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Abstract:

The number of IT professionals in the workplace depends in large part on the number of new university technology graduates, especially in computer science and MIS. Since 2000, this number has declined precipitously, and, despite the modest upswing since 2010-2011, organizations and universities still struggle with numbers. This study examines a partnership between one university and a global IT firm to help increase IT majors through an annual high school IT camp focused on invigorating interest in technology careers. These (hopefully) fun, four-day, in-residence camps, held annually since 2007, feature technology training, appropriate tours, engagement with technology professionals, and education on the nature of IT work and job prospects. Based on extensive data collection from five camps (2010-2014), participants (particularly males) significantly increased their career awareness and positive attitudes toward an IT career and were more determined to choose IT as a major and career. While we did not meet all objectives, the IT camps played a crucial role in boosting interest in IT as a career and enhancing perceptions and beliefs of IT.

Keywords: IT Careers, Technology Camps, Choice of University Major, Number of IT Majors, IT Enrollment.

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1 Introduction

The shortage of qualified information technology (IT) professionals since the turn of the 21st century has been well documented in the literature (Akbulut-Bailey, 2012; Becker, Hassan & Naumann, 2006; Downey, McGaughey & Roach, 2009; Looney & Akbulut, 2007; Whelan & Firth, 2012). As technology becomes ever more critical in both routine operations and strategic initiatives in almost all organizations, organizations' inability to fill their IT manpower requirements has come under increasing scrutiny. The problem is perplexing, particularly in the last ten years. At a time when demand for qualified workers is rapidly increasing, the number of graduating technology majors actually decreased, at least in the U.S. Between 2004 and 2010, the number of U.S. university IT graduates dropped from 59,488 to 39,589 (U.S. Department of Education, 2014). During the same time, unfilled technology jobs continued to be problematic for a wide variety of business organizations.

The number of available IT professionals relies mostly on the ability of colleges and universities to attract and produce technology graduates and on industry's ability to retain these workers. In this study, we examine only the former and, specifically, one U.S. region's attempt to foster more technology majors. It is the story of a working partnership between one university and a large, global data marketing company in which the goals of each intersected to produce a working solution that has helped increase the number of technology majors and, thus, graduates available for hire. This university experienced a rapid and alarming decline in students enrolled in its two technology majors: the majors comprised two of the largest on campus in 2001 but, by 2009, had shed over half their student numbers. At the same time, the data marketing firm suffered a significant shortage of available prospective employees while it was expanding and, thus, needed new technology talent.

The partnership between the company and the university led to their creating an IT career camp, a summer experience for high-achieving high school students from around the state. The camp was first held in the summer of 2007 and has been held each summer since. It is a four-day camp in which students (and faculty and mentors) stay in a dorm on the university campus, participate in some hands-on technology applications, visit technology companies, interact with IT professionals, and learn about careers in information technology. Its primary goal is to increase the number of technology majors and, eventually, technology professionals, including those from the underrepresented female student population. In this study, we empirically examine the success of the camps. In particular, we assess the last five camps held from 2010 to 2014 in which its organizers gathered extensive amounts of data.

While the primary goal of the IT camp is to increase the number of IT majors, we could not track most participants after the camps (we are just now making a concerted effort to do so). Therefore, it is difficult to measure the camp's success based only on number of IT majors given the quantity of outside and confounding influences. While the number of technology majors has risen steadily at this university since 2011, it is not possible to establish causality or even partial causality based on the IT camps that have been held. Instead, we examine several critical factors that are important to prospective students in choosing a college major and, in particular, a technology major. As such, we focus on examining the changes that occurred over the course of individual camps to participant's perceptions, attitudes, and beliefs about IT majors and careers. Such perceptions are critical in which major students choose. Over the course of each camp, the organizers enhanced positive perceptions, attitudes, and beliefs about IT as a career choice by increasing awareness (or dispelling myths) of IT job prospects (job demand, salaries, etc.) and IT work characteristics (interesting, challenging, team-oriented, etc.). We examine these and other beliefs and attitudes in a pre-camp and post-camp methodology to assess each camp's success on enhancing such characteristics. Given that one goal of the camps is to attract females, we divide data by gender as well. For this study, we define a technology major broadly to include both computer science (CS) and management information systems (MIS) majors (these are the only two available at the university). Hence, we do not limit the study to either the CS or MIS factions.

Universities' ability to provide sufficient technology graduates to support business demand is difficult during any time period, especially given the degree of difficulty such majors entail (similar to any STEM major). The events that have occurred from around 2000 in the US and globally (e.g., dot.com bust, recession) have made the challenge even more daunting. While several potential solutions have been offered over the years, the idea of holding IT summer camps has proven to be one successful way to increase majors at a relatively frugal cost in terms of time and money. Such an endeavor can attract students, which is of critical importance to university technology departments (i.e., CS and MIS), and provide a source of manpower for business organizations that require such talent. Given the demand for

IT professionals and the routine shortage of majors and IT employees, this is one approach that may be feasible for some universities.

2 IT Career Camp

Enrollment in information technology (IT) majors at U.S. universities has varied substantially since the establishment of computer science as a major in the late 1960s. Throughout the 1990s, the number of IT majors and degrees awarded rose steeply in part because of the advent of the typically business-based management information systems major in the 1980s and the emergence of the dot.com era in the late 1990s. These numbers continued to rise until around 2005, when they sharply declined through the end of the decade for a variety of reasons, including the dot.com bubble burst. While the numbers have slowly increased since around 2011, the fallout from the significant decline in numbers is still being felt in colleges and universities and in companies that would like to hire technology graduates. Figure 1 displays the number of IT degrees awarded through 2012, the most recent year covered by figures from the U.S. Department of Education (2014). While these numbers represent the number of U.S. graduates, evidence suggests that this is not merely a U.S. phenomenon (Akbulut-Bailey, 2012; Whelan & Firth, 2012).

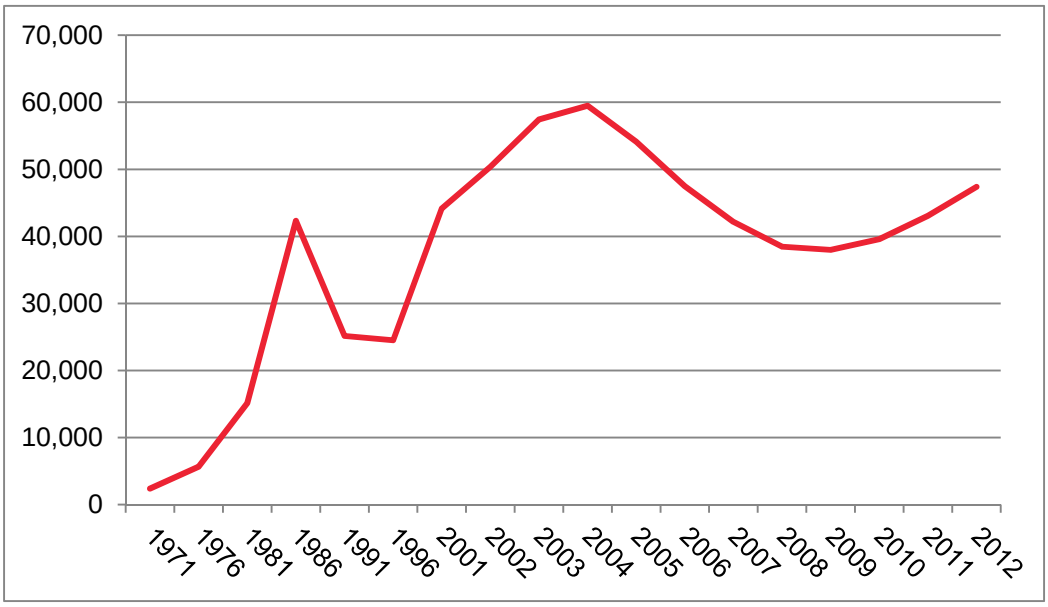

Figure 1. IT Degrees Awarded in US (U.S. Department of Education, 2014)

Despite the upswing in the number of majors since 2011, there is still a vast shortage of qualified IT workers, which academic studies, practitioner literature, popular press, and global government data have reported (Staffing Industry Analysts, 2013; Prince, 2013). According to the U.S. Department of Labor (2012), IT jobs are still among those with the highest growth potential (2012-2022).

This inconsistency between the number of IT professionals and employer needs is the result of a wide variety of issues. Ultimately, the overriding issue is the lack of technology majors in colleges and universities, which supply most of the new IT workers. Central to the issue, therefore, is the question of why students choose the majors they do. The factors influencing which majors student choose is a well-researched topic. Most studies concur that interest in the major and subsequent career is a critical factor (Downey, 2011; Mauldin, Crain, & Mounce, 2000; Moorman & Johnson, 2003). In fact, many studies of business majors have found interest to be the *most important* influence in choice of major (Kim, Markham, & Cangelosi, 2002; Malgwi, Howe & Burnaby, 2005; Strasser, Ozgur & Schroeder, 2002; Zhang, 2007). Other studies have shown interest to be a critical factor in many studies that concentrate on specific majors, including economics (Worthington & Higgs, 2004), marketing (Pappu, 2004), accounting (Mauldin et al., 2000), and MIS/computer science (Downey et al., 2009; Margolis & Fisher, 2002).

But interest is not the only factor—many others influence which major students choose. Students choose majors based on what they believe they are good at or whose areas in which they think they have talent (Carter, 2006). Kim et al. (2002) found that business students tended to pursue a fit with perceived ability, while Farley and Staniec (2004) found that students who believed they had high technical abilities (true or

not) tended toward math, science, or engineering majors. Belief in one's ability level, or self-efficacy, is a core motivational construct derived from Bandura's (1997) social cognitive theory, which holds that behavior can be explained as a continuous reciprocal relationship between cognitive and environmental factors, with self-efficacy as a key cognitive factor. Studies have found that higher levels of perceived ability to perform well in a technology major (i.e., high computer self-efficacy) was a significant and positive influence on choosing an IT major (Akbulut-Bailey, 2012; Lang, 2012; Roach, McGaughey & Downey, 2012).

Job prospects in the career field can also have a motivating influence on career choice. For example, starting salaries and projected future salaries influence choice of major (Farley & Staniec, 2004; Walstrom, Schambach, Jones, & Crampton, 2008). In one study, salary was the second most important influence (after interest) in students who chose to major in either CS or MIS (Downey et al., 2009). Researchers have attributed declining enrollments to the perception that IT jobs are not available (Foster, 2005; Mahmoud, 2005; Mauldin et al., 2000) or are moving offshore (Choudhury, Lopes, & Arthur, 2010; Foster, 2005; Locher, 2007; Walstrom et al., 2008). The character of the work involved in both a major and its subsequent career is another source of influence on choice of major. For example, studies have found that students choose majors (and subsequent careers) because it is challenging (Downey, 2011; Downey, McGaughey & Roach, 2011), creative (Downey, 2011) and offers the opportunity to be a part of a team (Downey et al., 2011; Roach et al., 2012).

Given the importance of these factors in choosing a major, we examine individual changes in such perceptions and beliefs resulting from participants' experience in one of the IT career camps. If participants developed these perceptions over the course of the camps, the literature suggests they are significantly more likely to major in an IT field and choose a career in IT.

2.1 IT Majors and Gender

One of the key issues raised in many studies on choosing an IT major is that of gender disparity. A wide variety of studies in both academic and practitioner literature has documented the lack of females in IT majors and careers both in the US and worldwide (Lang, 2012; Mims-Word, 2012; Repenning, 2012; Stemp-Morlock, 2014; Weldon, 2014). Several studies have found that more males experience an early and passionate attachment to computers, which leads to greater interest (Lang, 2012; Mims-Word, 2012). This male domination has been attributed to various factors. Trauth (2002) examines two leading theories as causes of the imbalance, including an essentialist argument suggesting biological or psychological differences between the genders and another relating individual response to socio-cultural influences. Another study concludes that masculinity, rather than biological gender itself, was a significant factor (Huffman, Whetten & Huffman, 2013). Ignoring the nature versus nurture argument, Margolis and Fisher (2002) posit socialization differences between the genders, with males demonstrating a fascination with computers and being rewarded over time by those feelings. While the cause of an IT gender imbalance may be debatable, it is clear that recruiting more women into IT majors could do much to alleviate the shortage of qualified IT graduates.

2.2 Reducing the IT Shortage

There has been a solid research stream since the downturn in number of majors approximately ten years ago on ways to alleviate shortages in IT majors and graduates for business and technology organizations. The focus of such interventions include marketing or promoting IT more effectively and updating IT curriculum to make it more attractive (Akbulut-Bailey, 2012). Promoting IT more effectively includes increasing awareness and knowledge of IT as a career and dispelling negative perceptions of IT as a career (Choudhury et al., 2010; Granger, Dick, Luftman, van Slyke, & Watson, 2007). Revising curriculum to make it more relevant and/or valuable is also designed to increase enrollment in a variety of ways. For example, studies have promoted concentrating curriculum-revision efforts on the first MIS service course, the one that all business majors take (Downey et al., 2009; Whelan & Firth, 2012), or using computer games to enhance early CS programming classes (Repenning, 2012). These efforts are interrelated, of course, and are intended to enhance perceptions and student interest in IT and provide increased information on job prospects and the nature of IT work. Some studies examine these issues from a gender context and focus on increasing female majors.

One of the interesting things coming from this research stream is timing. When students make the decision to choose a major has significant consequences on how and when recruiting efforts should be undertaken. While some students clearly choose (or change) a major late in their college career, studies

suggest that most students who choose IT do so early rather than later. Some studies, for example, have found that computer science majors typically chose their college major in high school or before (Downey et al., 2009; Margolis & Fisher, 2002). Weldon (2014) states that the optimum age window for reaching future IT professionals is between 14 and 17. Repenning (2014) even suggests that the critical time for choosing IT, especially for women and minorities, is during junior high, when many conclude that technology or science is not for them. These studies suggest that reaching students early, particularly in or perhaps even before high school, should be an important goal if IT majors are to increase. The IT camps we conducted attempted to exploit this.

2.3 IT Career Camp

Universities desire more IT majors and organizations desire more IT graduates. In 2000, the MIS Department in the University of Arkansas (our institution) was the largest on campus (in terms of majors and graduates); the CS Department also had a robust number of majors. By 2005, the number of majors started to plummet and, in 2009, hit its nadir. The declining numbers also had significant repercussions on local technology companies, which faced increasing difficulty in hiring qualified graduates. In particular, one locally based global technology company struggled; each year it hired the greatest number of the host university's IT graduates (in MIS, CS, a few applied math, and some support personnel, such as accounting, finance, etc.). To maintain anonymity, we refer to this company as TechCompany. TechCompany is a global data marketing company with a continual need for fresh IT talent. Both the university's MIS and CS departments worked closely with the company, and the idea of running a joint IT summer camp to promote IT careers for high school students was first conceived in 2006. The university and the company agreed to hold the first camp in the summer of 2007; TechCompany would provide complete funding through a grant, while the MIS department designed and operated the camp (the CS department did not officially collaborate in the camp until 2010). The first camp included 24 high school students selected from throughout Arkansas. Since then, we have held a camp each summer (eight so far), and the number of students invited has slowly increased to the current level of about 55.

From the beginning, the IT career camp has been residence based; that is, student campers get a taste of college life by staying in a dorm on campus for the length of the camp. The camp runs from Wednesday morning through Saturday midday. There students face no cost whatsoever; TechCompany completely funds the camp through the annual grant. This grant initially was USD$10,000 per year; in 2012, the number of students reached 50 for the first time and TechCompany upped its grant to USD$13,000. This annual grant provides the sole monetary funding for the camp (the university provides no funds at all). The cost per student for the camp is approximately USD$250 each (though, again, the camp is entirely free for students). For the first three years the camp, two faculty members from the MIS department managed the camp. For the last five years, however, two faculty members from the CS department joined in the effort, bringing the total to four. The faculty members are not compensated financially for the camp. College mentors provide additional support; MIS/CS students and/or graduates assist and mentor campers and stay in the dorm (along with faculty and campers). The last five years, there have been four mentors for each camp; each receives a nominal stipend for helping (USD$400-$500). During this time, three of the mentors have remained the same; indeed, they are graduates of the host university (two MIS, one CS), and work full-time at TechCompany.

The camp is advertised across the state through high school counselors and technology teachers. All high schools have technology instruction (keyboarding, for example); some have more extensive technology offerings, including graphic design and programming. In Arkansas, there is also a well-established curricular initiative that incorporates technology in the classroom through an elective lab class (this initiative has now expanded to four other states). Started in 1996, the environmental and spatial technology (EAST) initiative is now active in over 210 high schools and middle schools throughout the state, which provides students with a project-based, service learning class grounded in technology. The teachers involved in the EAST labs provide an efficient way of advertising the camp. Given that students face no cost to attend the camp, they are selected based solely on a competitive application (rather than financial ability). The application includes information such as age, class (freshman, sophomore, etc.), grade point average, a self-evaluation of technology skills, college desires, and a short essay on what they hope to gain from the camp. Since 2010, when we began collecting data, each application is rated by the four faculty members (two each in MIS and CS) plus TechCompany's point of contact, who has been intimately involved in the camp since the first discussions in 2006 (and still is). Those with the highest scores are invited to participate in the camp. Moreover, starting in 2010, we made a concerted effort to

invite some previous campers to return and included in the camp a more advanced technology track specifically for them.

2.4 Camp Objectives

While we recognize the importance of IT majors everywhere, we pragmatically seek to increase technology majors (particularly CS and MIS ones) at the University of Central Arkansas. Congruent with our goal, TechCompany is also interested in increasing IT majors. While they have and continue to hire from worldwide university campuses, they hire more graduates from the University of Central Arkansas than any other and so are enthusiastic about promoting IT majors there. In addition to promoting IT majors, however, the company is also interested in promoting awareness of their own company. Thus, the university and company have developed a symbiotic relationship.

To accomplish the goals of increasing IT majors and interest in the University of Central Arkansas and TechCompany, four primary objectives were developed. These objectives all support the idea that reaching out to high school students through a technology camp can be an effective way of increasing majors. The objectives include:

1. **Increase awareness and understanding of IT as a major and career.** Many high school students have little understanding of IT as a career choice. While most high school students know of computer science as a major, few have even heard of MIS, which we have anecdotally confirmed at the start of our camps when we specifically ask. Still, as we discuss above, most students are unaware of many particulars of work in IT, and misperceptions abound. Salary information, job demand and security, and the nature of IT work are areas about which we wish to improve student awareness and dispel misconceptions. Given the critical link between these factors and choosing an IT major, enhancing students' perceptions of IT as a career choice is a critical objective.
2. **Focus on attracting more female majors.** Tackling IT's gender discrepancy is one obvious way to increase IT majors. We wanted to use the camp to attract more females to the major. Depending on the number that applied to the camp, we specifically determined to include as many women as possible. During most years, the selection process worked well enough that about one third of the top rated students were female. On two occasions, in 2011 and 2013, we added three and two (respectively) female students to increase their number, which were the highest-rated females not yet selected.
3. **Make the camp a fun learning experience.** We knew that, if participants did not enjoy the camp or did not like what they saw and experienced about IT as a career, their interest in pursuing an IT major would dwindle. Therefore, we designed the camp from its beginning to be enjoyable and stimulating while still providing a learning experience. One way we did this was to include competitions (both individual and team-based ones). In addition, we consistently monitored campers' likes/dislikes and what students were passionate about by collecting data.
4. **Promote the University of Central Arkansas and TechCompany.** We incorporated positive exposure to the University of Central Arkansas and TechCompany at every opportunity. Using tours, the campus-stay, visits to TechCompany, t-shirts, speaker panels, and so on, we attempted to enhance campers' understanding of, familiarity of, and preference for both.

3 Evaluating Camp Success Camp Design and Data Analysis

To carry out our goal of enhancing perceptions of IT careers and majors we developed a two-pronged methodology. First, we designed the camp so that it maximized learning and fun. Secondly, we collected data to measure our progress and results. We began seriously collecting data in 2010 in the camp's fourth year. We have gathered almost all data we report in this study since that time, which includes the last five camps.

3.1 Camp Design

Of course, hosting an IT camp is not new (Purchase, Hussey, Brookes, & Leadbetter, 1997). Many IT (or computer) camps focus on skills development. While we wanted to include such activities, we focused primarily on positively engaging students and promoting their interest in IT. We designed the camp's structure and activity schedule to support this. The schedule evolved over time based on what we

perceived best accomplished our objectives. Although the camp time frame has remained the same (Wednesday through Saturday), the actual schedule of activities has varied some over the years. However, the focus has remained the same. We wanted student campers to learn about IT as a major and career and to have fun doing so through a variety of activities. These activities include skill development, interaction with several outside organizations (including TechCompany), and some competitions to whet interest. We wanted students to experience college life and we also wanted to involve parents in some way.

While some activities have changed over the years, the basic schedule has remained fairly static. On the first day, students check into the dorm and are introduced to the camp and college life. Parents (and siblings) are invited to the first afternoon's events, which conclude with the evening meal in the cafeteria (after which parents depart). These events include an introduction to the camp and IT careers, camp rules, a breakout session with parents, the first competition of students versus one of the camp faculty members on how computers "think", and a tour of the university. After parents leave, on the first evening, there is an ice cream social with local technology professionals (many from TechCompany). Most of the second day (Thursday) includes skills development for which we divide the campers into two groups. One group, including mostly previous campers, creates mobile game applications led by CS faculty. The second (larger) group create and design webpages (in teams of two) by using html, CSS, and some basic JavaScript. Faculty and mentors judge each application and webpage. Like with all competitions, we award the prizes to the top three teams at the final banquet. On Thursday evening, campers attend a play on campus (the camp has been held at the same time as the local Shakespeare festival of plays). Friday comprises visits to local companies to see IT professionals in action and to experience life as one. The students always visit TechCompany and its huge data center, though returning campers tour different areas and meet different professionals. The students also visit some smaller technology companies, many entrepreneurial in nature. Part of this experience includes carrying out IT-related tasks (in the form of some competition). On the final day, Saturday, students prepare a slide show of pictures and videos that they present at the final camp event, the awards banquet. At this banquet, attended by TechCompany representatives and college deans and chairs, we present awards (gift cards) for all of the competitions and four overall camp awards (e.g., most likely to be a CIO, most technical, biggest geek, etc).

3.2 Data Analysis of Camp Success

To monitor the IT camps' success, we collected data from students attending the camp. Starting with the 2010 camp, students filled out surveys at the camp's beginning and end. We collected data for this study from five consecutive camps from 2010 to 2014. This pre- and post- camp methodology allowed us to examine changes in student perceptions during each particular camp.

The initial data collection occurred in two hours of the opening of the camp. After the initial "welcome to the camp", we took students into a classroom and they completed the initial survey while parents and camp faculty discussed IT careers from a parent's perspective. Then, at the end of camp, right before the final awards banquet, students completed the post-camp survey. Most of the content in the surveys was exactly the same; however, the initial survey also included demographic information while the final survey included ratings for each activity during the camp and a final comments section (Tables 2 and 3 show most of the survey questions).

The surveys captured students' perceptions and awareness of IT as a career field, knowledge of college administrative activities (admissions, financial aid, and career services), aspirations in terms of attending the host university or working at TechCompany, and their desire for a personal future working or majoring in the IT field. The items that examined student's perceptions of IT as a career field comprises two primary areas: job prospects and the nature of IT work.

3.2.1 Demographics

Table 1 includes demographic information for the eight camps held between 2007 and 2014. The table totals this information into two categories: one an overall total for all eight camps and the other the totals for the five camps since 2010 (when we began collecting the data we report here). It also lists how many returning campers attended (i.e., students who attended the IT camp in a previous year).

Table 1. Demographic Data From all Camps

	Total	Males	Females	Age	GPA	Prev. attendees
2007	24	16	8 (33.3%)			
2008	28	18	10 (35.7%)			
2009	35	22	12 (34.3%)			
2010	26	16	10 (38.5%)	16.1	3.67	4 (15.0%)
2011	39	28	11 (28.2%)	16.1	3.56	5 (12.8%)
2012	55	42	13 (23.6%)	15.8	3.65	12 (21.8%)
2013	51	35	16 (31.4%)	16.1	3.80	15 (29.4%)
2014	51	32	19 (37.3%)	15.5	3.66	11 (21.6%)
Total*	**222**	**153**	**69 (31.1%)**	**15.87**	**3.67**	**47 (21.2%)**
Ovl Total	**308**	**209**	**99 (32.1%)**			
*Totals include 2010-2014 when full data collected; age and GPA are means.						

3.2.2 IT Knowledge and Intentions Results

We took the items for job security, nature of IT work, and intention to seek a technology major and/or work in the field from Choudhury et al. (2010). Interestingly, and unknown to us, they came to a similar conclusion about using an IT camp to increase majors, also around 2006, and reported their results on IT career camps held in 2007 in the 2010 study cited. In using their survey, we could compare our results with theirs, though their camp was not a multi-year endeavor. Table 2 presents data with the mean score of each item (with standard deviation in parenthesis) for both pre-camp and post-camp surveys. For the surveys, we mostly used a seven-point Likert scale (1 = "do not agree at all" and 7 = "agree completely"). We used a paired t-test to examine whether the two means were statistically different. Three items, noted by the number symbol (#), were reversed scored. For these, we hoped the mean decreased over the course of the camp (and, thus, would have a negative t-score); however, by reverse scoring, we turned that around so a positive t-score indicates the means did indeed decrease (this makes comparisons easier). The column marked "comparison" shows Choudhury, Lopes, & Arthur's (2010) paired t-test results.

There were eight survey items that examined job prospects of IT careers, labeled JP1-JP8 in Table 2. For all eight items, there was a significant difference between the student's pre-camp score and post-camp score in the expected direction. The highest scores came from the item concerning IT job demand in the US with means of 6.35 and 6.57 (pre and post, respectively). In general, the differences in mean between the two data gatherings were consistent with the results found by Choudhury et al. (2010). Their means were relatively similar to ours and the only difference in their t-test results was a lack of significance in JP7, the belief that jobs are moving offshore.

Table 2. Pre- and Post-Camp Technology Items

	Pre-camp	Post-camp	t-score	Comparison
JP1: High starting salaries	5.07 (1.2)	5.79 (1.1)	7.11**	7.26**
JP2: Job on graduation	5.73 (1.2)	5.99 (1.2)	2.49*	2.30*
JP3: Job choice flexibility	5.68 (1.1)	6.27 (.87)	6.25**	6.79**
JP4: Job demand in U.S. is growing	6.35 (.99)	6.57 (.77)	2.44**	4.67**
JP5: Job security	5.40 (1.2)	6.11 (.99)	7.05**	3.95**
JP6: Well informed on job market	4.45 (1.6)	5.34 (1.4)	7.71**	10.81**
JP7: Jobs are moving offshore#	4.38 (1.7)	5.15 (1.8)	6.02**	1.95 ns
JP8: Can apply IT skills	5.99 (1.1)	6.28 (.94)	3.02**	4.17**
NW1: IT is creative work	5.96 (1.0)	6.21 (1.1)	2.56*	4.37**
NW2: IT is challenging work	5.87 (1.2)	6.16 (1.0)	2.88**	.04 ns
NW3: IT is interesting work	6.34 (1.0)	6.40 (1.0)	.062 ns	4.25**
NW4: IT is mostly developing code#	3.63 (1.5)	3.97 (1.8)	2.78*	6.70**
NW5: Have strong math/science skills	5.42 (1.4)	5.51 (1.4)	.79 ns	4.09**

NW6: Must have interpersonal skills	5.10 (1.3)	5.48 (1.3)	3.47**	2.05*
NW7: IT professionals are nerdy#	3.14 (1.8)	3.33 (1.9)	1.51 ns	.17 ns
NW8: IT professionals work in teams	5.11 (1.2)	5.83 (1.2)	6.74**	3.79**
NW9: Interacts with computers- not people#	3.96 (1.6)	4.06 (1.6)	.81 ns	5.36**
NW10: Professionals are problem solvers	6.16 (.97)	6.29 (.86)	1.50 ns	4.15**
PF1: I am confident I will work in IT	5.07 (1.7)	5.17 (1.7)	.81 ns	2.42*
PF2: I am committed to an IT career	4.55 (1.9)	4.84 (1.9)	2.19*	1.22 ns
PF3: I will choose an IT major in college	4.98 (1.8)	5.17 (1.9)	1.48+	.98 ns
PF4: I will work with IT skills in future	5.35 (1.5)	5.39 (1.6)	.34 ns	2.90**
# Reversed scored. JP: job prospects in IT; NW: nature of IT work; PF: personal future in IT. Comparison is t-test results from Choudhury et al. (2010). **p < .01; * p < .05; + p < .10; ns = not significant.				

Ten items examined the nature of IT work. For most items, students gave high scores for both the pre- and post-camp surveys. Again on a 1-7 scale, students ranked four items above 6.0 on the post-camp survey: IT is interesting work (6.4), IT professionals must be problem solvers (6.29), IT is creative work (6.21), and IT is challenging work (6.16). Another three scored between 5.5 and 6.0. Unlike the significant t-test differences for the survey items concerning job prospects (JP1-JP8), five of the ten items examining the nature of IT work (NW1-NW10) did not significantly improve over the course of the camp. Of these, three of the item's pre-camp scores were quite high and so there was not much room for significant improvement (IT work is interesting, IT professionals must be problem solvers, and IT professionals must have strong math/science skills). The other two, IT professionals are perceived as nerdy and IT professionals interact more with computers than with people, scored in the middle range of the scale; the camp was not sufficient to significantly sway student opinion. Interestingly, five of our t-test results differed from the results of Choudhury et al.'s (2010) findings. In their study, only two of the items were not significantly different (we explore this point in Section 4).

Four items in the survey examined student's personal future in IT (PF1-PF4). Three of the questions asked students about their confidence and commitment to have a career in IT. The fourth question asked students if they would choose an IT major in college. For the pre-camp survey, the averages were all around 5 (4.99) on a 1-7 scale. For the post-camp survey, the average was 5.14. Two of the t-test differences were significant (one at the $p < .10$ level); two were not. The two items that were not significant were not what we hoped to see and, as we show below, were gender biased.

We surveyed seven other areas that Choudhury et al. (2010) did not. The first three addressed students' understanding of information presented by services offered by the university (career services, admissions and financial aid) on the first day, and, in each one, there was a significant difference between the pre-camp and post-camp scores. We presented information on these areas in the first afternoon and aimed it at both parents and students. Two of the questions dealt with TechCompany, including students' level of knowledge about it and their attitudes about potentially working there. One question concerned attitudes about attending the host university. Finally, there was also a measure of one's self-efficacy that used Hill, Smith and Mann's (1987) global measure, which included three items (range of 0-10) that rated one's confidence in their computer ability (averaged into one score). For all seven of these areas, we found a significant difference between the pre-camp and post-camp scores; Table 3 provides the results (means with standard deviations in parenthesis).

Table 3. Pre- and Post-camp Other Items

	Pre-camp	Post-camp	t-score
Understanding of financial aid	2.17 (1.2)	2.95 (.93)	7.72**
Understanding the application process	2.08 (1.1)	2.89 (.94)	8.38**
Understanding of career services	1.52 (1.0)	2.72 (1.0)	12.40**
Knowledge of TechCompany	1.88 (1.3)	3.36 (.82)	15.20**
TechCompany is a good place to work	3.10 (1.3)	3.51 (.66)	5.00**
Host university is a good place to go	3.03 (1.1)	3.29 (.81)	2.94**
Computer self-efficacy	7.95 (1.6)	8.37 (1.5)	3.54**
**p < .01			

3.2.3 Gender Differences

Table 4 presents the differences by gender, for which we examined eight job prospects items, ten nature of IT work items, four items for future in IT work, and self-efficacy. We examine these data from two perspectives: first, how did each item change from pre-camp to post-camp when dividing the data by gender (two middle columns in Table 4, "male diff." and "female diff."). Secondly, were the differences between the genders significant when comparing the same items at the same point in time (last column of Table 4)? For example, was the mean for males for JP1 (IT professionals have high starting salaries) at the pre-camp time frame significantly different from the mean for females for JP1 at the pre-camp (the answer is yes; 5.21 is significantly higher than 4.76, t = 2.78**).

Table 4. Gender Differences

	Male diff.	Female diff.	Diff time 1-2^
JP1 High starting salaries	5.21/5.90 (5.85**)	4.76/5.55 (4.13**)	2.78**/2.20*
JP2 Job on graduation	5.80/6.18 (3.12**)	5.57/5.58 (.00ns)	1.42ns/3.52**
JP3 Job choice flexibility	5.70/6.29 (5.20**)	5.62/6.29 (3.82**)	.54ns/.02ns
JP4 Job demand in US is growing	6.40/6.59 (1.71+)	6.22/6.51 (1.75+)	1.26ns/.61ns
JP5 Job security	5.40/6.14 (6.21**)	5.40/6.08 (3.60**)	0.0ns/.44ns
JP6 Well informed on job market	4.49/5.45 (6.71**)	4.35/5.13 (3.78**)	.76ns/1.87+
JP7 Convinced jobs are moving offshore#	4.27/5.14 (5.53**)	4.62/5.12 (2.24**)	-1.81+/.08ns
JP8 Can apply IT skills	5.99/6.32 (2.89**)	5.97/6.18 (1.17ns)	.15ns/.92ns
NW1 IT is creative work	5.93/6.18 (2.14*)	6.03/6.26 (1.26ns)	-.69ns/-.52ns
NW2 IT is challenging work	5.82/6.14 (2.56**)	5.97/6.20 (1.26ns)	-.95ns/-.41ns
NW3 IT is interesting work	6.34/6.51(1.58ns)	6.34/6.12 (-1.2ns)	.00ns/2.44*
NW4 IT is mostly developing code#	3.77/4.09 (2.09*)	3.29/3.72 (1.96*)	2.76**/1.87+
NW5 Must have strong math/science skills	5.47/5.51 (.32ns)	5.31/5.45 (.68ns)	.94ns/.39ns
NW6 Must have interpersonal skills	4.99/5.46 (3.48**)	5.35/5.58 (1.22ns)	-2.25*/-.75ns
NW7 IT professionals are nerdy#	3.01/3.30 (1.89+)	3.43/3.42 (-.05ns)	-2.13*/-.54ns
NW8 IT professionals work in teams	5.19/5.80 (4.90**)	4.96/5.95 (4.99**)	1.38ns/-.90ns
NW9 Interacts with computers/not people#	4.07/4.19 (.87ns)	3.74/3.78 (.22ns)	1.83+/2.12*
NW10 Professionals must be problem solvers	6.30/6.39 (.78ns)	5.82/6.05 (1.28ns)	3.24**/2.44*
PF1 I am confident I will work in IT	5.23/5.45 (1.68+)	4.71/4.58 (-.53ns)	2.79**/4.67**
PF2 I am committed to an IT career	4.72/5.14 (3.08**)	4.18/4.25 (.29ns)	2.73**/4.64**
PF3 I will choose an IT major in college	5.16/5.53 (2.78**)	4.57/4.39 (-75ns)	2.96**/5.86**
PF4 I will work with IT skills in future	5.52/5.76 (1.86+)	4.96/4.60 (-1.6ns)	3.13**/6.28**
Computer self-efficacy	8.19/8.64 (3.35**)	7.42/7.76 (1.54ns)	4.31**/4.60**
# Reversed scored. ^Negative differences indicate females had higher means. **p < .01; * p < .05; + p < .10.			

Tables 2 and 3 present the difference or amount of growth (or decline) between pre-camp and post-camp scores with the entire population. For the gender analysis, we divided the data by gender to examine each gender's significant differences in item responses between the start and end of camp. For the eight job prospect items, both genders' beliefs changed significantly during the course of the camp in almost all items. Two items were not significant both for males and females. One was JP2 (confidence in getting an IT job upon graduation), which remained virtually the same pre-camp and post-camp. The other was JP8 (ability to apply IT skills to a variety of domains), which increased only slightly. For males, all eight items significantly changed. JP4 (job demand in US is growing) was significant at the $p < .10$ level for both genders, but both started out initially very high, leaving little room for significant improvement. In the comparison between genders at the two time periods, of the sixteen comparisons for JP1-8, only five differed significantly, and, in each case save one, males believed more strongly in the item (last column of Table 4). JP1 (high starting salaries) was the only one in which males and females differed for both the pre-camp and post-camp surveys (5.21 vs. 4.76 at camp start; 5.90 vs. 5.55 at end of camp, both $p < .05$). At both the start and end of camp, males believed more strongly that IT graduates would have high starting salaries. Males had a significantly higher belief in getting a job on graduation (JP2) at the end of camp and thought they were better informed on the job market at the end of camp. Females, on the other

hand, were less convinced that jobs were moving offshore at the beginning of camp (4.27 vs. 4.62, $p < .10$; this item was reversed scored, meaning an increase in mean over the camp actually showed a decrease in the belief that jobs were moving offshore; in other words, the desired direction).

For the nature of IT work items, out of twenty comparisons, nine were significantly different between the genders. For all but two of these differences, males had the stronger beliefs. Males thought IT work was more interesting (post-camp), was more than just developing code (pre- and post-camp, reversed scored), that IT professionals interacted *less* with computers than people (both pre- and post-camp; reverse scored), and that IT professionals must have strong problem-solving skills (both pre- and post-camp). Females had stronger beliefs for two items both at the pre-camp survey: they thought IT professionals had to have strong interpersonal skills and thought IT professionals were less nerdy (reversed-scored).

The last items in the comparison between genders were all significantly different both pre- and post-camp and all decidedly male-oriented. For all four questions that examined one's future in IT, males were significantly more committed to such a future and college major than females. In addition, males had a stronger belief in their own computing ability (self-efficacy), which also grew significantly over the course of the camp.

4 Discussion

We designed the IT career camp around four major objectives to improve students' perceptions, attitudes, and beliefs toward IT careers overall, which would then hopefully increase the number of IT majors. Since 2010 (through 2014), at the University of Central Arkansas, the number of technology majors has risen from 260 to 374, an increase of almost 30 percent. While it is not possible to establish causality with respect to these camps, we do believe the camps had some impact. We have evidence that attitudes and beliefs towards technology have been significantly enhanced over the course of each camp. We believe that the ability of these camps to improve attitudes, particularly among males, has increased awareness of IT as a career among a wider high school population as participants returned back to their high schools. We also know that some students who attended one or more camps are now (or were and have graduated) technology majors at the University of Central Arkansas and some attributed their choice of major and college to the IT career camp. Changing attitudes and beliefs toward technology, the university, and TechCompany were specific camp objectives, and the collected data provide an empirical way of examining their success. We cover each in turn.

4.1 Increase Awareness and Understanding of IT as a Major and Career

We first wanted to increase awareness and an understanding of IT as both a major and career. By doing so, we hoped to increase students' interest in IT with subsequent enhanced positive attitudes and a higher desire to embark on an IT major and career (Downey, 2011). To test the success of this goal, we use the pre-camp and post-camp items concerning IT job prospects (eight items) and nature of IT work (ten items). Combining all five years together, we can see a significant difference between the pre- and post-camp results for 13 of the 18 questions (see Table 2). All eight items in the IT job prospects area were significantly different. The camps, therefore, performed well in increasing awareness of IT career expectations, including starting salaries, job availability, job security, job demand, and so on. Interestingly, many of the students came to camp with relatively strong perceptions (in five of the eight items students started the camp with an average more than 5.4 of 7), yet still significantly increased these beliefs by the end of camp.

For the nature of IT work area, with ten questions, half did not significantly increase. The success of the camp in this category was less pronounced. For two of the items, IT work is interesting and IT professionals must be problem solvers, the pre-camp average was quite high (6.34 and 6.16, respectively), so there was not room for much growth. Still, the camp failed to significantly dispel some of the more negative beliefs, including IT professionals are nerdy, must have strong math/science skills, and interact with computers and not people. One reason for such results may be because IT professionals are more introverted (in general) and do need stronger math/science skills than others. Students recognize this fact and, therefore, reported it accurately. The comparison with the Choudhury et al. (2010) study is quite revealing. Only one of these five non-significant items was also not significant in their study (IT professionals are nerdy). The other four significantly improved in their 2007 camps. One reason for this potential difference between our camps and those of Choudhury et al. was the audience. Their audience (and goal) was to increase IS majors, while our goal was directed toward all technology majors (i.e., MIS

and CS). In our camps, students covered some technical skills and interacted significantly with IT professionals of all kinds, which led students to recognize that some IT professionals do require stronger math backgrounds and that some really are "nerdy". Therefore, while we hoped that students would come away from the camps feeling like the IT profession is similar to other less-technical ones, it doesn't seem all bad that they did perceive the differences. The bright spot is that students, both pre-camp and post-camp, believed that IT work is interesting. Interest remains the most important factor in choosing a major and career (Downey, 2011).

Note that student's pre- and post-camp beliefs in their computer self-efficacy significantly increased (Table 3). One's belief in their computing ability is a direct and influential motivator to choosing an IT major, learning IT skills, and persistence when facing difficulty (Downey, Rainer & Bartczak, 2008). We used a general measure of computing ability, which measures a more trait-like perception of ability for the entire computing domain (Downey & Rainer, 2009). General measures are slower to change, which means that the results showing significant increase in CSE over the four-day camp are somewhat dramatic.

Probably the most important of the survey items examined one's personal future in IT. The four questions (three on choosing an IT career and one on choosing an IT major) provided mixed results. Two of the differences (pre- and post-camp) significantly increased (I am committed to an IT career and I will choose an IT major in college—the latter at the $p < .10$ level). The other two were not significant, though both of these started out relatively high (both had means in the pre-camp survey above 5). We hoped, of course, that students' attitudes toward a future in IT would substantially and significantly increase over the course of the camp, which turned out to be only partially true. Choudhury et al. (2010) also had only two of the four significantly increase, though, for their study, the two that increased were not the same two that increased as in our study. There was also a significant gender imbalance for these four items, which will discuss next.

4.2 Focus on Attracting More Female Majors

One of the primary goals in our camps was influencing females' perceptions, attitudes, and beliefs toward IT. In this goal, the camp was less successful. As Table 4 reports, many of the items for females did not significantly improve from the start to the end of camp. For the eight items concerning job prospects, six did significantly improve. But for the ten items on the nature of IT work, only two significantly improved. This suggests that we were not very successful in dispelling myths about the IT profession. One reason is that some items did start out (pre-camp) quite high (in particular that IT is creative, challenging, and interesting work, and that IT professionals must be problem solvers). But others did not increase over the course of the camp as we hoped. Most critical of all, however, was that none of the four items on major and career intentions significantly changed at all. Indeed, in three of these items, the post-camp average was slightly lower than the pre-camp average. In addition, for females, computer self-efficacy did not significantly improve (7.42 to 7.76, $t = 1.54$, not significant). For males, all four of these items and self-efficacy increased significantly.

Comparing the differences between males and females allows us to shed some light on why females did not have stronger feelings about IT majors and careers at the end of the camp. At the beginning of camp, examining all eighteen items from job prospects and nature of IT work, there were seven items that were significantly different among the genders (the last column in Table 4 indicates the items with significant differences; those with a positive t-score difference means males had the higher mean). In four of them, males had significantly higher means (high starting salaries, IT is mostly about developing code, one interacts with people and not computers, and IT professionals must be problem solvers). Females had higher means for three (jobs are moving offshore, IT professionals must have interpersonal skills, and are nerdy). For the post-camp survey, there were again seven significant differences, but, in all of them, males had the higher means. In addition, for both time periods, males had significantly higher self-efficacy beliefs than females (and males significantly increased their beliefs during camp while females did not). Thus, males responded over the course of the camp in ways that females did not. In both areas, job prospects and the nature of IT work, males displayed more significant differences in growth during camp and, at the end of camp, had significantly stronger beliefs in seven of these items. It appears that these differences between male and female beliefs at the end of camp in job prospects, nature of IT work and self-efficacy influenced their interest in an IT career at the end of camp. For males, these attitudes reinforced their belief in choosing an IT major and IT career. Females, however, did not significantly change some of their attitudes concerning the nature of work nor their self-efficacy, nor were they reinforced in their belief to choose IT.

Despite such findings, it does not mean that the camps were not successful in enhancing females' beliefs and attitudes toward IT. While the camp itself did not necessarily lead to significantly higher post-camp marks for many of the questions, almost all of the averages were relatively high, which suggests that females arrived with some positive beliefs. For the eighteen items measuring job prospects and nature of IT work, there were eleven items in which the male and female average was not significantly different from both the pre-camp and the post-camp surveys. This finding suggests that the gap in beliefs between male and female for most aspects of IT careers is similar in more ways than it is dissimilar.

What was different, however, between genders was the difference in career aspirations. In these, females were not swayed significantly during the camp. Conversely, males significantly enhanced their belief in such a major/career over the course of the camp. For all four items, males started with significantly higher beliefs, ended with significantly higher beliefs, and significantly enhanced these beliefs during camp, while females did not. The camps did not produce the most important metric we hoped to see improve for females. Many potential reasons for this finding exists. Campers attended many presentations and visited a variety of companies, including TechCompany and others. In most of these events and visits, the male domination in terms of numbers was apparent. The number of visible females reflected the number present in the IT population today, and the female campers could not help but observe this. There were not enough female role models provided to the female campers in terms of visits to companies and presentations during the camps. The camp leadership from the beginning recognized this lack, of course, and attempted to offset this by having two dynamic young female mentors who spent the entire camp with the students (as we mention above, both of these work at TechCompany and graduated from the University of Central Arkansas). In addition, one of the four key faculty members is female and the camp sponsor from TechCompany (since the beginning camp in 2007) who plays an influential camp role is female. Still, these factors were apparently not enough to significantly raise female students' career aspirations over the course of the camp.

Another potential reason for the lack of female improvement was our emphasis on technology majors and not just MIS majors. Unlike Choudhury et al.'s (2010) camps that promoted IS majors, our camp promoted all technology majors (their study does not provide a breakdown by gender, so we were unable to compare gender statistics). As such, we did not limit visits and presentations to the softer side of the IT industry. All students participated in training involving coding, had presentations by developers, and observed development in action. We did not want to present the IT profession in any other way. In retrospect, this method was probably not an effective way to attract females. We provide some potential lessons learned in the final section.

4.3 Make the Camp a Fun Learning Experience

It is difficult to create interest in a potential major or career if one's early experience in that field is not fun. While many students came in liking technology, the large majority did not truly understand what IT professionals do nor the nature of their work (as evidenced by the growth noted in those areas during camp). We realized that we had the four-day camp to instill an enhanced interest in technology and one of the key ways to do this was to make the camp fun. We set about doing this through two mechanisms. First, we ensured we included multiple games and/or competitions. In the first three years of the camp (2007-2009), we found that students especially enjoyed the competitions that we included and so continued that trend. Second, we asked students at the end of camp what they liked best and least about the camp (starting with the data collection effort in 2010). In this way, we could directly monitor the goal of making the camp fun. We confirmed that the vast majority of students liked the competitions; many reported they were the best things about camp. These included competitions integral to the camp's skills enhancement portion (creating websites for novice campers or mobile applications for the more advanced campers). There were two (and eventually three) team competitions in other areas, which included pitching a technology idea and creating plans for video meetings with global technology workers (in other countries).

The comments we received at the end of camp both confirmed this approach and suggested other ways to improve the camp (and make it more fun). In 2010, for example, we took all campers to a play that was held on campus (part of the annual Shakespeare festival); we were quite surprised when 80 percent of campers listed it as one of the events they enjoyed "most" during the camp (5 percent also enjoyed it "least"). We continued this for every later camp with similar results (though numbers in 2012 declined when the play was actually one from Shakespeare). Many liked the tours of the companies (especially TechCompany) and meeting IT professionals. We also discarded some events for being too "boring",

which included two that were directed more at parents during the first afternoon (information on financial aid and career services). In addition, we eventually deleted a round-table discussion by IT professionals because campers felt there was not enough student participation.

Overall, by keeping a close eye on student likes, dislikes, and comments that we gathered at the end of each camp, we have been able to refine the camp each year to make it better and more enjoyable for students. We determined to remain true to certain aspects of the camp—we wanted to inform students about IT careers, have them learn some technology, and see IT professionals in action. Fortunately, all of these key characteristics of the camps were ones that also promoted camp fun.

4.4 Promote the University of Central Arkansas and TechCompany

The final goal of the camp was to promote both the University of Central Arkansas and TechCompany. As we mention above, we promoted both entities through tours and engagement activities. We used the best dorm on campus for the camp and included visits to especially impressive areas, such as TechCompany's huge data center and its corporate offices. We attempted to make all interaction between students and representatives of the University of Central Arkansas and TechCompany positive and meaningful. To test success, we again used survey data. We directly asked students in the pre- and post-camp surveys two questions about TechCompany ("how familiar are you with TechCompany?" and "to what extent do you think it would be a good place to work?"). We also included one question that asked students if they thought the host university would be a good place to attend college. Table 5 provides the results for all campers. For all three questions, there was significant improvement over the course of the camp ($p < .01$). This was true for all campers, but was also true when broken down by gender. Both males and females demonstrated significant growth during the camp in knowledge about TechCompany and positive beliefs about working at TechCompany and attending the University of Central Arkansas.

Table 5. Firm and College Choice

	Males				**Females**			
Knowledge of TechCompany	1.50/3.01 (t = 12.98**)				1.16/1.88 (t = 8.50**)			
TechCompany: a good place to work	1.47/2.17 (t = 6.20**)				1.51/2.34 (t = 4.48**)			
University of Central Arkansas is a good place to attend	1.73/2.11 (t = 3.46**)				1.65/1.96 (t = 1.84*)			
First number is pre-camp/second is post-camp. ** p < .01 * p < .05								
Will choose the University of Central Arkansas (top four choices)								
	Males				**Females**			
	#1	#2	#3	#4	#l	#2	#3	#4
Pre-camp	43	36	15	3	25	15	4	1
Post-camp	57	30	17	2	28	14	2	2
% Change	24.6	-20.0	11.8	-50	10.7	-7.1	-100	50

In addition to these survey questions, we also asked students to list, in order of preference, the top four universities they were most considering attending. We asked them this question both at the beginning of camp and at the end of camp (Table 5 provides the results). At the beginning of camp, 68 students listed the University of Central Arkansas as their number one choice for college (31%); by the end of camp, that number rose to 85, a 20 percent increase. Both males and females showed significant increases with respect to choosing the University of Central Arkansas as their top choice (24.6% and 10.7%, respectfully). Most of this increase came at the expense of their number two choice but still indicates a healthy increase in desirability for the University of Central Arkansas. Overall, we considered the promotion of both TechCompany and the university to be successful during the camps.

5 Lessons Learned and Conclusions

The idea of hosting a summer camp focusing on IT careers is not new. What perhaps is new about this endeavor is its longevity and the data collection with which we could empirically assess its success. In examining the data, we found that the camp was mostly successful. Students' attitudes and beliefs concerning the prospects of IT jobs and the nature of IT work were mostly enhanced over the course of each camp. Many students left the camp with a stronger commitment to an IT career. We noted a 20 percent increase in students who wanted to attend the University of Central Arkansas as their number one

choice. Greater awareness of TechCompany and its opportunities were evident. That said, we did not meet all our goals. Most importantly, we did not as successfully enhance females' attitudes and perceptions. The beliefs of females that technology is in their future did not appear to change much, which was particularly troublesome.

We learned several lessons in the course of operating these camps that we can share. While such a camp has some compelling advantages, it is not for all universities. We provide some of the more important lessons in Sections 5.1 to 5.4.

5.1 Employer Buy-in is Mandatory

The camps are almost completely dependent on employer financial support. The University of Central Arkansas does not (and has not) have available funds to support such an endeavor. In this case, TechCompany came through in providing complete financial support. Over the years, the university has attempted to establish additional support from other companies (TechCompany supports such efforts). However, it was only in 2015 that another large global IT company agreed to provide support (to start in the 2015 camp). Beyond financial support, however, the camp's students need to see IT professionals in action, to interact with them, and to tour facilities. While this is a much easier proposition to arrange, it underscores the absolute need of employer support. While this camp has one primary supporter, at least through 2014 (though we tour many other companies and interact with their employees), a better model would include other major supporters (as in the Choudhury et al.'s (2010) camp held in 2007). Additional financial support could provide monetary incentive to participating faculty members as well (see below).

5.2 Faculty Participation is Critical

Faculty design and manage every aspect of the camp with few exceptions (one exception is coordinating the activities with TechCompany, which our long-time facilitator there does). A faculty champion (or champions) is absolutely required. At these camps, faculty were not compensated financially, so it took faculty members who were willing to work on their own to manage the process before and during the camp. The time commitment was not extensive overall but was significant during some brief periods of time: it included the time of student selection (typically in February), the time of arranging logistics (updating the website, dorm, schedule of events, transportation, etc.), which occurred between December and March, and, of course, the camp itself (in June, during summer school).

Given the number of years we have run this camp, it has also become apparent that faculty need to rotate off this endeavor after three or four years. In our case, this is what has happened; one faculty member wanted to rotate off while others desired to participate. We have also been able to grant course release for some faculty.

5.3 Determine How to Better Attract Women

As we discuss above, the camps have not been overly successful in reaching female students. We have not had a problem attracting females to apply for the camp; rather, the problem is making an IT career more appealing to them during the camp. We recognize that we cannot dispel years of socialization against females regarding technology (Margolis & Fisher, 2002); therefore, we have to positively influence females during the four day camp, which is challenging at best. We have discussed some possibilities to better reach women; one of the most promising is to break our female campers into a subgroup during parts of the camp. Instead of these campers seeing mostly male IT professionals, we could have some sessions in which their interaction is with female professionals. We will try this break-out at the next camp (summer 2015). In 2010, when we solidified our goal of attracting more female students, we brought in college mentors (two males and two females). These were college juniors or seniors at the time, and three have continued with each camp since then (including the two females); all three graduated and now work for TechCompany. We believe this has made a remarkable difference on women campers, though we do not have data to support this (since we collected no data prior to 2010); we do have anecdotal evidence in discussions with women campers that these mentors had a great influence for some on choice of major and on all in terms of college preparation.

5.4 Inviting Returning Campers is Successful

In 2010, we started systematically inviting previous campers to return for another camp with a second, more advanced track. The advanced track comprises more advanced technology skills (game

development with CS faculty) and a different tour of TechCompany (since they had already done the regular tour). At times, these students led camp activities. This undertaking has been successful in a way not anticipated. We have found that, if we can get the student back for a second camp, the chances of that person attending the University of Central Arkansas becomes much higher. We have had three campers that have attended the camp a record four times (one female); all are attending the host university and in a technology major. Of the twenty-one we know have attended the university (many currently attending), eight attended multiple camps (most attended two). Getting campers back for another camp tends to self-identify them with the host university and reinforces their conviction that it is where they belong.

5.5 Limitations

This study has several limitations. Most of these limitations are not methodology issues but rather ways to improve our assessment of camp success. First and foremost, we really don't know how many campers have or are attending the University of Central Arkansas, nor do we know their major. We did not make a concerted effort to track campers after the camp until 2013, which means that we only know of twenty-one that are at the university. Still, questioning these attendees, most concluded that the IT camp (or camps) were instrumental in their choice to attend the university and major in technology. Tracking campers after the camp(s) is somewhat difficult, but knowing where they end up would enable us to track camp success more accurately. Secondly, while we included parents in the first day's afternoon activities, we have no real idea if we are reaching them or not. Given that they are quite influential in helping their children decide on both choice of college and choice of major (Downey et al., 2009), a better understanding of how we are doing with respect to educating or influencing parents would be helpful. We do informally talk to parents the first day and during the time of pick-up; for the most part, they are very positive and so, anecdotally, we seem to be reaching them. But more clear-cut evidence would be helpful. During the next camp (2015), we plan to invite them to attend the awards banquet at the end of camp for the first time. We are also considering a short post-camp survey for parents. Finally, when students return back to their high schools after camp, we do not have a grasp on how they influence their friends and fellow students. We do know there has been some influence; each application requires an essay and, at times, we read that the student "heard" about the camp from a fellow student who had attended and enjoyed it. We have also heard from counselors and EAST lab instructors that some returning campers do a great job at extolling the camp. It would be helpful if we had a means to quantify this information.

5.6 Conclusion

We designed the IT career camps that have been held each summer from 2007-2014 at the University of Central Arkansas to attract more technology majors to the university in particular but also to eventually support technology manpower needs at TechCompany. Our proximal camp objectives were to enhance perceptions of IT, including an increased awareness of technology job prospects and the nature of IT work. We designed the camps to be fun, to be a learning experience, and to target females in particular. For the most part, we have successfully accomplished these goals, especially among males; we have empirical evidence that the camps have enhanced their attitudes and beliefs, that campers' intention to choose an IT major is more strongly held, and that they regard the University of Central Arkansas much more favorably as their college of choice. While some evidence suggests that women who attended the camps also experienced changes in beliefs, the camps have been less successful in reaching this population. We are continuing to make changes to reach women campers more successfully. Overall, since 2010, IT majors at the university have increased 30 percent and it appears that the IT camps have at least been a part of the story.

As the demand for technology jobs increases in the future, universities' ability to supply this demand is dependent on their proficiency in attracting majors; as with all STEM majors, this has been problematic. The results have been detrimental to both university technology departments and to businesses and organizations that require such talent. Despite slightly different aims (departments' desire higher enrollment and businesses desire more IT talent), in the case of TechCompany and the University of Central Arkansas, these needs converged and created an opportunity to work together to help solve the shortage issue. Reaching high school students through a technology career camp is one way to help address the shortage of IT majors. In this case, the results suggest that the camps significantly enhanced students' IT perceptions, beliefs, and attitudes.

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