Video games help to prepare girls for a competitive future in STEM

An analysis of how video games help to build visual-spatial skills and the positive influence early childhood gaming can have on girls

A thesis submitted to the School of Visual Communication Design, College of Communication and Information of Kent State University in partial fulfillment of the requirements for the degree of Master of Fine Arts

by

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Preface

I grew up as the youngest of three daughters to a mechanical engineer. I can remember taking a keen interest in all of his drafting tools at a very young age, quite possibly before entering kindergarten. Mechanical thinking, problem solving and tinkering were a natural part of life for me growing up, and for this, I am forever grateful for the opportunity I was given to develop into a free thinker.

While in elementary school, I wasn’t the most studious of students and received poor grades often. However, I believe how I spent my free time set me up for where I am today, both as a designer and researcher. I can clearly remember sitting in class and instead of doing my schoolwork, I would be illustrating and creating animated flipbooks. My favorite drawings always included baseball players—even though I hadn’t played a game of baseball in my life. If I wasn’t creating flipbooks, I was writing and illustrating my own “Choose Your Own Adventure” books—what a great concept those books were. Especially for indecisive kids such as myself.

By the early 1990s, during middle school, there was a computer programming class where we learned how to code—I thought it was the greatest thing. I became obsessed with the customization and the endless possibilities it offered, and the fun that it created! One of my most vivid memories was coding a stick figure to pull a bow and arrow—which actually worked! I was astounded! Not to mention that by coding in just a few characters, I could change the color of the figure, the bow or the bullseye. It was at that moment that I became comfortable with technology and the idea that I could CREATE technology. I don’t remember feeling gender-conscious per se...
about whether my abilities would match up to my male classmates, perhaps it was because I felt confident in my understanding of digital media.

Now the mother of three, two daughters and one son, this concept of an inclusive environment for girls in STEM has become something of a passion of mine and I feel a close connection to promoting the success and confidence of visual-spatial learners and girls in academics. Something I discovered during my research was the notion that somehow society still isn’t ready for women in leadership or technical fields. It’s hard to discern whether it’s due to their lack of exposure to digital media that discourages them from continuing STEM in higher education, or whether it is society preventing them from advancing due to apprehension with regard to their capabilities. Any way you look at it, there is work to be done.
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I must also express my profound gratitude to my parents Carol and Nicholas Theiss and to my husband, Paul Hughes, for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this thesis. This accomplishment would not have been possible without them.

Finally, I would like to express my most sincere gratitude for the support, patience, and encouragement I have received both during the work on this thesis as well as during my experience in graduate school. This thesis, as well as my personal and professional growth, is a result of the cumulative efforts of the following people: Jessica Barness, David Szalay, Andrew Fogle, Shelby Muter, Andrew Pavlick, Rachel Mathew, Amy Kozlowski & Mary Flenner.

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Chapter I

Introduction

Video games have long been blamed for indifferent behavior and hyperactivity in children. Though, regardless of playing video games, sociologists have found these same behaviors in children who are raised in highly restrictive and physically confined environments. More and more, children are being raised in urban or semi-urban neighborhoods and living in apartment complexes. As a result children are choosing to play video games rather than play outside, because in many cases, no other choice is available to them (Salen and Zimmerman, 2006).

Kids play digital games so often now that parents are viewing it as an obsession as opposed to a learning opportunity. Sometimes video games are blamed for problems that they do not cause—perhaps because these technologies which were not part of our childhoods and we are unsure of how to cope with their complications (Salen and Zimmerman, 2006). Through all these misconceptions, data is proving the benefits that gaming has on our youth.

After age three, there is solid evidence that educational tablet and smartphone games help children with numeracy and literacy. “In 2012, the Department of Education studied the use of the iPhone app, Martha Speaks Dog Party in schools. Children aged three to seven who used it every day for two weeks had widened their vocabulary by as much as 31 percent” (Stuart, 2014). Numerous computer and tablet games are now regularly used in school systems. Sites like SumDog, BugClub and Mathletics have been integrated into learning programs, allowing teachers to monitor the reading and math skills of their students. The game rewards students with points for successful tasks, an incentive development (Stuart, 2014).
For older children, there are plenty of games with creative and educational value. The most obvious example is the building simulator Minecraft, which can teach players everything from architecture and physics to electronics and geology. A company named TeacherGaming has now developed a special version named MinecraftEdu for use in classrooms, allowing teachers to set up and guide projects (Stuart, 2014).

While some educators and parents believe that online gaming is a distraction from their classwork, it has long been disputed by some that by incorporating different learning perspectives of play, children would learn and retain more in the classroom. Perhaps by including interactive gaming, children—specifically girls—could gain academic confidence as well as attain the information technical fluency needed to pursue higher degrees in STEM professions. Interactive games have the potential to do this—to inspire girls and give them the confidence they need to evolve their visual-spatial skills in early childhood development, skills they need to compete for future jobs, in a society where gender-related gaps in education still persist.

Chapter II

What is Play?

Game Schemas

So, what is play? Is there a difference between “play” and “game”— or are they the same thing? (Zimmerman, Salen, 2003 pg. 72) Some researchers see them as the same. Playing badminton, for example, is playing a game: players obey a set of rules and compete to win. The activities of playing on swings or a jungle gym, however, are free forms of play. Most forms of
play are loose and less organized than games and do not necessarily have rules. However, some forms of play are formalized, with rules, behaviors and objectives and these forms of play can often be considered games. In this sense, it is clear that “game” is a subdivision of “play” (Zimmerman, Salen, 2003 pg. 72). David Parlett, a game historian, helped to distinguish between formal and informal games by saying “An informal game is merely undirected play, or ‘playing around,’ as when children or puppies play rough and tumble.” It is important to note that play would be classified as an act of exploration and this can be seen as traditional play found on any playground. Girls playing hopscotch, boys playing kick ball, tag, or my ever favorite, Red Rover. All display characteristics of exploration with minimal rules that act as a framework to guide learning and discovery (Zimmerman, Salen, 2003 pg. 73).

Rules, play and culture are three primary schemas that will be explored in this chapter. Rules are a formal primary schema, and focus on the mathematical structure of games. Play is seen as an experiential primary schema that emphasizes a player’s interaction other players. Whereas culture is a contextual primary schema, and highlights the cultural contexts in which any game might be embedded (Zimmerman, Salen, 2003). Most importantly here, is play and how it pertains to one’s learning outcomes and goals. Rules are a very important component in games, as they provide structure with which to learn.

Board games like Chutes and Ladders or Mastermind all have a set of rules. Playing catch or playing doctor are activities that fall outside of the traditional definition of games because they do not have rules. “Although not all play fits the category of games, those things we define as games fit within a larger category of play activities” (Zimmerman, Salen, 2003 pg. 72).
**Play and Gender**

Growing up in an Amish community, I had unlimited access to fields, wooded areas, dirt, and endless roads to ride my bike on. My friends and I were lucky enough to leave home and go on daily adventures that would last from sun-up to sun-down—exploring ponds, cornfields and investigating the landscape of our neighborhood. Across the centuries, other children who were lucky much like myself, living in rural areas had miles of unchartered space to explore. Boys as young as 9 could go camping alone for days on end, only to return when they were needed to assist the family with household chores. Earlier in the 20th century was the development of urban playgrounds in the midst of city neighborhoods, which signaled a response to children’s diminishing access to space. In urban American today, children are living in smaller spaces and could potentially only have access to the several rooms inside their apartments. Video games allow these children to expand the hypothetical space of their imaginations (Salen and Zimmerman, 2006 p.334). Now, as a mother of three, my personal experience has been to always allow my children to play outside with other groups of children, but it’s never without the added worry of whether they are safe. Today’s children play outside but not without geographic restrictions, and perhaps not enough time to explore and conquer the outdoors like past generations.

These limitations have led to questions about whether or not children are getting proper play opportunities. The practice of observing a child’s play to determine his or her cognitive functioning level has received widespread attention by researchers and practitioners. Play assessment is an observational, functional assessment technique that can be used to focus on a particular domain in the context of a child’s play. There are three main advantages to using play
assessment. First, it allows a practitioner to view the child’s cognitive development through play in a natural environment. Second, play assessment is designed to produce the optimum level of performance. Finally, it provides a flexible format to monitor the child’s progress. As such, play is said to be an appropriate benchmark of a child’s current and ever changing cognitive functioning over time (Cherney, 2003 p.96).

Research has shown that boys and girls from as young as 18 months and throughout childhood exhibit differential behaviors when playing with certain toys. Surprisingly, by the age of 18 months boys and girls are already picking gender related and stereotyped toys. Several research studies have highlighted gender differences with regard to preference to play (Blumberg, Sokol, 2004). Gender differences found in the play of young children include differences in exploratory behavior, types of pretend play exhibited, and the complexity of play. There is also compelling evidence that the gender associated with toys, objects and/or characters can have significant impact on future toy preferences and exploration. Children’s play with toys and their toy choices have also been concluded to have long-term consequences for later social and cognitive development. For example, play with feminine toys seems to elicit nurturing and role-play, (Figure 1) whereas play with masculine type toys foster higher mobility, activity and manipulative play (Cherney, 2003 p.96-97).

Parents make choices all the time on what type of toys they prefer their children to play with, as the toys that are chosen help to form the environment with which their children’s cognitive development begins. Parents put a lot of thought on the purchases they make, typically taking gender into consideration and whether certain types of toys would be appropriate for their child. Toys judged to be more appropriate for boys differ from those judged appropriate
for girls: toys viewed as more appropriate for girls are seen as attractive, creative, nurturing, and manipulable. Masculine toys were identified as more competitive, aggressive, constructive, conducive to handling, encouraging sociability and reality based learning (Cherney, 2003 p.97). (Figure 2) Though, more gender-neutral mechanical toys, like LEGO, blocks and activity cubes may provide children with the motivation and confidence to play and perhaps help them to overcome possible initial apprehensions (Cherney, 2003 p.97).


Whereas toys rated as most likely to be educational and to develop children’s physical, cognitive, artistic, and other skills were typically categorized as neutral or moderately masculine. It’s been concluded that strongly gender-typed toys appear to be less supportive of optimal development than neutral or moderately gender-typed toys. Moderately masculine toys
have several positive qualities (spatial skills, science, building things, etc.) that parents might want to encourage in both their boys and girls” (Blakemore). Moderately masculine toys could be categorized as a microscope, a bike or Lincoln Logs, among others (Blakemore, Centers, 2005).

While moderately masculine toys are optimal for learning, girls are routinely offered gender-related toys. Historically, girl cultures formed under close maternal supervision and girls’ toys were designed to foster female-specific skills to prepare them for their future domestic responsibilities as wives and mothers (Salen and Zimmerman, 2006 p.336). (Figure 3) Though today, women’s responsibilities have changed drastically as more juggle motherhood, education and professions. This struggle is real for many women and their mounting expectations are not only linked to playing preferences as children, but compounded by the purchasing choices of their parents. Juggling parenthood and profession, there is the need to understand that obtaining and defending the concept of power is communicated through play—types of physical play that
have long been seen as male dominant. It’s these types of “rough and tumble” environments that have traditionally been difficult for females to compete on the same level as their male counterparts (Bertozzi, 2012). It is this male-dominant environment that women are still fighting to break through.

**Parental Influence And Potential Limitations**

Parents play a pivotal role in the development of their children through the activities they permit, provide and support, to the toys they purchase and the friends they allow their child to associate with. Gender identity becomes a crucial social aspect of a child’s life and their parents provide them with their first impressions with gender identity (Leaper, 2013).

In some parts of the world, parents with limited financial resources have strong preferences for bearing sons, and as a result, priority of resources from health care to education are allocated to sons over daughters. This stark difference of treatment is typically not seen...
in wealthier nations. In western culture, one consistent way that parents treat girls and boys differently is by encouraging gender-stereotyped activities. Purchasing toys is one way parents influence their child’s gender related behaviors by encouraging gender specific play preferences (Leaper, 2013).

One important aspect on studying influence of gender, is to specifically separate the influence of parents on children and the influences of children on their parents. For the past fifty years, the typical assumption based on decades of research was the notion that parents were influencing their children. However, recent studies have shown that children also influence the actions and purchasing and socialization habits of their parents. Children tend to start asking for preferred toys around the age of three [3], and it is unclear how much parents influence their children's play preferences at this phase. Parents are more likely to provide toy vehicles, action figures and sports paraphernalia to their sons; and more likely to give their daughters dolls, kitchen sets, and dress up toys (Leaper, 2013).

There are subtle ways in which parents reinforce gender stereotypes without aggressively encouraging them. Parents sometimes make blanket statements like “girls like dolls” or “boys like football”, also known as a descriptive stereotype, which describe general attributes about each gender (Leaper, 2013). (Figure 4) American parents tend to encourage athletic competition in their daughters (masculine-gender activity) but do not encourage doll-play with their sons (feminine-gender activity) Research shows that middle-class mothers who generally held gender-egalitarian views often used general statements with their preschool aged children. They tend to not challenge gender stereotypes. Some parents support gender-egalitarian views on domains such as occupations, yet remain traditional about other areas such as family roles.
Fathers tend to be more strict with their expectations of their sons as opposed to daughters (Leaper, 2013).

As more historical legislative measures are passed—such as gay marriage becoming legal in June of 2015—more gender-egalitarian thoughts and behaviors are expected to become a social normality. With this thought in mind, there is considerable research to show that parents are slowly becoming more tolerant of cross-gender-typed behaviors in their sons as seen in earlier decades. Western cultures are also slightly more flexible with in terms of what is considered acceptable play activities for their daughters (Leaper, 2013) as well, encouraging competitive sports starting at a young age.

To analyze not only parental purchasing habits, but also the playing preferences of children, I sought the permission of 14 parents to divulge the playing preferences of their children. The questionnaire asked how many children they had, their ages, their playing preferences based on gender, both separately and together. Additional information was

inadvertently obtained; such as console playing preference. A total of 14 parents responded to my anonymous online parent survey, with a total of twelve (12) mothers and two (2) fathers. A total of 48 children were evaluated based on their playing habits and preferences. Traditional playing habits were questioned, as well as what each gender enjoys playing with, both independently and/or together. (See Appendix A-B)

Chapter III

Visual-Spatial Skills

Nature vs. Nurture

Girls should play more video games, suggests a study by University of Toronto researchers, published in the journal of Psychological Science. Video games encourage visual-spatial skills—which is the ability to manipulate shapes and understand how the three-dimensional world works (Paul, 2013). Overall, girls and boys play with different kinds of games in early childhood that provide these different types of learning experiences. Most girls play with toys that emphasize relationships (i.e., playing house, playing with dolls) or creativity (i.e., drawing, painting.) (Figure 5) In contrast, boys typically play computer and video games or games that emphasize building (i.e., LEGO), both of which develop problem-solving, spatial-relationship and hands-on skills. There is considerable evidence that the gender differences are a result of nurture, rather than nature (Milgram, 2007). Regardless of modern progress, parents still tend to purchase gender specific toys, therefore limiting girls’ exposure to more mechanically inclined learning experiences. Exposure to a diverse selection of toys could have long-lasting benefits for females.
A study of gender differences in spatial relation skills of engineering students in the U.S. and Brazil found that there was a large discrepancy between the skills of female and male students. These studies attributed female student’s lesser skill sets to two statistically significant factors: 1) less experience playing with mechanical building toys and 2) having taken less drafting courses (Milgram, 2007). Offering girls more opportunities to practice visual-spatial skills in early childhood may begin to help close this gender gap—and produce more female scientists, engineers and mathematicians in the process, suggests a study by University of Toronto researchers, published in the journal Psychological Science. They found that playing an action video game could essentially eliminate the gender gap, while reducing the gender difference in the ability to mentally rotate objects, which is considered a higher-level spatial

**FIGURE 5. Seven Year Old Charlottes’ Strongly Worded Letter To LEGO.** Retrieved from https://thesocietypages.org/socimages/2014/01/
skill. Exposure to action video games, “could play a significant role as part of a larger strategy designed to interest women in science and engineering careers” (Milgram, 2007).

A female’s confidence level is a strong predictor of her success in the classroom. Having the opportunity to master the ability to mentally rotate objects within the mind, can provide her with invaluable confidence in the classroom—consequentially without it, she is much less likely to retain interest in the material if she feels incapable of mastering it (Paul, 2013). In order for girls to expand their horizons and get experience with hands on visual-spatial skill training, they must be exposed to digital gaming and the virtual challenges that they pose to learning in a virtual space. The educational sphere is seeing these challenges when teaching within the classroom and is beginning to acknowledge that each student learns differently.

Spatial abilities are essential to understanding and manipulating one’s environment (Spence, Feng 2010). In the late 1970s and early 1980s, games like Pong, Pac-Man, Donkey Kong, Space Invaders and most notably, Tetris became very popular—all of which required superior spatial skills to conquer. Following the publication of Maccoby and Jacklin in the mid 1970s, many psychologists began to question whether video games could provide instruction and training in spatial skills and whether they could indicate sex differences in spatial cognition. Their conclusions were that women did not perform as well as men on a few spatial tasks and questioned whether additional training could help eliminate this discrepancy. Due to the perceptual and cognitive skills needed to navigate them, playing action, driving, maze and puzzle games seems to have a positive impact on spatial skills. While maze and puzzle games often require the application of spatial skills, they rarely require the characteristic speed of driving and action games (Spence, Feng 2010).
A study conducted in 2004 by researchers Subrahmanyan and Greenfield, concluded that spatial performance was significantly higher among fifth-grade boys than fifth-grade girls with regards to video games and mental rotation abilities. According to Greenfield and colleagues, video games have the possibility of influencing information processing skills such as those relevant to spatial ability, which then have implications for more complex computer use (Blumberg, Sokol, 2004). This research is conclusive with others in regards to the benefits of spatial relationship training.

**Gender And Spatial Ability**

There has long been a societal assumption in western culture that men are stronger, smarter and even have bigger brains. Yet, research shows that in the area of social cognition, females of all ages are outperforming males on tests that require the recognition of emotion or relationships with other people. There are sex differences in regards to empathy, which surface in infancy and develop through childhood and adolescence. The empathy gap is larger in men and women than it is between boys and girls—these discrepancies could be attributed to ways in which boys and girls are raised and these traits are innately programmed as a method of nurture rather than nature. Sex differences that grow larger well into childhood are likely shaped by social and cultural influences. There is truth behind the theory that there are biological differences with male and female brains, however, the assumption that the differences are completely “nature” or “hardwired” are over simplified and inaccurate. Nurture plays a very large part in gender role perspectives, proving plasticity and malleability of the human brain, concluding that life experiences can change our brains (Eliot, 2009).

A study performed by researchers Peg Nopoulos, Jessica Wood and colleagues at the
University of Iowa in March of 2008 found that one subdivision of the brain, referred to as the straight gyrus (SG) of the ventral prefrontal cortex—an area involved in social cognition and interpersonal judgment—is proportionally larger in women, compared to men. The SG is a narrow strip of cerebral cortex that runs along the midline on the undersurface of the frontal lobe. In a study of 30 men and 30 women, Wood and colleagues found the SG to be approximately 10 percent larger in the group of women they studied, in relation to the group of men. Individuals who scored higher in interpersonal awareness also tended to have larger SGs. Wood and colleagues speculated on the evolutionary influence for this specific gender difference. Perchance, since women are traditionally the primary child-rearers, their brains have developed a larger SG, to prepare them to be more sensitive and compassionate caregivers (Eliot, 2009).

Wood and Nopoulos along with colleague Vesna Murko, conducted a second study in which they measured the same frontal lobe areas in children between the ages of 7 and 17. Their findings were surprising—the SG was actually larger in boys. The same test on interpersonal awareness revealed that skill in this area correlated with a smaller SG, not larger, like adults. The later maturation of males highlights an apparent reversal between childhood and adulthood. Consequently, while in adolescence, both sexes seem to experience a reduction of gray matter in the brain, this reduction could signal a reason for this reversal (Eliot, 2009).

Wood and colleagues also conducted another test, regardless of biological sex and based their findings merely on gender identity characteristics—based on interests, abilities and personality type. They found that in both adults and children, the measure of gender also correlated with SG size. Surprisingly, a larger SG indicated more feminine attributes in
adults, yet a small SG indicated the same traits in children. The SG appears to predict a person’s femininity better than one’s own biological sex. The work of Nopoulus, Wood et al. provided this new insight that brain structure correlates as well or better with psychological “gender” than it does with biological “sex” and is a critical aspect to keep in mind when analyzing male and female brains. Just because a difference is biological doesn’t make it “hard-wired”—as an individual’s gender traits and preferences for masculine and feminine clothes, careers, hobbies etc. are shaped more by nurture and experience rather than nature and their biological sex (Eliot, 2009).

**Cognitive Function**

Individual gender differences in cognitive ability show up in early childhood, inadvertently affecting confidence (Spence, Feng 2010). Children being raised in households that encourage multiple levels of play, where parents expose their kids to building and constructing toys, either in a traditional sense or via digital games, give their children an opportunity to develop and hone their visual-spatial skills at a very young age. This exposure gives children the necessary confidence boost to persevere in an academic environment.

Human cognition is reliant on spatial, verbal and analytic capabilities, with spatial cognition being the basis with which the other two were developed. Spatial cognition is thought to be the ability to hold an image of an object in mind, rotate, twist and manipulate it in space in order to match it up with other objects. There is suspicion that playing an action video game could modify spatial attentional processing and has brought upon new research on how to solve spatial problems (Spence, Feng 2010).

One early study by Michel Pépin and Michel Dorval (1986) examined how video game
training can affect spatial cognition development. They used the spatial relations test from a Canadian version of the Differential Aptitudes Test as their measure of spatial skill. This test relies on the ability to identify objects hidden in a distracting background. An example would be a favorite from my childhood, Hidden Pictures, published by Highlights Magazine. (Figure 6) The test items used by Dorval and Pepin placed substantial demands on spatial selective attention and spatial working memory. However, the authors did not discuss their measure of spatial ability in terms of the underlying sensory and perceptual processes—and there was no attempt

to investigate or characterize the mechanisms of spatial learning. Although experiments of this sort are still relevant and often useful, the focus has shifted since the pioneering experiments of Green and Bavelier (2003), whose research was the first to investigate how playing an action video game could alter fundamental attentional processes. Since then, experimental studies have concentrated on how video games can modify the fundamental sensory and perceptual processes that support spatial cognition (Spence, Feng 2010).

Video games work a wide spectrum of sensory, perceptual and cognitive functions—some games require highly developed skills in performing basic perceptual and cognitive tasks, where others depend upon superior cognitive skills. A study performed by Feng et al. (2007) determined its participants who played an action video game for a minimum of 10 hours acquired significant performance improvements in spatial tasks, where those who played a maze game for the same amount of time, showed no gains (Spence, Feng 2010). Though when players operate with first- or third-person avatars and have to manipulate its body, objects as well as multiple weaponry inside an extremely detailed game environment to survive—it’s a process that requires the ability to mentally map out the game world and the objects in it, in ways that literally rewire the brain (Bertozzi, 2012).

No study on spatial cognition was successful at closing the gender gap with regard to spatial rotation via the use of video games. The statistics ran parallel with men finishing consistently at higher levels. This could suggest that by the time a woman becomes an adult, the opportunity to close the gender gap with regard to visual-spatial skills could be lost. There is also evidence to show that preexisting gender differences with regard to spatial rotation did not benefit from additional training (Spence, Feng 2010).
Spatial cognition is key for successful problem solving skills in science, technology, engineering, and mathematics (STEM) education and occupations. “Designing structures such as bridges, buildings and aircraft; constructing flowcharts and other representations of computer programs; creating and interpreting charts, graphs, diagrams, maps, and engineering drawings” (Spence, Feng 2010 pg. 101) proficiency in visual-spatial skills, is strongly correlated with excellence in STEM fields. Progress can be made in the area of spatial advancement as studies show the frequently long-lasting effects of video game training (Spence, Feng 2010).

Chapter IV

Bias In Education

The Visual-Spatial Learner

An educational recognition towards the end of the century identified that students learn differently from each other. With this revelation came the introduction of personality types, learning styles, and multiple intelligences as a means of adapting to the individual differences of the student body. Differentiation has become enormously important in the delivery of services to all students. Most K-12 educators now attend workshops in which they learn about their own preferred personality type or learning style, and the various types, styles and intelligences of their students. The educational work force as a whole is consciously attempting to adapt teaching methods to the individual differences of students (Silverman).

Sequencing skills, which is the process of putting events, ideas, and objects in a logical order (Spivey 2008) are essential for school success. The scope and sequence of the modern curriculum and traditional methods of teaching favor the sequential learner. Auditory-
sequential students are able to show their work easily because they took a series of steps that can be retraced. They tend to be orderly, well-organized, and easily follow the sequence of events necessary for high academic performance (Silverman).

Whereas auditory-sequential students excel in these types of environments, visual-spatial learners often struggle in traditional learning environments. They are visually, rather than auditorially oriented: they need to see a concept in order to understand it. They excel at spatial tasks, such as geometry, map reading, geography, mazes, chess, construction activities, knowledge of mechanics, and three-dimensional puzzles. Activities such as these are not fundamental to school success, although they may be essential for high levels of creative production in adult life. They are divergent rather than convergent thinkers, often generating unusual solutions to problems. They often have marked disparities between their spatial strengths and sequential weaknesses. Gifted visual-spatial learners are often counted among creative students, artists, musicians, mathematicians, future engineers, and computer specialists (Silverman). Visual-spatial learners benefit greatly from gaming and the virtual learning benefits that it can offer.

**Observations In Education**

I sat down with and interviewed two elementary school teachers in the Cuyahoga Falls, Ohio school district. I asked a total of six questions over the period of sixteen minutes on October 28, 2015. Respondent A teaches second grade and Respondent B teaches first grade—their classroom is unique in that they teach together through a program called the 1-2 Team. It is a concept where they bring together children of different ability and cognitive levels in first and second grade into one inclusive classroom. Students serve as mentors to other students,
encouraging teamwork and camaraderie, while striving for academic success. I interviewed Respondents A and B together to get their mutual perspectives on their in-class student preferences and behaviors. The information I received from them was invaluable and helped to confirm my findings within my secondary research.

The interview proceeded in a casual manner with structured, preplanned questions. Permission was obtained by both respondents. I began by saying “I wanted to record the both of you together, because your situation is so unique because you teach together, with the 1-2 Team … I wanted to get your thoughts together. The questions are aimed at the students in your classrooms.” I then proceeded in asking them “What toys, gadgets and/or devices do girls naturally seem to gravitate towards? Any that they avoid?” The following is an excerpt from the structured interview. (See full transcript, Appendix C)

Respondent A: “something that’s crafty. I’m going to find more girls over there than I am boys.”

Interviewer: “Can you define crafty?”

Respondent A: “So, crayons, anything with artwork” … “the girls are more apt to get out my letters where they make words. Or they’ll be more apt, actually they are going to be ones to be more apt to sit and read a book, than what my boys are.” “I don’t know if they really avoid anything…”

Respondent B: “I don’t see [girls] go towards the LEGO’s… when [Respondent A] have LEGO’s out, it’s more like a circle of boys. Rarely, do I see a group of girls. But, they do do puzzles.”

Respondent A: “and it’s interesting, those who do go towards the LEGO’s,
they will often go towards the LEGO’s. So, it’s always the same girls.

I then asked “What toys, gadgets and/or devices do boys naturally seem to gravitate towards? Any that they avoid?”

Respondent A: “LEGO’s—that’s a huge draw”

Respondent B: “Anything they can build—blocks or the log cabins”

I followed up question two with “Have you noticed if one gender comes to class more mentally prepared to work on tablets/computers?”

Respondent B: “See it as equal”

Respondent A: “There’s not one gender—that does seem to impact is if they’ve had technology at home. If they’ve been exposed to it before school but as far as a gender delineation, no.”

I then asked “Have you noticed if one gender seems more or less engaged in class, during which academic lessons?”

Respondent B: “I would say math, boys were more involved in math.”

Respondent A: “Yeah, I would agree with [Respondent B], as far as it depends on the chemistry of that particular group for that particular year.

… I’ve got to be really careful as a teacher because girls oftentimes culturally are taught and expectations are such that they come to school with good student behaviors, they will sit quietly, they will follow the rules, so it’s more… kind of …how they’ve been taught at home, what culture expects.”

In order to fully understand the technology gender gap, it was important to question what technology the children were being offered in the classroom. With this in mind, I asked
respondents A & B the following question “What electronic, educational games/tools are they offered in class, if any?”

Respondent B: “because [the app or game] might say first or second grade, but we look at it and [think] ‘this doesn’t match anything that we’re learning or it’s too simple.’”

Respondent A: “that’s why I don’t use the iPads anymore, because the district doesn’t have the financial means to be able to buy an app, full, the complete one, so they’ll, we’ll do the lite ones where they’re free.”

Lastly, I was curious about bullying, between or within the genders. “Have you witnessed any bullying between the genders in class? If so, what specifically happened?”

Respondent A: “I have not seen a lot of bullying, but it’s typically within the gender. Like, it might be a girl bullying another girl. I’ve seen … being in second grade, somebody looking over and wrinkling a little nose and saying ‘why are you wearing those socks with that outfit?’”

The results from this interview highlight classroom interactions on both an individual and group level as well as play preferences that are conclusive with gender exclusivity and the influences of early childhood nurturing. Teachers may unknowingly encourage feminine qualities in their female students—praising them for being quiet, respectful, neat and calm while reinforcing males to think freely, be independent, active and ask questions. These gender stereotypes still prevail in modern American classrooms (Chapman).

**The Disparaging Message To Female Students**

Boys and girls can be sitting in the same classroom, listening to the same lessons by
the same teachers and receive completely different educations (Chapman). This can be seen in
classrooms on a daily basis throughout the United States. When entering elementary school,
girls outperform boys on nearly every measure of academic achievement, though by the time
they reach high school or college they have fallen far behind their male classmates (Chapman).
As a culture, we have to ask why this is happening and what strategies need to be taken to halt
and reverse this degenerative process.

The American Association of University Women published a study in 1992 documenting
how females receive less attention from the teachers than male students, and the attention
that they do receive is typically more negative than that of their male classmates. Examining
socialization patterns in schools and the evidence of gender bias curriculum proves that girls
have the odds stacked against them in the classroom (Chapman).

Current socialization in American schools assure that girls are made aware that they are
inferior to boys, (Chapman) and unfortunately, the consequences of the messages girls hear go
far beyond the classroom alone. Each time a school leader, administrator or teacher ignores an
accusation of sexual harassment, they allow the degradation of girls. When varying behaviors
are tolerated and the “boys will be boys” mentality is perpetuated, schools are unknowingly
supporting this quiet oppression of girls (Chapman). (Figure 7) By observing their peers early
on, girls see that popularity is more important than educational performance. Why is this
happening? Many social aspects are at play here. Girls in grades sixth and seventh report that
being popular and well-liked by their peers is more important than being seen as competent in
the classroom. In contrast, boys rate independence and competence as more important at this
age (Chapman).
Girls begin to lose interest in math and science around middle school, and there is a great deal of research to suggest why. (Figure 8) According to a study from 2001, researcher Diane Reay concluded that socialization begins much earlier than middle school. At a very young age girls begin to define their femininity in relation to other male classmates. Reay examined a previously performed study where four self-sorted groups of girls within one classroom: the nice girls, the girlies, the spice girls, and the tomboys. Through several interviews, Reay found that being considered a “nice girl” was deemed a derogatory label insinuating “… an absence of toughness and attitude.” “Girlies” were considered to be flirtatious in nature and spent their time socializing with boys. “Tomboys” played sports with the boys. “Spice girls” were known for being empowered and emanated more confidence over their social status. Reay’s findings were conclusive with each group finding their identities in proportion to those of their male
classmates (Chapman).

“As a teacher, I was struck by the Sadkers’ research on classroom exchanges and was forced to acknowledge the disproportionate amount of time and energy, as well as the different sorts of attention, I give to male students” (Chapman, pg. 3)—from a study done by Kelly Jones, Cay Evans, Ronald Byrd, and Kathleen Campbell conducted in 2000. Once gender-biased behaviors are identified in the classroom, teachers need to be provided the resources to help them change. Teachers who have the gender-biased behavior brought to their attention and who are able to address these discrepancies properly are better equipped to battle the bias and promote gender equality in their classrooms. Aside from their own teaching styles, educators need to be cognizant of the gender bias imbedded in decades-old educational materials and have to be proactive in order to combat this long-standing problem (Chapman).

Gender bias is a quiet and subtle problem that causes very few to stand up and take notice, let alone, take action. The victims of this bias in education have been silently subdued and trained throughout the course of their schooling and are unwilling to stand up and make noise about the unfair treatment they have received over the course of their lives. An uneven distribution of teacher time, energy, attention, and talent, with boys getting the majority of the attention, eventually takes its toll on girls. There needs to be recognition of the subconscious messages that students are hearing, where boys and men are bright, curious, brave, inventive, and powerful, but girls and women are silent, passive and invisible (Chapman).

However, there is evidence showing that girls are academically surpassing their male classmates, regardless of the fact that classroom socialization tendencies show that gender inequality still prevails. Though, not intentional, teachers are generally unaware of their
own biased teaching patterns because they are merely teaching how they were taught, and the pattern repeats itself. Luckily, curriculum researchers have identified key attributes in developing a gender-equitable curriculum—gender-fair educational materials need to be inclusive, fully representative, take into consideration life experiences of students, and the needs of both male and female students. “Until educational sexism is eradicated, more than half our children will be shortchanged and their gifts lost to society” (Chapman, pg. 3).
Chapter V

Digital Gaming

Game-Based Learning

Over the course of the last three decades of the twentieth century, digital and electronic games took on many forms and have been featured on many different computer platforms. More recently, these include personal computers or TV-attached game consoles, such as an XBox 360 or Playstation; handheld game devices, PDA's and game apps on cell phones. All of these forms are considered to be digital games (Zimmerman, Salen, 2003).

Game-based learning (GBL) and/or learning with digital learning games (DLGs) has been one of the most discussed forms of media based learning in recent years. Computer games that were originally designed for entertainment most often provided substantial learning opportunities in its players. For example, action and racing games are expected to increase motor and perception skills, while design and strategy games will increase forward-planning skills, and adventure games can foster complex problem-solving skills. (Hense, Mandl) All of these learning processes occur without the learner feeling as if the process is difficult, burdensome or uncomfortable. On the contrary, digital games are able to generate an enormous amount of motivation, which leads to intensive, sustained and emotional engagement with the game contents. To some degree, this engagement can extend far beyond the reaches of the game, either when users create online communities to exchange information (peer-to-peer learning) about the game or when they develop their own game content in the form of “mods” or modifications. Minecraft, a highly popular game for both kids and adults, does this with online forums and the intense exchange of YouTube tutorials and “how to's.” When analyzing computer games,
it is important to not only look at aspects pertaining to teaching and learning theory, but also consider the motivational and emotional perspectives that play an important role while playing these games (Hense, Mandl).

Four different theoretical approaches can be used to analyze the mechanisms which foster game based learning. The most important are behaviorism, cognitivism, individual and social constructivism. However, they should be regarded as complementary to one another, since the learning mechanisms proposed by the different theoretical approaches can be relevant for different learning goals and outcomes (Hense, Mandl).

**Gender And Gaming**

The digital gaming industry has been dominated by male perspective, both in profession and by the games they produce. Traditionally, games tend to be geared towards boys and men. Slowly video game developers are taking female gamers into consideration. Though, when developing video games and products with females in mind they often still base their game designs on stereotypical gender roles. For example, many game companies still think that female players want fashion, shopping, and dating games (Phan, Jardina, Hoyle, 2012). In 2012, researchers concluded that male gamers tend to play games of strategy, role playing, action and fighting genres more often than female gamers. Female gamers reported that they liked to play social, puzzle/card, music/dance, educational/edutainment and simulation genres (Phan, Jardina, Hoyle, 2012). Though preference of games differ, the desire to play is shared by both genders. (Table 1)

If girls enjoy playing video games, why are some shunning them? Vicious attacks on female game developer Zoe Quinn on a popular online forum Gamergate, sparked internet
discussions about bullying and sexual harassment in the gaming community. One study found that 70 percent of female gamers adopt male identities to avoid online harassment. A survey of 874 gamers suggests that 63 percent of women gamers have been harassed online and that 80 percent of gamers believe rampant sexism is a problem in the gaming community (Villines, 2015). Researchers gathered data on 126 recorded player interactions during a Halo 3 team death match. In one group, players remained silent. In the second group, researchers played while making unoffensive statements—such as “That was a good game, everyone”—in male or female voices. All of the players who responded to the statements were male, suggesting that female players either stayed silent or did not play the game. The team recorded each response, coding them as either positive or negative. “Do ya thing, girl,” for example, was coded as positive. “Should’ve made me a sandwich, b***” was negative” (Villines, 2015). It’s no wonder females are intimidated into not wanting to play games seen as more male centered. They feel less than welcomed—which is a contributing factor to their less than stellar confidence levels in the gaming world.
In the beginning, the playing field was rather level—the 1980s and early 1990s, the lack of graphical integrity did not allow for the sexualization of characters. In the mid-1990s came the next generation of game consoles, which allowed for more sophomore graphics, which brought a spike of sexualized female characters (Jarvis, 2016). Following the release of Tomb Raider in 1996 came a spike in sexualized protagonists in video games. Tomb Raider played a key role in the perceived rise in over-sexualized female characters—with its success then inspiring other developers to follow suit. This upward trajectory continued until the early 2000's. “There are also a lot of characters who are in keeping with more feminist notions of what a powerful, non-objectified woman would look like. The remake of the Tomb Raider series and Lara Croft’s redesign is an excellent example of the way the industry is now humanising female characters” (Jarvis, 2016 pg. 2). Luckily, the outlook of over sexualization of female game characters is looking better. According to a group of researchers at Indiana University, who suggest that the treatment of female characters in games has drastically improved over the last decade (Jarvis, 2016).

Regardless of the progress, age ratings on games still do little to protect underage players from the over-sexualization of viewing and interacting with female characters. Games rated ‘Teen’ (13-17) and ‘Mature’ (18+) show no differences in their portrayal of women. The proportion of primary female characters with primary roles has fallen from 52 percent to 42 in more recent years, while secondary female characters “continued to be sexualized to a much greater degree.” Role-playing genre (RPG) games tend to be more sensitive as it relates to their treatment of women, with its characters less likely to be sexualized in other genres such as action or fighting (Jarvis, 2016).
Teresa Lynch, a PhD student at Indiana University states “when women are interested in gaming, they tend to spend far more time playing games than men... When it’s central to their identity, they’re more protective of what it means to be a gamer. So women are an important part of the core culture of gaming” Lynch was also quoted as saying “Continuing to show one-dimensional portrayals of female characters and dismiss concerns about the way female characters are portrayed just doesn’t make good business sense” (Jarvis, 2016 pg. 3).

**Minecraft And Other Influential Games**

Minecraft is an open-ended, adventure-based platform game that allows players to build with 3-dimensional blocks in a 3D environment. (Figure 9) Similar to the concept of LEGO and interactivity of Sim City, Minecraft guides the player through survival and goal modes to create a virtual custom world. At its core, it is a game with the most basic of graphics and essentially no

![Figure 9](http://www.gamerevolution.com/cheats/xbox360/minecraft)
storyline, so it is amazing how, since its release in 2011, it has managed to become the third most popular video game of all time just behind Tetris but ahead of Super Mario Bros. Players create their own unique adventure with a virtual landscape where they can dig holes to collect blocks for fun—but it’s what the player does with the blocks that’s important. Imagination is key with this game, creating anything from a small mud hut to a giant concrete city landscape (Raven, 2014).

One way for children to express their creativity is to play what are called “sandbox” games. These types of games are especially conducive to modding and self-expression (Olson, 2010). Minecraft is a “sandbox” game. It is designed to be an open-ended game, meaning there is no way to “win it.” The objective is to collect materials (mine) to create new items (craft). In survival mode, players can choose to fight monsters, if they wish, but the main task is to design, build and share even more elaborate structures. The amount of enthusiasm that Minecraft has generated means kids don’t even realize they’re learning while they play. Children learn while playing it because it rewards them for getting information, combining resources and solving design problems (Dezuanni, 2015). Minecraft is a game that spans the ages—from children in elementary school to adults in their forties, it has something to interest just about anyone. (Table 2) Like LEGO, Minecraft is a 3D imagination system for applying design possibilities and then displaying the outcomes for others to see and use. It’s not so much a game, but a social network that values and circulates expertise (Dezuanni, 2015). While Minecraft can be an amazing tool for encouraging and training spatial abilities, it comes with the added pitfall that it was originally designed for adult men—not children. While children love to play Minecraft, boys still make up the majority of players. (Table 3)
Other strategy-based games like Sim City or Civilization allow the user to operate with several limitations at once, while evaluating their overall effects of their entire environment.

The Sims 2 is a digital life simulation game—where players essentially create a persona or “Sim” and are able to create homes for their Sims, customizing their environment by including the number of floors, entrances, type of wallpaper or carpeting, as well as phones or garbage cans. It is an effective tool for exploring social relationships by analyzing the social lives of their Sims player, an activity that has great appeal to female players. The Sims 2 also includes a de-emphasis on competition and action-oriented game play, with an emphasis on social interactions. They elicit low win/loss conditions, with essentially no competition, but offer little to no hand-eye reflex coordination. While Sims 2 appeals mostly to women, it lacks an additional modding component, which makes customizing the game any further nearly impossible (Yucel, Zupko, Seif El-Nasr, 2006).
Based on research conducted by Cheryl K. Olson of Massachusetts General University, there are hidden “social motivations” for playing video games, also referred to as “hanging out.” Children see video games as a social outlet and essentially view playing them as structured time with friends. In the context of social interaction and game play, this is an evolution of the days of playing board games or going bowling with friends (Olson, 2010).

While both genders use and play video games for social reasons, boys tend to use video games as a means of competing for social status. Boys can easily gain status among friends by owning and mastering popular games. A study conducted on male social identity of 149 boys, aged 14-15 years showed that being good at computer/video games was second only to being “fun” among one’s friends. Evidence shows that boys hold a considerable amount of value in their abilities to play and complete video games (Olson, 2010).

Peer-based learning allows young people to come together and cheer each other on around common interests as well as motivating one another. Multi-player games allow for a safe
place for young players to negotiate rules and investigate boundaries of what acceptable behavior might be, whether in-person or online. They also provide opportunity to learn leadership roles such as mediation, persuasion, and motivation through online group play sessions. Younger players can engage in the social practice of give and take as well as dabble in economics through the activities of collecting and trading game currencies (Olson, 2010).

“Flow” in a video game is a state of being pleasantly and completely absorbed by a goal-driven activity. Matching the skill level and pace preference of the player increases the likelihood of achieving flow. Certain underdeveloped visual-spatial skills, which are typically less developed in girls, may unintentionally prevent girls from easily achieving flow on beginner level games (Olson, 2010) due to the lack of familiarity with the game interface.

**Predation Play And Female Gaming**

Video games have helped to level the playing field, creating opportunities for women and girls unforeseen by Title IX (Bertozzi, 2012). Title IX was created by the United States Department of Education in 1972. Title IX was created with the intention to protect people from discrimination based on sex in education programs or activities that receive Federal financial assistance. Title IX states that: “No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance.” … “Educational programs and activities that receive ED [Education] funds must operate in a nondiscriminatory manner. Some key issue areas in which recipients have Title IX obligations are: recruitment, admissions, and counseling; financial assistance; athletics; sex-based harassment; treatment of pregnant and parenting students; discipline; single-sex education; and employment” (U.S.
Department of Education). The creation of Title IX was an encouraging step to the larger problems facing women and girls in the United States.

In western cultures, girls are raised to hold being “pretty” as a higher priority over being “smart.” They are raised to be less ambitious than males and are inadvertently told to focus on their looks as opposed to asserting themselves into leadership and being seen as “bossy.” As children, girls are often raised to prioritize nurturing and prosocial behaviors and are discouraged from engaging in competition. Yet, competition is a part of life, and females who have experience with it are more likely to succeed in competitive workplaces. These stereotypes are then internalized, and it’s very difficult to overcome such stereotypes—though one way to fight this is to provide positive, female examples to girls who break this stereotype. Playing in virtual worlds allows females the opportunity to free themselves from heteronormative stereotypes, at least for the duration of playing the game (Bertozzi, 2012).

Predation video games—games where the player is being hunted by others and must kill to survive—have long been dominated by a male audience. However, it has been argued that predation video games in particular can provide females with a safe environment in which to acquire and fine-tune specific skills, such as survival tactics and how to prevail in stress, competitive, aggressive environments. In predation games, the player is motivated by the game environment to learn what needs to be accomplished in order to progress through the game and learns to enjoy the process—these are important lessons for females. Yet, there are many reasons why females have kept away from the male dominated games—heteronormative female development discourages females from aggressive, competitive behavior. Females are more likely to play games with traditional feminine values, such as ones that emphasize beauty,
shopping, prosocial behaviors, and nurturing—games such as Sims and Farmville, to name a few (Bertozzi, 2012).

Predation play is unique in that it creates learning scenarios where a player dies almost immediately if they do not compete by fighting back to live. The perceived threat of death creates an intense situation that is conducive to learning because it simulates pressure and competition similar to real-world situations. Research suggests that the best way to master these games is by becoming competent at working with other players either in cooperative online environments or by playing with friends (Bertozzi, 2012).

Playing predation video games is a way of experiencing pleasure while in the process of acquiring and practicing the use of power. Competitiveness can be intimidating to those who feel they lack an ability to succeed—but when those skills are acquired and thorough, then accepting a challenge can be a thrill. Learning how to survive in predation game environments teaches players to “persevere in the face of hardship,” consider their resources and have the ability to recognize the difference between friend and foe. Such environments are constructed to develop friendly tension and encourage players to take resolve by increasing their skills, self-confidence and self-efficacy. When predation is played in games as opposed to simulated in real life, the player can learn to accept and rebound from defeat rather than being crushed by it. By engaging in this type of play, females might later find male behavior more comprehensible and be better able to compete with them on a professional level (Bertozzi, 2012).

An American Association of University Women (AAUW) report suggests that girls should be given LEGO and ERECTOR sets to play with, but unfortunately doesn’t mention any need for play with video games. Research shows that predation video games are “the most technologically
sophisticated, intellectually challenging environments currently available for the engagement of young minds” and are not even mentioned as a way for young females to develop essential skills (Bertozzi, 2012). Perhaps more research is needed to validate the benefits of playing video games on female development, but it is questionable why they are not even a suggestion. Though, it is probably sad to say that encouraging girls to play the same types of digital games as boys may begin to finally encourage females to seek and achieve the same kind of power of top males. To do this, parents and educators need to acknowledge the importance of predation play for the future success of females (Bertozzi, 2012).

Chapter VI

Media Literacy

Online Play And It’s Role In Digital Confidence

Video games are known and respected as a means for acquiring practical abilities, developing perception and skills in problem solving, strategy analysis, as well as media literacy (Yucel, Zupko, Seif El-Nasr, 2006). According to a recent study from the Pew Internet & American Life project, more than half of all teens have created online media content, and roughly one-third of these teens who use the internet have shared the content they have produced. In many cases, these teens are actively involved in what we currently call participatory cultures. A participatory culture allows for artistic expression and civic engagement, has strong support for creating and sharing, as well as some type of informal student mentorship, where experienced participants pass along knowledge to less experienced players. In a participatory culture, members believe their contributions matter and to some
degree, feel a social connection with one another. A particular form of participatory culture, referred to as Expressions is a form of skinning and modding, and fan fiction (Jenkins, 2009). Minecraft is a great example of how all of those forms work together in a participatory culture, as users utilize each one.

A growing body of scholars suggest potential benefits from Expressions and other forms of participatory culture, including opportunities for peer-to-peer learning, a changed attitude towards intellectual property rights, diverse cultural expression, and the development of skills valued in the modern workplace. Access to this participatory culture functions as a new form of hidden curriculum, predicting who will succeed and who will be left behind as they enter school and the workplace. Some have argued that children and youths acquire these key skills and competencies on their own by interacting with popular culture (Jenkins, 2009).

Educators must now work towards ensuring that all young Americans have access to these skills and experiences needed to become full participants, are able to articulate their understanding of how media shapes perceptions, and are socialized into the emerging ethical standards that could shape their practices as media makers and participants in online communities (Jenkins, 2009).

Many also argue that these new participatory cultures represent an ideal learning environment. Researcher, Dr. James Paul Gee, calls such informal learning cultures “affinity spaces,” and explores why people learn more, participate more, and engage more deeply with popular culture than they do with the contents of their textbooks. “Affinity spaces offer powerful opportunities for learning, Gee argues, because they are sustained by common endeavors that bridge differences—age, class, race, gender, and educational level—and because people can
participate in various ways according to their skills and interests, because they depend on peer-to-peer teaching with each participant constantly motivated to acquire new knowledge or refine their existing skills, and because they allow each participant to feel like an expert while tapping the expertise of others” (Jenkins, 2009 pg. 10).

With regard to video games, it’s unfortunate that equal access does not equate to equal opportunity. Many times, if accessible, video games can provide first lessons in media literacy and provide children with their first opportunity to interact with technology (Blumberg, Sokol, 2004). One important goal of media education should be to encourage young people to become more reflective about the ethical choices they make as participants and communicators and the impact they have on others (Jenkins, 2009). Another benefit to media literacy is that it could help bridge the gender gap in the gaming community by allowing girls and women to feel more welcomed in a society that has been dominated by men, giving them more acceptance and confidence to pursue challenging STEM careers. Society should encourage youths to develop the skills, knowledge, ethical frameworks, and self-confidence needed to be full participants in contemporary culture (Jenkins, 2009).

**Information Technology Fluency**

Girls are shunned from male-dominated online game forums, and continue to struggle with their online voices. Females have been groomed since childhood to be polite and know their place—to be feminine at any cost, making it more difficult for them to speak up for themselves. They have long been evaluated on the basis of appearance and caught in double standards: “achieve, but not too much; be polite, but be yourself; be feminine and adult; be aware of our cultural heritage but don’t comment on the sexism” (Pipher, 1994 pg. 44). Girls are trained to
be less than who they really are. They are expected to be what the culture wants of its young women, not what they themselves want to become (Pipher, 1994).

By Junior High girls already sense their lack of power, but usually cannot articulate why. They see that mostly men are congressmen, principals, bankers and corporate executives and notice that famous writers, musicians and artists are mostly men as well (Pipher, 1994). Using video games as a means of teaching confidence and learning for middle school girls can lead to something called Information Technology Fluency, which is knowledge of the skills needed to use today’s computer software applications (Yucel, Zupko, Seif El-Nasr, 2006). In order to be full participants in current and future technologies, students must develop fluency in three kinds of Information Technology (IT) knowledge: contemporary skills, fundamental concepts and intellectual capabilities. As proposed by the National Research Council (NRC), IT fluency has been proposed as a minimal standard for college graduates. The NRC also states that IT literacy alone is insufficient to prepare students for the computer software applications of the future. Because information technology is rapidly changing, the skills that are needed today will have to be continuously updated in the future. Students need more than just skills to use current technology like web browsers, email, and word processors. Rather they need to adapt those skills in a broader sense to allow for ‘as yet developed’ software, putting the students into a position where they will be able to adapt as IT changes. An instructive goal, is to provide students with a sufficient foundation of the three types of knowledge in IT so that they can “learn the rest of it” on their own as technological advancements develop (Werner, Campe, Denner, 2005).
Chapter VII

Closing The Gender Gap In STEM

Engineering And Computer Science

Many of the computing pioneers who programmed the first computers were women and for several decades, up until the mid 1980s, the number of women studying computer science was rising faster than that of men. Yet, in 1984 something changed—Apple released the first personal computer. There is some debate whether the release of the new Apple Mac had a significant impact on the decline of women’s presence in computer science—all while the percentage of women in other technical fields continued to grow (Henn, 2014).

In the early years of personal computers, they didn’t allow for much exploration and were nothing more than a means of playing games, like Pong, maybe a shooter game and perhaps

TABLE 4. Interest In Computer Science Based On Gender

<table>
<thead>
<tr>
<th>STRATEGY TYPE</th>
<th>Internal</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read Instructions</td>
<td>0.21</td>
<td>0.10</td>
</tr>
<tr>
<td>Trial and error</td>
<td>0.48</td>
<td>0.13</td>
</tr>
<tr>
<td>Total</td>
<td>0.69</td>
<td>0.31</td>
</tr>
</tbody>
</table>

Women’s and men’s interest in majoring in computer science after reading a newspaper article claiming computer science major fit or did not fit current stereotypes in Study 2. Scale ranged from 1 (strongly disagree) to 7 (strongly agree). Error bars represent standard errors.

Source: (Welsh)
some word processing, but nothing more. They were marketed almost entirely to boys, and it became a socially acceptable message that computers were intended for boys. Parents picked up on this message, and purchased personal computers for their sons, but their daughter’s interest in computers were largely ignored. “Movies in the 1980s such as Weird Science and Revenge of the Nerds perpetuated the “geek” tech culture.” A study conducted by Carnegie Mellon University revealed that families were much more likely to purchase personal computers for boys as opposed to girls—regardless of whether their girls had shown interest. As personal computers became increasingly common in the 1980s and 1990s, computer science professors assumed their students had grown up playing with and using computers at home, (Henn, 2014) but when their female students came to class seemingly unprepared, they were written off as being disinterested and undedicated students. The lingering doubt that was placed on female students had long-lasting, devastating results to their overall self confidence. (Table 4)

Since the release of Apple’s ground-breaking personal computer, technology has evolved ten-fold, yet women’s low confidence levels have been an unfortunate consequence of the technology gender gap. Not only have men and boys traditionally tinkered with computers and played video games, but they have been the ones creating them as well. Video game development has long been a male-dominated industry with only 11.5 percent of the jobs belonging to women. “This is an extreme case of a bigger problem in the larger IT industry. U.S. Department of Education (2004) reports that only 26.9 percent of total Bachelor’s degrees in computer and information sciences were awarded to women in 2002-2003, even though 57.5 percent of all Bachelor’s degrees in 2002-2003 were awarded to women” (Yucel, Zupko, Seif El-Nasr, 2006 pg. 2). (Table 5)
Females As STEM Professionals

A study from 2012 showed that the male-female ratio in higher education has been steadily moving in favor of females ever since the 1970s. (Table 6) Total enrollment figures show that females outnumber males for the first time in the late 1970s, and have steadily increased in numbers ever since. The superiority first came in public universities, followed soon by private universities which saw female enrollment surpass male enrollment (Borzelleca, 2012). Despite this shift in their favor, gender-related setbacks in STEM-related majors still prevail. With more women going to college these days, why aren’t more of them choosing engineering as a major? Is it their lack of preparation or perhaps their lack of confidence in technology? Are we as a society preparing them for such professions? One motivating force behind the “girl’s game” movement is the concept that, just like boys, girls need to be fluent with technology if they are going to be
adequately prepared to get good jobs for good wages (Salen and Zimmerman, 2006).

According to the United States Census Bureau, women’s representation in STEM occupations remains significantly underrepresented in engineering and computer occupations. Women’s representation in these fields has declined since the 1990s. Among science and engineering graduates, men are employed in a STEM occupation at twice the rate of women. Nearly 1 in 5 female science and engineering graduates are out of the labor force, compared with less than 1 in 10 male science and engineering graduates (Landivar, 2013). (Table 7)

Researchers find that women, African Americans, and Hispanics are less likely to be in a science or engineering major at the start of their college experience, and more unlikely to remain in these majors by graduation. Consequentially, there has been uneven growth in women’s representation in STEM occupations since the 1970s. In 1970, women were 3 percent of engineers, 14 percent of life and physical scientists, 15 percent of mathematical and computer...
workers, and 17 percent of social scientists. (Table 8) There has been minimal improvement since, yet given the amount of time that has passed, more progress is to be expected. In 2011, 26 percent of STEM workers were women and 74 percent were men—women were 13 percent of engineers, 27 percent of computer professionals, 41 percent of life and physical scientists, 47 percent of mathematical workers, and 61 percent of social scientists. Women’s underrepresentation in STEM is a result of their significant absence in engineering and computer occupations, as opposed to math and science occupations (Landivar, 2013).

The assumption that girls are somehow inferior, or perceived as weak, have made it harder for women to progress up the proverbial professional ladder. Though girls and women have strived to prove themselves as being strong and worthy of powerful positions, there is still a lot of work to do. Regardless of all the progress women have made, they still remain severely underrepresented in positions of power, authority, status and wealth and are still fighting the
Opportunities are scarce or difficult to obtain in high-level political positions, tenured faculty in STEM, CEO’s in Fortune 500 companies, or partners in law firms. To acquire such a position, it requires intense pressure in competitive environments—and more times than not, these powerful positions are rewarded to those who aren’t necessarily the best qualified, but to those who have adapted to thriving in highly competitive environments (Bertozzi, 2012). Power is not something that is given away, it has to be fought for, earned and then defended from anyone who might take it away. Sheryl Sandberg, author and business leader admits in her 2012, World Economic Forum (WEF) & Bloomberg state that women themselves still feel uncomfortable with ambition and power. “A consensus emerged from the discussions at the 2011 Power Summit that the discomfort many women feel with the concept of power may stem as much from women’s own internal gender bias as it does from external gender bias” (Bertozzi,
Women’s organizations have fought for decades to improve the work environment and make it more conducive to opportunistic egalitarian attitudes. Yet statistics show that these views are not enough (Bertozzi, 2012).

Women have to fight harder to prove themselves in both STEM majors and occupations and are typically not taken seriously or are “bullied” by the “good ol’ boys” in the office or classroom into not speaking up or advancing in their professional positions. Women are—and feel—like the minority and typically do not feel comfortable seeking a promotion or recognition. Creating an inclusive environment where women not only feel welcomed, but valued is imperative to the success of bringing more women and girls into STEM fields, specifically engineering and computer science. (Table 10)
Video Game Modding is a relatively new phenomenon in the gaming community. By its users it is the process of modifying an existing video game to create a completely personalized experience or to design a completely different video game. Modding is typically achieved by using software or programming languages pre-programmed within an existing game. Modding can, but typically does not include, third party software or raw coding language. Manipulating existing games allows for interaction with and the ability to manipulate code,
images and other materials that were intended for the original game. Students tend to be more motivated when given the opportunity to manipulate games they already enjoy playing (Yucel, Zupko, Seif El-Nasr, 2006).

Considerations needed in order to use video game modding as an effective learning tool to teach IT skills to an all-female student body were explored through an all-female class taught using video game modding. Results from several perspectives, such as collected surveys, observation, and analysis of student projects suggest that (1) video game modding is an effective motivational teaching tool (2) video game modding is a thorough approach to teaching IT skills, and (3) video game modding is an effective tool for teaching an all-female student body (Yucel, Zupko, Seif El-Nasr, 2006).

Modding has several positive effects on different age groups. Younger students tend to learn a variety of subjects by playing video games, whereas older students who are modding and building games, learned programming and other worthwhile IT skills. Modding serves as a great learning tool because it offers a learning process within the game, so the students or players are not only absorbing the knowledge but are active participants in creating the knowledge. This provides a superior approach to acquiring technical skills required in the IT industry and other STEM fields (Yucel, Zupko, Seif El-Nasr, 2006).

Game modding is especially beneficial for girls because it offers the benefits of game creation, but also has several other advantages. The scripting languages apparent in game modding are comparable to mainstream programming languages, like java and are easier to digest and learn, which to the benefit of girls, promotes creativity and confidence with technology. It allows them to focus on the problem at-hand and develop problem-solving skills,
all without spending too much time on creating infrastructure (Yucel, Zupko, Seif El-Nasr, 2006).

Game modding allows girls to feel in control of their gaming experiences as well as included in the broader digital community. By simply playing video games for less than an hour a day, can have a positive influence on kids’ mental health. (Figure 10)

Instructional Game Design Solutions

A study based on how to teach fractions to children highlighted different game-based learning preferences between the genders—boys emphasized competitive goals while girls emphasized instructional goals. The significant differences could indicate playing and learning preferences for girls, where exchanging of information and inclination for learning how to play video games could underscore their desire for greater cooperation and collaboration between players (Blumberg, Sokol, 2004).

Research shows girls exhibit several specific video game playing preferences, they
like complex social interaction, and are fascinated by relationships between characters and other game players. They often will identify with and mimic main characters in video games. Additionally, they prefer exploring interesting environments, adventure or puzzle based games. Overall, girls want collaboration. They enjoy working together to accomplish mutual goals rather than trying to outdo someone else (Yucel, Zupko, Seif El-Nasr, 2006).

A study conducted by researchers Subrahmanyan and Greenfield, as published in The Journal of General Psychology in 2004, concluded that spatial performance was significantly higher among fifth-grade boys than fifth-grade girls with regard to video games and mental rotation abilities. They found that boys have more hands-on experience with video games, which could explain their superior video game performance (Blumberg, Sokol, 2004).

PARTICIPANTS

Participants were 46 second-grade children (20 girls, 26 boys; M age = 7.4 years, range = 6.9–10.3 years) and 58 fifth-grade children (23 girls, 35 boys; M age = 10.5 years, range = 7.8-11.8 years) who attended schools in an ethnically diverse, middle-class school district in New York City (Blumberg, Sokol, 2004 p. 153). All participants had a signed parental or legal guardian permission form (Blumberg, Sokol, 2004).

VIDEO GAME TASK

SEGA’s Sonic the Hedgehog 2 video game was chosen for its gender neutral and non-violent nature. The primary goal of this game is to complete as many successful levels as possible. To complete this goal, each player was given three “Sonic” lives at the beginning of each game. Each time a player loses a life, they are reverted back to the beginning of that level (Blumberg, Sokol, 2004). Conclusions were based on the following criteria with regards to this game; (a) the
highest number of levels completed, (b) the highest level attained, (c) the number of free Sonics obtained, (d) the number of Sonics lost, and (e) the number of games started (Blumberg, Sokol, 2004 p. 153).

PROCEDURE

Each child was individually tested, for 10 minutes without interruption in a quiet area on the premises of their participating school (Blumberg, Sokol, 2004).

RESULTS

Players were classified as frequent players (those who had played “a lot” of video games) or infrequent players (those who did not play “a lot” of video games (Blumberg, Sokol, 2004). This general distinction was supported by a point-biserial correlation, \( r_{pb} = .28, p < .01 \), which indicated that the participants who were characterized as frequent players showed significantly better game performance than did the infrequent players. Seventy-two percent of the 44 percent of all children who reported frequent video game play were boys. The results of a chi-square analysis indicated a significant difference in the distribution of male and female frequent players. \( \chi^2 (1, N = 104) = 5.82, p < .02 \) (Blumberg, Sokol, 2004 p. 155).

All but nine of the children (seven second graders and two fifth graders) had previous experience playing the video game that was used for the study, which eliminated the need to examine the effects of game familiarity with performance. The children’s responses were classified into three mutually exclusive and exhaustive categories: (a) internally based strategies (63 percent of all responses), (b) externally based strategies (18 percent of all responses), and (c) none (19 percent of all responses). The last group of children were excluded from further analyses (Blumberg, Sokol, 2004 p. 155).
Conclusions from the following studies, hypothesized that girls would be more reliant on externally based strategies and a lower frequency of play than boys. Similarly, it was expected that boys would have a higher frequency of play and would be more reliant on internal based strategies than would girls. Lastly, it was hypothesized that internally based strategies would correlate with higher game performance more so than external strategies (Blumberg, Sokol, 2004). (Table 11) It can be concluded that girls would rely on external instruction due to their lack of familiarity with video games and game-based learning. Their apprehension and doubt in their abilities shines through with needing reassurance from an outside party that they are in fact doing it “correctly” or playing by the rules (Blumberg, Sokol, 2004).

The American Association of University Women (AAUW) reports that "one of the largest
gender differences in cognitive abilities is found in the area of spatial skills, with boys and men consistently outperforming girls and women. Spatial skills are considered by many people to be important for success in engineering and other scientific fields. Research highlighted in this report, however, documents that individuals’ spatial skills consistently improve dramatically in a short time with a simple training course. If girls grow up in an environment that enhances their success in science and math with spatial skills training, they are more likely to develop their skills as well as confidence and consider a future in STEM (Bertozzi, 2012).

Conclusions

In conclusion, play is beneficial in every aspect of a child’s life, both at home and in the classroom. It allows them to explore and problem solve at their own pace, all while gaining the all-important confidence in their abilities. Allowing children the opportunity to play both traditional games and digital games at home and promoting them into the classroom structure, will help to specifically encourage girls to develop skills that may have otherwise been overlooked and also engage those other visual-spatial learners who struggle to learn in an auditory-sequential environment.

Video games provide children with an exclusive opportunity to become intimately comfortable with digital media. “Children are not so much ‘addicted’ to video games as they are unwilling to quit before they have met their goals. …Video games are more like playgrounds and city parks rather than wild-spaces” (Salen and Zimmerman, 2006 p.340). Media literacy could help bridge the gender gap in the gaming community, allowing girls and women to feel more welcomed in a society that is dominated by men, potentially giving them more acceptance in challenging STEM careers. Our goal should be to encourage youths to develop
the skills, knowledge, ethical frameworks, and self-confidence needed to be full participants in contemporary culture (Jenkins pg. 9).

Likewise, if an individual has inadequate spatial skills, they are less likely to participate in learning opportunities that require engaging with spatial abilities. In the long term, these lost opportunities will have negative consequences on participation in STEM education and occupations. If education and training of spatial function can be improved, it would potentially have positive long-lasting intellectual effects in STEM fields. “Changes in childhood play and early education, geared toward improving spatial cognition, could have a major impact on the choice of programs of study and career decisions. Training to improve spatial skills would also have a beneficial impact on gender equity” (Spence, Feng 2010 pg. 2).

If gender discrepancies in spatial cognition could be removed by appropriate early training with exposure to video games, the subsequent educational and career paths of girls and boys might be more closely aligned (Spence, Feng 2010). Parents can help to close the technology gender gap by encouraging both gendered children to engage with technology while supporting play with a combination of feminine- and masculine-stereotyped toys and play activities during early childhood. By challenging gender stereotypes with their children, parents can help to eliminate gender bias and strengthen a positive learning environment where girls and boys learn to work together as equals, (Spence, Feng 2010) ergo creating a more inclusive digital community.

According to James Gee, video games are considered to be complex systems, composed of rules which interact. Where gamers have to think like designers to form hypotheses about how rules apply within games and how those rules can be used to accomplish results. Gee was quoted
as saying “Thinking like a designer in order to understand systems is a core 21st-century skill” (2015 Sales, Demographic and Usage Data, 2015 pg. 10). Mechanical thought and the ability to problem solve are essential to the advancement for women in STEM.

In the end, well thought out and considerate game design, where girls’ playing preferences are thought of during conceptualization as opposed to being an after thought can have great impact on whether or not girls become engaged in video games at a young age and remain engaged. Specifically, open-ended, 3D games that encourage spatial-skill training will give girls the greatest edge and confidence they will need later in life to pursue a STEM career. Girls enjoy gaming, but we must give them something to play.
Appendix A

Parent Survey—Interview Questions

Online Survey: *Toys and how they influence early childhood development—Parent Edition*

1. What are the gender and age of your children?
2. What toys do your girl(s) tend to play with?
3. What toys do your boy(s) tend to play with?
4. Any particular toys that both genders like to play with?
5. What video games do they enjoy playing and why?
Online Survey: *Toys and how they influence early childhood development—Parent Edition*

### Table B1: Total Subjects

<table>
<thead>
<tr>
<th>Gender</th>
<th>Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>20</td>
</tr>
<tr>
<td>Female</td>
<td>28</td>
</tr>
</tbody>
</table>

Average Mean Age:
- Male: 8.36
- Female: 9.15

Results based on sample size of 14, with a population of 48, margin of error +/- 22.48 with relative confidence level of 95%
Appendix B

Parent Survey—Results

Online Survey: *Toys and how they influence early childhood development—Parent Edition*

Table B2: Playing Preferences of Girls

- GIRLS like to play with:
  - action figures
  - balls (sports)
  - Barbies
  - bikes
  - blocks
  - board games
  - books
  - cards
  - (boats, trucks, planes, trains) cars
  - coloring / art
  - crafts
  - dolls
  - dress-up
  - electronics
  - farm animals
  - household items
  - jump rope
  - kitchen
  - LEGO
  - magic kits
  - musical toys
  - nail polish / make-up
  - Playdough
  - puzzles
  - Razor scooters
  - shape sorters
  - Shopkins
  - skateboarding
  - skates
  - stuffed animals
  - tea sets
  - video games

- 1 participant

Table B3: Playing Preferences of Boys

- BOYS like to play with:
  - action figures
  - balls (sports)
  - bikes
  - blocks
  - board games
  - (boats, trucks, planes, trains) cars
  - dolls
  - dress-up
  - electronics
  - jump rope
  - kitchen
  - LEGO
  - Mickey Mouse
  - Nerf guns
  - noisy toysplanes
  - Playdough
  - Power Rangers
  - puzzles
  - school
  - science kits
  - skateboard
  - tools
  - video games

- 1 participant
Appendix B
Parent Survey—Results

Online Survey: *Toys and how they influence early childhood development—Parent Edition*

Table B4: Toys/Games both genders like to play with

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Appendix B
Parent Survey—Results

Online Survey: *Toys and how they influence early childhood development—Parent Edition*

Table B6: Console Preferences

<table>
<thead>
<tr>
<th>CONSOLE PREFERENCE</th>
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<tbody>
<tr>
<td>X-Box</td>
<td>GIRLS</td>
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<tr>
<td>Wii</td>
<td>BOYS</td>
</tr>
<tr>
<td>Computer</td>
<td></td>
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Table B7: Video Games Genre Preference

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<th>VIDEO GAMES PLAYED by GENRES</th>
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<tr>
<td>animals</td>
<td>GIRLS</td>
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<tr>
<td>building</td>
<td>BOYS</td>
</tr>
<tr>
<td>carnival</td>
<td></td>
</tr>
<tr>
<td>cooking</td>
<td></td>
</tr>
<tr>
<td>fashion</td>
<td></td>
</tr>
<tr>
<td>make-up / beautification</td>
<td></td>
</tr>
<tr>
<td>racing</td>
<td></td>
</tr>
<tr>
<td>sports</td>
<td></td>
</tr>
<tr>
<td>war / fighting</td>
<td></td>
</tr>
</tbody>
</table>
Appendix C

Structured Teacher Interview—Full Transcript

In-Person Interview: Toys and how they influence early childhood development—Teacher Edition


Time length: 16:03

Interviewer: Leigh Hughes

Interviewer: “I wanted to record the both of you together, because your situation is so unique because you teach together, with the 1-2 Team, um, so I wanted to get your thoughts together. The questions are aimed at the students in your classrooms.”

Q1 | Interviewer: What toys, gadgets and/or devices do girls naturally seem to gravitate towards? Any that they avoid?

Respondent A: “I know the girls far more than the boys, it’s anything, or something that’s crafty. I’m going to find more girls over there than I am boys.”

Interviewer: “Can you define crafty?”

Respondent A: “So, crayons, anything with artwork…”

Respondent B: “coloring books…”

Respondent A & B: “coloring books and making cards”

Respondent B: “I noticed that they like to role play being the teacher and student, so,
they’ll use my easel and they’ll play, like school.”

Respondent A: “and they will practice some of those school skills, even if they’re not playing school, like the girls are more apt to get out my letters where they make words. Or they’ll be more apt, actually they are going to be ones to be more apt to sit and read a book, then what my boys are.”

Respondent A: “As far as what they, I don’t know if they really avoid anything…”

Respondent B: “I don’t see them go towards the LEGO’s. Cause, like in your room, when you have LEGO’s out, it’s more like a circle of boys. Rarely, do I see a group of girls. And that’s just what I’ve observed. But, they do do puzzles”

Respondent A: “and it’s interesting, those who do go towards the LEGO’s, they will often go towards the LEGO’s. So, it’s always the same girls.

Q2 | Interviewer: What toys, gadgets and/or devices do boys naturally seem to gravitate towards? Any that they avoid?

Respondent A: “LEGO’s—that’s a huge draw”

Respondent B: “Anything they can build—blocks or the log cabins”

Q3 | Interviewer: Have you noticed if one gender comes to class more mentally prepared to work on tablets/computers?

Respondent B: “See it as equal”

Respondent A: “There’s not one gender—that does seem to impact is if they’ve had technology at home. If they’ve been exposed to it before school but as far as a gender
Interviewer: Have you noticed if one gender seems more or less engaged in class, during which academic lessons?

Respondent B: If I were to compare my group right now, I would just, it’s equal. But, I’ve had groups where I’ve had stronger, I’ve had one gender where I’d say is stronger. If I’m comparing it right now, what I’m observing it’s pretty equal.”

Interviewer: “In the past, which gender was probably more engaged?”

Respondent B: “I would say math, boys were more involved in math.”

Respondent A: “Yeah, I would agree with [Respondent B], as far as it depends on the chemistry of that particular group for that particular year. One of the things that I’ve noticed, however is that I’ve got to be really careful as a teacher because girls often times culturally are taught and expectations are such that they come to school with good student behaviors, they will sit quietly, they will follow the rules, so it’s more of, kind of I think what is you know how they’ve been taught at home, what culture expects, so it’s not necessarily that the girls are more engaged it’s just that when you look, you gotta be careful that you look to see how are the boys exhibiting that engagement, does that make sense?” … “So they may be sometimes more, movers and shakers, their attention might be as long, um they may um approach things differently, but it doesn’t mean they’re not engaged.”

Interviewer: “So, when you say ‘they’ you’re referring to boys?”

Respondent A: “yeah”
Interviewer: “and do you agree, [Respondent B]?”

Respondent B: “oh, I would totally agree.”

Respondent A: “They need, this is the other thing, boys I’ve often found, they need a lot more opportunities to express themselves with movement, and if you’re in a classroom where as a teacher you don’t have that philosophy you’re going to see boys who are less engaged.”

Respondent B: “They’re more naturally active you know it’s like, as a teacher we have to plan lessons that are active and meet their needs too, so getting them out of their seats, going to centers, tearing the instruction to them, that’s gonna relate to how they learn, which is our task everyday.”

Respondent A: “Mmmhmm, yes, yes” agreeing

Respondent B: “If we talked in front of the class everyday, and these kids never moved, I don’t think our boys would make any growth.”

*Inaudible*

Respondent A: “Yes, it would be an unpleasant, unpleasant learning experience for them”

Respondent B: “We’d have huge behavior problems”

Q5  |  Interviewer: What electronic, educational games/tools are they offered in class, if any?

Respondent B: “both genders have the opportunity to use the Chrome books.”

Respondent A: “iPads”

Respondent B: “iPads, classroom computers”

Respondent A: “classroom computers”
**Respondent B:** “SmartBoards. As far as educational games, we have um iReady, which we use, and that’s more of lessons, and there is a little game to it but it’s not really educational, I don’t think iReady has educational, the game is not…”

**Respondent A:** “it’s more of a lesson as opposed to a game”

**Respondent B:** “Correct, but they do play a little game”

**Respondent A:** “that’s a reward”

**Respondent B:** “that’s a reward”

**Respondent A:** “that’s a reward, yeah”

**Respondent B:** “They do Razkids, we have some sites that we have linked to the 1-2 team website, you know there’s that education learning one we have.

**Respondent A:** “Mmmhmm” agreeing

**Respondent B:** “We have a lot of math games that are appropriate for um first and second grade.”

**Interviewer:** “and you guys encourage a lot of those things at home too, which is good.”

**Respondent B:** “well, when they login, I tell them they have to type in 1-2 team go to those websites that I’m referring to, and click on it, so they know how to get to their iReady, their RazKids, their math stuff.”

**Respondent A:** “as far as educational games, I mean, [Respondent B] and I, I mean there’s probably not too many days that go by that we don’t have some kind of game played at some point in time during the day. You know, you can make games when you’re teaching reading, when you’re teaching math, they’re not always electronic games, but they’re different cooperative learning types of games.”
Respondent B: “But, one thing too that, we put a lot of our own time in, is making sure, you know if we’re going to use the iPads, are the apps appropriate? Are the games appropriate that we’re going to assign to them online, because sometimes we find things that are either too easy or it’s too challenging, so we have to spend a lot of our own time researching the educational games that are used online.”

Interviewer: “OK”

Respondent B: “because they might say first or second grade, but we look at it and we’re like ‘this doesn’t match anything that we’re learning or it’s too simple.’”

Respondent A: “that’s why I don’t use the iPads anymore, because the district doesn’t have the financial means to be able to buy an app, full, the complete one, so they’ll, we’ll do the lite ones where they’re free.”

Respondent B: “Hmm hmm” [agrees with Respondent A]

Respondent A: “so, a lot of those skills are kindergarten, first grade, so by the time they get to second grade…”

Interviewer: “Could you, this is just a question, but could the PTA maybe, could you approach the PTA to maybe help fund the apps?”

Respondent A: “I have no idea.”

Respondent B: “that’s the thing we’ve always thought about, we need, how do you organize that to make sure, it’s almost like each teacher needs their own folder and you are authorized to purchase the apps that you feel is appropriate—because to say that, okay only first grade is going to use this, well, you know how much technology changes, like, it might be okay this year, but next year, that’s not really a game that’s appropriate. It’s
really hard.”

**Interviewer:** “… you’d almost have to have a budget for something like that.”

**Respondent B:** “yeah”

**Interviewer:** “… to like update the apps.”

**Respondent B:** “and you have to research that app…”

**Respondent A:** “yes.”

**Respondent B:** “…I have to go in and make sure it’s appropriate for my class, so that is a ton of time.”

**Respondent A:** “yeah.”

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**Q6** |  **Interviewer:** Have you witnessed any bullying between the genders in class? If so, what specifically happened?

**Respondent B:** “…like boy verses boy or boy verses girl?”

**Interviewer:** “either really, I mean, I guess, any”

**Respondent A:** “see… I… that’s an interesting question. I… limited… I have not seen a lot of bullying, but it’s typically within the gender. Like it might be a girl bullying another girl. I’ve seen everything from being in second grade, somebody looking over and wrinkling a little nose and saying ‘why are you wearing those socks… with that outfit?’ um hmmm, so you know, yeah, I don’t know… if I’ve seen boys bullying boys… an example of that…”

**Respondent B:** “it’s more a boy bullying a girl or vice versa”

**Respondent A:** “yes, see and I…”

**Interviewer:** “no boys bullying each other?”
Respondent A: “it’s limited”

Respondent B: “well, they may do that outside of our classroom, as soon as we see a problem, before it even turns into bullying, we see a conflict. [Respondent A] and I are not going to let it be a bullying situation. Now, if it’s a bullying situation outside of school that’s beyond our control. But, I really don’t wanna see, I don’t really see that eyewitness bullying. I see more conflicts. I don’t see people purposefully treating [in audible] in the classroom during instruction because that just doesn’t happen.

Respondent A: “I think the other thing though, I think [Respondent B] and I do an awful lot to prevent it from happening in the first place. We are more than willing to take the time during the day to stop academic instruction to address that so that it never goes to that next level of where people are being intimidated by others, by classmates, um…”

Respondent B: “and I think kids feel comfortable with us too, like if there is an issue, and I can think of one your students, where I won’t mention her name, there was an issue outside at recess, mom was involved, she was questioning about what was going on and how [Respondent A] problem solved with that student, of what she needs to do when she’s faced with another student, so maybe given strategies of how to, I don’t know what the words are, like how to, not like stick up for yourself, but don’t let someone talk to you like that!”

Respondent A: “yeah, don’t be the victim…”

Respondent B: “don’t be the victim”

Interviewer: “yeah”

Respondent A: “yeah”
**Interviewer:** “Interesting. You guys, always have, in my experience, have always dealt with those situations really well.”

**Respondent B:** “I think we both have the same…”

**Respondent A:** “it’s handled…”

**Respondent B:** “…in a safe environment.”

**Respondent A:** “and those are the skills they need… for life…”

**Respondent B:** “yeah”

**Interviewer:** “yeah… forever!”

**Respondent A:** “yeah, exactly”

**Respondent B:** “Everyone wants to feel like that… I mean… you come to school, this is a safe, fun place, and if someone felt, I know that feeling, I remember kids being mean at school, that’s an awful feeling…”

**Respondent A:** “it is, yeah”

**Interviewer:** “me too”

**Respondent B:** “I think we’ve all had our own…”

**Respondent A:** “and some of that really is just, is just the nature of the beast about being a child and growing up.”

**Respondent B:** “and learning how to work with someone.”

**Respondent A:** “and sometimes, I think sometimes, society has gotten ahold of that word bullying—and like [Respondent B] said it’s a simple conflict that kids need to learn from, and it’s an opportunity to learn and then somebody’s labeled it as a bully and it’s… not really a bullying situation… and then that really gets sensationalized…”
**Respondent B:** “my kid was bullied at [school]... well, really?”

**Interviewer:** “OK”

**Respondent B:** What really happened?”

**Interviewer:** “there’s a matter of defining what actually, being bullied is. Interesting.”

**Respondent B:** “I think when conflicts are addressed... then that... that bullying is gonna get worse, then I would say that is bullying. I mean if, someone is getting bullied and no one is doing anything about it, then I think there is an issue, but I think a lot of the teachers, we try to intervene and problem solve, the guidance councilor will get involved, before it ever really becomes an issue.

**Respondent A:** “or anything more extreme..”

**Respondent B:** “yeah”

**Interviewer:** “cool, thank you.”

**Respondent A:** “you’re welcome”

**Respondent B:** “you’re welcome”
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