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# Perceptions Regarding the Use and Experience of Information and Communication Technology from Female Students in a Catholic Middle School

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LOYOLA MARYMOUNT UNIVERSITY

Perceptions Regarding the Use and Experience of Information and Communication Technology  
from Female Students in a Catholic Middle School

by

Julio C. Tellez

A dissertation presented to the Faculty of the School of Education,  
Loyola Marymount University,  
in partial satisfaction of the requirements for the degree  
Doctor of Education

2013

Perceptions Regarding the Use and Experience of Information and Communication Technology

from Female Students in a Catholic Middle School

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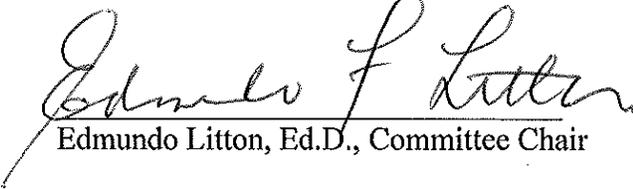
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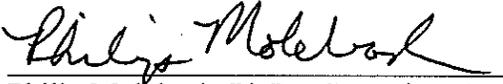
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June 3, 2013  
Date

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“Teach each other, and advise each other, in all wisdom. With gratitude in your hearts sing psalms and hymns and inspired songs to God” Colossians 3:16

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DEDICATION

To my wife, Laura Lynn Tellez

And our children

Anna Rose, Elijah Michael, and Rebecca Ann Tellez

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## ABSTRACT

Despite advancements in the search of equity, females still struggle to find acceptance in the field of information and communication technology. Research indicates that differences in perception of ability of ICT use begin to manifest in the middle school level. This mixed methods study explored the experiences and perceptions of 46 middle school females and males to expose possible influential factors about the use of ICT by females. The dissertation study occurred in two phases. The first phase involved a survey that was given to the entire middle school. Data from the survey provided participants for the second phase, which involved a focus group discussion with six female students in grades 7 and 8 to examine influential factors in the use of ICT. Findings indicated statistically significant differences between males and females exist at the study site. Females were more likely to (a) access ICT at the after school program and at a relative's house; (b) identify a relative as an important influence in ICT; (c) share created media; (d) declare higher experience with Photoshop; (e) seek medicine as potential career and less likely to (f) report building a robot or invention using technology; (d) use ICT to play multi-user online games; (f) express interest in action, competition, and graphics in games (h) know terms such as firewall and torrent; (i) pursue careers as computer programmers, engineers, or computer game designers than their male counterparts. The findings support the need for school leadership establishing or enhancing a technology integration program to consider the difference between males and females as foundational cornerstone in the technology integration program.

## **CHAPTER ONE**

### **BACKGROUND**

Technological advances have shaped the culture of nations for thousands of years. In time, those advances have also shaped the modern world. The computer and the Internet today are two of the most recent technological advances that have transformed the world through the utilization of information and communication technology (ICT) by people throughout the globe (Kolikant, 2009). ICT reached the field of education and it was not without implications for leaders within the different fields of education. As Galla (2010) notes, issues contending with the integration of technology include “teacher preparation and beliefs about technology and professional development” (p. 1) and student access to this technology, otherwise known as the digital divide. Creating a technology integration plan that will improve on academics is not only necessary for the sustainability of Catholic schools but it is essential to meet the needs of the 21st Century learner. This also denotes implications for leadership in their decision process to cultivate a community that embraces ICT.

#### **Background of the Problem**

The integration of ICT in Catholic schools has been on the rise as research reveals the benefit of this integration. As a leader of the technology team at Saint Mary Star of the Sea (a pseudonym) and a member of Computer Using Educators (CUE), I decided to attend a conference in a Southern California city to further expand my knowledge on the current technology available for our students. During the conference, a poster session entitled “Girls Do Math, Science and Technology” captured my attention. In this program, seventh grade females attend a weeklong camp taking part in projects involving science, technology, engineering, and

mathematics (STEM). This program is geared toward low socio-economic status, seventh grade females. Being a strong believer that technology, one of the major STEM components, contributes an important role in the learning process of the modern day student, I was intrigued by the notion that implies females require a specialized camp to engage in the use of math, science, and technology. This statement inundated my thoughts throughout the remainder of the conference.

Questions arose such as why do females need a segregated instruction of math, science, and technology? Is there an advantage that males have over females regarding the integration of the aforementioned subjects? Why females in seventh grade? As a father of two girls and one boy, these questions prompted me to research the difference between the engagement of females and males as it relates to ICT, if any. As a Catholic school educator, these questions prompted me to research the benefits and possible challenges of the integration of ICT in middle school classrooms. As a leader of the technology team at my school site, these questions prompted me to investigate the different technological tools that students could access in order to achieve the rigorous academic curriculum set forth by Catholic schools.

Prior to continuing, it is important to define the term information and communication technology (ICT) for clarity. Researchers have frequently used ICT and computers synonymously. Elen et al. (2010), found that there is no clear distinction between the term “computer” and “ICT” when using word associations to separate the two terms. One of the few distinctions occurs when the term “computer” is associated with desktop or laptop in which computers are seen more as the mediums for data retrieval and ICT are mostly associated with communication (Elen et al., 2010). Further, ICT includes items such as cell phones, tablets,

computers, and game consoles, in addition to things such as the Internet and software that help facilitate communication and collaboration. In short, computers are a medium through which information can be exchanged, thus they are included in the vast number of tools in ICT. For the purpose of this study, the term ICT will be used as a term that encompasses the use of computers, Internet, and other forms of technology-mediated communication.

Benefits of ICT range from increased collaboration in the classroom (Smith, Hardman, & Higgins, 2007), to increased engagement (Heemskerk, Dam, Volman & Admiraal, 2009; Volman, van Eck, Heemskerk, & Kuiper, 2005), and increased academic achievement (Sokal & Katz, 2008) especially for female students when the ICT used is gender inclusive (Heemskerk et al., 2009; Mammes, 2004). Thus females appear to require instructional activities and interesting content for them to be more engaged in using the ICT (Heemskerk et al., 2009). In a study conducted by Volman, van Eck, Heemskerk, and Kuiper (2005) regarding ICT, it was noted that both genders engage in the use of ICT with the same consistency in the primary levels, ages six through 12, in the Netherlands, and it is in the secondary level, ages 12 through 18, that a discrepancy becomes more noticeable. Relating these ages to the United States grade system, this equates to 7<sup>th</sup> through twelfth grade where the discrepancies become evident. It is therefore prudent to conduct research in the early stages of these United States grade levels to determine possible factors that deter or encourage female students to become involved in the use of ICT. Further, it is imperative to address the implications for leaders as they establish an appropriate technology integration program that takes into consideration the perceived abilities and skills of all constituents.

Just as benefits of technology integration become apparent, challenges also emerge, and they range from access and using the existing technology to the perceived abilities of use by females at various levels of these technology. Researchers Ajelabi and Agbatogun (2010) noted that teachers in the private school sector deemed the introduction of this kind of ICT more favorably than the public school counterparts. In addition, Dosen, Gibbs, Guerrero, and McDevitt (2004) noted that, in general, private schools tend to be well equipped with ICT and need to address the issue of the digital divide by providing access to these tools to both faculty and students. Gibbs, Dosen and Guerrero (2008) state that although most Catholic schools were well equipped with adequate ICT, the majority of the faculty were not as engaged in its use. Fewer teachers used it to engage students directly, and overall, “Catholic school faculties, as a body, are not using technology extensively as an instructional tool” (p. 184).

With females perceiving their skills and confidence lower than their male counterparts at the secondary level, it is important to conduct research in the field of ICT use and perception of ability at the middle school level, which is where research alludes to a difference in engagement beginning to emerge (Mercier, Barron, & O’Connor, 2006). In the United States, the middle school age ranges from 11 to 14 years, at times ranging from 10 to 15 due to differentiating circumstances, and covers grades six through eight. The remainder of the study will henceforth address students from ages 11 through 14 as middle school students.

Research further suggests that a difference in approach toward technology (use and perception of ability) by males and females can create a disadvantage for females when it comes to ICT because of their lower confidence and negative perception towards it. As Miliszewska and Moore (2010) posit, the use of ICT tends to be “institutionally based” (p. 161) and because

most of these perceptions occur in the secondary level and adulthood and not in the elementary grades (Broos, 2005; Hargittai & Shafer, 2006; Heemskerk et al., 2009; Kahveci, 2010; Lee & Yuan, 2008; Volman et al., 2005), it begs the question: What are the experiences of middle school females that create a less than favorable perception of ICT or what are some influential factors that may contribute to these perspectives?

Mammes (2008) suggests that in order for females to be interested and engaged in ICT, technology education must take place and it is most essential in the “elementary school because it is the earliest opportunity for curriculum intervention” (p. 89). Research shows, however, that there is no difference in perceived ability in the elementary grades (Volman et al., 2005), and there are little to no differences in middle school (Jackson, von Eye, Fitzgerald, Zhao, & Witt 2009) yet there may be other influential factors that deter females from seeking further education in ICT (Mercier et al., 2006).

### **Statement of the Problem**

Research has been conducted in the areas of technology integration and gender (Broos, 2005; Chou, Yu, Chen, & Wu, 2009; Lapayese, 2012; Lee & Yuan, 2010; Mammes, 2004; Volman et al., 2005), yet most research involves studies whose findings reveal a higher benefit for males than for females (Hargittai & Shafer, 2006; Heemskerk et al. 2009; Hwang, 2010; Kahveci, 2010; Smith et al., 2009; Sokal & Katz, 2008). Despite decades of struggle for equity regarding the gender gap through policy, such as Title IX, females remain underrepresented in the workforce in the fields of science, technology, engineering, and math (Robelen, 2012). In particular in the technology aspect, there appears to be little difference in ability to use ICT (Chou et al., 2009; Mercier et al., 2006), however the discrepancy in perception becomes evident

from adolescence into adulthood (Hargittai & Shafer, 2006; Kahveci, 2010; Volman et al., 2005). In addition, Heemskerk, Dam, Volman, and Admiraal (2009) noted that males and females approach the use of ICT differently, alluding to the notion that this difference approach may cause the perception of ability to use ICT in the future.

With the majority, if not all of the elementary schools in the Los Angeles Archdiocese being co-educational schools, the move toward the integration of ICT in Catholic schools may prove to be a disadvantage to female students because research in the intersections of technology, gender, and Catholic schools is scarce. This poses an issue for leaders in Catholic schools seeking to create a technology integration program. Galla (2010) and Gibbs, Dosen, and Guerrero (2008, 2009), conducted research with technology integration and Catholic schools; however, the gender component is lacking from these studies. In addition, research noted that despite having access to adequate ICT, the tools are not used adequately by teachers or students (Gibbs et al., 2008), and when ICT is used it must be implemented by having staff participate in professional development (Galla, 2010; Gibbs et al., 2009), and it must have the support of all constituents (Galla, 2010). Although providing ICT and training to staff may be facilitated by the school administration, it is futile if teachers, as classroom leaders, do not utilize this information for the benefit of their students. In addition, ICT integration is irrelevant if the constituents' voices are not taken into consideration. The promise of academic success will be nullified if influential factors that promote or deter student use of ICT are not addressed, in particular taking the mission of Catholic schools to educate the entire child into consideration.

Only recently, Lapayese (2012) studied gender and technology with female teachers and the researcher suggests studying how gender-specific media influences academics. It is

therefore, imperative to identify the extent to which Catholic school leadership and administration consider student experience and perception of ability to use ICT when establishing a technology integration plan.

### **Purpose of the Study**

The purpose of this study was twofold. The first goal was to investigate experiences and perceptions of male and female students in a Catholic middle school regarding the use of ICT. The second goal was to provide a voice for females in the same school through which they can express their perceptions of ICT use and in turn use these expressions as a way to promote change in ICT integration. It also shifted beyond the scope of having students self-identify as computer users as Mercier, et al. (2006) suggested, and investigated the self-perceptions of middle school females on their ability to the use ICT. Further, it found influential factors that may contribute to the experiences and self-perceived views of middle school females regarding the use of ICT. These influential factors provided clear evidence to leaders in the school setting and influence their decisions in establish a technology plan at their sites.

The school for the proposed research study is the only Catholic school in a small suburban area within the Los Angeles Archdiocese jurisdiction. There are currently 50 middle school students out of which females comprise of 46%. The school site also introduced a technology program in the 5th grade through 8th grade levels that involved the use of tablets. With most of the research regarding technology being conducted in co-educational settings at the primary and secondary level (Gibbs et al., 2008, 2009; Hargittai & Shafer, 2006; Heemskerk et al., 2009; Hwang, 2009; Kahveci, 2010; Lee & Yuan, 2010; Rudasill & Callahan, 2010; Smith et al., 2007; Volman et al., 2005), it was imperative to conduct the research in a middle school

setting to compare the results with research that is pertinent to this age group (Chou et al., 2009; Jackson et al., 2009; Mercier et al., 2006; Miller & Robertson, 2001).

### **Significance of the Study**

This research was significant because of the evident gap in research in middle school grades, in particular Catholic school, regarding the use of ICT. When Mercier et al. (2006) researched the image of self and others as computer users, it was noted that “there is a cultural stereotype, which the majority of students replicate, that knowledgeable computer users are male, or at least that knowledgeable computer users are not female” (p. 343). This research, however, was conducted in public schools. Research on the perceptions of students regarding ICT in the elementary grades (Chou et al., 2009; Hargittai and Shafer, 2006; Heemskerk et al., 2009; Kahveci, 2010; Sokal & Katz, 2008; Volman et al., 2005) as well as high school and college (Mammes, 2004; Rudasill & Callahan, 2010; Volman et al., 2005), technology in Catholic schools by Galla (2010), Gibbs et al. (2008, 2009) and United States Department of Education (Planty et al., 2009), and on technology integration and gender has been conducted recently, however there is lack of research in which all three elements, Catholic schools, technology, and gender intersect. Further, the research of technology in Catholic schools (Galla, 2010; Gibbs et al., 2008, 2009) was also minimal and required further investigation. School leadership, as well as educators in Catholic and public schools will find the information from this research beneficial when making a step towards integrating technology in the school as the information derived from this research will help inform what the female population at the middle school level requires in order to be successful in achieving their individual, school, academic, and personal goals as they relate to ICT integration.

## **Conceptual Framework**

Concerned with the struggles of females towards equality and equity in the field of technology, a critical lens for this study is from the perspective of feminist theory. Several branches of feminist theory will be discussed along with a branch of feminist theory addressed by Hawthorne and Klein (1999) as Cyberfeminism. Cyberfeminism promotes a female-centered perspective about technology that advocates empowerment through the use of ICT. This approach will enable this case study to provide female students in the middle school a voice to demonstrate their perceptions of issues or pedagogy that prevents them from becoming involved to the same extent as males in the field of technology. A second approach for this research is the identity control theory. Explained thoroughly by Nach and Lejeune (2010), it is the way that people identify and create meaning about who they are and their role in society through personal perceptions and environmental stimulations:

According to identity control theory, if, in an interactive setting, people perceive their reflected identity meanings to be congruent with the meanings in their identity standard, they will maintain that alignment by continuing to act in the same manner that is producing those perceptions of the self. (p. 619)

Since the research involves measuring the self-perception and experiences of female students in regards to the use of information and communications technology, identity control theory allowed this study to investigate possible factors that influence the perception or experiences of female students.

## **Research Questions**

The guiding questions for this research are as follows:

1. What are the perceived experiences of female students in a Catholic school at the middle school level regarding the use of information and communication technology in comparison to male students?
2. What factors influence uses and perceptions of information and communication technology by middle school female students?

## **Research Design and Methodology**

This study required a mixed methods approach for various reasons. The quantitative phase of this research provided two main objectives. First, a survey involving the accessibility, experience, perception, and interest in ICT use determined a general attitude toward ICT by both female and male students. In conjunction with the aforementioned, a survey that encompasses student self-perceptions and abilities was essential. A modified version of the Access, Interest, and Experience Survey developed by Barron, Walter, Martin, & Schatz (2010) was the instrument used to obtain data measuring abilities, engagement, and confidence with ICT. Descriptive statistics provided a current depiction of the perception of female students in comparison to male students across all three levels of middle school (grades 6, 7, and 8). The second objective of this quantitative section was to provide possible participants whose perceived abilities in using ICT is similar thus providing an ideal focus group (Hatch, 2002).

To acquire an understanding of the experiences of females and their technology use in the Catholic school at the middle school levels, research with a focus group was essential, thus evoking the necessity for the qualitative phase of this research. The focus group provided an in-

depth look into motivating factors behind the positive influences or deterrents for female students in their ICT engagement. Providing an emic view into the experiences and perceptions of female students in Catholic schools at the middle school level required interviews of this group. Further, Stake (2005) posits that a research such as this must include triangulation to “clarify meaning by identifying different ways the case is being seen” (p. 454). Through the use of different measuring tools, such as the survey and the data from the focus groups, this triangulation was made possible.

According to Fetterman (1998), qualitative research aims to explain the culture through the emic perspective (middle school females). The survey from the quantitative research established a baseline of perceived technology abilities by all students. This provided the study with a general perception of the female students, which then informed and guided the observations and focus group discussions with the middle school female students. By emphasizing story telling (Stake, 2005), female students were given a voice to express their experiences and perceptions with the use ICT. This notion was supported by Hawthorn and Klein’s (1999) concept of cyberfeminism by allowing the female students engage in the change to improve their experiences with ICT.

### **Limitations, Delimitations, and Assumptions**

Limitations to this research varied. First, the time allotted for this study constrained the number of focus group interviews and time observing students in the classroom or computer lab interacting with the ICT. The second aspect was the positionality of my role as the researcher in relationship to the proposed site. As a current employed faculty member, I have a biased

perception regarding the integration of ICT. Further, I have been the educator of the participants in the previous years.

Delimitations to this research include the school site. In choosing my own school site as a research base, I have omitted other sites, which may reflect a larger population of participants whose experiences and perceptions regarding the use of technology may differ from that of my school site. This may compromise the generalizability of the findings.

An assumption of this research site is that there are differences in perceived abilities as the research suggests. These assumptions, however, are not based on research within the school and account only for my experience with the students as their teacher.

### **Definition of Terms**

Information and Communication Technology (ICT):

Tools such as social websites, email, and electronic reference resources. The term ICT as described by Elen et al., (2010) includes the “manipulation and communication of information” through the use of computers, cellular phones, radio, television, and Internet (p. 228).

Middle School Level:

Grade levels that separate elementary education from secondary education in the United States typically addressed by grades 6, 7, and 8. Ages for students in these grades range from 11 to 14 years and in rare cases ranging from 10 to 15 years.

### **Organization of the Study**

This study will examine the self-perceived skills of middle school female students through surveys, interviews, and observations. Chapter One has provided background

information, the statement of the problem, the purpose of the study, significance of the study, research questions, along with a brief description of the methodology for the study, limitations, and delimitations. In Chapter Two, a comprehensive examination of literature regarding the integration of technology, technology in Catholic schools, and the intersection of gender and the perception of the use of technology by female students will be provided. Chapter Three provides a thorough explanation of the research design. The mixed methods design will explain the importance of the quantitative and the qualitative instruments for this research. Chapter Four will analyze the quantitative data to determine if there are significant differences between males and females and the qualitative data according to a holistic approach as described by Fetterman (1998). This study will conclude with Chapter Five, which will offer a summarization of the findings along with the implications and future suggestions for the implementation of technology in Catholic schools.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

A review of literature for this study will expose the differences between the genders regarding the use of information and communication technology (ICT). These differences include perceived skills by the genders and the use and integration of ICT by teachers and students. In addition, the innate connection to the fundamental principle of Catholic education will be reviewed. First, a brief purpose statement will provide an introduction and the reasons behind this study. A brief statement on the historical background on the topic of gender, technology, and Catholic schools will follow, continued by an explanation of the conceptual framework. Finally, a review of the literature regarding gender differences, ICT, Catholic schools and the intersection among all three entities will conclude the chapter.

#### **Purpose Statement**

The purpose of this literature review is to provide a reason of the need to investigate the self-perception of female students in Catholic schools at the middle school level regarding their experiences with the use of ICT. As mentioned above, this literature review will provide a brief overview of the conceptual framework that guides the focus of this research. It will provide an overview of gender differences, which provide evidence of biological and cognitive differences among the genders, age related perceptions on ICT, developmental factors, and differences in interaction with ICT, all of which emphasize the justification for research of ICT and middle school females. In addition, it will provide a review of literature involving Catholic schools and ICT which will then present a clear picture of the lack of disconnect and intersection among all three elements of this research, ICT, female students, and Catholic schools.

Researchers Mercier et al. (2006) examined the perception of sixth and eighth grade students regarding “knowledgeable computer users” (p. 335) in which students answered Likert-responses to questions about their involvement with computers. Further, they were asked to describe their perception of what a “knowledgeable computer user” would typically look like through a drawing and/or using words. The majority of students, both male and female, described the “knowledgeable computer user” as a male either through drawings or written depictions. The second study involved interviews in which the discussion of computer user was continued. This part delved deeper into the notion of a “computer-type person” (p. 339) in which students were asked if there was a computer-type person and if they perceived themselves as such users. Once again, both genders reported that there is such a thing as a computer type person (males 78% and females 75%), however, when reflecting how this applied to a perception of themselves, 60.6% of males and 64.6% of females did not view themselves as a computer-person.

This study proceeded beyond the scope of having students self-identifying themselves as computer users as explored by Mercier et al. (2006) and investigated the self-perceptions of middle school girls on their ability to use ICT. Further, it sought to find influential factors that may contribute to the experiences and self-perceived views of middle school girls regarding the use of ICT. Empirical data demonstrates improvement in attitudes toward technology (Chou et al., 2009; Gibbs et al., 2009; Heemskerk et al., 2009; Kahveci, 2010; Mammes, 2004; Meece, Glienke, & Burg, 2006) yet there is minimal improvement in academics linked to technology and there is little to no research on the role of technology, gender and a Catholic school environment.

## **Historical Background**

Since technology emerged in the realm of education, numerous researchers have investigated and discovered that there exists a plethora of differences among males and females in the way ICT (information and communication technology) are used, as well as in perception of ability regarding the use of these tools (Ajelabi & Agbatogun, 2010; ChanLin, 2007; Chou et al., 2009; Coyl, 2009; Hargittai & Shafer, 2006; Heemskerk et al., 2009; Jackson et al., 2009; Kahveci, 2010; Lamothe, 2011; Mammes, 2004; Mercier et al., 2006; Rudasill & Callahan, 2010; Volman et al., 2005). Studies on ability and perception of ability to use ICT are minimal at the elementary level (Chou et al., 2009; Coyl, 2009; Mammes, 2004); however, the purpose for which the technology is used varies (Smith et al., 2007; Sokal & Katz, 2008). Students in middle school tend to demonstrate a stereotypical view of a computer user as a “male with glasses” and a large percentage of males and females do not perceive themselves as computer users (Mercier et al., 2006, p. 343). In high school, female students perceive their ability to use ICT to be less capable than their male counterparts (Heemskerk et al., 2009; Kahveci, 2010; Lee & Yuan, 2010). There is, however, no difference in their actual ability (Kahveci, 2010) and yet, the perception of inability or inadequacy continues into adulthood (Broos, 2005; Gorder, 2008; Hargittai & Shafer, 2006; Hwang, 2010). These findings have implications for Catholic schools and their mission to provide an equitable education to every student.

Catholic schools were founded on the principle to educate all students, in particular, marginalized students (Watzke, 2005; Youniss & Convey, 2000). Thus if a group is not being well represented in education, such as females, the mission of a Catholic school becomes compromised. Catholic schools have attempted to integrate technology into education and have

discovered that it is not without challenges. Gibbs et al., (2008) found that “most Catholic school faculties have some individuals who are using technology in a wide variety of ways, but that overall, most members of the faculty are not as engaged” (p. 182). Further, only teachers that participated in professional development workshops, which were geared toward technology integration increased their use and engagement in technology (Gibbs et al., 2009). Technology integration in Catholic schools is essential to continue with the tradition of educating the entire student with religious and academic rigor (Youniss & Convey, 2000) and ensuring that professional development for teachers occurs is necessary to sustaining a technology plan in Catholic schools (Galla, 2010). Since it has been shown that female students perceive themselves less capable than their male counterparts, female students are at a disadvantage in exploring a career in the field of ICT. It is important for Catholic schools to investigate the aforementioned discrepancies in order to provide females with an opportunity to decide their own career choice be it far, or near that of a technology-based career.

### **Conceptual Framework**

Females continue to struggle towards equity and equality in the field of technology (Rosser, 2005; Sadker & Silber, 2008). An appropriate and critical lens for this study must be from the perspective of feminist theory. In addition, the theory of self-efficacy (which looks into the way people react to their environments) and identity control theory (focuses on the individual ability to create meaning out of those reactions) were used as lenses through which the study sought to find the perceptions and influential factors of ICT use by female students. This section will describe the mentioned theories and will provide a justification for their use in this study.

**Feminist theory.** Rosser (2005) focused on three aspects of the nexus with women and ICT, which included, “women in the information technology workforce, women as users of information technology, and women and information technology design” (p. 1). Because this study seeks to investigate the perception of ICT use and ability by female students, along with possible factors that influence these perspectives, the section of “women as users” of ICT will be explained in this section. Rosser (2005) proceeded to elaborate on numerous lenses within feminist theory. Liberal feminism, existentialist feminism, and cyberfeminism will be the different branches that will be noted for this study and a rationalization for their use as part of the conceptual framework follows.

***Liberal feminism.*** This lens proposes that females are suppressed because there are unjust discriminations and thus, it seeks to achieve “equal consideration without discrimination on the basis of sex” (Rosser, 2005, p. 2). This lens notes that since many of the developers of existing technology are male, the technology is mostly useful for the male perspective (Rosser, 2005). Assuming this lens provides an accurate representation of the current state of ICT, it is important to investigate the perception of female students regarding these tools. Technology that is predominantly geared towards a gender inadvertently places the other gender at a disadvantage.

***Existentialist feminism.*** In addition to liberal feminism, this lens proposes that biological differences are not the causes that create a disparity in the use of ICT, but it is the value that society assigns to the biological differences that creates the disparity (Rosser, 2005). Studies involving gaming consoles (Miller & Robertson, 2010) and the use of interactive whiteboards (Smith et al., 2007) exemplify this lens. Gains in self-esteem were noted in Miller

and Robertson (2010) in conducting a study with the use of game consoles, however, the achievement was not segregated by gender. With an added value to technology for financial profit (Rosser, 2005), it is female students that once again, find themselves at a disadvantage. This is because according to Rosser (2005), the gaming industry is reluctant to change a formula that generates financial stability and whose main contributors are male, this section excludes women as users of ICT.

**Cyberfeminism.** A subgroup of feminist theory addressed by Hawthorne and Klein (1999) is known as Cyberfeminism, which provides a female-centered “perspective that advocates women’s use of new ICT of empowerment” (as cited in Rosser, 2005, p. 17). In essence, this approach empowers females to voice their perceptions, experiences, and/or practices that may thwart their involvement in the field of technology through the use of ICT. The purpose for using this lens is to provide female students with the opportunity to voice their perspective on the use of ICT through the use of ICT in terms of completing an online survey and participating in a focus group with the use of current ICT.

**Self-efficacy theory.** The second theoretical component is the theory of self-efficacy first proposed by Bandura and Adams (1977). Meece et al. (2006) utilized different theories regarding gender and motivation, two of which include “contemporary expectancy-value theory” and “self-efficacy theory” (p. 358). Contemporary expectancy-value theory involves the social, parental, and educational expectations that are an important part of the way children perceive the world regarding their gender role (Meece et al., 2006). For example, a male youth may be expected by his parents to play with toy cars and balls whereas a female youth will be expected to play with dolls. These views can be shared by society and have a tendency of being

reinforced at school. In essence, this theory reinforces the notion of nurtured gender differences. As Mercier et al., (2006) noted, both males and females frequently depict a computer user as a “male with glasses” (p. 339), supporting the perception that technology is a male-dominated field in which females struggle to gain equality.

Perceiving ICT as a male dominated field, it is essential to consider Bandura and Adams’ (1977) theory of self-efficacy. This theory expresses the influence of a student’s own abilities to achieve goals (Meece et al., 2006), to be attentive, make learning relevant, have self-confidence and be satisfied with results (Kahveci, 2010), and to have self-determination (Hwang, 2010). All of these are combined in the area of motivation and attitude toward learning. Through the use of this theoretical lens, the study will provide a way to access the potential factors and influences that female students are subject to in the use of ICT and how this shapes their perception of their ability in the field. Bandura & Adams (1977) posit that self-efficacy theory affects the choices that people make regarding their activities and behavior, the amount of energy they exert, and their persistence in the face of obstacles. With this theory in mind, it is important to determine the self-efficacy of female students regarding the use of ICT to determine the possible factors that influence such perceptions.

**Identity-control theory.** A third lens for this research is the identity control theory. Originally a derivation identity theory, identity control theory is the idea that behavior is a reaction of an individual to a classification provided by society (Burke, 2007). Explained thoroughly by Nach and Lejeune (2010), it is the way that people identify and create meaning about who they are and their role in society through personal perceptions and environmental stimulations:

According to identity control theory, if, in an interactive setting, people perceive their reflected identity meanings to be congruent with the meanings in their identity standard, they will maintain that alignment by continuing to act in the same manner that is producing those perceptions of the self. (p. 619)

Since the research involves measuring the self-perception and experiences of female students in regards to the use of information and communications technology, identity control theory allows the researcher to investigate possible factors that influence the perception or experiences.

### **Overview of Gender Differences**

Reviewing the concepts of gender and technology use and integration will increase our understanding how students learn and what motivates them, regardless of gender.

Administrators, educators, and other members of the academia will benefit from the research study because in developing plans for the integration of technology, they will be able to consider the issues of gender and meet the needs of all learners. Further, a strong limitation to this review is the lack of research that encompasses all three areas. There is no lack of research behind gender differences and integration of technology, but their role in the Catholic school environment remains elusive.

Gender differences are one of the areas frequently and quickly recognized by educators and those involved in academia. The differences are numerous, however this investigation will address biological and cognitive differences, differences in male stereotyped domains (math, science, and technology), and perceived technological skills. Further, ICT use and integration by teachers, students and specifically how each gender perceives technology will be addressed.

Last, the role of ICT in Catholic schools will also be examined.

**Stereotypes and generalizations.** Prior to addressing issues regarding differences between the genders, a clarification must be made especially to distinguish between generalization of genders and gender stereotype. Stereotypes have a negative connotation and tend to be given to every single person in a given category, for example one stereotype is that males struggle in language arts and females dislike physical sciences (Sadker & Silber, 2008). In contrast, a generalization may be made about certain people that share similar characteristics, however, there are exceptions and the shared characteristics tend to have a positive connotation. For example, females are good in language arts and males enjoy technology more than females (Sadker & Silber, 2008). Therefore, it is appropriate to address these differences as generalizations instead of stereotypes.

**Biological and cognitive differences.** Physical differences between the genders are typically noticeable. Biological differences were examined by Halpern et al. (2007) and found that there are significant differences in the brain structure. Females have a higher percent of gray matter over all, whereas males have a higher percentage of gray matter on the left and “the percentage of cerebrospinal fluid was higher on the right,” which provides nourishment and cushioning for the brain (Halpern et al., 2007). This physical difference may attribute to the difference in processing information and engagement in academic content. Sadker and Silber (2008) reported similar findings and yet another difference in which they state that females “have a larger corpus callosum relative to cranial capacity” than males (p. 39), which helps in the information exchange between the hemispheres. These biological differences encompassed within the domain of the brain attribute to the cognitive differences and the different ways that information is processed. These findings support findings from other researchers regarding the

use or purpose of ICT between males and females (Heemskerk et al., 2009; Smith et al., 2007; Volman et al., 2005). They do not, however, support a negative perception towards the use of ICT. As Rosser (2005) noted, existentialist feminism negates the aforementioned findings and proposes that it is the value of these biological differences that society places on them that creates a disparity.

In the elementary years, differences to the perceived abilities to use ICT tend to be minimal, however, the largest differences occur by the beginning of high school (Halpern et al., 2007). The categories with higher discrepancies are verbal and nonverbal abilities and visual-spatial abilities. Research shows that females have an advantage in verbal and nonverbal abilities than males and that males have an advantage over females in visual-spatial abilities (Halpern et al., 2007; Sadker & Silber, 2008). Sadker and Silber (2008) expand on the differences by pointing out the motor skills and perception skills. Females are better at hearing, have better fine motor skills, and have a better memory, whereas males have a better visual perception and have better gross motor skills (Sadker, & Silber, 2008). Since most ICT can be accessed through screens and monitors and males tend to be visual learners, they embrace the use of ICT more readily than females.

In the analysis of literature, Spear (2000) posits that adolescence, age 12 through 18, is manifested in maturational changes in the brain and focused on five topics involving behavioral changes, drug use, stress, hormonal changes, and neural alterations. Spear (2000) explains that during this stage, adolescents tend to perceive a higher number of conflicts with their parents, take higher risks to explore adult behavior, which includes using drugs, and their decision making tends to be vulnerable to stress. Females in particular tend to be more vulnerable to

stress and to perceive events more stressful than males. In addition, adolescents eat more and sleep less, demonstrate extreme moods, go through pubertal stages, and report that they are “most happy when talking with peers” (p. 420). This last statement alludes to the notion of the strong need for students to expand and maintain their social development. A discussion on this aspect and social media will be addressed in the section with gender differences and ICT. The biological and cognitive differences appear to emerge during adolescence, which ages vary according to research, however, it is typically noted that adolescence ranges from 10 to 18 years of age.

**Development during adolescence.** Brumback, Arbel, Donchin, & Goldman (2012) noted that during adolescence (ages 8-13) females “have a shorter latencies,” or response in decision tasks, and “smaller amplitudes,” or level of resources allocated to the tasks (p. 1331). These were a result of comparing female and male responses using word stimuli. Further, this latency diminishes and amplitude magnifies for both genders as age and pubertal status increase. For females, the improvement occurred as they proceed through puberty-related changes and for males as they advance in age. This suggests more efficient information processing for females. Brumback et al., (2010) posits that an emphasis on gender needs to be considered “whenever developmental issues are addressed” (p. 1336).

In addressing adolescent development it has been noted that depression is a factor that both males and females contend with during their pubertal development process. Researchers Marcotte, Fortin, Potvin, and Papillon (2002) used numerous variables in an attempt to understand this common symptom during adolescence. Based on their results on self-reported answers to symptoms of depression, instrumental (e.g. ambitious, analytical, assertive) and

expressive (e.g. affectionate, gentle, loyal) characteristics related to gender roles, pubertal status, life events, satisfaction with self-image, and self-esteem, it was noted that females report higher levels of depressive symptoms, relate more expressive characteristics, have a more negative body image, have higher numbers of stressful life events, are more advanced in their pubertal status, and report a lower self-esteem than males.

The girls adopted more expressive characteristics than did the boys,  $F(1, 423) = 67.41, p < .001$ , whereas the boys adopted more instrumental characteristics than did the girls,  $F(1, 423) = 14.00, p < .001$ . The girls also reported a more negative body image,  $F(1, 423) = 26.59, p < .001$ ; a lower self-esteem,  $F(1, 405) = 6.50, p < .01$ ; a higher number of negative stressful life events,  $F(1, 397) = 8.86, p < .01$ ; and a more advanced pubertal status,  $F(1, 417) = 132.71, p < .001$  than did the boys. (p. 32)

In addition, when age was factored in the analysis, it was noted that younger groups had more positive body images, a higher self-esteem, and less stressful events. Taking these factors into consideration when discussing gender differences during adolescence is essential as Marcotte et al., (2002) note, “these results support the hypothesis that body image, self-esteem, and negative stressful life events mediate the relationship between pubertal status and depressive symptoms during the transition to high school” (p. 36). The results on depressive behaviors were confirmed by other researchers (Edwards, Rose, Kaprio, & Dick, 2011). However, at age 12, males and females tend to show the same depressive symptoms.

Some of these symptoms may be attributed to the increase use of social media (Farber, Shafron, Hamadani, Wald, & Nitzburg, 2012). A great percentage of adolescents tend to spend some time on social sites while at the same time facing challenges such as “sleep deprivation, social anxiety, aggression, Internet addiction, and susceptibility to the influence of online advertising” (p. 1226). Despite these challenges, adolescents tend to prefer social media because it allows them to continue socializing while at the same time providing a “safer emotional”

separation that face-to-face conversations would require (p. 1228). In addition, adolescents tend to keep positive social interactions, although they tend to be only superficial (Farber et al., 2012).

**General differences in ICT.** The use and integration of ICT also involves vast amounts of empirical data with minimal qualitative research. In technology, a vast number of researchers have made significant contributions regarding this area. Research also revealed the reluctance of females to consider themselves capable of working with ICT (Broos, 2005; Hargittai & Shafer, 2006; Heemskerk et al., 2009; Hwang, 2010; Kahveci, 2010; Mammes, 2004; Sadker & Silber 2008; Volman et al., 2005). In the elementary school level, Mammes (2008) found that there were differences in the intensity of interest between females and males. This quasi-experimental design noted that prior to treatment (technological training), there was a significant difference between the genders and their interest in technology, mainly males having a positive interest and females a negative interest in ICT, yet this perspective changed after the treatment as implemented (Mammes, 2004). In addition, it was noted that females had a significantly different interest, frequency of use, and an emotional relation to ICT in comparison to males (Mammes, 2004).

Researcher Ingalore Mammes (2008) suggests that in order for females to be interested and engaged in technology, technology education must take place and it is most essential in the “elementary school because it is the earliest opportunity for curriculum intervention” (p. 89). Research shows, however, that there is no difference in perceived ability in the elementary grades (Volman et al., 2005), and there are little to no differences in middle school (Jackson et al., 2009) yet there may be other influential factors that deter females from seeking further education in ICT (Mercier et al., 2006).

Further, Mercier et al. (2006) also note that there is a difference in student perception, when it comes to seeing themselves as being computer users. A large percentage of female students, 64.6% did not consider themselves as computer users versus 60.5% of males and 16.7% of females considered themselves computer user versus 21.1% of males perceiving themselves as computer users (Mercier et al., 2006). Jackson et al. (2009) also found supporting evidence to this trend by noting that twelve-year-old females tend to utilize the Internet for communication more than males, yet males utilize the Internet for video games.

The theme continued in secondary school, however, as Kahveci (2010) found that although females did not view ICT as something negative, they felt less confident in using ICT. Although these perceptions towards ICT appear to be favorable towards men, there is little difference in actual ability to use these tools (Hargittai & Shafer, 2006). In a study of adult learners and online perceived and actual skills by Hargittai and Schafer (2006), the researchers noted “that there was no statistical significant difference between men’s and women’s ability to find content on the web” (p. 442). There was, however, a perception by females that they were less skilled in using the Internet than their male counterparts. Further, it was stated that no male selected “novice” as a choice to describe their online skills and that no female selected “expert” as a choice to describe their online skills (Hargittai & Schafer, 2006).

Broos (2005) noted that “men (10.1%) perceived themselves more than women (2.2%) as being ahead of others with respect to computer use, whereas more women (62.3%) than men (54.8%) perceived themselves as being behind others” (p. 25). Heemskerk et al. (2009) noted that in secondary schools, more females reported learning something from technological tools (CD-ROM/Internet) that offered a gender inclusiveness perspective than males and males

reported that the tools were easy to use and thus “did not learn much about how to use a computer” (p. 267).

Another of these studies, conducted by Hwang (2010), involved the notion of self-efficacy theory, which was investigated as it relates to ICT. Findings revealed that during collaboration processes through email, males attempted to control the conversations and their collaboration tended to include information about the content (Hwang, 2010). In contrast, females collaborated through sharing issues that tended to be more personal (Hwang, 2010). Further males tend to report more confidence and a positive self-perception in the ability to use ICT, whereas females report less confidence and a negative self-perception in the ability to use ICT (Chou et al., 2009; Hargittai & Shafer, 2006; Heemskerk et al., 2009; Hwang, 2009; Mammes, 2004; Mercier et al., 2006; Volman et al., 2005).

***ICT use and integration.*** Grant (2011) provides evidence that furthers the gap in perception in a study of the connection, or lack there of, between school and home by noting that participants, which included teachers, parents, and students perceive the home and school as two separate entities and using ICT to increase communication may support a link between the two. Jackson et al., (2009) noted that ICT use was an accurate predictor of the dimensions of self-concept and self-esteem where video game playing had negative influences on self-concept, yet, Internet use had positive influences on self-concept. In addition, Chou et al. (2009) found that students in the elementary school level perceive the Internet as a “useful and powerful tool for their academic work and daily lives” (p. 308).

ICT are used by both genders as a tool to gather and research information, however research shows differences also exists at the various levels of education. The section involving

technology use and integration can also be regarded in four different aspects. The first is the skills with ICT as perceived by the genders, which involves the way females and males differ in perception of ability involving technology. The second is the use and integration by teachers, which addresses the perception of how ICT are integrated. This section relates to the experiences and/or factors that may be influential in the engagement of technology by females. The third is the perception regarding the use of ICT by students and motivating factors. The last section is studies involving technology and Catholic schools.

***Perceived skills by gender.*** In an empirical study conducted by ChanLin (2007), it was reported that personal factors influenced the use of ICT such as interest in the content area, personal growth, family support, and interest in using computers. These factors further influence the perceived skills that people have regarding the use and integration of technology. The examined literature that addressed the perceived ability to use ICT revealed that females were less likely to feel confident and males were more likely to report self-confidence in using technology (Broos, 2005; Hargittai & Shafer, 2006; Kahveci, 2010; Mercier et al., 2006; Volman et al., 2005). This assumption, however, is not consistent with actual abilities because these abilities do not differ between males and females (Hargittai & Shafer, 2006).

Volman et al., (2005) found that although differences in perceptions at the elementary grades were small, a gap emerged in the secondary level. Females were less positive towards the use of ICT than males. The study, however, did not reveal possible factors for this discrepancy. The study conducted by Broos (2005) regarding computer use found that females were more likely to report a negative perception of themselves as computer users, more likely to have anxiety over using computers, and less likely to report that they feel confident in using

computers. Hargittai and Shafer (2006) demonstrated similar results including noting that “not one woman thought of herself as an “expert” user, and not one man thought of himself as a “complete novice” (p. 442). Further, Kahveci (2010) found that females in secondary schools, although having a positive attitude towards computer use, felt less comfortable in using technology and Volman et al., (2005) found that girls use computers less. These findings emphasize the importance in conducting research regarding the experiences and perceptions of female students at the middle school level to investigate the factors that may influence a decrease in use or perceived ability to use ICT.

It has been noted that in the latter part of the elementary school level differences in the intensity of interest between females and males begin to manifest (Mammes, 2004) and differences in perception as computer user also begin to appear (Mercier et al., 2006). Students from age six through twelve (elementary level) demonstrate little difference in engaging in the use of ICT, however, there is a difference by the time they enter secondary school, ages twelve to eighteen (Volman et al., 2005). Overall, females in the secondary schools use less ICT at home and at school, achieve less in computer oriented classes, have a less positive attitude toward ICT, and “score less well than boys in tests that measure ICT knowledge and skills” (Volman et al., 2005, p. 43). The discrepancy between perceived and actual ability continues into adulthood where females still perceive themselves as less capable than their male counterparts (Hargittai & Shafer, 2006). It is evident that females in the lower grades (primary through elementary) exhibit little differences, but negative perceptions in the upper grades (middle school through high school) begin to emerge, and these perceptions continue into adulthood. It is important to

investigate the early stages of these grades (7-8) to determine if there are any possible factors that deter or promote the use of ICT by female students.

***Experience of ICT by students.*** Conducting research in the way the genders use technology, or their experience with technology because “computer experience and Internet experience seem to have a positive influence on the ICT attitude of both women and men” (Broos, 2005). Various researchers found that children, regardless of gender, enjoy using technology (Chou et al., 2009; Gibbs et al., 2009; Mammes, 2004; Smith et al., 2007; Sokal & Katz, 2008). The use of this technology, however, is used differently by the genders. Males tend to use technology more frequently (Chou et al., 2009), tend to think of themselves as more skillful (Broos, 2005; Hargittai & Shafer, 2006; Hwang, 2010), play more computer games (Heemskerk et al., 2009) and tend to dominate when collaborating and using technology (Kahveci, 2010; Smith et al., 2007). In contrast, females have a negative view of technology (Chou et al., 2009; Mammes, 2004; Sadker & Silber, 2008; Volman et al., 2005), spend more time using email (Hwang, 2010), have different interest in technology and lose interest in the technology over time (Mammes, 2004). Based on these findings, it can be concluded that the genders use and apply technology in different ways.

Sokal and Katz (2008) found that mostly males benefit from the use of computer-based books in reading intervention classes. In comparing male perception of reading as a feminine activity, students who were provided digital material to read from expressed an increased interest in reading and a decreased view of reading as a feminine activity than the male students who did not use digital media for reading. Although this did not create a significant gain in their reading performance, it improved their attitude towards reading (Sokal & Katz, 2008). Additionally, in a

study involving the use of interactive whiteboards for instruction and collaboration, Smith et al. (2007) found that males tend to dominate the classroom discourse when this technology is integrated. Males also have a positive attitude towards the use of ICT as well as higher reports of confidence in this area (Hargittai & Shafer, 2006; Hwang, 2010; Kahveci, 2010; & Volman et al., 2005). Research suggests that the integration of ICT has minimal benefits for females unless the implementation is not biased or gender specific (Heemskerk et al., 2009; Mammes, 2004).

Various researchers have found that children in the elementary grades, regardless of gender, enjoy using ICT (Chou et al., 2009; Gibbs et al., 2009; Mammes, 2004; Smith et al., 2007; Sokal & Katz, 2008), however it has also been proven that a difference in engagement in ICT between males and females exists. Males tend to use technology more frequently (Chou et al., 2009), tend to think of themselves as more skillful (Hargittai & Shafer, 2006; Heemskerk et al., 2009; Kahveci, 2010; Rudasill & Callahan, 2010), play more computer games (Heemskerk et al., 2009) and tend to dominate when collaborating and using technology (Kahveci, 2010; Smith et al., 2007). In contrast, females have a negative view of technology (Chou et al., 2009; Mammes, 2004; Sadker & Silber, 2008; Volman et al., 2005), spend more time using email and socialization tools (Hwang, 2010), and lose interest in technology as they advance through grade levels (Mammes, 2004). Regarding perceptions of being a person who uses computers, Mercier et al. (2006) found that “there was no statistical difference between the responses of males and females” (p. 341), meaning that females in middle school were just as likely to consider themselves computer users as much as males.

**Catholic schools and technology.** Students tend to perceive themselves differently depending on age, gender, ethnicity, and socioeconomic status as far as use of ICT is concerned.

It has been noted that attitudes and perception of ICT use in public and private schools tend to have similarities. There is, however, disagreement between public and private schools with the statement “I am more aware of the potential of the Internet for learning than most of my teachers are” students (Kolikant, 2009, p.140). Private school students, who experienced a “learner-centeredness,” disagreed with the statement whereas students in the public school agreed with the statement (Kolikant, 2009). This perception alludes to a difference between the use of ICT in the public and private school sectors. As mentioned at the beginning of this review, research involving Catholic schools and technology has been limited. Through this research, a limited but clear interpretation can be made regarding technology. Galla (2010), Gibbs et al., (2008, 2009) and Lapayese (2012) have conducted research on the implications of technology and Catholic schools. Most of the research conducted, however, tends to be specific to the integration of technology and gender is rarely an item of discourse. This section will expose the limited data on technology in Catholic school and the need to investigate this phenomenon.

***Technology integration.*** In the implementation of a technology plan, professional development is key in a successful integration (Galla, 2010). Teachers who are involved in professional development apply those learned skills and integrated technology more frequently and reported a higher level of skill than those that did not participate (Gibbs et al., 2009). Further, students also increased the use of technology because of the increased use by teachers (Gibbs et al., 2009). Participants also noted a positive impact in teaching, although age, level of teaching experience, and gender were not factors that influenced the use and integration of technology (Gibbs et al., 2008).

In a subsequent study by Gibbs et al., (2009), the researchers noted the importance of “providing a coordinated integration of technology and professional development” for teachers and students “into a school’s academic program” (p. 25). Although not all participants in the research by Gibbs et al. (2009) took part in the professional development, it was noted that those who participated reported “a greater ability to work with technology in general” (p. 21). Galla (2010) researched the leadership and implementation of technology integration in Catholic schools. In the findings, the researcher reported that leadership styles and practices that embrace technology are essential to in the implementation process and some of the challenges derived from the findings include having the time to establish a partnership and supporting the change financially and by providing professional development (Galla, 2010). Based on these findings, it is imperative, as Galla noted, to include professional development, strong leadership, and the support from all of its constituents (administration, teachers, parents and students). In addition to the challenges to Catholic schools mentioned, there are the challenges of use of ICT by students and perceived abilities.

Regarding the findings in Catholic schools, Gibbs et al. (2008) found that most teachers are not as engaged in integration of technology. Despite the fact that they have sufficient and adequate technology, teachers are still reluctant to use this ICT unless professional development is provided (Dosen et al., 2004). There is also a need for teachers to use technology purposefully (Gibbs et al., 2008; Gorder, 2008). There were no significant differences in the means of males and females, years of teaching, content area and integrating technology but there is a difference within the grade levels (Gorder, 2008). It was found that higher levels of the academia tend to integrate more technology (Gorder, 2008). The implications for these findings demonstrate that

professional development is essential when integrating technology to ensure that the students become engaged.

*Catholic schools, technology, and gender.* Lapayese (2012) remarks that there is a strong need for research involving media education and gender by emphasizing the dangers facing females regarding the inundation of images portraying females in a negative way. In the study, the researcher found that female teachers acknowledged the influential aspect of gender specific media education, which provided Catholic school females a forum for engaging in academic and faith-based discourse, which in turn, provided a voice for female students (Lapayese, 2012). In investigating female perception of the use of ICT in middle schools, it extends the work from Lapayese (2012) to providing a voice for females to express their own perception of ICT and eventually leading to their own engagement in academic and faith-based discourse.

## **Conclusion**

The review of the literature of the gender differences in technology and Catholic schools represents a need in research in the nexus of all three entities. Because there is vast amount of research supporting the discrepancies of ICT among the genders, the differences in perception, and the minimal literature of technology and Catholic schools, a need arises to ensure that females in Catholic schools obtain a forum to express their own perceptions and possible motivating factors that will help them promote or overcome challenges faced when deciding to immerse themselves in a technology-based career.

## **CHAPTER THREE**

### **METHODOLOGY**

According to Robelen (2012), despite decades of improvement for equity in the gender gap, females remain underrepresented in the workforce in the fields of science, technology, engineering, and math (STEM). Federal policy, such as Title IX, has been able to improve conditions for females in education of STEM subjects, however, the possible reasons for the phenomenon of underrepresentation in the work place remain elusive. In the technology aspect, there appears to be little difference in ability to use ICT (Chou et al., 2009; Mercier et al., 2006), however the discrepancy in perception becomes evident at the secondary level (Hargittai & Shafer, 2006; Kahveci, 2010; Volman et al., 2005). In addition, Heemskerk et al. (2009) noted that males and females approach the use of ICT differently, alluding to the notion that this approach difference may be a cause the perception of ability to use ICT in the future.

This mixed methods study seeks to identify the perception of female students regarding their use of ICT and possible factors that influence this perception. Because the perceptions of inability are elusive in the primary and elementary levels and the perceptions manifest themselves in the secondary years, it is important to investigate the notion that there are possible deterrents in the middle school level or in transition to the secondary level that generate a negative view of ICT in female students. Investigating perception and ability of females in the middle school will provide this study with possible causes that deter females from engaging in the use of ICT.

## Research Questions

The purpose of this study was to find the answer to the following questions:

1. What are the perceived experiences of female students in a Catholic school at the middle school level regarding the use of information and communication technology in comparison to male students?
2. What factors influence uses and perceptions of information and communication technology by middle school female students?

An initial hypothesis for this study assumed that females in the middle school level have a perception of ability to use ICT that is similar to their male counterparts. The quantitative methods of this study provided an overview of the perception of both males and females regarding their ability to use ICT at the middle school level as well as influential factors that help determine a positive or negative perception of ICT. In addition, it compared the perceptions of males and females and determined the hypothesis assumption to be correct for many of the variables addressed. The qualitative section of this study provided an in-depth analysis of female students' perception towards ICT as well as the necessary triangulation for this study. Further, the second phase focused on obtaining possible influential factors that females view as obstacles or opportunities to use ICT.

Data about the students' perceived ability and overall perception was collected in two different manners. The first was a confidential survey, which generated data from both male and female students and their perception of ICT. The survey was distributed through Qualtrics™, which is a web-based application for distributing surveys and collecting data. The second data collection method was the focus group discussions, which was centered on the perception of

ability to use ICT and possible factors that influence these perceptions by female students. The primary tool used for the collection of this data was a tablet, which was used primarily as a recording device. For the purpose of this study, there was no video recording due to the age of the participants. The subsequent sections will detail the setting and the design of the study as well as providing the justifications for the setting, data collection tools and data analysis.

### **Setting**

Originally built in 1954, Saint Mary Star of the Sea (pseudonym for site) is one of six K-8 Catholic schools in the Los Angeles County area. It now consists of four different buildings. There is the primary center, the north wing, the west wing, and the south wing. The east side of the school is fenced and runs parallel to a noisy highway. The majority of the classrooms reside in the north and west wings. The south wing is where the science lab, computer lab, and a small math room are located. Every homeroom is equipped with two to five computers that are hardwired to the Internet and have specific programs for the different grade levels. Every teacher also has a laptop, which they are allowed to use at school and at home. Currently, there are no specific standards for students or teachers regarding the use of technology, however, the technology committee is in the process of adopting technology standards for every grade level.

The school serves 194 students from kindergarten through eighth grade. Currently there is one teacher per grade, an aide in kinder, first, and second grade classrooms, and the middle school is departmentalized, which consists of five different teachers. In total, there are 11 teachers in the school. The majority of the school is Caucasian, however, many of the students come from multicultural families. When separated by gender, the school population consists of 55.7% males (N = 108) and 44.3% females (N = 86). The middle school population is 25.8% of

the entire school population in which males make up 54% (N = 27) and females make up 46% (N = 23). The school serves a community whose average income is middle to high socio-economic status, however, it does provide tuition assistance for families whose income is lower than the average for the community.

Although the school functions under the guidance of the Los Angeles Archdiocese, its governance remains in the stewardship of lay people. Further, there are no teachers or administrators who are part of any religious orders (i.e. sisters, brothers, priests). The school has been through various changes in leadership that resulted in the formation of a technology integration process. The first technology advancement in the school came near the culmination of a 10-year leadership. At the time, the school served nearly 300 students and it was during this administration that ICT was first introduced at the school. The second administration encountered difficult circumstances. Teacher turnover, departure of students, and a struggling economy caused the technology emphasis to falter at the beginning. In time, technology integration returned towards the end of the four years of administration through the revision of the school's mission, vision, and philosophy. With technology being one of the cornerstones of the revised vision, the succeeding administration continued the vision and created a technology team that began working on a technology plan for the school. This third administration, however, was only temporary until a new administrator took the helm. The plan resulted in the adoption of an iPad program in grades five through eight. The vision for the future has this plan eventually shifting into a one-to-one initiative for the entire middle school and mobile carts for the elementary section of the school. The current administration is working on expanding this program to include other grades. The school resembles many Catholic schools in the area

regarding the integration of technology, however with the introduction of the iPad, it has become one of the leading Catholic schools in the area.

## **Design**

This quasi-experimental, mixed methods study was designed to use a cross sectional survey that provided a descriptive snapshot of the perception of ability by female and male students in the middle school level. Data from the aforementioned survey provided the researcher with information to select the participants for the second phase of the study. The second phase involved the use of focus groups, which provided an in-depth description of the perceptions by female students regarding the use of ICT and possible factors that influence this perception. This mixed methods approach, referred to by Gay, Mills, & Airasian (2009) as the explanatory mixed methods design, provided the study with data that informed the researcher about the current perception of both male and female students and an in-depth look into the perceptions and possible factors that influence these perceptions, in particular, the influences for female students. Because this study sought to primarily to find the perception of female students, the focus groups consisted of only female students.

**Procedures.** Because this was a mixed methods study, the data collection took place during four different time periods. The first, second, and third data collections included the use of an online survey and were conducted on three separate occasions according to grade level. The fourth set of data collection was the audio recording of focus group discussion about ICT. This section will explain the protocol for the survey and the focus groups as well as provide the rationale for the procedures.

*Use of surveys.* According to Gay et al. (2009), a cross-sectional survey is “effective for providing snapshot of the current behaviors, attitudes, and beliefs in a population” (p. 176). Based on this premise, the use of surveys was appropriate for the first phase of this study because it provided a snapshot of the current perception of abilities by female and male students. Hackett (1981) posits that surveys have value in researching perceptions among other things such as “reactions to, and the use of counseling” (p. 599). Due to the nature of perceptions being strongly influenced by self-efficacy, it is important to use items in the survey that report what Bandura (2011), calls “I can” statement of efficacy versus the “I will” statement of intent. According to Bandura (2011) “a statement of intent should not be included in a self-efficacy scale” (p. 16). This is addressed through the Access, Interest and Experience Survey through “I am...” statements that refer to skill level (*Not skilled at all, Not very skilled, Fairly skilled, Very skilled, Expert*) thus maintaining the concept of efficacy and not of intent. The surveys provided a perception of abilities by both genders and helped determine the participants for the second phase of the study.

*Participants.* The participants for the quantitative section of this study were composed of the middle school students at Saint Mary Star of the Sea school. The school currently serves 194 students from kindergarten through eighth grade out of which the middle school population consists of 50 students. From these 50 participants, four females were unable to participate in the study; two did not return their consent, one was absent, and one had difficulty with the tablet and was unable to complete the survey. Thus the total number of participants was 46 out of which 19 were female and 27 were male students. This population is then a purposive sample. A challenge to this sampling, as noted by Gays et al., (2009), was that the main weakness of this

sampling could have been “the potential for inaccuracy in the researcher’s criteria” (p. 135), however, the criteria for this study is very distinctive because the participants are (1) students in the middle school level, (2) enrolled in a Catholic institution, and (3) nearly half of the selected participants were female students. Although this sampling did not produce results that can be generalized, the purpose of this phase was to compare the perception of ability to use ICT between male and female students at Saint Mary Star of the Sea. Because this study sought to find the perception of female students in a Catholic school at the middle school level, the participants satisfy the requirements in this phase.

*Measure.* The first data collection occurred at the school during a time when all members of the grade were present. Since the school offers a departmentalized middle school program, the students are only together as a class during specific times throughout the day. Thus the survey was administered to each grade at different times. The participants had approximately 40 minutes to complete the survey. Participants who required more time were allotted an additional 10 minutes for completion. The instrument used in this phase of the research was a modified version of the Access, Interest and Experience Survey (see Appendix A) used by Barron et al., (2010) to investigate relationships between access tools and student experience with creative production activities in the eighth grade. The underlying concept of this tool was to obtain information about student’s perception and experience with ICT and run correlations with the creativity and collaboration.

For the purpose of this study, only the sections that explored the perception and experiences were considered (see Appendix A). Out of the 14 original sections from the Access, Interest and Experience Survey, only ten sections adequately measured nominal information

about the students' experience and perception of ICT. The omitted sections of the original survey (I and XI) were not used in this research study because they focused on goals and generic perceptions of the individual and not in regards to ICT and (X and XIV) focused on collaboration and creativity of the student. As a result of this exclusion, students were asked to answer a total of 27 questions, which were broken down into three different categories (nominal information, experience with, and perception about ICT).

The first section of the survey asked students to identify locations and frequent use of ICT (How often do you use a computer in the following places: at home, at school, at the library, etc.) and the kind of access that they have to ICT (how many working computers does your family have in the place(s) where you live?) that allow the participants to settle into the mindset of answering questions about ICT.

The second section involved questions geared toward determining the experience that students have with ICT (How often have you ever done one of the following computer related activities: created a website, made a publication, created a multimedia presentation, etc.). The third section required students to express their feelings through a Likert-type (*strongly disagree, disagree, neutral, agree, or strongly agree*) response to statements that will measure their perception of ICT and a perception of their skills in using ICT (i.e. I would like to learn more about computers, I am good with computers, etc.).

The fourth, and final section of the survey required participants to answer questions about their hobbies, future career possibilities and stating their gender and grade level. In investigating their interests, it revealed the different influential parts of their development as students and their use of ICT.

The survey, which was administered through Qualtrics™, was taken through the tablets being integrated in the school. This allowed the participants to focus on the questions at hand and focus on their individual assessment. In addition, having male students respond to these questions also helped in providing comparative data to female responses.

*Analyzing survey data.* Data of the structured questions were tabulated using spreadsheets, which were then imported into SPSS, a tabulation application, which was used to run a comparative analysis of the male and female responses. In addition, Qualtrics™ provided a cross tabulation application that was used in collaboration with the SPSS analysis. Descriptive statistics were applied to the data collected to determine the difference between male perception and female perception, as well as the difference between male and female experiences with ICT. An analysis of the five-point Likert scale (1=*Strongly Disagree*, 5=*Strongly Agree*), which measured students' perception was conducted to ensure that the reliability and validity of the instrument remained within the same parameters as the original instrument (alpha 0.89).

*Use of focus groups.* Hatch (2002) noted that focus groups center on a group of “individuals with similar characteristics or having shared experiences” (p. 24) and thus for this phase of the study, female students that had similar perceptions of their use and ability to use ICT were identified and comprised the participants for this second phase of the study. These focus groups comprised of three seventh and three eight grade students with similar interest and perception of ICT use in order to provide a comfortable zone for the students to express their real thoughts regarding the use of ICT (Gay et al., 2009).

Further, Hatch (2002) posits that focus groups are meant to be interactive forums in which discussion around a certain topic takes place, thus all participants had an opportunity to express their thoughts and opinions. Bertrand, Brown and Ward (1992) also note that focus groups allow participants to “volunteer information on points that are important to them” (p. 199). Because this study focused primarily in investigating middle school females’ perspective on ICT and potential factors that influence set perceptions, a group of females discussing how they use ICT and their perspective on their abilities was adequate for this phase of the study. Having focus groups also reduced the researcher’s potential influence in responses as Hatch (2002) notes that the focus groups “may make participants more willing to express opinions that they perceive might not fit with researcher expectations” (p. 132). The following sections will describe the rationale behind the use of focus groups as a supplemental data for the study.

*Focus group participants.* The use of the survey in the first phase of this study helped to establish participants for the second phase. The criteria for the participants was that they needed to be female students, in the middle school level, who have similar perceptions of their ability to use ICT and also have similar characteristics in their actual ability. The purpose of the study was to identify female perspective on the use of ICT and to identify possible factors that influence these perspectives, thus this focus group interview went in-depth with the participants from the previous, survey phase of the study. The groups encompassed female students from seventh and eighth grades due to their proximity to entering the secondary level of education. Three students from the aforementioned grades will be the participants (N = 6). To provide confidentiality, pseudonyms were used for all six participants, as well as names of teachers mentioned in the focus group.

*Measure for qualitative data.* The primary goal of the focus groups was to investigate in depth the phenomenon of perceived abilities by female students regarding the use of ICT and to identify possible factors that influence these perceptions. Meetings were held in a small classroom typically used for enrichment classes order to establish a comfortable environment for the participants and ran for approximately forty minutes. The room provided ample space for the participants to sit around a large table with the recording devices in the center, yet not cramp spaces as suggested by Hatch (2002) to provide a comfortable and relaxing environment. The meetings were conducted during the school hours of operation. A permission letter and user consent form was provided to the parents of the female participants informing them of the intent and ensure the confidentiality and security of their children. These were promptly returned and collected.

For this focus group interview, digital recording applications, QuickVoice and GarageBand were used to record the discussion. Anecdotes and notes were written on notebook paper. Bertrand et al. (1992) posit that notes become essential when referring back to comments that were unclear, thus the note-taking capability is essential. This allowed the researcher to extend the data collection to include observations of the meeting without video recording, which would compromise the confidentiality of the participants (Hatch, 2002). The QuickVoice application allowed the researcher to download the recordings as an mp3 file, allowing for the use of a transcribing application. According to Bertrand et al. (1992) “only the moderator and reporter can do the transcription and translation accurately” (p. 201) thus, the application ExpressScribe, an application on the personal computer, allowed the researcher to control the speed of the recording while maintaining audible and recognizable speech to transcribe the data.

Once transcribed, the data was ready for analysis. A selected group of students, not included in the qualitative section of this research study, was given the questions for discussion to ensure the questions were comprehensible to the actual participants. Adjustments to this instrument were made accordingly (see Appendix B).

*Qualitative data analysis.* Bertrand et al. (1992) note that it is essential to transcribe the entire recording accurately. Following the transcription, the variation to the process of margin coding (Bertrand et al., 1992) was used to identify themes, or frames of analysis, within the discussion. The researcher used color codes to identify the frames of analysis within the discussion. A blue color denoted discussions involving perception of abilities and a red color denoted possible factors that influence the perceptions. An inductive analysis (Hatch, 2002) on the data was performed by identifying patterns to responses made by the female students.

### **Limitations**

A study is not without limitation and the following section will identify and address three of the limitations of this study. The first was the self-reported data by students in the first phase of this study, the second was the experimenter bias effect (Gay et al., 2009), and the third was my prior interactions with the participants.

Self-reported data posed different challenges for this study. First, the self-report threatens an honest response from the participants. Because of the relation that the participants have with myself as the researcher, it is possible that honesty and positive responses to items may have been affected due to the participant believe “that is what the researcher desires” (Gay et al., 2009, p. 153). It is proposed by Gay et al. (2009) to have the participants respond to the survey anonymously, however, this inhibited the selection of the participants for the second phase of the

study. The aforementioned notion led to the second challenge of self-reported data. With anonymity missing from the survey, it was important to emphasize the issue of confidentiality. The survey protocol ensured that this was clearly understood by the participants and thus reduced the potential for self-reported threats.

Gay et al. (2009) posit that unintentional actions, feelings, perception from the researcher may affect study results or affect the participants due to prior knowledge of them. This threat to external validity will be addressed through the surveying method. Because the survey was an online survey, it was taken in their comfort zone of their classroom using the tablet devices they were using as part of the integration plan. Another way of addressing this threat was the protocol for the survey. It was important to emphasize that the survey they were completing was not a reflection of their educational achievement, thus diminishing anxiety over the survey.

The third limitation is my position as the researcher and my prior experience with the participants. As an employed faculty member, I have been the educator of the participants and have instructed these students on rudimentary use of ICT. My role as a technology leader at my school site is to integrate technology in my teaching and provide professional development to teachers in the school. As such, these students have received a basic exposure to ICT. This exposure, however, was not gender inclusive. To eliminate this bias, the participants were taking the confidential survey, which provide the students a way to respond honestly. The only identifiers were the gender, grade level, and a randomly created number for that student. In addition, I was not the sole administrator of the survey. The colleague that instructs the class was present and trained to answer questions that may arise during the survey.

## **Conclusion**

The preceding chapters have addressed an introduction to the study, provided a thorough review of the literature, and provided the methodology required to pursue the research in the topic of technology, gender and Catholic schools. The purpose of the study was to provide equity for female students as they seek to advance their future in STEM careers by providing them with a venue to express their perception and expose factors that promote such perceptions regarding the use of ICT.

## CHAPTER FOUR

### DATA ANALYSIS AND FINDINGS

This mixed methods study focused on the perception of ability to use ICT by Catholic school female participants in the middle school level as well as identifying possible influential factors that promote or detract from their engagement in the use of ICT. The first phase of this study focused on the entire middle school population (N = 46), which included males (N = 27) and females (N = 19) and their general perceptions and possible influential factors in using ICT. The second phase involved in-depth interviews with middle school females (N = 6) whose perception of ICT use was similar to one another. Both males and females participated in the survey to provide a comparison group for female students and their experience and perception with ICT. The data and results reveal answers to the proposed questions in the study:

1. What are the perceived experiences of female students in a Catholic school at the middle school level regarding the use of information and communication technology in comparison to male students?
2. What factors influence uses and perceptions of information and communication technology by middle school female students?

Data from the survey revealed that for the majority of the questions and topics, females and males tended to respond in a very similar manner. In essence, it signals to the notion that both males and females access, experience, are interested in, perceive themselves, and are influenced to use ICT in a very similar fashion. Both males and females tend to demonstrate a great deal of similarity, however, results also show at least one significant difference in each category of access, experience, interest, influence, and perception.

As noted in Chapter Three, the hypothesis for this study assumes that females in the middle school level have a perception of ability to use ICT that is similar to their male counterparts. Out of 210 variables that students reported on the survey, only 16 demonstrated statistical significant differences, thus maintaining the hypothesis for this study is true. Females and males accessed ICT in similar manners at home and at school where just over half of the participants (52.2%) accessed ICT at home a few times per week. A large percentage of participants (80.4%) reported *never* having used ICT at local community centers such as the YMCA or the Boys and Girls Club. In addition, similar percentages of males and females reported ownership of a computer and usage in their room. Both genders also reported having access to the Internet, however the method of access (DSL or Cable) was overwhelmingly unknown by the participants.

Over 71.7% of the participants reported having created a multimedia presentation. This was the highest percentage reported with a positive affirmation of use by the participants. In contrast, between 80 to 90% of the participants reported *never* having created their own newsgroup, blog, or discussion site on the Internet (84.8%), created a Website using applications (89.1%) or HTML (97.8%), put a Website so that others could see it (80.4%), built a robot or created an invention of any kind using technology (82.6%), built a data base (82.6%), or created a computer game (91.3%). When using the Internet for specific tasks, over 50% of the participants reported *never* having shared media (60.9%), gotten and shared information about political issues (60.9%), created and shared media with political messages (73.9%), checked the qualifications or credentials of authors on the Internet (67.4%), or gone to the “About Us” pages (52.2%). Further, over 80% of the participants have not taken any ICT classes beyond their school setting.

Interest in ICT was broken down into two subcategories. The first subcategory was gaming. Both genders reported engagement in games as part of their ICT use and interest. The trend of response continued in this area, however, there were two differences in responses with “shooter” games where a large percentage of males (74.1%) preferred this style game than females (15.8%) and “party” games where females (94.7%) demonstrated preference over this style of game than males (37.1%). These differences, however, did not reveal any significant differences. The second subcategory was aspirations. A larger percentage of responses revolved around negative responses in which participants opted to select “*absolutely not*” or “*probably not*” for the provided professions. The greatest of these percentages was a combination of “*absolutely not*” and “*probably not*” (89.1% combined) to pursue a career as a politician. Careers in ICT fields also received low responses.

In the category of perception, participants expressed a positive reaction to their use of ICT. Considering their responses of “*Agree*” and “*Strongly Agree*” combined, 52.2% of students would like to learn more about computers, 65.2% feel confident about their ability to use computers, 69.5% find computers interesting, and 65.2% believe that it is important to their friends that they are knowledgeable about computers. In addition, 80.4% of the participants responded with disaccord to the statement “I am not the kind of person who works well with computers” signaling to an affirmation of confidence in working with ICT from both genders. In contrast, a large percentage of participants reported having *little to no skill* in troubleshooting (78.3%) and programming (76.1%). Participants also reported a low knowledge of ICT terms.

Both males and females reported that “playing around on my own” was the highest percentage (54.4% combined from *very much* to *extremely*) of importance of ICT use. After school clubs (67.4%), community center computer labs (71.1%), and classes out of school (50.0%) were least important. Participants also identified the level of importance that influential people had in their learning of ICT for which siblings were *not important at all* (65.2% sisters and 52.2% brothers), school teachers (47.8%) and friends (41.3%) had *some importance*, and father figures had the highest percentage (50.0% *very much* and *extremely* combined) for being influential. When prompted to specifically select a parent or guardian by gender and their influence of ICT decisions, the majority of the time it was both parents that had the higher percentage in influence as noted by the participants.

In essence, the experiences of female participants in a Catholic school at the middle school level regarding the use of ICT are not very different from that of male students. Both genders access ICT in similar places, have similar experience and interests in ICT, perceive themselves as adequate users of ICT, and do not differ significantly in their influences for ICT use. There are, however, several variables within each of the categories surveyed that demonstrate statistical significant differences. The following sections provide the results for the survey and interview conducted at the research site. The results from the survey are segregated into five different categories, which include access, experience, interest, perception, and potential influential use of ICT by middle school participants. They will provide evidence that the hypothesis that males and females have similar access, experience, interest, perception, and influential aspects regarding ICT use will be maintained. It will be followed by the results from the interview with the female participants and the major findings from that investigation.

## Survey Results

To answer the question referring to the experiences of females students in a Catholic middle school regarding their use of information and communication technology more explicitly, it was important to compare the female perspective to the perspective of their male counterparts. Analysis from the data revealed the existence of some significant differences among the genders within all five categories covered by the survey. The five categories were access, experience, interest, perception and influence. Significant differences noted were few in comparison to the results from entire survey. Females tend to access ICT at similar places as males with the exception of after-school programs and at a relative's house, where females report more access in the former and less access in the latter in comparison with their male counterparts. Differences became apparent in the way participants utilized different resources, in their experience with use of, their interest in, perceive their use of ICT and the way they interpret possible influences of their ICT encouragement or deterrents. The following sections provide the descriptive analysis that was conducted.

**Access to ICT.** The self-reported age of participants first using a computer was 4.7 for 6th grade (SD = 0.70), 6.9 for 7th grade (SD = 1.78), and 5.3 for 8th graders (SD = 1.76). Males reported first using a computer at an average age of 5.9 (SD = 1.87) and females reported first using a computer at an average age of 5.7 (SD = 1.86). The participants' age averaged to 5.6 years (SD = 1.82) as the time where they first engaged in the use of ICT was 5.6 years old. Further, regarding their first exposure or use of a computer, there is no significant difference among the genders,  $t(35.557) = .238$ ,  $p = .813$ . Males reported a higher rate of sharing the primary computer at home (57.9%) than females (48.1%). A slightly higher percentage of

participants claim ownership of their computer (52.2%) in which females report a slightly higher percentage than males (47.4% and 44.4% respectively). Females also report having had their own computers prior to the survey, however they no longer have possession of it. Table 1.A shows the percentages of males and females who currently own their own ICT. Other tables demonstrating the comparison between males and female access to ICT, which add to the description can be found on Appendix C.

Table 1.A  
Percentages of male and female ownership of computers

	Males	Females
Yes	44.4	47.4
No	44.4	21.1
I used to	11.1	31.6

\* p < 0.05  
\*\* p < 0.01

Participants who did own a computer or laptop device reported being between the ages of 5 and 14 when they first had their own computer. Males outnumbered females in their report of having a computer in their room (56.6% and 47.4% respectively). In addition, 73.9% of the participants were unaware of the kind of Internet access they had at home, yet, 89.1% of participants reported having wireless access at home. Females also reported a higher percentage of not knowing their type of Internet access (79.0%) than males (70.4%).

Every participant reported having a printer in their home and a similar high response was provided for game consoles (93.5%), devices for digital music (93.5%) and hand-held devices (91.3%). Females reported a higher percentage for these items in comparison to males, however, the differences were not statistically significant in this section for access. Although the other variables did not yield high percentages, the similarities remained throughout the section. Table 1.B demonstrates these findings.

Table 1.B  
Male and female comparison of ownership of additional ICT in percentages

	Males	Females
Printer	100.0	100.0
Scanner	51.9	73.7
Digital Camera	74.1	84.2
Digital Movie Camera	48.2	42.1
Hand-Held Device	70.4	63.2
Game Console	88.9	94.7
Digital Music Player	92.6	94.7
Wireless Internet	88.9	89.5

\* p < 0.05

\*\* p < 0.01

A small majority of the participants access a computer at home a *few times a week* (52.2%) and females access these more frequently than males (68.4% and 40.7% respectively), however, males (48.1%) are more likely than females (26.2%) to use of a computer at home on a *daily* basis. The 8th grade class also reported a higher percentage of use at home than 7th and 6th grades (70.6%, 44.4%, and 45.5% respectively). Accessing ICT at school during class time a *few times a week* was the second highest response with 41.3% of the participants. Females reported less use (36.8%) than males (44.4%) during this time and purpose. Regarding school access and grade level, the reported use was opposite than that of the home use. For the class use, 8th graders (47.1%) reported less use than 7th (55.6%) and 6th (63.6%) graders. In addition, a large percentage of participants (80.4%) reported *never* using ICT in a community center.

Further analysis of the access that participants have to ICT during the site's after school program revealed a significant difference by the genders  $t(27.909) = 2.366, p < .05$ , where males ( $M = 1.70, SD = 1.38$ ) were less likely than females ( $M = 3.05, SD = 2.20$ ) to report using ICT at

the location. At a relative's house,  $t(31.99) = 3.091$ ,  $p < .01$ , however, males ( $M = 2.52$ ,  $SD = 1.63$ ) were more likely than females ( $M = 4.32$ ,  $SD = 2.14$ ) to report ICT use at least *once per month*.

Table 1.C  
Frequency of ICT use at the given locations in percentages

	Never	Less than once a month	Once a month	A few times per month	Once a week	A few times per week	Daily	Several times a day
At home	-	-	-	2.2	6.5	52.2	23.9	15.2
At school during class	2.2	4.3	-	28.3	19.6	41.3	4.3	-
At school on your own time	32.6	15.2	8.7	23.9	10.9	4.3	2.2	-
In an after school program/club	52.2*	23.9	2.2	6.5	2.2	8.7	4.3	-
At a relative's house	19.6	30.4*	6.5	23.9	2.2	6.5	6.5	4.3
At a friend's house	19.6	21.7	13.0	28.3	4.3	2.2	6.5	4.3
At the library	50.0	13.0	8.7	13.0	-	8.7	2.2	-
At a community center like the YMCA or the Boys and Girls Club	80.4	8.7	2.2	2.2	-	2.2	2.2	2.2

\*  $p < 0.05$

\*\*  $p < 0.01$

Statistically significant differences were found in the sections where participants access ICT regarding the after school program and at a relative's house, however they were elusive in the use of ICT at home ( $t(43.860) = .779$ ,  $p = .440$ ), at school during their own time ( $t(36.043) = .278$ ,  $p = .783$ ), at a friend's house ( $t(32.410) = 1.220$ ,  $p = .231$ ), the library ( $t(40.156) = 1.491$ ,  $p = .144$ ), or a community center ( $t(22.665) = .975$ ,  $p = .340$ ). Table 1.C demonstrates the percentages in which the participants most frequently use ICT. Possible reasons regarding the use of ICT during an after school program or at a relative's house will need to be explored to determine the possible factors that influence male and female use of ICT at those locations. With the exception of the after-school program and a relative's home, males and females do not differ significantly in ways that they have access to ICT. Their experience with ICT also

revealed similarities to the findings of access where four specific differences were noted to be statistically significant.

**Experience with ICT.** Responses to participant experience with different components of ICT varied. There was, however, one answer in particular with the highest percentage (71.7%) where participants of both genders reported using a computer *more than six times* was creating a multimedia presentation. Other components revealed *some* experience, however the overall percentages were small. More than fifty percent of the participants reported *never* having experience with writing computer programs (57%), creating their own newsgroup, blog, or discussion site (85%), creating Websites with applications (89%) or HTML (98%), posting Websites for others to see (80%), building robots or creating inventions of any kind using technology (83%), using simulation to model real life situations (70%), building data bases (83%), creating animation (67%), creating computer games (91%), or creating multimedia projects with other people (50%). Evidence from this data eluded to low exposure and experience that participants have with the different aspects of ICT, other than creating presentations.

The percentages of the experience by males and females as they relate to the number of times that they have reported experience with the given component are demonstrated on Table 2.A. As noted by Table 2.A, significant differences between the genders became evident where  $t(37.43) = 2.09, p < .05$ . Males ( $M = 1.3, SD = .542$ ) were less likely to report that they had *never* built a robot or invention using technology than females ( $M = 1.05, SD = .229$ ). A Cronbach's alpha of .757 on this category provides an adequate level of reliability for this group of participants.

Table 2.A  
Experience with ICT components in percentages.

	Never	Once or twice	3-6 times	More than 6 times	Non Response
Created a multimedia presentation (e.g. PowerPoint)	2.2	8.7	17.4	71.7	-
Written computer program (code) using a computer language	56.5	26.1	4.3	8.7	4.3
Made a publication, like a newsletter, using a desktop publishing program	39.1	28.3	13.0	19.6	-
Created your own newsgroup, blog, or discussion site on the Internet	84.8	13.0	-	2.2	-
Created a Web site using application (e.g. Dreamweaver, iWeb)	89.1	8.7	-	-	2.2
Created a Web site using HTML	97.8	2.2	-	-	-
Put a site on the Web so that other people could see it	80.4	15.2	2.2	2.2	-
Created a piece of art using an application (e.g. PhotoShop, Illustrator)	19.6	39.1	17.4	21.7	2.2
Designed a 2-d or 3-d model or drawing (e.g. CAD or ModelShop)	43.5	30.4	21.7	4.3	-
Built a robot or created an invention of any kind using technology	82.6	15.2*	2.2	-	-
Used a simulation to model a real life situation or set of data	69.6	19.6	2.2	6.5	2.2
Built a database (e.g. Filemaker Pro, Microsoft Access)	82.6	15.2	-	2.2	-
Created a digital movie (e.g. iMovie or MovieMaker)	4.3	30.4	39.1	26.1	-
Created an animation (e.g. Flash, Alice, Scratch)	67.4	26.1	4.3	-	2.2
Created a computer game (e.g. Stagecast, GameStar, Scratch)	91.3	6.5	-	-	2.2
Created a piece of music (e.g. GarageBand, FruityLoops)	10.9	52.2	21.7	13.0	2.2
Created a spreadsheet, graph, or chart (e.g. Excel)	13.0	41.3	17.4	23.9	4.3
Created a digital media project in collaboration with other people	50.0	17.4	23.9	8.7	-
Worked on an academic project with other people that lasted a week or longer	15.2	26.1	23.9	34.8	-

\* p < 0.05

\*\* p < 0.01

Yet another significant difference emerged in the area of participating in multi-user online games where  $t(37.67) = 2.41, p < .05$ . Females ( $M = 2.63, SD = 2.087$ ) reported a higher

tendency (11.1% of males and 42.1% of females) than males ( $M = 4.11$ ,  $SD = 1.987$ ) to *never* use ICT for this activity. Table 2.B addresses these differences.

Table 2.B  
Frequency of ICT use for the listed items in percentages

	Never	Less than once a month	Once a month	A few times a month	Once a week	A few times a week	Daily	Several times a day
Play games (on the computer, online, or on a game console)	2.2	2.2	2.2	21.7	8.7	41.3	10.9	10.9
Participate in multi-user, online games	23.9*	21.7	2.2	19.6	10.9	10.9	8.7	2.2
Work on your own digital media projects outside of school	28.3	21.7	26.1	15.2	2.2	4.3	-	-
Conduct research on the Internet for school	4.3	8.7	8.7	32.6	13.0	21.7	6.5	2.2
Collect, view, organize images or music	17.4	19.6	10.9	17.4	17.4	4.3	6.5	4.3
Write for fun	47.8	26.1	8.7	8.7	4.3	4.3	-	-
Read or send email	10.9	15.2	13.0	17.4	13.0	19.6	4.3	6.5
Edit/design your own blog/social networking page	60.9	10.9	2.2	2.2	6.5	4.3	8.7	4.3

\*  $p < 0.05$

\*\*  $p < 0.01$

Regarding computer use, 41.3% of participants reported using a computer for playing games *a few times a week*. This, however, was the highest positive trend reported. A slightly higher percentage (47.8%) of participants reported that they *never* use the computer to write for fun, which eluded to a pattern of higher negative responses toward the use of ICT. The self-perceived use of the Internet by middle school students provides similar results in which the highest percentage reported involved the response of *never*. In addition, participants reported that they *rarely* or *never* checked sources on the Internet to identify or verify the validity of Websites. Table 2.C demonstrates these findings (see the following page).

Table 2.C

Frequency of the Internet (blogs, social networking sites, wikis, other websites for the listed items in percentages)

	Never	Less than once a month	Once a month	A few times a month	Once a week	A few times a week	Daily	Several times a day
Share media (movies, songs, pictures that you've created)	60.9*	8.7	2.2	8.7	6.5	6.5	-	4.3
Get or share information (news or opinions about political issues)	60.9	8.7	8.7	6.5	6.5	4.3	-	2.2
Create and share media with a political message	73.9	13.0	-	2.2	-	2.2	-	2.2
Talk to others about a hobby	39.1	17.4	4.3	10	8.7	4.3	8.7	2.2
Learn information about a topic that is of personal interest to you	21.7	10.9	13.0	17.4	6.7	13.3	8.9	6.7

\* p &lt; 0.05

\*\* p &lt; 0.01

A very small percentage of participants were involved in extracurricular activities that integrated *some* use of ICT such as the Yearbook (6.5%) and the Podcast Club (21.7%). Regarding the question about technology classes, every category received a negative response with at least 80% of the participants. Table 2.D illustrates the high percentage of negative responses to the engagement in the given options to pursue knowledge of ICT beyond the school setting.

Table 2.D

ICT classes beyond the school setting in percentages

	No	Yes, at my camp/summer school	Yes, at a community center	Yes, through an online course	Yes at a local college/university	Other
Basic applications (word processing, spreadsheets, databases)	84.8	4.3	-	-	-	8.7
Computer literacy (computer history/future, ethics, societal impact)	80.4	2.2	-	4.3	-	10.9
Production and layout of print publication (newspaper, magazines, yearbook)	89.1	2.2	2.2	-	-	4.3
Multimedia authoring, Web design, or graphic arts (PhotoShop, Flash, etc.)	84.8	6.5	-	2.2	-	4.3
Computer networks, hardware, or operating systems	89.1	-	-	-	-	8.7
Computer science or programming	87.0	-	-	4.3	-	4.3
Engineering technology, industrial design, or robotics	80.4	8.9	-	-	-	8.9

\* p &lt; 0.05

\*\* p &lt; 0.01

Based on the results from the survey, it can be deduced that the participants lacked experience with ICT. Appendix D provides further evidence for this conclusion. This supports Gibbs et al., (2009) in which he finds that although Catholic schools have sufficient and adequate technology, they are not utilizing it to their full potential. Although these were the only variables with a significant difference found in the data within the realm of experience, more differences exists within the population of this research in other categories.

**Interest.** Using ICT for gaming was the focus of two questions from the survey. Appendix E demonstrates the results for the interest. Every participant (100%) reported that they had played a video game. The largest discrepancy occurred in two different game types, where 74.1% of males reported liking “shooter” games versus 15.8% of females and 37.0% of males versus 94.7% of females reported liking “party games”. Table 3.A reflects the percentage of participants that have partaken in the type of game noted.

Table 3.A  
Enjoyment of games according to categories by males and females in percentages

	Males	Females
I don't enjoy playing any type of video game	-	-
Sports games	70.4	52.6
Racing games	59.3	73.7
Simulations	37.0	57.9
Online Role-playing games	25.9	10.5
Role-Playing games	33.3	15.8
Strategy games	48.1	47.4
Puzzle games	33.3	73.7
Shooters	74.1	15.8
Party games	37.1	94.7
Educational games	18.5	15.8
Adventure games	63.0	52.6

\* p < 0.05  
\*\* p < 0.01

Although these differences in percentages are great, no statistical significant difference exists in this section. One significant difference in the importance of game style preference occurred in “action games” ( $t(32.34) = 2.792, p < .01$ ) in which males ( $M = 4.15, SD = .949$ ) reported a higher level of importance than females ( $M = 3.21, SD = 1.228$ ). In considering competition with others, human or electric, males ( $M = 3.81, SD = 1.145$ ) also reported higher levels of importance than females ( $M = 3.00, SD = 1.000$ ). A t-tests revealed a significant difference between the genders ( $t(41.86) = 2.56, p < .05$ ). Further, the art of the game such as animation and graphics also proved to be a significant difference ( $t(29.87) = 3.55, p < .001$ ) between males ( $M = 4.30, SD = 1.031$ ) and females ( $M = 2.89, SD = 1.487$ ), where males reported a higher importance in this variable over females. A Cronbach's alpha of .916 on this category provides a high level of reliability for this group of participants. Table 3.B demonstrates these findings.

Table 3.B  
Level of importance of gaming preference in percentages

	Not at all important	Not really important	Neutral	Somewhat important	Very important
Action	4.3	10.9	21.7	30.4	32.6**
Creating or building things	15.2	28.3	19.6	26.1	10.9
Playing games with friends or other people	4.3	13.0	26.1	39.1	17.4
Leveling up, increasing skills within the game	2.2	13.0	17.4	17.4	47.8
Following story-lines	4.3	23.9	30.4	15.2	26.1
Exploring	8.7	28.3	23.9	17.4	21.7
Connecting the characters within the game	15.2	32.6	21.7	17.4	10.9
Solving puzzles	10.9	26.1	23.9	26.1	13.0
Collecting and/or trading things	10.9	32.6	21.7	21.7	13.0
Taking on a new role, such as becoming a hero	13.0	26.1	15.2	21.7	21.7
Personalizing characters or their environments	6.5	17.4	19.6	28.3	28.3
Escaping into another world	21.7	13.0	23.9	30.4	10.9
Competing with others, human or electronic	4.3	17.4	26.1	30.4	21.7*
The challenge of the game	2.2	10.9	15.2	30.4	39.1
The art of the game	8.7	15.2	17.4	13.0	45.7**

\*  $p < 0.05$

\*\*  $p < 0.01$

Only 30.4% of the participants reported an activity such as Podcast club, playing on the iPads, and movie making as their favorite in-school activity and only 19.6% of participants reported sports as their favorite in school activity. Further, only 26.1% of the participants reported enjoying an activity involving ICT. The preferred out of school activity was participating in some sort of sport (65.2%) such as basketball, volleyball, or soccer.

Table 3.C  
Future aspirations in percentages

	Absolutely Not	Probably Not	Maybe	Probably Yes	Definitely Yes
taking more classes about computers	28.3	52.2	15.2	2.2	2.2
becoming a computer programmer or engineer of some sort	41.3**	34.8	23.9	-	-
becoming a graphic designer or Web designer	34.8	32.6	23.9	4.3	4.3
becoming a computer/network specialist	47.8	37.0	13.0	2.2	-
becoming a computer or technology teacher	56.5	30.4	10.9	-	-
becoming a computer game designer	41.3*	21.7	26.1	6.5	4.3
becoming a scientist	39.1	26.1	21.7	6.5	6.5
becoming a lawyer	28.3	26.1	26.1	8.7	10.9
becoming a teacher	37.0	19.6	32.6	8.7	2.2
becoming a doctor or nurse	15.2	28.3	34.8	17.4*	4.3
becoming a mathematician	47.8	28.3	17.4	4.3	2.2
becoming a journalist	43.5	30.4	15.2	6.5	4.3
becoming a politician	54.3	34.8	4.3	2.2	4.3
becoming an artist	34.8	23.9	26.1	13.0	2.2
starting a business	10.9	10.9	50.0	21.7	6.5
becoming a police officer or firefighter	34.8	26.1	28.3	10.9	-
creating and sharing media to promote social change in your community or more globally	45.7	37.0	10.9	4.3	-

\* p < 0.05

\*\* p < 0.01

Significant differences were reported on three of the 16 career options that participants were given as possible choices (see Table 3.C). A Cronbach's alpha of .856 revealed a high level of reliability for this question. In considering becoming a computer programmer or engineer of some sort ( $t(43.09) = 3.45, p < .001$ ) females ( $M = 1.42, SD = .597$ ) reported less desire to

pursue the career than males ( $M = 2.11$ ,  $SD = .847$ ). In addition, males report a higher percentage of considering this option by noting that 40.7% of males reporting “*maybe*” and no females expressing a desire to become a programmer or engineer. Becoming a computer game designer also demonstrated significant differences ( $t(43.35) = 3.02$ ,  $p < .01$ ) where females ( $M = 1.58$ ,  $SD = .769$ ) reported less desire than males ( $M = 2.48$ ,  $SD = 1.252$ ) as a positive outlook for this career. Likewise, becoming a doctor or a nurse ( $t(37.24) = 2.05$ ,  $p < .05$ ) where females ( $M = 3.05$ ,  $SD = 1.079$ ) reported a higher probability than males ( $M = 2.41$ ,  $SD = 1.010$ ) to pursue a career in the medical field. Careers such as education ( $p = .724$ ), politics ( $p = .826$ ), and entrepreneurship ( $p = .944$ ) demonstrated minor differences, however, these too fail to demonstrate statistical significance.

**Perception.** Overall, the highest percentage of responses had a tendency to remain neutral on issues regarding self-perception of ICT use. The feeling of confidence about their own ability to use computers was positive with 54.5% of males and 44.4% of females *agreeing* to the statement. A similar response was provided to the statement “I am good with computers” for which males reported 51.9% and females reported 47.4% of *agreement* with the statement. In response to the statement “It is important to me that I am knowledgeable about computers,” females (47.7%) reported a higher percentage than males (29.6%) in *agreement* to the statement although there was no statistical significance ( $p = .848$ ). Further, in response to the statement “I am NOT the kind of person who works well with computers”, males (51.9%) and females (42.1%) reported a *disagreement* with the statement. The statistical significance was also lacking. Analysis of this segment in perception provided a Cronbach's alpha of .771 supporting the reliability.

Table 4.A  
Self-reported Perception of ICT use

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I would like to learn more about computers	2.2	10.9	34.8	41.3	10.9
I feel confident about my ability to use computers	-	4.3	30.4	47.8	17.4
Computers are interesting to me	2.2	6.5	21.7	47.8	21.7
Learning about what computers can do is fun	2.2	19.6	41.3	21.7	15.2
I am not the kind of person who works well with computers	32.6	47.8	17.4	22.2	-
I am good with computers	-	6.5	28.3	50.0	15.2
It is important to my friends that I am knowledgeable about computers	21.7	26.1	34.8	17.4	-
I like the idea of taking computer classes	28.3	23.9	26.1	17.4	4.3
It is important to my parents that I am knowledgeable about computers	6.5	19.6	41.3	21.7	10.9
It is important to my teachers that I am knowledgeable about computers	-	10.9	43.5	37.0	8.7
It is important to me that I am knowledgeable about computers	-	8.7	34.8	37.0	17.4

\* p < 0.05

\*\* p < 0.01

Despite the lack of statistical significance in perception of ICT use, the perceived level of experience contained one segment in which a significant difference was revealed by the analysis of the data. In the self-identified experience with Photoshop, females ( $M = 3.21$ ,  $SD = .918$ ) reported a higher level of experience with the program ( $t(49.31) = 2.32$ ,  $p < .05$ ) than males ( $M = 2.56$ ,  $SD = .974$ ). None of the remaining 17 programs or applications demonstrated statistical significance between males and females (see Table 4.B). Analysis of this segment in perception provided a Cronbach's alpha of .845 supporting the reliability.

When the familiarity with ICT terms was analyzed, two more elements were found to contain a statistical significance. Analysis of this section revealed a Cronbach's alpha of .906 thus supporting the reliability of the skill segment. In response to the familiarity of ICT terms, a significant difference was found in the knowledge of the key terms "firewall" ( $t(34.57) = 2.45$ ,  $p$

< .05) and “torrent” ( $t(26.00) = 2.21, p = .05$ ). For the key term “firewall,” females ( $M = 1.21, SD = .419$ ) were more likely to report of having *little to no knowledge* about the key term than males ( $M = 1.81, SD = 1.178$ ). The same trend occurred for the key term “torrent,” where 100% of females ( $M = 1.00, SD = .000$ ) reported having *no knowledge* of the key term versus 81.5% of the males ( $M = 1.33, SD = .784$ ). Table 4.C demonstrates these findings. A Cronbach's alpha of .906 on this category provides a high level of reliability for this group of participants.

Table 4.B  
Level of experience with the given ICT items in percentages

	I have no				I'm an expert and can teach someone who to use it.
	I don't know what this is	experience but I have heard of it	I've played around with it	I have used it to make something	
Flash	37.0	45.7	13.0	4.3	-
PhotoShop	10.9*	21.7	45.7	17.4	4.3
Illustrator	30.4	43.5	17.4	6.5	-
Scratch	47.8	34.8	10.9	6.5	-
GameStar Mechanic	52.2	39.1	6.5	2.2	-
ComicLife	47.8	39.1	8.7	4.3	-
FruityLoops	71.7	21.7	4.3	2.2	-
ProTools	67.4	26.1	6.5	-	-
iMovie	-	4.3	37.0	50.0	8.7
iWeb	32.6	32.6	17.4	13.0	-
GarageBand	-	2.2	43.5	39.1	15.2
Digital photo camera	8.7	13.0	26.1	30.4	21.7
Digital movie camera	10.9	19.6	32.6	23.9	13.0
Word/Pages	6.5	4.3	15.2	37.0	32.6
PowerPoint/Keynote	6.5	2.2	15.2	41.3	32.6
Lego Mindstorms	39.1	43.5	8.7	6.5	2.2
Dreamweaver	71.7	19.6	4.3	4.3	-
Fireworks	73.9	17.4	8.7	-	-

\*  $p < 0.05$   
\*\*  $p < 0.01$

Table 4.C  
Familiarity with ICT terminology in percentages

	None	Little	Some	Good	Full
JPEG	80.4	10.9	6.5	-	-
Frames	63.0	21.7	10.9	4.3	-
Preference settings	41.3	26.1	17.4	10.9	4.3
Newsgroup	69.6	15.2	6.5	6.5	-
PDF	54.3	17.4	13.0	10.9	2.2
Refresh/Reload	15.2	8.7	17.4	30.4	28.3
Advance Search	26.1	13.0	26.1	15.2	17.4
Weblog	47.8	23.9	15.2	4.3	2.2
Bookmark	8.7	13.0	21.7	21.7	34.8
Spyware	60.9	23.9	6.5	4.4	4.3
Bcc (on email)	60.9	10.9	15.2	4.3	8.7
Tagging	37.0	15.2	13.0	15.2	19.6
Tabbed Browsing	47.8	17.4	6.5	6.5	21.7
RSS	87.0	4.3	2.2	-	-
Wiki	21.7	15.2	28.3	13.0	21.7
Malware	76.1	17.4	4.3	-	2.2
Social Bookmarking	58.7	15.2	8.7	4.3	10.9
Podcasting	21.7	30.4	26.1	13.0	8.7
Phishing	80.4	17.4	2.2	-	-
Web Feeds	58.7	15.2	13.0	10.9	-
Firewall	67.4	17.4	8.7*	4.3	2.2
Cache	80.4	15.2	4.3	-	-
Widget	60.9	19.6	17.4	2.2	-
Favorites	6.5	8.7	26.1	23.9	34.8
Torrent	89.1*	4.3	4.3	2.2	-
Blog	80.4	15.2	2.2	2.2	-

\* p < 0.05

\*\* p < 0.01

Despite the statistical differences in the aforementioned components, when the perceived skill of ICT use was analyzed, there was lack of evidence of statistical significant differences in the perceived skills section of the survey. From the twelve concepts of skill, the participants reported having *little to no skill*. In trouble shooting and debugging, males (70.3%) and females

(89.4%) reported having *little to no skill*. In programming, males (74.0%) and females (78.9%) reported *little to no skill* (see Table 4.D in Appendix F).

**Influence.** In attempting to identify possible influences, participants were questioned on their parents or guardians computer use. Both males and females reported high percentage of parents/guardians using a computer at their place of employment. Regarding their fathers or male guardians, 92.3% of males and 88.2% of females reported that their father figures use computers at their place of employment. Regarding their mother figures, 64.0% of males and 73.7% of females reported use of computers by their mother figures at their place of employment (see tables in Appendix G). These high percentages (see Table 5.A) support that there is a possibility of parental influence with the use of ICT by the participants, however, when asked to provide the level of importance of other people in their lives that have contributed in their learning of ICT, teachers, fathers, and friends tend to have a higher influence.

Table 5.A  
Importance of people in the learning of ICT in percentages

	Not at all	A little	Some	Very much	Extremely much
School teacher	-	17.4	47.8	21.7	13.0
My mother	23.9	34.8	13.0	17.4	6.5
My father	13.0	13.0	19.6	32.6	17.4
My guardian	41.3	19.6	10.9	8.7	8.7
My sister	65.2	17.4	4.3	4.3	2.2
My brother	52.2	10.9	13.0	10.9	4.3
Another relative (uncle, aunt, cousin, etc.)	19.6	32.6*	30.4	8.7	6.5
My friend (or friends)	6.5	30.4	41.3	21.7	-
Adult at community center	76.1	6.5	2.2	4.3	-

\* p < 0.05

\*\* p < 0.01

A significant difference exists when comparing the influence of relatives on males and females ( $t(32.14) = 2.37, p < .05$ ). Females ( $M = 2.95, SD = 1.224$ ) report a higher instance of

influence by their relatives than males ( $M = 2.15$ ,  $SD = .925$ ). The reliability on this section revealed an acceptable Cronbach's alpha of .774. Because there were some sections in which males and females differ significantly in perception, the following section will provide possible reasons for this discrepancy.

### **Interview Results**

The interview of six middle school females (three from 7th and three from 8th grade) provided an in-depth look in to the possible motivating factors as to why females perceive themselves to be less capable than their male counterparts regarding the use of ICT. Closer examination of the data revealed females in 7th and 8th grade responded similarly to over 50% of the questions. Their responses to the questions and the prompts matched 54.6% of the time and as thus, they were selected to participate in the interview. In addition, their responses to their own perception of use, skill, and experience with ICT tended to reflect a negative perspective. Throughout the interview, several ideas became trends and became the focus by the participants. Positive influences for the use of ICT included communication, productivity, entertainment, influential people, and their own perception of abilities. Negative influences included troubleshooting challenges, and their own perception on the use of ICT. The names used in this study are pseudonyms for all of the participants to protect the confidentiality agreement previously established.

Regarding the perceived experiences of ICT use by female students in a Catholic school at the middle school, it was noted by several participants that technology in general was not “their thing.” It was also intimidating to deal with glitches or errors that appeared to be common in the tablet technology that the participants were using as part of the integration plan. The participants

noted the positive aspects of using ICT, in particular in the use of communication with their peers and relatives. In addition, all of the participants expressed the need to learn about ICT in order to be prepared for their future endeavors. Along with this revelation, teachers were deemed important influences for their uses and perceptions of ICT at middle school level along with siblings, and to a smaller extent, parental figures. Further, they expressed their exasperation in being unable to troubleshoot issues with their tablets or computers, which diminished their confidence level. The following sections will illuminate in detail these findings.

**Positive influences.** Most of the students confirmed the survey by stating that they access ICT primarily at home and then at school. Three uses of ICT emerged in the topics of homework, communication, and entertainment, however, the topic of homework was not elaborated upon and the concepts of communication and entertainment remained at the center of the discussion. Homework was not a consistent topic as Lucia, one of the participants noted, “Half of the time is for homework and the other half of the time is like, for chatting with friends and checking my email and stuff like that. Interacting with my family in the Philippines.” Margaret also commented briefly on the topic when she stated, “Um, I sometimes do homework on the computer but I usually watch YouTube.” In addition, the participants acknowledged several people as influential in their use of ICT. As such, the following sections will describe how parents and teachers, their own perception, the concepts of communication and productivity, and entertainment are influential factors that promote the use of ICT by female students.

***Parents and teachers as positive influences.*** The participants portrayed parents as both helpers and deterrents. On one side of the spectrum, parents were viewed as less experienced users of ICT that required the participant’s help. When asked if their parents were important

contributors in helping the participants with technology, participants included comments such as, “I teach them,” and “My mom knows nothing.” On the opposite side, participants also acknowledged that it is frequently their parents who they turn to for help when running into problems by stating that, “I ask my mom or dad for help”, “Normally, I would just ask my dad or my brother”, “Yeah, well, my step dad gave me my lap top,” and “my dad is like half knowledgeable ‘cause he’s a technician.”

The discussion of teachers as influential in ICT use revealed similar participant responses as those regarding parents. The participants singled out one teacher as being the most helpful when issues with ICT arose. Another teacher was noted for wanting the students use ICT, however, the teacher did not provide support. Two other teachers were not perceived not to be users of ICT in their classroom. When asked if they thought that the ICT currently being used in school was going to benefit them in the future, all of the participants responded with an affirmative. They included reasons by stating that, “Yes because, I don’t know how to do some things and Mr. Smith teaches me so I do it at home I’ll know how to do it,” and “Yes because, um, Mr. Smith helps me a lot with the stuff I need.” Further study of these influential people would determine the degree of influence that they have on the use of ICT by female students.

***Positive perceptions.*** Although the participants were selected based on similarity of responses and negative perception of ICT, they had positive perceptions about their own ICT use. All of them admitted to using some form of ICT at home and at school and completing their assignments. In addition, when asked if they would be excited or more likely to use ICT based on their friend’s recommendation, Penelope responded, “It’s not interesting ‘cause they don’t know what they’re talking about.” Upon a request to assert her answer and asked if she felt that

she knew better than them, her response was, “Sometimes.” In addition, in response to a direct question regarding their own perception of being “smart computer users” Margaret responded:

I know how to do the stuff that I want to do like, play games, go on the Internet, email, stuff like that. I know how to do that, and that’s about it. But I do know how to do other things but those are the things that I really need to know how to do.

Another participant felt confident in her abilities because she was able to complete homework tasks, take a break and play games, and then continue her tasks on a computer. Although the responses were limited and the minority in the interview, it is still worthy of noting due to the fact that they knew what kind of applications to run for specific purposes such as Instagram for sharing pictures, FaceTime, Skype, or email for communication, and had knowledge about computer games.

***Positive use of ICT for communication.*** It was noted by various researchers that males and females used technology for different reasons (Chou et al., 2009; Mercier et al., 2006), such as communication or socialization and productivity. The same concepts became evident in the interview when Lucia mentioned that “interacting with my family in the Philippines” was a reason she used ICT. When prompted to discuss cellular phones or other devices, all of the participants responded that they like to use their phones for texting more than talking on the phone. One participant, Sandra, shared the following about her phone, “Well like the phone I have, is not really a phone, it is usually for my alarm and...and games.” In addition, the participants shared that they like to use applications such as Instagram to see what their friends and relatives are doing. Cellular phones are not allowed in the school grounds and thus, this type of activity takes place primarily during their time away from school. Participants did not comment further on texting, talking on the phone, or using ICT for other forms of productivity or

communication at home. Although communication was a possible factor of females using ICT, further research is required to identify the level of importance that communication has on the positive or negative influence of ICT use.

***Positive use of ICT for productivity.*** Participants readily shared their experiences with ICT in the school. When using devices such as tablets and computers, the participants described the primary function of using them was to use the device as a typing device. When asked upon the primary purpose of the tablets or computers, Penelope responded immediately, “Typing.” This was echoed by the nods and affirmations of the remaining participants. Claudia appeared to stand alone in her comment; “I like typing my notes better than writing them because it is faster for me.” Both, Shannon and Lucia, prefer to write their notes than use a tablet to type them. It was clarified later that the typing the participants were referring to, was not an application used to learn how to type, but rather productivity as reported by Lucia, “That’s really, yeah. We type up things like reviews from the book and then sometimes, very rarely we like research stuff and then sometimes in science and history, then we use it for tests but only sometimes.” The conversation alluded to the notion that although the school has adequate technology, it may not be utilized to the best of its intended purpose, which were similar results as Gibbs et al. (2009).

Participants shared their use of tablets was positive because “it’s like different than like the usual, just, like writing notes, and reading and stuff,” however, contrasting comments alluded to an alternative use of the tablet when Lucia mentioned, “Well, ‘cause when I want to use the iPads, I only want to use them ‘cause I’m bored” and Margaret noted, “I like using computers and iPads because, well, it’s like um, pretty fun to do.” The use of devices for entertainment both in and out of the school subdued the notion of productivity. In a similar way to

communication, productivity did not yield a high response from the participants, further supporting the notion that productivity, although positive, was not a high influence in the use of ICT.

***Positive use of ICT for entertainment.*** Although there was mention of the use of ICT for productivity, the discussion of use of ICT for entertainment became the new focus. Participants focused their discussion on after school activities such as texting, flipping through pictures, listening to music, gaming and watching videos as their primary function of their ICT. Shannon noted, “Um, I sometimes do homework on the computer but I usually watch YouTube.” Many of the participants also mentioned their use of ICT included for listening to music, gaming, and alarm clocks. In particular, when addressing the tablet technology that is currently available at the school, they noted that they prefer to use that for gaming purposes as Lucia mentioned, “Yeah like I like the games on the iPad that’s pretty much the only thing I like about them.” The sentiment was supported by her peers with positive affirmations, and the other participants concurred by stating that it kept them “entertained.”

Further investigation regarding reasons for this approach of ICT revealed that they had selected purposes for the given ICT as was noted by most of the participants that when given a choice between a stand-alone computer and a tablet, they would rather use a computer for productivity but if it was for entertainment, they would rather use a tablet as Margaret noted, “It depends what for. If it’s for playing games, then yes iPad.” All of the participants also mentioned that they play games on various devices.

Entertainment became the focus of the conversation, which signified a greater interest in the use of ICT for entertainment more than for communication and productivity. Upon further

inquiry, participants revealed some troubling aspects for them as users of ICT. Lucia noted,

Like, it's cool for like, to be able to touch the screen but then again it's annoying sometimes because like, if you click on things and sometimes it just doesn't click or if you're like just putting, accidentally putting your hand on something then it clicks it or does something weird with it.

With an increased discussion over troubleshooting issues, the topic was addressed and thus a new trend became visible as a possible deterrent of ICT use by females. The following section addresses these concerns by the participants.

**Negative influences.** The participants shared numerous positive aspects of ICT such as communication, productivity, and entertainment, however, challenges and negative perspectives emerged during the interview as well. These factors surfaced in different ways. As was reported earlier, research supports the evidence of different perception by female and males as well as the actual ability to use ICT, which posits that females and males do not differ significantly in ability. Their responses revealed negative views by society of females as technology savvy individuals and self-perception as negative influences. The second influence emerged in the process of discussing troubleshooting issues with the ICT that is used in the school, which revealed to be a greater deterrent than the previous factor for the participants. In addition, the participants provided some possible explanations for the discrepancy between males and female use of ICT.

**Perceptions by society.** Reactions to the statement that males perceived themselves as very good users of computers versus females, who perceived themselves, as not so good users of computers were indicative of the perception of the participants. All of them readily agreed with the statement either verbally or with affirmative nods. Lucia reflected:

That like, people think that they're not good with computers cause there are some girls that,

out there that really are knowledgeable about computers. But then again if you go to like Staples it's usually a guy that is their computer help instead of girls.

Beyond what may be experienced in real life, participants also noted what they perceived to be a view of ICT use by females in the media.

I think that girls aren't really supposed to be a, good at computer stuff because usually on like T.V. shows and stuff usually there is like a dorky boy like that its obsessed with computers and like knows everything about it and the girl is all, 'Ah, help me, help me, I need help with my computer,' Yeah.

It is perceived by them that in general, people tend to think as males dominating the fields of ICT and females tend to turn to them when they are having issues with the technology. The focus of society's perception was shifted toward the participants who felt that even if people thought about ICT and gender in one way, it was Penelope who verbalized the sentiment of the group when she stated, "I think it depends on what you think, 'cause like the girls like, don't think that they are smart enough, then like, they don't try it, but if they do, they'll like do it." Further research could reveal if the perceived notion of society's influence on the view of female students does indeed provide a substantial degree of influence needs to be conducted to support the perceptions of these participants.

***Self-perceptions as negative influences.*** A heavy undertone contributed to the self-reported notion that the participants did not consider themselves "smart about technology". Frequent responses included the inability to troubleshoot issues with a tablet or computer. One participant stated, "Um, cause I just don't know how to fix computers, I don't know things about computers." Further questioning the issue demonstrated her frustration over computer glitches and inability to troubleshoot, "I know how they work it just if something happened to a computer I don't know what to do about it." The comment was reinforced by a second participant:

Lucia:

No. It's same Penelope's reason like you simply cant know what to do. But I am smarter than some people like my mom. I, I guess it depends on what you mean by smart. Like, how like, techie smart like you know exactly what to do if something goes wrong or smart as in you know more, you know enough to use it, cause I know enough to use it I just don't know all the details.

The participants alluded to the notion that because they did not know how to troubleshoot an issue, they did not consider themselves smart about computers by noting that they only knew “the basic stuff” or that they didn’t “know how to fix problems.”

Confidence in the ability to use ICT diminished as the discussion of issues arose. In an effort to divert attention from the confidence and provide support when issues came up, a hypothetical class was envisioned and the participants were asked if they would be willing to partake in the course. A negative response was unanimous. They responded that, “That’s not my thing” and “it doesn’t sound fun to me.” Further, they commented that classes such as those and getting help from others made them feel “stupid”. It became clear that a low level of confidence equated to a reluctance to participate in anything that challenged the confidence level. In this issue, it was the ability to work through issues that arise when dealing with ICT such as blank screens or glitches.

***Challenges with troubleshooting.*** It was early in the interview when challenges with ICT were addressed. Issues with typing on the tablet, to blank screens, functionality of applications, pop-ups, uniformity with tablets and existing computer, and even the sound that was emitted from the tablet appear to be frustrating and difficult to conquer. Participants expressed concern over the functionality of the most recent ICT being used and inconsistency with the older, existing ICT. Concerns over the speed and lag of the older systems was mentioned by some but non-verbally agreed by all. At first, issues were dealt with relative ease

as noted: “It depends on what the problem is. If its like, random stuff popping up then I’ll x it out but then if the stuff isn’t x-ing out then I’ll turn off the computer and turn it back on and that usually works.” As issues became more complicated, however, a feeling of frustration compiled in the room to reveal a reason for females to refrain from using ICT.

Lack of management such as saving papers or the inability to use an external drive connection made the participants feel that ICT was not there to help them be successful. In addition, the complication of touching different locations simultaneously on the tablet made the participants desire older, slower technology to the recent tablet. Even more frustrating appeared to be the inability to do anything about a blank screen, or a blue screen, out of which the frustration about the use of ICT or inability to work with it became evident in the following conversation:

Lucia:

But like what if it’s frozen? That’s the one I hate most cause like if it’s frozen and you don’t and mouse isn’t moving and you cant click anything then there’s nothing you can...

Margaret:

Hit the buttons!

Lucia:

...that wont help though. ‘Cause like there is nothing you cant do you, just have to wait and if it’s nine o’clock at night and you need to get your homework done and you have to sleep, cause I like sleep, and then I just it doesn’t work and then I just get all frustrated, so it’s hard to deal with that cause its like inside the computer its not outside the computer, sorry.

A tendency to walk away, eventually return or completely avoid the ICT became the agreed reaction by the participants. It would be important to verify the technology integration process of the school to identify if proper classes about the use of ICT in the classroom are implemented. As noted by Galla (2010), it is important to have a professional development plan in place in

order to produce a culture receptive to ICT. A variable that will strongly support or rebuke the notion that frustration is a factor in the use of ICT by females is the instruction that teachers provide to the students regarding such issues like troubleshooting the ICT in use at the school site.

*Other possible factors.* When prompted to provide possible reasons for the discrepancy between male and female use of ICT, the participants noted that gaming was possibly the biggest difference. It is not that females do not engage in the activity, however, it was noted, both in the survey and in the interview that there is a difference in the way gaming is perceived by males and females. According to the participants, males tend to be affected more by games to the extent that they forego socialization and would rather play games. They also mentioned that the male counterparts in their classroom were obsessed with games, as were their male siblings. As they move on to high school, according to the participants, females expand their group of friends and would rather spend time socializing while males will remain at home playing video games. The notion of using ICT for socializing was revealed in earlier research, however, the participants were proposing a notion that a move into high school and an influx of relationships separates the need for different use of ICT by the genders.

## **Conclusion**

The data collected provided evidence that females do not differentiate much in comparison to their male counterparts, however in 16 different variables, a statistical significant difference was undeniable. In accessing ICT, it was noted that significant differences existed in two variables, with use of ICT in the after school program and at a relative's house. Three more differences arose in the category of experience in which, females were less likely to report

experience in building robots or inventions using technology, were less likely to participate in multi-user online games, but were more likely to share media that they had created.

Six more significant differences surfaced in the category of interest. Females were less likely to report “action”, “competition”, and “art” as important aspects of games than males. In addition, females reported with a higher frequency their reluctance to become computer programmers or engineers of some sort, or computer game designers. They did, however, report a higher level of interest in becoming doctors or nurses. When addressing the issue of perception, three other significant differences emerged. Females are more likely than males to perceive themselves as experts on Photoshop. They are also more likely to report little to no knowledge of terms such as “firewall” and “torrent” than their male counterparts. Further, females report a higher percentage than males where relatives are a little important in learning about ICT. These differences were supported by the interviews with the female students. The participants also, factors such as glitches, a feeling of incompetence with troubleshooting, lack of confidence, and teachers as influences that aid, or deter from further engagement in the use of ICT. In essence, the experiences of female participants in a Catholic school at the middle school level regarding the use of ICT are not very different from that of male students. Both genders access ICT in similar places, have similar experience and interests in ICT, perceive themselves as adequate users of ICT, and do not differ significantly in their influences for ICT use.

The data from this research study suggests that although there are differences among the genders when it relates to their use and perception of ICT, those differences as significant as they may be, help support previous research that males and females differ in their approach to ICT use. Significant differences in aspirations and perceptions may contribute more to a positive or

negative influence on the use of ICT by the genders than access or experience. As noted in the survey there were some significant differences in which males reported a higher rate of becoming a computer programmer or engineer or becoming a computer game designer. Further, a feeling of insecurity or confidence by female students, as noted in the focus group, provided a glimpse of the reluctance to engage in ICT use because of the fear of the inability to manage glitches or issues. Further discussion and recommendations will be addressed in the following chapter.

## CHAPTER FIVE

### DISCUSSION, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this study was to investigate the experiences and self-perceived views of middle school females regarding the use of ICT in comparison to males, to provide a voice for female students in a Catholic middle school in order to express their perspective about ICT, and to find influential factors, which contribute to or detract the use of ICT by the female students. In addition, the findings were to provide people in key, leadership positions with an understanding of these perceptions and experiences of female students in order to create or enhance a technology plan that integrates the perspective of all its constituents. Results from this study revealed that females in the middle school do not differ significantly from males in the middle school in many aspects in the areas of access, interest, experience, perception, and influence. There are, however, several statistical significant differences within the aforementioned areas. The following sections will provide a discussion of the results of this study as they support and contradict previous studies, the implications these results have for leadership in the decision process to establish or enhance a technology integration program, and recommendations for future studies.

#### **Discussion**

It is important to note that, despite confirming the results of previous research, this study also found statistically significant differences between males and females in their access, interest, experience, and influence in perception of ICT use. As mentioned in Chapter Four, the statistical significant differences between males and females were that females: (a) were more likely to access ICT at the after school program and at a relative's house; (b) report a higher instance of

never building a robot or invention using technology; (c) include a relative as an important person in learning about computers; (d) report a lower tendency to use ICT to play multi-user online games; (e) report a higher tendency to share media that they have created; (f) express less interest in action, competition, and graphics in games; (g) declare higher experience with Photoshop; (h) were less likely to know terminology such as firewall and torrent; (i) were less likely to see themselves as computer programmers, engineers of some sort, or computer game designers; (j) but more likely to see themselves as becoming doctors or nurses than their male counterparts. The results of access, experience, interest, perception, and influences will be addressed in the following sections.

**Access similarities and differences.** A combined 91.0% of participants in this study reported accessing ICT at home on a regular basis (combination of a few times per week, daily, and several times a day), which is similar to the results found by Barron et al., (2010) where a large percentage of the population accessed ICT at home. The site is located in a city whose socioeconomic status ranges from medium to high, which explains the high access of ICT at home. This study also supported the results from Volman et al., (2005) in which females were less likely than males to use ICT at home (26.3% and 48.2% respectively) on a daily basis. Results from the interview provide evidence for this trend. Females reported that doing different activities with others was preferred to using technology.

Although Barron, et al. (2010) compared groups according to experience level (i.e. *Beginner, Specialist, Explorer, Generalist*), the overall percentages in the frequency of access (i.e. *Never, Less than once a month, Once a month, A few times a month, Once a week, A few times a week, Daily, and A few times a day*) were similar to those revealed in this study. Despite

having similar ownership of computers (females 47.4% and males 44.4%), the greatest discrepancy between males and females was in the likelihood of females accessing ICT at the after school program and at a relative's house. Unlike Barron et al., (2010) this difference was only evident in the participants in the Catholic school.

Numerous influential factors can contribute to the existence of this difference. One explanation is the way that the after school program is structured at the school which allows students a free choice of activities from athletic competition, to working on homework, or to have recreational and academic use of ICT. Females typically help younger students while in the after school program with homework or with getting on to a website on the computer. In addition, less males at the middle school level attend the after school program because of sports. This survey was conducted at the end of the football season at the school, a sport in which only males participate, thus females were more likely to attend the after school program. Although the use of ICT is available for academic purposes, recreational use is the predominant use in the after school program. The majority of users tend to be primary and elementary grade male students. This type of ICT use is perceived by female students as using ICT for entertainment and gaming rather than for academics.

Using ICT at a relative's house more frequently by females can be explained by the relationship between the level of influence perceived by the female participants and their relatives. As noted in Chapter Four, females (68.4%) were twice as likely as males (30.8%) to find an uncle, cousin, or aunt important in their learning how to use computers. Some the students attending the school have relatives also enrolled in the school. As mentioned in the literature review, middle school students are also entering the adolescent stage in which they find

themselves at odds with their parents (Spear, 2000). Relatives are people close enough to the family to be influential, however distant enough to deflect tensions of adolescence and parent conflict.

**Importance of experience.** A greater percentage of the responses demonstrated that the participants were more likely to respond “Never,” “Once or twice,” or “Less than once a month” to experiences with specific ICT uses such as creating Websites or creating media to share. Although the Catholic school has access to updated ICT with the tablets and an updated wireless network, the low experience to ICT related activities reported by the participants suggests accordance with Gibbs et al., (2008) where it was noted that Catholic school had sufficient and adequate technology, however, it was not used adequately. This, however, was not true of the site. Numerous variables were tested to find the experience of both males and females and how the genders compare, however, as noted in this study, only six variables (building with technology, participating in multi-user online games, sharing media, Photoshop, firewall, and torrent) demonstrated a significant difference between males and females. All of the aforementioned are discussed in the following sections.

**Low experience with ICT.** Although the site has introduced the use of tablets as a major part of the technology integration plan, intricate integration of ICT was not part of the program. Students at the site are not asked to write in code, create websites, or post things on to the Internet. These concepts, however, were asked of the participants and they responded with a majority of negative confirmations such as “Never” or “Less than once a month.” Over fifty percent of the students had overwhelmingly responded to never having participated in the following activities: (a) written computer program using compute language; (b) created their own

newsgroup, blog, or discussion site on the Internet; (c) created a website using applications; (d) created a website using HTML; (e) put up a site on the Web so that other people could see it; (f) built a robot or created an invention using technology; (g) use a simulation to model a real life situation or set of data; (h) built a data base; (i) created an animation; (j) created a computer game; or (k) created a digital media project in collaboration with other people, which constitute 57.9% of the listed activities. Not surprisingly, over 80% of the participants have not participated in ICT classes beyond the school setting. The low exposure to ICT is not necessarily a reflection of the site since it is only in the beginning stages of introducing the tablet program. In addition, the computer lab used at the site contains older computer, which tend to delay and cause frustration.

Included in this frustration was the issue of troubleshooting problems when they arose. The participants in the interview debated frequently regarding their frustration when things went awry while using ICT. From blank or blue screens to annoyance of the typing noises, the exasperated undertones that the interview participants demonstrated was a feeling of ineptitude that could not be overcome by working out the problem themselves. This notes the site's lack of instruction in fundamental use of ICT use. Having an IT department that focuses on troubleshooting issues is something to consider. There are, however some strategies and procedures that need to be followed in order to avoid further frustration and loss of time. Teaching students using ICT these fundamental procedures would minimize the level of frustration, help them understand that glitches and blue screens tend to be part of the learning process, and help establish a level of confidence in females that have a low self confidence because of their inability to troubleshoot.

**Internet use.** The use of the Internet by the participants noted a more positive view of ICT when checking for reliability of websites. When checking for validity or reliability of Internet sources, participants have a higher occurrence of checking for views of fact or opinion, seeking other sources to validate information, check to see which other sites link to that Website, checking to see who the authors are, and checking if the contact information is given. This reflects the effects of the site's first goals toward the technology integration program, which was to educate students on their ability to recognize if Websites that they use for research are valid and reliable. In addition, items in the experience with ICT included complicated and meticulous assignments, which would require a different ICT instead of a tablet.

Chou et al., (2009) noted that a significant difference exists between males and females as it relates to their perception of the Internet where males perceived it as a tool and toy more than females. This study supports these findings in conjunction with those by Jackson et al., (2009) where it was noted that females use technology for communication and males use it for gaming. This study noted that males (88.9%) were more likely to participate in multi-user online games than females (52.6%) and females (52.6%) were more likely to share media that they had created than males (26.9%). Beyond the Internet, differences with ICT are found in specific areas such as creating robot, using Photoshop, and terminology.

**Applications and terminology.** A statistical significant difference was revealed when asked if the participants had built a robot or created an invention using technology of any kind. Females (94.7%) had a higher percentage in the "Never" section to this question than males (74.1%). The school site does not currently host science fair program and as such, robot building and/or invention are encouraged but not as part of the curriculum. Exposure to this experience is

entirely based on activities taken by the participants beyond the school setting. Mammes (2006) suggested gender inclusive programs to promote the use of ICT by females and specifically for this kind of integration; it would benefit both males and females to integrate creativity and invention into the technology integration program.

Participants also reported a significant difference in the use of Photoshop in which females (79.0%) had at the minimum, played around with the application in contrast to males (59.3%). In addition, none of the females reported not knowing what the application was versus 18.5% of males who reported that they did not know what that application was. Because females tend to use ICT for communication and sharing more frequently than males, this difference can be attributed to the accumulating differences between males and females. Sharing photos was a trend that was visible both in the survey results and in the interview results where females reported using Instagram as a way to keep in touch with others. Some females (10.5%) even declared being experts and being able to teach others about it. This alludes to the notion identified by the female interview participants when Margaret noted,

“I know how to do the stuff that I want to do like, play games, go on the Internet, email, stuff like that. I know how to do that and that’s about it. But, I do know how to do other things but those are the things that I really need to know how to do, so.”

It is important for females to understand a need to integrate the technology that they are using. Using Instagram, for example, as a way to take pictures and communicate with others has its purposes with the social aspect, as thus, females at this site have knowledge of Photoshop, which allows them to manipulate digital photos. When the ICT is relevant and purposeful, participants will engage in its use, such as gaming for males and Photoshop and Instagram for females.

In terminology, females were less likely than males to identify torrent and firewall. One hundred percent of the female participants in the survey admitted to knowing nothing or very little about the term “firewall” and no knowledge of the term “torrent”. In contrast, 74.1% of males reported knowing nothing or very little about the term “firewall” and 88.9% reported knowing nothing or very little about the term “torrent”. One cause of these differences is that some of the parents are involved in ICT in some way. One parent of an 8<sup>th</sup> grade student is involved in the technology integration program at the school and works in the information technology (IT) department at the local university. Another possible explanation for this discrepancy is the likeness of the word “torrent,” (a file containing information on other files) to “turret” (a building addition typically built for defense of a castle), which is used frequently in games involving strategy and action. Since male students partake in gaming more often than females, the familiarity with “turret” by males can account for the statistical difference. Clarification from the male and female participants in these terms would have provided a clearer explanation of the statistical significant difference.

Supporting evidence from this study regarding the use of ICT for Internet use, gaming, and other activities (i.e. creating Websites, blogging, sharing digital media, etc.) suggest that the participants from this study tend to reflect the findings of other researchers. There is, however, a strong indication in this study that the participants have a low exposure to ICT activities, noted by the tendency to report “Never,” “Once a month,” or “Less than once a month” responses. This low exposure was also supported by the female interviews in which all of the participants indicated the use of tablets and computers was primarily for typing. This lack of exposure to different activities and aspects of ICT may be indicative of the low responses of future

aspirations involving ICT. The use of ICT for gaming was also evident in the results from this study. The use of ICT for gaming concurred with Heemskerk et al., (2009) and with Jackson et al., (2009) where males engage in video games more frequently than females.

These results, however, are indicative of the beginning of an integration program, whose focus is to begin using ICT for navigating the Internet and using the tablets as a way to transform pedagogy in the school. The plan for shifting into this type of integration had been discussed for a long time and the tablet integration program was more sudden than what was anticipated. Acknowledging the existence of other influential factors is imperative in understanding the entire student. The following section will discuss the influential factors that were discovered in the survey and interview with the participants.

**Influential factors.** Five different questions in the survey were used to identify potential influential sources or factors that would contribute to or deter the use of ICT by both males and females. These included sources such as digital or printed (i.e. classes in and out of school, books, manuals, magazines, online discussion threads, software help menus, tutorials, playing on the computer either around on a program or playing games, after school programs or community center computer labs), people (i.e. teacher, parent, sibling, relative, friends, other adults), parent's profession (i.e. does your father/mother/guardian use computers at their jobs), parent involving in the use of ICT (buying, renting, using, asking for help, paying for ICT help), and future aspirations (i.e. becoming a politician, teacher, police officer, etc.). Out of these, people and future aspirations were the only two subcategories that demonstrated significant differences.

***Teachers and relatives as influence.*** Spear (2000) noted that during adolescence, people tend to perceive a higher number of conflicts with their parents and their decision-making tends

to be vulnerable to stress, females in particular, tend to be more vulnerable to stress. With these findings in the forefront, this study asked participants to provide a level of agreement to the following prompt: “It is important to (my friends, my parents, my teachers, me) that I am knowledgeable about computers.” Both genders identified their friends (17.4%) and parents (32.6%) as having less impact than their teachers (45.7%) or themselves (54.4%) in the importance of knowledge about computers. This supports the findings by Spear (2000) that adolescents have a higher number of conflicts with their parents. Females in the interview suggested similar results as they stated that they would not be engaged if their friends shared ICT news, were more likely to help their parents than to get help from them, and would use technology because their teacher helped them work through some issues with the ICT. Participants in the interview did identify other members of their family as influential such as siblings, uncles, and grandparents.

The only statistical significant difference in this section of influence was the importance of relatives as females (68.4%) reported that relatives were some what, to extremely important in the learning how to use ICT in contrast to males (30.8%). It is important to note the higher positive responses to the self and to teachers as influential factors in the use of ICT, in particular when teachers are willing to engage in the use of ICT in the classroom. As Gibbs et al., (2009) noted that students were more likely to engage in the use of ICT when teachers integrated the use of technology in their classrooms. As mentioned earlier, the access to ICT at a relative’s house by female students suggests that this frequent access and the importance of relatives’ influence on ICT learning are related. More importantly, the concept of the self as being of high importance in the learning of ICT must be discussed.

These findings also support identity control theory (Burke, 2007) where the participants felt that their teachers had an expectation of them as ICT users, yet only some teachers were willing to provide assistance when needed. In essence, teachers are important to the development of skill and use of ICT and have the responsibility as leaders to ensure that both males and females are receiving adequate training in the ICT that is being implemented at the site. A lapse on this instruction has unintended repercussions on adolescents who are struggling to find their own identity and at the same time adapt, establish, or confront the norms of society. Without the proper education, they will have little to no chance of succeeding in their future aspirations in ICT careers.

*The self as an influential factor in ICT.* As Bandura and Adams (1977) noted, the theory of self-efficacy is used to explain the influence of a student's own abilities to achieve goals, to be attentive, make learning relevant, have self-confidence, be determined, and be satisfied with results. All of these are combined in the area of motivation and attitude toward learning. This concept was frequently a topic of discussion in the interview. Females stated that they were able to do things with ICT that they wanted to do and that a person must like what they do to be "into" what they like. The females in the interview whose view of ICT was mostly negative tended to see other people as better than they were at technology, however, after further discussion, it was revealed that they also knew more about technology than others that they knew (i.e. Lucia knew more than her mom, Penelope knowing more than her grandma, etc.). Other participants, such as Margaret and Sandra, were on the positive spectrum of the ICT use and they reported feeling excited about using new technology.

Using technology integration in education as a part of the pedagogical approach to provide equity in the field of technology is essential to ensure that females have a positive image of themselves as users of ICT. Although the perception of both male and females did not show statistical significant differences, a small percentage of females (5.3%) agreed with the comment: “I am NOT the kind of person who works well with computers” where no males agreed with the statement. In addition, a small percentage of females strongly disagreed with the statements: “Computers are interesting to me” and “I would like to learn more about computers” where no males strongly disagreed with these comments, but females did (5.3% on both). It ponders the question if this integration was to have occurred in the younger grades as suggested by Mammes (2008), would the same results be given?

Spear (2000) also noted that during this age, adolescents report that they are “most happy when talking with peers” (p. 420). This study also supports the aforementioned results where females were less likely to report to never having shared media that they had created than males. This was also supported in the interviews in which females described using ICT such as Skype or Instagram to see what their friends and relatives were doing. This use of ICT is also consistent with the results from Chou et al., (2009), Heemskerk et al., (2009), Hwang (2010) and Mammes (2008). As such, it is imperative to consider the way ICT is being integrated throughout education and ensure that this integration is taking into consideration influences, perceptions, and experiences of middle school students, in particular, female students who have demonstrated a decrease interest in ICT as they approach the beginning of high school. The following section will discuss interests of male and females as influential factors that promote or deter the use of ICT.

**Interest as an influential factor.** There were a total of four questions involving interest. Two had to deal with gaming and gaming preferences and the last two had to do with school and out of school activities. This section will address the four questions as two subcategories. The first will discuss school activities and out of school activities and the second part will discuss gaming as influential factors to promote or deter ICT use.

***School and out of school activities.*** Participants noted that while in school, 21.7% of participants reported sports, 24.0% reported reading and writing, and 32.6% reported engagement with ICT as their favorite activity. Out of school activities showed slightly different results in which 8.7% of participants reported reading or writing, 24.0% reported ICT use, and 65.2% noted that sports were their favorite out of school activity. The notion that reading and writing had low participant responses was not surprising seeming that middle school students are departing from learning to read pedagogy and entering the reading to learn pedagogy. Reading increases in complexity and as such, fewer partake on it as a recreational hobby. In addition, a greater amount of time is used for sports. Part of the culture of the school is the involvement of students in extracurricular activities, which include organized sports and dance. As such, it was not alarming to see the results of these questions reflect the culture of the school where a great percentage of out of school activities involve sports.

The use of ICT, both during and out of school, as favorite hobbies were very close in percentage (32.6% and 24.0% respectively). It is important to note that an increase of sports in out of school activities has effects on reading, writing and ICT use; the percentages decrease in out of school activities. This alludes to the notion that participants prefer academics and ICT use during school as opposed to sports because they have more time to access these platforms than

they do beyond the school day. The school has sports teams that participate in after school tournaments and physical education classes, however, these are not available on a daily basis. Reading and ICT use are required and encouraged during the school day, which supports the results that a greater percentage of participants prefer these activities during the school day.

**Gaming.** In the two questions involving gaming, males reported higher levels of importance in action, competition, and graphics of games, which were significantly different to females. Jackson et al., (2009) and Heemskerk et al. (2009) noted that males were more likely to engage in video game playing than females. This study noted similarities where males reported higher percentages of game enjoyment on seven out of the eleven categories and females reporting higher percentages on four out of the eleven categories. Two of the greatest differences in percentages with types of games were found in the “Shooter” category where males (74.1%) engaged on this type of games with more consistency than females (15.8%). In engaging in “Party” type gaming, females (94.8%) were more likely to engage in these games than males (37.0%). This revelation supports a notion that although males are more likely than females to engage in games (Jackson et al., 2009; Heemskerk et al., 2009), females are still engaged in gaming, just in different variety. The interview supported these results for many of the females stated that they would use the tablets for gaming or that they would like to play games that involved the notion of party or dancing.

The female participants in the interview attributed the engagement of video games as a reason why males were engaged in the use of ICT more than females. The participants also acknowledged that they were interested in gaming, however it was for different reasons, supporting the research Mammes (2008), who noted that there were different intensities of use

by males and females. These differences can be attributed to the higher likelihood of females using ICT for socializing and males engaging in ICT, gaming in particular, for competition and visual stimulation. The elements in gaming that demonstrate the greatest statistical significant differences between males and females will now be discussed.

This study revealed that the statistically significant differences occurred, not in the types of games, but in the importance given to the in the characteristics of the game (i.e. Action, Graphics, and Competition). The notion of video games as a motivating factor to encourage the use of ICT is also supported by Sadker and Silber (2008) who note the difference in motor skills and perception skills such as males have a better visual perception and have better gross motor skills. As mentioned earlier in Chapter Two, most ICT can be accessed through screens and monitors and males tend to be visual learners, they embrace the use of ICT more readily than females. In addition, gaming requires a sort of motor skills that is repetitive and, more recently, requires gross motor skills to increase the interaction with the game.

The fast pace and visual stimulation that action games provide makes them appealing to males to a greater extent than females. Participants in the interview expressed that video games were a waste of time to them or they became bored within a matter of minutes of playing video games. Females would engage in game playing, in particular if it involved “Party” characteristics. Rosser (2005) noted that the gaming industry was reluctant to change a formula that generates financial stability and whose main contributors are male and as such, females are being excluded from ICT engagement. Miller and Robertson (2010) also noted that there was an increase in correct answer and self-esteem when using game consoles as part of the learning process. By excluding female inclusive characteristics from the games in the use of ICT, it is

inevitably lowering interest in ICT, accurate answers, and self-esteem. These in turn replicate and perpetuate the cycle and continue to separate females from ICT careers.

Mammes (2008) noted the importance of increasing female interest in ICT and technology training being a key component of this transformation. The different ways that females and males use ICT, in particular gaming, is an influential factor in the technology integration process. When the technology being integrated is interesting to the constituents, frequent use will evolve naturally and it will remain mutually beneficial for males and females. The following section will address how the findings of this study promote implications for leaders in schools and in particular the integration of ICT into education.

### **Implications**

Over the entire study, the results and analysis revealed sixteen statistical significant differences between males and females and their approach to using ICT. These include where they access ICT (after school program and at a relative's house), the experience with ICT (never building a robot, gaming, Photoshop, terminology, and sharing media), interest (gaming), and influence (relatives and future aspirations). Because many of these differences have an impact on the ICT integration in schools, implications for leadership and administration of Catholic schools will be discussed.

**Access.** Although the school site may provide access to ICT while the students are in campus, when integrating a comprehensive technology program it is important to understand where and how the constituents access ICT when not using school property. It is important to note that all of the participants, males and females, had Internet access at home, however, it was unclear which kind of Internet access was available (i.e. dial up, cable, wireless, etc.). In

addition, 88.9% of males and 89.5% of females noted that they had wireless access at home. Moving the middle school into a one to one tablet program will need to address the issue of Internet access with the remaining 10% of students who do not yet have wireless access. In particular for this school, the technology team and administration will need to provide time after school for students who lack the necessary wireless access at home in order to provide an equitable environment for all participants in the technology program.

In addressing the statistically significant differences, because females are more likely to use ICT in the after school program, it is important to establish a structured program that allows all users of ICT, male and female, to learn how to use the technology platform that they are being allowed to use. Many times it is taken for granted that because students are young and have access to ICT at home, they are digital natives when the reality is that they still need to be educated in the proper use of technology.

Addressing access to ICT beyond the school setting can be a daunting task. A technology user agreement may release the school from liability within and beyond the school boundaries and protect users by encouraging safe use of ICT. Once the ICT leaves the school grounds, it becomes difficult for the school to retain control of how it will be used and where it will be accessed. Mobile technology has made the monitoring task much more difficult and much more expensive. For Catholic schools, it is absolutely imperative to develop a user agreement that emphasizes the responsibility of the ICT user regardless of where the technology is being accessed. The user agreement must also not be restrictive to certain places, such as home and school, and must allow for use of ICT in different locations such as a relative's house or even

places where students travel to as part of their breaks during the school year. Ultimately, the responsibility will increase for the user as the institution relinquishes control over access.

**Experience and interest.** Participants demonstrated the beginning stages of the technology integration program in which they were educated on safe Internet use and basic skills of the tablets. In addition, they did express a low experience with many other items within the experience domain of the research study. Female participants in the interview did note they have access to many applications in their tablets, however, they also reported using ICT primarily to type. As noted by Galla (2010) and Gibbs et al., (2008, 2009), professional development is essential in establishing a successful technology integration plan. In this study, the participants alluded that they were expected to know how to use the technology by some of their teachers but very few were able to provide assistance when needed. Since the data collection, the school site has increased their professional development involving the use of tablets by teachers and provided teachers with time to develop lessons involving the integration of the tablets.

As noted in the results, females were less likely to report that they had ever built a robot or created an invention using technology. Although the prospect of robotics in a middle school is possible, albeit costly, establishing a science program that would allow students to showcase their creativity and ingenuity, in particular when the use of ICT is encouraged, will increase the exposure of all participants to STEM based careers and opportunities. Infusion and integration of ICT into education will not occur naturally and it is imperative that the leadership and administration of any site does so with all constituents, males and females, in the forefront.

Yet another implication in the experience and use of ICT for leadership is the need to instruct users of ICT in basic troubleshooting. Integration will not be a smooth transition if the

teacher spends half of the class time working out issues with the students. A series of classes geared primarily in troubleshooting and thorough knowledge of the ICT would provide students with enough background to minimize the need for a teacher at a time where engagement in the content is more essential than time in working out glitches.

When considering video games as a way to integrate technology into education it is important to note that males and females did not report having “never having played a video game.” Video games as educational tools are not new. However, they have recently gained momentum. In choosing to integrate ICT through video games, it is important to know the reaction and likelihood of differences in engagement by both males and females. A site that provides gaming as a venue to integrate technology by using games that have action, challenge others, or extensive graphic designs will be overlooking the female students within their midst. If the site decides to use games that have a tendency to have a “party” or “dance” style gaming, then females will be more involved, along with games that require socialization. It is imperative to recognize the different approaches to gaming so as not to ostracize one gender over another. Just as important are the results in this study in which females report a lower tendency to play multi-user online games. This study provided a clear difference in how males and females are interested in games. The holistic approach to gaming is not the sole intent of this study, however, it does provide some of the implications to consider when establishing a technology program involving games as a way to integrate ICT.

Expectations of vocabulary development are generally embedded in education. Teachers review vocabulary words with students frequently in science, social studies, language arts, liberal arts, and mathematics. Moving into a technology integrated platform of education, technical

terms become an important part in the development. Although many of the participants responded low in ICT terminology, it is important to note that overall, females reported less knowledge of terminology than males. As mentioned in the literature review, females have an edge over males in verbal and nonverbal abilities as well as on memory (Halpern et al., 2007; Sadker & Silber, 2008). As such, it is imperative for leaders and administrators to recognize this and use it to the advantage of female students. Teaching not only how to use ICT in education but educating the student on the terminology and jargon of technology will help increase the exposure and confidence in the ICT fields. Although the terms “firewall” and “torrent” may not be considered the holy grail of technology jargon, it is terminology that eventually affects the way ICT can be used.

A very clear implication for leadership in the integration of a technology program was the likelihood of females sharing media that they had created and declaring a higher experience with Photoshop than their male counterparts. In the interview, females also shared the use of photography through Instagram as a way of using and enjoying ICT. Introducing this type of visual media into the technology integration program would encourage female students to partake in the use of ICT in the things that they already enjoy doing and feel confident about (sharing media and Photoshop). In order for the technology plan to have success and be inclusive of all constituents, the inclusion of these two findings is essential. It may be included as a digital photography class or as intricate as a film and fine arts class. Including these findings may not necessarily promote the participation of male students. But excluding them does exclude female experience with ICT and as such, it prevents female students from sharing their experiences and perceptions of ICT and female participation.

**Influence.** An influential factor that may promote or deter ICT use not previously considered in this study was the notion of relatives as influential people in the learning about ICT use process. Parents and teachers are natural choices due to the proximity and time that they spend with students. It was interesting to note that this group of participants selected a relative as having some, very, or extreme importance in the learning of ICT, in particular for females. The implications for leadership and administration in this area are clear however. It is important to note that no longer are the teachers the sole distributors of information in school, nor the parents at home. The use of ICT affects every part of a student's life including parents, teachers, relatives, and friends. It will be important for teachers to accept that students will question approaches to technology not only in what is done at home, but in what is done at a relative's house. The leadership of the school must understand that the student has multiple sources of information and must receive aid in how to best be able to apply the method for their task. It is once again, asking the school as a leader to relinquish control and apply a pedagogical shift that the school is only one of many sources of information for a child.

As adults, people change professions several times before settling into a career choice that is convenient, financially sound, and satisfying. Although middle school is as far off as a time when students will decide what they will be as professionals, it is an important place to begin establishing a foundation toward those careers and to explore the possibilities. Increased exposure to careers through career days or visitations by professionals will increase the visibility of these, for after all, what kind of exposure are students getting to careers at the middle school level? If the answer is not very much, the school's approach to exposure to the outside world

may be likened to Plato's Allegory of the Cave (*The Republic*, Book VII) where all students see is shadows of possibilities but never what the career truly is or what is involved in it.

Female students were less likely to select a career where ICT use was one of the primary goals and fundamental skills of the career (i.e. computer programmers, engineers of some sort, or computer game designer, etc.). They were, however, more likely to pursue careers such as doctors or nurses. This denotes a great implication for leadership and administration. Although not directly involved in the career planning for future students by selecting what career choices the students should pursue, schools are responsible for establishing a general education and an arsenal of tools from which a student can eventually gain independence, think critically, and make his or her own decisions. Without discussion of career possibilities, the school is denying students valuable information in the decision making process and as such, negating the purpose of a Catholic school to provide an education for the entire child that is ready to face the challenges of today's world.

**Leadership implications.** This study sought to find the perceptions and experiences of female students at the middle school level and possible influential factors that encourage or deter the use of ICT. These findings have implications for school leadership in establishing or enhancing a technology plan that meets the needs of the students. First, this study demonstrated that knowing where students access ICT (i.e. at an after school program or at a relative's house) is a piece of information that may be overlooked in a technology integration plan. However, placing restrictions where students access ICT beyond the school setting can result in inadvertent exclusion of use by female students if this access is denied. It is therefore, imperative that

restrictions of access be avoided so as not to mandate exclusive access to selected places such as only being able to access ICT used in a one-to-one initiative at home and school.

This study also demonstrated that both, males and females have prior experience and bring their expertise in the use of ICT to school. This is just as important as not restricting access. School leadership must acknowledge the experience that all students, female in particular, bring with them as they integrate ICT in their education process. Beyond considering what students bring, it is imperative to assess the level of experience to establish a baseline and then create an appropriate method of instruction in which students will be educated about the ICT they will be required to use. As noted earlier, female students reported a high level of experience with Photoshop and have a tendency to share media they created more frequently than their male counterparts. Providing the ability to integrate this type of knowledge into an integration program will give female students an edge and confidence in their ability to use ICT. Just as important as the female strengths in using ICT, it is important to educate and reinforce areas that require more attention such as terminology. This has a direct effect on students of both genders. Part of the integration plan must include grade appropriate standards for ICT use, in which technology terms can be addressed. This study noted that the participants had little knowledge of many ICT terminologies, which was a reflection of both the newness of the integration program and the need for school leadership to integrate vocabulary as part of the integration program. School leadership must be cognizant of the need to educate students in terminology of ICT just as vocabulary is essential to other fields such as science, math, social studies, or language arts, so that students can understand and apply this knowledge in their use of ICT as they would apply their knowledge of vocabulary in other content areas.

Although at this point, the concept of introducing video games a form of integrating technology in education is in its beginning stages, the study investigated the notion of gaming and the interest by the participants. Results demonstrated that playing video games was one item that all participants had taken part in, regardless of gender. Not considering interest in the ICT integration process will be detrimental to the success of an adequate technology plan. Similar to looking at books and other resources to ensure that they meet a standardized system, the integration of ICT must also contend with the correct technology to meet the needs of the student population. In this study, for example, the use of tablets in the middle school was the first step toward integration. The perception of many participants was that the tablet was used as a gaming device.

An unintended consequence of the integration of this technology is this perception; however, it does not imply that video games should not be considered as a way to introduce content. Because the interest in using ICT already exists with video games, school leadership should consider this enthusiasm and use its momentum to propel an integration plan in which gaming is a part, regardless of the extent, of an extensive plan to ensure that students are engaged in the learning process. In addition to video games, the likelihood of selecting a career with an ICT component by the participants should advise school leadership as to their purpose of heading a school into the new paradigm where ICT is not only a part of education but it is infused within every academic program.

It may be argued that the middle school is hardly the time and place where a person decides what they are going to do for the rest of their lives. However, the same can be said about high school and higher education. Not everyone knows exactly what they want to pursue as a

profession, however, not knowing what opportunities are available is just as limiting. This notion makes a school one that serves the purpose of perpetuating the cycle of the replicating society in which the opportunity to succeed lies only with those with power. It is important as a school leader to understand that even if students change their attitudes in the future and seek other careers, not providing them with the tools limits the opportunities they will have in the future. This study noted that females were less likely than their male counterparts to consider a career in ICT, in particular becoming an engineer of some sort, a computer programmer, or a game developer. They were, however, more likely to consider a career in medicine. The implication for leadership is that there is a need to create a technology program that is gender inclusive. This does imply that education of ICT being integrated is essential, to the point of considering single gender classes geared toward one gender. Essentially, a minimum of three things should be considered when creating or enhancing a technology plan that is adequate for both males and females. A technology program must (a) not be restrictive to a limited amount of locations where students can access ICT; (b) consider, evaluate, and create an educational plan based on the experiences that the students bring; and (c) be gender inclusive, meaning to use the strengths that both genders provide and reinforce on the challenge areas such as troubleshooting, vocabulary development, and a greater exposure to ICT careers.

***Implications for technology committee, principal, and/or IT coordinator.*** As a technology coordinator at a school that is moving toward a one-to-one initiative, these findings revealed the need to approach instruction of ICT for females differently than males. Regarding access to ICT, it is essential to understand where and when students utilized ICT, in particular places beyond the school premises. Because this study noted the higher tendency of females to

use ICT at a relative's house more frequently than their male counterparts, it is imperative that user agreement policies do not include restrictive measures that prevent, male and female students alike, from accessing ICT at different locations. Even if the school is providing a specific technology device, restrictions on where the device can be used must be eliminated in order to provide a desirable environment for the students to participate in their own education through the use of ICT.

It is also imperative that teachers receive appropriate professional development in technology integration prior to full adoption by the school. This will guarantee a successful integration plan. Along with the professional development, it is essential that schools assess students and develop appropriate plans for ICT integration based on existing knowledge and experience by students. It was noted in this study that females have different preferences on ICT use. Specifically, the females in this study declared a higher experience with Photoshop and a higher tendency to share media that they had created. It is important to incorporate the experiences that students bring to school in order to establish a collaborative environment where students have the opportunity to use problem based learning and other pedagogical approaches to learning that involve more student participation. In concurrence with professional development for teachers, it is just as important to teach students on the technology device that they will be using, in particular if the school will be dictating the specific device to be used. This study also noted that frustrations and negative perceptions from female students became evident when they were faced with troubleshooting issues. In order to minimize these negative influences, learning how to operate devices is essential.

In conjunction with education of specific devices and troubleshooting, ICT vocabulary must also be included in the curriculum integration process. Similar to expecting students to know and understand vocabulary such as chloroplast in photosynthesis, themes in literary analysis, and quadratic equations in mathematics, understanding vocabulary such as firewalls, weblogs, wireless access points, torrents, and networks have to do with technology is essential. Technology teams and technology integration coordinators must be willing to consider the aforementioned suggestions even to the extent of creating a single gender technology class to enhance and develop the experience that students bring to the classroom regarding their use of ICT.

If gaming is to be considered as one of the latest integration of ICT into education, the difference between female and male perspective and influence must be taken into serious consideration. Females noted in this study that they prefer a different style of games such as party games and were less interested in the action, competition, and aesthetical graphics that current games offer. As leaders in the ICT integration process, it is imperative to understand that one size fits all mentality is no longer a feasible tool to use when integrating games as educational tools. In addition, relatives are also a source of learning that should not be overlooked by school leadership or administration. It was also noted in this study that females declared their relatives as an important source of influence regarding their use of ICT. It is therefore, essential to embrace the paradigm shift that the teacher is no longer the only source of information and that ICT has made the gathering of information easier for everyone, including students in the middle school. Using relatives as resources in educating the student population

on ICT can be beneficial to the school, in particular a Catholic school that requires participation by its constituents to meet the needs of the student population.

**Perception and social justice.** Results from the interview in this study concurred with those by Broos (2005) in which females were more likely to report a negative perception of themselves as computer users, more likely to have anxiety over using computers, and less likely to report that they feel confident in using computers. The participants in the interview expressed their frustration with glitches and often cited abandoning the ICT and using old fashion methods such as pen and paper, or returning at a later time hoping that the problem had been resolved. Halpern et al., (2007) noted that differences in perceived abilities are minimal at the elementary level, however they begin to manifest toward the beginning of high school. Research by Volman et al., (2005) supported these findings. This study also supports that there is little significant difference in perceptions of ICT use in the middle school level. A large percent of the participants in the survey (65.2%), out of which 66.7% were males and 63.2% were females, acknowledged that they felt confident in their own ability to use computers. In contrast to the findings by Mercier et al., (2006), where research revealed that a large percentage of males and females do not perceive themselves as computer users, this study revealed a higher percentage of students (65.2%) agreed or strongly agreed to the notion of being good with computers. There were, however, no statistical differences in the perception of ability to use ICT in this study further agreeing with the results Mercier et al., (2006).

The perception that females were not as capable of using ICT as they approach the beginning of high school was also evident in this study. The response to the previous question about confidence of computer use revealed that 6th grade students (81.8%) were more likely than

7th (55.5%) and 8th (64.8%) further agreeing with previously cited research (Halpern et al., 2007; Hargittai & Shafer, 2006; Kahveci, 2010; Mammes, 2004; and Volman et al., 2005). These results were also evident in this study within the interview with the female participants where they noted not having confidence in the use of ICT, in particular with dealing with troubleshooting was the main concern and their deterrent to use ICT on a regular basis. The results suggest that lack of knowledge of troubleshooting is one of the reasons for a lack of confidence in the use of ICT by females. This revelation places both female and male students at risk of disengaging in ICT use. The social justice goal of Catholic schools is to enrich the life of the entire child and a rift between the genders is being created if the instruction of how to troubleshoot is being excluded from an integration plan. The lack of instruction on troubleshooting is contributing to the female disinterest in the use of ICT.

Because the gap in perception begins to manifest as students, in particularly females, reach high school, it is important to consider their developmental status and its influence on the use of ICT by both genders. Although this study did not focus explicitly on self-esteem, it was noted by research that females tend to have a lower self-esteem than males (Marcotte et al., 2002). This was also revealed in the interview with females in which they shared the feeling of being “stupid” or “not from America” if they were unable to resolve issues with the ICT they were using. A challenge arises for the leadership in Catholic school regarding the issue of self-esteem and ICT and how to create confidence in female students as they partake in the ICT integration.

Research shows that despite biological differences (Sadker & Silber, 2008), it is the value that society places, or assigns to these difference that creates a disparity between the genders (Rosser, 2005). For the females in the interviews, this was definitely true. Some viewed the

influence of society as a deterrent for females as they noted that at times, in stores, the computer help desk is more likely to be attended by males rather than females. This view is also evident in television as the female participants stated that females are frequently depicted as individuals that require the assistance of males in fixing or working with computers. In addition, the female participants shared their belief that gaming was a great cause of the gap of female and male perception, noting that males tended to primarily use ICT for gaming.

In juxtaposition, there were no significant differences in perception in the survey results. It is important, however, to note the level of importance of these perceptions as Bandura and Adams (1977) posit that self-efficacy theory affects the choices that people make regarding their activities and behavior, the amount of energy they exert, and their persistence in the face of obstacles. The challenge for administration in establishing a comprehensive technology integration program is to negate the effects of the social perspective that ICT is primarily a male dominated field. This type of perception and stereotype leads to a misguided or misconstrued view of females and males as it relates to ICT use. A social justice issue is generated by this notion which lies beyond the realm of the school, however, not beyond the ability to integrate classes that work toward equalization in this area as suggested by Lapayese (2012).

### **Recommendations for Future Research**

The population in this study was reflective of one Catholic school and reflect the perception of a group of female students at the given research site. As previously noted, many of the findings in this study support the findings of numerous researchers (Burke 2007; Gibbs et al., 2009; Halpern et al., 2007; Hargittai & Shafer, 2006; Heemskerk et al., 2009; Hwang, 2010;

Kahveci, 2010; Mammes, 2004; Marcotte et al., 2002; Sadker & Silber, 2008; Spear, 2009; Volman et al., 2005). Some recommendations for future research follow.

A similar study with multiple sites will ensure a generalizability of the findings for this study. A larger sample size that includes multiple Catholic schools with similar ICT accessibility will also provide comparative views of technology integration programs that may be providing female students with adequate preparation to engage in the use of ICT. Establishing technology programs that benefit all of its constituents is an essential part for the sustainability of struggling Catholic schools to remain an influential force behind the social teachings of the Catholic Church. A derivative of the first recommendation is to complete a comparative study between a Catholic school and a public school. Conducting research in this area would be beneficial to both entities, as it would reveal possible differences that support an adequate technology integration program or similarities that can be applied and molded into each sector as they deem it necessary. After all, the purpose of education in public or Catholic sector is to educate our future leaders and citizens.

Yet another recommendation to continue to expand on the results from this survey is to explore the experiences of female students in the early secondary levels (grades 9 and 10 in high school) to identify similarities or differences with the results from this study. This will provide more insight into the influential factors that contribute to the deterring or increased use of ICT by females. In addition, this future study would be able to provide a comparative analysis with middle school students to further establish when the discrepancy in perception is strongest. This would help leadership in academia to establish a course of action to assist in the development of a strategic technology plan that will benefit males and females alike.

A similar focus group could be conducted in relationship to males and their perceived skills of use of ICT and how they compare to female students. This study focused on female perspective and provided a female voice as a path to establishing equity in the learning of ICT in the school setting. It is unjust to not allow the male perspective to be heard despite having a higher perception of themselves as being better with ICT and approaching ICT differently than females.

Because this study utilized an existing instrument (Access, Interest and Experience Survey) developed by Barron et al., (2010), a narrow scope with the focus on either access, experience, interest, perception, or influences would also be beneficial. This focus will provide a better understanding of the given category and it would provide a greater understanding on which category would better explain the differences in perception and approach.

It is essential for Catholic schools to keep pace with the integration of ICT in the schools to create a sustainable action plan for the longevity of Catholic schools. It is also important to pursue ICT integration, in particular in elementary and middle schools, in order to provide a viable opportunity for females to pursue ICT careers if they so choose to. Ultimately, such decisions lie within the individual. The decision to educate students adequately in the use of ICT lies directly on school leadership and as such, it is imperative that the leadership of any school, Catholic or public, take into consideration the perception, experience, and influential factors from this and like studies to prepare students in the decision making process that will determine a livelihood. Until the school has made every effort to eliminate deterrents from successfully implementing an ICT integration program, there is still work to be completed, however, a

program that provides females with the opportunity to continue to pursue the use of ICT is a step in the right direction.

## **Conclusion**

Although females have made great advancements in the pursuit of equity, they still struggle to find acceptance in the field of ICT. Research indicates that differences in perception of ability of ICT use are elusive in the primary and elementary level, begin to manifest in the middle school level, and become substantially noticeable in the secondary level and into adulthood. This mixed methods study explored the differences in experiences and perceptions of middle school females and males and exposed influential factors that contribute and deter the use of ICT by females. The analysis of the first phase (survey) indicated statistically significant differences between males and females exist at the study site. Females were more likely to (a) access ICT at the after school program and at a relative's house; (b) identify a relative as an important influence in ICT; (c) share created media; (d) declare higher experience with Photoshop; (e) seek medicine as potential career and less likely to (f) report building a robot or invention using technology; (d) use ICT to play multi-user online games; (f) express interest in action, competition, and graphics in games (h) know terms such as firewall and torrent; (i) pursue careers as computer programmers, engineers, or computer game designers than their male counterparts. In addition, similar results became evident in the second phase of the study (interview) where females noted that not knowing how to troubleshoot an issue deters from their use of ICT.

The findings of this study contribute to the literature in which the fields of gender, technology, and Catholic schools intersect. In addition, it supports the need for school leadership

establishing or enhancing a technology integration program to consider the differences between males and females as a foundational cornerstone in the technology integration program. Knowing where their students access, experience with, interest in, are influenced to use, and perceive their own use of ICT will have an impact on the ICT integration in schools. The implications for school leadership and administration, in particular for Catholic schools, whose goal is to educate the entire child, need to be given serious consideration when integrating or enhancing a technology program that is inclusive of the female perception and ability to use ICT. The female students in the focus group, in addition to revealing important details about their perception of ICT use, began questioning why it was that females perceived themselves as less capable than their male counterparts. In particular, Lucia's reaction to the question regarding the difference between male and female perception was a profound realization to this notion. She noted, "I was actually thinking about that." The thoughtful reflection on this topic allowed me to perceive the importance of involving the students in the discovery of the perceptions and experiences that they bring with them as digital citizens, as it is noted in an ancient Chinese Proverb, "Tell me and I'll forget; show me and I may remember; involve me and I'll understand."

## APPENDIX A

### Modified Access, Interest and Experience Survey<sup>1</sup>

#### Section I

Q1. How often do you use a computer at the following places:

	Never	less than once a month	Once a month	A few times per month	Once a week	A few times per week	Daily	Several times a day
At home								
At school during class								
At school on your own time								
In an after school program/club								
At a relative's house								
At a friend's house								
At the library								
At a community center, like the YMCA or the Boys and Girls Club								

Q2. How old were you when you first used a computer?

Q3. How many people, besides you, share the primary computer that you use at home?

Q4. Do you have a computer that you call your own (you are the main user: others have to ask you for permission to use it)?

- Yes       No       I used to

Q5 If yes, how old were you when you got a computer you could call your own?

Q6 Do you have a computer that you use in your room (a laptop counts)?

- Yes       No       I used to

Q7 How many working computers does your family have in the place(s) where you live?

- 0 (My family does not have a computer at home)     1     2     3 or more

Q8 What sort of Internet access do you have at home?

- I do not have Internet access at home  
 I do have Internet access at home but I don't know what sort  
 Dial-up  
 DSL or Cable

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<sup>1</sup> Adapted from "Predictors of Creative Computing Participation and Profiles of Experience in Two Silicon Valley Middle Schools," by B. Barron, S. E. Walter, C. K. Martin, and C. Schatz, 2010, *Computers & Education*, 54, 178. Copyright 2009 by Elsevier Ltd. Adapted with permission.

Q9 Please mark any extra computer equipment your family has:

- Printer       Wireless Internet       Hand-held device (Palm Pilot, Pocket PC, etc.)  
 Digital Camera     Digital Movie Camera     Game Console (XBox, Playstation, etc.)  
 Scanner       Digital music player (iPod, etc.)

Section II

Q10 How often have you EVER done the following computer-related activities?

	Never	Once or twice	3 to 6 times	More than 6 times
Created a multimedia presentation (e.g. PowerPoint)				
Written computer program (code) using a computer language (e.g. C, Java, Visual Basic)				
Made a publication, like a newsletter, using a desktop publishing program (e.g. PageMaker, Word, ComicLife)				
Created your own newsgroup, blog, or discussion site on the Internet				
Created a Web site using application (e.g. Dreamweaver, iWeb)				
Created a Web site using HTML				
Put a site on the Web so that other people could see it				
Created a piece of art using an application (e.g. PhotoShop, Illustrator)				
Designed a 2-d or 3-d model or drawing (e.g. CAD or ModelShop)				
Built a robot or created an invention of any kind using technology				
Used a simulation to model a real life situation or set of data				
Built a database (e.g. Filemaker Pro, Microsoft Access)				
Created a digital movie (e.g. iMovie or MovieMaker)				
Created an animation (e.g. Flash, Alice, Scratch)				
Created a computer game (e.g. Stagecast, GameStar, Scratch)				
Created a piece of music (e.g. GarageBand, FruityLoops)				
Created a spreadsheet, graph, or chart (e.g. Excel)				
Created a digital media project in collaboration with other people				
Worked on an academic project with other people that lasted a week or longer (with or without a computer)?				

Q11 How important have the following items been in your learning of how to use computers?

	Not at all	A little	Some	Very much	Extremely much
Classes in school					
Classes out of school					
Books or manuals					
Magazines					
On-line articles, discussion threads, etc.					
Software help-menus					
Step-by-step tutorials / instructions					
Playing around on my own					
Playing computer games					
An after-school club					
A community center computer lab					

Q12 How important have the following people been in your learning how to use computers?

	Not at all	A little	Some	Very much	Extremely much
School teacher					
My mother					
My father					
My guardian					
My sister					
My brother					
Another relative (uncle, aunt, cousin, etc.)					
My friend (or friends)					
Adult at community center					

Q13 Do your parents use computers in their jobs?

	Yes	No	I don't know
Mother/ Female Guardian			
Father / Male Guardian			

Q14. I am interested in the ways your parents have been involved in your learning and participation in computer and technology activities.

	Mother / Female Guardian	Father / Male Guardian	Both
Looked for technology-related activities for me to do/or signed me up for them (like classes, clubs, camps, etc.).			
Taught me how to do something on the computer (like typing, how to create a Web page, etc.).			
Worked with me on a technology or computer-related project (like built a robot, worked on Flash tutorial together, etc.).			
Bought me things to support my computer activities and learning (like hardware, software, books, courses, etc.).			
Bought me entertainment related technology (like games, console, etc.).			
Had things (like books, equipment, software) at the house that I use.			
Gave me advice on non-technical issues that have helped me with technology activities.			
Paid me to do something technical or on the computer for him/her.			
Let me watch how they do something (like turn on the computer, set up a printer) that I eventually learn how to do from observing them.			
I have taught them how to do something with the computer.			

### Section III

Q15. How often do you use a computer (anywhere) to do each of the following:

	Never	Less than Once a Month	Once a Month	A Few Times a Month	Once a Week	A Few Times a Week	Daily	Several Times a Day
Play games (on the computer, on-line or on a game console).								
Participate in multi-user on-line games.								
Work on your own digital media projects outside of school.								
Conduct research on the Internet for school.								
Collect, view, organize images or music (e.g. put your photos, images or sounds from the Web into folders).								
Write for fun.								
Read or send email.								
Edit/design your own blog/social networking page (e.g. MySpace or Facebook).								

Q16 How often do you use the Internet (blogs, social networking sites, wikis, or other websites) to:

	Never	Less than Once a Month	Once a Month	A Few Times a Month	Once a Week	A Few Times a Week	Daily	Several Times a Day
Share media (movies, songs, pictures) that you've created.								
Get or share information (news or opinions) about political issues.								
Create and share media with a political message.								
Talk to others about a hobby.								
Learn information about a topic that is of personal interest to you.								

Q17 When you use the Internet to look for information for school, how often do you do the following?

	Never	Rarely	Sometimes	Often	Very Often
Check to see if the information is current.					
Consider whether the views represented are fact or opinions.					
Seek out other sources to validate the information (e.g. books, teachers, encyclopedias, magazines).					
Check to see who the authors are.					
Check to see what other sites link to the Website you are viewing.					
Check if contact information is provided on the Website.					
Check the qualifications or credentials of the author.					
Go the "About Us" pages (pages about who runs the site, who owns the site and so on).					

Q18 Please indicate if you ever participated in any of the following electives/clubs offered at school:

	Yes	No
Yearbook		
Podcast Club		
Music		

Q19 Have you taken any technology-related classes before or outside of the school? Please mark all that apply.

	No	Yes, at my a camp/ summer school	Yes, at a commu nity center.	Yes, through an on- line course.	Yes, at a local college/ universi ty	Other
Basic applications (word processing, spreadsheets, databases)						
Computer literacy (computer history/future, ethics, societal impact)						
Production and layout of print publication (newspaper, magazines, yearbook).						
Multimedia authoring, Web design, or graphic arts (PhotoShop, Flash, etc.).						
Computer networks, hardware, or operating systems.						
Computer science or programming.						
Engineering technology, industrial design, or robotics.						

Q20 If you have never played a video game, click the first choice and skip to the following question. Which of the following types of games do you enjoy playing? Check all that apply:

- I don't enjoy playing any type of video game.
- Sports games (e.g. Madden, Tiger Woods Golf, SSX, etc.).
- Racing games (e.g. Mario Kart, Gran Turismo, Burnout, etc.).
- Simulations (e.g. The Sims, Civilization, Animal Crossing, etc.).
- On-line Role-Playing games (e.g. World of Warcraft, Everquest, Runescape, etc.).
- Role-Playing games (e.g. Final Fantasy, Pokemon, Kingdom Hearts, Harvest Moon, etc..
- Strategy games (e.g. Warhammer, Civilization, Advance Wars, Age of Empires, etc.).
- Puzzle games (e.g. Solitaire, Bejeweled, Tetris, most Pogo and Yahoo! Games, etc.).
- Shooters (Halo, Splinter Cell, America's Army, etc.).
- Party games (e.g. Dance, Dance Revolution, Mario Party, etc.).
- Educational games (e.g. Chessmaster, Nintendo DS Brain Age, Leapster, etc.).
- Adventure games (e.g. Kameo, Legend of Zelda, Tomb Raider, etc.).

Q21 Regarding the video games you play, how important are the following features to your enjoyment of a game?

	Not at all important	Not really important	Neutral	Somewhat important	Very Important
Action					
Creating or building things					
Playing games with friend or other people					
leveling up, increasing skills within the game					
Following story lines					
Exploring					
Connecting the characters within the game					
Solving puzzles					
Collecting and/or trading things					
Taking on a new role, such as becoming a hero					
Personalizing characters or their environments					
Escaping into another world					
Competing with others, human or electronic					
The challenge of the game					
The art of the game (e.g. the graphics and the animation, etc.)					

Q22 How much do you agree with each statement?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I would like to learn more about computers.					
I feel confident about my ability to use computers.					
Computers are interesting to me.					
Learning about what computers can do is fun.					
I am NOT the kind of person who works well with computers.					
I am good with computers					
It is important to my friends that I am knowledgeable about computers.					
I like the idea of taking computer classes.					
It is important to my parents that I am knowledgeable about computers.					
It is important to my teachers that I am knowledgeable about computers.					
It is important to me that I am knowledgeable about computers.					

Q23 How would you describe your level of experience with the following computer applications/equipment?

	I don't know what this is	I have no experience but I have heard of it	I've played around with it	I have used it to make something	I'm an expert and can teach someone how to use it
Flash					
Photoshop					
Illustrator					
Scratch					
GameStar Mechanic					
ComicLife					
FruityLoops					
ProTools					
iMovie					
iWeb					
GarageBand					
Digital photo camera					
Digital movie camera					
Word/Pages					
Keynote/Keynote					
Lego Mindstorms					
Dreamweaver					
Fireworks					

Q24 The following is a list of technology-related topics/tasks. For each, I am interested to know how you would describe your own skill level.

	Not skilled at all	Not very skilled	Fairly skilled	Very skilled	Expert
Internet searching					
Knowing who to ask for help for specific technology topics					
Knowing where to look on-line for help for school-related topics					
Distinguishing valid information from non-valid					
Working with digital images					
Using creative tools like making movies or music					
Touch typing					
Word processing/document formatting					
Basic computer operating system use and understanding					
File management					
Troubleshooting and debugging					
Programming					

Q25 How familiar are you with the following computer and Internet-related terms? "None" represents no understanding and "Full" represents full understanding of the item.

	None	Little	Some	Good	Full
JPEG					
Frames					
Preference settings					
Newsgroup					
PDF					
Refresh/Reload					
Advance Search					
Weblog					
Bookmark					
Spyware					
Bcc (on email)					
Tagging					
Tabbed Browsing					
RSS					
Wiki					
Malware					
Social Bookmarking					
Podcasting					
Phishing					
Web Feeds					
Firewall					
Cache					
Widget					
Favorites					
Torrent					
Blog					

Section IV

Q26 What are your favorite school related hobbies?

Q27 What are your favorite out of school hobbies?

Q28 In the future, can you see yourself doing any of the following?

	Absolutely Not	Probably Not	Maybe	Probably Yes	Definitely Yes
taking more classes about computers					
becoming a computer programmer or engineer of some sort					
becoming a graphic designer or Web designer					
Becoming a computer/network specialist					
becoming a computer or technology teacher					
becoming a computer game designer					
becoming a scientist					
becoming a lawyer					
becoming a teacher					
becoming a doctor or nurse					
becoming a mathematician					
becoming a journalist					
becoming a politician					
becoming an artist					
starting a business					
becoming a police officer or firefighter					
creating and sharing media to promote social change in your community or more globally					

Q29 How old are you?

Q30 What is your grade level?

- 6th Grade
  7th Grade
  8th Grade

Q31 What is your gender?

- Male
  Female

Q32 Please enter the 4-digit number provided to you by the researcher.

## Appendix B

### Student Focus Groups Protocol and Questions

#### Introduction:

Welcome! I would like to thank both you and your parents for making this meeting possible. I want to start off by informing you on the reason as to why you were chosen to participate in this discussion.

Most of you know me as Mr. Tellez, the fifth grade teacher. I am also a student at Loyola Marymount University and I am working towards a doctoral degree that focuses on ICT (ICT) and females in Catholic Schools. This group discussion is part of the dissertation process and will help our school find ways to ensure that our female students are well represented and recognized when the integration of technology is considered.

You are all female students and you provide this study with unique experiences and perceptions about using computing devices such as cell phones, iPads, and desktop computers. I would like to get to know your reasons behind the way you use the technology that is available to you both at home and at school.

Your voice will be recorded through the use of this digital device (note the iPad), however, I will be the only person that will every hear this file to transcribe it (explain transcription), and I will be changing your names while I write. Your identities will remain confidential. If at any point you feel uncomfortable with a question or a statement, please feel free to omit, or say skip, your response.

Before we get started, do you have any questions?  
(Pause for questions, continue if none, address questions as necessary).

#### Questions:

1. Please begin by stating your name, grade level, and a brief statement about what you would like to do as a profession (what do you want to be when you grow up?).
2. What kind of technology do you have at school?
3. To what extend to you like using this technology?
4. Generally, what is your main purpose for using technology during school?
5. Do you use any technology at home? If so, what kind?
6. To what extend to you like using this technology?
7. What is your main purpose for using technology at home?
8. Do you run into issues or problems when using technology and if so, what do you do?

9. Do you believe that there are benefits to technology and if so, what are they?
10. Do you believe that there are negative effects to using technology and if so, what are they?
11. Do you think of yourself as a person that knows technology well? Why or why not?
12. What are some things that would make you want to use technology?
13. What are some things that would make you not want to use technology?
14. Do you believe that boys (males) are better at using technology than girls (females)? Why or why not?
15. Did you think of anything else about technology that I did not go over?

#### Concluding Remarks

Thank you once again for being here! I appreciate your time and honest answers. I am looking forward to reviewing the conversation that we had and including it in my research.

If you have any comments or questions that come up later on, please let me know. Thank you once again.

## APPENDIX C

### Tables of Access

Table 1.A  
Percentages of male and female ownership of computers

	Males	Females
Yes	44.4	47.4
No	44.4	21.1
I used to	11.1	31.6

\* p < 0.05  
\*\* p < 0.01

Table 1.B  
Male and female comparison of ownership of additional ICT in percentages

	Males	Females
Printer	100.0	100.0
Scanner	51.9	73.7
Digital Camera	74.1	84.2
Digital Movie Camera	48.2	42.1
Hand-Held Device	70.4	63.2
Game Console	88.9	94.7
Digital Music Player	92.6	94.7
Wireless Internet	88.9	89.5

\* p < 0.05  
\*\* p < 0.01

Table 1.C  
Frequency of ICT use at the given locations in percentages

	Less than		A few		A few		Several	
	Never	once a month	Once a month	times per month	Once a week	times per week	Daily	times a day
At home	-	-	-	2.2	6.5	52.2	23.9	15.2
At school during class	2.2	4.3	-	28.3	19.6	41.3	4.3	-
At school on your own time	32.6	15.2	8.7	23.9	10.9	4.3	2.2	-
In an after school program/club	52.2*	23.9	2.2	6.5	2.2	8.7	4.3	-
At a relative's house	19.6	30.4*	6.5	23.9	2.2	6.5	6.5	4.3
At a friend's house	19.6	21.7	13.0	28.3	4.3	2.2	6.5	4.3
At the library	50.0	13.0	8.7	13.0	-	8.7	2.2	-
At a community center like the YMCA or the Boys and Girls Club	80.4	8.7	2.2	2.2	-	2.2	2.2	2.2

\* p < 0.05  
\*\* p < 0.01

Table 1.D  
 Percentages of male and female use of computer in their room

	Males	Females
Yes	55.6	47.4
No	37.0	26.3
I used to	7.4	26.3

\* p < 0.05  
 \*\* p < 0.01

Table 1.E  
 Male and female report on working computers at home in percentages

	Males	Females
0	-	-
1	7.4	15.8
2	18.5	15.8
3 or more	74.1	68.4

\* p < 0.05  
 \*\* p < 0.01

Table 1.F  
 Male and female comparison of knowledge of Internet access in percentages

	Males	Females
No Internet Access	-	-
Don't know	70.4	79.0
Dial Up	-	5.3
DSL or Cable	29.6	15.8

\* p < 0.05  
 \*\* p < 0.01

## APPENDIX D

### Tables of Experience

Table 2.A  
Experience with ICT components in percentages.

	Never	Once or twice	3-6 times	More than 6 times	Non Response
Created a multimedia presentation (e.g. PowerPoint)	2.2	8.7	17.4	71.7	-
Written computer program (code) using a computer language	56.5	26.1	4.3	8.7	4.3
Made a publication, like a newsletter, using a desktop publishing program	39.1	28.3	13.0	19.6	-
Created your own newsgroup, blog, or discussion site on the Internet	84.8	13.0	-	2.2	-
Created a Web site using application (e.g. Dreamweaver, iWeb)	89.1	8.7	-	-	2.2
Created a Web site using HTML	97.8	2.2	-	-	-
Put a site on the Web so that other people could see it	80.4	15.2	2.2	2.2	-
Created a piece of art using an application (e.g. PhotoShop, Illustrator)	19.6	39.1	17.4	21.7	2.2
Designed a 2-d or 3-d model or drawing (e.g. CAD or ModelShop)	43.5	30.4	21.7	4.3	-
Built a robot or created an invention of any kind using technology	82.6	15.2*	2.2	-	-
Used a simulation to model a real life situation or set of data	69.6	19.6	2.2	6.5	2.2
Built a database (e.g. Filemaker Pro, Microsoft Access)	82.6	15.2	-	2.2	-
Created a digital movie (e.g. iMovie or MovieMaker)	4.3	30.4	39.1	26.1	-
Created an animation (e.g. Flash, Alice, Scratch)	67.4	26.1	4.3	-	2.2
Created a computer game (e.g. Stagecast, GameStar, Scratch)	91.3	6.5	-	-	2.2
Created a piece of music (e.g. GarageBand, FruityLoops)	10.9	52.2	21.7	13.0	2.2
Created a spreadsheet, graph, or chart (e.g. Excel)	13.0	41.3	17.4	23.9	4.3
Created a digital media project in collaboration with other people	50.0	17.4	23.9	8.7	-
Worked on an academic project with other people that lasted a week or longer	15.2	26.1	23.9	34.8	-

\* p < 0.05

\*\* p < 0.01

Table 2.B  
Frequency of ICT use for the listed items in percentages

	Never	Less than once a month	Once a month	A few times a month	Once a week	A few times a week	Daily	Several times a day
Play games (on the computer, online, or on a game console)	2.2	2.2	2.2	21.7	8.7	41.3	10.9	10.9
Participate in multi-user, online games	23.9*	21.7	2.2	19.6	10.9	10.9	8.7	2.2
Work on your own digital media projects outside of school	28.3	21.7	26.1	15.2	2.2	4.3	-	-
Conduct research on the Internet for school	4.3	8.7	8.7	32.6	13.0	21.7	6.5	2.2
Collect, view, organize images or music	17.4	19.6	10.9	17.4	17.4	4.3	6.5	4.3
Write for fun	47.8	26.1	8.7	8.7	4.3	4.3	-	-
Read or send email	10.9	15.2	13.0	17.4	13.0	19.6	4.3	6.5
Edit/design your own blog/social networking page	60.9	10.9	2.2	2.2	6.5	4.3	8.7	4.3

\* p < 0.05

\*\* p < 0.01

Table 2.C  
Frequency of the Internet (blogs, social networking sites, wikis, other websites) for the listed items in percentages

	Never	Less than once a month	Once a month	A few times a month	Once a week	A few times a week	Daily	Several times a day
Share media (movies, songs, pictures that you've created)	60.9*	8.7	2.2	8.7	6.5	6.5	-	4.3
Get or share information (news or opinions about political issues)	60.9	8.7	8.7	6.5	6.5	4.3	-	2.2
Create and share media with a political message	73.9	13.0	-	2.2	-	2.2	-	2.2
Talk to others about a hobby	39.1	17.4	4.3	10	8.7	4.3	8.7	2.2
Learn information about a topic that is of personal interest to you	21.7	10.9	13.0	17.4	6.7	13.3	8.9	6.7

\* p < 0.05

\*\* p < 0.01

Table 2.D  
ICT classes beyond the school setting in percentages

	No	Yes, at my camp/ summer school	Yes, at a community center	Yes, through an online course	Yes at a local college/ university	Other
Basic applications (word processing, spreadsheets, databases)	84.8	4.3	-	-	-	8.7
Computer literacy (computer history/future, ethics, societal impact)	80.4	2.2	-	4.3	-	10.9
Production and layout of print publication (newspaper, magazines, yearbook)	89.1	2.2	2.2	-	-	4.3
Multimedia authoring, Web design, or graphic arts (PhotoShop, Flash, etc.)	84.8	6.5	-	2.2	-	4.3
Computer networks, hardware, or operating systems	89.1	-	-	-	-	8.7
Computer science or programming	87.0	-	-	4.3	-	4.3
Engineering technology, industrial design, or robotics	80.4	8.9	-	-	-	8.9

\* p < 0.05

\*\* p < 0.01

Table 2.E  
Frequency of Internet use with a given purpose in percentage

	Never	Rarely	Sometimes	Often	Very often
Check to see if the information is current	10.9	39.1	34.8	10.9	2.2
Consider whether the views represented are fact or opinions	10.9	37.0	21.7	23.9	4.3
Seek out other sources to validate the information	8.7	32.6	26.1	19.6	13.0
Check to see who the authors are	23.9	37.0	21.7	10.9	4.3
Check to see what other sites link to the Website you are viewing	23.9	26.1	32.6	8.7	6.5
Check if contact information is provided on the Website	45.7	30.4	13.0	4.3	2.2
Check the qualifications or credentials of the author	67.4	19.6	2.2	8.7	-
Go to the "About Us" pages (pages about who runs the site, who owns the site and so on)	52.2	26.1	10.9	6.5	2.2

\* p < 0.05

\*\* p < 0.01

Table 2.F

Participation in the given school-related activities in percentages by gender.

	Yes		No	
	Males	Females	Males	Females
Yearbook	-	15.8	100.0	84.2
Podcast Club	30.8	10.5	69.2	89.5
Music	22.2	38.9	77.8	61.1

\* p &lt; 0.05

\*\* p &lt; 0.01

## APPENDIX E

### Tables of Interest

Table 3.A  
 Enjoyment of games according to categories by males and females in percentages

	Males	Females
I don't enjoy playing any type of video game	-	-
Sports games	70.4	52.6
Racing games	59.3	73.7
Simulations	37.0	57.9
Online Role-playing games	25.9	10.5
Role-Playing games	33.3	15.8
Strategy games	48.1	47.4
Puzzle games	33.3	73.7
Shooters	74.1	15.8
Party games	37.1	94.7
Educational games	18.5	15.8
Adventure games	63.0	52.6

\* p < 0.05  
 \*\* p < 0.01

Table 3.B  
Level of importance of gaming preference in percentages

	Not at all important	Not really important	Neutral	Somewhat important	Very important
Action	4.3	10.9	21.7	30.4	32.6**
Creating or building things	15.2	28.3	19.6	26.1	10.9
Playing games with friends or other people	4.3	13.0	26.1	39.1	17.4
Leveling up, increasing skills within the game	2.2	13.0	17.4	17.4	47.8
Following story-lines	4.3	23.9	30.4	15.2	26.1
Exploring	8.7	28.3	23.9	17.4	21.7
Connecting the characters within the game	15.2	32.6	21.7	17.4	10.9
Solving puzzles	10.9	26.1	23.9	26.1	13.0
Collecting and/or trading things	10.9	32.6	21.7	21.7	13.0
Taking on a new role, such as becoming a hero	13.0	26.1	15.2	21.7	21.7
Personalizing characters or their environments	6.5	17.4	19.6	28.3	28.3
Escaping into another world	21.7	13.0	23.9	30.4	10.9
Competing with others, human or electronic	4.3	17.4	26.1	30.4	21.7*
The challenge of the game	2.2	10.9	15.2	30.4	39.1
The art of the game	8.7	15.2	17.4	13.0	45.7**

\* p < 0.05

\*\* p < 0.01

Table 3.C  
 Future aspirations in percentages

	Absolutely Not	Probably Not	Maybe	Probably Yes	Definitely Yes
taking more classes about computers	28.3	52.2	15.2	2.2	2.2
becoming a computer programmer or engineer of some sort	41.3**	34.8	23.9	-	-
becoming a graphic designer or Web designer	34.8	32.6	23.9	4.3	4.3
becoming a computer/network specialist	47.8	37.0	13.0	2.2	-
becoming a computer or technology teacher	56.5	30.4	10.9	-	-
becoming a computer game designer	41.3*	21.7	26.1	6.5	4.3
becoming a scientist	39.1	26.1	21.7	6.5	6.5
becoming a lawyer	28.3	26.1	26.1	8.7	10.9
becoming a teacher	37.0	19.6	32.6	8.7	2.2
becoming a doctor or nurse	15.2	28.3	34.8	17.4*	4.3
becoming a mathematician	47.8	28.3	17.4	4.3	2.2
becoming a journalist	43.5	30.4	15.2	6.5	4.3
becoming a politician	54.3	34.8	4.3	2.2	4.3
becoming an artist	34.8	23.9	26.1	13.0	2.2
starting a business	10.9	10.9	50.0	21.7	6.5
becoming a police officer or firefighter	34.8	26.1	28.3	10.9	-
creating and sharing media to promote social change in your community or more globally	45.7	37.0	10.9	4.3	-

\* p < 0.05

\*\* p < 0.01

## APPENDIX F

### Tables of Perception

Table 4.A  
Self-reported Perception of ICT use

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I would like to learn more about computers	2.2	10.9	34.8	41.3	10.9
I feel confident about my ability to use computers	-	4.3	30.4	47.8	17.4
Computers are interesting to me	2.2	6.5	21.7	47.8	21.7
Learning about what computers can do is fun	2.2	19.6	41.3	21.7	15.2
I am not the kind of person who works well with computers	32.6	47.8	17.4	22.2	-
I am good with computers	-	6.5	28.3	50.0	15.2
It is important to my friends that I am knowledgeable about computers	21.7	26.1	34.8	17.4	-
I like the idea of taking computer classes	28.3	23.9	26.1	17.4	4.3
It is important to my parents that I am knowledgeable about computers	6.5	19.6	41.3	21.7	10.9
It is important to my teachers that I am knowledgeable about computers	-	10.9	43.5	37.0	8.7
It is important to me that I am knowledgeable about computers	-	8.7	34.8	37.0	17.4

\* p < 0.05

\*\* p < 0.01

Table 4.B  
Level of experience with the given ICT items in percentages

	I don't know what this is	I have no experience but I have heard of it	I've played around with it	I have used it to make something	I'm an expert and can teach someone who to use it.
Flash	37.0	45.7	13.0	4.3	-
PhotoShop	10.9*	21.7	45.7	17.4	4.3
Illustrator	30.4	43.5	17.4	6.5	-
Scratch	47.8	34.8	10.9	6.5	-
GameStar Mechanic	52.2	39.1	6.5	2.2	-
ComicLife	47.8	39.1	8.7	4.3	-
FruityLoops	71.7	21.7	4.3	2.2	-
ProTools	67.4	26.1	6.5	-	-
iMovie	-	4.3	37.0	50.0	8.7
iWeb	32.6	32.6	17.4	13.0	-
GarageBand	-	2.2	43.5	39.1	15.2
Digital photo camera	8.7	13.0	26.1	30.4	21.7
Digital movie camera	10.9	19.6	32.6	23.9	13.0
Word/Pages	6.5	4.3	15.2	37.0	32.6
Keynote/Keynote	6.5	2.2	15.2	41.3	32.6
Lego Mindstorms	39.1	43.5	8.7	6.5	2.2
Dreamweaver	71.7	19.6	4.3	4.3	-
Fireworks	73.9	17.4	8.7	-	-

\* p < 0.05  
\*\* p < 0.01

Table 4.C  
Familiarity with ICT terminology in percentages

	None	Little	Some	Good	Full
JPEG	80.4	10.9	6.5	-	-
Frames	63.0	21.7	10.9	4.3	-
Preference settings	41.3	26.1	17.4	10.9	4.3
Newsgroup	69.6	15.2	6.5	6.5	-
PDF	54.3	17.4	13.0	10.9	2.2
Refresh/Reload	15.2	8.7	17.4	30.4	28.3
Advance Search	26.1	13.0	26.1	15.2	17.4
Weblog	47.8	23.9	15.2	4.3	2.2
Bookmark	8.7	13.0	21.7	21.7	34.8
Spyware	60.9	23.9	6.5	4.4	4.3
Bcc (on email)	60.9	10.9	15.2	4.3	8.7
Tagging	37.0	15.2	13.0	15.2	19.6
Tabbed Browsing	47.8	17.4	6.5	6.5	21.7
RSS	87.0	4.3	2.2	-	-
Wiki	21.7	15.2	28.3	13.0	21.7
Malware	76.1	17.4	4.3	-	2.2
Social Bookmarking	58.7	15.2	8.7	4.3	10.9
Podcasting	21.7	30.4	26.1	13.0	8.7
Phishing	80.4	17.4	2.2	-	-
Web Feeds	58.7	15.2	13.0	10.9	-
Firewall	67.4	17.4	8.7*	4.3	2.2
Cache	80.4	15.2	4.3	-	-
Widget	60.9	19.6	17.4	2.2	-
Favorites	6.5	8.7	26.1	23.9	34.8
Torrent	89.1*	4.3	4.3	2.2	-
Blog	80.4	15.2	2.2	2.2	-

\* p < 0.05  
\*\* p < 0.01

Table 4.D  
Self-reported skill level of ICT use in the given areas by percentage

	Not skilled at all	Not very skilled	Fairly skilled	Very skilled	Expert
Internet searching	-	-	47.8	37.0	15.2
Knowing who to ask for help for specific technology topics	-	19.6	47.8	30.4	2.2
Knowing where to look on-line for help for school- related topics	-	15.2	47.8	28.3	8.7
Distinguishing valid information from non-valid	8.7	23.9	45.7	19.6	2.2
Working with digital images	8.7	15.2	50.0	23.9	2.2
Using creative tools like making movies or music	10.9	15.2	37.0	28.3	8.7
Touch typing	-	10.9	34.8	30.4	21.7
Word processing/document formatting	-	26.1	52.2	10.9	10.9
Basic computer operating system use and understanding	6.5	21.7	41.3	19.6	8.7
File management	13.0	28.3	37.0	17.4	2.2
Troubleshooting and debugging	41.3	37.0	21.7	-	-
Programming	43.5	32.6	21.7	-	-

\* p < 0.05

\*\* p < 0.01

## APPENDIX G

### Tables of Influence

Table 5.A  
Importance of people in the learning of ICT in percentages

	Not at all	A little	Some	Very much	Extremely much
School teacher	-	17.4	47.8	21.7	13.0
My mother	23.9	34.8	13.0	17.4	6.5
My father	13.0	13.0	19.6	32.6	17.4
My guardian	41.3	19.6	10.9	8.7	8.7
My sister	65.2	17.4	4.3	4.3	2.2
My brother	52.2	10.9	13.0	10.9	4.3
Another relative (uncle, aunt, cousin, etc.)	19.6	32.6*	30.4	8.7	6.5
My friend (or friends)	6.5	30.4	41.3	21.7	-
Adult at community center	76.1	6.5	2.2	4.3	-

\* p < 0.05  
\*\* p < 0.01

Table 5.B  
Importance of tools in the learning of ICT in percentages

	Not at all	A little	Some	Very much	Extremely much
Classes in school	6.5	26.1	41.3	19.6	6.5
Classes out of school	50.0	26.1	8.7	4.3	8.7
Books or manuals	41.3	34.8	13.0	6.5	4.3
Magazines	47.8	28.3	15.2	6.5	-
On-line articles, discussion threads, etc.	47.8	26.1	19.6	4.3	2.2
Software help-menus	41.3	30.4	17.4	6.5	-
Step-by-step tutorials or instructions	28.3	30.4	17.4	19.6	4.3
Playing round on my own	-	13.0	32.6	19.6	34.8
Playing computer games	15.2	32.6	19.6	10.9	21.7
An after-school club	67.4	19.6	6.5	-	4.3
A community center computer lab	71.7	19.6	6.5	-	2.2

\* p < 0.05  
\*\* p < 0.01

Table 5.C  
Parent use of computer at work in percentages

	Mother/Female Guardian	Father/Male Guardian
Yes	65.2	84.8
No	23.9	6.5
I don't know	6.5	6.5

\* p < 0.05

\*\* p < 0.01

Table 5.D  
Parent influence on ICT decisions in percentages

	Mother/ Female Guardian	Father/ Male Guardian	Both	Non Response
Looked for technology-related activities for me to do/or signed me up for them (like classes, clubs, camps, etc.).	37.0	8.7	13.0	41.3
Taught me how to do something on the computer (like typing, how to create a Web page, etc.).	21.7	45.7	23.9	8.7
Worked with me on a technology or computer-related project (like built a robot, worked on Flash tutorial together, etc.).	17.4	28.3	28.3	26.1
Bought me things to support my computer activities and learning (like hardware, software, books, courses, etc.).	23.9	21.7	32.6	21.7
Bought me entertainment related technology (like games, console, etc.).	15.2	17.4	63.0	4.3
Had things (like books, equipment, software) at the house that I use.	15.2	19.6	41.3	23.9
Gave me advice on non-technical issues that have helped me with technology activities.	10.9	34.8	23.9	30.4
Paid me to do something technical or on the computer for him/her.	19.6	17.4	17.4	45.7
Let me watch how they do something (like turn on the computer, set up a printer) that I eventually learn how to do from observing them.	17.4	34.8	37.0	10.9
I have taught them how to do something with the computer.	32.6	8.7	50.0	8.7

\* p < 0.05

\*\* p < 0.01

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