How Adolescent Boys and Girls View Today's Computer Culture

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Abstract

This paper summarizes a yearlong qualitative study of uses and mental concepts of computers and computer culture in seventh and eighth grade boys and girls. A social-constructivist stance formed the theoretical framework for this study. I used interpretive methods in an open-ended environment to study and explain gender diversity in technology-rich, middle school classrooms. My goal was to gain insight into how adolescent boys and girls conceptualized and used computers in the current computer culture. By focusing particularly though not exclusively on girls, I hoped to shed light on how girls view their experiences with technology. The focus of this study was not to further investigate the perceived gender gap regarding technology, but rather to address the meanings that adolescents assign to computers as they interact with them. Adolescent boys and girls view and use computers differently. Each gender seems to accept this as a natural part of their culture, and, in general, is accepting of each other's visions and uses.

Introduction

The focus of this yearlong qualitative study of seventh and eighth grade boys and girls was not to further investigate the perceived gender gap regarding technology, but rather to address the meanings that adolescents assign to computers and the ways they interact with computers. By focusing particularly though not exclusively on girls, who historically are either left out or are underrepresented in studies of technology, I hoped to shed light on how girls and boys view their experiences with technology. In my role as teacher/researcher, I used interpretive methods in an open-ended environment to study and explain gender diversity in technology-rich, middle school classrooms.

One of the major challenges of such as study is that it focuses on three moving targets: students developing from their formative years to adolescence, a culture with evolving and changing gender roles, and, as Volman and van Eck (2001) indicate, an evolving and changing computer culture within educational settings.

Literature Review

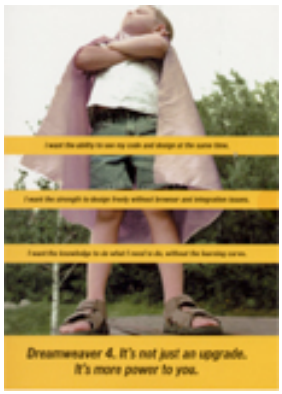
I view both gender and computers as social constructions that exist in particular contexts. Gender is assumed to be constructed within a culture and not genetically inherent in an individual. West and Fenstermaker (1993) believe that gender is "a mechanism whereby situated social action contributes to the reproduction of social structure in which people do gender; and men and women do it differently" (p. 158). In a similar vein, objects, such as computers, take on meanings constructed by individuals as they interact with these objects. Technologies do not exist in a vacuum – with no history and no social implications or connections. Technologies exist only in social contexts. People negotiate and renegotiate meaning as they personally interact with objects, thereby constructing a social order as well as a personal meaning. Within this perspective, gender and computers are social constructions that vary from person to person. This research delves into these personal meanings.

A review of empirical studies on gender and computers conducted between 1984 and the present paints an overall picture of male dominance. Males used computers more than females, especially for programming and game playing. This tendency began in elementary classrooms where boys tended to dominate computer use and often crowded girls out (Elkjaer, 1992; Inkpen, Booth, & Klawe, 1992). In addition, three times as many boys as girls participated in summer computer camps, and parents were more likely to purchase computers, computer software and peripherals for boys than for girls. By high school, the gender gap in computer use was even more pronounced. Boys were more likely to own a computer, understand the electronic operations of computers and be part of extracurricular computer classes. Lack of female role models, gender-stereotyped computer course materials, and male-oriented names of computer science courses also contributed to students' existing connotation of computers as male domains (Schofield, 1995). The trend continued at the university level where, in an introductory computer course, more than half the males used the computer lab after hours while almost none of the females took advantage of this opportunity.

At all levels, boys were more likely to be chosen to assist the teacher with technology than were girls (Sanders, 1990). Christie (1995) observed that girls generally enjoyed computing less than boys because most available software appealed to boys rather than to girls; the software used gaming formats that were competitive and often violent and which pitted two players against each other or one player against the computer. Girls preferred to explore feelings, solve problems, and work cooperatively and interactively at the computer. They also preferred adventure, friendship or creativity as the focus of software (AAUW, 2000; Fiore, 1999). And finally, male teachers used computers more than female teachers at the elementary, secondary, and university levels (Hattie & Fitzgerald, 1987). Therefore students lacked female role models in this domain.

Gender stereotyping attitudes are very prevalent. When surveying 1,600 kindergarten through grade 12 students, Wilder, Mackie, and Cooper (1985) found that both boys and girls considered computers as more appropriate for males than females. When asked to draw a computer user, both boys and girls were more likely to draw boys/men in this role (Martin, Heller, and Mahmoud, 1992). Gender stereotypes were reinforced by parents, peers, and the educational system (Walkerdine (1990).

This cultural gender bias is found extensively in advertising and is perpetuated through advertising (Gooler, 1986; Nye, 1991). Although this trend has begun to change in the last five years, technology advertising is more likely to picture a male "computer nerd" or "computer geek" than a female computer scientist. Similarly, computer users tend to be pictured as females. The perception that males are *programmers* and females are *users* is captured well in Figures 1 and 2 below.



I want the ability to see my code and design at the same time.

I want the strength to design freely without browser and integration issues.

I want the knowledge to do what I need to do without the learning curve.

Dreamweaver 4. It's not just an upgrade. It's more power to you.

Figure 1: Dreamweaver Advertisement

Text: XP called an operating system even your mother would love.

Implication: We, the male computer scientists, have made XP so simple even a woman can use it.

Figure 2: Microsoft News Event

This lack of *female-in-control of technology* examples, coupled with the plethora of *female-needing-help using computers* examples deters girls from exploring computers and computer-related careers. One further deterrent for females is the use of sex as an advertising tool, as pictured in Figure 3, which uses a nude female figure to advertise a Palm Pilot.

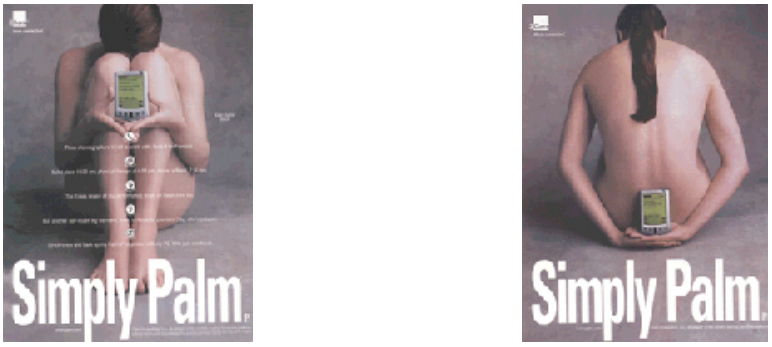


Figure 3: Palm Pilot Advertisement

Kramer and Lehman (1990) contended that the male-as-computer-programmer image was accurate when computers were nothing more than number-crunching machines. With the rapid changes and advancements in technology, however, the presumption that maleness and computers are closely related domains contributes to an "increasingly inaccurate portrayal" (p.170) of computer use in the 1990 and 2000s. Hoyles (1988) summed up this tendency succinctly: "computers tend to be conceptually assimilated to the category of science, mathematics, and technology and acquire some of the traditional qualities of differentiated interest amongst boys and girls" (p. 10). This outdated view of computers, which disadvantages any "non-logical" person, and women are perceived to be highly represented in this category, serves to reinforce the bias that women are less competent and confident with computers than males.

Turkle and Papert (1990) called for a new social construction of the computer to contribute to our understanding of the ways males and females think about and use computers. After reviewing ten years of research on gender, ethnicity, and social class differences in the uses of computers in K-12 classrooms, Sutton (1991) concluded that there is a need to more fully understand the complexities of inequities in computer use is schools. This paper answers these calls.

Project Description

The focus of this study was not to further investigate the perceived gender gap surrounding technology, but rather to address the meanings that adolescents assign to computers as they interact with them. Since our culture is experiencing evolving and changing gender roles, and, since the computer culture within educational settings is evolving and changing, it is appropriate that this study addresses how today's adolescents view and use computers within an educational setting.

In my role as teacher/researcher, I team-taught a technology-rich social science unit to 250 middle school students. My teammate (a seventh- and eighth-grade Language Arts/Social Studies teacher) and I worked with each group of 25-30 students for approximately eight to ten hours in four separate sessions. Our classes took place in a computer lab, so each student had access to a computer. Despite this one-to-one ratio of computers to students, students frequently collaborated both on and off the computer.

The classroom was structured around seventh and eighth grade Language Arts and Social Studies standards that focused on problem solving, critical thinking, reading, writing, viewing and presenting. Technology was the tool that helped us integrate student learning. In our classroom, we used a student-centered approach that views learning as a social process, and learners as active participants in their learning and therefore responsible for their own learning paths. Students constructed individual knowledge in an environment that featured collaboration as well as feedback from peers and teachers. Our classroom was grounded in the following principles:

- Learning is an active process facilitated by an environment that encourages risk-taking, creative thinking, and critical thinking;
- Teachers create such environments to facilitate learning and to provide opportunities for self-reflection and self-evaluation;
- Learning is social and is fostered by collaboration;
- Learners learn by doing within specific contexts;
- Learning is reflective and incorporates feedback from teachers and peers;
- Students and teachers learn through their mistakes; and
- Technology is a tool to facilitate learning and is NOT the focus of learning.

Methodology

This paper describes a university-middle school partnership involving 250 middle school students from twelve schools. Students were bussed to a nearby urban university where students had ready access to computers and the Internet so they could complete a web-based unit on cloning. The unit was team-taught by a middle school teacher and a university professor. The students benefited from access to technology and the university professor was able to conduct a qualitative research study on gender and technology with these middle school students.

Students' mean age was 12.5 years. The project participants were approximately 50% males, 50% females. Students were:

- 75% Caucasian
- 18% Hispanic
- 5% Asian American
- 1% African American
- 1% Native American

Data sources included: open-ended student surveys about students' uses of and attitudes toward technology, open-ended parental surveys about parents' uses of and attitudes toward technology, observational data and field notes, documents created by students, and student responses from structured focus groups.

Students and their parents completed surveys (See Appendices A and B) prior to the start of the project. Observations and associated field notes and digital photographs were recorded throughout the project. Student products and reflective logs were collected at every step of the project. At the completion of the project, a number of structured focus groups were conducted with the students. Focus group responses were recorded and transcribed.

All data were analyzed using a constant comparison method, not in the sense that Glaser and Strauss (1967) use this method to derive theory, but simply to sort through and process my data. I recursively used the first two steps that Glaser and Strauss suggest that researchers follow:

1. compare incidents applicable to each category
2. integrate categories and their properties

In terms of my general approach to data analysis, I first looked through the raw data for divisions along gender lines. But my examination did not stop there, as I considered no gender difference as interesting as gender differences. I noted same-gender and cross-gender interactions in an effort to understand how these adolescents viewed and used computers. I followed the model of Gilligan (1982) who presents female and male voices to highlight the differences between two ways of viewing experiences rather than suggesting generalizations about either gender.

Findings

All of the adolescent girls and boys in this study were competent, confident and frequent users of computers, computer software, and the Internet. Despite their equivalent competence, confidence and frequency of use, girls and boys viewed and used computers differently. Each gender seemed to accept this as a natural part of their culture, and, in general, was accepting of each other's visions and uses.

In terms of definitions, girls saw the computer as much more multi-dimensional then did boys. The phrase "it's whatever you want it to be" best captures this understanding. Girls defined computers as multi-use tools that facilitate connecting with friends, doing homework and research, gathering information, solving math problems, organizing ideas and information, producing more professional products, and accomplishing a multitude of tasks in a quicker, easier way. Boys, on the other hand, had a more narrow view of computers. Boys identified computers as machines, toys, or high tech calculators that let you do things quicker and easier. It is interesting that no girls used the terms machine or toy in defining the computer. Rather, they focused on what the computer allowed them to accomplish. The major foci for girls, in order of importance, were computer as

communication tool, computer as productivity tool, and computer as multi-purpose tool. The major foci for boys, in order of importance, were a machine for entertainment and gaming, a thinking machine, and an information machine.

In terms of general use, girls utilized computers to connect with others, and boys used computers to compete with others. Girls' most predominant uses centered around communication: emailing friends and family, chatting with friends, making new friends, using instant messaging to communicate daily with classmates, and connecting to and flirting with guys. Boys' most predominant uses centered on competitive, often violent, gaming activities such as war games and killing simulations, and sporting games. In terms of school-related use, girls focused on the numerous ways they used computers, including word processing, creating multimedia presentations, writing multiple drafts of papers, and producing neat, professional looking work. Boys, however, mentioned that they used computers for homework and schoolwork only now and then, and the only tool they mentioned was the Internet.

In terms of Internet use, each gender identified several uses not mentioned by the other gender. Girls said they used the Internet to shop or browse for fashion ideas. They also focused on using the Internet to flirt with guys or see pictures of "handsome hunks." Most girls played computer games not at all or only when they were very, very bored. They then elaborated that they thought computers games were bad influences on their male classmates because gaming made the boys into anti-social couch potatoes who didn't know how to communicate with their female classmates. Boys mentioned using the Internet to look up codes for various games that would allow them to move to the next level of the game. And several boys mentioned their sophisticated use of computers to create FTP sites for other gamers to find codes and secrets for popular software and Internet games.

An interesting and unexpected trend that I discovered when analyzing data was that girls used more exact language to describe computer use than did boys. For example, boys said they used computers for homework; girls specified that that used word processing, PowerPoint™ and the Internet to do homework. Boys called the computer a machine that allows you to look up stuff, while girls said it was a resource tool for learning. Boys were less specific about their uses than girls. For example, boys never mentioned how they did homework, while girls mentioned how they used word processors to do multiple drafts and how using the computer made their work look neater and more professional. And even though both boys and girls mentioned the convenience of computers, they chose different language to express this idea. Boys used the generic “it” when they said “it let's you do things quicker and easier;’ girls identified the computer as a tool when they said “it's a tool that helps you work quicker.”

Figure 4 delineates the exact phrases adolescent girls and boys used to define the term computer.

Girls' Definitions
Something to keep you connected to your friends It helps you communicate with others A machine that does things that you tell it to do A lot of stuff combined into one thing to make life easier A gateway to information It can substitute for a book because it contains so much information It organizes and stores your thoughts It's a resource tool for learning things It can communicate, it can do problems in math and it can write It improves your everyday life A tool that makes your work look neater and more professional A tool that helps you work quicker It's whatever you want it to be
Boys' Definitions
A machine with a CPU and a motherboard and circuits A high tech calculator, a giant calculator A machine that does what you program it to do A machine that thinks for you A machine that processes information and stores it A toy for people to have for entertainment A machine that does things faster than a human can A machine that allows you to look up stuff It let's you do things quicker and easier.
Figure 4: Adolescent Girls' and Boys' Definition of "Computer"

Figure 5 delineates the exact phrases adolescent girls and boys used to describe how they used the computer.

Girls' Uses of Computers
Word processing for homework and research Word processing for writing process to easily do lots of drafts PowerPoint™ presentations for classes Email to talk to friends both locally and at a distance Chat rooms to keep in touch with friends and make new friends Instant messaging to talk to classmates Email to talk to guys and flirt with guys Games to play if I'm really, really bored, like PacMan or Solitaire Definitely NOT for games The Internet to shop or "window shop"

Boys' Uses of Computers
Mainly for fun, maybe some homework now and then To play games (Solitaire, casino games, sporting games, logic games, simulations where you kill people, war games) Entertainment 24 hours a day The Internet for information to do homework The Internet for Nintendo codes Run an FTP from my computer that's up 24 hours a day
Figure 5: Adolescent Girls' and Boys' Uses of the Computer

There are a number of stereotypes that seem less strong than they once were. For example, as illustrated in Figure 6, males are more likely to take control of the mouse than are females, but some females are comfortable taking control of the mouse.

Figure 6: Breaking Gender Stereotypes Regarding Mouse Control

As shown in Figure 7, females enjoy and use collaboration for computer-based assignments, but males also enjoy and use collaboration as a learning tool.

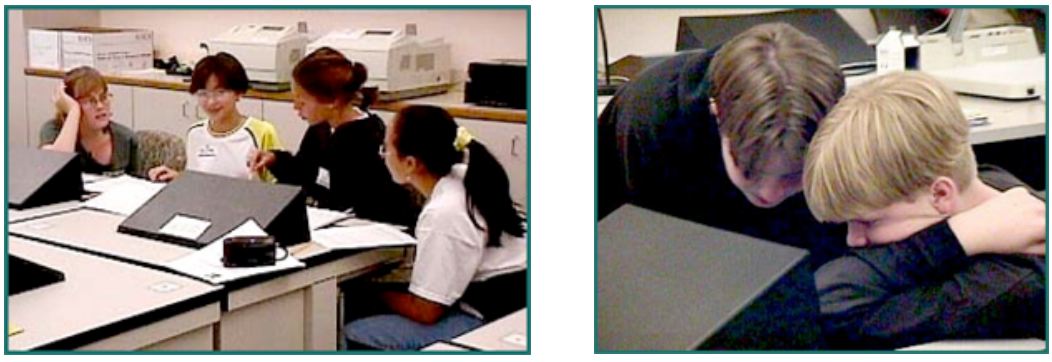


Figure 7: Breaking Gender Stereotypes Regarding Collaboration

And there was evidence of the evolving, often confusing, gender roles of girls and women in the world of computers, as shown in Figure 8.

"I'm fourteen years old and all's I'm interested in is boys. I'm not SUPPOSED to be interested in computers and the Internet and stuff like that."

"I can't believe it! I'm really enjoying using the computer!"

Figure 8: Evolving Gender Roles Regarding Computers

Implications for Classroom Practice

The gender differences surrounding technology are not differences in competence, confidence, or frequency of use. Instead, the differences lie in how adolescent girls and boys view computers and the way they choose to use them. It is imperative, then, that K-12 teachers understand that the culture of computer use in schools is changing, and that females are embracing technology in numerous new ways as computes evolve into a more versatile and complex tools that can be used in a wide variety of ways depending on the user.

Because there is a pervasive perception that the computer domain is male, parents and teachers need to work to disrupt the stereotypically gendered character of technology. In general, technological use is often dictated by a rigid gender ideology: vacuum cleaners, washing machines, and electric typewriters are for women; power saws, tractors and household tools are for men. But computers, although far from neutral, offer a way to interrupt and re-define gender differences. Technological advancements have changed both the computer and the image of the computer. Computers are no longer simply number crunchers; they are now multifaceted technologies that facilitate unlimited opportunities in application, use and vision. Men may have aligned themselves with a number crunching computer in the past; but the newer image of computer as more complexly functional opens the door to differently gendered use. In fact, this study stands as firm evidence that girls are aligning themselves with computers and are using computers to defy long-standing gender stereotypes.

A delineation of classroom strategies that will ensure that both girls and boys use computers in ways that enhance learning and growth is the topic for another article. The first step, however, is raising teachers' consciousness about the inherent disadvantage girls have in the computer domain. Helping teachers become more aware of issues surrounding girls and computers can make a difference. A group of 240 teachers attending the Carnegie Mellon Summer Institute from 1997 to 1999 were trained in "gender equity instruction that would increase the numbers of girls taking high school

computer science" (Margolis & Fisher, 2002, p. 109). These teachers reported the following changes as a result of the institute:

- Teachers were more aware of their own behavior that disadvantaged girls;
- Teachers made a greater effort to call on everyone in the classroom, not just the boys;
- Teachers personally made greater efforts to recruit girls into high school computer science classes;
- Teachers had a better idea of how to work with girls;
- Teachers worked harder to retain girls in their classes;
- Teachers encouraged girls now; and
- Teachers considered issues of gender equity more (Margolis & Fisher, 2002).

Implications for Future Research

Turkle and Papert (1990) called for a new social construction of the computer as well as feminist scholarship to contribute to our understanding of the ways males and females think about and use computers. I created, within my classroom, a micro-culture that encouraged new social constructions of the computer and the computer culture by both boys and girls. By closely examining the interface of girls and computers, and boys and computers, I was able to gain insights into how each gender views and uses computers.

This study breaks ground for future studies to create, and simultaneously study, computer cultures that honor female and male ways of knowing and that allow the research community to begin to break down gender stereotypes and the idea of one privileged (usually male) way of thinking about computers.

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