"Girls Don't Waste Time": Pre-Adolescent Attitudes toward ICT

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Abstract
Relying on naturalistic observation, via video self-documentaries, contextual interviews, and focus groups, we explored gender differences in the information and communication technology (ICT) perception and use of United States middle school students. Our study revealed four key dimensions which foreground the significant gender differences in how students of this age approach and interact with technology. These differences should be considered when developing age appropriate technology and education programs. Our later research will explore the relationship among ICT use, self-efficacy, and career choices through a large-scale survey.

Keywords
User studies, gender differences, ICT perceptions and use, middle school students

ACM Classification Keywords
H.1.2. Models and Principles: User/Machine Systems – Human factors; H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction
It is now common knowledge in the CHI community that demographic factors, such as age, gender, and culture, have significant impact on software use and

Who do you think are better at using technology, boys or girls?

Sample answers from boys…

"Our sisters are much better."

"Girls always use cell phones."

"Girls that care about it probably use it a lot more."

"They don't waste their time trying to figure out – 'oh, how does this work, how does that work, how does this get through there.' They just go, 'oh, that's there, that's there - that's fine.'"

therefore should be considered in design. There are now burgeoning research areas in evaluating systems for children [2, 3, 4], older adults [12, 13], and cross-cultural user groups [5]. However, equivalent efforts to probe deeper into gender differences have stalled.

In the early-1990's, Brenda Laurel [9] set out a challenge with the foundation of Purple Moon, a company that created interactive media for girls. Its fundamental assertion was that girls may very well play video games, if the games are designed for their sensibility and life experience. This began an exploration of gender-focused design and evaluation criteria [8] that has yet to reach full maturity.

To this day, little is known about the gender-related differences in technology use and how design should accommodate and evaluate these. We set out to examine gender differences in approaches to and use of information and communication technologies (ICT) among pre-adolescents. This study is part of a larger exploration of the impact of ICT perception and use by United States middle schoolers (ages 9-13) on self-efficacy and later IT career path choices. Self-efficacy has been linked to career choice as a factor in social theory [10], and our investigations aim to explore the relationships between ICT use and self efficacy. Early findings from our qualitative data analysis have revealed themes of relevance to the CHI community and will hopefully spark debate anew.

This study builds upon earlier research that showed boys and girls view technology, especially computers, differently. Girls treated computers as a tool to complete a task [1], while boys considered computers as recreational devices [6]. Our results confirmed and expanded these discoveries regarding the role of technology in pre-adolescents' lives. We not only looked at their computer usage, but also focused on their use, knowledge, and experience with other ICT.

In the remainder of the paper, we detail the complete study design, step through four key dimensions revealed in analysis, and conclude with design implications and a call for renewed gender focus in CHI research.

Methodology

Our qualitative field work followed generally accepted assumptions in CHI research. Assuming that technology use is influenced by context necessitated the use of contextual probes. Assuming that technology use is influenced by interactions with others required a mix of naturalistic observation and group-dynamic-preserving focus groups. The study was designed to capture the relevant language and indigenous categories of pre-adolescents' ICT use based on gender, while concurrently identifying factors that govern their behavior within the context of their life experiences.

We began with naturalistic observations to understand the behaviors of youth interacting with technology. Seven middle school participants (three girls and four boys) were asked to video record their own and their friends' everyday technology use in five clips, lasting one to two hours total. Altogether we had video clips of 14 students on their ICT use. The clips depicted how the participants used ICT alone, with their friends in a social context, and a short exercise of teaching their parents to use the camcorder. The discussions between the two friends revealed additional information about their ICT use. This technique has been proposed by

Who do you think are better at using technology, boys or girls?

Sample answers from girls…

"In sixth grade, I think girls are a lot better at technology than boys, because the boys just want the gory stuff - most of the boys do that - they'd rather be outside playing sports or attacking people with fake swords."

"Girls are really good at cell phones, like I know a lot of guys, who can't do [it]. I mean, they have cell phones; […] they know how to call people, and that's about it."

"Guys are really good at their fighting games or stuff like that, whereas we don't do that for fun."

"I think that the things that we do are more for ourselves in some ways, like video games don't really help you, or like give your advantage, like you are trying to beat the game or something, but if you are using IM, maybe you are helping with yourself to make plans and stuff.

experts of usability evaluation with children to prevent the difficulties of using "think-aloud" methods with young users [11]. The participants were all good communicators who used technology, but were not especially technologically savvy. We provided them with the instructions on the project requirements, camcorder use, as well as all the necessary equipment, including the camcorder, tripod, and tapes. This methodology was employed in order to significantly reduce adult researcher observer bias, which could affect the natural behaviors surrounding the use of digital media technology. The participants' mastery of the camcorder and their use of its advanced features were also noted and analyzed. Once the videos were complete, the participant "camerapersons" were individually interviewed about their experience with the videotaping process and asked to describe some of the key scenes that they shot.

We then deepened these findings with a series of six focus group interviews consisting of four to seven participants each, with a total of 37 students participating. The purposive sample was chosen from six demographically distinct public middle schools in Maryland, USA. This captured both lower and higher socioeconomic groupings as well as all levels of student aptitude to maximize our sample's diversity. Each focus group session lasted approximately one hour.

All of the individual and group interviews were video and audio recorded. These recordings, along with the video self-documentaries, were transcribed. The textual data was coded according to standard qualitative analytic procedures [14] using Nvivo®. The coding included both inductive and deductive iterations focusing on reasons of technology use, attitudes towards and perceptions of technology, while paying special attention to gender differences. The initial coding was done by multiple researchers, and adjustments were made in each round to ensure accuracy in the coding and interpretation of data. We were confident that our data collection had reached saturation when we saw the same themes emerging from both our video and focus group data collection. While many of these results are transferable to other US public school students, we intend to validate and expand our findings through surveying a large number of middle school students in the coming months.

Findings

The participants indicated that the most popular ICT among pre-adolescents included computers (especially instant messaging, downloading music, games, and word processing), iPods®, cell phones, picture and video cameras, and game systems. However, we found that boys and girls tended to use different types of technology, which confirmed earlier findings [7]. Whereas boys were keen on technology used for entertainment and fun, girls preferred using technology for communication. In general, boys were interested in playing video games on different computing platforms. Most of the girls preferred technology that facilitated communication with friends, such as IM, cell phones, "*blogs*" and "*picture Web sites*."

Detailed data analysis revealed four key dimensions of difference in ICT usage and perception between the boys and girls in our middle schools: (1) ICT feature exploration versus main functionality; (2) correct terminology use as engineers versus less specific terminology reference as users; (3) lots versus little of

ICT assemblage experience; and (4) perceptions of the role of the physical appearance of ICT.

Firstly, boys and girls seemed to approach ICT functionality in different ways. Boys were more experimental and explorative about the different ICT features, while girls focused on the main functionality that they truly needed for their tasks without further experimentation. For example, the first two male video project participants (hereinafter referred to as VP1 and VP2 … VPN) spent a lot of time exploring the digital effect features of the camcorder and made an effort to include the different visual special effects in their recordings. In contrast, none of the female VPs did that in their tapes. The girls appeared to be content to turn on the camcorder, zoom in and out to capture what they wanted to film, and play back what they recorded. Three girls said that they did try pushing the "Digital Effects" button on the camcorder, but when nothing happened, they just gave up. Not being able to make "Digital Effects" work did not influence their mode of filming or confidence in their abilities in any way; all girl VPs were pleased with and proud of their recordings.

Girls also did not appear to be interested in more advanced ICT features. Among many other examples, all the girls in one focus group preferred digital cameras with simple, rather than complicated features, because "*that's easier than the more expensive ones*, [which are more complicated]" (Focus Group Participant 1–FGP1). "*Since we just take it for fun, we're not like professional photographers; for us, all we need is basically pictures*" (FGP2). Boys, on the other hand, appeared to be more interested in showing off and discussing what they knew about the various features of the ICT that they frequently used, such as their computers, iPods®, and game systems.

Secondly, gender differences existed in how participants described ICT and used technical terminology. Our data showed that girls tended to talk about technology from an end-user's point of view, focusing on how they actually used the ICT, while boys discussed ICT in the tone of software or hardware engineers, focusing on what ICT could do and the ICT specifics. In his description of the ICT that he used, VP2 specifically noted that "*Computers nowadays have… from 256MB to up to 4 GB of RAM, and that makes computers really fast*." VP1 also detailed in his tapes the different game systems that he had, taking time to compare and explain the differences of the controllers, size and capacity of the memory cards, and the size and features of the game consoles themselves. Utilizing ICT in different roles – as end-users versus engineers – seemed to affect boys' and girls' use of IT terminology as well. Boys made efforts to indicate they knew the correct IT terminology, such as pointing out "*RAM, which is random access memory*" (VP2), while girls were less specific, such as referring the cable modem as "*the computer thing from Comcast [a US Internet service provider]*" (VP4).

Thirdly, boys demonstrated much more ICT assemblage experience than girls. In his recordings, VP2 spent a long time documenting in detail how he connected a desktop monitor to a laptop and how he took apart an old computer. Other male VPs also illustrated in detail how to connect the different parts of the technology to make them work, such as connecting the controllers to the game cube and then the game cube to the TV. One boy in the focus group also mentioned that "*I usually*

build my own computer every 2 years" (FGP3). In contrast, girls mostly did not talk about any ICT modification or assemblage. VP4 was the only girl who mentioned building something on her own - a disco ball like lamp shade made of blank CDs. When she showed this item in her tape, she was actually showing it more as an art piece than as technology. In general, female VPs simply listed the different kinds of technology in their lives without going into detail. Girls in the focus groups were the same, focusing on describing the ICT's main functionality that they utilized. None of these girls discussed any ICT specifics, theories of how each technology worked, or had ICT assemblage experience.

Fourthly, even though both boys and girls thought various aspects of physical appearance, such as color, could be a factor for choosing the right ICT, such as an iPod®, a radio, or a cell phone, they seemed to have different perceptions of this criterion. When VP2's friend described one of his game controllers that lit up, he mentioned that because it lit up, he could "*see all the circuits*," and that he could also tell "*it turns on when it lights up*" and that "*it is off because the control stops lighting up*." He seemed to treat the controllers being "lit up" more for the functional purpose than for aesthetics. Girls, on the contrary, liked a lot of different kinds of technology, because they were "*pretty*," such as the "*cute*" and "*pretty*" digital voice recorder (FGP4), a "*pretty*" green stereo (FGP5), "*fun*" and "*pretty*" cars (FGP6), and a "*pretty*" lamp with different colors (VP4).

Conclusions

Our study indicated that the meaning and goal of technology interactions were different for boys and girls. For the boys mastery of ICT was primary. The ability to understand, talk about, and control complex technology brought enjoyment and social status. For the girls, literacy was important. Technology was not an end in and of itself, but only a means to support the activities that mattered in their lives. Both gender groups were heavy users of ICT, but for different reasons; thus requiring different design approaches. Counter-intuitively, girls were generally viewed by their peers as better at technology than boys (we surmise because of their routine use of task-specific technologies) – the girls "*don't waste their time trying to figure out – 'oh, how does this work, how does that work, how does this get through there.' They just go, 'oh, that's there, that's there - that's fine'* " (FGP7).

Boys and girls also attributed different meanings and roles to ICT in their lives demonstrated by their different approaches to and interaction with technology. Boys in our study strove to achieve control over the technology by understanding the construction and functioning. Technology was an object to understand and master. Girls, on the other hand, made ICT work for their purposes without understanding analytic details of the technology. Technology for girls was an intermediary to achieve their goals. These findings expand on earlier descriptions of gender differences in ICT use by considering a wider range of technologies and using naturalistic methods. In addition to differences in use, we also examined attitudes and perceptions of technology.

These gender differences identified in attitudes and interaction styles should be considered when designing technology and developing technology training programs for middle school students. The different attitudes show that variations will appear not only in the class of technology favored by the different

genders, but also in the characteristics of the device or interaction method. The training programs can also reflect these differences in the types of activities they employ.

Despite the fact that boys were more involved with technology, our study showed that girls' IT ability was perceived stronger by middle-schoolers. This contrast and the differences in ICT perceptions and use raise interesting questions about how interactions and experience with technology influence perceived and actual ability, self efficacy, and career decisions. We are continuing our investigations to address these questions. We hope that ultimately our findings will help educators develop more appropriate programs to encourage increased and better gender-balanced participation in ICT-related classes, courses, and fields.

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