University of Nevada, Reno

WHERE HAVE ALL THE WOMEN GONE FROM THE MANAGEMENT INFORMATION SYSTEMS (MIS) PROGRAM IN THE COLLEGE OF BUSINESS?

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Information Systems

by

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August 2015

THE GRADUATE SCHOOL

We recommend that the thesis
prepared under our supervision by

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Entitled

Where Have All The Women Gone From The Management Information Systems (Mis) Program In The College Of Business?

be accepted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE

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August, 2015

ABSTRACT

This is a study about the large, gender-balance inequality in technology related sectors in the college class-rooms. This study used an experimental method approach looking at popular literature beliefs about the lack of women in information systems. Different projects were completed by the students attending an introductory Computer Information System (CIS) class in the college of Business at a western state school. The students self-selected the type of project that they would complete for the semester, with each project limited to a set number of students to ensure a balance of students in each project group. The impact of these treatments was measured by a survey that was administered to the students at the beginning of the semester, before the introduction of the projects, and then administered again at the end of the semester, after completion of the projects by the students.

The results of a chi-square analysis, which was conducted on the survey question asking students whether they were planning on majoring in information systems were not significant for the class as a whole between an instrument administered at the beginning of the semester before any treatments were conducted and the again at the end of the semester after the treatments were conducted except as it related to the students meeting with professionals from the community. The results of compiled student comments from their individual project did provide some positive attitudes and some of the women students individually indicated that they were considering information systems where before they had not.

ACKNOWLEDGMENTS

First I want to thank the one women, without whom none of this work would have ever been possible, Dr. Dana T. Edberg. Here guidance, support and friendship through-out the years has inspired me in ways both seen an unseen. My perseverance through many hurdles in my academic career are due to the shining example that she has always set for me. I feel truly blessed to have had her as a role model, mentor and friend from my first days as an undergrad though to the completion of my second graduate degree.

I would like to thank Dr. Mark G. Simkin, whose belief in me and acceptance of my "process" allowed me to work though the steps in my own way in order to finally complete this project. Without his input and guidance from the beginning, there wouldn't have even been a project to complete.

I would also like to thank Dr. Dana Kabat-Farr. Her quiet patience and support while I worked through the "writing" provided me with the break-through that I needed to actually get my thoughts on the page. To her it was probably a small suggestion, but to me, it opened my eyes and provided me that aha-ha moment that I needed to continue. Her knowledge and understanding of the gender issues I was struggling to write about were truly valuable.

Lastly I would like to thank my family for their continued support and patience while I worked through this many-year adventure. It was often difficult and there was conflict, but ultimately, they were always on my side. So thank you to my husband, son, and mother

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CHAPTER 1
INTRODUCTION

I’ve been working in the information systems field for over 15 years. I am a woman who never felt discriminated against, or felt like a minority. There were always other women in my chain of command and the other engineers I worked with were varied as to age and gender. I had solid role-models and mentors who supported me throughout my academics and work career. The company I worked for had money to spend and treated its employees well. It coordinated white-space projects and inter-office competition to spur new development and creative ideas from their employees. Training and conferences were available for those who wished to attend. In short, I loved the industry I worked in and I loved my job! Then… things began to change.

I didn’t begin to really notice any differences in my environment until I entered the mid-way point in my career. I worked for much of my career on what are known as “legacy” systems, or a more recent term I heard them called, “anchor applications”. This was the perfect description for the applications that I supported that funded 80% of the company’s revenue, which “kept the lights running”, as the saying goes. As time went on, I learned what I needed to know to support the products that I was responsible for and my end-users loved me.

Unfortunately, by the time all my fellow legacy engineers had been laid-off and all the work I supported was moved offshore, my current “peers” thought I didn’t know anything and it turns out that they were right (and wrong, I’ll explain more about that later). My experience in the newer technologies was that of a novice, and while I felt I could catch-on eventually (I’ve always had the ability to learn new things) I had finally reached a point in my career where I wasn’t sure that I wanted to put in the effort that would be required to become truly viable as a modern software engineer.

It was at this time that I began to take a closer look at the current crop of engineers that were coming up in the industry. I realized that sometime over the past 5-8 years I had become the legacy dinosaur, supporting a product that wasn't changing, and that wasn't ever going to change. The other engineers that were around me were young, excited men with Computer Science degrees who were hungry and knew the latest-and-greatest. They were eager to work on the products that were experiencing the explosive growth rates and involved the newest technologies. When I "looked up" I realized that in my particular work environment I was suddenly the "minority"! I was the only woman software engineer, and I was the only software engineer over 50, (most of the other engineers were in their 20's). I was reaching the end of my career life and had already raised a family while my peers were either single or newly married with very young families. I felt totally out of step with my peers, with whom I had almost nothing in common anymore.

The connections that I had been making all along and the relationships I had been building were with the business I supported. They were with other middle-aged women, just like myself. It wasn't until later that I realized that by making myself attractive to the business I supported, I was in-fact alienating myself within my own workgroup. This feeling of isolation I had within my work environment, begged the questions then: "Where were my technology peers"? "Why, when I looked around myself, did I see almost no other women?" "Why is this inequality so bad for the industry"? And "How can I help to make things better"?

Statement of the Problem

The benefits of having a more gender-balanced workgroup in business has long been touted in the literature, which has shown that more increasingly in the industry our most important discoveries are coming from collaborative teams, those with a balance of men and women. The studies have shown that gender balanced teams are more effective than teams that don't have diversity (Bear and Woolley

2011). Men and women think differently and when presented with issues in business and society they will offer different solutions based on their differing perspectives. These differences foster creativity and brainstorming that enable solutions to be suggested that appeal to everyone in our society. Diversity helps teams solve problems and having gender balanced teams has been shown to increase a business's profits (Badal and Harter 2014; Herring 2009; Hoogendoorn et al. 2013; Richard et al. 2013). Gender-balanced science teams have their articles cited at a higher rate than other teams made up of homogenous members, suggesting that the quality of the work of the gender-balanced teams' is viewed as higher (Campbell et al. 2013). Other studies have shown that having gender diversity on work teams has significantly improved the team's performance especially where the business is focused on innovative outcome (Bear and Woolley 2011; Dezsö and Ross 2012).

On top of the issue of not having gender-balanced teams in most technology workgroups, which would make the teams more productive, the Bureau of Labor statistics (BLS) has indicated that the Technology Industry is currently dealing with an overall shortage of engineers in the Information Systems field in general (2012), which makes obtaining more balanced teams even more difficult. These labor shortages in the Science, Technology, Engineering, and Math (STEM) fields have worsened post the 9/11 crisis making it harder for companies to obtain H1B Visas (non-immigrant temporary work visa for specialty occupations). At the same time the growth in Asia has drawn more qualified professionals back to their home countries instead of remaining in the United States after completing their education (Hewlett 2008).

Adding to the dearth of workers seems to be the continuing underrepresentation of women in technology fields despite attempts by the industry to attract them (Bear and Woolley 2011; Beede et al. 2011; Downey et al. 2011; Hewlett 2008). According to the BLS, women currently make up only 23.1% of the total workforce in computer occupations (2014). This percentage gap has been consistent over time and in fact hasn't changed from women representing only 24% of overall STEM workers in the

2000-2009 time-frame. In fact, when looking at Computer Science specifically, there is a decline in the percentage of women that made up the workforce during this timeframe from 30% to 27%. (Beede et al. 2011). Studies about the underrepresentation of women started appearing decades ago in the literature (Brush 1991; Durndell et al. 1995; Gerver 1986; Kay et al. 1989; Spertus 1991; Taylor and Mounfield 1994). Which is why the question continues to be asked today, "Why are there still so few women in engineering fields"? (Hill et al. 2010; Tietjen 2004)

Significance of the Study

In the past, a degree in computing wasn't needed to enter the technology field. Women found their way into information systems by becoming a subject matter expert (SME) for a particular business application, or learned on-the-job. However, as technology has evolved it has become more critical for information systems workers to have the formal education that a college or university can provide. This can be seen in the Bureau of Labor Statistics Occupational Outlook Handbook for Computer and Information Technology Occupation, where all of the computer related positions require at a minimum a Bachelor's degree for entry-level position (2012).

At a science conference in 1995, Anita Borg, who is a founding member of the Grace Hopper Celebration of Women in Computing Conference (GHC), challenged colleges to have 50% of their computer science degrees awarded to women by 2020 (SECRETARY 2005). Ironically, in 2015 with only five years remaining on this deadline, we are still no closer to achieving this goal for women in computing since women still only make up 14.5% of students who were awarded Bachelor's degrees in computer related areas (Computer Science (CS) and Management Information Systems (MIS)) (Zweben and Bizot 2014). The declining enrollments, (of both men and women), in Management Information Systems (MIS) departments at Universities, which have been the norm since the dotcom bust of 2000, is just exacerbating this situation (Croasdell et al. 2011; Downey et al. 2011; Hill et al. 2010; Scragg and Smith 1998; Scutt et al. 2013; Zhang 2007).

Purpose of the Study

In an effort to encourage more students and specifically more women to select a major in MIS in the College of Business, we conducted different interventions in the freshman-level introductory information systems class at the University of Nevada Reno. This class is required for all students who are seeking an undergraduate degree in any business discipline. Women typically represent 50% of the students in the class. This study was conducted in two separate sections offered for the IS101 class over the course of a semester.

The literature has discussed many areas where the potential to reverse the decline of student enrollments is possible. Areas having to do with mentorships and meeting with professionals from the community. Working on “meaningful assignments”, and feeling as they all have a better understanding of what is available have all helped in some way. In our study, we have looked at four areas where we hoped to move the needle in getting more women to major in information systems.

The interventions included four projects: (1) write a term paper about MIS, (2) complete an Excel workbook project, (3) meet with student mentors, and (4) meet with professionals from the industry. The students, divided by gender, self-selected in to the project they wanted to complete for the semester. Each project was capped to a specific number of students, to ensure an even distribution of students in all projects.

The questions addressed in the term paper surround topics such as the different types of jobs IT professionals may have, how much training is required to work in the IT profession, what type of salary do IT professionals make, what are the different types of certification that IT professionals can earn, and what type of gender issues are currently being faced by the information systems field in general.

Research Questions

Based on the reasons in the literature discussed above, several different questions arose that are guiding the purpose of this study.

1. Will knowledge of professional opportunities in IS encourage more women to major in Management Information Systems?
2. Will experience in actually solving a problem encourage more women to major in Management Information Systems?
3. Will meeting with student mentors, who are IS majors, on a regular basis encourage more women to major in Management Information Systems?
4. Will having a question and answer session with a female professional from the IT industry encourage more women to major in Management Information Systems?

CHAPTER 2
LITERATURE REVIEW

For this particular experiment we will be discussing how interventions on students in an introductory computer information systems class can change their interest in majoring in information systems. This experiment is addressing the specific concerns as to why students, and specifically more women, are not choosing to major or minor in MIS because they are unfamiliar or intimidated by the environment, or simply feel that they are ill prepared.

In addition to addressing the differences between MIS, and CS in the literature review we also look at what research has said about why women specifically may not be selecting a major in MIS and in the technology fields in general. These issues range from societal and environmental reasons women may not be selecting a technology career, to lack of understanding and preparedness for a major in MIS, to women's view of themselves and their own abilities, or lack thereof.

Benefits of Gender Diversity

Having gender diversity in the workplace, as stated earlier, has been documented to improve productivity, increase revenue and generate greater creativity within teams (Badal and Harter 2014; Bear and Woolley 2011; Herring 2009). Gender diversity has also been shown to reduce turnover in organizations and reduce the stress in work environments (Nishii 2013).

MIS vs CS

As a part of the literature review it is important to make the distinction between Management Information Systems (MIS) and Computer Science (CS). These disciplines are similar in relation to technology and appear to be vying for attention from the same pool of high school and freshman college students. While the focus of this study is dealing with the MIS discipline, much of the literature refers to the CS discipline. But, in the context of computing we feel that the findings would be similar if viewed from an MIS perspective as much of it deals with studies of college freshman and pre-college students.

There has been some confusion about what the MIS discipline is, especially compared to the more familiar CS discipline. Both majors involve technological components with similar classes. Both majors can fulfill students' interest in higher salaries and the desire to be challenged in their work. So, it makes sense that both majors can be attractive to the same students, however the overall focus of both majors is very different (Downey et al. 2009).

Historically MIS had been identified as a service type role that assisted end-users in the decision making process by converting data to information (Pitt et al. 1995). MIS drew heavily upon the CS disciplines, among other disciplines, since many of its initial practitioners had roots in that field (Baskerville and Myers 2002). With the beginning of data processing in the 1950's through the implementation of enterprise-wide information systems in the 1990's, the MIS field has gone through major changes to the role it plays in organizations (Petter et al. 2012).

In today's era of customer focus and cloud computing the MIS field bridges the gap between technology and the business (Barakat et al. 2011). The business uses information technology in a holistic way to respond to challenges that impact the organization in order to solve problems, develop new products, and stay competitive in the industry. This tracks with the assertion that students in MIS need to have a well-rounded understanding of the business environment, including areas such as accounting and marketing, and how these disciplines add value to the company (Downey et al. 2009). Understanding these facets of the business fully will enable the creation of complex information systems that will allow the organizations to be successful in their current business environment (Laudon et al. 2012).

In contrast to MIS, CS has been described as a “resource-based theoretical perspective of technology”, which defines a “pure mathematical, algorithmic solution to a core issue, irrelevant to how the solution will be implemented” (Lewis and Smith 2005; Parlante 2005). This definition of CS has been accepted and used in an effort to introduce computational thinking in the K-12 arena and covers processes like; programming, hardware design, networks, etc. (Barr and Stephenson 2011).

Reasons for Underrepresentation

The literature has put forth many reasons why women aren’t entering technology fields in numbers that would help to reduce the disparity between genders in the industry. One of the areas deals with the broader societal factors that may be preventing women from even considering a technology related major in college such as: gender bias, peer and family pressure, negative stereotypes, and stereotype threat.

Women may choose female dominated majors because they are risk-adverse and do not want to be put in a position to compete with peers in the more male dominated majors (Anelli 2013; Booth and Nolen 2012). This ties with findings from one study showing that women were significantly less likely to choose a science related major based in part on Holland personality traits that emphasized self-confidence and aggressiveness for those types of majors (Porter and Umbach 2006). Personality traits of aggressiveness and self-confidence have been shown to be a result of the socialization process of children and have long been identified with boys (Block 1983).

Gender Bias

Gender bias in computing has been discussed in the literature for many years. Research has shown that this implicit bias is the unconscious beliefs that we associate to specific genders such as the belief that boys are better at math than girls. Unconscious beliefs that boys are superior in technical skills to girls then influences society and how girls are viewed in a technological context. Girls facing this belief experience anxiety when dealing with computers, which ultimately leads to a self-fulfilling prophecy in which we see a performance difference between boys and girls (Cooper 2006). Indeed, differences in math and science performance between boys and girls can be predicted based on the level of implicit bias occurring in the country (Nosek et al. 2009).

These themes are consistent with the views that society strongly influences the behavior and acceptability for the roles that boys and girls adopt. From an early age girls form opinions that computers are for boys because boys are better at math and like the machines, which tend to make girls uncomfortable (Bhargava et al. 1999). The way boys interact with computers as a group in school has the subtle effect of making girls feel excluded, as if their own interests are unacceptable (Balcita et al. 2002). The ongoing influence of the video-game industry (geared toward males) and girls' reduced access to computers from an early age have combined to deprive these girls of confidence in their own abilities through lack of hands-on experience (Klawe 2002).

This type of implicit bias may be keeping girls from pursuing the sciences from the beginning in an academic environment due to the influences placed on them by cultural biases (Hill et al. 2010). Karen Purcell (founder of PK Electrical Inc.) noted that girls are not encouraged the same way boys are to pursue STEM fields through-out their school years (Coger et al. 2012). The experience and attitudes that young girls face prior to reaching high school strongly affects the choices that they make concerning the pursuit of a STEM related career, which further contributes to the gender effect that inhibits girls from pursing that type of career path (Sadler et al. 2012).

Peer and Family Influence

The influence that peers may have on women choosing to major in Information Systems is somewhat mixed in the literature. In some studies the researchers found that a woman's choice of major did not seem to be influenced by their peers (Croasdell et al. 2011; Ficano 2012). However, many additional studies find that women's choices are impacted by their peers' and the social psychology theories agree that females are more influenced by their peers (Han and Li 2009). This is supported by Zhang's study which found that female students considered others' opinions before forming their own intentions (Zhang 2007). Giorgi, et al 2010, found in their study that if more than one of a student's peers was to choose a major, then the student themselves are likely to follow suit even when the major is not a good fit for them academically (De Giorgi et al. 2010). Even when women demonstrated academic success their male peers still viewed them as performing worse, which just adds to the women's negative peer pressure (Ficano 2012).

All is not negative when faced with the power of peer pressure or socialization, good things have come from it as well. In fact there have been many studies that found a women's academic performance could be positively impacted by their peers (Carrell et al. 2008; Han and Li 2009). Women who believed that they could learn math skills were able to overcome the negative societal view that women aren't as good as men at math (Good et al. 2012; Yeager and Dweck 2012). Women even when starting out at an academic disadvantage as compared to their male peers have managed to succeed in school.

While Croasdell and colleagues did not feel that students were influenced by their peers, they did find a students' decision to major in IS was more likely affected by the views of family, which was also found by other researchers (Croasdell et al. 2011; Downey et al. 2011; Lee and Lee 2006). An earlier study found that parental influence, how involved the parents were in their child's education, had a positive correlation on the student's participation in classes in high-school that would more likely lead to a major in a STEM field (Maple and Stage 1991).

A study from one Eastern University found that gaining parents' approval was an important factor in students' choice of major (Zafar 2009). This may help to explain findings by Zhang that female students feel that going into Information Systems is less expected of them. Zhang's data showed that the opinion of the student's families was consistent with the dominant socialization pattern that information systems is not meant for female students (Zhang 2007) and that computers and programming are something in which boys excel (Klawe 2002). The impact of the family can also have a larger effect on women from lower socioeconomic backgrounds where the father's profession can have a strong influence on the daughter's choice of college major (Leppel et al. 2001).

Negative Stereotypes

Humans are social and will instinctively seek to belong with others like themselves, so when they feel like they do not belong in a particular setting, they may disengage (Stout and Camp 2014). In one experimental study, an environment that is "stereotypical" of the computer world, (i.e. posters of Star Trek, lots of junk food, electronics, etc.), had a negative effect on women who may infer that it is not a group they belong in, even if the room is full of women engineers (Cheryan et al. 2009).

Exacerbating this feeling of not belonging is the lack of available women role models in IS. The lack of female role models in sufficient numbers in the industry provides an unwitting barrier to young women who may otherwise identify with and join the industry (Schäfer 2006; Walstrom and Schambach 2012). Research has demonstrated that the lack of perceived similarity with others in a field predicted less intent to enter that field (Cheryan and Plaut 2010). This research aligns with other findings that the negative stereotypical image that girls have of scientist precluded them from seeking to enter the profession because they couldn't see themselves in a similar role (Buck et al. 2008).

This sense of belonging is a key component in women choosing to select a major in Information Systems. However, the need to belong makes women feel vulnerable and this feeling is intensified when combined with negative stereotypes that can lower their abilities to perform (Dweck 2006; Nguyen and Ryan 2008). Research has also shown that the mindset or attitude of a student helps determine the level of success that student may have. Women with "fixed" mindsets believe that their intelligence is innate and can't be changed. These women are much more likely to succumb to the negative stereotypes about IS, lose confidence in themselves and not even attempt a path in STEM (Hill et al. 2010).

Stereotype Threat

Engineering has been long identified as a male dominated profession (Hatmaker 2013). In a survey researchers asked the students that weren't currently in an IS major, why they did not chose Information Systems. The third highest response received, behind "not what the student wanted to do" and "not of interest", was the negative image of the IT worker (Walstrom et al. 2008). The misconceptions about the computer industry have been perpetuated in negative ways by the media (Jepson and Perl 2002). In a study performed after the completion of an introductory-level information systems course about student perceptions of the IT profession, students thought that some people in the profession were "geeky and nerdy" (Joshi and Schmidt 2006).

One potential result of the negative stereotypes that people associate to workers in technology is an effect known as stereotype-threat, which can have a more insidious and deeper impact on women. Stereotype threat exist when people feel that they may personify the negative stereotype and the potential stereotype threat can in fact lead to a self-fulfilling prophecy. That is, the reduced confidence associated with the stereotype threat and resulting poor performance reinforces the person's belief that they will do poorly, which in turn leads them to do badly (Wikipedia).

In meta-analysis studies covering over 17 years of data it has been shown that women consistently underperform compared to their male counterparts, when taking standardized math exams due to stereotype-threat (Picho et al. 2013). Another meta-analysis of 15 years of data showed similar results where girls noticeably underperformed compared to boys in math, science and spatial skills (MSSS) tests (Flore and Wicherts 2014).

Spatial skills are a key component in determining STEM success, however the existence of stereotype threat in children has been shown to have an adverse effect. Girls will perform better if the test is framed in a positive, female light. Meaning that if the girls think that the task is something that girls are naturally good at to begin with like cooking for instance, they will do better. However, they will underperform or under-evaluate themselves if the test is framed as threatening or male dominated in order to maintain their own gender stereotype views (Neuburger et al. 2015). Performing mathematical problems is integral to developing problem solving skills for engineering. Stereotype threat helps explain the lack of women in MIS majors. Many studies have shown that women feel that their own abilities are at a lower level than men's abilities in math and computers (Huang 2013). When women feel that they aren't good with math and computers, or not adept at the type of work necessary in these fields, they will not pursue computer-related degrees.

Women are influenced by externally generated pre-stated perceptions regarding computer abilities. A study demonstrated that women undervalue their skills as compared to men after performing an experimental task (Correll, 2004). In that study, half of the women were told men were naturally better at the task then women, and the other half were told the genders were equal at performing the task. The results showed that the women who were told that men were better at the task rated themselves more poorly after completing the task (Correll 2004).

Students form perceptions of their own academic competencies based on: external comparison of assessing their abilities to another, and internal comparisons where the student compares one subject relative to another (Koopmann 2014). Studies have found that girls assess their own mathematical and computer abilities lower than boys assess their abilities in those areas, yet at the same time the girls hold themselves to a higher standard than boys do (Hill et al. 2010; Miura 1987). But the suggestion that Hill makes is that gender only influences students' perception negatively for areas considered male domains, like math and computers (Hill et al. 2010). So, not only are women at risk to stereotype threat, but they also are at risk for thinking that their own work is poorer than the men that dominate the industry!

Lack of Knowledge

Prior studies found that students who hadn't selected to major in MIS had the perception that the field was narrowly defined and very technical, which many students would find boring (Scott et al. 2009; Von Hellens et al. 2009; Weinberger 2004).

For women that did choose to major in MIS one survey found that this group of students felt that they were less prepared for a job in their field then students majoring in other business areas (Kim et al. 2002). This assumption was based on the specific course work the students were completing and their understanding of careers in information systems. Continued misunderstanding adds to the confusion surrounding the MIS field and how it is differentiated from that of a CS major, which may be more attractive to a different type of student who is solely focused on the technical aspects of computers (Scott et al. 2009).

There are many misconceptions concerning MIS related careers and the types of people who work in the field (Croasdell et al. 2011). Students with no other information think that MIS careers are very narrowly focused, requiring them to work in a windowless basement offices, sitting behind desks, and coding all day (Kuechler et al. 2009; Scott et al. 2009). This view hurts enrollments in MIS because studies have shown that there is a strong correlation between knowing and understanding available career choices and selecting a major in that discipline (Walstrom and Schambach 2012).

A number of studies measuring students' perceptions about careers in MIS showed that students incorrectly believed that the career in information systems was isolating and did not allow for interaction with others (Agosto et al. 2008; Walstrom and Schambach 2012). Social interaction is very important for the current generation of college students and women surveyed reported that they would not have the social interaction that they desired in their career path if they selected a major in MIS (Scott et al. 2009). Unfortunately these same misperceptions were echoed in a study conducted over a decade ago, which found that students did not think a career in technology would allow them to help, or work with others (Beyer et al. 2004).

Adding to the misperception of the technology field is the belief that students truly do not know what career options are available to them and therefore may hesitate to choose a MIS major. The mysterious career path and not knowing how to move forward in the field acts as an impediment to the field (Hewlett 2008). Since awareness about a major has been shown to be a key factor in a student's choice it is not surprising that students did not select a major in MIS (Croasdell et al. 2011; Walstrom et al. 2008). This unfamiliarity with MIS careers seems to be exacerbated in part due to the lack of understanding of high school or college guidance counselors or advisors, which is where students often first form their ideas about potential careers after college (Joshi and Schmidt 2006; Rettenmayer et al. 2007).

Lack of Preparation

Some women many not choose a major in Information Systems because they do not think they are good enough to do the work. In a study conducted by Smith, women who perceived that they worked harder than their peers had less motivation toward the field of study (Smith et al. 2013). Other surveys among college students found the perception that the courses required for the major were more difficult than courses for other business majors (Kuechler et al. 2009).

Further exacerbating this problem is slower indoctrination of girls into the computing world, which is lagging that of boys from an early age in part to the view that computers are for boys and the gaming industry markets primarily to that segment (Moorman and Johnson 2003). One study comparing girls' and boys' beliefs regarding the usefulness of computers showed that even though girls believed that computers were more useful than boys believed, the girls still lacked the confidence to believe they could do well with them (Young 2000). In a recent study Baruch noted that women interviewed felt more confident about computers than was noted in studies from the 1990's. However, the researchers considered that this may be a bi-product of the lack of males in the environment from which the women were selected giving the women a heightened level of confidence (Baruch 2014). Huffman found that this technology self-efficacy is more related to gender roles and the associated skills rather than whether the student is male or female (Huffman et al. 2013).

The lack of women selecting an MIS major then should not be a surprise when one study discovered that the number of completed math courses in high school was found to be, considerable and consistently lower for girls than boys (Kaspura 2012). This continuing disparity for girls has spurred some groups to focus on exposing young women to these subjects at earlier ages in order to peek their interest, which is the mandate for the "Expanding Your Horizons" conferences (Jepson and Perl 2002).

A higher degree of computer use in high school has been shown to have a positive effect on the choice of a STEM related major in college (Trusty 2002). Unfortunately when looking at computer use in high school, surveys have shown that the formal and informal prior computer experience for girls was well below that of the boys (Carter 2006). While some girls may have had limited access to computers in high school, when they did use computers they did not use them to develop problem solving skills, which may have led to a higher interest in technology (Varma 2006).

Lack of Meaningful Work

Stereotyping can have a negative connotation, but it can also be a means to codify our perceptions and make it easier to recruit students to the appropriate business major (Noël et al. 2003). However, the strong stereotype of the computer nerd has led to discouraging women and others that do not fit the "mold" from pursuing a career in computers (Whitney et al. 2013). The stereotypical computer geek has long been identified as a scruffy, inappropriately dressed, long-haired male programmer, more interested with the systems than with helping people and women want a career where they can help others (Ensmenger 2012).

Many women believe that a career in computers will not lead to truly meaningful work and have indicated that they would rather study for careers that are useful, where they can help others (Weinberger 2004). Unfortunately, the direct link to helping people is not as easily demonstrated in computer majors as it is in a major like biology (Zur et al. 2005). This sentiment is reflected in a proposed new framework from Agosto and colleagues who argued for the change of MIS curriculum to include active mentoring and positive role models, to show that MIS related jobs are solving human problems and making a difference in the world (Agosto et al. 2008).

Literature has shown that by creating assignments that show how women's use of technology can directly improve human's quality of life in support of women's desire to make a difference in the world (Clark Blickenstaff* 2005). The benefits of providing exercises for students to perform are designed to help alleviate concerns that students do not select the MIS majors because they are unfamiliar with the profession.

Prior Interventions Attempted

Summer Camps

There are positive ways to increase girls' interest in technology at younger ages, like summer camps and school partnerships with corporate sponsors. Increasing girls' exposure to computers in a playful way will help motivate them and spark further technological curiosity (Denner 2011; Denner et al. 2014). Hands-on exercises and on-site visits with corporate partners showed success in changing students perceptions about possible career choices in technology (Choudhury et al. 2010).

The benefits of summer camp has been touted as a way to promote an appreciation of computing and introduce young women to basic programming while serving to undermine existing negative stereotypes (Adams 2007; Choudhury et al. 2010; Wolz et al. 2011). Additionally 9^{th} and 10^{th} grade students who attended summer game camps showed a marked improvement in computer skills while gaining self-confidence (Al-Bow et al. 2009).

Greater Exposure in K-12

Many studies have shown that interest in math and science classes while in high school has proven to be a clear predictor of students' choice in selecting STEM related majors in college (Crisp et al. 2009; Green and Sanderson 2014; Maltese and Tai 2011). In fact, a strong correlation was found between the highest levels of math and science taken in high school and the declaration of a STEM major (Riegle-Crumb et al. 2012). A student's relative math and science skills in high school have also been shown to aid their ability to perform in introductory programming classes (Byrne and Lyons 2001).

Positive Reinforcement

Another method of intervention that has shown success is providing the student with positive feedback and encouragement. One study required students in an introductory physics class to write down their most important values in affirmation. In this study there was significant difference in the test results of the women who participated and whom ultimately outperformed the males in the class (Miyake et al. 2010). Positive affirmations have been shown to work with women in other academic settings as well, where they are they are the minority in the gender dominated majors (Walton et al. 2015).

In another approach parents were encouraged to speak with their children about the importance of taking math and science in high school, which had the effect of significantly enrolling more students in those types of classes (Harackiewicz et al. 2012). Fostering these positive value beliefs in the sciences has been shown to benefit all students, but in particular the female students received the most benefit from this type of intervention (Gaspard et al. 2015).

Mentors

Studies have shown that when women have the opportunity to interact with their peers and discuss academic and career issues, they are more likely to do better in school and have a more positive expectation for their professional outcome (Szelényi et al. 2013). One study found that the female students really appreciated the collaboration and the online environment that allowed them to participate in a safe environment and ask questions without fear of feeling ignorant, which enhanced their experience (Rich et al. 2004). When girls are allowed to work in teams with more advanced students, a natural mentor/partner relationship develops which provides positive results to both parties in the equation (Alvarado et al. 2012). By providing the opportunity for students to meet with their peers we hoped to provide the positive impact that the literature speaks of.

Role-Models

Much of the literature proposes role-models or mentors as a solution in the recruitment, retention and general encouragement of the females in STEM fields, both as students and in the workplace (Orser et al. 2012; Whitney et al. 2013) Mentorship has been framed as a way to improve students' leadership abilities and encourages a developmental relationship between the mentee and the mentor (Campbell et al. 2012).

In one article, the author claimed that young women seeing other successful women could change the societal constraints discouraging women from STEM careers in the next generation (Stout et al. 2011). One high school girl said, "Meeting the industry women inspired me to look ahead with optimism to feel confident that I can do whatever I want…" after meeting computer science women acting as role models (Jepson and Perl 2002).

Summary

This literature review addressed the reasons why it is more beneficial to have gender balanced teams due to the wider breadth of solutions and improved financial outcomes. We showed different reasons why women may be underrepresented, including dealing with negative peer pressure and gender bias. We also looked at issues around the lack of knowledge and the lack of academic preparation that may be holding women back from majoring in MIS. In conclusion we looked at some of the prior interventions that have been attempted to affect change in this area as we now move onto to address the interventions that we undertook in our attempts to see more women enrolled in MIS.

CHAPTER 3
METHODS

This study takes an experimental approach to examine the issue of whether more students, and specifically more women can be encouraged to select MIS as their major of study in the College of Business. Defined Interventions were taken with students and a survey tool was used to gauge the impact of the interventions on students and their intentions to major in information systems.

To measure the impact that the interventions may have had on students' choice to major in MIS, a survey was administered at the beginning of the semester and then again at the completion of the semester. A Chi-Square test was conducted on the results to analyze the student's intentions between the beginning and the end of the semester in order to determine if the female students' opinion about MIS had changed after exposure to the overall class and the specific treatment that the student completed.

Treatments

The literature has put forth many suggestions as to how to correct the disparity of women selecting to major in STEM related majors. For this experiment four different treatments were offered to the students In an effort to determine if any direct actions in an introductory information systems class would have an impact on students', and specifically women's, intent to major in the college of business's MIS degree program.

These interventions were completed by incoming students in an introductory IS101 computer class, which is required for all students seeking a business major. The interventions consisted of four different projects, one of which the students were tasked with completing during the course of the semester. The projects were: write a term paper about MIS, complete an Excel workbook project, meet with student mentors, and meet with professionals from the industry. The students, divided by gender, self-selected into the project they wished to complete for the semester. Each project was capped to a specific number of students, to ensure an even distribution of students of both genders in all projects.

TERM PAPER

Students were asked to write a four page term paper (not including bibliography) properly cited, which addressed specific questions about the IT professionals and type of work professionals do in order to help the students become more familiar with the IT professionals, their job responsibilities, and their workplace.

The below questions were required to be answered in the course of the term paper. For ease in grading the students were also required to submit a bullet-point table with their term paper that indicated where in the paper each of the questions were answered.

1. What do IT professionals do? Do all professionals work in the same type of job, or are their several categories of jobs? Are most of these jobs at the same level of an organization chart, or are some jobs higher than others?
2. How much training do IT professionals need? What skills are required by IT professionals? Do most such professionals need a bachelor's degree in computer science, or do training needs vary by job, company, or some other criteria?
3. How much money do IT professionals earn? Do all IT workers earn about the same amount, or do their salaries vary from person to person? Are there any hourly workers? Do IT salaries vary by type of job or by area of the country? How do these salaries compare to other professional jobs like accounting?
4. Are there professional certifications that IT personnel can obtain? What organizations administer these certifications? What are the requirements for maintaining these certifications, are there continuing credits needed?

5. What are some of the concerns about gender in the IT workplace? Why are they concerns? What are businesses doing to address them?

The correct answers to the above questions were worth 60% of the project grade. The answers in the term paper were evaluated on a 0 – 5 point scale: Missing = 0, Poor = 1-2 Correct, Average = 3 Correct, Good = 4 Correct, and Excellent = 5 Correct.

Providing the correct citations and bibliography entries was worth 20% of the students' grade for this project. The final 20% of the grade was based on proper mechanics of the writing such as grammar, spelling, punctuations, etc.

EXCEL WORKBOOK PROJECT

Students were asked to complete an Excel workbook project based on a scenario that they were working as part of a group of personal trainers at a local gym with a goal of helping people lose a significant amount of weight. The students were supplied with the beginning data in an Excel workbook and asked to answer the below questions using the various tools available in the software to come to their conclusions.

1. Which participant lost the most weight between July and September?
2. What was the most successful month in terms of overall weight loss from all participants?
3. Using an IF statement, add a column to the "Weigh-Ins" tab entitled "Goal Attainment". Show a value of "Met Goal" for participants that succeeded and "Did Not Meet Goal" for participants that did not succeed.
4. For each user, calculate the total amount of weight lost in months where they met or exceeded their Monthly Fuel Points Goal.
5. Which activity accounted for the most calories burned over the course of the year?

6. Which trainer accounted for the most weight lost over the course of the year?
7. Show a count of the intensity levels reached for each user for the entire year.
8. Did males or females experience the most weight loss in terms of average percentage of weight lost over the course of the year?
9. Create a 3-D clustered column chart that shows the total amount of weight loast by all users per month.
10. Create a 3-D pie chart which shows the percentage of weight that each participant lost in relation to the group as a whole.
11. Create a 2-D Line chart with Markers that plots the selected participants starting weight and every weigh-in from January through December.

Answering the above questions correctly was worth 80% of the project grade. The responses were evaluated on a scale of Missing to Excellent: Missing = 0 Correct, Poor = 1-3 Correct, Average = 4-6 Correct, Good = 6—9 Correct, and Excellent = 10-11 Correct.

In addition to completing the Excel workbook, students were also required to write a 1-2 page report worth 15% of the project grade. The report was to be an executive-type summary detailing the results for an upper level management audience. The report was evaluated on a scale of 0 – 4: Missing = 0, Poor = 1, Average = 2, Good = 3, and Excellent = 4.

The final 5% of the project grade was recommendations included in the above report which would discuss additional data points that could be collected with similar technology with the goal of enhancing the end-user’s health. These recommendations were evaluated on the same 0 – 4 point scale used for the report.

STUDENT MENTOR

Advanced-level students from among the Information Systems student population were assigned as student mentors to different groups of incoming students from the IS101 class, female mentors were assigned to female students and male mentors were assigned to the male students from the class. The mentors met regularly throughout the semester with their student groups at scheduled meetings.

Attendance at the group meetings was worth 60% of the student's grade for this project, with students required to attend at least four of the five one-hour meetings in order to obtain full credit for the project. In addition students were required to write four journal entries of approximately 250 words in length detailing what they learned from each meeting worth 20% of the project. The completed journal entries were evaluated on a scale of 0 – 4: Missing = 0, Poor = 1, Average = 2, Good = 3, and Excellent = 4. The journal entries were to contain one entry per meeting and relate what the student learned from their mentors based on the below questions.

1. What classes are required to become an Information Systems professional?
2. What types of activities are completed in an Information Systems class?
3. What prerequisite preparation is needed to succeed in an Information Systems class?
4. How do the study techniques that you actually used in high school differ from those required to succeed in college?
5. What kinds of study techniques help students succeed in Information Systems classes?
6. What are the general policies required in Information Systems classes, (homework, attendance, hours of work, etc.)?
7. Is it necessary to work as part of a group in all Information Systems classes?
8. How much experience with computers do other students have when they start a degree in Information Systems?

9. What is the background of the mentor you are meeting with, (did they start college intending to major in Information Systems, did they work with computers in high school, what are their favorite classes, etc.)?
10. How do the classes for an Information Systems professional differ from those required for a computer scientist?
11. What careers are available for students majoring in Information Systems?
12. Are there any clubs/student organizations available for students majoring in Information Systems?
13. What activities should the student do to make themselves more employable after graduation?
14. Do you need to know about different types of computers to be successful in an Information Systems major?

The final 20% of the students' grade for this project was based on the student submitting a table that indicated the location where each of the questions noted above were discussed in their journals.

IT PROFESSIONAL

Professionals from the IT community volunteered their time to speak with the students in one-hour Q&A sessions. The professionals related their experiences and the particular paths they took to become IT professionals. The sessions were conducted over an eight week period and were segregated by gender with female professionals speaking with the female students and male professionals speaking with the male students.

Attendance was worth 60% of the grade for this project and students were required to attend at least four sessions in order to receive full credit. For each missed session students lost 15% of the points for this project.

Students were required to write a report for this project between 1,200-1,600 words worth 25% of the points for the project. The report was evaluated based on a scale of 0 – 4: Missing = 0, Poor = 1, Average = 2, Good = 3, and Excellent = 4. The report was to contain a different section for each professional with the professionals responses to the below questions along with the students view of the professional and what they might have learned that they can apply to themselves.

1. What is the professional's career journey-line?
2. How does the professional stay current with technology?
3. What are the basic company statistics where the professional is currently working?
4. What type of networking events has the professional attended or do they plan to attend?
5. What opportunities have the professionals taken to give back to the community?
6. What are the professionals' career goals for the future?
7. What does a typical day/week look like for the professional?
8. What part of their job would the professional change if they could?
9. What current issues are facing the professional?
10. How does their family life impact their work life and vice versa?

The final 15% of the students' grade for this project was based on the student submitting a table that indicated the paragraph location for each of the questions which was discussed in their report.

There were a total of seven women professionals who came to the University to speak with the female students from the IS101 class. Their professions ranged from applications specialist and analyst employed by the University system to IT managers and system analysts employed by various companies from the community. Their individual years of experience ranged from 10 years to over 30 years in the IT field.

Six of the women professionals spoke at two different sessions, while one professional only spoke at one session. Most sessions were evenly attended with 24 female students attending at the heaviest attending of the sessions and four female students attending at the least attending of the sessions. The attendance averaged out to about 17 female students getting the chance to hear each women professional speak.

In all 21 of the female students attended four separate sessions with professionals as required. Ten of the female students attended three sessions with two attending only two sessions and one female student attending only one session.

There were a total of eight male professionals who came to the University to speak with the male students from the IS101 class. Their professions ranged from security consultants and analyst, to systems engineers and applications specialist. Their individual years of experience ranged from three years to just over 15 years of experience in the IT field.

Six of the male professionals spoke at two different sessions, while three of professionals only spoke at one session. The level of attendance at these sessions were mixed with two and three male students at a couple of sessions with 31 male students attending one of the last available sessions. An average of about 30 male students were able to hear three of the male professionals speak. With an average of about 10 male students being able to hear the other five male professionals speak.

In all 11 of the male students attended four separate sessions with professionals as required. There were 23 male students who attended three separate sessions. While 12 male students attended two sessions and 12 male students attending only one session.

<u>Survey</u>

The survey consisted of questions about the student's intended major or likely major and the reason that they were taking the class. Many of the questions used a Likert scale to gauge how the students felt about different areas concerning the information systems profession. The final survey had two additional questions about which specific project the students selected and whether completing the project or the course had any impact on the decisions they had made about a career in information systems.

The initial survey was administered at the beginning of the semester to the incoming students of the introductory IS101 computer class before the students had any exposure to the treatments. The survey was administered through Web Campus (online academic tool) where the students completed the survey through the web. The students had two days to complete the survey before it was made unavailable to them.

The survey questions being analyzed for this paper from the initial survey are:

1. Gender: M/F
2. How likely is it that you will declare a major in information systems?

   - Won't major in IS
   - Probably won't major in IS
   - Might major in IS
   - Likely major in IS
   - Very Likely major in IS
3. How likely is it that you will declare a minor in information systems?

   - Won't minor in IS
   - Probably won't minor in IS
   - Might minor in IS
   - Likely minor in IS
   - Very Likely minor in IS

The final survey was administered to the students via Web Campus after the students' projects were completed at the end of the semester. The students again had two days within which to complete the survey. In addition to the three questions above, two additional questions were added to the survey and are being analyzed as a part of this paper.

4. Which project did you select to complete for this exercise?

   - Term Paper

   - Excel Workbook Project

   - Meet with a Student Mentor

   - Meet with Professionals from the community

5. I feel that the project has positively changed my perceptions of having a career in information systems.

   - Strongly Agree

   - Agree

   - Neutral

   - Disagree

   - Strongly Disagree

CHAPTER 4
RESULTS

The focus of this experiment was to determine if more women could be encouraged to select a major or minor in information systems in the College of Business at a Western state university. The experiment focused on projects completed by two sections of an introductory computer class during a single semester at the school. The data results are for the subset of students who agreed to participate in the study.

The projects consisted of either the Term Paper – Project A, Excel Workbook Project – Project B, Meeting with a student mentor – Project C, or Meeting with a professional from the IT community – Project D. We looked at both the women's responses to the question of intent to Major in IS and their intent to Minor in IS after completing the projects.

There were a total of 239 students who completed the survey at the beginning of the semester and 149 students who completed the survey at the end of the semester. Of the students completing the survey at the end of the semester, 108 gave permission to have their results used as part of this research project. The breakdown showed that 56 Women agreed to participate with 52 Men agreeing to participate. Of the 56 women 15 completed the Term Paper project, 13 completed the Excel workbook project, 14 agreed to meet with student mentors and 14 met with professionals from the IT community. Of the 52 male students who agreed to participate, 20 completed the Term Paper project, 11 completed the Excel workbook project, 14 agreed to meet with student mentors, and 7 met with professionals from the IT community.

Row Labels	Count of Students
Female	**56**
Project A - Term Paper	15
Project B - Excel Project	13
Project C - Meet with a Mentor	14
Project D - Meet Professionals from the Community	14
Male	**52**
Project A - Term Paper	20
Project B - Excel Project	11
Project C - Meet with a Mentor	14
Project D - Meet Professionals from the Community	7
Grand Total	**108**

We used a Chi-Square test to determine if the hypothesis that intervention in the introductory class had a positive impact on the female students and their intention to major in information systems. The questions in the initial survey being analyzed are about the students intentions to major or minor in information systems, "How likely is it that you will declare a major in information systems?" and "How likely is it that you will declare a minor in information systems?"

The equation listed below represents the Chi-Square test that was used. The results of a Chi-Square test are considered significant if the results are less than .05. For all the tests completed for each of the projects, considering both intent to major and intent to minor, only Project D had significant results and then only for the intent to major in information systems.

$$x^2 = \sum \left(\frac{Observed\ Value - Expected\ Value}{Expected\ Value} \right)^2$$

The x^2 value is summarized for all the projects in the below table for the women's response to the survey question about whether they intend to major or minor in MIS. The Chi-Square value for Project C for students considering a minor in information systems resulted in a divide-by-zero error and is therefore unavailable.

	Major	Minor
Project A	0.591840772	0.964246814
Project B	0.990084904	0.97601019
Project C	0.860983591	n/a
Project D	0.044621499	0.321249608

As the data analysis above shows, there was no significant change in student's intentions to major or minor in information systems, except for the group who attended the professional sessions working on Project D. Their intent to major showed significant change toward the positive from the beginning of the semester to the end. There were also some positive comments heard from students who had the opportunity to speak with professionals in the community, which provided some anecdotal corroboration to the Chi-Square test results.

The following tables show the counts represented by project for the women responding to the survey questions which were included in the analysis. Unanswered results were not included as part of the counts for the observed values or expected values (not all students responded to both questions in the survey). The Begin column represents the student's response to the survey questions at the beginning of the semester and the End column represents their response to the same questions at the end of the semester concerning their intention to major or minor in MIS, after treatments were completed.

Project A	**Major**			**Minor**		
	Begin	**End**	**Total**	**Begin**	**End**	**Total**
Very Likely major in IS		1	**1**			**0**
Likely major in IS	2		**2**	1	2	**3**
Might major in IS		2	**2**	2	2	**4**
Probably won't major in IS	4	4	**8**	6	6	**12**
Won't major in IS	12	9	**21**	8	6	**14**
Total	**18**	**16**	**34**	**17**	**16**	**33**

Project B

	Major			Minor		
	Begin	End	Total	Begin	End	Total
Very Likely major in IS	1	1	**2**			**0**
Likely major in IS			**0**	1		**1**
Might major in IS	2	1	**3**	3	3	**6**
Probably won't major in IS	5	5	**10**	6	5	**11**
Won't major in IS	9	7	**16**	7	5	**12**
Total	**17**	**14**	**31**	**17**	**13**	**30**

Project C

	Major			Minor		
	Begin	End	Total	Begin	End	Total
Very Likely major in IS			**0**			**0**
Likely major in IS			**0**	2	1	**3**
Might major in IS	3	2	**5**	2	2	**4**
Probably won't major in IS	6	3	**9**	8	5	**13**
Won't major in IS	8	10	**18**	5	7	**12**
Total	**17**	**15**	**32**	**17**	**16**	**32**

Project D

	Major			Minor		
	Begin	End	Total	Begin	End	Total
Very Likely major in IS	2		**2**	2	1	**3**
Likely major in IS	2	2	**4**	1	4	**5**
Might major in IS	1	1	**2**	3	2	**5**
Probably won't major in IS	4	10	**14**	5	5	**10**
Won't major in IS	9	19	**10**	7	2	**9**
Total	**18**	**14**	**34**	**18**	**16**	**32**

There was one other data set that was compared, which was the female students' response to the survey question, "I feel that the project has positively changed my perceptions about having a career in Information Systems." The responses, (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree), to the question where assigned numeric values 5-1 for comparison. All of this data was from the survey administered at the completion of the semester. The table below represents the results of a simple Average test where a "3" is considered a neutral response.

	Total	Count	Average
Project A	78	18	**4.333333**
Project B	38	17	**2.235294**
Project C	68	17	**4**
Project D	70	18	**3.888889**

For project "A" 18 women responded that they Agreed or Strongly Agree that the completion of the Term paper positively changed their perceptions about having a career in IS. Project "C" and "D" had similar high response with 17 women for project "C", and 18 women for project "D" feeling that they Agreed that meeting with their peers or meeting with professionals had a positive impact on their perceptions about having a career in IS. The 17 women who completed project "B" and responded to this question on the survey Disagreed about having a more positive perception of careers in IS.

The positive aspect reported here in the survey data and feedback received from the students participating in the project has contributed to our belief that exposing the students at younger ages to the technology field will have more of an impact on them when it does some time to select a major or minor in information systems.

CHAPTER 5

CONCLUSION, LIMITATIONS, AND FUTURE DIRECTIONS

This research examined the ability to change student's decisions about majoring or minoring in information systems through a series of experiments conducted within the class. This study used an experimental method approach looking at popular literature beliefs about the lack of women in information systems. Different projects were completed by the students attending an introductory Computer Information System (CIS) class in the college of Business at a western state school. The students self-selected the type of project that they would complete for the semester, with each project limited to a set number of students to ensure a balance of students in each project group. The impact of these treatments was measured by a survey that was administered to the students at the beginning of the semester, before the introduction of the projects, and then administered again at the end of the semester, after completion of the projects by the students.

The purpose of this experiment was to see if empirical evidence can support the claims made in the literature on how to improve the issue of encouraging more women to select IT majors. Claims like mentoring and providing good role models. Claims like being more informed or having more practice in the skill.

As the results of the experiment stated, there were limited discernably change in the attitudes and intentions of the students to elect a major or a minor in information system. Only those female students who attending sessions with professional speakers indicated that they would be more likely to major in information systems.

Positive change of a more general nature was noted from the students who completed the term paper project, met with peers, or met with professionals all of which led the students to state that they had a more positive attitude about the information systems field in general. In this particular experiment the students who completed an Excel coding project reported a somewhat negative change in their views of the information systems field.

Limitations

One limitation of the experiment was the small sample set that was used. The experiment was conducted over a single semester and the pool of students used in the experiment was limited to the two sections of the introductory computing class that was being offered that semester. Further since this study is primarily focused on the results of the women only about half of the student's results were considered in the results for this experiment. The count of available women was further dispersed when divided into the four separate projects limiting the final sample size for each project.

Another limitation to this study is the single point in time from which this study was conducted. With the experiment lasting only a single semester there are many outside factors that could have impacted these particular students at this particular point-in-time to elicit the results that were produced in the study.

Future Research

Tracking the students over a broader period of time may yield more insightful results about the interventions that were undertaken in their introductory information system class and their success in actually encouraging more students to major or minor in information systems. Conducting experimentation with a larger sample size may also show a more accurate representation as to the effectiveness of the individual treatments on a student's intentions.

Based on the findings and information from the literature review, this type of impact on student's, (specifically young girls), attitudes towards pursuing a career in information systems should be approached at a sooner point in the young girls education, before bias and ingrained behavior have had a chance to impact their decisions. By the time the students reach their freshman year of college, they have often already made academic decisions, or lack the necessary high-school classes to support a major or minor information systems. Conducting experiments in high-school or middle-school may provide a better insight into the ability of impacting a women's choice to major in information systems by reaching them at more impressionable ages.

REFERENCES

2012. "Computer and Informaiton Technology Occupations: Occupational Outlook Handbook," *Bureau of Labor Statistics*).

2014. "Labor Force Statistics from the Current Population Survey,").

Adams, J. C. 2007. "Alice, Middle Schoolers & the Imaginary Worlds Camps," *ACM SIGCSE Bulletin*: ACM, pp. 307-311.

Agosto, D., Gasson, S., and Atwood, M. 2008. "Changing Mental Models of the It Professions: A Theoretical Framework," *Journal of Information Technology Education: Research* (7:1), pp. 205-221.

Al-Bow, M., Austin, D., Edgington, J., Fajardo, R., Fishburn, J., Lara, C., Leutenegger, S., and Meyer, S. 2009. "Using Game Creation for Teaching Computer Programming to High School Students and Teachers," *ACM SIGCSE Bulletin* (41:3), pp. 104-108.

Alvarado, C., Dodds, Z., and Libeskind-Hadas, R. 2012. "Increasing Women's Participation in Computing at Harvey Mudd College," *ACM Inroads* (3:4), pp. 55-64.

Anelli, M., and Giovanni Peri. 2013. "Peer Gender Composition and Choice of College Major," *National Bureau of Economic Research* (w18744).

Badal, S., and Harter, J. K. 2014. "Gender Diversity, Business-Unit Engagement, and Performance," *Journal of Leadership & Organizational Studies* (21:4), pp. 354-365.

Balcita, A. M., Carver, D. L., and Soffa, M. L. 2002. "Shortchanging the Future of Information Technology: The Untapped Resource," *ACM SIGCSE Bulletin* (34:2), pp. 32-35.

Barakat, S. M., Yaghi, K., and Hamdan, Z. 2011. "Mis Students Perception of Most Wanted Mis Job Market Skills," *Computer and Information Science* (4:3), p. p33.

Barr, V., and Stephenson, C. 2011. "Bringing Computational Thinking to K-12: What Is Involved and What Is the Role of the Computer Science Education Community?," *ACM Inroads* (2:1), pp. 48-54.

Baruch, R. 2014. "Women and Information Technology: How Do Female Students of Education Perceive Information Technology, and What Is Their Approach toward It?," *Journal of International Women's Studies* (15:1), pp. 190-214.

Baskerville, R. L., and Myers, M. D. 2002. "Information Systems as a Reference Discipline," *Mis Quarterly*), pp. 1-14.

Bear, J. B., and Woolley, A. W. 2011. "The Role of Gender in Team Collaboration and Performance," *Interdisciplinary science reviews* (36:2), pp. 146-153.

Beede, D., Julian, T., Langdon, D., McKittrick, G., Khan, B., and Doms, M. 2011. "Women in Stem: A Gender Gap to Innovation. Esa Issue Brief# 04-11," *US Department of Commerce*).

Beyer, S., Rynes, K., and Haller, S. 2004. "Deterrents to Women Taking Computer Science Courses," *Technology and Society Magazine, IEEE* (23:1), pp. 21-28.

Bhargava, A., Kirova-Petrova, A., and McNair, S. 1999. "Computers, Gender Bias, and Young Children," *Information Technology in Childhood Education.* (1999), pp. 263-274.

Block, J. H. 1983. "Differential Premises Arising from Differential Socialization of the Sexes: Some Conjectures," *Child development*), pp. 1335-1354.

Booth, A., and Nolen, P. 2012. "Choosing to Compete: How Different Are Girls and Boys?," *Journal of Economic Behavior & Organization* (81:2), pp. 542-555.

Brush, S. G. 1991. "Women in Science and Engineering," *American Scientist*), pp. 404-419.

Buck, G. A., Clark, V. L. P., Leslie-Pelecky, D., Lu, Y., and Cerda-Lizarraga, P. 2008. "Examining the Cognitive Processes Used by Adolescent Girls and Women Scientists in Identifying Science Role Models: A Feminist Approach," *Science Education* (92:4), pp. 688-707.

Byrne, P., and Lyons, G. 2001. "The Effect of Student Attributes on Success in Programming," *ACM SIGCSE Bulletin*: ACM, pp. 49-52.

Campbell, C. M., Smith, M., Dugan, J. P., and Komives, S. R. 2012. "Mentors and College Student Leadership Outcomes: The Importance of Position and Process," *The Review of Higher Education* (35:4), pp. 595-625.

Campbell, L. G., Mehtani, S., Dozier, M. E., and Rinehart, J. 2013. "Gender-Heterogeneous Working Groups Produce Higher Quality Science,").

Carrell, S. E., Fullerton, R. L., and West, J. E. 2008. "Does Your Cohort Matter? Measuring Peer Effects in College Achievement," National Bureau of Economic Research.

Carter, L. 2006. "Why Students with an Apparent Aptitude for Computer Science Don't Choose to Major in Computer Science," *ACM SIGCSE Bulletin* (38:1), pp. 27-31.

Cheryan, S., and Plaut, V. C. 2010. "Explaining Underrepresentation: A Theory of Precluded Interest," *Sex roles* (63:7-8), pp. 475-488.

Cheryan, S., Plaut, V. C., Davies, P. G., and Steele, C. M. 2009. "Ambient Belonging: How Stereotypical Cues Impact Gender Participation in Computer Science," *Journal of personality and social psychology* (97:6), p. 1045.

Choudhury, V., Lopes, A. B., and Arthur, D. 2010. "It Careers Camp: An Early Intervention Strategy to Increase Is Enrollments," *Information Systems Research* (21:1), pp. 1-14.

Clark Blickenstaff*, J. 2005. "Women and Science Careers: Leaky Pipeline or Gender Filter?," *Gender and education* (17:4), pp. 369-386.

Coger, R. N., Cuny, J., Klawe, M., McGann, M., and Purcell, K. D. 2012. "Why Stem Fields Still Don't Draw More Women," *Chronicle of Higher Education* (59:10), pp. B24-B27.

Cooper, J. 2006. "The Digital Divide: The Special Case of Gender," *Journal of Computer Assisted Learning* (22:5), pp. 320-334.

Correll, S. J. 2004. "Constraints into Preferences: Gender, Status, and Emerging Career Aspirations," *American Sociological Review* (69:1), pp. 93-113.

Crisp, G., Nora, A., and Taggart, A. 2009. "Student Characteristics, Pre-College, College, and Environmental Factors as Predictors of Majoring in and Earning a Stem Degree: An Analysis of Students Attending a Hispanic Serving Institution," *American Educational Research Journal* (46:4), pp. 924-942.

Croasdell, D., McLeod, A., and Simkin, M. G. 2011. "Why Don't More Women Major in Information Systems?," *Information Technology & People* (24:2), pp. 158-183.

De Giorgi, G., Pellizzari, M., and Redaelli, S. 2010. "Identification of Social Interactions through Partially Overlapping Peer Groups," *American Economic Journal: Applied Economics*), pp. 241-275.

Denner, J. 2011. "What Predicts Middle School Girls' Interest in Computing?," *International Journal of Gender, Science and Technology* (3:1).

Denner, J., Werner, L., O'Connor, L., and Glassman, J. 2014. "Community College Men and Women a Test of Three Widely Held Beliefs About Who Pursues Computer Science," *Community College Review*), p. 0091552114535624.

Dezsö, C. L., and Ross, D. G. 2012. "Does Female Representation in Top Management Improve Firm Performance? A Panel Data Investigation," *Strategic Management Journal* (33:9), pp. 1072-1089.

Downey, J., McGaughey, R., and Roach, D. 2011. "Attitudes and Influences toward Choosing a Business Major: The Case of Information Systems," *Journal of Information Technology Education: Research* (10:1), pp. 231-251.

Downey, J. P., McGaughey, R., and Roach, D. 2009. "Mis Versus Computer Science: An Empirical Comparison of the Influences on the Students' Choice of Major," *Journal of Information Systems Education* (20:3), pp. 357-368.

Durndell, A., Glissov, P., and Siann, G. 1995. "Gender and Computing: Persisting Differences," *Educational Research* (37:3), pp. 219-227.
Dweck, C. 2006. *Is Math a Gift? Beliefs That Put Females at Risk*. na.
Ensmenger, N. L. 2012. *The Computer Boys Take Over: Computers, Programmers, and the Politics of Technical Expertise*. Mit Press.
Ficano, C. C. 2012. "Peer Effects in College Academic Outcomes–Gender Matters!," *Economics of Education Review* (31:6), pp. 1102-1115.
Flore, P. C., and Wicherts, J. M. 2014. "Does Stereotype Threat Influence Performance of Girls in Stereotyped Domains? A Meta-Analysis," *Journal of School Psychology*).
Gaspard, H., Dicke, A.-L., Flunger, B., Brisson, B. M., Häfner, I., Nagengast, B., and Trautwein, U. 2015. "Fostering Adolescents' Value Beliefs for Mathematics with a Relevance Intervention in the Classroom,").
Gerver, E. 1986. "The under-Representation of Women in Computing," *Open Learning* (1:2), pp. 28-32.
Good, C., Rattan, A., and Dweck, C. S. 2012. "Why Do Women Opt Out? Sense of Belonging and Women's Representation in Mathematics," *Journal of personality and social psychology* (102:4), p. 700.
Green, A., and Sanderson, D. 2014. "Steps to Success: An Analysis of Persistence and Attainment in Stem Majors," *Available at SSRN 2451256*).
Han, L., and Li, T. 2009. "The Gender Difference of Peer Influence in Higher Education," *Economics of Education review* (28:1), pp. 129-134.
Harackiewicz, J. M., Rozek, C. S., Hulleman, C. S., and Hyde, J. S. 2012. "Helping Parents to Motivate Adolescents in Mathematics and Science an Experimental Test of a Utility-Value Intervention," *Psychological Science*), p. 0956797611435530.
Hatmaker, D. M. 2013. "Engineering Identity: Gender and Professional Identity Negotiation among Women Engineers," *Gender, Work & Organization* (20:4), pp. 382-396.
Herring, C. 2009. "Does Diversity Pay?: Race, Gender, and the Business Case for Diversity," *American Sociological Review* (74:2), pp. 208-224.
Hewlett, S. A. 2008. *The Athena Factor: Reversing the Brain Drain in Science, Engineering, and Technology*. Harvard Business School.
Hill, C., Corbett, C., and St Rose, A. 2010. *Why So Few? Women in Science, Technology, Engineering, and Mathematics*. ERIC.
Hoogendoorn, S., Oosterbeek, H., and Van Praag, M. 2013. "The Impact of Gender Diversity on the Performance of Business Teams: Evidence from a Field Experiment," *Management Science* (59:7), pp. 1514-1528.
Huang, C. 2013. "Gender Differences in Academic Self-Efficacy: A Meta-Analysis," *European journal of psychology of education* (28:1), pp. 1-35.
Huffman, A. H., Whetten, J., and Huffman, W. H. 2013. "Using Technology in Higher Education: The Influence of Gender Roles on Technology Self-Efficacy," *Computers in Human Behavior* (29:4), pp. 1779-1786.
Jepson, A., and Perl, T. 2002. "Priming the Pipeline," *ACM SIGCSE Bulletin* (34:2), pp. 36-39.
Joshi, K. D., and Schmidt, N. L. 2006. "Is the Information Systems Profession Gendered?: Characterization of Is Professionals and Is Career," *ACM SIGMIS Database* (37:4), pp. 26-41.
Kaspura, A. 2012. "The Engineering Profession: A Statistical Overview,").
Kay, J., Lublin, J., Poiner, G., and Prosser, M. 1989. "Not Even Well Begun: Women in Computing Courses," *Higher Education* (18:5), pp. 511-527.
Kim, D., Markham, F. S., and Cangelosi, J. D. 2002. "Why Students Pursue the Business Degree: A Comparison of Business Majors across Universities," *Journal of Education for Business* (78:1), pp. 28-32.

Klawe, M. 2002. "Girls, Boys, and Computers," *ACM SIGCSE Bulletin* (34:2), pp. 16-17.

Koopmann, A. F. 2014. "A Model for First-Generation Students Least Likely to Engage in High-Impact Practices: A Mixed Methods Study,").

Kuechler, W., McLeod, A., and Simkin, M. G. 2009. "Filling the Pipeline for Is Professionals: What Can Is Faculty Do?," *Journal of Information Systems Education* (20:4), p. 407.

Laudon, K. C., Laudon, J. P., and Brabston, M. E. 2012. *Management Information Systems: Managing the Digital Firm*. Pearson.

Lee, Y., and Lee, S. J. 2006. "The Competitiveness of the Information Systems Major: An Analytic Hierarchy Process," *Journal of Information Systems Education* (17:2), p. 211.

Leppel, K., Williams, M. L., and Waldauer, C. 2001. "The Impact of Parental Occupation and Socioeconomic Status on Choice of College Major," *Journal of Family and Economic Issues* (22:4), pp. 373-394.

Lewis, T. L., and Smith, W. J. 2005. "The Computer Science Debate: It's a Matter of Perspective," *ACM SIGCSE Bulletin* (37:2), pp. 80-84.

Maltese, A. V., and Tai, R. H. 2011. "Pipeline Persistence: Examining the Association of Educational Experiences with Earned Degrees in Stem among Us Students," *Science Education* (95:5), pp. 877-907.

Maple, S. A., and Stage, F. K. 1991. "Influences on the Choice of Math/Science Major by Gender and Ethnicity," *American Educational Research Journal* (28:1), pp. 37-60.

Miura, I. T. 1987. "The Relationship of Computer Self-Efficacy Expectations to Computer Interest and Course Enrollment in College," *Sex Roles* (16:5-6), pp. 303-311.

Miyake, A., Kost-Smith, L. E., Finkelstein, N. D., Pollock, S. J., Cohen, G. L., and Ito, T. A. 2010. "Reducing the Gender Achievement Gap in College Science: A Classroom Study of Values Affirmation," *Science* (330:6008), pp. 1234-1237.

Moorman, P., and Johnson, E. 2003. "Still a Stranger Here: Attitudes among Secondary School Students Towards Computer Science," *ACM SIGCSE Bulletin*: ACM, pp. 193-197.

Neuburger, S., Ruthsatz, V., Jansen, P., and Quaiser-Pohl, C. 2015. "Can Girls Think Spatially? Influence of Implicit Gender Stereotype Activation and Rotational Axis on Fourth Graders' Mental-Rotation Performance," *Learning and Individual Differences* (37), pp. 169-175.

Nguyen, H.-H. D., and Ryan, A. M. 2008. "Does Stereotype Threat Affect Test Performance of Minorities and Women? A Meta-Analysis of Experimental Evidence," *Journal of Applied Psychology* (93:6), p. 1314.

Nishii, L. H. 2013. "The Benefits of Climate for Inclusion for Gender-Diverse Groups," *Academy of Management Journal* (56:6), pp. 1754-1774.

Noël, N. M., Michaels, C., and Levas, M. G. 2003. "The Relationship of Personality Traits and Self-Monitoring Behavior to Choice of Business Major," *Journal of education for business* (78:3), pp. 153-157.

Nosek, B. A., Smyth, F. L., Sriram, N., Lindner, N. M., Devos, T., Ayala, A., Bar-Anan, Y., Bergh, R., Cai, H., and Gonsalkorale, K. 2009. "National Differences in Gender–Science Stereotypes Predict National Sex Differences in Science and Math Achievement," *Proceedings of the National Academy of Sciences* (106:26), pp. 10593-10597.

Orser, B., Riding, A., and Stanley, J. 2012. "Perceived Career Challenges and Response Strategies of Women in the Advanced Technology Sector," *Entrepreneurship & Regional Development* (24:1-2), pp. 73-93.

Parlante, N. 2005. "What Is Computer Science?," *ACM SIGCSE Bulletin* (37:2), pp. 24-25.

Petter, S., DeLone, W., and McLean, E. R. 2012. "The Past, Present, and Future of “Is Success”," *Journal of the Association for Information Systems* (13:5).

Picho, K., Rodriguez, A., and Finnie, L. 2013. "Exploring the Moderating Role of Context on the Mathematics Performance of Females under Stereotype Threat: A Meta-Analysis," *The Journal of social psychology* (153:3), pp. 299-333.

Pitt, L. F., Watson, R. T., and Kavan, C. B. 1995. "Service Quality: A Measure of Information Systems Effectiveness," *MIS quarterly*), pp. 173-187.

Porter, S. R., and Umbach, P. D. 2006. "College Major Choice: An Analysis of Person–Environment Fit," *Research in Higher Education* (47:4), pp. 429-449.

Rettenmayer, J., Berry, R., and Ellis, S. 2007. "The Image of the Information System Profession: An Investigation of Gender Differences," *Journal of Computing Sciences in Colleges* (22:5), pp. 46-51.

Rich, L., Perry, H., and Guzdial, M. 2004. "A Cs1 Course Designed to Address Interests of Women," *ACM SIGCSE Bulletin*: ACM, pp. 190-194.

Richard, O. C., Kirby, S. L., and Chadwick, K. 2013. "The Impact of Racial and Gender Diversity in Management on Financial Performance: How Participative Strategy Making Features Can Unleash a Diversity Advantage," *The International Journal of Human Resource Management* (24:13), pp. 2571-2582.

Riegle-Crumb, C., King, B., Grodsky, E., and Muller, C. 2012. "The More Things Change, the More They Stay the Same? Prior Achievement Fails to Explain Gender Inequality in Entry into Stem College Majors over Time," *American Educational Research Journal* (49:6), pp. 1048-1073.

Sadler, P. M., Sonnert, G., Hazari, Z., and Tai, R. 2012. "Stability and Volatility of Stem Career Interest in High School: A Gender Study," *Science Education* (96:3), pp. 411-427.

Schäfer, A. I. 2006. "A New Approach to Increasing Diversity in Engineering at the Example of Women in Engineering," *European Journal of Engineering Education* (31:6), pp. 661-671.

Scott, C., Fuller, M. A., MacIndoe, K. M., and Joshi, K. 2009. "More Than a Bumper Sticker: The Factors Influencing Information Systems Career Choices," *Communications of the Association for Information Systems* (24:1), p. 2.

Scragg, G., and Smith, J. 1998. "A Study of Barriers to Women in Undergraduate Computer Science," *ACM SIGCSE Bulletin*: ACM, pp. 82-86.

Scutt, M., Gilmartin, S., Sheppard, S., and Brunhaver, S. 2013. "Research-Informed Practices for Inclusive Science, Technology, Engineering, and Math (Stem) Classrooms: Strategies for Educators to Close the Gender Gap," *Am Soc Engineering Educ*).

SECRETARY, N. O. 2005. "Scientist; Founder of Systers," *The Internet: Biographies*), p. 28.

Smith, J. L., Lewis, K. L., Hawthorne, L., and Hodges, S. D. 2013. "When Trying Hard Isn't Natural Women's Belonging with and Motivation for Male-Dominated Stem Fields as a Function of Effort Expenditure Concerns," *Personality and Social Psychology Bulletin* (39:2), pp. 131-143.

Spertus, E. 1991. "Why Are There So Few Female Computer Scientists?,").

Stout, J., and Camp, T. 2014. "Now What?: Action Items from Social Science Research to Bridge the Gender Gap in Computing Research," *ACM SIGCAS Computers and Society* (44:4), pp. 5-8.

Stout, J. G., Dasgupta, N., Hunsinger, M., and McManus, M. A. 2011. "Steming the Tide: Using Ingroup Experts to Inoculate Women's Self-Concept in Science, Technology, Engineering, and Mathematics (Stem)," *Journal of personality and social psychology* (100:2), p. 255.

Szelényi, K., Denson, N., and Inkelas, K. K. 2013. "Women in Stem Majors and Professional Outcome Expectations: The Role of Living-Learning Programs and Other College Environments," *Research in Higher Education* (54:8), pp. 851-873.

Taylor, H. G., and Mounfield, L. C. 1994. "Exploration of the Relationship between Prior Computing Experience and Gender on Success in College Computer Science," *Journal of educational computing research* (11:4), pp. 291-306.

Tietjen, J. S. 2004. "Why So Few Women, Still?," *Spectrum, IEEE* (41:10), pp. 57-58.

Trusty, J. 2002. "Effects of High School Course-Taking and Other Variables on Choice of Science and Mathematics College Majors," *Journal of Counseling & Development* (80:4), pp. 464-474.

Varma, R. 2006. "Making Computer Science Minority-Friendly," *Communications of the ACM* (49:2), pp. 129-134.

Von Hellens, L., Clayton, K., Beekhuyzen, J., and Nielsen, S. 2009. "Perceptions of Ict Careers in German Schools: An Exploratory Study," *Journal of Information Technology Education: Research* (8:1), pp. 211-228.

Walstrom, K., and Schambach, T. 2012. "Impacting Student Perceptions About Careers in Information Systems," *Journal of Information Technology Education: Research* (11:1), pp. 235-248.

Walstrom, K. A., Schambach, T. P., Jones, K. T., and Crampton, W. J. 2008. "Why Are Students Not Majoring in Information Systems?," *Journal of Information Systems Education* (19:1), pp. 43-54.

Walton, G. M., Logel, C., Peach, J. M., Spencer, S. J., and Zanna, M. P. 2015. "Two Brief Interventions to Mitigate a “Chilly Climate” Transform Women’s Experience, Relationships, and Achievement in Engineering," *Journal of Educational Psychology* (107:2), p. 468.

Weinberger, C. J. 2004. "Just Ask! Why Surveyed Women Did Not Pursue It Courses or Careers," *Technology and Society Magazine, IEEE* (23:2), pp. 28-35.

Whitney, T., Gammal, D., Gee, B., Mahoney, J., and Simard, C. 2013. "Priming the Pipeline: Addressing Gender-Based Barriers in Computing," *Computer* (46:3), pp. 30-36.

Wikipedia. "Stereotype Threat."

Wolz, U., Ouyang, Y., and Leutenegger, S. 2011. "Scratching the Subject Surface: Infusing Computing into K-12 Curriculum," *Proceedings of the 42nd ACM technical symposium on Computer science education*: ACM, pp. 489-490.

Yeager, D. S., and Dweck, C. S. 2012. "Mindsets That Promote Resilience: When Students Believe That Personal Characteristics Can Be Developed," *Educational Psychologist* (47:4), pp. 302-314.

Young, B. J. 2000. "Gender Differences in Student Attitudes toward Computers," *Journal of Research on Computing in Education* (33:2), pp. 204-216.

Zafar, B. 2009. "College Major Choice and the Gender Gap," *FRB of New York Staff Report*:364).

Zhang, W. 2007. "Why Is: Understanding Undergraduate Students' Intentions to Choose an Information Systems Major," *Journal of Information Systems Education* (18:4), pp. 447-458.

Zur, E., Irani, L., Barker, L., and Guzdial, M. 2005. "Contrasting Women's Experiences in Computer Science at Different Institutions," *ACM SIGCSE Bulletin*: ACM, pp. 63-64.

Zweben, S., and Bizot, B. 2014. "2013 Taulbee Survey," *COMPUTING* (26:5).