; Bethea, 2002; Hackbarth, 2001). Additionally, the social pressures on pubescent girls start to affect technology access and use (Center for Media Literacy, 2007; Eckes & Trautner, 2000; Jenkins, 1992). Boys spend more time on computers, and parents tend to buy boys their own computers more than they purchase them for girls (Compaine, 2001; Jennings, 2000).

The school culture is not much better (AAAS, 1999; Bethea, 2002; Black, 2004; Jenson, 1999; Parsad & Jones, 2005; Sadowski, 2003). Technology-enhanced projects are gender-neutral or more male-oriented. Girls are sometimes discouraged from taking advanced math, science or tech courses. Girls lack information about the impact of technology on career opportunities, salaries, and promotions. Thus, girls tend to classify all tech jobs as masculine (Green, 2000; Koszalka, 2002).

What's the Impact?

Particularly since the Bureau of Labor Statistics stated in 2000 that almost three-quarters of jobs incorporate technology, it is surprising that only a quarter of females work in technology-related fields, and that only ten percent are in top technology jobs (U.S. Senate, 2002). When girls do not see their futures in technology, they are not prepared to major in technology-related fields and have a hard time competing in the employment world (Green, 2000; Smith, 1999). More profoundly, they have fewer resources at hand in order to make informed decisions and enjoy their adult lives. Hence, girls might not reach their full potential, and society cannot realize its full potential either (Warschauer, 2003).

What's the Solution?

The United Nations developed a set of recommendations regarding the use of information literacy by girls. Some of the points included using the Web to engage teen girls, using other technologies to engage teen girls, and providing mentoring venues to engage teen girls. Other national (e.g., GEAR-UP, 2007; ISTE, 2000; U. S. Department of Education, 2005) and local (e.g., Becker, 2003; McGrath, 2004) recommendations also highlighted the need for – and the ability of – females to learn about technology and apply those skills. The issue will not go away. Solutions need to be found in order to promote an equitable, equipped society.

The Role of Adults

It takes the entire community to systematically address this issue, from caring adults and engaging resources to positive learning environments and motivating activities. Caring adults can provide teenage girls access to technology itself and information about technology. Educators can facilitate career exploration about technology that addresses girls' interests. As a gateway to information, library use of technology focuses on information literacy and research, steps that encourage lifelong problem-solving and decision-making (Agosto, 2004; Crew, 1997; O'Dell, 2002). Parents and community members can link technology use to personal and social change.

As is, adults impact girls' perceptions and use of technology both overtly and covertly. Unlike today's digital "natives," the majority of adults are electronic immigrants (Negroponte, 1995). Many women still consider technology as The Other, something that has to be dealt with rather than enjoyed and controlled (Harris, 1999; Turkle, 1984). Adults may feel overwhelmed by technology, especially at its fast-moving pace (Leonard, 2003).

Adults' technology skills, knowledge, and dispositions need to be assessed and addressed. While adults should know some basic features of technology and be comfortable with some aspects of technology use, they don't have to become techies to help support teenage girls' interest and engagement in technology. Adults also need to realize that their life experiences and moral compass give them unique advantage when working with girls around the issues of technology. Rather, a positive, accepting attitude that supports girls' intellectual risk-taking vis-à-vis technology is more important (Deal & Barker, 2003; Fine, 2001; Gilligan, 1982; Labaton & Martin, Laskin & O'Neill, 1992; Mackoff, 1996; Orenstein, 1994; Pipher, 1994). Adults are access facilitators – and psychological safety nets. At their best, informed and caring adults can transform teenage girls' lives.

Because girls value relationships and a sense of community, adults should collaborate to provide an inclusive community-based environment for technology engagement (Belenky, Brown, Gurian & Henley, 1986; Hom, 2002; Hrabowski, 2002; Jones, 2000; McGillicuddy-De Lisi & De Lisi, 2002; Oberman, 2002; Rice & Golgin, 2004; Thompson, 2005). They can offer consistent messages about the consequences of inappropriate technology use while helping girls develop coping skills that enable them to be critical evaluators and producers of information (Hobbs, 2007; Media Literacy Clearinghouse, 2007). It should be noted that empowering girls means negotiating control, which may be difficult for adults (Putallaz & Bierman, 2005; Underwood, 2003). However, the benefits out measure the discomfort.

Technology Resources with Girls in Mind

In some areas of the world, technology seems ubiquitous. The fourteen year-old Japanese girl with her electronic wearables technology exemplifies instant access to technology (Mann, 2001). Most teenage girls in the U.S. can get their hands of technology if they want to. The issue is to provide equitable, appropriate technology for *all* girls – and to show girls that technology can be used to further their own futures as well as to entertain them in the now (Roschelle, 2004; Rosser, 1995; Sanders, 1997; Saul, 2004).

A variety of equipment is available to explore technology, from handheld computers to laptops and cheap desktops. Digital-related peripherals, software, and products abound. Equipment to capture and edit still and moving images is becoming very popular – and can even be available in many cell phones. Telecommunications provide a natural "hook" for girls' technology engagement, particularly as these communication channels facilitate personal relationships and a sense of community. Technology production and broadcasting, be it via blogs or podcasting, offers effective ways for girls to express themselves creatively. Nevertheless, while digital information is ubiquitous, it is often inaccurate and misleading; careful evaluation of resources is needed in order to optimize learning conditions. The following initiatives exemplify ways foster deeper thinking about technology use: http://www.bluejeanonline.com,http://www.girlstart.org/, http://www.siu.edu/~sistem/funlink.htm

While access to technology is necessary, it is not sufficient. Teenage girls need to know how to understand and use technology protocols and features efficiently and purposefully. They also need to understand the legal and ethical issues that technology poses (Center for Media Literacy, 2007; Dobosenski, 2001; Johnson, 2003).

How Girls Can Use Technology

Probably the easiest way to get teenage girls engaged in technology is to build on their existing success as Grand Communicators (AAUW, 2000; Agosto, 2004). While it is important for girls to be informed consumers of information, they should be encouraged to become active creators of digital information (Hobbs, 2007; Keeble & Loader, 2001). Furthermore, because teenage girls can be very idealistic, getting involved in important-to-

them causes, showing how technology can change society for the good can be very compelling. At the core, adults should help teenage girls reframe technology use from an immediate personal gratification to an empowering tool for self-fulfillment and social change (Children's Partnership, 2000; Katz, Rice & Aspden, 2001). Girls need to gain critical skill in assessing, using, manipulating, and sharing ideas for immediate fun and for lifelong benefit.

In-School Incorporation

Schools serve as natural conduits for engaging technology-based learning. Even with the U.S. Department's National Technology Plan, the school community needs to pro-actively develop a coordinated curriculum and relevant learning activities that facilitate female involvement. The school library and its staff often spearhead technology initiatives and provide technology-rich resources, so they should collaborate actively with the rest of the school community through curricular-based technology planning and implementation (Agosto, 2004; Crew, 1997; O'Dell, 2002). Co-curricular offerings should also be considered. A variety of learning activities can be developed by teacher librarians in collaboration with classroom teachers to reflect a variety of teenage girl interests and career opportunities.

1. Writing: creating desktop publishing documents
2. Art and design: using computer-aided design to produce advertisement, architecture, etc.
3. Animals and environment: analyzing statistics about ecology
4. Healthcare: using science probes to measure fitness
5. Law: researching digital databases about animal rights
6. Education as a career: videotaping instructional best practices.

Community-Based Initiatives

Because teenage girls spend significant time outside of school, community agencies and businesses have many opportunities to engage girls in technology-rich experiences. In addition, some teenage girls drop out of school, so local entities may be the only way that these girls can connect positively with caring adults. Also unlike schools, community groups can develop a greater variety of programs in terms of content, delivery, and timeframe. Individual mentoring and coaching also provides teenage girls with positive role models of technology use (Hull & Schultz, 2002; O'Dell, 2002; Ramnanan, 2001). When communities coordinate their efforts with each other, including educational institutions, they optimize their impact, particularly for at-risk girls (Gambone, Klem, & Connell, 2002). A variety of sample learning activities reflect a variety of teenage girl interests, and link to career opportunities.

1. Entertainment: creating and broadcasing videos
2. Fashion and beauty: using software to create fashions
3. Sports and fitness: using nutrition and personal fitness software
4. Personal advice: blogging about personal issues
5. Child care: accessing online tutorials on child development
6. Business/self-employment: developing marketing documents.

Teacher librarians are well poised to help teenage girls to be empowered through technology. They know how to use technology to access, manipulate, and communicate information. Particularly since the majority of teacher librarians are female, they can serve as positive role models and encourage teenage girls to explore technology and make it their own vehicle for self-expression and empowerment.

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