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CLOSING THE GENDER GAP IN THE TECHNOLOGY MAJOR

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ABSTRACT

CLOSING THE GENDER GAP IN THE TECHNOLOGY MAJOR.

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Technology makes up our daily lives and is a part of everything we do. The tech job market is expanding with more and more jobs needing to be filled by those with the necessary qualifications. Students are realizing the vast opportunities a career in technology can offer them and many are making the conscience decision to major in a technical field, such as computer science, management information systems, or information technology. However, women only make up a small percentage of those students who major in technical fields. With the job market in technology expanding and opportunities widely available, why is it that women hold only a small percentage of those students majoring in those fields?

The purpose of this thesis is to show the influences that impact the choice of a woman's selection in a degree of study related to technology. This research is the result of multiple methodologies taken to explore the influences behind the gender gap. Survey questions were sent to and conducted on undergraduate students registered in Computer Science, Computer Information Technology, and Management Information System courses at the University of North Carolina Wilmington, working professionals belonging to the organization called Systers, and working professionals belonging to Cape Fear Women in Tech (CFWIT).

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CHAPTER 1: INTRODUCTION

Technology is becoming one of the most in-demand job markets. “Employment of computer and information technology occupations is projected to grow 12 percent from 2014 to 2024, faster than the average for all occupations” (U.S. Bureau of Labor Statistics, 2014). These occupations are expected to add about 488,500 new jobs, from about 3.9 million jobs to about 4.4 million jobs from 2014 to 2024 (U.S. Bureau of Labor Statistics, 2014). Jobs in technology are increasing at such a high rate that soon there will be more jobs than qualified people to fill the positions (Robaton, 2015). An increase in students deciding to major in a technology-related field has occurred with over 47,000 graduating in 2012 with a degree in computer and information sciences (10 percent increase than the year before) (Bachelor's, Master's, and Doctor's Degree, 2012-13). However, women only make up 18 percent of the students who earn an undergraduate degree in computer and information sciences (Bachelor's, Master's, and Doctor's Degree, 2012-13). In 2014, women accounted for 57 percent of professional occupations in the United States, but only 26 percent of professional computing occupations (U.S. Bureau of Labor Statistics, 2014). With the job market in technology expanding, why is it that women are only a small percentage of those students majoring in technology-related fields?

PURPOSE

The purpose of this thesis is to find out what influences affect the choice of a woman's selection of a degree of study related to technology. The influences that will be discussed in this paper are whether the perception of technology is viewed as a field only for men, how the media portrays women in technology as “geeky”, role models that are reinforcing negative stereotypes, parental encouragement, access to computer courses prior to college, and confidence in technical abilities among women. This research is the result of multiple methodologies taken to explore

the influences behind the gender gap. Specially, the objective of this study is to find out what are the influences behind whether or not women decide to pursue a major in the technology field?

An analysis will be conducted from the data collected in order to understand the influences behind the decision of women deciding or not deciding to pursue a degree in technology. The final outcome of this research is to use the data collected to create a set of recommendations to provide to universities to help increase the number of women deciding to major in technology. Six hypotheses were formed and tested from the research:

Hypothesis 1: Women have less confidence in their programming abilities than men, which affects their interest in majoring in technology?

Hypothesis 2: Women are more likely to begin college with less programming experience than men, which leads to less women deciding to major in technology?

Hypothesis 3: Limited access to computer courses before attending college affect a woman's decision to major in technology

Hypothesis 4: Lacking positive role models on television/media affect a woman's decision to major in technology.

Hypothesis 5: Parental encouragement is an influential factor that steers women to major in technology.

Hypothesis 6: Technology is perceived to be male-dominated or "nerdy", which could be discouraging women from majoring in technology.

CHAPTER 2: REVIEW OF LITERATURE REVIEW AND ANALYSIS

In recent years, there has been a rise in the number of women enrolled in four-year institutions. This rise has led to more women enrolled in college than men. According to the U.S. Department of Education, as shown in Table 1, in 2012 women made up 57% of the total number of undergraduate students enrolled in a four-year institution in the United States (U.S. Department of Education, 2011-12).

Gender by Attendance intensity (all schools).			
Gender	Male (%)	Female (%)	Total
Estimates			
Total	43.0	57.0	100%
Attendance intensity (all schools)			
Exclusively full-time	43.6	56.4	100%
Exclusively part-time	42.2	57.8	100%
Mixed full-time and part-time	42.9	57.1	100%
NOTE: Rows may not add up to 100% due to rounding.			
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2011-12 National Postsecondary Student Aid Study (NPSAS:12).			
Computation by NCES QuickStats on 6/23/2013			

Table 1: 2012 Gender by Attendance intensity (all schools) (U.S. Department of Education, 1)

Although, women outnumber men in college, men dominate the technology field. Women earned only 18% of undergraduate degrees awarded in computer and information sciences in 2012 (Bachelor's, Master's, and Doctor's Degree, 2012-13). Only 12.9% of those in 2012 who were awarded an undergraduate degree in computer science were women (See Figure 1) (Snyder, T.D., and Dillow, S.A., 2015). The percentage in 2012 of women who were awarded an undergraduate degree in information technology was 20.7% and 25.5% of those awarded an

undergraduate degree in management of information systems were women (See Figure 1) (Snyder, T.D., and Dillow, S.A., 2015).

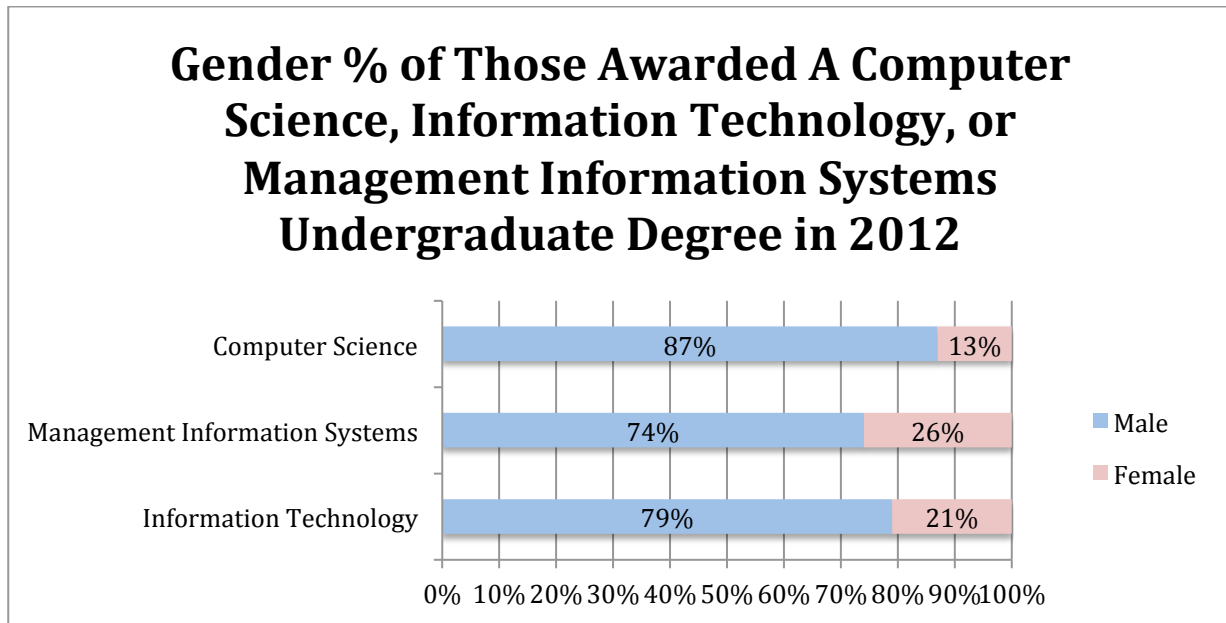


Figure 1: Students Awarded CS, IT, or MIS Undergraduate Degree in 2012 by Sex (Snyder, T.D., and Dillow, S.A., 2015).

As of Fall 2015, UNCW offers 55 Bachelor degrees in 49 majors, has 13,261 undergraduate students enrolled with 62.4% female and 37.6% male (UNCW, 2015). UNCW offers three technology-related undergraduate majors: Management Information Systems, Computer Science, and Computer Information Technology. However, the computer and information sciences field at UNCW is not ranked as one of the university’s most popular majors (Office of Institutional Research, 2015). Between July 1, 2014 and June 30, 2015, 3074 bachelor degrees were conferred at UNCW (Office of Institutional Research, 2015). The field with the highest number of bachelor degrees awarded belonged to biological/life sciences with 275 (8.95%) bachelor degrees awarded, four times the number of bachelor degrees awarded by the computer and information sciences programs (Office of Institutional Research, 2015). Currently within these three technology-related majors, there are fewer females than males. Within the

computer science major approximately 18% are female, as is also true for the computer information technology major, and within the management information systems major 25% are female. These female percentages reflect the national statistics for women in technology.

Three decades ago, women were more likely to earn a degree in technology. From the late 1970's to 1984, the percentage of women in technology was on the rise with numbers steadily increasing. In 1984, the number of women obtaining a computer science degree was at its peak at 37.2%, which surpassed the number of women going to medical school, and trailed closely behind the number of women going to law school (see Figure 2). However, as shown in Figure 2, in 1985 the percentage of women graduating with a computer science degree began to decline (National Science Foundation, 1). The descent continued and dropped to a low 18.2% in 2010, which is almost half of the 1985 percentage of women graduating with a degree in computer science. The percentage of women earning degrees in computer and information science degrees continues to wane while the number of women in law school, medical school and other STEM fields steadily increases. Since the start of 1984, what has contributed to the dramatic drop in the number of woman in technology?

The Influence of Marketing

The introduction of the personal computer may have contributed to the increase in the gender gap (Larson, Selena). "In the 1980s, when the PC became a standard home appliance, it was mostly used by men" (Larson, Selena). A 1985 study, conducted by the National Science Foundation found that men were substantially more likely to use a computer and to use it for more hours than women; *55% of adult women reported not using the computer at all in a typical week, compared to 27% of men* (National Science Foundation, 2001). How advertisements have portrayed women in regard to technology in the 1980's could be why men were more likely to

use a computer and why the numbers of females in technology have been declining since 1985 (When Women Stopped Coding, 2014). In 1977, the personal computer industry exploded when Apple launched the Apple II. “The Apple II was among the first successful personal computers and responsible for launching the Apple company into a successful business” (Dernbach, 2008). The Apple II was not only affordable to home users, but also user friendly, so users did not need to know how to program in order to use it (Dernbach, 2008).

What Happened To Women In Computer Science?

% Of Women Majors, By Field

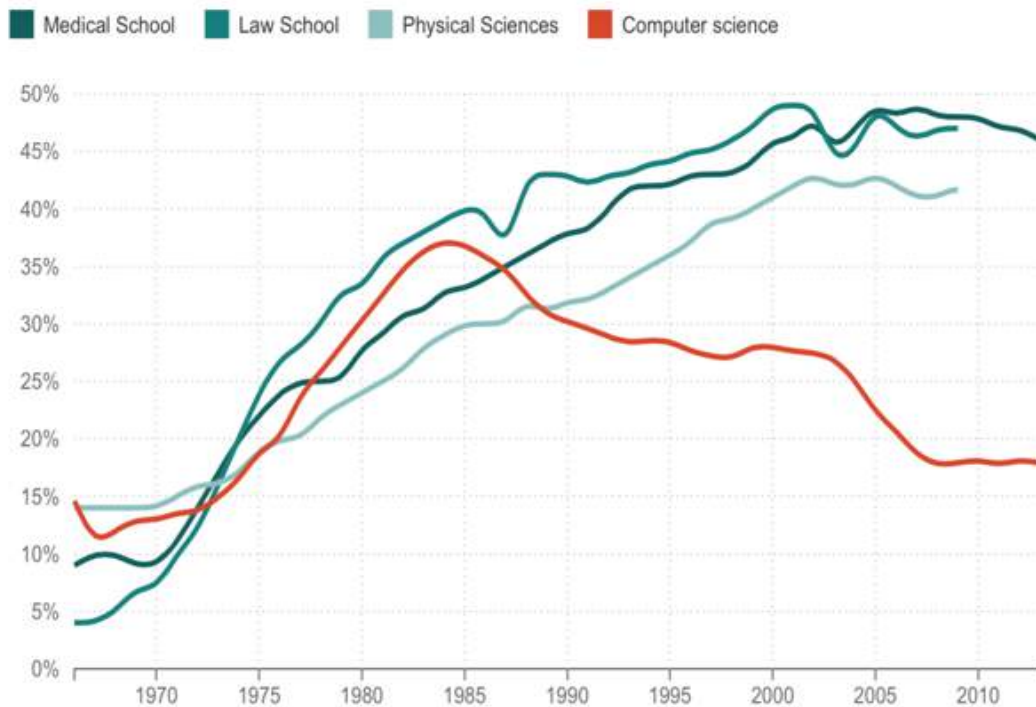


Figure 2:

Percent of Women Majors, By Field. (National Science Foundation, 1).

Apple II was highly successful even after Apple introduced the Macintosh product line; it remained Apple’s primary revenue source for years. However, marketing efforts for the Apple II were targeted almost entirely to men. As shown in Figure 3, Apple ran this advertisement for the Apple II in the 1980’s (Oro, Aaron, Anna Olson, Gabe Cramer, and Minna Xiao, 2015). This is

one example of many advertisements that were used in the 1980's that deployed this marketing technique. In the Apple ad, the man is using the computer, engaged in an activity while hard at work; while the woman is standing at a distance, passively observing his activity, and slicing tomatoes.



Figure 3: Apple II Advertisement. (Oro, Aaron, Anna Olson, Gabe Cramer, and Minna Xiao, 2015)

Marketing plays a huge role in impacting society's point of view (Rashotte, 2007). With marketing, if you want a certain demographic to buy your product then that demographic needs to appear in all forms of the marketing scheme. In doing so, it makes it easier for the target audience to picture themselves in the role of actually using the product. The marketing of personal computers towards men may have shifted women's view of computers since "individuals are influenced by the majority: when a large portion of an individual's referent social group holds a particular attitude, it is likely that the individual will adopt it as well" (Rashotte, 2007). When Apple marketed the Apple II, and many of its other lines, primarily to men, it helped the stereotype that personal computers are meant for only men to use. "Over 20 years of showing the visual of men with computers is one of the many reasons why women don't even think to pursue this avenue" (Rajai & Paria, 2015).

In the 1980's, computers were marketed as toys for boys, and girls were pushed aside (When Women Stopped Coding, 2014). A study conducted by Gallup, interviewed nationally representative samples of 1,673 seventh to twelfth grade students, 1,685 parents of seventh to 12th grade students and 1,013 first to twelfth grade teachers via telephone in 2014 (Google, 3). As shown in Figure 4, 72% of female students think boys are more interested than girls are in computer science and 45% of female students think boys are more likely than girls are to be successful in learning computer science. This is compared to 34% of female students thinking females would be more likely to be successful in computer science (Google, 3).

Media Portrayal of Women in Technology

"Media has a strong influence on girl's impression of computer science and technology and may play an important part in why there are fewer women deciding to major in technology" (Gürer, Camp, 2002). How a social group is represented in the media including broadcast media

(e.g., television, film), Internet media (e.g., blogs), and print media (e.g., newspapers) influences how people think about that group and their relation to it (Cheryan, Plaut, Handron & Hudson, 2013). In addition, academic fields possess stereotypes, or mental representations of the group's characteristics (Cheryan, Plaut, Handron & Hudson, 2013).

PERCEIVED GENDER DIFFERENCES IN INTEREST IN AND SUCCESS IN LEARNING COMPUTER SCIENCE, BY GENDER

% STUDENTS

		GENDER	
		Male	Female
Who do you think is MORE INTERESTED in learning computer science?	<i>Boys</i>	75%	72%
	<i>Girls</i>	10%	17%
	<i>Both equally</i>	11%	8%
	<i>Don't know</i>	3%	3%
Who do you think is MORE LIKELY TO BE SUCCESSFUL in learning computer science?	<i>Boys</i>	43%	45%
	<i>Girls</i>	27%	34%
	<i>Both equally</i>	20%	15%
	<i>Don't know</i>	8%	6%

Figure 4: Perceived Gender Differences in Interest in and Success in Learning Computer Science by Gender (Google, 2014).

It is rare to see women in roles related to technology on television. A study that analyzed 11,927 speaking roles across three media: prime-time television programs aired in spring 2012, children's television shows aired in 2011, and family films (rated G, PG, or PG-13) released between 2006 and 2011 (Smith, Choueiti, Prescott & Pieper, 2012). The ratio of men to women in STEM fields was 14.25 to 1 in family films and 5.4 to 1 on prime time TV (Smith, Choueiti, Prescott & Pieper, 2012). The researchers reported they found a lack of aspirational female role models in all three media categories, and cited five main observations: female characters are sidelined, women are stereotyped and sexualized, a clear employment imbalance exists, women

on TV come up against a glass ceiling, and there are not enough female characters represented working in STEM fields (Smith, Choueiti, Prescott & Pieper, 2012).

The few women that are portrayed in technical roles are usually typecast as “geeky”, creating stereotypes about females in technology. On *Criminal Minds*, for example, a primetime show about a team of FBI agents who catch various criminals through behavioral profiling, the technical analyst on the team is Penelope Garcia (Bernhardt, 2014). Although she is one of the few females in a technical role on television, her character reinforces many stereotypes of the technology field. She is depicted as a somewhat ‘quirky’ person who is a technology genius, obsesses over online gaming, wears glasses, dresses in what might be considered somewhat funky or ‘geeky’ attire, and is often referred to as the ‘tech with glasses’ (Bernhardt, 2014). “When she is shown working with computers, she also is usually working alone in a darkened room” (Bernhardt, 2014). Other technical women on television, such as Abby Scuito on CSI, also portray the geek stereotype.

A study conducted at the University of Washington in 2013, asked undergraduate students to describe computer science majors. The most common answers, from both women and men, were geniuses, technology-oriented, lacking interpersonal skills, while also being singularly focused on computers (Cheryan, Plaut, Handron & Hudson, 2013). “Most depictions of computer science are not glorified in nature and negatively imply that computer science is only for geeks and nerds” (Blue). As a result, some women, even those qualified to enter the field, may assume they are not intellectually equal to those already in the field and may be reluctant to enter it (Cheryan, Plaut, Handron & Hudson, 2013).

With more positive female television characters in the media to represent a field that is dominated by men, more women may consider technology as a major (Forrest, 2014). In a study

when conducted by Stefanie Simon, a psychology professor at Tulane University, it was found that viewing media images of powerful women decreased women's negative self-perceptions and increased their leadership aspirations (Simon & Hoyt). Forensics was a field dominated by men as Sylvia Buffington-Lester (a supervisor in the latent print division at Virginia's Department of Forensic Science and the only woman in that division when she started in 1987) recalls "I used to tell people when I first came that we considered forensic science *Boys Town*, but now it's more like a girls world" (Potter). An *Associated Press* review of accredited forensic science programs in the United States found that approximately 75% of graduates are women, an increase from about 64% in 2000 (Potter).

Today, forensics is one of the few sciences that are dominated by women. This increase could be attributed to primetime shows, such as *CSI* and *Bones*, due to these shows are populated with female role models, including real-life professionals or fictional characters, such as Temperance Brennan in *Bones* and Sara Sidle on *CSI*, and have become extremely popular (Chandler, 2012). "Sites such as the Canadian Broadcast Corporation, the Guardian, *the Chronicle of Higher Education*, CBS News online, *The Oprah Winfrey Show*, the *Washington Post* and *TV Zone* have all commented on the popularity of *CSI* with female audiences" (Steenberg, 2012). Dr. William Walkenhorst, chair of the Department of Chemistry at Loyola University in New Orleans, estimates that approximately one-third of the students in the Department of Chemistry major in forensic chemistry compared to in 1999, there were only 45 female students studying forensic chemistry" (Lemaine, 2004).

Role Models

One of the influences that has been cited as contributing to the educational gender gap in technology is the lack of female role models in the technology field (Pearl, Pollack, Riskin,

Thomas, Wolf & Wu, 1990). “The U.S. Department of Education (2007) says that exposing girls to female role models who are successful in math and science can counteract “stereotype threat”—negative stereotypes that girls may develop about themselves” (Lyon & Jafri, 2010). However, many of the role models available to young girls at an early age, such as Barbie, send negative message to young girls.

Barbie has long been one of the most popular toys for young girls in the United States. “In 1998, approximately two were purchase every second in the world and in the United States an average of eight dolls were owned by young girls” (Turkel, 1998). “Dolls like Barbie because of their iconic status are likely to act as salient role models, at least for very young girls” (Dittmar, Halliwell & Ive, p. 283-292). In 1992, Mattel introduced Teen Talk Barbie to the public at the American International Toy Fair (Driscoll, p. 423). “For each doll, the manufacturers randomly selected 4 phrases from a total of 270 possible phrases” (Driscoll, p. 423). One of these four random phrases Barbie would say was “Math class is tough”. “Although many students struggle with math, regardless of gender, this message from a popular toy only helped to reinforce negative stereotypes about girls’ math abilities, despite ample evidence of their achievements” (Adya and Kaiser, 2005).

Since its introduction in 1959, Barbie has been portrayed with many different careers, each doll sold with sets of clothes and accessories that correlate with its career. In 2010, the first Barbie to have a career in technology was introduced as Computer Engineer Barbie along with the accompanying book called *Barbie: I Can Be a Computer Engineer*. While this book had the potential to portray Barbie as a positive role model, it instead reinforced negative stereotypes of women in technology. In the book, Barbie is working on designing a computer game that will show kids how computers work. However, Barbie states she is only able to create the design of

the game and is not able to program the game without her male companions doing the work. This book projects a negative stereotype that may impact young girls as they age because many stereotypes stem from biases that are taught at a young age and continue to affect people as they mature (Bartlett, 2014). “When women have this pejorative stereotype accessible in memory, they experience stereotype threat: the arousal, worrying thoughts, and temporary cognitive deficits evoked in situations where a group member’s performance can confirm the negative stereotype about their group’s ability in that domain” (Rydell, Rydell & Boucher, 2010).

Social Encouragement

According to the National Center for Women & Information Technology (NCWIT), another influential factor on whether women choose a technology-related major might reside with parental support (“Resources”). In a study conducted by Casey George-Jackson in 2012 at the University of Illinois, undergraduate students at nine large universities were asked to participate in a survey to gather data about their pre-college and college majors. The survey resulted, in over two thousand students responding with 85% of them majoring in STEM. When asked who most influenced them to choose their current major, 30% of the respondents selected “myself” as their answer (56.6 % of the respondents were female and 42.2 % were male) (George-Jackson, 2012). The second most popular answer was their parents at 25% (See (George-Jackson, 2012). High school teachers were the third most influential at 19%, and their peers were fourth with less than 10% (George-Jackson, 2012). Figure 5 highlights the survey responses.

According to another study by NCWIT, the encouragement of parents to go into a field of technology may be the most influential factor compared to one’s peers, teachers, and counselors (Ashcraft et al., 2013). The study surveyed 954 U.S. high school and college women and found

that encouragement and direction provided by parents was more influential than that of counselors or teachers. The survey results also showed that women most frequently chose their father (37%) or mother (29%), as the most influential person in their decision to pursue a computing career (Ashcraft et al., 2013). In addition, the survey also found that girls were significantly more likely than boys to seek input about careers” (Ashcraft et al., 2013).

Social encouragement, regardless of technical skills from either parent, can help influence women to major in technology (Google, 2014). As a study conducted by Google in 2014 observed, (see Figure 6) women who were computer science graduates were more likely to have their mother or father encourage them to study computer science when compared to graduates from other degrees (Google, 2014). Among computer science graduates when compared, both mothers and fathers encouraged respondents to study computer science almost equally for both male and female respondents. Siblings also played a role in influencing someone to major in computer science, but not nearly at as high a level as their mother or father.

According to a study conducted by Turner, Bernt, and Percora in 2002 at Ohio University, the occupation of one’s parents might also contribute to the reasoning as to whether or not women choose to major in technology. There were 275 respondents that were surveyed from a women-only IT group (Systers) and were asked about the occupation of their mother and father. “Twenty-seven percent of their fathers had an occupation that was classified in the technical field of engineering, computer science, mathematics, physics, or chemistry while only 2% of their mothers had an occupation under that category” (Turner, Bernt & Percora, 2002). The results of this study show that some women are encouraged or inspired by their parent’s career in technology and decide to major in it.

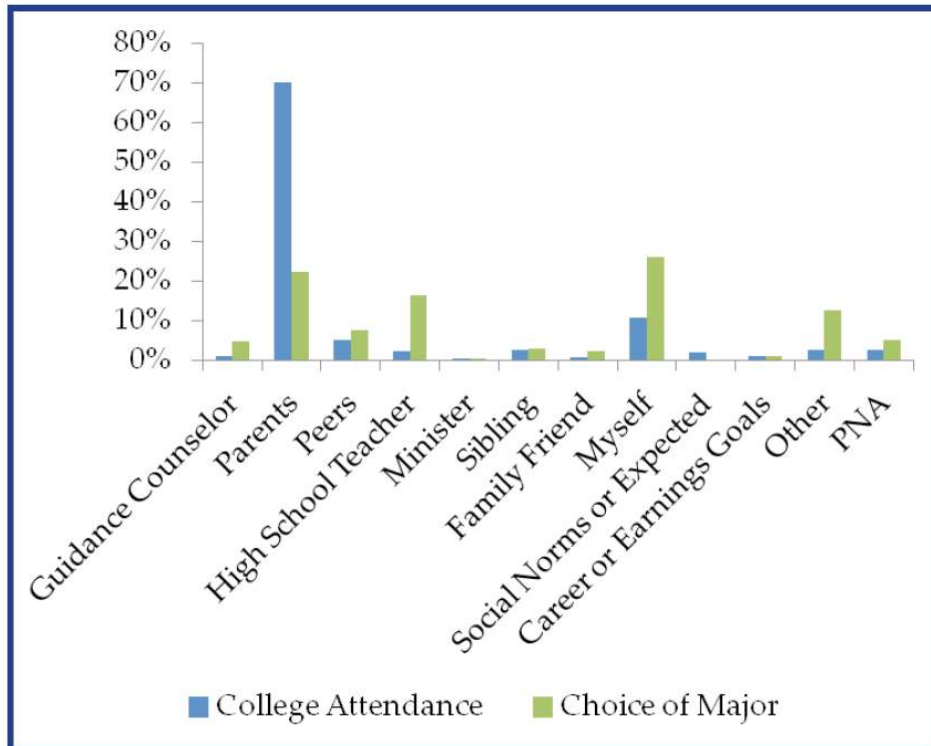


Figure 5: Influences of Students' College Attendance and Choice of Major. (George-Jackson, 2012).

Impact of Education

Currently, many high schools do not offer the opportunity for students to take certain computer courses. In 2014, only 3,751 schools reported students taking the AP Computer Science exam (College Board, 2014). With over 42,000 high schools in the United States, only 9% of high schools offer AP Computer Science to students. There are fewer high schools that offer AP Computer Science than AP Biology (10,513 to 3751) (College Board, 2014). In 2014, out of the 39,278 students who took the AP Computer Science exam, only 7,846, or 20% were female (College Board, 2014). Figure 7 provides the College AP test score statistics in 2014.

The lack of opportunity to take computer courses before entering college may be a contributing factor as to why many students as well as women are not pursuing technical majors (Google, 2014). "Greater access to and use of computers and other IT at home and in schools are viewed as generating interest among students to pursue CS/CE majors at the university level"

(Adya & Kaiser, 2005). Taking computer courses before college can help familiarize women with technology and could lead to a decision to pursue it as a major. “Early exposure to Computer Science is important because familiarity with a subject can generate interest and curiosity while establishing a sense of competency” (Google, 2014).

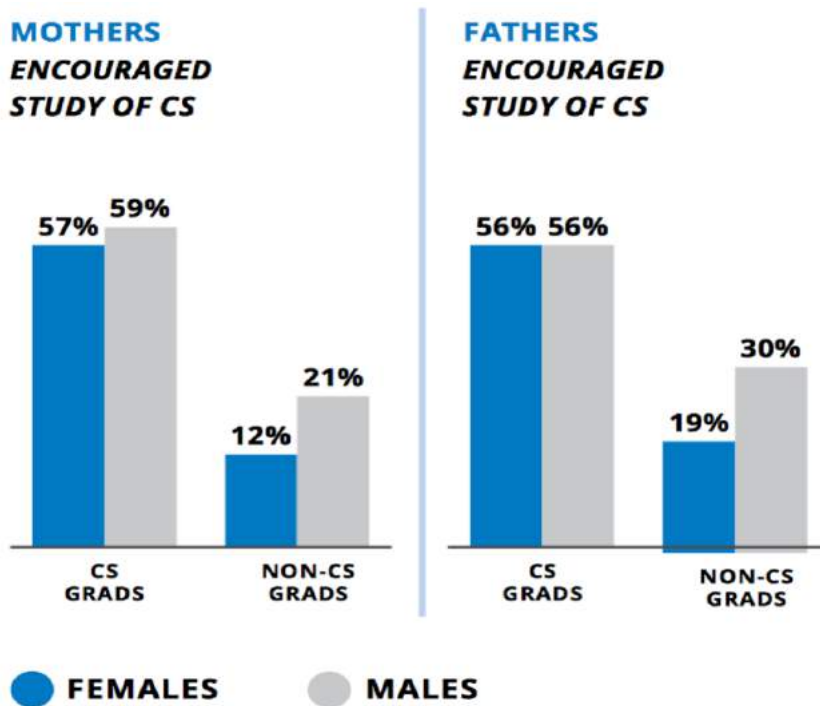


Figure 6: Family-Member Encouraged Study of CS By Sex. (Google, 2014).

A study conducted by Google in 2014, surveyed, 1000 women and 600 men who were academically and geographically diverse (Google, 2014). The study found the ability to participate in Computer Science courses and activities accounted for 22.4% of the explainable factors influencing the decision to pursue a Computer Science degree (Google, 2014). The opportunity to take computer related courses in school prior to entering college could increase the chances of female students deciding to major in technology. The same study conducted by

Google, found women are 38% more likely to pursue a Computer Science degree after having taken AP Computer Science in high school” (Google, 2014).

The exposure to technology through taking classes before college may help increase women’s confidence in the field. In 2015, Gallup interviewed nationally representative samples of 1,673 seventh to 12th grade students, 1685 parents of seventh to 12th grade students and 1,013 first to 12th grade teachers via telephone in 2014 (Google, 2015). This study found that students with more exposure to computer technology reported higher levels of confidence in their ability to learn computer science. (Google, 2015). Students with more exposure to technology were also more confident in their skills in fundamental areas of learning, such as math, science, reading and writing, as well as other skills foundational to computer science learning, such as designing and creating things and figuring out how things work (Google, 2015).

“On average, undergraduate women who enter Computer Science at Carnegie Mellon have less prior computing experience than their male peers” (Margolis & Fisher, 2000). At many universities, such as Carnegie Mellon, women are less likely to enter college with previous programming experience compared to their male counterparts. Margolis and Fisher researched and analyzed four years of interviews with male and female computer science majors and found that while 38 percent of first year men had significant self-initiated, out-of-school programming experience, only 10 percent of women had such experience” (Margolis & Fisher, 2002).

Less experience than their male counter parts can lead to confidence issues among women (Margolis & Fisher, 2002). At Carnegie Mellon, female students in computer science with less experience felt vulnerable in unfamiliar territory (Margolis & Fisher, 2002).

Confidence issues among women may lead to fewer women entering the major because as confidence drops, so does interest (Margolis & Fisher, 2002). "Even among women and men

who have similar grades, women in computer-related majors are less confident than their male peers of their ability to succeed in their major” (Hill, Corbett & Rose, 2010).

In the same study Gallup conducted in 2015, male students identified themselves as generally more confident than female students in their ability to learn computer science and are more likely to think they will have a job involving computer science in the future (Google, 2015). The results of the study conducted by Gallup are shown in Figure 8. 62% of male students say they are “very confident” they could learn computer science if they wanted to, compared to 46% of female students (Google, 2015). Forty-two percent of male students expect to have a job someday for which they would need to know some computer science, compared to 33% of female students (see Figure 8) (Google, 2015). "Without a sense of ability and confidence, interest in exploring can be thwarted” (Margolis & Fisher, 2002).

Objective and Hypotheses

The objective of this research is to identify the influential factors behind whether or not women choose to major in a technology-related field. From the literature review presented above, it can be concluded that there are many influential factors, such as, whether the perception of technology is now viewed as a field only for men, how the media portrays women in technology as “geeky”, role models that are reinforcing negative stereotypes, parental encouragement, access to computer courses prior to college, and confidence in technical abilities among women behind whether or not women choose in the major. Specially, the objective of this study is to address the following research question:

1. What are the influences behind whether or not women decide to pursue a major in the technology field?

PROGRAM SUMMARY REPORT

	STUDENTS IN												2013		2014		% CHANGE	NO. OF COLLEGES
	SCHOOLS	9TH GRADE	10TH GRADE	11TH GRADE	12TH GRADE	Not HS	<9TH GRADE	NOT STATED	MALE	FEMALE	PROGRAM TOTAL	PROGRAM TOTAL	PROGRAM TOTAL	PROGRAM TOTAL				
ART HISTORY	1,992	220	3,677	7,515	11,296	14	3	528	8,077	15,136	22,723	23,213	2	1,225				
BIOLOGY	10,513	2,947	25,210	81,339	99,552	138	34	4,074	87,163	126,131	203,189	213,294	5	2,769				
CALCULUS AB	13,723	525	5,949	71,738	209,893	933	73	4,961	151,471	142,601	282,814	294,072	4	2,950				
CALCULUS BC	6,734	385	3,435	29,632	76,450	501	75	1,635	65,610	46,503	104,483	112,113	7	1,889				
CHEMISTRY	8,734	228	11,206	82,083	52,304	397	18	2,318	78,173	70,381	140,006	148,554	6	2,323				
CHINESE LANGUAGE & CULTURE	1,528	1,026	2,445	3,657	3,290	33	36	241	4,831	5,897	10,121	10,728	6	529				
COMPUTER SCIENCE A	3,751	852	7,003	13,372	17,201	82	40	728	31,432	7,846	31,117	39,278	26	1,373				
MACROECONOMICS	4,607	362	3,480	17,061	93,091	751	1	2,453	65,041	52,168	108,219	117,209	8	2,108				
MICROECONOMICS	3,824	205	3,219	15,890	52,385	754	7	1,569	42,586	31,463	67,505	74,049	10	1,875				
ENGLISH LANGUAGE & COMP.	11,897	209	12,170	429,372	52,029	135	7	11,322	192,779	312,465	476,277	505,244	6	3,203				
ENGLISH LITERATURE & COMP.	13,735	87	2,233	47,342	340,539	174	9	7,093	148,876	248,601	385,576	397,477	3	3,321				
ENVIRONMENTAL SCIENCE	5,323	3,907	8,553	44,923	69,969	50	14	2,905	58,776	71,545	118,288	130,321	10	2,340				
EUROPEAN HISTORY	4,749	986	66,239	15,563	24,702	40	5	2,762	52,147	58,150	109,878	110,297	0	2,067				
FRENCH LANGUAGE & CULTURE	3,282	238	1,341	5,698	13,484	10	91	406	6,755	14,513	20,725	21,268	3	1,223				
GERMAN LANGUAGE & CULTURE	1,164	81	407	969	3,519	1	38	96	2,649	2,462	4,966	5,111	3	748				
GOVT. & POL. - U.S.	1,302	150	1,857	3,870	14,042	17	1	424	10,419	9,942	20,317	20,361	0	1,138				
GOVT. & POL. - INTL.	8,536	5,845	22,738	35,136	201,669	98	11	5,546	129,408	141,635	255,758	271,043	6	2,879				
HUMAN GEOGRAPHY	3,531	80,113	23,528	12,847	15,881	26	49	4,004	61,552	74,896	114,361	136,448	19	1,903				
ITALIAN LANGUAGE & CULTURE	453	28	81	345	1,819	5	5	48	874	1,457	1,980	2,331	18	383				
JAPANESE LANGUAGE & CULTURE	601	127	328	635	1,166	2	11	42	978	1,333	2,234	2,311	3	343				
LATIN	1,118	15	375	2,137	3,917	2	2	94	3,288	3,254	6,667	6,542	-2	583				
MUSIC THEORY	2,949	232	2,031	6,228	8,735	5	31	454	9,669	8,047	18,192	17,716	-3	1,228				
PHYSICS B	5,797	385	3,981	36,571	50,817	119	41	1,660	61,077	32,487	89,263	93,574	5	2,023				
PHYSICS C - E&M	2,302	31	258	2,919	17,093	165	13	286	15,927	4,838	19,380	20,765	7	809				
PHYSICS C - MECH	3,910	102	544	7,843	37,529	250	18	714	34,307	12,683	42,858	47,000	10	1,348				
PSYCHOLOGY	7,425	760	19,550	96,833	136,761	165	56	5,664	93,444	166,345	238,962	259,789	9	2,924				
SPANISH LANGUAGE	7,310	5,142	19,613	48,883	53,542	101	4,504	3,556	51,020	84,321	135,259	135,341	0	2,286				
SPANISH LITERATURE	1,647	349	1,871	6,606	10,691	5	1	595	6,895	13,223	18,785	20,118	7	1,037				
STATISTICS	7,944	383	8,927	35,276	135,008	655	155	3,759	89,474	94,689	169,508	184,173	9	2,722				
STUDIO ART - DRAWING	3,553	28	428	3,264	11,861	11	0	1,336	3,856	13,072	16,597	16,928	2	1,446				
STUDIO ART - 2-D DESIGN	4,062	111	1,011	5,472	18,080	11	0	2,126	6,882	19,929	24,928	26,811	8	1,738				
STUDIO ART - 3-D DESIGN	1,366	2	85	652	3,142	1	0	374	1,206	3,050	4,167	4,256	2	728				
U.S. HISTORY	12,530	2,420	50,190	383,553	16,332	79	23	10,169	215,811	246,955	442,890	462,766	4	2,913				
WORLD HISTORY	6,161	16,904	193,381	19,554	8,162	52	717	6,929	112,023	133,676	230,107	245,699	7	2,240				
TOTAL NO. OF EXAMS TAKEN		125,395	507,344	1,574,778	1,865,911	5,782	6,089	90,901	1,904,476	2,271,724	3,938,100	4,176,200	6					
TOTAL NO. OF STUDENTS		119,162	424,088	856,949	875,442	2,512	5,924	58,451	1,036,069	1,306,459	2,218,578	2,342,528	6					

Figure 7: 2014 College Board AP Test Statistics. (College Board, 2014).

CONFIDENCE AND LIKELIHOOD TO LEARN AND WORK IN COMPUTER SCIENCE

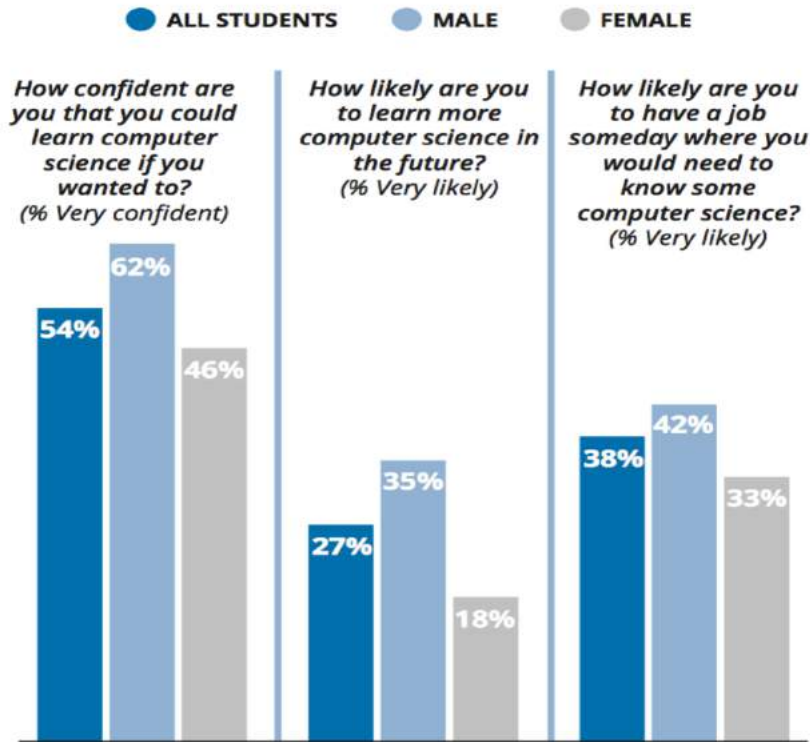


Figure 8: Confidence and Likelihood to Learn and Work in Computer Science (Google, 2015)

In order to collect data, survey questions were sent to and conducted on undergraduate students registered in Computer science, Computer Information Technology, and Management Information Systems courses at the University of North Carolina Wilmington in the spring semester of 2016. While previous research has looked at only the female population, this study was conducted on both the male and female population in order to better assess the influences. An analysis was conducted from the data collected in order to understand the influences driving the decision of women deciding or not deciding to pursue a degree in technology. Based on the influences discussed six hypotheses have been drawn and will be tested based on the results from the survey:

Hypothesis 1: Women have less confidence in their programming abilities than men, which affects their interest in majoring in technology?

Hypothesis 2: Women are more likely to begin college with less programming experience than men, which leads to less women deciding to major in technology?

Hypothesis 3: Limited access to computer courses before attending college affect women's decision to major in technology

Hypothesis 4: Exposure to positive role models will help inspire young girls/women to want to major in technology.

Hypothesis 5: Reimagining the technology major will help more women decide to pursue a degree in the field.

Hypothesis 6: Parental encouragement is an influential factor that steers women to deciding to major in technology.

The final outcome of this research was to use the data collected to create a set of recommendations to provide to universities in the United States looking to increase the number of women deciding to major in technology.

CHAPTER 3: METHODOLOGY

The methodology behind finding out the influences as to why women choose to pursue a degree of study related to technology required data collection and analysis. In order to collect the data needed, two different surveys were developed using the platform Survey Monkey: survey one (see Appendix A) and survey two (see Appendix B). An online survey was chosen due to the quickness of feedback, ease of distribution, and the results filed electronically. The survey questionnaires were designed and implemented using Survey Monkey due to its ease of use and popularity among students. Survey Monkey was chosen in order to make sure the respondent only answers the survey once, which will prevent multiple entries from one student. Pilot testing took place, in order to test both surveys before each survey is sent to the intended recipients.

Pilot testing was conducted to make sure the survey questions are easily understood, conducted in a clear manner, and to eliminate poorly worded questions. The purpose of the pilot test is to gain feedback to ensure the survey questions are easily understood and asked in a clear manner. During the pilot test, both surveys were sent using a different web link for survey one and survey two to those who belong to the email distribution list for the Master of Science in Computer Science and Information Systems at the University of North Carolina graduate and current students group. There was a comment box at the end of each survey for respondents to express their changes and concerns.

After this formative testing, the results were analyzed and modifications, if necessary were made to both of the surveys. Once the surveys were complete, all links for survey one and survey two (see Appendix A and Appendix B) was sent to the specific target groups asking respondents to participate with the identity of the respondent remaining anonymous. Survey one was sent using a different web link per target group to four different target groups, and survey

two will be sent using different web link per target group to two different target groups. Different web links were sent containing the specific survey in order to separate the results into the specific target group. The final deliverable is a set of recommendations created to provide to universities to help increase the number of women deciding to major in technology.

Overview: Survey One

Survey one focused on collecting data from those who are current students. Survey one will be sent out to two different target groups each using a different web link for the respondents of the specific target group to access in order to complete the survey (refer to Appendix A). Using a different web link per target group kept the respondent's answers of the target group separate from the other groups, so the results of each target group could be analyzed efficiently.

The first target group was comprised of both male and female students that are currently registered and taking undergraduate Management Information Systems, Computer Information Technology, and Computer Science major specific (non-perquisite) courses at the University of North Carolina Wilmington at the end of spring semester of 2016. Survey one was sent using a different web link to the first target group through the course's distribution email (refer to Appendix A). Management Information Systems, Computer Information Technology and Computer Science are the technology related majors offered at the University of North Carolina Wilmington, and this survey was sent out to courses that are required for those who have decided to major in technology (refer to Appendix C for courses). This target group was mostly comprised of those who have already made the decision to major in technology and are taking the courses to complete the major. The purpose of sending survey one to this group was to target those who have already decided to major in technology and to find out the influences behind their choice to pursue a degree in technology.

The second target group was sent to both male and female students in undergraduate Management Information System, Computer Information Technology, and Computer Science pre-requisite courses at UNCW. The second target group that survey one was sent to through the course's distribution email included those in pre-requisite courses that are needed in order to declare a major in technology. However, some of these courses are pre-requisite requirements for other majors and will be included. These courses are included in order to collect data on those who may not decide to major in technology or are not majoring in technology. For example MIS 313, is a pre-requisite course for the Management Information Systems concentration, but also is a requirement for other majors, such as Accounting in the business school at UNCW. A list of the courses that are comprised of the second target group survey one will be sent out to can be found in Appendix D. Pre-requisite courses were chosen in order to collect data on those who have not decided or committed to majoring in technology, and to assess those students of all different majors including those who are undeclared. The purpose of sending survey one to the second target group is to collect data from those students who may not necessarily have chosen to major in technology and find out the influences behind why they may or may not choose to continue in subsequent courses.

Overview: Survey Two

Survey two focused on collecting data from working professionals and not current students. The second survey was sent to two different target groups each using a different web link in order to make sure the results are separated from the first survey and from each target group in survey two (refer to Appendix B for survey two). The first target group that was sent survey two was those who are members of the Cape Fear Women in Tech (CFWIT) Facebook group. CFWIT is a group whose mission is to advance women in technology in the Cape Fear,

NC region and foster professional development (“Cape Fear Women in Tech”). The Facebook group is comprised of 193 members whose mission focuses on women helping women and inspiring women to choose careers in technology (“Cape Fear Women in Tech”). The web link for survey two was posted to the Facebook group asking those who are not current students to complete the survey in order to focus on the perspective of those who are professionals. The web link was also be included in the May monthly newsletter that is forwarded to all members of the group. The purpose of sending survey two to the first target group is to collect information on the perspective of professionals and the influences behind why they may or may not have decided to major in technology.

The second target group that was sent survey two are those who are working professionals belonging to the private email forum called Systers. Systers is a forum for all women involved in the technical aspects of computing comprised of over 6,000 members from at least 60 countries around the world (“Systers-Anita Borg Institute”) it is a resource that can also be used to assess the perspective of working professionals. Systers welcomes the participation of women technologists of all ages and at any stage of their studies or careers, and it is the world’s largest email community of women in technical roles in computing (“Systers-Anita Borg Institute”). Survey two was sent using a different web link through the Systers email distribution list asking those who are current undergraduate or graduate students to participate. The purpose of sending survey two to the second target group is to focus on the current female working professional perspective and the influences behind why they decided to major in technology.

Design of Survey One and Two

Survey one was comprised of 24 questions each with seven multiple-choice questions, five open-ended questions, and eight “check all that apply” questions. There was one drop-down

question, and three questions with multiple sub-levels and a scale ranging from “Strongly Agree to Strongly Disagree.” Survey two was comprised of 25 questions with seven multiple-choice questions, six open-ended questions, and eight “check all that apply” questions. There was one drop-down question, and three questions with multiple sub-levels and a scale ranging from “Strongly Agree to Strongly Disagree.”

The design of the first part of survey one (questions 1-5) and survey two (questions 1-6) was to collect background information on the survey respondent. The first three questions of both surveys asked for the respondent’s gender, age and ethnicity. For survey one, the fourth and fifth questions focused on what year in school is the respondent and the fifth question asks the respondent to “check all that apply” to see if the respondent is majoring in technology. For survey two, the fourth question asked the respondent to fill in their current occupation, and the fifth question focuses on finding out if the respondent’s occupation belongs in the technology industry. The sixth question asked the respondent to “check all that apply” to see if the respondent majored in technology.

The second part of both surveys focused on collecting data on the influences behind whether or not the respondent decided to major in computer science, management information systems, or computer information technology. Building from question five for survey one and building from question six for survey two, the next question asked the respondent to “check all that apply” to find out the influences behind the respondent’s choice of major. This question was used to gain insight on the influence of different types of social encouragement that may impact the respondents choice of major especially women.

Question seven/eight and question eight/nine for survey one/two focused on social encouragement. Question seven/eight asked if anyone in the respondent’s family encouraged the

respondent to major in management information systems, computer science, or computer information technology. Based on the literature review, the National Center for Women in Information Technology showed the encouragement of parents to go into the field of technology may be the most influential factor compared to others (Ashcraft et al., 2013). This question was used to collect data specifically on who in the respondent's family might have encouraged them to major in technology. Question eight/nine assessed whether teachers encouraged the respondents to major in technology. "Faculty can positively or negatively influence student taste for a field – some compelling teachers can get students engaged in fields that they previously disliked, while other, more uncharismatic faculty can alienate students from entire bodies of knowledge, sometimes permanently" (Chambliss & Takacs).

Question nine/ten helped to gain a better insight as to what majors some respondents are switching from when they switch into a technical-related field. This question asked if the respondent switched their major to computer science, computer information technology, or management information systems and if the respondent did switch to list the major before the switch. This question was used to find out information behind which majors students are switching from into these technical majors and to see if there is a reoccurring trend. Question ten/eleven built on that question and asked the respondent to explain the reasoning behind the switch in order to get an explanation behind the switch and to see if respondents are switching to the field for the same reasons.

Question eleven/twelve looked at the influence of role models when the respondent is deciding on their major. The literature review discusses how exposing girls to female role models who are successful in math and science can counteract "stereotype threat"—negative stereotypes that girls may develop about themselves (Lyon & Jafri, 2010). Question

twelve/thirteen is asked to find out the influences behind the respondent's major regardless of whether he or she majored in technology. Question twelve/thirteen is asked on a Likert scale in order to see more in depth how each of the statements influenced the respondent's decision. Question twelve/thirteen assessed nine statements a Likert scale that allows respondents to rank their answers from "Strongly Disagree" to "Strongly Agree." The statements assessed are:

1. I believe my friends played a significant part in my selection of major.
2. I believe my college professors played a significant part in my selection of major.
3. I believe my college advisors played a significant part in my selection of major.
4. I believe my high school teachers played a significant part in my selection of major.
5. I believe my high school advisors played a significant part in my selection of major.
6. I believe my parents played a significant part in my selection of major.
7. I believe my siblings played a significant part in my selection of major.
8. I believe I would have picked my major regardless of the field my family is in.
9. I believe people on television/media played a significant part in my selection of major.

Based on the literature review, marketing could be one of the influences behind why there are less women majoring in technology with targeted male personal computer advertisements in the 1980's attributing to the perspective of computing now being viewed as predominately for men (When Women Stopped Coding, 2014). Question thirteen/fourteen and question fourteen/fifteen helped to gain data behind whether the perception of technology is now viewed as a field only for men. Question thirteen/fourteen asks "who do you think is more likely to be successful in management information systems, computer science, or computer information technology?" with the possible responses "men", "women", "both", "don't know." Question fourteen/fifteen asks "who do you think is more likely to major in management information

systems, computer science, or computer information technology?” with the possible responses “men”, “women”, “both”, “don’t know.” These two questions helped to gain insight on the perception of technology and those who decide to major in it.

Question sixteen/seventeen and seventeen/eighteen asked the respondent to “check the box if you took any computer courses while in elementary, middle, or high school?” The responses include “elementary school”, “middle school”, “high school”, and the respondent is able to check all the boxes in which they took a computer course. This question explored the respondent’s interaction with computers at schools and was compared to the respondent’s response to question twenty-one/twenty-two, which is structured as a Likert scale to assess how interested in computers/technology the respondent was before attending college. The scale ranks from “I was extremely interested in computers/technology before entering college” to “I was extremely not interested in computers/technology before entering college”. The responses will be analyzed to see if taking prior computer courses in elementary, middle, and high school impacts the respondent’s interest in majoring in technology before entering college.

Question eighteen/nineteen assessed if the respondent’s high school offered AP computer science. This question addressed whether or not respondents have the opportunity to take AP computer science before entering college. The literature review discusses the positive benefit of early exposure to computers by high schools allowing students the opportunity to take AP computer science. According to the literature review, women are 38% more likely to pursue a Computer Science degree after having taken AP Computer Science in high school” (Google, 2014).

Question nineteen/twenty and question twenty/twenty-one assessed the respondent’s programming experience and background. Question nineteen/twenty asked if the respondent has

any programming experience before coming to college and if so, write what programming languages have you programmed in before coming to college?” Based on the literature review, on average, undergraduate women who enter a technology major have less prior computing experience than their male peers (Margolis & Fisher, 2000). These questions were used to collect data on how many female respondents have prior programming experience and what languages they have experience programming in before entering college.

Building upon question nineteen/twenty, question twenty/twenty-one assessed the respondent’s confidence in their programming abilities. Based on the literature review, having less experience than their male counter parts can lead to confidence issues among women (Margolis & Fisher, 2000). Question twenty/twenty-one assessed how confident the respondent is in their programming abilities. This question was analyzed along with the respondent's answers to question nineteen/twenty to measure and see if there is any correlation between the lack of having prior programming experience and confidence in abilities.

Question twenty-one/twenty-two asked the respondent to “list three adjectives that come to mind when thinking about the majors: computer science, computer information technology, or management information systems?” This question assesses the respondent’s perception of technology. The literature review discusses how the perception of those who major in technology are viewed as “geniuses”, “technology-oriented”, lacking interpersonal skills, while also being singularly focused on computers (Cheryan, Plaut, Handron & Hudson, 2013). The purpose of this question was to assess the respondent’s perception of technology and if the computer science, computer information technology, and management information systems is perceived to be only comprised of those individuals who are considered to be “geniuses”, “technology-oriented”, “lacking interpersonal skills”, while also being singularly focused on computers.

Question twenty-two/twenty-three and question twenty-three/twenty-four analyzed if women are underrepresented in the media. Based on the literature review, there is a lack of aspirational female role models in the media, and concluded five main observations: female characters are sidelined, women are stereotyped and sexualized, a clear employment imbalance exists, women on television come up against a glass ceiling, and there are not enough female characters working in STEM fields (Smith, Choueiti, Prescott & Pieper, 2012). Question twenty-two/twenty-three asked the respondent to “list two women in technology that appear on television (If you do not know of any leave blank)?” Question twenty-three/twenty-four asked the same question, but instead of listing two women, the question asks the respondent to list two men. The first purpose of these two questions was to collect data and see if respondents are able to identify women who play a role in technology on television. The second purpose of this question was to compare and see if respondents are able to identify more men or more women in technology roles on television.

The last question of both surveys asked the respondents in an open-ended question, “What do you think could be done to attract more females into the technology major?” This question is open-ended to allow the respondent to express additional thoughts on what could be done to attract more women to major in technology.

CHAPTER 4: OUTLINE OF COMPLETED THESIS

Overview: Survey One

Data collection for target group one and target group two of survey one began on April 27th, 2016 and ended May 5th, 2016 using Survey Monkey. The return rate for each target group sent survey one was mixed. Target group one for survey one received 107 responses while target group two for survey one received 116 responses. The overall background demographics of the respondents collected from the survey questionnaires for each target group are shown in Table 2:

	Target Group 1: Survey 1	Target Group 2: Survey 1
Gender		
Male	68.22% (73)	59.48% (69)
Female	31.78% (34)	40.52% (47)
Other (Please Specify)	0%	0%
Age Range		
0-18	.93% (1)	6.9% (8)
19-22	50.47% (54)	69.83% (81)
23-30	34.58% (37)	16.38% (19)
31-40	10.28% (11)	3.45% (4)
Over 40	3.74% (4)	3.45% (4)
Ethnicity		
Black or African American	11.21% (12)	4.31% (5)
Hispanic or Latino	1.87% (2)	5.17% (6)
White or Caucasian	74.77% (80)	84.48% (98)
Native American or American Indian	.93% (1)	1.72% (2)
Asian or Pacific Islander	5.61% (6)	1.72% (2)
Other	5.61% (6)	2.59% (3)
Class Year		
Freshman	1.87% (2)	16.38% (19)
Sophomore	7.48% (8)	37.93% (44)

Junior	27.10% (29)	35.34% (41)
Senior	57.94% (62)	10.34% (12)
Graduate	5.61% (6)	0.00% (0)

Table 2: Background demographic for Survey one: Target group one and two

Survey One: Target Group One

Survey one was sent using an individual web link to target group one comprised of students who were enrolled in non-perquisite Management Information Systems (MIS), Computer Information Technology (CIT), and Computer Science (CSC) courses at the University of North Carolina Wilmington in the spring semester of 2016 (see Appendix C). The purpose of sending survey one to this group was to target those who have already decided to major in technology and to find out the influences behind their choice to pursue a degree in technology. In total, there were 107 participants who took the survey. The majority of respondents were Caucasian males between the ages of 19-22 who were in their senior year at the University of North Carolina Wilmington (see Table 2).

All 107 participants were identified as having a major or minor in Computer Science (CSC), Management Information Systems (MIS), or Computer Information Technology (CIT). Participants were asked “Are any of the following your current major or minor? (Check all boxes that apply)” with answer choices including “Management Information Systems”, “Computer Information Technology”, “Computer Science”, “N/A”, or “Other”. 17.76% of respondents identified as majoring/minoring in Management Information Systems, 40.19% of all respondents identified as majoring/minoring in Computer Information Technology, 46.73% identified as majoring/minoring in Computer Science, 0% of respondents answered “N/A”, and 14.95% of respondents answered “Other”.

However, the individual responses of the 14.95% of respondents that answered “Other” were examined, and it was concluded that each respondent that selected “Other” also chose either Management Information Systems, Computer Information Technology, or Computer Science as a major/minor in addition to selecting “Other”. These respondents were considered to have a major/minor in technology since the respondents were able to check more than one option due to the respondents possibly having more than one major/minor.

Overall, it was concluded of target group one that every single respondent of the 107 that responded answered as having a major/minor in technology. The results were then analyzed by the data collected from target group one being filtered into two different groups: Females that are majoring/minoring in technology and males that are majoring/minoring in technology. Two groups for target group one were created in order to analyze the influences, and the differences between male and female’s selection to major in technology (see Table 3).

Survey One: Target Group Two

The second target group was comprised of students registered in pre-requisite Management Information System, Computer Science, and Computer Information Technology courses at the University of North Carolina Wilmington in the spring semester 2016 that were sent survey one using a different web link containing in order to separate the results from target group one. The purpose of sending survey one to the second target group was to collect data from those students who may not have chosen to major in technology and find out the influences, and the differences between male and female’s selection to major or not major in technology. In total, there were 116 participants who took the survey. The majority of respondents were Caucasian males between the ages of 19-22 who were in their sophomore year at the University of North Carolina Wilmington.

Participants were asked “are any of the following your current major or minor? (Check all boxes that apply)” with answer choices including “Management Information Systems”, “Computer Information Technology”, “Computer Science”, “N/A”, or “Other”, 5.17% of the 116 respondents identified as majoring/minoring in Management Information Systems, 21.55% of all respondents identified as majoring/minoring in Computer Information Technology, 26.72% identified as majoring/minoring in Computer Science, 18.10% selected “N/A”, and 34.48% of respondents answered “Other”. Data collected from target group two for survey one was separated into four different groups: Females who major/minor in technology, males who major/minor in technology, females who do not major/minor in technology, and males who do not major/minor in technology.

The first group was comprised of females who are majoring in technology are those who identified as being a “female”, and who selected either “Management Information Systems”, “Computer Information Technology”, or “Computer Science” and did not select either “Other” or “N/A” as their major (see Table 3). The second group consisted of males who are majoring/minoring in technology are those who identified as being a “male”, and who selected either “Management Information Systems”, “Computer Information Technology”, or “Computer Science”, and did not select either “Other” or “N/A as their major. The data was filtered into group one and two in order to analyze the influences, and the differences between male and female’s selection to major in technology (see Table 3). The data in target group two was filtered into groups one and two in order to analyze and compare the influences, and the differences between why male and females choose to major in technology.

The third group was comprised of females who are not majoring/minoring in technology are those who identified as being a “female”, and who only selected “Other” or “N/A”, and did

not select either “Management Information Systems”, “Computer Information Technology”, or “Computer Science as their major (see Table 3). The fourth group was comprised of males who are not majoring in technology are those who identified as being a “male”, and who only selected “Other” or “N/A”, and did not select “Management Information Systems”, “Computer Information Technology”, or “Computer Science as their major. The data was filtered into groups three and four in order to analyze the influences, and the differences between why male and females may not choose to major in technology (See Table 3).

The background demographics of the respondents, and the response numbers for each group of target group one and two can be found in Table 3:

	Survey 1, Target Group 1: Group 1 - Females (Technology Majors Only)	Survey 1, Target Group 1: Group 2- Male (Technology Majors Only)	Survey 1, Target Group 2: Group 1- Females (Technology Majors Only)	Survey 1, Target Group 2: Group 2- Male (Technology Majors Only)	Survey 1, Target Group 2: Group 3- Females (Non-Technology Majors Only)	Survey 1, Target Group 2: Group 4- Male (Non-Technology Majors Only)
Response Number						
	34	73	14	43	33	26
Age Range						
0-18	0% (0)	1.37% (1)	0% (0)	6.98% (3)	3.03% (1)	15.38% (4)
19-22	52.94% (18)	49.32% (36)	57.14% (8)	65.12% (28)	81.82% (27)	69.23% (18)
23-30	35.29% (12)	34.25% (25)	28.57%(4)	18.60% (8)	15.15% (5)	7.69% (2)
31-40	8.82% (3)	10.96% (8)	7.14% (1)	2.33% (1)	0.00% (0)	7.69% (2)
Over 40	2.94% (1)	4.11% (3)	7.14% (1)	6.98% (3)	0.00% (0)	0.00% (0)
Ethnicity						
Black or African American	11.76% (4)	10.96% (8)	0% (0)	4.65% (2)	6.06% (2)	3.85% (1)
Hispanic or Latino	0% (0)	2.74% (2)	0% (0)	2.33%(1)	12.12% (4)	3.85% (1)
White or Caucasian	73.53% (25)	75.34% (55)	85.71% (12)	88.37% (38)	72.73% (24)	92.31% (24)
Native American or American Indian	0.00% (0)	1.37% (1)	7.14% (1)	0.00% (0)	3.03% (1)	0.00% (0)
Asian or Pacific Islander	11.76% (4)	2.74% (2)	7.14% (1)	2.33% (1)	0.00% (0)	0.00% (0)
Other	2.94% (1)	6.85%(5)	0.00% (0)	2.33% (1)	6.06% (2)	0.00% (0)

Class Year						
Freshman	2.94% (1)	1.37%(1)	28.57% (4)	23.26% (10)	3.03% (1)	15.38% (4)
Sophomore	8.82% (3)	6.85%(5)	21.43% (3)	32.56% (14)	42.42% (14)	50.00%(13)
Junior	29.41% (10)	26.03%(19)	35.71% (5)	34.88% (15)	45.45% (15)	23.08% (6)
Senior	50% (17)	61.64%(45)	14.29% (2)	9.30% (4)	9.09% (3)	11.54% (3)
Graduate	8.82% (3)	4.11%(3)	0.00% (0)	0.00% (0)	0.00% (0)	0.00% (0)
Major						
Management Information Systems	29.41% (10)	12.33% (9)	14.29% (2)	9.30% (4)	0.00% (0)	0.00% (0)
Computer Information Technology	23.53% (8)	47.95% (35)	35.71% (5)	46.51% (20)	0.00% (0)	0.00% (0)
Computer Science	47.06% (16)	46.58% (34)	57.14% (8)	53.49% (23)	0.00% (0)	0.00% (0)
N/A	0.00% (0)	0.00% (0)	0.00% (0)	0.00% (0)	30.30% (10)	42.31% (11)
Other (Please Specify)	17.65 (6)	13.70 (10)	0.00% (0)	0.00% (0)	72.73% (24)	61.54% (16)

Table 3: Demographics for all groups in Survey One: Target groups one and two

Overview: Survey Two

Data collection for target group one and target group two of survey two began on April 27th, 2016 and ended May 5th, 2016 using Survey Monkey (See Appendix B). The return rate for each target group sent survey two was mixed. Target group one for survey two received 14 all female responses while target group two for survey two received 30 all female responses. The overall background demographics of the respondents collected from the survey questionnaires for each target group are shown in Table 4:

	Target Group 1: Survey 2- CFWIT	Target Group 2: Survey 2- Systems
Gender		
Male	0%	0%

Female	100% (14)	100% (30)
Other (Please Specify)	0%	0%
Age Range		
0-18	0%	0%
19-22	7.14% (1)	3.3% (1)
23-30	14.29% (2)	26.67% (8)
31-40	42.86% (6)	30.00% (9)
Over 40	35.71% (5)	40.00% (12)
Ethnicity		
Black or African American	0%	3.33% (1)
Hispanic or Latino	7.14% (1)	0%
White or Caucasian	92.86% (13)	80.00% (24)
Native American or American Indian	0%	0.00% (0)
Asian or Pacific Islander	0%	10.00% (3)
Other	0%	6.67% (2)
Occupation Industry		
Information Technology	21.43% (3)	20% (6)
Computer Science	21.43% (3)	40% (12)
Management Information Systems	14.29% (2)	6.67% (2)
Other	42.86% (6)	33.33% (10)

Table 4: Background demographic for Survey two: Target group one and two

Survey Two: Target Group One

Data collected from both target groups for survey two were separated into two different groups per target group for a total of four different groups: CFWIT females who majored/minored in technology, CFWIT females who did not major/minored in technology, Sisters females who majored/minored in technology, and Sisters females who did not major/minor in technology. The first target group that was sent survey two were to those who are working professionals, and members of the Cape Fear Women in Tech (CFWIT) Facebook

group. CFWIT is a group whose mission is to advance women in technology in the Cape Fear, NC region and foster professional development (“Cape Fear Women in Tech”). The Facebook group is comprised of 193 members whose mission focuses on women helping women and inspiring women to choose careers in technology (“Cape Fear Women in Tech”). In total, there were 14 participants who took the survey. The majority of respondents were Caucasian females between the ages of 31-40 (See Table 4).

The second target group that was sent survey two were to those who are working professionals, and members of the group Systems. Systems is a forum for all women involved in the technical aspects of computing comprised of over 6,000 members from at least 60 countries around the world (“Systems-Anita Borg Institute”) it is a resource that can also be used to assess the perspective of working professionals. The majority of respondents were Caucasian females over the age of 40 (See Table 4). In total, there were 30 participants who took the survey. The purpose of sending survey two to these four groups was to target those who are working professionals in technology and to find out the influences behind their choice to pursue a degree in technology.

The first group of target group one was comprised of CFWIT females that majored in technology. Only 6 participants were identified as having a major or minor in Computer Science (CSC), Management Information Systems (MIS), or Computer Information Technology (CIT). Participants were asked “Are any of the following your current major or minor? (Check all boxes that apply)” with answer choices including “Management Information Systems”, “Computer Information Technology”, “Computer Science”, “N/A”, or “Other”. 33.33% of respondents identified as majoring/minoring in Management Information Systems, 16.67% of all respondents identified as majoring/minoring in Computer Information Technology, 66.67% identified as

majoring/minoring in Computer Science, 0% of respondents answered “N/A”, and 0% of respondents answered “Other” (See Table 5).

The second group of target group one was comprised of CFWIT females that did not major in technology. Only 8 participants were identified as not having a major or minor in Computer Science (CSC), Management Information Systems (MIS), or Computer Information Technology (CIT) when participants were asked “Are any of the following your current major or minor? (Check all boxes that apply)” with answer choices including “Management Information Systems”, “Computer Information Technology”, “Computer Science”, “N/A”, or “Other” with 100% of participants responding “Other” (See Table 5).

Survey Two: Target Group Two

The first group of target group two was comprised of those who are working professional females belonging to the group Systems that majored in technology. Only 24 participants were identified as having a major or minor in Computer Science (CSC), Management Information Systems (MIS), or Computer Information Technology (CIT). Participants were asked “Are any of the following your current major or minor? (Check all boxes that apply)” with answer choices including “Management Information Systems”, “Computer Information Technology”, “Computer Science”, “N/A”, or “Other”. 20.83% of respondents identified as majoring/minoring in Management Information Systems, 8.33% of all respondents identified as majoring/minoring in Computer Information Technology, 79.17% identified as majoring/minoring in Computer Science, 0% of respondents answered “N/A”, and 0% of respondents answered “Other” (See Table 5).

The second group of target group two was comprised of Systems females that did not major in technology. 6 participants were identified as not having a major or minor in Computer

Science (CSC), Management Information Systems (MIS), or Computer Information Technology (CIT) when participants were asked “Are any of the following your current major or minor? (Check all boxes that apply)” with answer choices including “Management Information Systems”, “Computer Information Technology”, “Computer Science”, “N/A”, or “Other” with 100% of participants responding “Other”, and all 6 participants responded “Other” (See Table 5).

	Survey 2, Target Group 1: Group 1 – CFWIT Females (Technology Majors Only)	Survey 2, Target Group 1: Group 2- CFWIT (Non-Technology Majors Only)	Survey 2, Target Group 2: Group 1- Systems Females (Technology Majors Only)	Survey 2, Target Group 2: Group 2- Systems (Non-Technology Majors Only)
Response Number				
	6	8	24	6
Age Range				
0-18	0% (0)	0% (0)	0% (0)	0% (0)
19-22	0% (0)	12.50% (1)	4.17% (1)	0% (0)
23-30	16.67% (1)	12.50% (1)	25.00%(6)	33.33% (2)
31-40	50% (3)	37.50% (3)	29.17% (7)	33.33% (2)
Over 40	33.33% (2)	37.50% (3)	41.67% (10)	33.33% (2)
Ethnicity				
Black or African American	0% (0)	0% (0)	4.17% (1)	0% (0)
Hispanic or Latino	0% (0)	12.50% (1)	0% (0)	0% (0)
White or Caucasian	100% (6)	87.50% (7)	75% (18)	100% (6)
Native American or American Indian	0.00% (0)	0% (0)	0.00% (0)	0.00% (0)
Asian or Pacific Islander	0% (0)	0% (0)	12.50% (3)	0% (0)
Other	0% (0)	0% (0)	8.33% (2)	0% (0)
Industry Occupation				
Information Technology	16.67% (1)	25.00%(2)	8.33% (2)	66.67% (4)
Computer Science	50% (3)	0% (0)	41.67% (10)	33.33% (2)
Management Information Systems	16.67% (1)	12.50% (1)	8.33% (2)	0% (0)
Other	16.67% (1)	62.50%(5)	41.67% (10)	0% (0)
Major				

Management Information Systems	33.33% (2)	0% (0)	20.83% (5)	0% (0)
Computer Information Technology	16.67% (1)	0% (0)	8.33% (2)	0% (0)
Computer Science	66.67% (4)	0% (0)	79.17% (19)	0% (0)
N/A	0.00% (0)	0.00% (0)	0.00% (0)	0.00% (0)
Other (Please Specify)	0.00% (0)	100%(8)	0.00% (0)	100.00% (6)

Table 5: Demographics for all groups in Survey two: Target groups one and two

Survey Results

Target group one that was sent survey one (see Appendix A) received 107 responses. Out of the 107 responses, 68.22% (73) respondents identified their gender as “male” while 31.78% (34) respondents identified their gender as “female”. Out of the 34 responses that identified their gender as female, 50% (17) of the female respondents identified their class year as being a “senior” while out of the 73 responses that identified as male, 61.64% (45) male respondents identified their class year as being a “senior” (See Table 3), which was to be expected since target group one was comprised of those students registered in non-perquisite courses for CS, MIS, and CIT, which are usually comprised of upperclassman who have already declared their major.

Participants were asked “are any of the following your current major or minor? (Check all boxes that apply)” with answer choices including “Management Information Systems”, “Computer Information Technology”, “Computer Science”, “N/A”, or “Other”, out of the 34

responses that identified as female, 29.41% (10) responded to majoring/minoring in “Management Information Systems”, 23.53% (8) responded to majoring/minoring in “Computer Information Technology”, 47.06% (16) responded to majoring/minoring in “Computer Science”, 0.00% (0) responded “N/A”, and 17.65% (6) responded “Other”. However, the 6 female respondents that answered “Other” were individually examined, and it was concluded that each respondent that selected “Other” also chose either Management Information Systems, Computer Information Technology, or Computer Science as a major/minor in addition to selecting “Other”. These 34 respondents who identified as “female”, and selected a major/minor in technology are part of group one of target group one. These respondents were considered to have a major/minor in technology the respondents were able to check more than one option due to the respondents possibly having more than one major/minor. When asked to expand on their selection of choosing “Other”, they responded with the following along with any additional selections from the answer choices:

1. *Accounting* (Also selected Management Information Systems)
2. *Major is Mathematics/Minor is Computer Science* (Also selected Computer Science)
3. *MSCSIS* (Master of Science in Computer Science and Information Systems) (Made no additional selections)
4. *Art* (Also selected Computer Science)
5. *Business Administration* (Also selected Management Information Systems)
6. *Technically no “major/minor”. Start the MSCSIS program next semester. Have just been getting prerequisites last couple of years.* (Made no additional selections)

For target group one, out of the 107 responses received, 73 responded that they identified as “male”. When asked “are any of the following your current major or minor? (Check all boxes

that apply)” with answer choices including “Management Information Systems”, “Computer Information Technology”, “Computer Science”, “N/A”, or “Other”, 12.33% (9) responded to majoring/minoring in “Management Information Systems”, 47.95% (35) responded to majoring/minoring in “Computer Information Technology”, 46.58% (34) responded to majoring/minoring in “Computer Science”, 0.00% (0) responded “N/A”, and 13.70% (10) responded “Other”. However, the individual responses of the 10 male respondents that answered “Other” were individually examined, and it was concluded that each respondent that selected “Other” also chose either Management Information Systems, Computer Information Technology, or Computer Science as a major/minor in addition to selecting “Other”. These 73 respondents who identified as “male”, and selected a major/minor in technology are part of group two of target group one. These respondents were considered to have a major/minor in technology since the respondents were able to check more than one option due to the respondents possibly having more than one major/minor. When asked to expand on their selection of choosing “Other”, they responded with the following along with any additional selections from the answer choices:

1. *Chemistry* (Also selected Computer Science)
2. *Finance – Second Major Leadership – Minor* (Also selected Management Information Systems)
3. *Programming* (Also selected Computer Information Technology)
4. *Criminal Justice* (Also selected Computer Information Technology)
5. *Finance* (Also selected Management Information Systems)
6. *Electrical Engineering* (Also selected Computer Science)
7. *Communication Studies* (Also selected Computer Science)
8. *Mathematics* (Also selected Computer Science)

9. *Operations Management* (Also selected Management Information Systems)

10. *Physics* (Also selected Computer Science)

Target group two that was sent survey one received 116 responses. The 116 responses were then grouped into four different groups: Females who major/minor in technology, males who major/minor in technology, females who do not major/minor in technology, and males who do not major/minor in technology. Out of the 116 responses, 59.83% (70) respondents identified their gender as “male” while 40.17% (47) respondents identified their gender as “female”. Out of the 47 responses that identified their gender as female, 42.55% (20) of the female respondents identified their class year as being a “junior”, and 36.17% (17) identified their class years as being a “sophomore” while out of the 70 responses that identified as male, 38.57% (27) male respondents identified their class year as being a “sophomore”, and 31.43% identified their class year as being a “junior” (See Table 3), which was to be expected since target group two was comprised of those students registered in prerequisite courses for CS, MIS, and CIT, which are usually comprised of sophomore-juniors who have not declared their major.

In order to filter the data into the four groups, participants were asked “are any of the following your current major or minor? (Check all boxes that apply)” with answer choices including “Management Information Systems”, “Computer Information Technology”, “Computer Science”, “N/A”, or “Other”. Out of the 47 responses that identified their gender as female, 29.78% (14) selected that they are majoring/minoring in one or more of the following: “Management Information Systems”, “Computer Information Technology”, or “Computer Science”. These 14 respondents were grouped in the first group of target group two comprised of females who are majoring/minoring in technology (see Table 3). Of the 14 respondents, 14.29% (2) selected majoring/minoring in “Management Information Systems”, 35.71% (5) selected

majoring/minoring in “Computer Information Technology”, and 57.14% (8) selected majoring/minoring in “Computer Science”. It is important to note that one respondent selected both “Management Information Systems” and “Computer Information Technology”. However, out of the 47 female respondents 51.06% (24) selected “Other”. Each response under “Other” had to be individually examined due to respondents possibly having more than one major/minor thus might have selected more than one answer. It was concluded that each response under “Other” was not associated with the selection of Management Information Systems, Computer Information Technology, or Computer Science as a major/minor in addition to selecting “Other”, so those respondents would not be considered as majoring/minoring in technology.

The 69 respondents who identified their gender as “male” were also asked the question above and 62.3% (43) selected that they are majoring/minoring in one or more of the following: “Management Information Systems”, “Computer Information Technology”, or “Computer Science”. These 43 respondents were grouped in the second group of target group two comprised of males who are majoring/minoring in technology (see Table 3). Of the 43 respondents, 9.30% (4) selected majoring/minoring in “Management Information Systems”, 46.51% (20) selected majoring/minoring in “Computer Information Technology”, and 53.49% (23) selected majoring/minoring in “Computer Science”. It is important to note that one respondent selected both “Computer Information Technology” and “Computer Science”, one respondent selected both “Management Information Systems and Computer Information Technology”, and one respondent selected all three-technology majors. However, out of the 69 male respondents 24.63% (17) selected “Other”. Each response under “Other” had to be individually examined due to respondents possibly having more than one major/minor thus might have selected more than one answer. It was concluded that each response under “Other” was not associated with the

selection of Management Information Systems, Computer Information Technology, or Computer Science as a major/minor in addition to selecting “Other”, so those respondents would not be considered as majoring/minoring in technology.

Out of the 47 overall female responses, 70.21%(33) selected they are not majoring/minoring in technology by having chose one or more of the following: “N/A” or “Other” with 30.30% (10) choosing “N/A”, and 72.73% (24) of the 33 respondents choosing “Other”. It is important to note that one respondent chose both “N/A” and “Other”. These 33 respondents were grouped in the third group of target group two comprised of females who are not majoring/minoring in technology (see Table 3). When asked to expand on their selection of choosing “Other”, they responded with the following (see Appendix E) with no additional selections from the answer choices except for one respondent who also selected N/A.

Of the 69 respondents who identified their gender as “male”, 37.68% (26) selected that they are not majoring/minoring in technology by having chose one or more of the following: “N/A” or “Other” with 42.31% (11) choosing “N/A”, and 61.54% (16) of the 26 respondents choosing “Other”. These 26 respondents were grouped in the fourth group of target group two comprised of males who are not majoring/minoring in technology (see Table 3). It is important to note that one respondent chose both “N/A” and “Other”. When asked to expand on their selection of choosing “Other”, they responded with no additional selections from the answer choices except for one (see Appendix F).

Target group one that was sent survey two received 14 responses. The 14 responses were then grouped into two different groups: CFWIT Females who major/minor in technology, and CFWIT females who did not major/minor in technology. Out of the 14 responses only 6 were identified to have majored in technology (see Table 5). Of the 6 respondents, 33.33% (2) selected

majoring/minoring in “Management Information Systems”, 16.67% (1) selected majoring/minoring in “Computer Information Technology”, and 66.67% (4) selected majoring/minoring in “Computer Science”. However, out of the 14 overall respondents 8 respondents selected “Other”. Each response under “Other” had to be individually examined due to respondents possibly having more than one major/minor thus might have selected more than one answer. It was concluded that each response under “Other” was not associated with the selection of Management Information Systems, Computer Information Technology, or Computer Science as a major/minor in addition to selecting “Other”, so those respondents would not be considered as majoring/minoring in technology. When asked to expand on their selection of choosing “Other”, they responded with the following with no additional selections from the answer choices:

1. *Business Administration*
2. *Graphic Design*
3. *Business Administration*
4. *Marketing*
5. *Education*
6. *Art*
7. *History*
8. *Psychology*
9. *Technical Writing*

Target group two that was sent survey two received 30 female responses. The 30 responses were then grouped into two different groups: Sisters Females who major/minor in technology, and Sisters females who did not major/minor in technology. Out of the 30 responses

24 were identified to have majored in technology (see Table 5). Of those 24 respondents, 20.83% (5) selected majoring/minoring in “Management Information Systems”, 8.33% (2) selected majoring/minoring in “Computer Information Technology”, and 79.17% (19) selected majoring/minoring in “Computer Science”. However, out of the 30 overall respondents 6 respondents selected “Other”. Each response under “Other” had to be individually examined due to respondents possibly having more than one major/minor thus might have selected more than one answer. It was concluded that each response under “Other” was not associated with the selection of Management Information Systems, Computer Information Technology, or Computer Science as a major/minor in addition to selecting “Other”, so those respondents would not be considered as majoring/minoring in technology. When asked to expand on their selection of choosing “Other”, they responded with the following with no additional selections from the answer choices:

1. *Poetry*
2. *Psychology*
3. *Astronomy*
4. *Literature*
5. *History*
6. *Spanish/Biology*

Choosing a major in college is one of the most important decisions that a student faces in his or her life. As discussed in the literature review there are many different reasons why students decide on a major. The choice of major students’ pursue in college are influenced by others, their own interests, and their own motivators (Casey-Jackson, 2012). Participants that received survey one and two were asked to rate nine statements on a Likert scale with the options

of selecting “Strongly Agree”, “Agree”, “Neutral/Unsure”, “Disagree”, or “Strongly Disagree” with each of the nine statement assessing if a certain influence impacted their decision of choosing their major. This analysis included all ten groups: group one and two in both target groups for survey one, and survey two, in order to find out what influences these participants impacted their decision of choosing their major. The first statement: “I believe my friends played a significant part in my selection of major” (refer to Figure 9) had mixed results. Both women that selected, and did not select that they were majoring in technology strongly disagreed that their friends had influence over their selection of major while both men that did and did not major in technology disagreed, or were neutral towards the statement. Based on these results, it can be concluded that friends did not have a significant impact on one’s decision of major.

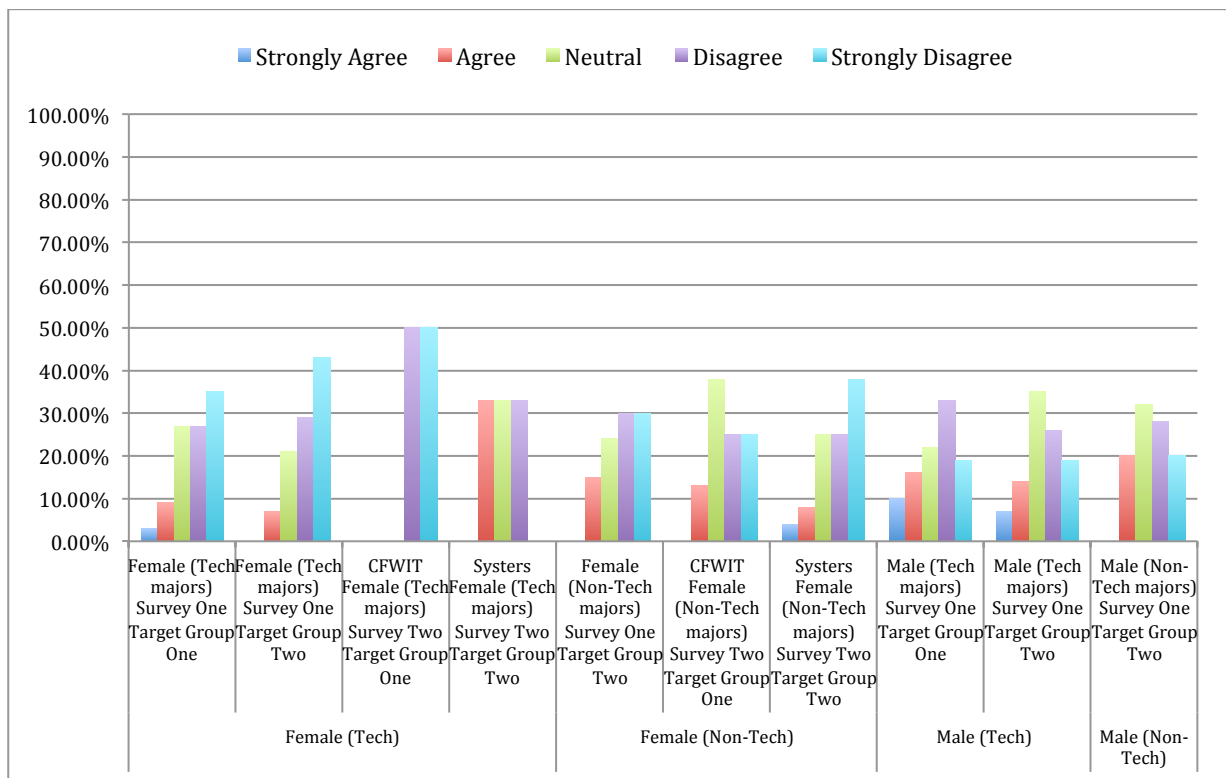


Figure 9: Responses to friends playing role in selection of major

The second statement: “I believe my college professors played a significant part in my selection of major” (refer to Figure 10) also had mixed results. When compared both men and

women had responses that varied from “Strongly Agree” to “Strongly Disagree”. Female respondents that belonged to the group Systems that majored in technology had the most responses agreeing with the statement. However, based on the results it is inconclusive as to whether college professors have a significant impact on a student’s decision of major. The third statement: “I believe my college advisors played a significant part in my selection of major” (refer to Figure 11) also had mixed results. When compared both men and women had responses that varied from “Strongly Agree” to “Strongly Disagree”. Female respondents that belonged to the group Systems, and CFWIT that majored in technology had the highest responses disagreeing with the statement. However, based on the results it is inconclusive as to whether college advisors have a significant impact on student’s decision of major.

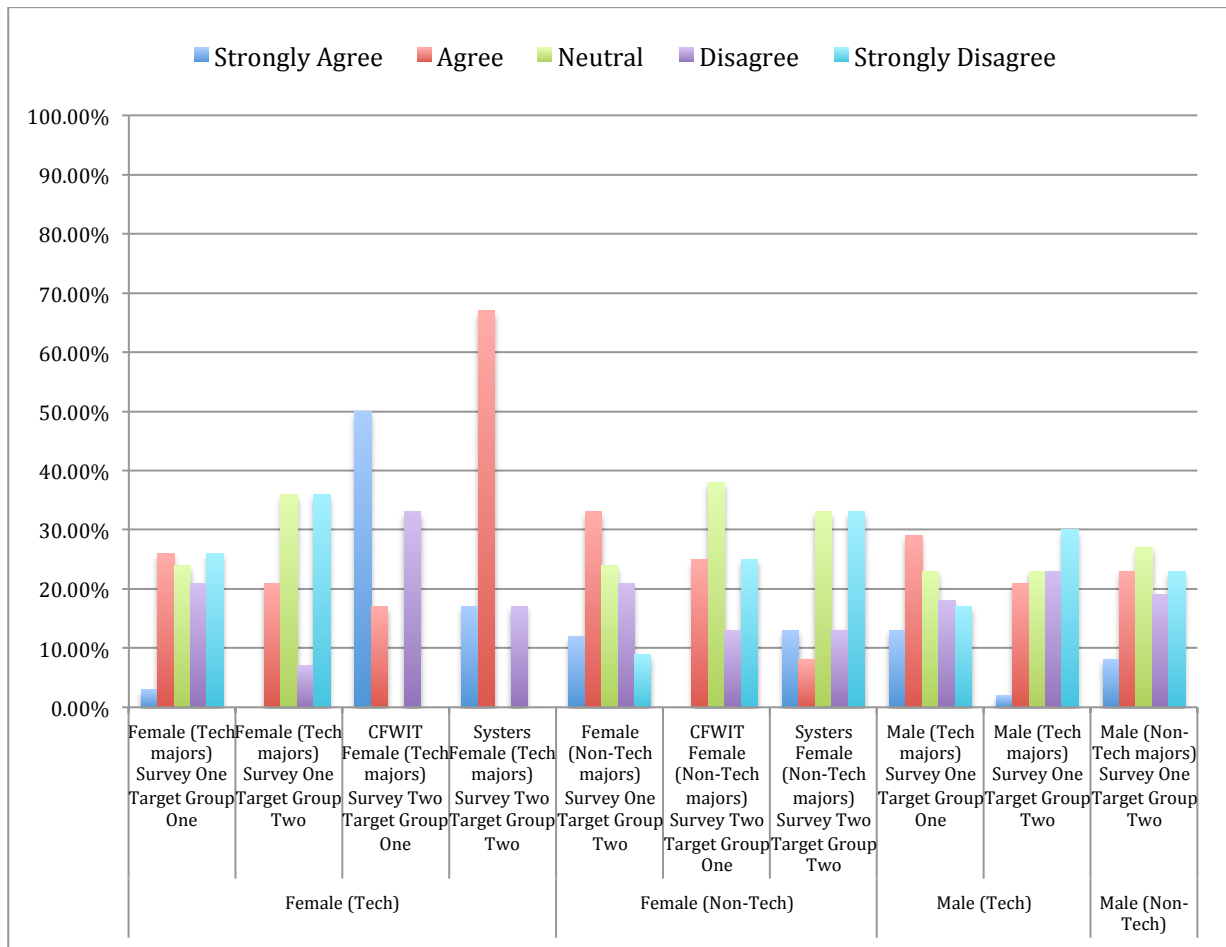


Figure 10: Responses to college professors playing a role in selection of major

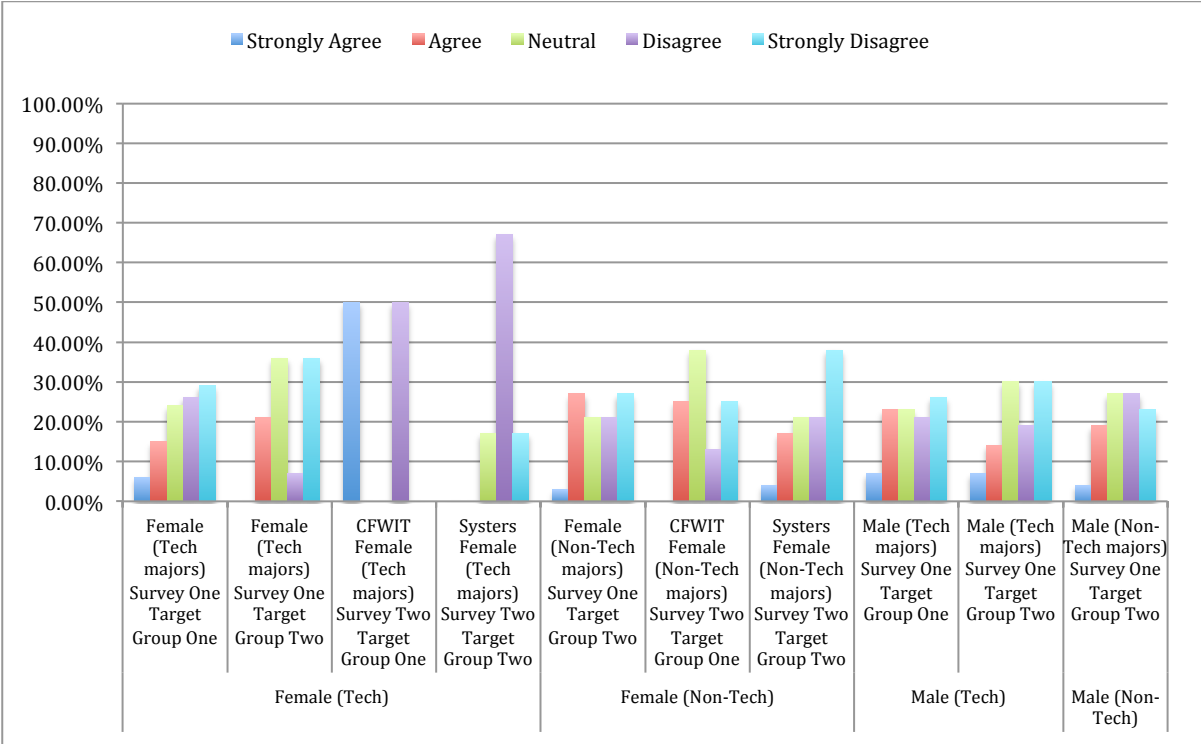


Figure 11: Responses to college advisors playing a role in selection of major

The fourth statement: “I believe my high school teachers played a significant part in my selection of major” (refer to Figure 12) also had mixed results. When compared both men and women had responses that varied from “Strongly Agree” to “Strongly Disagree”. Female respondents that majored in technology for all groups had the most responses stating they “Strongly Disagree” with the statement. However, female respondents that did not major in technology had the highest responses agreeing with the statement especially CFWIT female responses that did not major in technology. Male respondents that did not all major in technology were “Neutral” to the statement. However, based on the results it is inconclusive as to whether high school teachers have a significant impact on student’s decision of major.

All groups that responded to the fifth statement: “I believe my high school advisors played a significant part in my selection of major” (refer to Figure 13) selected either “Disagree”, or “Strongly Disagree”. The responses for “Strongly Disagree” ranged from 24%- 46%, and the

responses for “Disagree” ranged from 21% - 67%. Based on the results it can be concluded that high school advisors do not have a strong influence on a student’s decision of major.

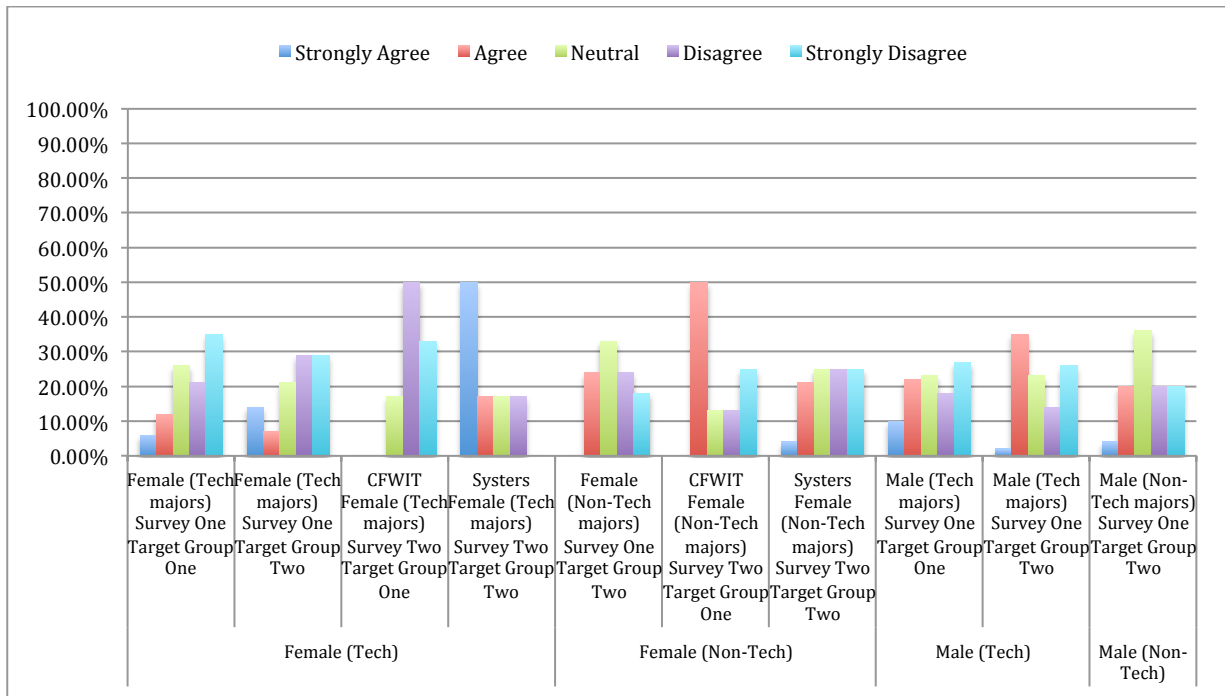


Figure 12: Responses to high school teachers playing a role in selection of major

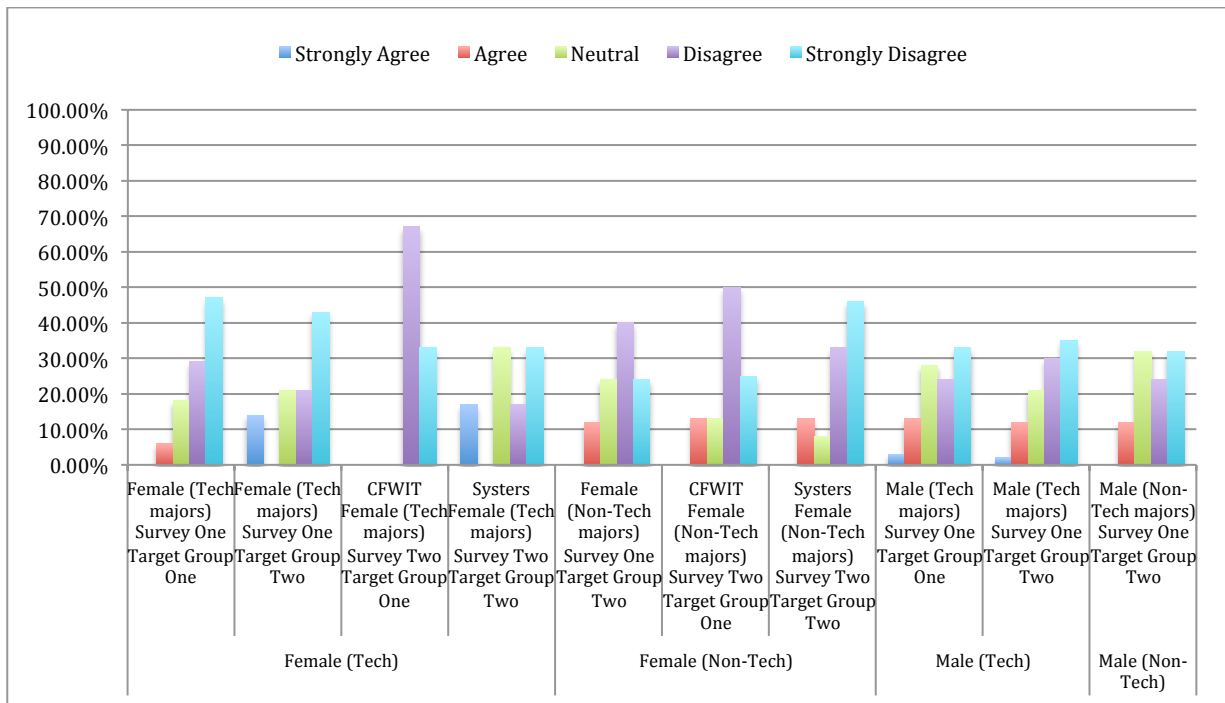


Figure 13: Responses to high school advisors playing a role in selection of major

All groups that responded to the sixth statement: “I believe my parents played a significant part in my selection of major” (refer to Figure 14) selected either “Agree”, or “Neutral” except for female respondents that belongs to the group Systems that did not major in technology who selected “Disagree”. It is also important to note that most female respondents that belong to Systems are over the age of 40, which could have impacted the results. However, for both male and female respondents that majored in technology, the majority selected “Agree”, or “Strongly Agree”. Based on the results it can be concluded that parents may have an influence on those students that decide to major in technology.

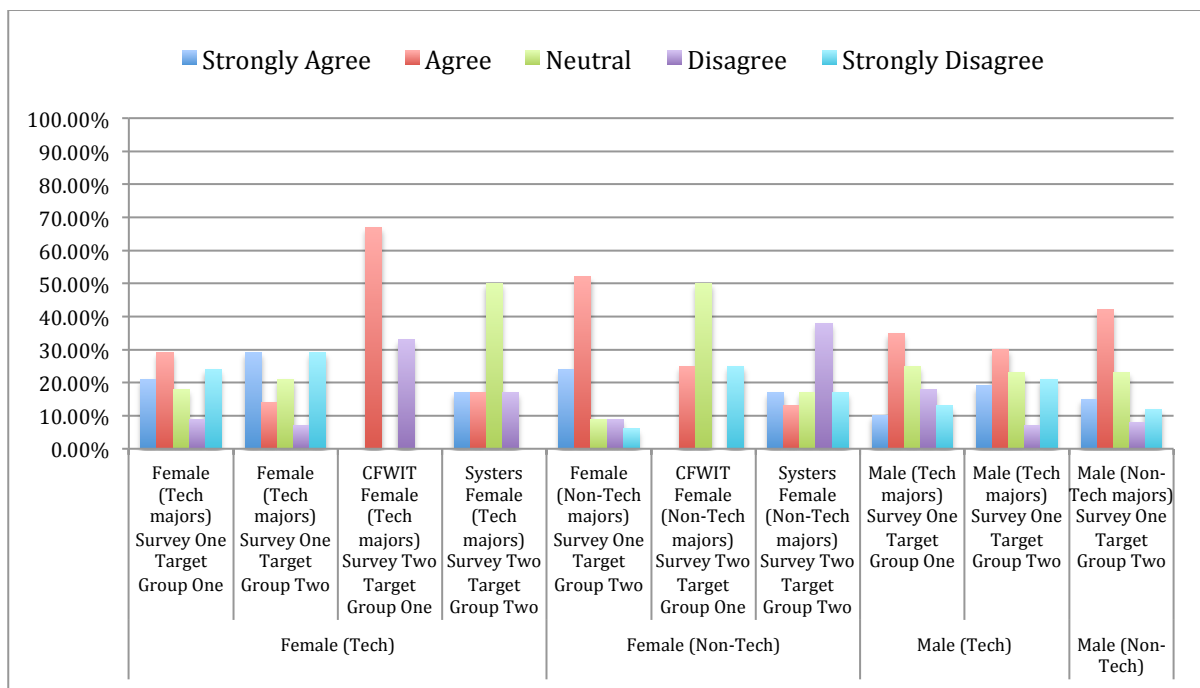


Figure 14: Responses to parents playing a role in selection of major

All groups that responded to the seventh statement: “I believe my siblings played a significant part in my selection of major” (refer to Figure 15) selected “Disagree”, “Neutral”, or “Strongly Disagree”. The highest number of responses that selected “Disagree” belonged to those who majored in technology and belonged to the group CFWIT, and the highest number of responses for those who selected “Strongly Disagree” belonged to those who did not major in

technology and belonged to the group Systems. Based on the results it can be concluded that siblings do not have a huge impact on one’s decision of college major. All groups responded with either “Agree” or “Strongly Agree” to the eighth statement: “I believe I would have picked my major regardless of the field my family is in” (refer to Figure 16). The highest number of responses to select “Strongly Agree” belonged to those who majored in technology and belonged to the group Systems, and the highest number of responses to select “Agree” belonged to those who majored in technology and belonged to the group CFWIT. Based on the results it can be concluded that the field a student’s parent is in does not have an impact on the student’s decision of college major.

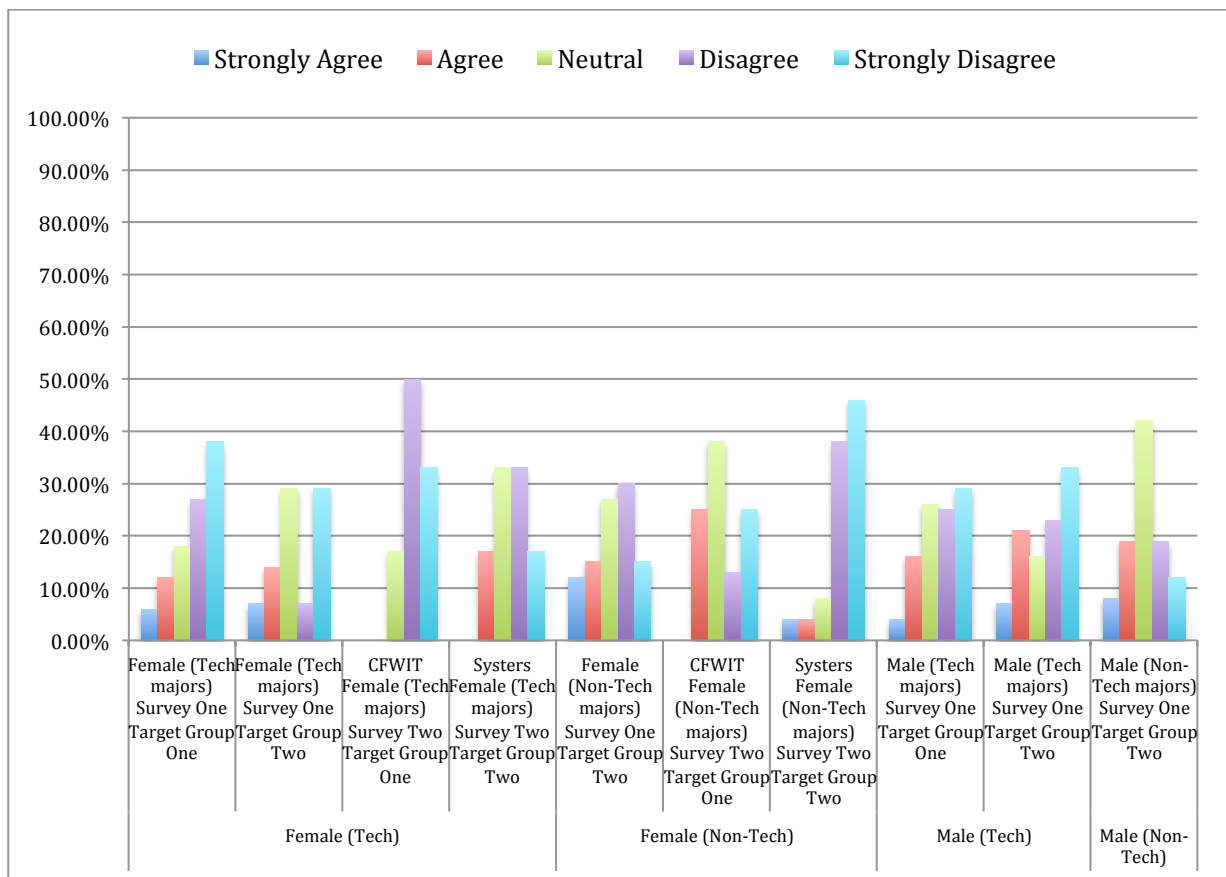


Figure 15: Responses to siblings playing a role in selection of major

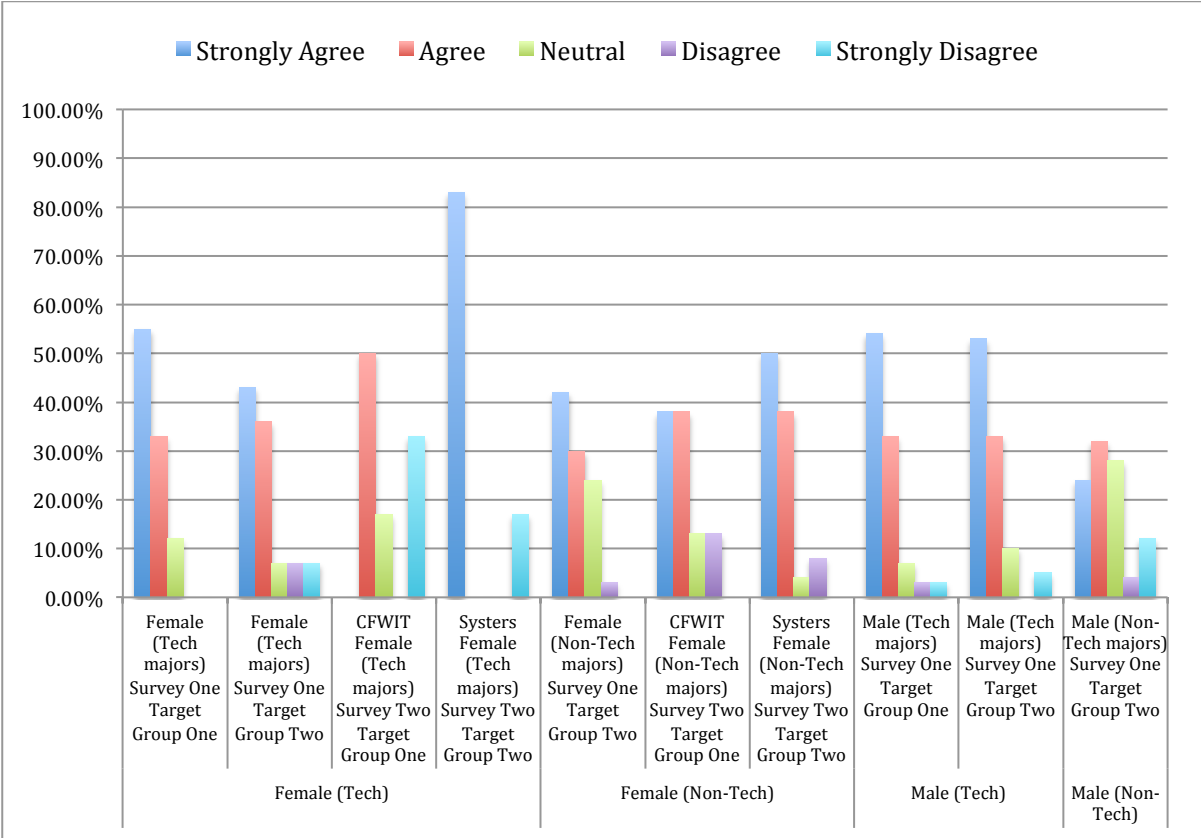


Figure 16: Responses to what field parent’s is in and selection of major

All groups responded with either “Disagree”, “Strongly Disagree”, or “Neutral” to the eighth statement: “I believe people on television/media played a significant part in my selection of major” (refer to Figure 17). The highest number of responses to “Strongly Agree” belonged to those female respondents who majored in technology and were registered in pre-requisite CSC, MIS, and CIT courses at UNCW. However, the majority of males that did or did not major in technology selected “Neutral”. Based on the results it can be concluded that the people on television, and the media may not have an impact on the decision of one’s college major.

As discussed in the literature review, role models are important influences that may impact a woman’s choice to major in technology since career choices are often influenced by role models, which are usually familial or educational (Hanton, 2015). To examine an overview of which role models influence women to major in technology, participants were asked, “Did any

roles models encourage you to major in Management Information Systems, Computer Science, or Computer Information Technology (Mark all that apply)?” with answer choices including: “Family”, “Friends”, “Teacher”, “Academic Advisory”, “Myself”, “People on television/media”, “None I am not majoring in technology”, and “Other”. Figure 18 compares four different groups: Female respondents that are majoring in technology, female respondents who did not choose to major in technology, male respondents majoring in technology, and male respondents who did not choose to major in technology.

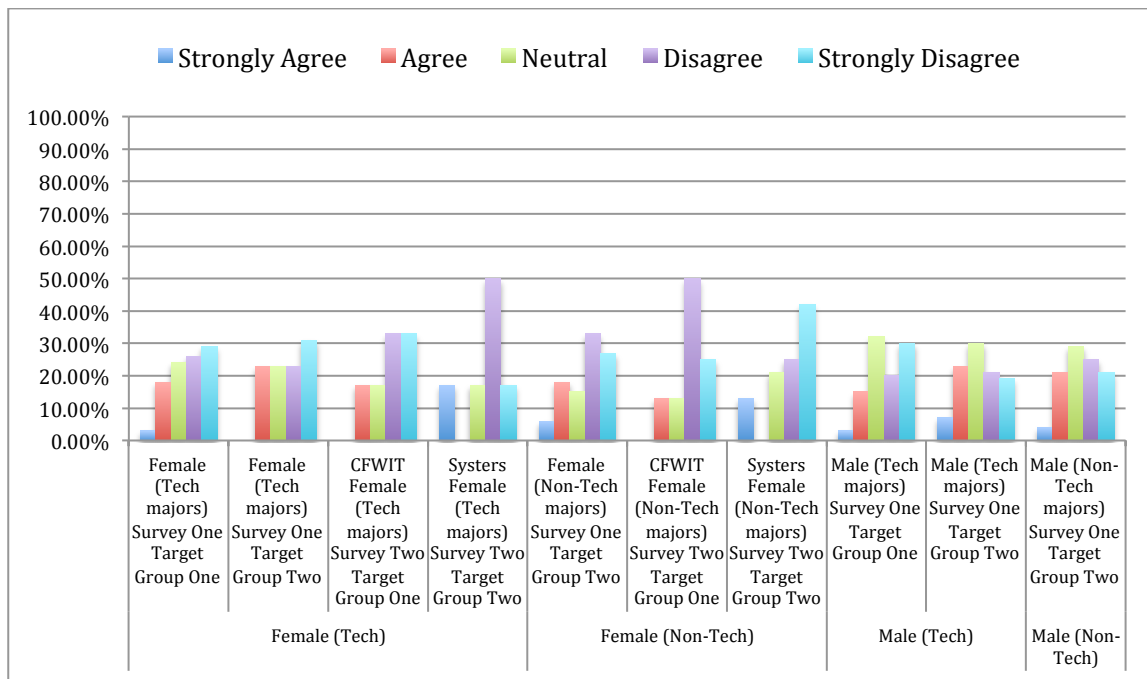


Figure 17: Responses to people on television/media and selection of major

The group of female respondents that are majoring in technology included: Female respondents who selected they are majoring in technology that are registered in non pre-requisite MIS, CSC, and CIT courses at UNCW, female respondents who selected they are not majoring in technology that are registered in pre-requisite MIS, CSC, and CIT courses at UNCW, female respondents in the CFWIT group that selected they are majoring in technology, and female respondents in the Systers group that selected they are majoring in technology.

The group of male respondents that are majoring in technology included: Male respondents who selected they are majoring in technology that are registered in non pre-requisite MIS, CSC, and CIT courses at UNCW, and male respondents who selected they are majoring in technology that are registered in pre-requisite MIS, CSC, and CIT courses at UNCW. The group of female respondents that are not majoring in technology included: Female respondents who selected they are not majoring in technology that are registered in non pre-requisite MIS, CSC, and CIT courses at UNCW, and female respondents who selected they are not majoring in technology that are registered in pre-requisite MIS, CSC, and CIT courses at UNCW, female respondents in the CFWIT group that selected they are not majoring in technology, and female respondents in the Systems group that selected they are not majoring in technology. The group of male respondents that are not majoring in technology included: Male respondents who selected they are not majoring in technology that are registered in non pre-requisite MIS, CSC, and CIT courses at UNCW, and male respondents who selected they are not majoring in technology that are registered in pre-requisite MIS, CSC, and CIT courses at UNCW.

The highest response for female technology majors and male technology majors was “Myself” which ranged from 33%-56% for female respondents, and 61%-63% for male respondents. However, for women who selected they majored in technology that belonged to the group CFWIT, resulted in “Family” having the highest percentage of respondents at 50%. For women majoring in technology, the second highest response was “Family”, which ranged from 27% - 50%, and for men majoring in technology, the second highest response for those in non pre-requisite course was “Teachers” at 27%, and for those men in pre-requisite courses “Family” was the second highest answer at 23%. The results for both female and male respondents not majoring in technology was mixed with “None, I am not majoring in technology” as the highest

response for all respondents. In hindsight, the research could have been improved by not listing “None I did not majoring in technology” in order to better evaluate if any role models encouraged those who did not major in technology to major in the field.

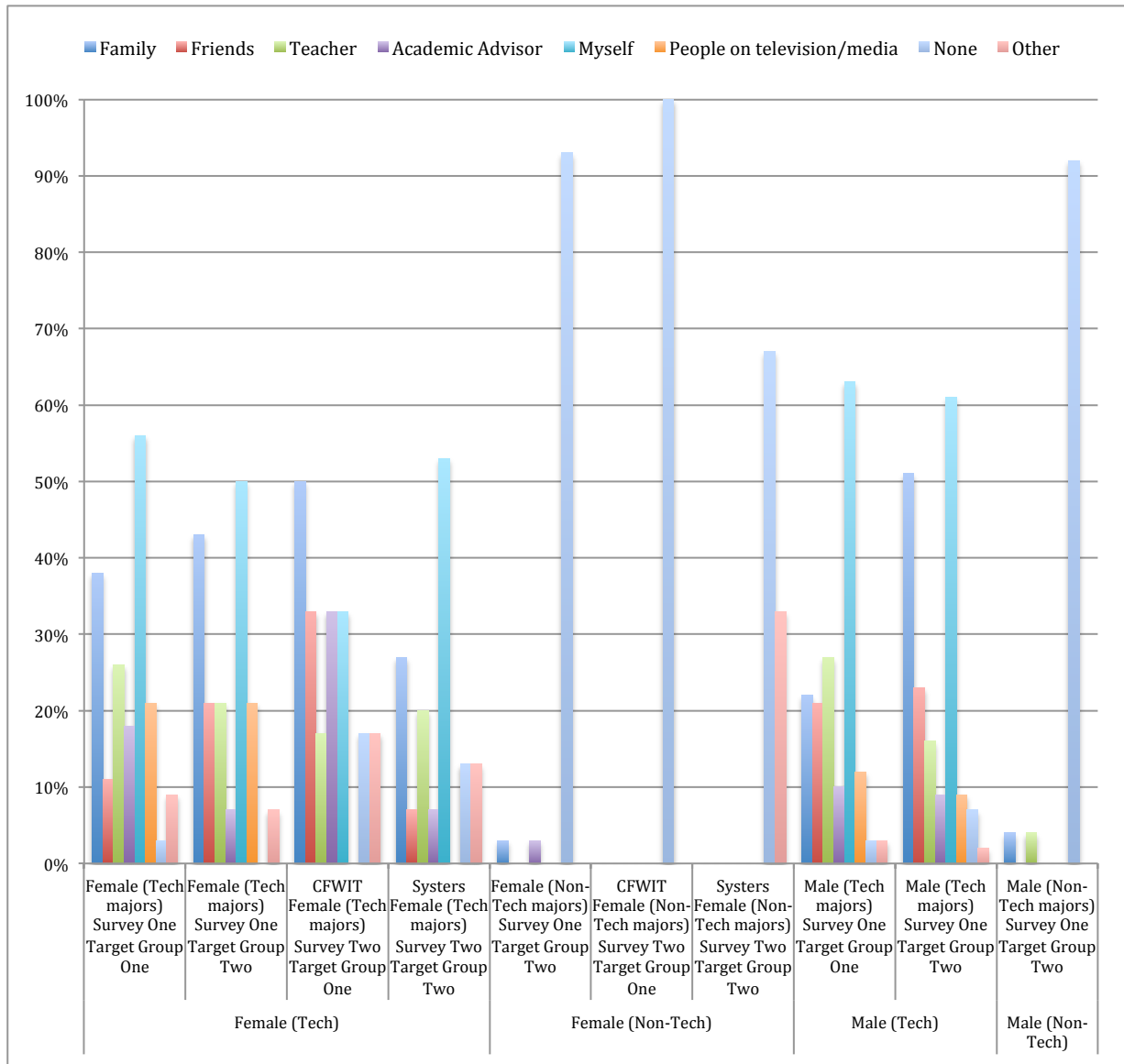


Figure 18: Responses to role models encouraging respondents to major in technology

Overall, results indicate that the respondent themselves and their family are two of the most important role models that encouraged both male and female respondents to major in technology. Participants were then asked why did they select their major. The survey provided

possible responses as well as an option for participants to add in other reasons, and participants could select more than one reason. Figure 19 shows an overview the reasons why all ten groups of participants selected their majors.

However, this question was asked primarily to address those who have decided to major/minor in technology. Both male and female participants who were concluded as majoring/minoring in technology for both surveys were included in this analysis. This analysis included six groups: group one and two in both target groups for survey one, and group one for both target groups for survey two, in order to find out what influences encouraged males vs. females to make the decision to major in technology.

Figure 20 shows the comparison of male to female reasons of why all six groups of participants who majored/minored in technology selected a technology major. Future hiring potential/salary, I wanted to learn more about technology, I encouraged myself, and my family encouraged me were in the top four responses (not in order) for each of the four female groups comprised of female respondents who are/were majoring/minoring in technology with the exception of “Other” being the top response for female respondents who were technology majors/minors in CFWIT sent survey two (Survey two, target group one). The three participants in the CFWIT group, who made up the 50% that answered “Other” as a motivator for majoring/minoring in technology, responded when asked to explain their selection with:

1. *UNCW academic advisor*
2. *I like computers, but didn't want to go into engineering*
3. *College professor*

In total, out of the female respondents that majored/minored in technology there were 21 responses in the category “Other”. The remaining 18 female technology major/minor responses

are recorded in Appendix G. For the male respondents, the top four responses included: Future hiring potential/salary, I encouraged myself, I wanted to learn more about technology, and I enjoyed computer courses in high school (not in order) (See Figure 20). However, for male respondents, I enjoyed computer courses in high school ranked above my family encouraged me when compared to female respondents who are technology majors/minors. In total, out of the male respondents that majored/minored in technology there were 14 responses that selected the category “Other”, and their responses are recorded in Appendix H. Based on the results, future-hiring potential/salary, wanting learn more about technology, family encouragement, encouragement from oneself, and computer courses in high school are motivating factors that may lead males and female to major in technology.

The choice of a student’s major in college is a very important decision that is influenced by others, their own interests, and their own motivations (George-Jackson, 2012). As stated in the literature review earlier, social encouragement includes positive reinforcement from family and peers, and is part of the explainable factors influencing a young woman’s decision to pursue a technology major (Google, 2014). Parental encouragement to go into the field of technology may be the most influential factor compared to others, such as one’s peers, teachers, and counselors (Ashcraft et al., 2013).

To see if there was a correlation between a particular family member’s encouragement and women deciding to major in technology, participants were asked to identify if anyone in their family encouraged them to major in Management Information Systems, Computer Science, or Computer Information Technology, and to mark all that apply. The answer choices available to participants included: “Mother”, “Father”, “Sister”, “Brother”, “Aunt”, “Uncle”, “None”, “N/A I did not choose to major in technology”, or “Other (Please specify)”.

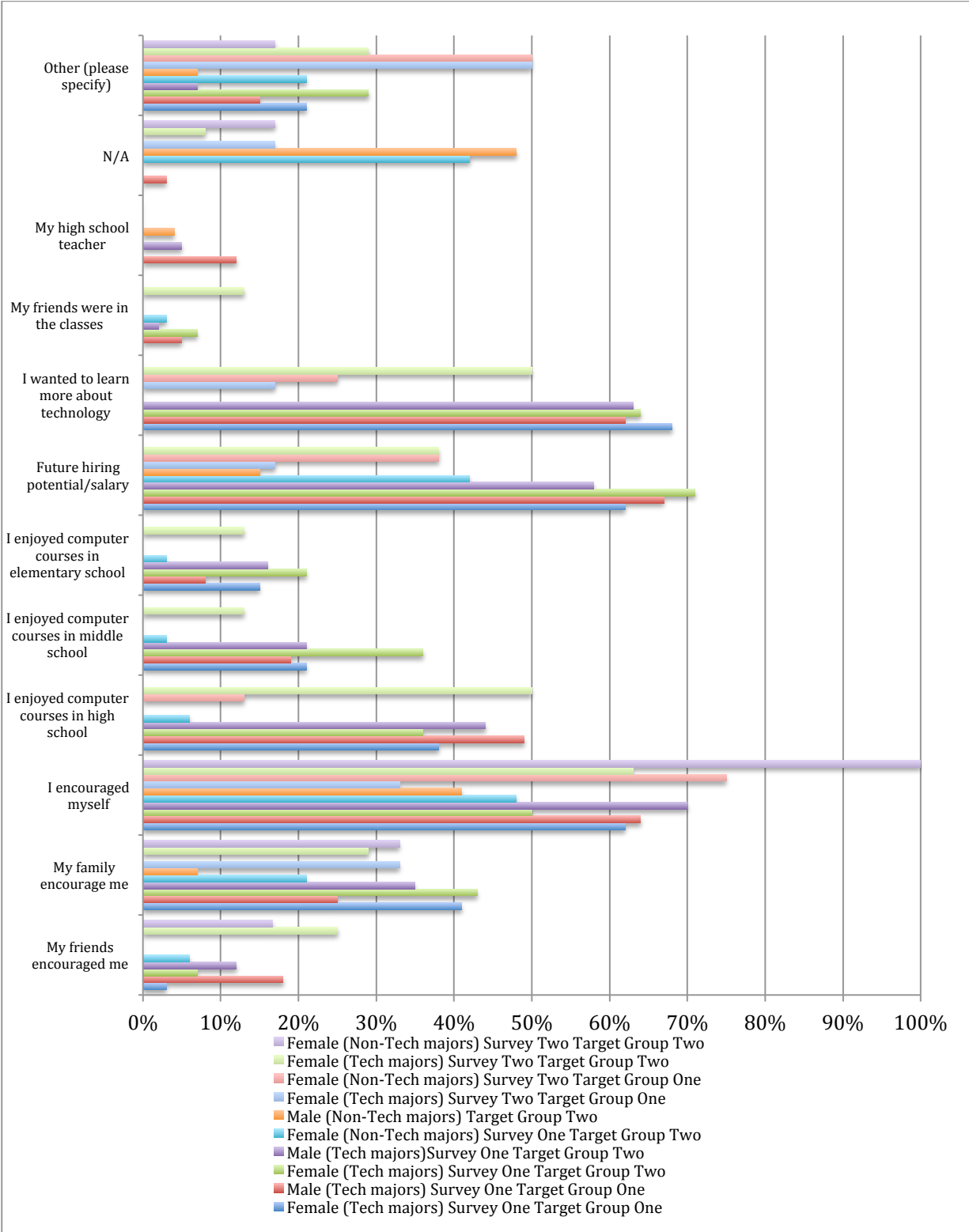


Figure 19: Overview of reasons for selecting major

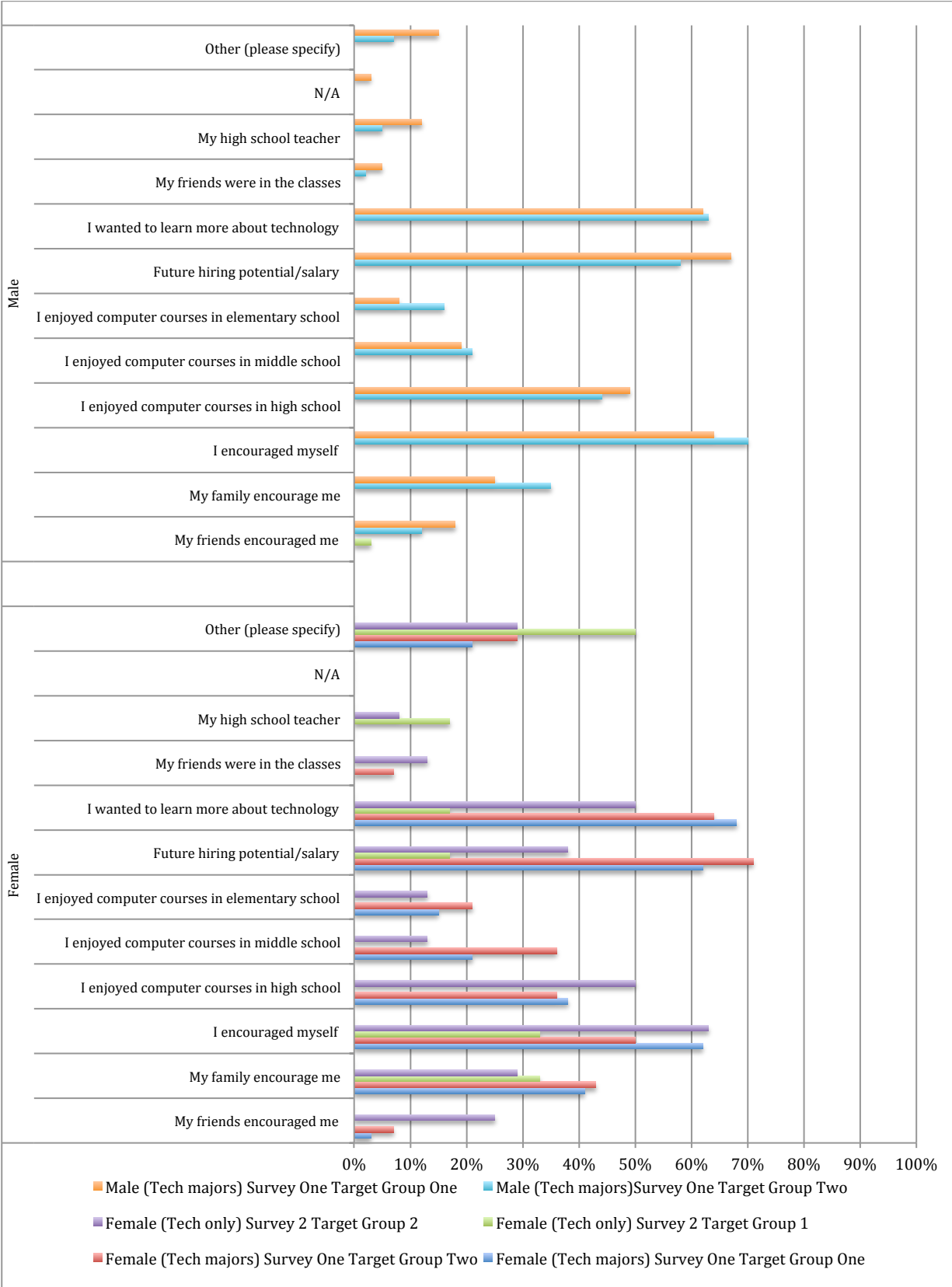


Figure 20: Comparison of reasons given for selecting technology major

Female and male responses that are majoring/minoring in technology at UNCW were compared to female and male responses that did not decide to major in technology (See Figure 21). A comparison between both groups in target group one and two is shown in Figure 21. “None” was the most popular response among male and female technology majors/minors except for female technology major respondents who were taking perquisite Computer Science, Management Information Systems, and Computer Information Technology courses at UNCW (Survey one- Target Group Two, Group 1) who listed “None” as 50% and “Mother” at 50% (see Figure 21).

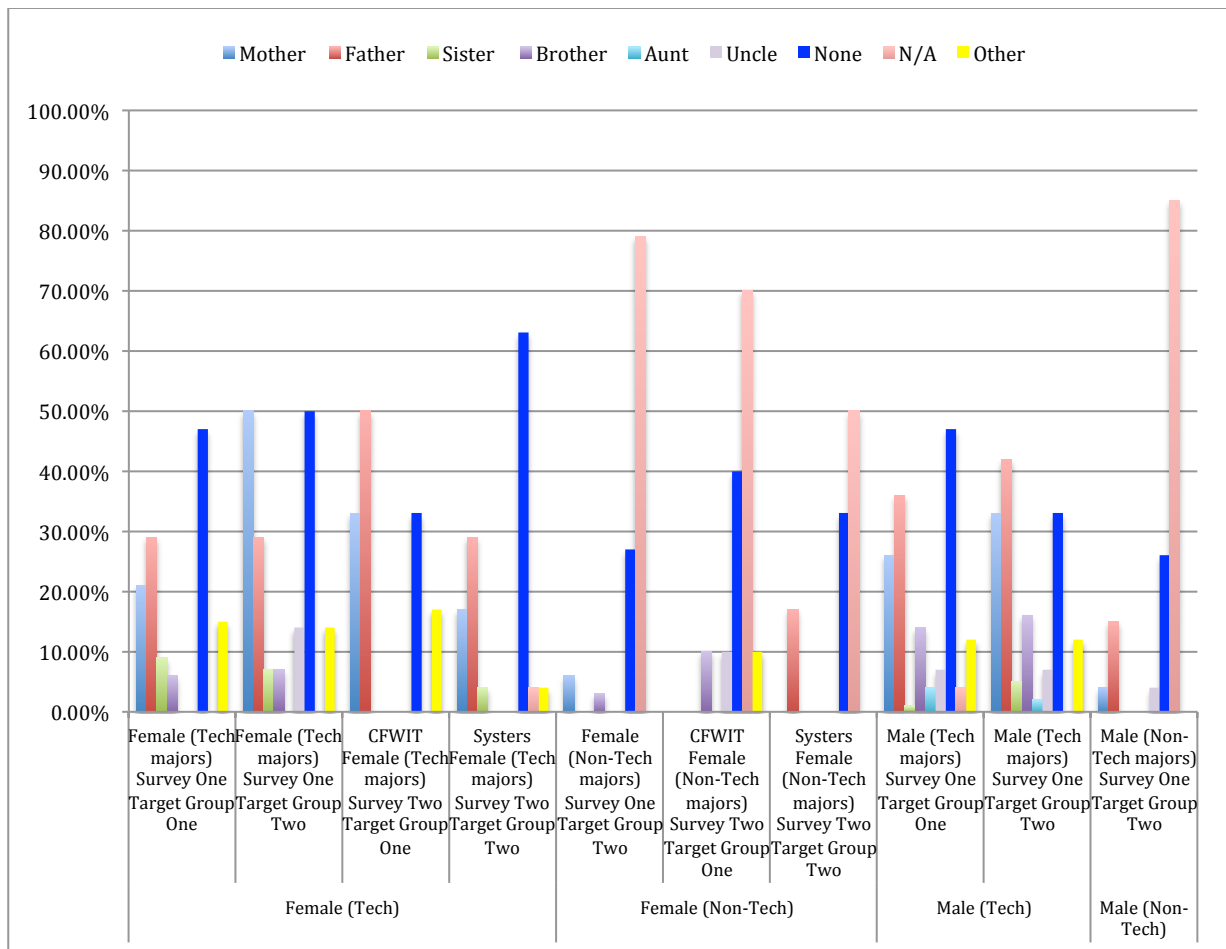


Figure 21: Responses to family member’s encouragement to major in technology

A comparison between the target groups categorized into both male and female is shown in Figure 22. The results show the influence of individual family members excluding “None” and “N/A” for male technology majors who filled out survey one in either pre-requisite or non-prerequisite Computer Science, Management Information System, or Computer Information Technology courses at UNCW, “Father” held the highest number of responses for both, and for female technology majors in target group one “Father” held the highest number of responses while “Mother” held the highest number of responses for target group two (see Figure 22).

“N/A” was the most popular response for both male and female respondents who were not majoring/minoring in technology. The second most popular response among both male and female respondents not majoring/minoring in technology was “None” (see Figure 22). However, if you look at the results among the influence of individual family members excluding “None” and “N/A” for male non-technology majors “Father” held the highest number of responses at 15%, and for female non-technology majors in target group one “Mother” held the highest number of responses at 6%. Based on the results, it is inconclusive as to whether one specific family member’s encouragement helps women to major in technology, however both mother, and father had the highest response rates when “None”, “N/A”, and “Other” were excluded leading to the conclusion that either the encouragement of a woman’s mother or father could help lead them to major in technology.

According to the literature review, teachers may also be an influence on those deciding to major in technology. Teachers, schools, and the media are significant sources of influence on young students’ aspirations and are an influence on one’s decision to major in technology (Appianing & Van Eck, 2015). Participants were also asked to “Identify if any of their teachers before college encouraged them to major in MIS, CSC, or MIS, and to mark all that apply” with

answer choices including: “Elementary School Teacher”, “Middle School Teacher”, “High School Teacher”, “None”, “N/A did not major in technology”, “Other”. When compared, most female respondents answered “None”. Figure 23 compares four different groups: Female respondents that chose to major in technology, female respondents who did not choose to major in technology, male respondents that chose to major in technology, and male respondents who did not choose to major in technology.

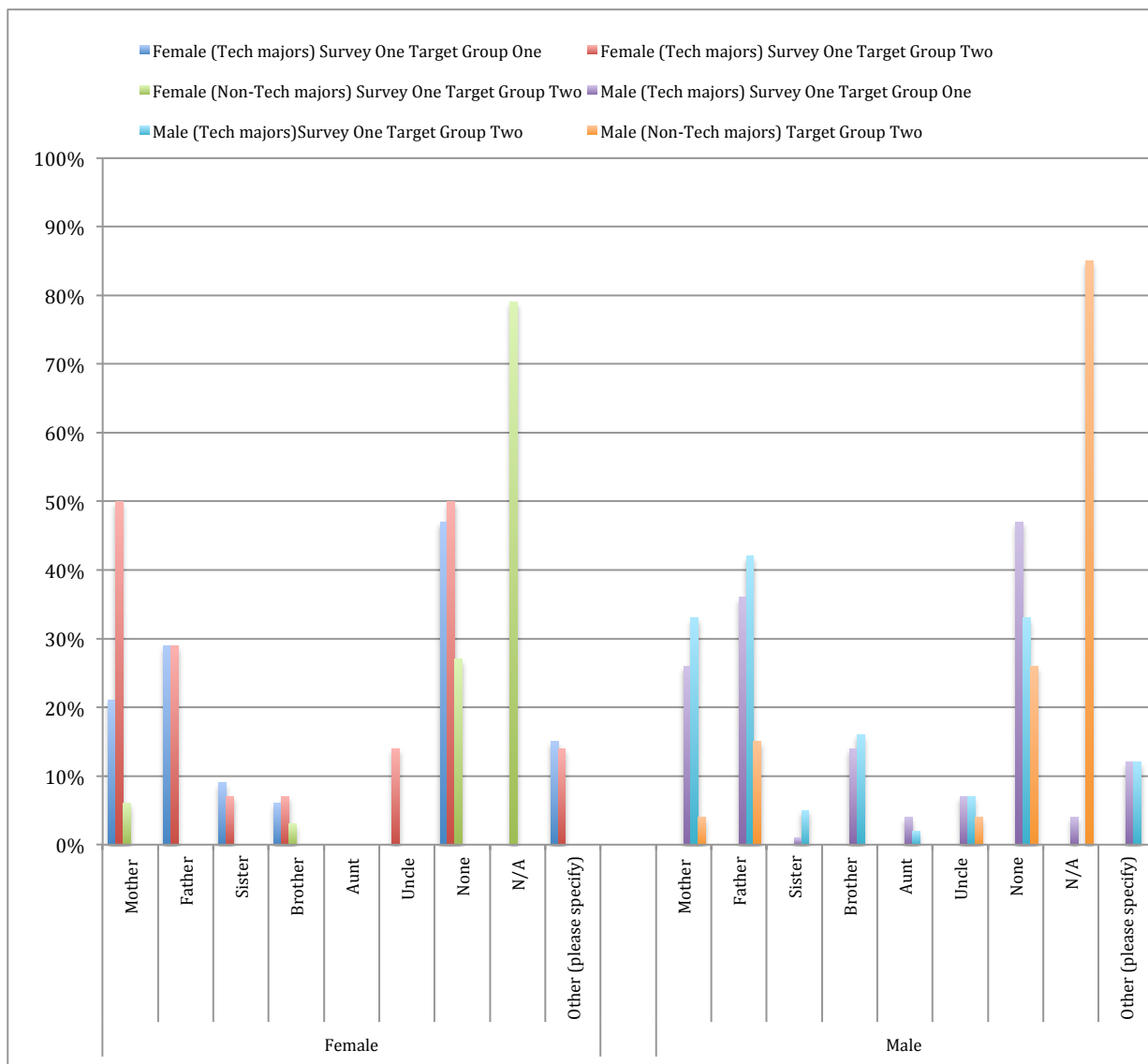


Figure 22: Male/Female responses to family encouragement to major in technology

For each group within females and males that chose to major in technology, the percentage of those female and male respondents that selected “None” ranged from 70-80% for female respondents and from 25-50% for male respondents. High school teachers held the second highest number of responses for both male and female respondents that had chose technology as their major, but the percentages were very low with female response percentages ranging from 0%-29% and male responses ranging from 0-25%. For both male and female respondents who did not choose to major in technology most respondents selected “N/A I did not choose to major in technology”, but the second answer with the highest responses was “None”. Both male and female respondents who are majoring/majored in technology did have higher response rates for high school teachers when compared to male and female respondents who did not major in technology. Based on the results, it cannot be concluded that teachers play an important role in encouraging women to major in technology.

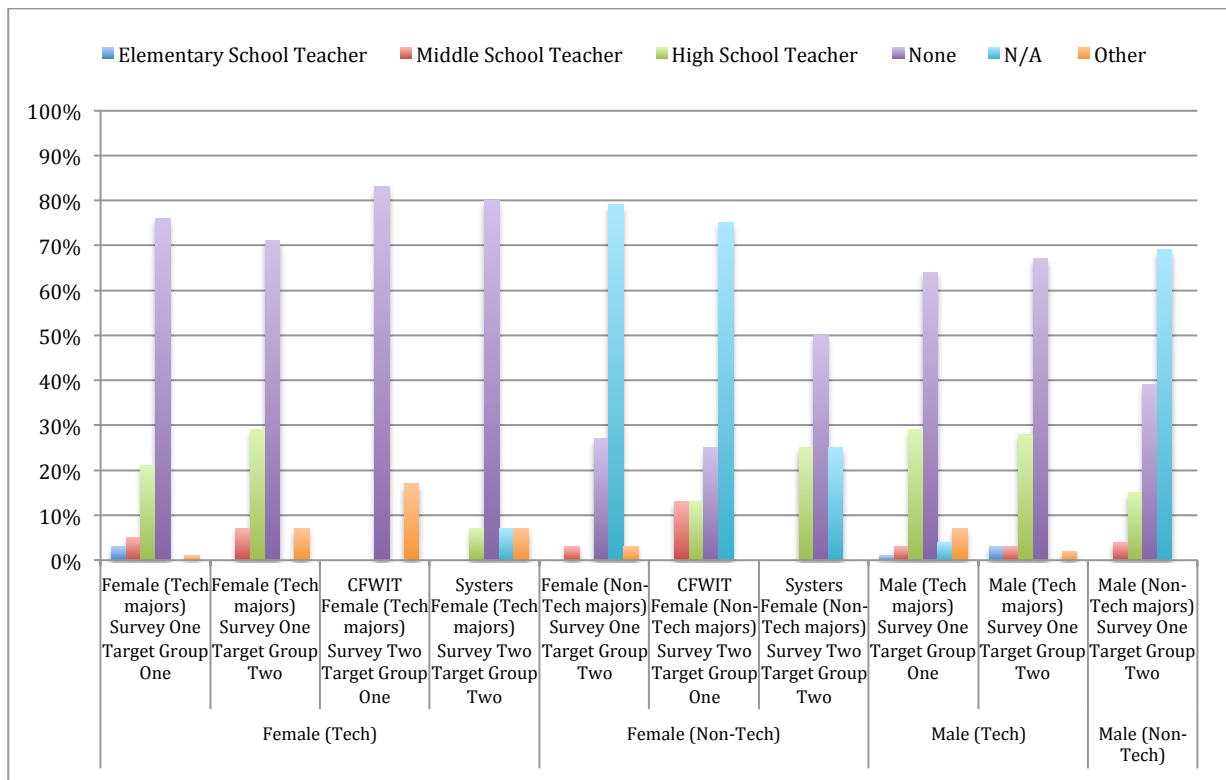


Figure 23: Encouragement of teachers

Participants were asked if they switched their major to Computer Science, Computer Information Technology, or Management Information Systems in order to see if most women who end up graduating majoring in technology are entering college having already chosen to major in technology or are they switching from another major? This question is used to find out information behind which majors students are switching from into these technical majors and to see if there is a reoccurring trend.

Female students responses who took survey one that have already chosen to major/minor in technology at UNCW who took survey one (Group one of both target group one and two) were compared to male responses of those male students who took survey one and have already chosen to major/minor in technology at UNCW is show in Figure 24. 47% of those female student responses who are majoring/minoring in technology in non-prerequisite CSC, CIT, and MIS courses at UNCW who took survey one responded with “No” meaning they originally entered UNCW as a Computer Science, Computer Information Technology, or Management Information Systems major while 53% or 18 responded with “Yes” meaning they switched to a technology major. However, 65% of females that are majoring/minoring in technology in pre-requisite CSC, CIT, and MIT courses at UNCW responded with “No” that they did not switch to technology as their major while 36% (5 respondents) of those females who responded stated “Yes” meaning they did switch their major to CSC, CIT, MIT.

For female’s majoring/minoring in technology at UNCW, there were multiple majors that had the same amount of responses when asked what major they switched from in order to major in CSC, CIT, or MIS at UNCW. These majors included film studies, accounting, education, chemical engineering, chemistry, and English each had two responses and were the most popular.

47% of those female student responses who are majoring/minoring in technology in non-prerequisite CSC, CIT, and MIS courses at UNCW who took survey one responded with “No” meaning they originally entered UNCW as a Computer Science, Computer Information Technology, or Management Information Systems major while 53% or 39 responded with “Yes” meaning they switched to a technology major. It is surprising to note that these percentages align with the female results in that target group. However, 79% of males that are majoring/minoring in technology in pre-requisite CSC, CIT, and MIS courses at UNCW responded with “No” that they did not switch to technology as their major while 21% (9 respondents) of those males who responded stated “Yes” meaning they did switch their major to CSC, CIT, MIT. For males majoring/minoring in technology at UNCW, the major most switched from was business administration to CSC, CIT, or MIS, and the second most popular was biology. Based on the results, there is not a specific major that female respondents are switching from in order to major in technology, however many of the majors respondents switched from resided in business, or science, which could be a potential area when recruiting more women into the major.

As previously discussed in the literature review, marketing plays a huge role in influencing and changing society’s point of view (Rashotte, 2007). Back in the 1980’s marketing efforts for computers were directed more towards boys, and girls were pushed aside (When Women Stopped Coding, 2014). Marketing technology advertisements, and computers towards mostly men could be attributed to the perspective of computing now being viewed as predominately for men (When Women Stopped Coding, 2014). Research indicates that underrepresentation of women in STEM fields, including technology, is related to attitude rather than aptitude (Appianing & Van Eck, 2015). It has long been established that women perceive technology careers and majors as boring, male dominated, geeky, and nerdy, and one factor that

has been attributed to the decline of women in technology has to do with the perception that the profession is filled by stereotypical “nerds,” leading some women to choose what they perceive to be more people-oriented majors or occupations” (Appianing & Van Eck, 2015).

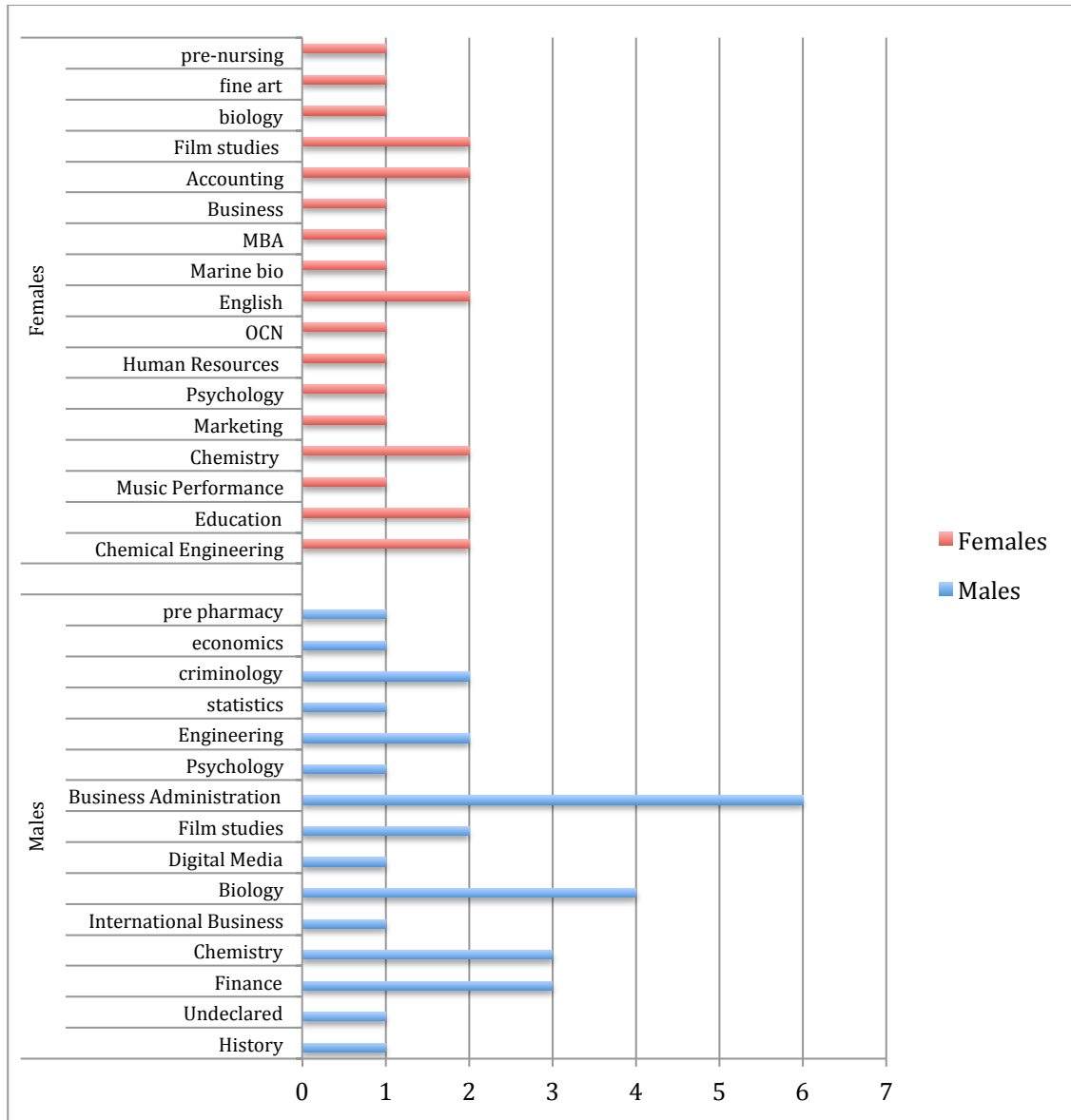


Figure 24: Previous majors before switching to technology

As previously discussed in the literature review, marketing plays a huge role in influencing and changing society’s point of view (Rashotte, 2007). Back in the 1980’s marketing efforts for computers were directed more towards boys, and girls were pushed aside (When

Women Stopped Coding, 2014). Marketing technology advertisements, and computers towards mostly men could be attributed to the perspective of computing now being viewed as predominately for men (When Women Stopped Coding, 2014). Research indicates that underrepresentation of women in STEM fields, including technology, is related to attitude rather than aptitude (Appianing & Van Eck, 2015). It has long been established that women perceive technology careers and majors as boring, male dominated, geeky, and nerdy, and one factor that has been attributed to the decline of women in technology has to do with the perception that the profession is filled by stereotypical “nerds,” leading some women to choose what they perceive to be more people-oriented majors or occupations” (Appianing & Van Eck, 2015).

A study conducted by Google in 2014, surveyed 1000 women and 600 men who were academically and geographically diverse, found the ability to participate in technology courses and activities accounted for 27.5% of the explainable factors influencing the decision to pursue a degree related to technology (Google, 2014). The negative potential associated with flawed or incomplete career perceptions is an incorrect perception of the discipline actively dissuades young women from choosing to major in it (Google, 2014).

To assess and compare the perception of the technology major among males and females, participants were asked to “List three adjectives that come to mind when thinking about technology majors in general.” Each target group for both surveys was analyzed except for survey two those respondents who identified their gender as female and majored/minored in technology were grouped together for both CFWIT, and Systems. Those respondents who identified their gender as female and did not major/minor in technology were also grouped together for both CFWIT and Systems. In total, there were 8 different groups whose responses were analyzed (See Figure 25 and 26).

Figure 25 and 26 shows the comparison between the responses of those female respondents who are majoring/minoring in technology for both surveys compared to the responses of those female responses who are not majoring/minoring in technology. For all female respondents who majored/majoring in technology the most common adjective listed to describe technology majors was “smart/intelligent”. It is surprising to note that the top adjective listed by all respondents was “smart/intelligent”, which was listed overall 87 times. The second highest adjective was “nerdy”, which was listed overall 25 times. However, “male-dominated”, or “men” was only referenced a combined 7 times.

When responses for those who identified themselves as female and are majoring/majored in technology were compared to those female respondent who were not majoring in technology, the adjective that had the highest responses for those females majoring in technology was “smart/intelligent”, which was listed by 19 different female respondents who are majoring/majored in technology. The second most common answer was “interesting”, which was listed by 12 different female respondents majoring/majored in technology, and the third most common answer was “nerdy”, which was listed by ten different female technology respondents. For female respondents that were not majoring/majored in technology the most common adjective listed was also “smart”, which was listed a combined 25 times between both the combined female respondents who did not major in technology that belonged to the group Systems and CFWIT, and those female respondents who did not major in technology and were registered in pre requisite CSC, CIT, or MIS courses at UNCW.

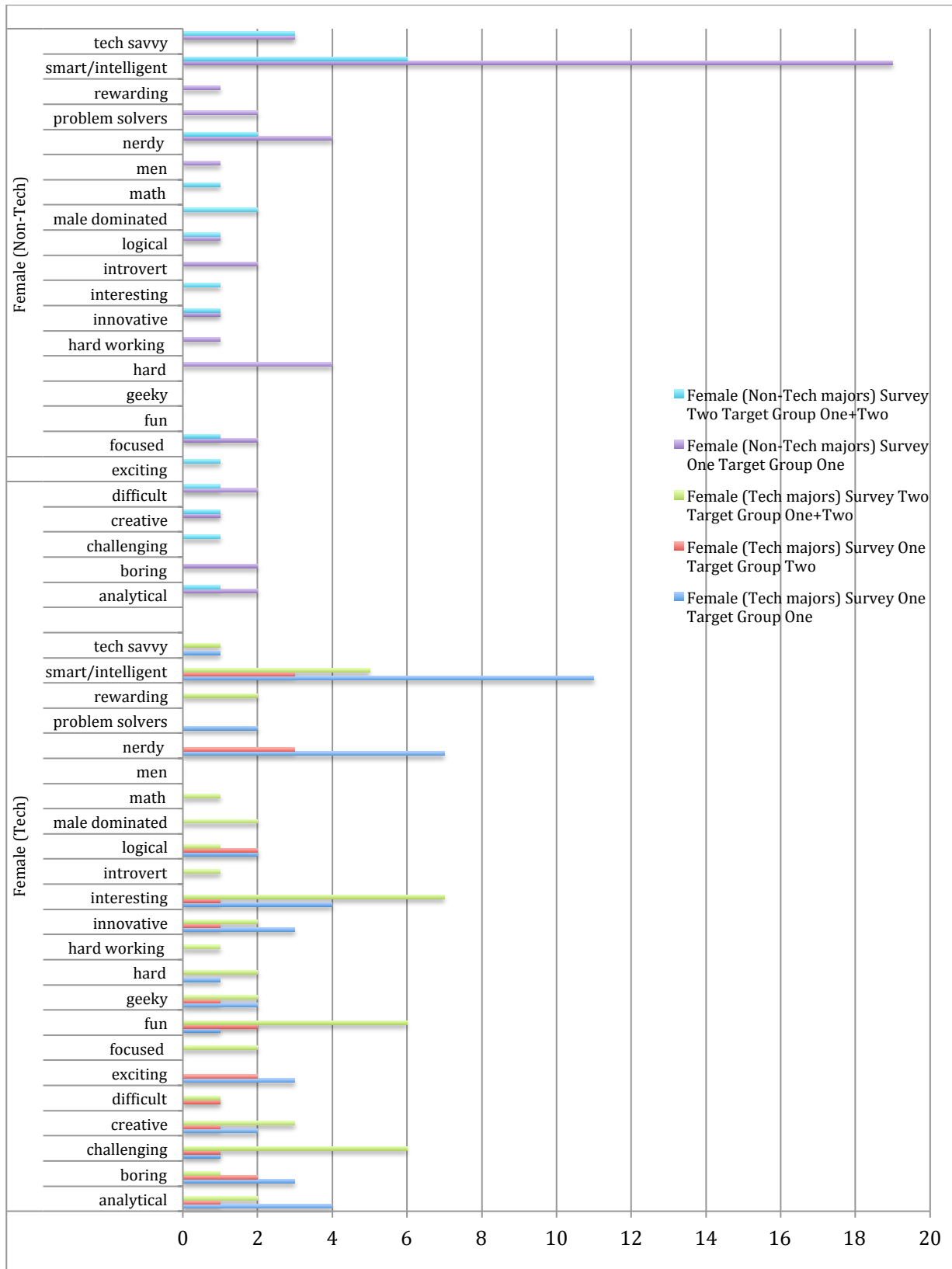


Figure 25: Adjectives used by female respondents to describe technology majors

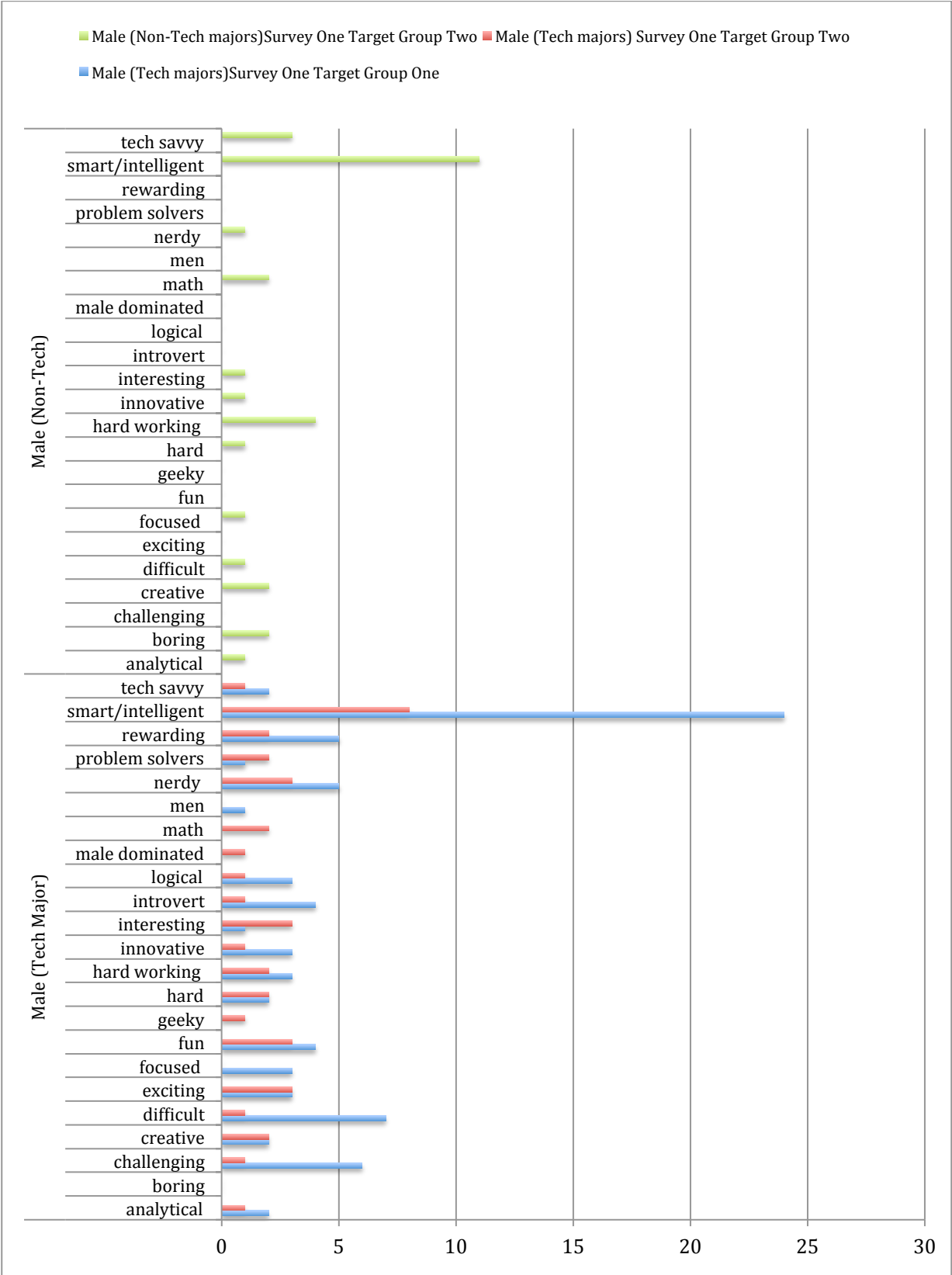


Figure 26: Adjectives used by male respondents to describe technology majors

The second most common adjective listed for female non-technology majors was “nerdy”, which was listed 6 times. It is important to note that adjectives with a positive connotation, such as “interesting”, and “creative” were not listed as often as they were among female technology majors. For male respondents that were majoring/majored in technology, the most common adjective listed was also “smart/intelligent”, which was listed by 32 different male respondents who are majoring/majored in technology. The second most common answer was “nerdy”, which was listed by eight different male technology respondents.

For male respondents that were not majoring/majored in technology, the most common adjective listed was also “smart/intelligent”, which was listed a combined 11 times. The second and third most common adjective listed for male non-technology majors was “hard worker”, which was listed 4 times and “tech savvy”, which was listed 3 times. It is important to note that only one respondent out of the male respondents who are not majoring in technology listed “nerdy”. The results have shown that most respondents surveyed believed you have to be smart in order to major in technology. However, this may be a deterring factor as to why women are not choosing to pursue this major. The perception that students must be academically advanced to learn it may discourage certain types of students from participating, especially if parents, teachers and school administrators reinforce this belief (Google, 2014). Based on the results, both male and female student’s view technology majors are “smart/intelligent”, and “nerdy”.

Based on the literature review, there is a lack of aspirational female role models in the media, and concluded five main observations: female characters are sidelined, women are stereotyped and sexualized, a clear employment imbalance exists, women on television come up against a glass ceiling, and there are not enough female characters working in STEM fields (Smith, Choueiti, Prescott & Pieper, 2012). One of the influences that have been cited as

contributing to the educational gender gap in technology is the lack of female role models in the technology field (Pearl, Pollack, Riskin, Thomas, Wolf & Wu, 1990). “The U.S. Department of Education (2007) says that exposing girls to female role models who are successful in math and science can counteract “stereotype threat”—negative stereotypes that girls may develop about themselves” (Lyon & Jafri, 2010).

Continuing to assess the perception of technology and the impact of the media on women deciding to major in technology, participants were asked to “List two women in technology that appear on television/media? (If you do not know write N/A)”, and then asked to “List two men in technology that appear on television/media?” (If you do not know write N/A). These questions were asked in order to assess the influence of media on women deciding to major in technology and if there is a lack of role models for women in technology. Figure 27 and 28 shows the percentages for each group within each target group that listed “N/A” and was not able to list two women technology, and two men in technology who appeared on television/media. It is important to know that in every group the percentage of those who could list two men in technology far exceeded those that could list two women. The group with the highest percentage that was able to identify two women in technology belonged to those who belonged to the group Systems, and identified themselves as a female who did not major in technology. Only 11% of those in the group comprised of females in pre requisite CSC, MIS, and CIT courses at UNCW, but are not majoring in technology were able to identify two women in technology, but 25% could identify two men. Bill gates was the most popular name listed for both male and female respondents, followed by Steve Jobs and Mark Zuckerberg.

Carly Fiorina was the top listed women in technology for men respondents while Sheryl Sanberg and Penelope Garcia were the top listed women in technology for female respondents.

Since a high percentage of participants could not identify women in technology, but such a high percentage of participants could identify men in technology on television or in the media gives creditability to the assumption that women in technology are rarely portrayed in the media or on television.



Figure 27: Response percentages of listed women in technology

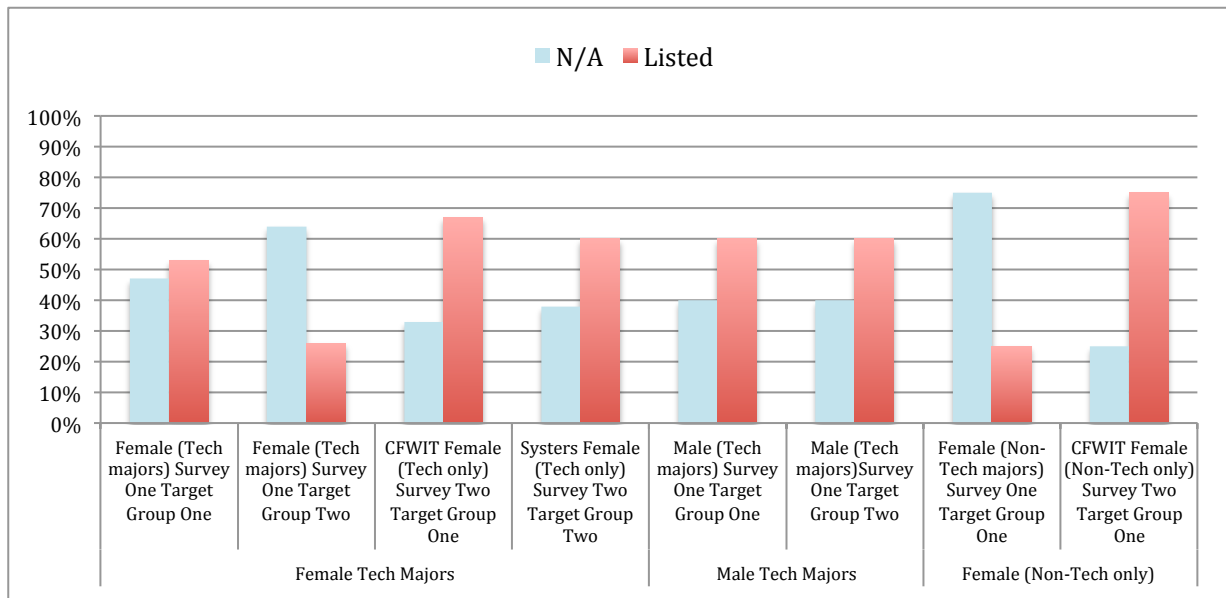


Figure 28: Response percentages of listed men in technology

Based on the literature review, the lack of opportunity to take computer courses before college may be deterring women from majoring in technology. Exposure to computer courses before college can help familiarize women with technology, which can generate interest and curiosity while establishing a sense of competency” (Google, 2014). Currently, many high schools do not offer the opportunity for students to take certain computer courses. In 2014, only 3,751 schools reported students taking the AP Computer Science exam (College Board, 2014). The lack of opportunity to take computer courses before entering college may be a contributing factor as to why many students as well as women are not pursuing technical majors (Google, 2014). A study conducted by Gallop showed, in general, those who had the opportunity to take the Advanced Placement (AP) Computer Science exam were 46% more likely to indicate interest in a Computer Science major (Google, 2014). This is particularly true for women who are 38% more likely to pursue a Computer Science degree after having taken AP Computer Science in high school (Google, 2014).

Participants were asked to check all that apply for the following statements “My high school offered AP computer science and I took the course in high school”, “My high school offered AP computer science and I did not take the course in high school”, “My high school did not offer AP computer science and I did not take the course in high school”, and “If my high school did offer AP computer science I would have taken the course”. According to figure 29, only 5.9% of female respondents who are majoring/minoring in technology at UNCW who were registered in non-pre-requisite CSC, CIT, or MIS courses stated their high school offered AP computer science and took the course and 13.3% took the course that were females who majored in technology belonging to the group Systems. It is important to note that females who were not majoring/minoring in technology in pre-requisite courses at UNCW had an unexpected high

percentage (9.1%) of those whose high school offered AP computer science and took the course. Most female respondents who majored in technology responded that their high school did not offer AP computer science and I did not take the course in high school, which shows the limited opportunity of advanced computer courses to high school students. Based on the results, a high percentage of women and men selecting “If my high school did offer AP computer science I would have taken the course” indicates the need for more AP computer science opportunities available to both male and female students, which may result in more women and men majoring in technology. Based on the literature review, exposure to technology through taking computer classes before college in high school, middle school, or elementary school may help increase women’s confidence in the field, and encourage women to major in technology. “The stage in life by which children are exposed to computers can influence their attitudes, confidence and interests toward the technology fields” (Appianing & Van Eck, 2015).

According to the study conducted by Gallop exposure to computer technology reported higher levels of confidence in their ability to learn computer science, and young women who had the opportunities to engage in Computer Science coursework were more likely to consider a Computer Science degree than those without opportunities (Google, 2015). Figure 30 is divided into UNCW female respondents who majored in technology, UNCW female respondents who did not major or choose to major in technology, UNCW male respondents who majored in technology, and UNCW male respondents who did not major or choose to major in technology. Participants were asked to check if they took any computer courses while in elementary school, middle school, or high school or none? (See Figure 30) Female respondents in pre-requisite UNCW CSC, CIT, or MIS courses had a high percentage of responses for taking computer courses in both elementary and middle school. The group also had a low percentage of responses

that was much lower than female UNCW respondents in pre-requisite technology course that did not decide to major in technology for “none”, which help validate that exposure to computer courses helps encourage women to major in technology.

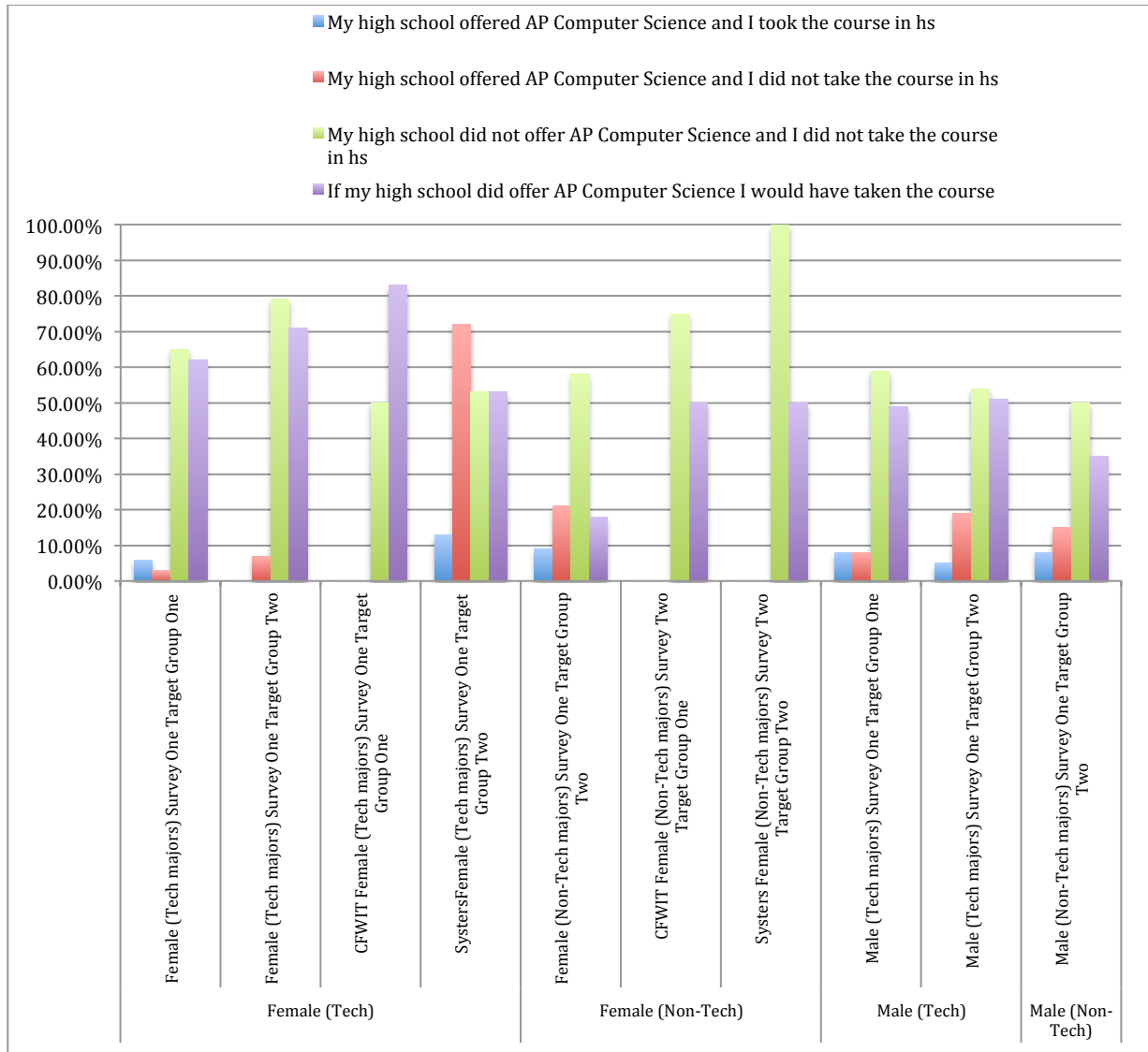


Figure 29: Responses to AP Computer Science

However, among female respondents at UNCW that did not major in technology, there were high percentages of responses for both taking computer courses in middle school and high school. It is important to note that female respondents that majored in technology at UNCW in non pre-requisite technology courses had a high percentage listed as “none” meaning they never

took a computer course before college, which disproves the thought that taking computer courses before college helps encourage women to major in technology. Overall based on the results, more exposure to computer courses did not positively improve women's decision to major in technology as show by the high percentages of computer courses taken before college for those female respondents who did not major in technology at UNCW.

In addition to asking participants about what computer courses they took prior to college, participants were also asked if they took any computer literacy courses in elementary, middle, or high school, or none at all in order to further assess female exposure to technology. Figure 31 shows the results of the responses grouped into female respondents who majored/minored in technology, female respondents who did not major/minor in technology, male respondents who majored/minored in technology, and male respondents who did not major/minor in technology. The results were not expected because female respondents who are not majoring in technology had higher percentages of schools offering computer literacy courses in elementary, middle and high school when compared to female respondents who majored in technology at UNCW. Overall, more exposure to computer literacy courses does not positively improve women's decision to major in technology as shown by the high percentages of computer courses taken before college for those female respondents who did not major in technology at UNCW.

According to the literature review, lacking prior programming experience may be a deterring factor as to why women are not choosing to major in technology. Both male and female students in non pre-requisite and pre-requisite MIS, CS, and CIT courses at UNCW were assessed on whether they had prior programming experience before entering college. "On average, undergraduate women who enter Computer Science at many universities have less prior computing and programming experience than their male peers" (Margolis & Fisher, 2000). This

pattern is also shown among both male and female students in non pre-requisite and pre-requisite MIS, CS, and CIT courses at UNCW. Figure 32 reflects the responses categorized into four groups: Female respondents that are majoring in technology, female respondents that are not majoring in technology, male respondents that are majoring in technology, and male respondents that are not majoring in technology.

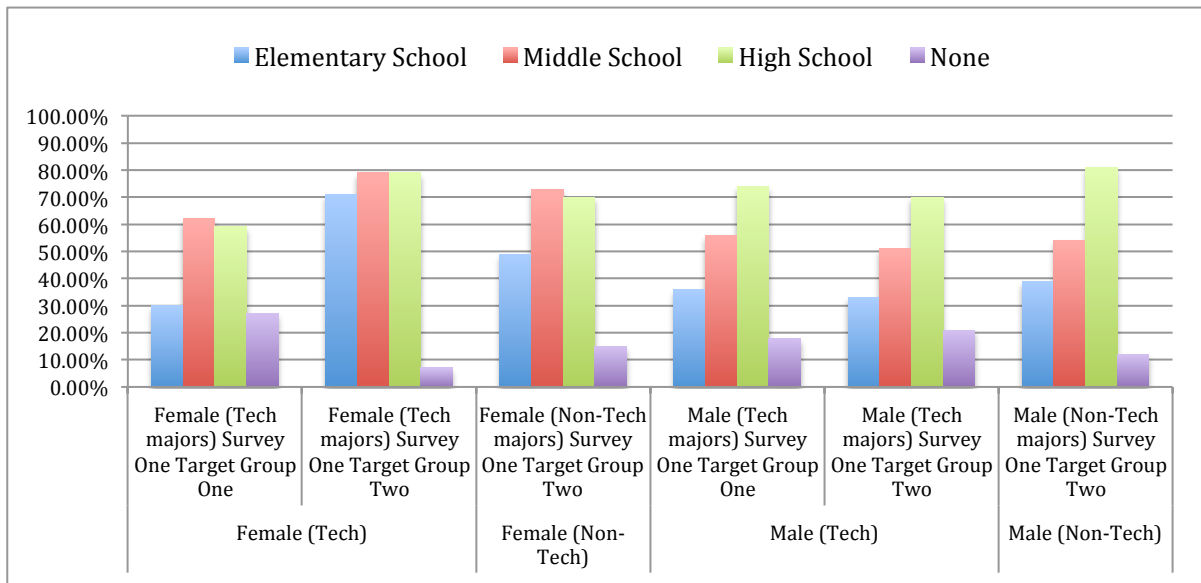


Figure 30: Computer courses taken by respondents before college

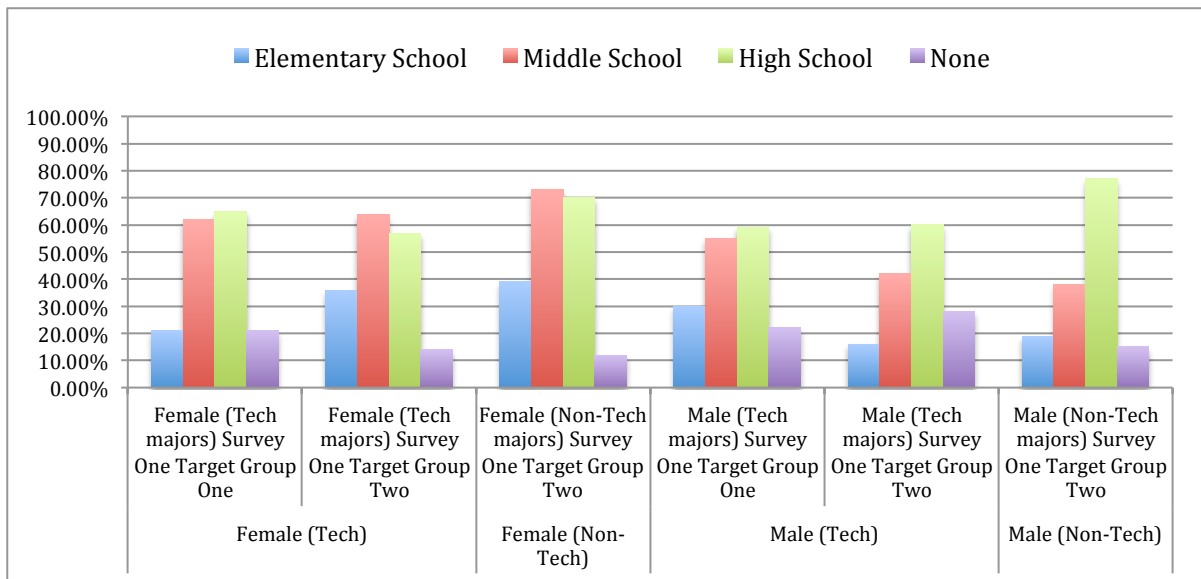


Figure 31: Computer literacy courses taken by respondents before college

For both female groups, a high percentage of women selected that they did not have prior programming experience ranging from 71%- 100% (See Figure 32). It is important to note that female respondents who were not majoring in technology had a 100% response rate stating that they did not have prior programming experience before entering college. Only a small percentage selected they did have prior programming experience before college ranging from 0%-29%. However, the results of those who had prior programming experience before college among the male respondents was much higher. There were still more men coming to college without prior programming experience ranging from 56%-73%, however, there was a higher percentage of men enter with programming experience when compared to their female counterpart ranging from 27%-44%. It was surprising to note that among the male respondents that did not choose to major in technology, 27% reported to having prior programming experience while female respondents not majoring in technology, 0% reported having prior programming experience.

When participants were asked what programming languages they had experience with before enter college, the most popular language for men in technology was HTML, followed by JavaScript, Java, CSS and C++. However, the most popular programming language for women in technology since all women who were not majoring in technology did not have programming experience was HTML. Based on the results, two conclusions can be inferred: the low percentage of women entering college with programming experience gives credibility to the assumption that men enter college with more programming experience, which often encourages men to major in technology more often than women, and most students with programming before entering college are exposed to more web-based programming languages like HTML.

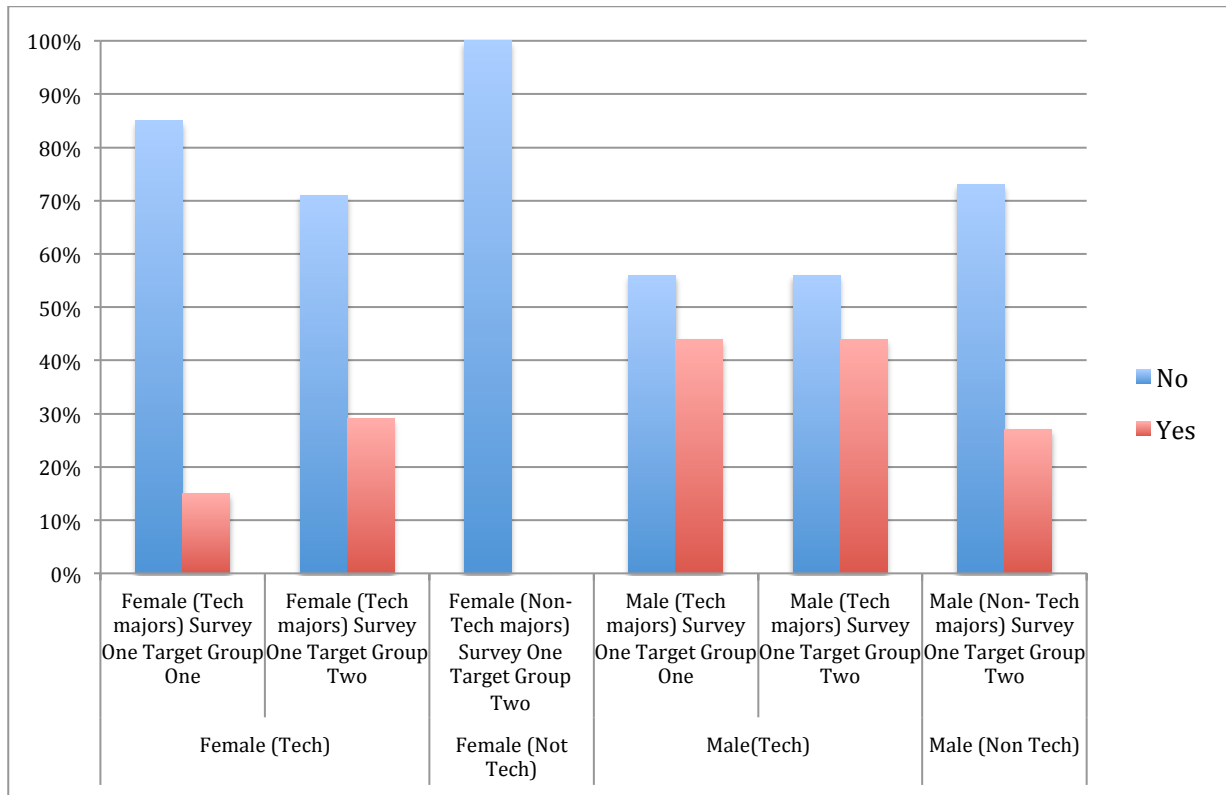


Figure 32: Percent of respondents that had previous programming experience

Lacking programming experience before entering college can affect women’s confidence in computer courses. Compared to males, females often lack the prerequisite computing experience relevant for college technology academic programs, and as a result of this, they often lack confidence and tend to give up on technology academic programs at higher rates than their male counterparts (Appianing & Van Eck, 2015). "Even among women and men who have similar grades, women in computer-related majors are less confident than their male peers of their ability to succeed in their major” (Hill, Corbett & Rose, 2010).

Students in both pre- requisite and major specific CSC, CIT, and MIS courses at UNCW were asked how confident they were in their programming abilities in order to assess if women in computer-related majors are less confident than their male peers shown in Figure 33. Male respondents majoring in technology in major specific courses showed a higher percentage of

responses than their female peers in their computer programming abilities. 62% of male respondents stated they were confident in their programming abilities while only 41% of female respondents were confident in their abilities. It is also important to note that female respondents not majoring in technology showed 67% selecting that they were “Not Confident” in their programming abilities while only 47% selected they were “Not Confident”. Based on these results, it is shown that men majoring in technology are more confident in their programming abilities when compared to their female peers, which could be attributed to men having more programming experience entering college.

Participants were also assessed on their interest in computers/technology prior to coming to college in order to examine if interest in computers before college influences a women’s decision in major in technology, and if there is a correlation between confidence in programming skills and interest in computers. As stated in the literature review, female students in technology with less experience felt vulnerable in unfamiliar territory, and confidence issues among women may lead to fewer women entering the major because as confidence drops, so does interest (Margolis & Fisher, 2002). Participants in both major specific and pre-requisite MIS, CSC, and CIT courses at UNCW were asked “How interested in computers and technology were you before attending college?” and their responses are shown in figure 34. As shown in the previous figure, male respondents who are majoring in technology showed a higher level of confidence in their programming skills (67%) compared to female respondents majoring in technology, which showed only 41%.

Male respondents majoring in technology also had higher percentages at 59% of being “Extremely Interested” in computers/technology before attending college while female participants majoring in technology showed only 21% being “Extremely Interested”. It is

important to note that male respondents not majoring in technology also had higher percentages at 15% of being “Extremely Interested” in computers/technology before attending college while female participants not majoring in technology showed only 6% being “Extremely Interested” in computers/technology before attending college, as well as the only group to select “Extremely Not Interested” at 6%. Reflecting back on the previous figure, male respondents not majoring in technology also had a higher confidence level of 15% selecting “Confident” in their programming abilities while only 6% of female respondents not majoring in technology selected “Confident”. Based on the results, it is possible there is a correlation between confidence in programming abilities and interest in computers/technology prior to college affecting women’s decision to major in technology.

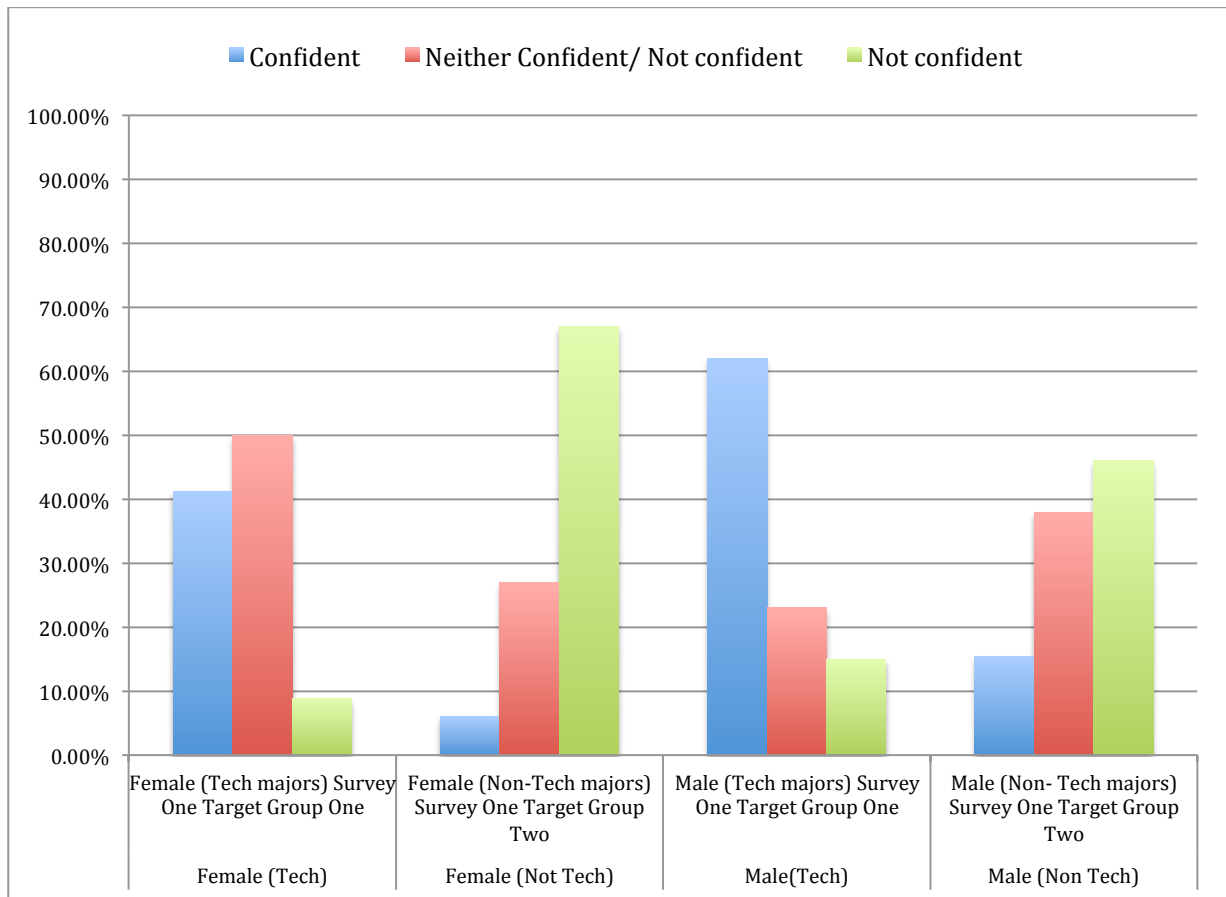


Figure 33: Confidence levels in programming abilities for both genders

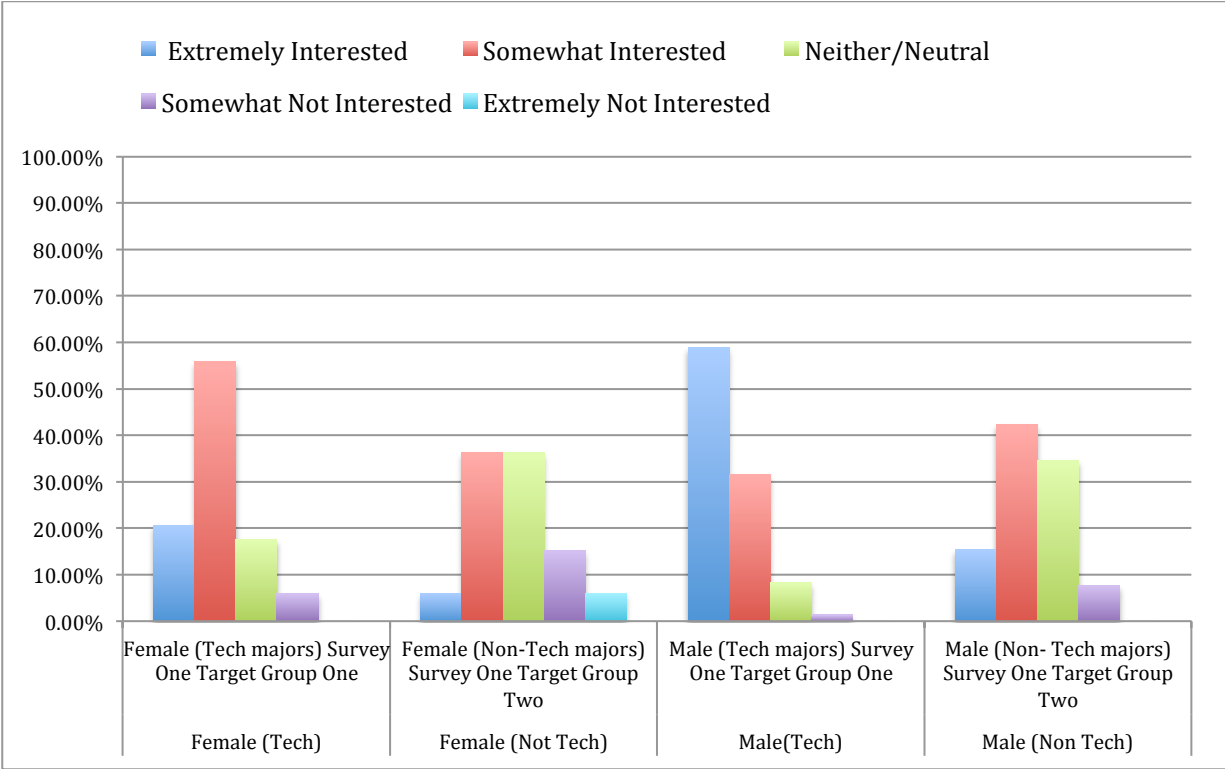


Figure 34: Interest in computers before college

It has long been established that women perceive technology as being male dominated (Appianing & Van Eck, 2015). Girls, college students, and parents perceive that STEM-related fields are male domains, for example, Archer interviewed the parents of young students about their views on science-related careers, and half of the parents considered science careers as male-dominated areas (Appianing & Van Eck, 2015). Considering the influence that parents have on career aspirations and choices perhaps are what lead girls to describe STEM fields as “geeky” and “uncool” (Appianing & Van Eck, 2015). “The perceptions of parents’ and students in this regard are supported by the reality that many women in technology fields experience and leading them away from majoring in technology (Appianing & Van Eck, 2015).

When participants were asked “Who do you think is more likely to be successful in Management Information Systems, Computer Science, or Computer Information Technology?” with answer choices “Men”, “Women”, “Both”, or “Don’t know every single group including

male and female both majoring or not majoring in technology at UNCW responded with “Both” (see Figure 35). “Men” held the second highest amount of responses, but received only around half the amount of responses that “Both” received. Participants were then asked “Who do you think is more likely to major in Management Information Systems, Computer Science, or Computer Information Technology?” with answer choices “Men”, “Women”, “Both”, or “Don’t know”(see Figure 36). For both male and female respondents at UNCW who majored or did not major in technology, “Men” was the most popular answer by majority of responses from 54% to 88%. It is surprising to note how low the response percentage was for women, only 1-3% selected “Women” as being the most likely to major in a technology major. Based on the results it can be concluded that the perception of the technology major is thought of to be male dominated, and that women are more likely to major in technology than men.

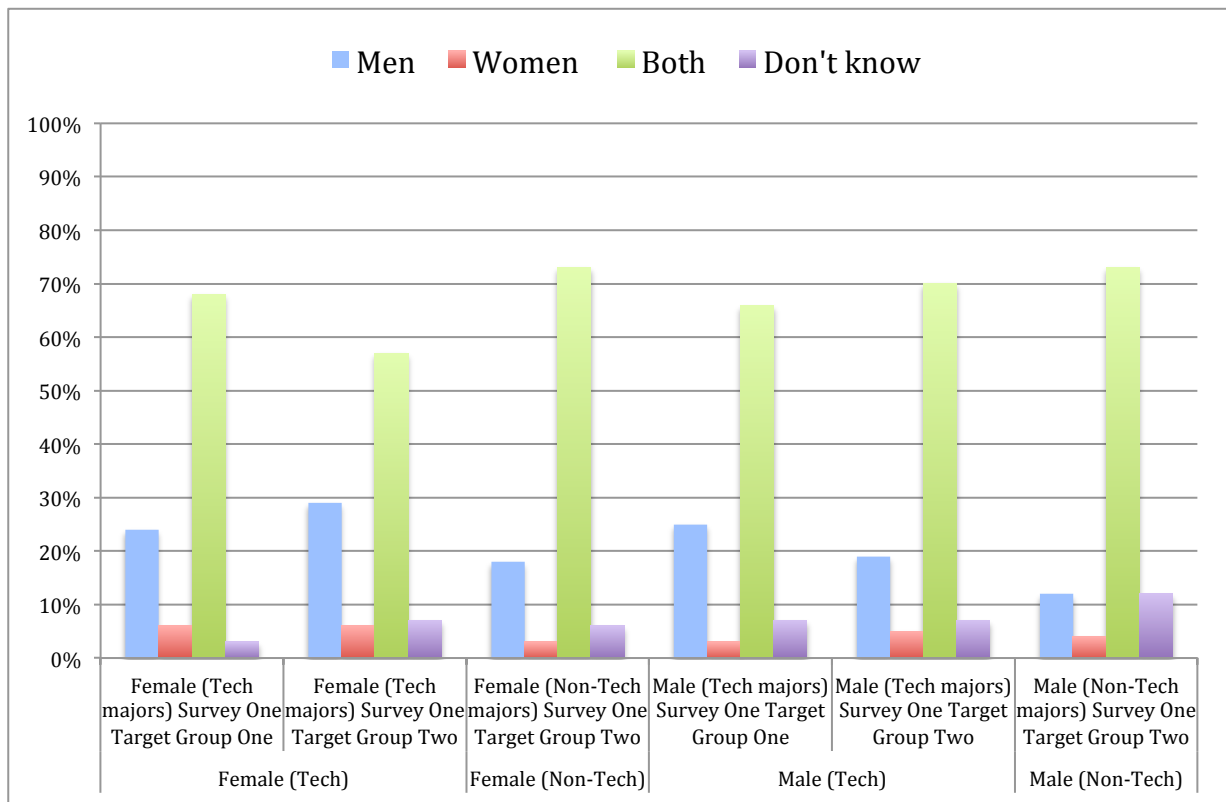


Figure 35: Perception of success

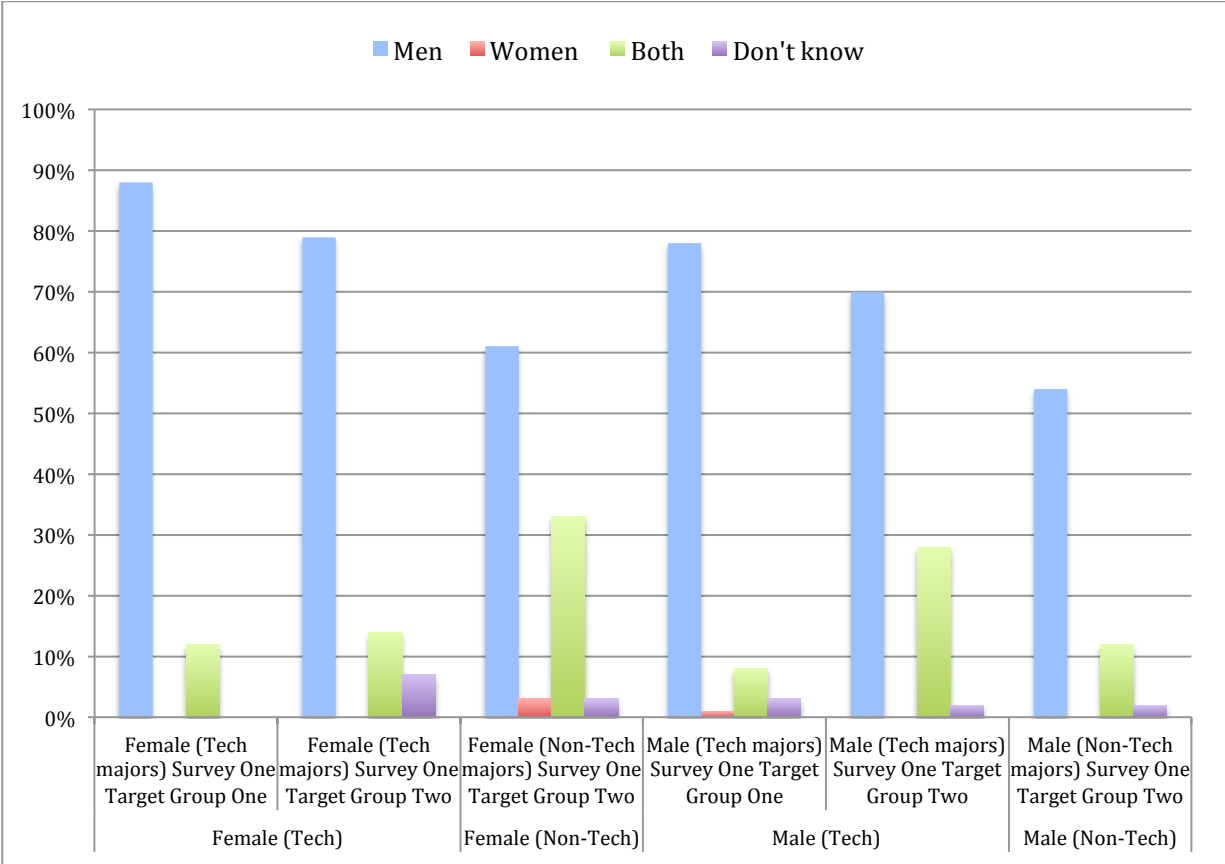


Figure 36: Perception of who is more likely to major in technology

CHAPTER 5: CONCLUSION AND FUTURE WORK

Conclusion

This study was conducted in order to determine the influences that impact the choice of a woman's selection in a degree of study related to technology. To reiterate, this research is the result of multiple methodologies taken to explore the influences behind the gender gap. Based on the influences discussed, six hypotheses were formed and were tested on the results of the survey:

Hypothesis 1: Women have less confidence in their programming abilities than men, which affects their interest in majoring in technology?

As described earlier, participants were asked "How confident are you in your computer programming abilities?" with answer choices including "I am confident in my programming abilities", "I am neither confident nor not confident in my programming abilities", "I am not confident in my programming abilities". Students in both pre-requisite and major specific CSC, CIT, and MIS courses at UNCW were asked "How confident are you in your computer programming abilities?" with answer choices including "I am confident in my programming abilities", "I am neither confident nor not confident in my programming abilities", "I am not confident in my programming abilities" in order to assess if women in computer-related majors are less confident than their male peers shown in Figure 33.

Male respondents majoring in technology in major specific courses showed a higher percentage of responses than their female peers in their computer programming abilities. 62% of male respondents stated they were confident in their programming abilities while only 41% of female respondents were confident in their abilities. According to the results of the survey, there are more men in pre-requisite and non pre-requisite CSC, CIT, and MIS than women majoring in

technology (46 women compared to 116 men), so based on these results, it is shown that men majoring in technology are more confident in their programming abilities when compared to their female peers, which could be attributed to more men majoring in technology than women at UNCW.

Hypothesis 2: Women are more likely to begin college with less programming experience than men, which leads to less women deciding to major in technology?

Participants were asked “Did you have any experience with computer programming before college?” with answer choices including “yes”, or “no”. Four different groups were asked: Female respondents that are majoring in technology, female respondents that are not majoring in technology, male respondents that are majoring in technology, and male respondents that are not majoring in technology.

For both female groups, a high percentage of women selected that they did not have prior programming experience ranging from 71%- 100% (See Figure 32). It is important to note that female respondents who were not majoring in technology had a 100% response rate stating that they did not have prior programming experience before entering college. Only a small percentage selected they did have prior programming experience before college ranging from 0%-29%. However, the results of those who had prior programming experience before college among the male respondents was much higher. There were a higher percentage of men entering college with programming experience when compared to their female counterpart ranging from 27%-44%. Based on the results, the conclusion can be inferred: the low percentage of women entering college with programming experience gives credibility to the assumption that men enter college with more programming experience, which often encourages men to major in technology more often than women.

Hypothesis 3: Limited access to computer courses before attending college affect women's decision to major in technology

Participants were asked to check if they took any computer courses while in elementary school, middle school, or high school or none? Female respondents in pre-requisite CSC, CIT, or MIS courses at UNCW who were technology majors had a high percentage of respondents select they took computer courses in both elementary, middle school, and high school. The group also had a low percentage of responses for “none” that was much lower than female UNCW respondents in pre-requisite technology course that did not decide to major in technology, which help validate that exposure to computer courses helps encourage women to major in technology. However, among female respondents at UNCW that did not major in technology, there were high percentages of responses for both taking computer courses in elementary, middle school and high school. It is important to note that female respondents that majored in technology at UNCW in non pre-requisite technology courses had a high percentage listed as “none” meaning they never took a computer course before college, which disproves the thought that taking computer courses before college helps encourage women to major in technology. Overall based on the results, more exposure to computer courses did not positively improve women's decision to major in technology as show by the high percentages of computer courses taken before college for those female respondents who did not major in technology at UNCW.

Hypothesis 4: Exposure to positive role models will help inspire young girls/women to want to major in technology.

In order to assess the perception of technology and the impact of the media on women deciding to major in technology, participants were asked to “List two women in technology that appear on television/media? (If you do not know write N/A)”, and then asked to “List two men in

technology that appear on television/media? (If you do not know write N/A). These questions were asked in order to assess the influence of media on women deciding to major in technology and if there is a lack of role models for women in technology. Figure 27 and figure 28 shows the percentage for each group within each target group that listed “N/A” and was not able to list two women or two men in technology who appeared on television/media. It is important to know that in every group the percentage of those who could list two men in technology far exceeded those that could list two women. The group with the highest percentage that was able to identify identified two women in technology belonged to those who identified as female and did not major in technology.

However, there were only a total of four responses from the group, which could contribute to why the percentage was so high. Referring to figure 27 and figure 28 you can see the percentages of those respondents who were able to list two women in technology that appear on television/media was significantly low than one group comprised of females in pre requisite CSC, MIS, and CIT courses at UNCW, but are not majoring in technology, only 11% were only able to identify two women in technology, but 25% could identify two men. Figure 27 and figure 28 shows the notable difference between the numbers of respondents that listed women in technology compared to men. Bill gates was the most popular name listed for both male and female respondents, followed by Steve Jobs and Mark Zuckerberg. Carly Fiorina was the top listed women in technology for men respondents while Sheryl Sanberg and Penelope Garcia were the top listed women in technology for female respondents. The fact that such a high percentage of participants could not identify women in technology, but such a high percentage of participants could identify men in technology on television or in the media gives creditability to the assumption that women in technology are rarely portrayed in the media or on television, and

could be why women are not choosing to major in technology.

Hypothesis 5: Parental encouragement is an influential factor that steers women to deciding to major in technology.

To see if there was a correlation between a particular family member's encouragement and women deciding to major in technology, participants were asked to identify if anyone in their family encouraged them to major in Management Information Systems, Computer Science, or Computer Information Technology, and to mark all that apply. The answer choices available to participants included: "Mother", "Father", "Sister", "Brother", "Aunt", "Uncle", "None", "N/A I did not choose to major in technology", or "Other (Please specify)". Female and male responses that are majoring/minoring in technology at UNCW compared to female and male responses that did not decide to major in technology (See Figure 21).

A comparison between both groups in target group one and two is shown in Figure 21. "None" was the most popular response among male and female technology majors/minors except for female technology major respondents who were taking prerequisite Computer Science, Management Information Systems, and Computer Information Technology courses at UNCW (Survey one- Target Group Two, Group 1) who listed "None" as 50% and "Mother" at 50% (see Figure 21). A comparison between the target groups categorized into both male and female is shown in Figure 22. The results show the influence of individual family members excluding "None" and "N/A" for male technology majors who filled out survey one in either pre-requisite or non-prerequisite Computer Science, Management Information System, or Computer Information Technology courses at UNCW, "Father" held the highest number of responses for both, and for female technology majors in target group one "Father" held the highest number of

responses while “Mother” held the highest number of responses for target group two (see Figure 22).

“N/A” was the most popular response for both male and female respondents who were not majoring/minoring in technology. The second most popular response among both male and female respondents not majoring/minoring in technology was “None” (see Figure 22). However, if you look at the results among the influence of individual family members excluding “None” and “N/A” for male non-technology majors “Father” held the highest number of responses at 15%, and for female non-technology majors in target group one “Mother” held the highest number of responses at 6%. Based on the results, it is inconclusive as to whether parental encouragement helps women to major in technology.

Hypothesis 6: Technology is perceived to be male-dominated or “nerdy”, which could be discouraging women from majoring in technology.

It has long been established that women perceive technology careers and majors as boring, male dominated, geeky, and nerdy, and one factor that has been attributed to the decline of women in technology has to do with the perception that the profession is filled by stereotypical “nerds,” leading some women to choose what they perceive to be more people-oriented majors or occupations” (Appianing & Van Eck, 2015). To assess and compare the perception of the technology major among males and females, participants were asked to “List three adjectives that come to mind when thinking about technology majors in general.” Each target group for both surveys was analyzed except for survey two those respondents who identified their gender as female and majored/minored in technology were grouped together for both CFWIT, and Systems. Those respondents who identified their gender as female and did not major/minor in technology were also grouped together for both CFWIT and Systems. In total,

there were 8 different groups whose responses were analyzed (See Figure 25 and 26).

Figure 25 and 26 shows the comparison between the responses of those female respondents who are majoring/minoring in technology for both surveys compared to the responses of those female respondents who are not majoring/minoring in technology. For all female respondents who majored/majoring in technology the most common adjective listed to describe technology majors was “smart/intelligent”. It is surprising to note that the top two adjectives listed by all respondents was “smart/intelligent”, which was listed an overall 87 times and “nerdy”, which was listed an overall 25 times. However, “male-dominated”, or “men” was only referenced a combined 7 times.

When responses for those who identified themselves as female and are majoring/majored in technology were compared to those female respondent who were not majoring in technology, the adjective that had the highest responses for those females majoring in technology was “smart/intelligent”, which was listed by 19 different female respondents who are majoring/majored in technology. The second most common answer was “interesting”, which was listed by 12 different female respondents majoring/majored in technology, and the third most common answer was “nerdy”, which was listed by 10 different female technology respondents.

For female respondents that were not majoring/majored in technology, the most common adjective listed was also “smart/intelligent”, which was listed a combined 25 times between both the combined female respondents who did not major in technology that belonged to the group Systems and CFWIT, and those female respondents who did not major in technology and were registered in pre requisite CSC, CIT, or MIS courses at UNCW. The second most common adjective listed for female non-technology majors was “nerdy”, which was listed 6 times. It is important to note that adjectives with a positive connotation, such as “interesting”, and

“creative” were not listed as often as they were among female technology majors.

For male respondents that were majoring/majored in technology, the most common adjective listed was also “smart/intelligent”, which was listed by 32 different male respondents who are majoring/majored in technology. The second most common answer was “nerdy”, which was listed by eight different male technology respondents.

For male respondents that were not majoring/majored in technology, the most common adjective listed was also “smart/intelligent”, which was listed a combined 11 times. The second and third most common adjective listed for male non-technology majors was “hard worker”, which was listed 4 times and “tech savvy”, which was listed 3 times. It is important to note that only one respondent out of the male respondents who are not majoring in technology listed “nerdy”. The results have shown that most respondents surveyed believed you have to be smart in order to major in technology. However, this may be a deterring factor as to why women are not choosing to pursue this major. The perception that students must be academically advanced to learn it may discourage certain types of students from participating, especially if parents, teachers and school administrators reinforce this belief (Google, 2014). Based on the results, both male and female student’s view technology majors are “smart/intelligent”, and “nerdy”, which could be causing women not to choose technology as a major.

Recommendations

As a result of this study, several recommendations can be made to universities in order to increase the number of women majoring in technology. The follow recommendations are made as a result of this study:

1. Female technology role models should be more prominent on television, incorporate more women in technical roles on television or in the media. These women should be

depicted as doing working that is helping other people and show the benefits of majoring in technology, and not always follow the “nerd” stereotype.

2. College campuses should continue to emphasize how majoring in technology will create future job possibilities and a good salary because according to results this was one of the main motivators as why to why women decide to major in technology.
3. The technology major needs to be reimaged, and more inclusive, instead of having the major portrayed as being only for those who are “smart”, or “nerdy”, it should be portrayed as inclusive and not just for students that are highly intellectual.
4. AP Computer Science should be made more readily available to students in high school.
5. Recruitment to major in technology should be implemented in science courses as an alternative major because as shown in the results, most males and females switch their major from a science related course or engineering due to “difficulty”.
6. Beginners programming courses should be made more readily available to middle school, high school, and college students in order to increase their exposure to programming at an early age.
7. One-on-one tutor should be used to help tutor students in the programming courses, in order to increase student’s confidence and understanding before college.

Future Work

Continued research should also be done to gain insight on the retention of women majoring in technology at the end of each semester. Although the main objective of this study was to find out the influences behind whether or not women choose to major in technology, retention of women in the major is another important factor. It is important to encourage women

to join the major, but it is also just as important to keep them in the major. Another survey could be sent out targeting women in CSC, MIS, CIT courses at UNCW and assessing their satisfaction with the courses and the major in order to find out the influences behind why women may be leaving the major at UNCW.

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APPENDIX A
Survey One Questions

Appendix A:

*** 1. I identify my gender as?**

Female

Male

Other (please specify)

*** 2. What is your age?**

0-18

19-22

23-30

31-40

Over 40

*** 3. What is your ethnicity?**

*** 4. What year in school are you?**

Freshman

Sophomore

Junior

Senior

Graduate

*** 5. Are any of the following your current major or minor? (Check all boxes that apply)**

Management Information Systems

Computer Information Technology

Computer Science

N/A

Other (please specify)

*** 6. If you checked one or more of the boxes to the question above why did you decide upon this major? (Check all that apply)**

My friends encouraged me

My family encouraged me

I encouraged myself

I enjoyed computer courses in high school

I enjoyed computer courses in middle school

I enjoyed computer courses in elementary school

Future hiring potential/salary

I wanted to learn more about technology

My friends were in the classes

My high school teacher

N/A

Other (please specify)

* 7. Did anyone in your family encourage you to major in Management Information Systems, Computer Science, or Computer Information Technology? (Mark all that apply)

Mother

Father

Sister

Brother

Aunt

Uncle

None

N/A I did not choose to major in any of those fields listed above

Other (please specify)

* 8. Did any of your teachers encourage you to major in Management Information Systems, Computer Science, or Computer Information Technology? (Mark all that apply)

Elementary school teacher

Middle school teacher

High school teacher

None

N/A I did not choose to major in any of the fields above.

Other (please specify)

* 9. Did you switch your major to Computer Science, Computer Information Technology, Management Information Systems?

No

Yes (please list what major you switched from?)

* 10. If you selected yes in the previous question please explain why you switched your major to Computer Science, Computer Information Technology, or Management Information Systems? (If you did not switch write N/A)

* 11. Did any role models encourage you to major in Management Information Systems, Computer Science, or Computer Information Technology? (Mark all that apply)

Family

Friends

Teacher

Academic Advisor

Myself

People on television/media

None I am not majoring in any of the fields listed above

Other (please specify)

* 12. Please rate each answer according to what your view is:

	Strongly Agree	Agree	Neutral/Unsure	Disagree	Strongly Disagree
I believe my friends played a significant part in my selection of major.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe my college professors played a significant part in my selection of major.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe my college advisors played a significant part in my selection of major.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe my high school teachers played a significant part in my selection of major.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe my high school advisors played a significant part in my selection of major.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe my parents played a significant part in my selection of major.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe my siblings played a significant part in my selection of major.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe that I would have picked my major regardless of the field my family is in.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe people on television/media played a significant part in my selection of major.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 13. Who do you think is more likely to be successful in Management Information Systems, Computer Science, or Computer Information Technology?

- Men
- Women
- Both
- Don't Know

* 14. Who do you think is more likely to major in Management Information Systems, Computer Science, or Computer Information Technology?

- Men
- Women
- Both
- Don't Know

* 15. Check if you took any computer classes while in elementary, middle, or high school? (Mark all that apply)

- Elementary School
- Middle School
- High School
- None

* 16. Did your classroom in elementary, middle, or high school offer a computer literacy class? (Mark all that apply)

- Elementary School
- Middle School
- High School
- None

* 17. Select all that apply?

- My high school offered AP computer science and I took the course in high school
- My high school offered AP computer science and I did not take the course in high school
- My high school did not offer AP computer science and I did not take the course in high school
- If my high school did offer AP computer science I would have taken the course

18. Did you have any experience with computer programming (coding) before entering college?

- No
- Yes (Please write which programming languages you had experience with)

*** 19. How confident are you in your computer programming abilities?**

I am confident in my programming abilities I am neither confident nor unconfident in my programming abilities I am not confident in my programming abilities

How confident are you in your programming abilities? ○ ○ ○

*** 20. How interested in computers/technology were you before attending college?**

I was extremely interested in computers/technology before entering college I was somewhat interested in computers/technology before entering college I was neither interested nor disinterested in computers/technology before entering college I was somewhat not interested in computers/technology before entering college I was extremely not interested in computers/technology before entering college

How interested in computers/technology were you before attending college? ○ ○ ○ ○ ○

*** 21. List three adjectives that come to mind when thinking about technology majors in general?**

*** 22. List 2 women in technology that appear on television/media? (If you do not know write N/A)**

*** 23. List 2 men in technology that appear on television/media? (If you do not know write N/A)**

*** 24. What do you think could be done to attract more females into the technology major?**

APPENDIX B

Survey Two Questions

Appendix B:

*** 1. I identify my gender as?**

- Female
- Male
- Other (please specify)

*** 2. What is your age?**

- 0-18
- 19-22
- 23-30
- 31-40
- Over 40

*** 3. What is your ethnicity?**

*** 4. What is your current occupation?**

*** 5. What industry does your occupation reside in?**

- Information Technology
- Computer Science
- Management Information Systems
- Other (please specify)

*** 6. What was your major? (Check all that apply)**

- Management Information Systems
- Computer Information Technology
- Computer Science
- Engineering
- Other (please specify)

*** 7. What influences helped you decide upon this major? (Check all that apply)**

- My friends encouraged me
- My family encouraged me
- I encouraged myself
- I enjoyed computer courses in high school
- I enjoyed computer courses in middle school
- I enjoyed computer courses in elementary school
- Future hiring potential/salary
- I wanted to learn more about technology
- My friends were in the classes
- My high school teacher
- Other (please specify)

*** 8. Did anyone in your family encourage you to major in Management Information Systems, Computer Science, or Computer Information Technology? (Mark all that apply)**

- Mother
- Father
- Sister
- Brother
- Aunt
- Uncle
- None
- N/A I did not choose to major in any of those fields listed above
- Other (please specify)

* 9. Did any of your teachers encourage you to major in Management Information Systems, Computer Science, or Computer Information Technology? (Mark all that apply)

- Elementary school teacher
- Middle school teacher
- High school teacher
- None
- N/A I did not choose to major in any of the fields above.
- Other (please specify)

* 10. Did you switch your major to Computer Science, Computer Information Technology, Management Information Systems?

- No
- Yes (please list what major you switched from?)

* 11. If you selected yes in the previous question please explain why you switched your major to Computer Science, Computer Information Technology, or Management Information Systems? (If you did not switch write N/A)

* 12. Did any role models encourage you to major in Management Information Systems, Computer Science, or Computer Information Technology? (Mark all that apply)

- Family
- Friends
- Teacher
- Academic Advisor
- Myself
- People on television/media
- None I am not majoring in any of the fields listed above
- Other (please specify)

* 13. Please rate each answer according to what your view is:

	Strongly Agree	Agree	Neutral/Unsure	Disagree	Strongly Disagree
I believe my friends played a significant part in my selection of major.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe my college professors played a significant part in my selection of major.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe my college advisors played a significant part in my selection of major.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe my high school teachers played a significant part in my selection of major.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe my high school advisors played a significant part in my selection of major.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe my parents played a significant part in my selection of major.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe my siblings played a significant part in my selection of major.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe that I would have picked my major regardless of the field my family is in.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe people on television/media played a significant part in my selection of major.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 14. Who do you think is more likely to be successful in Management Information Systems, Computer Science, or Computer Information Technology?

- Men
- Women
- Both
- Don't Know

* 15. Who do you think is more likely to major in Management Information Systems, Computer Science, or Computer Information Technology?

- Men
- Women
- Both
- Don't Know

* 16. Check if you took any computer classes while in elementary, middle, or high school? (Mark all that apply)

- Elementary School
- Middle School
- High School
- None

* 17. Did your classroom in elementary, middle, or high school offer a computer literacy class? (Mark all that apply)

- Elementary School
- Middle School
- High School
- None

* 18. Select all that apply?

- My high school offered AP computer science and I took the course in high school
- My high school offered AP computer science and I did not take the course in high school
- My high school did not offer AP computer science and I did not take the course in high school
- If my high school did offer AP computer science I would have taken the course

19. Did you have any experience with computer programming (coding) before entering college?

- No
- Yes (Please write which programming languages you had experience with)

* 20. How confident are you in your computer programming abilities?

	I am confident in my programming abilities	I am neither confident nor unconfident in my programming abilities	I am not confident in my programming abilities
How confident are you in your programming abilities?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 21. How interested in computers/technology were you before attending college?

	I was extremely interested in computers/technology before entering college	I was somewhat interested in computers/technology before entering college	I was neither interested nor disinterested computers/technology before entering college	I was somewhat not interested in computers/technology before entering college	I was extremely not interested in computers/technology before entering college
How interested in computers/technology were you before attending college?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 22. List three adjectives that come to mind when thinking about technology majors in general?

* 23. List 2 women in technology that appear on television/media? (If you do not know write N/A)

* 24. List 2 men in technology that appear on television/media? (If you do not know write N/A)

* 25. What do you think could be done to attract more females into the technology major?

Done

APPENDIX C

Courses That Received Survey One

Appendix C:

Courses Received Survey 1 (Target Group 1)

MIS = Management of Information Systems			
CIT = Computer Information Technology			
CSC = Computer Science			
Subject	Course Numb	Section	Title
CSC	220	1	3-D Computer Graphics Tools and Literacy
CSC	231	1	Introduciton to Data Structures
CSC	231	2	Introduciton to Data Structures
CSC	231	3	Introduciton to Data Structures
CSC	231	3	Introduciton to Data Structures
CSC	242	1	Computer Organization
CSC	320	1	Computer Animation
CSC	331	1	Object-Oriented Programming and Design
CSC	331	2	Object-Oriented Programming and Design
CSC	340	1	Scientific Computing
CSC	342	1	Operating Systems
CSC	342	2	Operating Systems
CSC	360	1	Formal Languages and Computability
CSC	380	1	Design and Anaylsis of Algorithms
CSC	385	1	Professional and Ethical Issues in Computer Science
CSC	385	2	Professional and Ethical Issues in Computer Science
CSC	434	1	Programming Languages
CSC	450	1	Software Engineering
CSC	450	2	Software Engineering
CSC	455	1	Database Design and Implementation
CSC	475	1	Topics in Computing: Natural Language Processing
MIS	216	1	Introduction to Business Applications
MIS	312	1	Information Systems Hardware and Software
MIS	312	2	Information Systems Hardware and Software
MIS	315	1	Management of Database Systems
MIS	315	2	Management of Database Systems
MIS	316	1	Business Application Development
MIS	316	2	Business Application Development
MIS	323	1	Busienss Telecommunications
MIS	324	1	Information Security and Assurance
MIS	327	1	Data Center Management
MIS	413	1	Systems Design/Capstone Project
MIS	419	1	Information Technology Project Management
CIT	213	1	Intro to Databases
CIT	225	1	Platform Technologies
CIT	410	1	Web Application Development
CIT	425	1	Human-Computer Interfaces

APPENDIX D

Courses That Received Survey Two

Appendix D:

Courses Received Survey 1 (Target Group 2)			
MIS = Management of Information Systems			
CIT = Computer Information Technology			
CSC = Computer Science			
Subject	Course Number	Section	Title
CSC	112	1	Introduction to Computer Programming C/C++
CSC	131	1	Introduction to Computer Science
CSC	131	2	Introduction to Computer Science
CSC	131	3	Introduction to Computer Science
CSC	131	4	Introduction to Computer Science
CSC	133	1	Discrete Mathematical Structures
CSC	133	2	Discrete Mathematical Structures
CSC	133	3	Discrete Mathematical Structures
MIS	313	1	Introduction to Management Information Systems
MIS	313	2	Introduction to Management Information Systems
MIS	313	4	Introduction to Management Information Systems
MIS	313	5	Introduction to Management Information Systems
MIS	313	6	Introduction to Management Information Systems
CIT	110	1	Fluency in IT

APPENDIX E

Majors of Female Respondents Not Majoring In Technology Who Selected “Other”

Appendix E:

1. *Business Administration*
2. *Communications*
3. *Marketing Strategy*
4. *Communication Studies major, Digital Arts minor*
5. *Marketing*
6. *Environmental Science Engineering*
7. *Operations management*
8. *Finance*
9. *Stats*
10. *Business marketing*
11. *Finance (N/A)*
12. *Accounting*
13. *International Business*
14. *Management and leadership*
15. *Finance*
16. *Finance, Ops management*
17. *Business Administration, Management*
18. *Human Resource Management*
19. *Finance*
20. *Accounting*
21. *Mathematics*
22. *Marketing*

*23. Business Admin. w/ Concentration in Management
and Leadership*

24. English

APPENDIX F

Majors of Male Respondents Not Majoring In Technology Who Selected “Other”

Appendix F:

1. *Finance*
2. *Accounting*
3. *Sociology*
4. *Business and Economics*
5. *Finance*
6. *Marketing*
7. *Management and ops
management (N/A)*
8. *Business (Marketing) and
Film Studies*
9. *EBD*
10. *Marketing*
11. *Accounting*
12. *Business Admin*
13. *Finance*
14. *Finance*
15. *Accounting*
16. *English and Com*

APPENDIX G

Female Technology Major Responses That Chose “Other” For Motivating Factors

Appendix G:

1. *Wanted to change careers*
2. *Enjoyed web design*
3. *I enjoyed computer classes in college*
4. *College advisor*
5. *Television exposure to major/related fields*
6. *College advisor*
7. *Internship*
8. *I enjoyed learning HTML/CSS from a website and wanted to learn more*
9. *Related to my current job*
10. *Several college teachers*
11. *Wanted to do computer science with a digital arts minor, but my math game is weak*
12. *Scholarship for women to study math or CS*
13. *I'm good at math and enjoy the subject*
14. *I chose computer science as an interesting way to apply my skills in mathematics*
15. *I just always knew since I first got a PC at age 13*
16. *I took a computer science course in my first year and really liked it*
17. *I enjoyed introductory CS classes in college*
18. *This seemed more doable than my current major (mechanical engineering)*

APPENDIX H

Male Technology Major Responses That Chose “Other” For Motivating Factors

Appendix H:

1. *I have been doing this type of work in the military*
2. *Have always enjoyed programming*
3. *Turns out I am good at it*
4. *Felt that IT was more hands on and technical than MIS*
5. *I didn't enjoy chemistry lab, and I wanted to design video games in the beginning*
6. *The major just made sense to me. Found the other majors I attempted to be boring
(switched four times)*
7. *The thought of building something, code that solves a problem interests me.*
8. *I enjoy programming and technology*
9. *I have always had an interest in computers and wanted a career dealing with them*
10. *Similar to "I enjoyed computer courses in high school" but I am old and didn't get a
computer until my first semester of college in the 1990s*
11. *Computer science is easy*
12. *I have always been interested in computers*
13. *Enjoyed CSC 112*
14. *I have always been fascinated with computers*