

## **GIRLS AND GAMES LITERATURE REVIEW**

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Considerable research has been conducted on gender differences and games. This chapter intersperses a literature review of this domain with expectations of how girls and boys in the research experiment will compare in their reactions when they are required to play six different space-related games in same-sex, same grade, small group settings of fifth and eighth graders. Throughout this chapter, "game" is used to refer to digital forms of games, including ones played on computers and consoles such as PlayStation, unless otherwise noted.

### **1.1 GENDER GAPS IN NATURAL SCIENCES**

The computer culture gender gap mirrors adolescent female and male attitudes toward science and math. The National Center for Educational Statistics documents achievement gaps related more to attitudes than to course taking (Bae, Choy, Geddes, Sable, & Snyder, 2000). Female high school graduates have taken as many or more upper level classes in math, biology, and chemistry. However, 8th and 12th grade females were less likely than males to like math and science, and less likely to think they were good in math and science. Elementary school girls and boys have comparable perceptions of their own abilities. By ninth grade and throughout high school, girls gradually lower their perceptions of their own abilities compared to boys (Phillips & Zimmerman, 1990). Girls at age 8 and 9 report feeling confident, assertive, and authoritative about themselves and their abilities. But they emerged from adolescence with poor self image, constrained views of their future and their place in society, and much less confidence in themselves and their abilities. (American Association of University Women, 1991). Since the early 1970s, women have made dramatic gains in postsecondary education in terms of enrollment and attainment, and are successful relative to men in aspirations, enrollment, and bachelor's degree completion. Gender differences in college majors persist, however, with women still concentrated in fields like education and men more likely than women to earn degrees in engineering, physics, and computer science (Bae, et al., 2000).

The fundamental goal of science education is to communicate scientific information and to encourage a deep comprehension of scientific concepts, reasoning and problem-solving

skills (Kim et al., 2000). In an effort to reach this goal, many science education reforms have occurred over the past decades—all in the name of preparing the next generation by making science learning more applicable and pertinent (Yager, 2000). However, many of the customary science learning activities, such as lectures and labs, do not adequately and effectively promote the learning of science; students are either required to passively accept textbook- or teacher- provided knowledge, or must attempt to reconcile discrepancies between their flawed experimental results and the expected outcomes based on established scientific ideas (Nott & Smith, as cited in Kim et al., 2000).

Many authors have recommended that new technologies, specifically computer simulations of natural science phenomena, the Web as a “virtual classroom,” and the inclusion of multimedia among others, melded with proven pedagogies such as experiential learning, constructivism, collaboration among students, and teachers’ role as facilitator of learning instead of provider of knowledge, might provide a feasible alternative to previous ways of learning science (Kim et al., 2000; Moor & Zazkis, 2000). Due in great part to the generous support of the National Science Foundation, this essential transformation in science education is presently underway. One way NSF is supporting this transformation is by seeking \$200 million to initiate a new partnership project—the President’s Math and Science Partnership—which is part of the President’s initiative No Child Left Behind (<http://www.ehr.nsf.gov/mathandsciencepi.asp>). The reality behind the initiative is complex: too many children are not receiving the math and science education they need to succeed in an increasingly technological society; too many girls, students with disabilities, and minority students are underserved and underrepresented in science classes and fields (Directorate for Education and Human Resources, 1999; Monhardt, 2000; Swiatek, 2000); teachers are inadequately prepared to teach math and science; and not enough U.S. schools offer demanding and challenging science courses (<http://www.ehr.nsf.gov/mathandsciencepi.asp>; Kumar & Libidinsky, 2000). The consequence is that not enough students are pursuing science study that will equip them for future opportunities and contributions in science areas.

New technologies hold great promise for enhancing science and math education. Teachers reason that if designers can make computer games so entertaining as to be termed “addictive,” why can’t some of that talent be used to design equally compelling educational materials (AAUW, 2000)? A proposed remedy to achieve gender equity in the computer culture is to get more girls and women involved in the creation of hardware and software and thus themselves participate in the evolution of computer culture. To wait only compounds the problem; it is far better to involve females in the creation of this culture now than to try to reshape it later.

## 1.2 GENDER GAPS IN COMPUTING AND PLAY

Technology holds great promise for advancing science education. However, there exists a troubling computer game culture gender gap. In contemporary culture, the computer is no longer an isolated machine: It is a centerpiece of science, the arts, media, industry, commerce, and civic life (AAUW, 2000). As AAUW Commission on Technology, Gender, and Teacher Education co-chair Sherry Turkle writes, the computer culture has become linked to a characteristically masculine worldview, such that women too often feel they need to choose between the cultural associations of “femininity” and those of “computers” (AAUW, 2000, p. 7). Most computer games often have subject matter of interest to boys, or feature styles of interaction known to be comfortable for boys (AAUW, 2000). Statistics on girls’ participation in the culture of computing are of increasing concern, from the point of view of education, economics, and culture. We need a more inclusive computer culture that embraces multiple interests and backgrounds and that reflects the current ubiquity of technology in all aspects of life. As the AAUW report describes, girls assert a “we can, but I don’t want to” attitude about participating in computer activities.

Almost all the sex differences documented in electronic game studies conform to social gender roles. People are under social pressure to act in accordance with their gender roles, and their play activities are also governed by such pressure. Studies suggest gender-stereotyped toy preference is established as early as 18 months of age (Serbin, Poulin-Dubois, Colbourne, Sen, & Eichstedt, 2001). Males play with machines that stimulate motor activity while females play with dolls that induce nurturance (Eisenberg, Murray, & Hite, 1982). As they grow older, boys are more likely to be sent to computer classes and have new computers. Girls are more likely to receive productivity-oriented software (i.e. “Learn to Type”) and “hand-me-down” computers (Ray, 2003, p. 3), reinforcing that mastering computers is not important to a girl’s life. Gradually, girls learn to see computers as tools that facilitate work, instead of a source of entertainment (Ray, 2003; Turkle, 1988). As a result, using computers to have fun is less natural for females than for males.

### **1.3 GAMING IS MASCULINE**

There is fundamental gender-inequity in computer gaming today. Playing computer games is still considered a masculine activity and it has been well established that game play is more popular among males than females (Bryce & Rutter, 2003; Colwell, Grady, & Rhaki, 1995; Funk & Buchman, 1996a, 1996b; Griffiths & Hunt, 1995; International Hobo, 2004; Roberts, Foehr, Rideout, & Brodie, 1999). Not only have academics found this to be true, representatives from the industry generally share the same view. Laurel (2001) comments that computer gaming is a culture dominated by young males. Falstein (1997) points out that the industry is male dominated, from production to distribution channels. Ray adds that the software publishing industry has not encouraged women to see computers as an

entertainment medium (2003).

### **How many females play games?**

In today's market, if a game has a female player population of 15% or more (as in the case of *EverQuest*), it is classified as being "girl-friendly" (Falstein, 1997; Taylor, 2003a; Yee, 2001). However, some research contradicts evidence that males play more than females. ISDA industry research has reported a female gamer population of nearly 50% (Interactive Digital Software Association [IDSA], 2001, 2002). Another source documented 60% of college females playing computer games compared to 40% of males (Jones, 2003). However, this study categorized operating systems' built-in games such as *Solitaire* as computer games. Indeed, solitaire on a computer is a computer game, but it exists outside of the realm of the game market. If a female had ever played Solitaire, although far from the current notions of a "gamer", she would be part of the 60% female gaming population in the study. This exemplifies the importance of clarification of key terms in game studies. The original surveys by the IDSA and their methodology have never become fully available to the public. Therefore, the precision of their data cannot be determined. Very similar issues have also been noted by veteran game designer Chris Crawford (n.d.), questioning another set of results regarding player demographics published by the Entertainment Software Association (2003).

### **Females do not play games as much as males**

Numerous studies related to games have found that males not only comprise the majority of the gaming population, they spend more time playing than females (Colwell & Payne, 2000; Funk & Buchman, 1996b; Ivory & Wilkerson, 2002; Phillips, Rolls, Rouse, & Griffiths, 1995; Roberts et al., 1999; Woodard & Gridina, 2000). In a survey of 900 fourth to eighth graders, boys reported significantly more time playing games than girls, at home and in the arcade (Funk & Buchman, 1996a). Several extensive U.S. national surveys sampling children across age groups, consistently found that boys spend more time on video games than girls (The Henry J. Kaiser Family Foundation, 2002; Rideout, Vandewater, & Wartella, 2003; Roberts, et al., 1999). Quite a lot more boys consider gaming as their favorite activity while girls did not give it as much importance (Funk & Buckman, 1996b; Thomas & Walkerdine, 2000). Likewise, many girls in another study preferred other activities over playing games, although they did express an interest in gaming (Inkpen, et al., 1994).

## **1.4 GENDER STEREOTYPES REFLECTED IN GAMING**

Researchers focusing on game content have indicated that most titles on the market are designed by males to please males (Chaika, & Groppe, 1996; Gorriz & Medina, 2000; Klawe Inkpen, Phillips, Uptis, & Rubin, 2002; Miller,). In one experimental study where educators with programming experience were instructed to design software to teach 7th-grade girls, 7th-grade boys, and 7th-grade students in general, the software designed for girls resembled "learning

tools” whereas those for boys and for general students were highly similar – they were game-oriented, emphasizing eye-hand coordination and competition (Huff & Cooper, 1987). The result reveals perhaps unconscious programmer assumptions that the software meant for students as a whole was designed only with boys in mind, and that boys play games but girls use learning software.

Some academics suggest that it is not “socially rewarding for females” to identify themselves as gamers because gaming is considered a male dominated area (Griffiths, 1997, p. 235). Funk and Buchman (1996b) found that it is more socially acceptable for boys to play a lot of games than for girls. Other researchers proposed that females tend to have psychological barriers when gaming in public, while private domains provide more comfort for such activities. (Bryce & Rutter, 2003).

### **When boys play games, girls step aside**

However, even within domestic gaming settings, girl gamers often take on the role of watcher while male family members act as the expert, even when the females own the gaming equipment (Schott & Horrell, 2000). In a study focusing on both children and adult females gaming in home environments, researchers concluded that girls’ gaming rights existed under conditions of “social dynamics and gender hierarchies”(Schott & Horrell, p.42).

It is difficult to determine whether it is the girls’ “stepping aside” from their opportunity (Schott & Horrell, 2000, p.42) or it is the boys “crowding out” (Ray, 2003, p. 4) the girls. Nonetheless, this aggressive-passive chemistry seems to exist between males and females pervasively when it comes to using gaming machines. Inkpen, et al. (1994) made available ethnographic data collected from an exhibit where gaming consoles and computers were available to all visitors. According to the observation,

When a particular station was filled with a group of boys, the girls were very hesitant to approach. If they did approach, they would usually watch for a few minutes and then walk away. (1994, Presence of Others section, para. 1)

Researchers also noted that:

Many girls would enter the exhibit, look around, and then leave. Some would stay if they saw a free machine or if a group of girls were playing a game. Few girls would approach if a large crowd of children were clustered around a particular game. (1994, Girls' Interest in Electronic Games Section, para. 5).

Additionally, the researchers indicated that girls often “waited to be offered a turn” (1994, Ways of Playing and Watching Electronic Games Section, para. 2), while boys usually approached the current player to request turns.

Is it a “large group” of people or a “large group of boys” that makes girls hesitate to approach the games? Is it gaming in public that makes them uncomfortable? Or is it that they feel uneasy to encroach into boys’ territory? Are they too shy to ask for a turn? Do the findings reveal what a previous study described as “a sense of female inferiority in relation to gaming

competence" (Schott & Horrell, 2000, p.42)? Does that attitude apply to the general use of computers, or even technology in general?

### **Are girls less confident with games/computers/technologies?**

Laurel's research may offer an answer. She suggests that playing computer games makes boys more confident with technology (Laurel, 2003, 2001) and that girls tend to blame themselves when they encounter computer difficulties. Research indicated that the performance of females who lack experience and confidence with computers is dramatically influenced by the instructors' expectations [CH1] about how well they will perform (Robinson-Stavely & Cooper, 1990). Those with more computer experience are generally unaffected by external expectations about their performance. Inkpen et al. noticed that girls often started with games they already knew when they first entered the exhibit. What is more, when trying out a new game, girls often commented to themselves "Oh, I am terrible at this" even before playing (1994., Confidence and Challenge section, para. 2).

### **Gender-neutral games for both genders**

Some psychologists argue that the context of games can dramatically influence how girls perform on them. Researchers have been urging the development of gender-neutral entertainment software for both boys and girls to play. In an experimental study where children played the same piece of software, when it was introduced as a test there was no difference in boys' and girls' performances. However, when it was introduced as a game, girls performed significantly worse than when they were told it was a test, whereas boys were very little affected by the context (Littleton et al., 1999). In another experimental study, boys and girls played two versions of a game that were fundamentally identical, with the exception that one version was gender-neutral, the other masculine-associated. The [CH2] results indicated girls performed better in the gender-neutral version whereas boys again were very little affected by the context. (Littleton, Light, Joiner, Messer, & Barnes, 1998). Similar findings were reported by Culp and Honey (2002).

## **1.5 MASCULINE AND FEMININE GAMEPLAY STYLES**

Perhaps there are basic gender differences in handling tasks. In a study observing children playing video games, when girls' characters were chased by a creature, the girls tended to react dramatically, giggling, swinging their bodies, and even screaming, while boys were more likely to stay quiet and focused on the tasks (Thomas & Walkerdine, 2000).

### **Risk-taking**

Turkle (1988) has pointed out that males adapt a trial-and-error approach when using computers and playing games, which is a good computer learning strategy. They are willing to take the risk of failing before they can succeed. However, many females find it difficult not to take failure personally, and prefer games that they can understand the rules of before starting

to play. Needing to know how to play before they start becomes a hurdle to learning games. The researcher infers risk-taking is a masculine trait.

### **Beating the game**

It seems important for boys to be able to beat the games. Klawe et al (2002) found that when girls were first exposed to the game in their study, they spent more time on the story plot while boys rushed to complete the game. Documented in various studies, boys were quick at figuring out strategies to score and exchanged notes with each other (Klawe et al., 2002; Subrahmanyam & Greenfield, 1998). On the other hand, girls took their time exploring without hurrying to finish the game, and appeared lukewarm about hidden clues and secret tips, let alone further conversation about game magazines or trading games (Gorriz & Medina, 2000; Inkpen, et al., 1994; Klawe et al., 2002; Miller et al., 1996). Laurel argues that mastering a game is a “social plus” for boys, while for girls it is a “social taboo” (2003). Supporting findings indicate that boys place emphasis on mastering the game to prove their skills, while girls play to enjoy the emotional experience and social occasion. Thus boys’ play styles may fit what Taylor (2003b, p.301) described as “Power Gamer”, while girls’ play style may qualify them as “Casual gamers” or “Role Players”.

### **Non-linear game flow**

Girls value “free play” (Laurel, 2003), non-closure game flow (Miller et al., 1996), and like to explore the game world. One may argue that boys do as well, but it appears that girls have less tolerance toward linear game flow. In Kafai’s study (1998), the games that boys designed were mostly goal-oriented, whereas games girls designed were more “activity-based” (Ray, 2003, p.8). Games boys designed tended to punish the players who gave wrong answers with “game over”, forcing the game to end completely so the players had to start over from the beginning. Girls seemed more flexible about their consequences, allowing the game to continue.

Gorriz and Medina (2000) supported the above finding, stating that girls do not appreciate starting games over each time the character “dies”, which is a main characteristics of the games on the market that are mostly played by boys. One may argue that males do not like starting over either, however the degree of disliking does not seem to be strong enough to stop them from playing.

### **Genre preferences**

Across age groups, males generally like Shooters, Fighters, Sports, Racing/Speed games Fantasy/Role Playing, Action-Adventure, Strategy, and Simulations more than females like those genres. Females favor traditional games such as Classic Board Games, Arcade, Card/Dice, Quiz/Trivia, Puzzle, and Kids games (Roberts et al., 1999; Sherry, Lucas, Rechtsteiner, Brooks, & Wilson, 2001). However, Sherry et al.’s survey study reveals that Racing games are embraced by both genders, which is an anomaly among the literature. The researchers attribute the interest in Racing games to the experience of learning to drive during

high school.[\[CH3\]](#)

Girls perform better on verbal tasks (Berk 2003) and pattern-matching, which may explain why quiz-trivia or puzzle games such as Tetris are favored by females (Laurel, 2003; Sherry, Holmstrom, Binns, Greenberg, & Lachlan, n.d.) Developmentally, Miller et al. suggest that older girls tend to prefer educational games while younger girls seek more entertainment-oriented content (1996).

### **Exercising reflexes**

In terms of game genre preference, it has been found that girls prefer solving puzzles more than exercising their eye-hand reflexes (Gorriz & Medina, 2000), which is boys' favorite. Kafai's research indicated adolescent girls prefer games that do not require quick-paced interactions (1996). Likewise, college males reportedly favor games that require fast reactions (Sherry et al., 2001) while females prefer games they can play quietly such as puzzle solving and trivia games.

### **Action content**

Across age groups, it is believed that boys are more likely than girls to play action content games, while girls prefer puzzle, quiz-trivia or classic board games (Roberts, et al., 1999; Sherry et al., n.d.). With regards to females who play action games, Buchman and Funk (1996) found that girls play less fighting games as they grow older, as gender roles become more firmly entrenched Funk & Buchman, 1996b). According to one survey, not only did three fourths of children agree that in general boys prefer fighting games, but the sampled boys tended to consider violent games inappropriate for girls to play (Funk & Buchman, 1996b). Some researchers suggest content such as fighting, competition, or sports is a turn-off to girls (Bryce & Rutter, 2003; Greenfield, 1994; Kafai, 1996; Provenzo, 1991). Among girls who like violent content, Buchman and Funk indicated that they usually prefer fantasy or cartoon violence while boys prefer realistic, human violence (1996, p.31). In general, girls do not especially enjoy "shooting bad guys and monsters" (Klawe, et al., 2002, p.211). In Kafai's study involving children designing games, boy designers tended to provide violent feedback to the players when they gave incorrect answers, whereas girls provided non-violent feedback (Kafai, 1998).

### **Role playing games: social interaction, story, characters, adventures**

Researchers have found that the elements girls enjoy in games include role playing (Brunner, Bennet & Honey, 1998), social interaction (Gorriz & Medina, 2000; Klawe et al., 2002; Thomas & Walkerdine, 2000), narrative (Gorriz & Medina, 2000; Laurel, 2001), and adventure (Falstein, 1997; Gorriz & Medina, 2000). Girls like to construct narratives and hence, need complex characters to develop narration (Laurel, 1998). Littleton et al. (1998) reported that girls in their study identified with the characters in the gender-neutral version of game. Role Playing Games with a single player is a genre with an extensive female audience, with a complex story line and adventures. Some predict that Massive Multi-Player Online Role Play

Games may encourage female gaming in domestic settings because they provide social interaction and anonymity, perhaps reducing gender stereotyping from other players (Bryce and Rutter, 2003).

### **Creation and destruction, or themes?**

Gorriz and Medina suggest girls prefer creating content than destroying (2000). Examples of this play style include *The Sims* and *Tycoon* series of games. However, this concept may not be universal. The themes of the games also have an important effect on their popularity among genders. For example, the goals of *Sim City* and *The Sims* are identical: to build the given subjects into prosperity. Fast reflex reactions are not needed, nor do they involve combat or competition with other players. Both games are all about creating, not destroying. Yet *Sim City* was not as successful as *The Sims* in attracting female players. A likely reason is that the themes of the games that matter: in *Sim City* the player is a mayor building and running a city, while in the home-oriented *The Sims* one maintains a home and the characters' relationships with each other.

### **Platform**

Girls prefer playing games on the computer than on video game consoles (Gorriz & Medina, 2000; Klawe, et al., 2002; Thomas & Walkerdine, 2000). Video games have larger male gamer populations (60%) than female (21%), while the gender difference for computer games is much smaller (29% to 24%) (Roberts et al., 1999). The reason for this is undetermined. It may result from the basic difference in the input devices between that of consoles and of computers. Many console games, especially the fighting genre, require reflexes and hand-eye coordination. It may also be that the themes of the console games do not appeal to females. Many popular console games belong to the genres of sports, action, and strategy/RPG, while computer games' bestsellers are strategy, child, and family (IDSA, 2002).

## **1.6 BIOLOGICAL SEX DIFFERENCES IN SPATIAL SKILLS**

Biological sex differences in spatial skills may help explain the different preferences for game genres between the genders. Psychologists believe that females are disadvantaged in certain spatial skills such as mental rotation and spatial perception, and this sex difference exists by age four, emerges by mid-childhood, and lasts throughout one's lifespan (Berk, 2003; Kerns & Berenbaum, 1991; Levine, Huttenlocher, Taylor, & Hangrock, 1999; Provenzo 1991). Research has indicated that playing action video games improves spatial skills (Okagaki & Frensch, 1996; Subrahmanyam & Greenfield, 1996), which is likely to be a key component of sex differences in mathematical reasoning (Berk, 2003). Playing action video games also improves one's visual attention (Green & Bavelier, 2003) and other visual intelligence skills, which may be "training wheels" for computer literacy (Subrahmanyam, Kraut, Greenfield, &

Gross, 2000). Laurel (2003) argues under time pressure, boys perform better on mental rotation. When time pressure is removed, girls' performances equal to boys'.

### **1.7 GAMING FOR COMPUTER LITERACY?**

Psychologists point out that both genders can improve spatial skills by practicing video games. Many imply that girls are disadvantaged in the long run by playing far less games (Cassell & Jenkins, 1998; Ray, 2003). Regardless of the element of violence, games have been envisioned as potentially effective tools for learning. Furthermore, researchers believe that gaming opens a door to computer literacy leading to potential technology careers (Cassell & Jenkins, 1998; Ray, 2003; Subrahmanyam et al., 2000).