THE PENNSYLVANIA STATE UNIVERSITY
SCHREYER HONORS COLLEGE

DEPARTMENT OF PSYCHOLOGY

WHAT DRIVES STUDENTS TO STEM CAREERS?
THE ROLE OF SKILL-RELEVANT INTERESTS, VALUES, AND SELF-CONCEPTS

MELANIE ANGLE
Spring 2011

A thesis
submitted in partial fulfillment
of the requirements
for a baccalaureate degree
in Psychology
with honors in Psychology

Reviewed and approved* by the following:

Lynn S. Liben
Distinguished Professor of Psychology
Thesis Supervisor

William J. Ray
Professor of Psychology
Honors Advisor

* Signatures are on file in the Schreyer Honors College.

ABSTRACT

Women are dramatically underrepresented in the STEM (Science, Technology, Engineering, Mathematics) workforce, which means that many females' intellectual potential and interests in STEM remain underdeveloped. STEM careers are essential for the advancement of society in the United States; yet with women's untapped resources, these areas are not being fully utilized. Of particular interest in this thesis are the factors that drive students to pursue and achieve in certain domains, specifically the STEM careers. A survey was distributed to undergraduate students to examine the relationship between their self-ratings of domain-relevant skills, values, and interests and their interest in pursuing various occupations, including STEM careers and careers that require variable levels of spatial skills. Gender differences emerged in the students' ratings of skill, value, and interest in domains, with males reporting higher levels of each in the spatial, science, mathematics, and athletic domains, while females reported higher levels in the English and foreign language domains. Participants' ratings of their self-concept of ability in spatial skills were positively correlated with their performance on a spatial task; however this relationship was weaker for females. Finally, the students reported interest in careers that were believed to be culturally stereotyped as consistent with one's own gender. Males reported a greater interest in the majority of the STEM careers, which were subsequently believed by the students to be culturally stereotyped as masculine, providing evidence that knowledge of cultural stereotypes may affect females' interest in the STEM fields.

Table of Contents

ACKNOWLEDGMENTS

I would like to take this opportunity to thank my thesis advisor, Lynn Liben, for all of her help, support, and unending guidance throughout this process. Her knowledge, leadership, and support was truly invaluable. In addition, I would like to extend my thanks to Emily Coyle, Lacey Hilliard, and Stephanie Brunner for their constant assistance, patience, and willingness to lend a hand in any way, shape, or form. Furthermore, I would like to express my gratitude to my honors advisor and second reader for this thesis, William Ray, as well as the Psychology Department. Lastly, I could not have completed this thesis without the constant support from my friends and family, specifically my parents and sister who have always pushed me to do my best, be persistent, and fulfill my potential.

Introduction

The educational and professional fields of Science, Technology, Engineering, and Mathematics (STEM) are vital to the development, expansion, and success of society in the United States. The talented scientists, researchers, engineers, educators, and practitioners of these fields have helped to drive the United States to a position of global leadership through innovation, discovery, and performance (National Science Board, 2003; Newcombe, et al. 2009). However, the National Science Foundation reports several predictions based on trends in the STEM workforce that may prove to be problematic in the future advancement and success of the STEM fields in the United States, a primary issue being a decrease in student interest in the physical and mathematical sciences at the baccalaureate level (National Science Board, 2003). Our nation faces a challenge of continuing to increase the number of citizens pursuing a degree and career in STEM, while also lacking the long-term goals and strategies that aid in recruitment, education, and development of a highly skilled STEM workforce (National Science Board, 2003). Moreover, women and minorities have been shown to be drastically underrepresented in the STEM workforce and academia. Women pursue degrees in science and engineering at a rate of half of that of men (National Science Board, 2003). With the low numbers of females present in the fields, the STEM workforce cannot reach its full potential, as resources and intelligence in countless women remain untapped. In addition, the women who refrain from pursuing these degrees are creating a disservice to their own levels of achievement and development of skills. While the National Science Board suggests that the Federal Government should increase the funding for STEM programs at the collegiate level in an attempt to attract, retain, and graduate women from the STEM departments, when examining the various possible reasons for the underrepresentation of women in these fields, it is evident that there may be additional methods for increasing the number of women in the disciplines (National Science Board, 2003). This thesis aims to examine the various factors that may drive college students to pursue various STEM careers. Of particular interest is the relationship between college students' reports of self-efficacy, value, and interest in spatial domains and their interest in pursuing careers with varying levels of science, technology, engineering, and mathematical skills.

Spatial Skills: Importance in STEM and the Gender Gap

Increasingly, research is pointing to the need for spatial skills and abilities in the STEM school subjects and occupations. The Spatial Intelligence and Learning Center (SILC) of the NSF Science of Learning Center is dedicated to developing programs to aid in the education and development of spatial skills in individuals, which will help them to "compete in a global economy" (Spatial Intelligence and Learning Center, 2011). The existence of the SILC and the participation and support from the NSF, engineers, scientists, and other professionals in the STEM fields point to the importance of spatial skills in these disciplines. In addition, the very nature of many of the occupations indicate a need for spatial skills, as diagrams, graphics, measurements, maps, and other spatial representations are commonly used in the sciences, technology, engineering, and mathematics fields. Furthermore, Wai, Lubinski, and Benbow (2009) conducted a longitudinal study of over 11 years to examine the importance of spatial skills in education and future pursuits. The results showed that spatial ability during adolescence was a significant factor in students' achievement and pursuit of education and occupations in STEM. The researchers concluded that spatial skills are essential to success in the STEM fields (Wai et al., 2009).

While the need for spatial ability in the STEM areas is salient, this necessity poses a potential issue in closing the STEM gender gap. A great deal of research exists that points to females' lower performance and ability on spatial tasks than males'. The various types of spatial tasks, including mental rotation and horizontality tasks, produce differing levels of performance in males and females; but nonetheless, all are important skills necessary for success in science, technology, engineering, and mathematics.

A meta-analysis conducted by Linn and Petersen (1985) examined the magnitude, nature, and age that sex differences in spatial skills are established. The meta-analysis found that sex differences in spatial awareness and skill can be found at age eight, but are significant at age eighteen and later (Linn & Petersen, 1985). In addition, males tended to outperform females on mental rotation tasks at any age. Furthermore, Quinn and Liben (2008) found that gender differences in mental rotation occur as early as 3 months. These variable findings demonstrate that sex differences in spatial ability are found to begin at various ages depending on the type of tasks involved – i.e. mental rotation, horizontality tasks, spatial perception and visualization – but nonetheless are consistently found in favor of males (Linn & Petersen, 1985; Liben, 2006).

Many explanations for these gender differences have been constructed, including biology, heritability, evolution, and cultural factors. Linn and Petersen (1985) discuss the potential explanations for the sex differences in spatial ability. The article discredits a biological explanation that hypothesizes hormonal changes at puberty affect sex differences due to the finding that the extent of the differences did not change in early adolescence. Another popular explanation for sex differences is the contribution of genetic factors and heritability to spatial skills; however, the evidence for this explanation is inconsistent (as cited in Linn & Petersen, 1985). Fennema and Sherman (1977) conclude that stereotyping of activities and subjects as masculine can have an effect on females' pursuit of and success in the subject. An additional explanation for the gender gap in spatial skills may lie simply in the difference in experiences that males and females encounter throughout their lifetimes. While there does not exist much evidence documenting this relationship, it may provide insight to or at least supplement the reason for the gender gap, as well as provide information for the training of spatial skills (Linn & Petersen, 1985). That is, if females experience fewer occasions in which spatial skills are called upon throughout their lifetimes, such as using maps, creating structures or building things with toys such as Lego's, or exploring new outdoor areas, training programs could be developing that aim to utilize these experiences to better develop females' spatial skills.

STEM-Relevant Interests, Values, and Self-Concepts

While there exists many explanations for the spatial skills, and thus STEM, gender gap, the conjecture of particular interest in the present study is that of the individual's interests, value, and self-efficacy in the STEM arenas. Self-efficacy, or self-concept of ability as it is referred to by Denissen and colleagues (Denissen, Eccles, & Zarrett, 2007), is the individual's beliefs in their skill and ability level to attain educational goals. Factors such as the value one places on certain activities or subjects, the individual's beliefs about how successful he/she would be in the area, and the individual's interest in the subject may all have an impact on the decision to pursue a career that involves the particular subject. In examining how motivation to succeed influences choices and persistence, researchers have developed and utilized the expectancy-value theory of motivation and achievement (Wigfield & Eccles, 2000; Denissen et al., 2007; DeBacker & Nelson, 2000). This theory states that individuals' expectations about how well they will do in an area, as well as the value they place on it, will influence their choice, persistence, and performance in that area (Wigfield & Eccles, 2000). One's self-concept of ability, domain-specific interests and values, and achievement interact and influence future domain-specific choices, according to the expectancy-value theory of achievement (Denissen, et al., 2007).

Utilizing this theory, Eccles, Barber, and Josefowicz (as cited in Newcombe et al., 2009) draw a link between an individual's choices to pursue certain subjects or careers with two beliefs: (1) expectations of success in the pursuit and, (2) the importance of the field to the individual. Thus, if the individual believes he or she *can* do the task and *wants* to do the task, he or she will pursue the task (as cited in Newcombe et al., 2009).

In regards to the individual's belief that he or she *can* do the task, researchers have found self-efficacy to be essential in becoming proficient in and continuing with STEM classes (Newcombe et al., 2009). In addition, Bandura (as cited in Britner & Pajares, 2006) maintained that self-efficacy beliefs are a better predictor of academic achievement than objective measures such as tests and grades. Research maintains that students who believe they can do well and achieve in science are more likely to choose activities and undertakings that utilize science; while students who do not share this belief are likely to avoid tasks that require science skills (Britner & Pajares, 2006). In addition, confidence in one's science abilities at the collegiate level predicts choices and success in science-related majors and careers (as cited in Britner & Pajares, 2006). Drawing on these findings, this study aims to examine whether the same relationships exist with regards to spatial skills.

In addition to the research regarding the effects of self-efficacy on academic and career choices, Britner and Pajares (2006) discuss several sources of self-efficacy. The researchers point to four roots of self- efficacy:

1. *Mastery experiences*: previous experiences in the task or arena that have been interpreted as successful will increase the individual's confidence; while those interpreted as unsuccessful will lower it.

2. *Vicarious experience*: through observation of others performing the same or similar tasks, individuals construct a belief regarding the probability of their own success. This source is mainly a result of little previous experiences with the task or uncertainty about their abilities.
3. *Social persuasion*: the messages and judgments from others regarding the individual's abilities that affect the construction of their personal beliefs regarding their own ability. These persuasions can be positive or negative.
4. *Physiological states*: apprehension stress, mood, and overall arousal offer clues to the individual regarding their beliefs and abilities. Tasks that elicit high stress, nervousness, or negative emotions can lead the individual to expect negative outcomes or may hinder success on the task, which can lead to a decrease in self-confidence.

An individuals' sense of self-efficacy may be a result of the combination of these four factors (Britner & Pajares, 2006). Thus, if an individual has had successful previous experiences with a certain domain, has witnessed others achieving in the domain, receives positive messages from others about their abilities (verbal or non), and feels positive arousal when engaging in tasks of the domain, he or she will be likely to have a high self-efficacy in that domain and subsequently pursue further studies or a career in it (Britner & Pajares, 2006; Denissen et al. 2007). Of course, this example is be a bit simplistic, as the source of an individual's self-efficacy results from a combination of various factors, experiences, and information; however it illustrates Britner and Pajares' contention in this article. A concern that results from this contention is that a perception of low self-efficacy may lead students to avoid science and math courses, and thus steer clear of

STEM careers, regardless of their actual ability or potential to succeed in the fields (Britner & Pajares, 2006).

Cultural Stereotypes of Occupations

The gender gap that exists among the STEM subjects and occupations may, as noted above, be a result of a multitude of factors. One possibility that may help to elucidate the small representation of women in the science, technology, math, and engineering fields as compared to men may be the belief that society views certain jobs as particularly masculine or particularly feminine. A job that is stereotyped or believed to be stereotyped as masculine or mainly to be performed by men may be avoided by females, and vice versa. For instance, a job as a construction worker has been found to be culturally stereotyped as masculine (Liben & Bigler, 2002). A female who is aware of or believes that this stereotype exists in society may not choose to pursue that occupation out of a concern with acting inappropriately or anomalous to one's sex (Liben & Bigler, 2002; DeBacker & Nelson, 2000). Research by Liben and Bigler (2002) found that adults, as well as children, stereotype many occupations as primarily for one sex or the other. In the study, the researchers asked, among other things, who the participants believed *should* do certain jobs: only men, mostly men, both men and women, mostly women, or only women. They also were asked to rate their personal interest in the occupations: not at all, not much, some, and very much. The study found that women who held fewer stereotypes overall showed more self-endorsement of masculine items (Liben & Bigler, 2002). This finding is important in the present study because it points to the issue of the existence of gendered stereotypes, which can hinder individuals' occupational interests and choices. The study also found that adults who hold stereotypic beliefs regarding occupations were likely to hold stereotypic beliefs regarding activities and traits, as well (Liben & Bigler, 2002). The implications from this study demonstrate that if females hold stereotypic beliefs regarding certain occupations as mostly for men, they are also likely to regard certain activities (such as the domains reported on in the present study) as mostly for men. In addition, if women hold fewer stereotypes among the domains and occupations, they may be more likely to report a higher interest on the stereotypically masculine items.

Recent research on STEM occupations and the relationship between achievement and self-confidence in STEM-related domains has shown an implication that most STEM fields and subjects are seen as stereotypically masculine (DeBacker & Nelson, 2000; Liben & Bigler, 2002). DeBacker and Nelson (2000) report that male and female students of all ages report stereotypic images of science as a masculine sphere, particularly the physical sciences (as cited in DeBacker & Nelson, 2000). Moreover, the researchers found that the perception of science as a masculine field was negatively correlated with achievement and persistence in science for high school girls (DeBacker & Nelson, 1999). Another finding reported in this article was that mathematics was also seen as stereotypically masculine, but was reported as such by boys more than girls (as cited in DeBacker & Nelson, 1999). These findings suggest that because males may view STEM fields as more predominantly masculine, they would be more inclined and motivated to pursue and achieve in these fields; thus resulting in the gender gap within the STEM careers.

The Present Study

The purpose of this study is to examine the relationship between college students' self-reports of domain-specific skills, values, and interests to their reported interest in pursuing various careers, including several STEM careers. The participants first rated their interests, value, and self-efficacy in six domains, including English, foreign language, athletic, science, math, and spatial skills. To examine each participant's actual spatial skills, a horizontal water level task was included in the survey. The participants then reported on their interest in engaging in various careers, which included a list of 82 familiar jobs and 11 novel jobs. The students were provided with a definition of each novel job, which varied in the degree to which it emphasized spatial skills. Finally, the students rated their attitudes toward the existence of cultural stereotypes of the jobs; that is, whether they believe people in American culture generally believe each job is primarily for men, primarily for women, or for both men and women. The study was designed as a computerized survey with Likert scales for the measures of interest, value, and self-efficacy in each domain, as well as Likert scales for the job interest section and the cultural beliefs about the jobs.

The hypothesis is that the participants' ratings of self-efficacy, value, and interest in each subject will correlate with his/her interest in certain careers that require those subjects. Specifically, a gender difference in the ratings of self-efficacy, value, and interest was expected. Males were anticipated to be more likely to rate their interests, values, and self-efficacy higher than females for the science, math, and spatial skills domains. Likewise, males were expected to report a higher interest in pursuing STEM careers, stereotypically masculine careers, and the highly-spatial novel jobs than females.

In addition, it was expected that participants' ratings of spatial skill level would correlate with participants' performance on the water level task measuring spatial skills. Participants who rated themselves high on spatial skills were expected to perform better on the water level task than the participants who reported a lower level of spatial skills. A finding such as this would coincide with the expectancy-value theory that individuals who believe they are skilled in an area and *can* succeed in that area will perform better than those who report a lower self-efficacy.

METHODS

Participants

Participants for this study were undergraduate college students from The Pennsylvania State University. The students were recruited through the Psychology department's subject pool. In total, there were 149 student participants: 79 females and 70 males. The students were from a variety of majors, ranging from psychology, communications, engineering, education, business, and several others. The participants were mainly between the ages of 18-22 with a mean age of 19.48. They represented a variety of racial backgrounds, including African American, Asian, Hispanic, White, and American Indian, with the 78.7% being White.

Procedure

***What Do You Think* Survey.** The students participated in this study through a computerized survey titled *What Do You Think*. The participants were able to take the survey at a computer in any location and were only permitted to access the survey once. The entire survey took about thirty minutes or less to complete. There were several forms of the survey to ensure that the order in which each domain was presented did not affect the participants' responses (further explanation of this is included in *Measures*). The domains were randomized into six different orders. Another reason for creating several forms of the survey was to alternate which novel jobs were depicted as highly spatial. There were two versions that varied with regard to the novel jobs definitions. In one version, half of the jobs were described as highly spatial, while the other half were described in non-spatial terms. The second version presented the opposite. Thus, the six versions of randomized domains multiplied by the two versions of the novel jobs definitions resulted in twelve versions of the survey. The reasons for the various forms will be explained later. For now, it will suffice to know that there were twelve versions of the survey, each with the exact same questions presented in differing orders. In order to ensure that there was an even but random distribution of participants for each form, subjects were directed to one of twelve forms based on the month in which they were born.

***What Do You Think? Job Skills* Survey.** Because an important aspect of this study is examining how students' skill, value, and interest in spatial skills affects their interest in pursuing certain careers, it was also necessary to examine the extent to which each of the jobs were perceived as needing spatial skills. To do this, a separate sample of 65 undergraduate students completed a survey that asked them to rate how much each of the 82 familiar jobs and 11 novel jobs called on skills from the six domains. This survey is referred to as the *Job Skills Survey*. The questions were posed as follows:

A job as a dentist calls upon math/English/science/spatial skills:

(1) Not at all
(2) A little
(3) Some
(4) Pretty much
(5) A lot

This was also a computerized survey that the participants could take at the location and time that was most convenient for them. The entire survey took about 30 minutes to complete. There were two forms of this survey. One form included the novel jobs with the non-spatial definitions, while the second form included the novel jobs with the spatial definitions. The two forms were created to investigate whether the emphasis on spatial skills in the definition would cause variance in the ratings of spatial skills necessary for the jobs. The expectation was that those who received the spatial definitions would rate the job as requiring more spatial skills than those who received the non-spatial definitions.

What Do You Think Measures

Domains. There were six domains on which participants reported their interest, value, and self-efficacy: English, foreign language, athletic, science, math, and spatial. For each domain, participants were asked 10 questions that aimed to measure these constructs. The questions were as follows, with the "_______" representing where the words "math", "science", "English", "foreign language [skills]", "athletic [skills]", and "spatial [skills]" would be inserted:

1. "I have always had good _______ skills."
2. "In general, I think that developing my _______ skills is useful to me."
3. "I learn _______ skills quickly."
4. "I'm hopeless when it comes to _______."
5. "I think I would do well in a job that requires strong _______ skills."
6. "Compared to others my age, I have good _______ skills."
7. "I generally find working on _______ very boring."
8. "Working on _______ is easy for me."
9. "It is important for me to have good _______ skills."
10. "I really like working on _______ a lot."

These questions were developed after referencing the studies done by Simpkins, et al. (2006) and Denissen et al. (2007) that examined students' self-concept of ability and perceptions of the importance of school subjects, respectively. The questions used in these studies were adapted and abbreviated for the domains used in the present study. The 10 questions were designed to measure each of the three factors of self-efficacy, value, and interest in each domain. Questions 1, 3, 4, 5, 6, and 8 intended to measure the participants' self-concept of their skill level in each domain. Questions 2 and 9 aimed to measure the value that the participants place on each domain. Questions 7 and 10 intended to measure the participants' interest in each domain. The answer choices were presented on a scale of 1 to 7 as follows: (1) completely false, (2) mostly false, (3) a little more false than true, (4) neutral, (5) a little more true than false, (6) mostly true, and (7) completely true. With this scale, a higher rating indicated a higher level of self-efficacy, value, and interest for each domain. Questions 4 and 7 were reverse coded so as to coincide with the scales of the other questions.

The six domains were presented in six random orders. Randomizing the order in which the domains were presented controlled for potential boredom or carelessness in responding after answering the first 30-40 questions. That is, in order to ensure that the final two or three domains were not continually answered lackadaisically as a result of monotony in the survey, the order in which the domains were presented was scrambled for each participant. For instance, one participant may have received the order of domains as foreign language skills, science, English, math, spatial skills, and athletic skills; while another participant may have received English, foreign language skills, athletic skills, science, spatial skills, and math. The ten questions within each domain were presented in the same order for each.

Spatial Task. A water level task was included in the survey as a way to objectively measure the participants' actual spatial skill level. This task consisted of 15 questions; each presented a water container in a tipped position on a table top with a line drawn in the container to show where the water is filled to. The participants were asked to respond to the question, "Does the line show where the water would be if the container is held in this position?" with "Yes" or "No". A correct image of the water line is one in which the line is parallel to the table top. The participants who answered a higher number of questions correctly are thought to have better spatial skills.

Job Interests. The participants were then asked to rate their interest in 82 familiar jobs and 11 novel jobs on a 5-point Likert scale: (1) Not at all, (2) A little, (3) Some, (4) Pretty much, (6) A lot. The list of familiar jobs was created using the occupation items on the OAT-AM and OAT-PM (Liben & Bigler, 2002). In order to have an adequate representation of STEM careers on this list as well, careers classified as STEM careers by the Federal Government were used. These careers were researched using a simple internet search of STEM careers on Federal Government websites and sources (Higher Education, 2005; Terrell, 2007; Career Clusters, 2009). According to the National Science Board (2003), the definition of the STEM workforce should include jobs consisting of employees of various educational levels, including a "precollege teacher" with a baccalaureate degree or the equivalent, practitioners with two-year degrees and certificates, and doctoral level professionals. The addition of STEM jobs to the OAT list for this study intended to incorporate occupations at each of these levels of education. A list of these jobs can be found in Tables 4 and 5 in Appendix A at the end of this paper. The list of familiar jobs was presented in a random order for each participant, so as to again avoid lackadaisical answering for the same jobs repeatedly, as well as to avoid jobs such as "dentist" and "dental assistant" being presented subsequently, and thus perceived as very similar.

The novel jobs titles and basic definitions were taken from *Pink and Blue Collar Jobs: Children's Judgments of Job Status and Job Aspirations in Relation to Sex of Worker* (Liben, Bigler, & Krogh, 2001). These jobs were included in the survey to contrast the familiar jobs and potential prior opinions of jobs regardless of the spatial skills involved. That is, participants may already have a judgment regarding a job as a nurse or an electrical engineer that is not based on the spatial skills involved. To combat this, the novel jobs with which the participants were unfamiliar were included as method of manipulating the level of spatial skills involved in a job and examining the effect of that on the participant's interest in the job. Because the participants were not familiar with these jobs, an explanation of each job was provided. The explanations of the novel jobs by Liben et al. (2001) were expanded upon for the current study by creating two highly descriptive definitions for each of the 11 jobs – one that was highly spatial and one that was not. The highly spatial definitions were created in collaboration with Dr. Lynn S. Liben, as well as in consultation of *Learning to Think Spatially: GIS as a Support System in the K-12 Curriculum* (2006). The highly spatial definitions include wording that deals with shapes, orientation, perspective, measurements, and other spatial perspectives. The non-spatial definitions consist of descriptions regarding any details that do not deal with spatial aspects, such as aesthetics, profits, and consumers. Both definitions of each of the 11 jobs can be found in Appendix B at the end of this paper.

The participants randomly received one of two versions of the novel jobs definitions. Half of the surveys included spatial definitions of the even-numbered novel jobs and non-spatial definitions of the odd-numbered novel jobs (ES/ON). The other half of the surveys included non-spatial definitions of the even-numbered novel jobs and spatial definitions of the odd-numbered novel jobs (OS/EN). Therefore, in both forms of the survey, the job definitions alternated a spatial definition and then a non-spatial definition. The various forms of the definitions and surveys were created to examine whether participants' interest in the jobs differed based on whether the job was described as highly spatial or non-spatial.

Cultural Beliefs about Jobs: Gender. The section regarding cultural beliefs about jobs was designed to investigate whether the participants believed that cultural stereotypes exist regarding the masculinity or femininity of each job. That is, do participants believe that our culture generally thinks a job as a mechanical engineer is mostly for men, or a job as a cook in a restaurant is equally for men and women? This section of the questionnaire was based on the OAT-AM measure by Liben et al. (2002). The wording of the question and rating scale was altered a bit to fit the current study. The question was posed as: "Who do you think people in our culture generally think each of the following jobs is for?" with the answers presented on a 5-

point Likert scale: (1) Only for men, (2) Mostly for men and a few women, (3) Equally for men and women, (4) Mostly for women and a few men, (5) Only for women. This question was posed for each of the 82 familiar jobs, as well as the 11 novel jobs.

RESULTS

Gender Differences among Domains

One of the central objectives of this study was to examine whether a gender difference exists in participants' ratings of their domain-relevant skills, values, and interests. Particularly, the expectation was that males would report higher rankings for the math, science, and spatial skill domains than females. A finding such as this would be the basis for the hypothesis that skills, values, and interests are predictive of future career pursuits, and thus males would show higher interest in the STEM fields than females.

In order to calculate the mean ratings of males and females for each domain, the questions that targeted the participants' self-concept of skill were combined and the mean rating of the individual's skill level was computed. The same was done for the questions regarding value and interest, creating a total of 18 new variables (3 variables x 6 domains). For ease of understanding, these variables are called "[DOMAIN] Skill Average", "[DOMAIN] Value Average", and "[DOMAIN] Interest Average." An independent-samples t-test was conducted to compare gender with the mean ratings of each of these three variables of each domain. Tables 1, 2, and 3 in Appendix A illustrate the means and standard deviations of each rating by males and females, as well as the combined ratings. The tables also report the p-values obtained from the independent-samples t-test.

On average, females reported a higher level of skill, value, and interest in English than males, though the only statistically significant difference was in the value ratings, t (124.53) = 3.00, p = .003.

In the foreign language domain, females reported a higher level of skill in foreign language, though statistical significance was not found. There does exist a statistically significant difference in the ratings of value and interest for foreign language. Females reported a higher value of foreign language, t (133) = 4.20, $p < .001$, as well as a higher interest in foreign language, t (147) = 2.59, $p = 0.01$.

For the athletic domain, males reported a significantly higher skill level, t (147) = -2.40, $p = 0.02$. While males also reported a higher value and interest in the athletic domain, these findings were not statistically significant.

As was predicted, males reported a significantly higher skill level in science, t (147) = -2.65, $p = 0.01$, as well as significantly higher interest in science, t (147) = -2.40, $p = 0.02$, than females. Males also reported a higher value placed on science, though statistical significance was not found.

In addition, males reported statistically significant higher ratings of skill level, t (138) = -3.89, $p < .001$, value, t (147) = -3.14, $p = .002$, and interest in mathematics, t (145.51) = -3.06, $p = .003$.

Finally, males reported a significantly higher level of spatial skill level than females, t (147) = -2.02, $p = .04$. Males also reported higher levels of value and interest in spatial skills, though these findings were not statistically significant.

Self-Concept of Spatial Skills and Performance on Spatial Task

A main interest in this study is whether the participants' reported self-concept of ability in the spatial skills is related to their actual performance on spatial tasks. If participants who believe that they are skilled in the spatial domain (i.e. have a higher self-concept of ability) perform better on the spatial tasks, the implications are numerous. This would lend support to the theory that self-efficacy in certain areas does in fact influence performance on tasks requiring skills in those areas.

To correlate the participants' self-efficacy of spatial skills with their performance on the water level task (WLT), a total score was first computed for the WLT. One point was awarded for each correct answer; thus the closer the score was to 15, the better the performance. A Pearson product-moment correlation was run to determine the relationship between the participants' reported spatial skills level and performance on the spatial task. There was a significant positive correlation between reported spatial skill level and performance on the WLT, $r = 0.33$, n = 149, $p < .001$. The data, however, was not normally distributed, but instead showed a bimodal trend. To combat this, a second analysis was computed in which the scores on the WLT were coded as either low performance (0-12 correct answers) or high performance (13-15 correct answers) to create a new categorical variable that could be related to spatial skill levels in a binomial correlation. A correlation was run again using this variable.

A Pearson product-moment correlation was run to compare the relationship between the participants' reported spatial skill level and whether the participant was a low or a high performer on the WLT. A separate correlation was run for males and females to examine whether these two variables were differentially related among gender. Because the expectation was that a higher level of reported spatial skills would be correlated with a higher level in the water level group, a one-tailed test of significance was used. Again, the participants' reported spatial skill level was positively correlated with performance on the WLT. However, females' reported skill level showed a lower correlation with water level group, $r(79) = 0.26$, $p = 0.01$, than males, $r(70) = 0.41$, $p < .001$. This is not necessarily due to a poorer performance by females on the WLT, evident by the number of females in the low water level group ($n_{FL} = 59$) and the high water level group ($n_{FH} = 20$), as compared to males ($n_{ML} = 38$, $n_{MH} = 32$). Instead, this finding suggests that females are not rating their spatial skill level as accurately as males.

Gender Differences among Job Interests

Of most interest in the present study is whether males and females reported differing levels of interest in the 93 careers. The participants' interest ratings of the 93 jobs are conveyed in Tables 4 and 5 in Appendix A. The table shows the percentage of male and female participants who responded with each answer choice, as well as the mean response for interest in each job on a scale from 1 (not at all) to 5 (a lot). Due to the extensive number of jobs included in the survey, the most efficient and succinct way to convey the results of this aspect of the survey is to report the ten jobs rated of most interest to each gender. The results of the *Job Skills Survey* regarding the extent to which spatial skills are perceived as necessary for each of the 10 jobs will then be presented. This will allow for a comparison between the skills needed for the jobs ranked highest by males and females.

Most Preferred Jobs. The highest rated jobs of interest for female participants were psychologist (*M* = 3.63, *SD* = 1.34), interior decorator (*M* = 2.92, *SD* = 1.33), pediatrician (*M* = 2.89, *SD* = 1.60), doctor *(M* = 2.87, *SD* = 1.62), school teacher (*M* = 2.82, *SD* = 1.44), physical therapist (*M* = 2.72, *SD* = 1.32), clothing designer (*M* = 2.68, *SD* = 1.35), baker (*M* = 2.63, *SD* = 1.24), nurse (*M* = 2.62, *SD* = 1.50), and nutritionist (*M* = 2.54, *SD* = 1.35).

The top 10 jobs of interest to the male participants are professional athlete (*M* = 3.09, *SD* = 1.73), psychologist (*M* = 3.01, *SD* = 1.40), school teacher (*M* = 2.79, *SD* = 1.23), doctor (*M* = 2.71 , *SD* = 1.49), engineer (*M* = 2.64, *SD* = 1.46), lawyer (*M* = 2.51, *SD* = 1.24), surgeon (*M* = 2.49, *SD* = 1.45), nuclear engineer (*M* = 2.46, *SD* = 1.41), aerospace engineer (*M* = 2.41, *SD* = 1.36), and architect (*M* = 2.37, *SD* = 1.29).

While the top 10 jobs of interest to the female participants do not differ entirely from the jobs of interest to males, there are some notable differences. Psychologist, school teacher, and doctor were among the top rated jobs for both genders. As was found in previous research by Liben and Bigler (2002), several of the top rated jobs by females are those that have been culturally stereotyped as feminine, including interior decorator and nurse. Similarly, Liben and Bigler (2002) report “elementary school teacher” to have been found to be culturally stereotyped as feminine; while the present survey did not include the modifier “elementary.” While it is important to note the difference, the two jobs are quite similar, allowing us to conjecture that “school teacher” might be similarly stereotyped as feminine. What’s more, none of the jobs in the females’ top ten are among the STEM careers that were added to the original OAT list.

Even more notable is the amount of jobs of interest to males that coincide with the findings of Liben and Bigler (2002). Lawyer, engineer, architect, professional athlete, and doctor were all previously found to be culturally stereotyped as masculine. These results are thus fairly consistent with previous research regarding the cultural stereotypes of the masculinity and femininity of jobs, in that females tended to be interested in several of the “feminine” jobs, while males were interested in several of the “masculine” jobs. Additionally, the only stereotypically “masculine” job in the females’ top 10 careers was doctor; while males did not report a high interest in any stereotypically feminine careers. Finally, 3 of the top 10 jobs of interest to males were among the jobs categorized as STEM careers—surgeon, nuclear engineer, and aerospace engineer—as opposed to 0 listed in the females’ top 10.

Least Preferred Jobs. Though the interest in this study was initially and primarily on those jobs that participants’ rated as high interest, interesting findings also resulted from those jobs rated as the lowest interest. Females’ lowest rated jobs of interest included elevator operator (M = 1.08, SD = 0.38), dishwasher in a restaurant (M = 1.11, SD = 0.42), electrician (M = 1.16, SD = 0.49), automotive engineer (M = 1.23), computer designer (M = 1.25, SD = 0.54), computer software developer (*M* = 1.27, *SD* = 0.59), construction worker (*M* = 1.28, *SD* = 0.77), auto mechanic (*M* = 1.28, *SD* = 0.78), electrical engineer (*M* = 1.30, *SD* = 0.74), and factory owner (*M* = 1.33, *SD* = 0.67).

The jobs with the lowest ratings of interest for males included manicurist (*M* = 1.30, *SD* = 0.69), dishwasher in a restaurant (*M* = 1.31, *SD* = 0.69), refrigerator salesperson (*M* = 1.32, *SD* = 0.74), elevator operator (*M* = 1.33, *SD* = 0.72), telephone installer (*M* = 1.37, *SD* = 0.73), plumber (*M* = 1.40, *SD* = 0.71), ballet dancer (*M* = 1.40, *SD* =0.94), birth attendant (*M* = 1.40, *SD* = 0.79), hair stylist (*M* = 1.43, *SD* = 0.81), and librarian (*M* = 1.44, *SD* = 0.84).

Several of the lowest rated jobs of interest to males were previously found by Liben and Bigler (2002) to be culturally stereotyped as feminine, including manicurist, birth attendant, hair stylist, ballet dancer, and librarian. Likewise, females reported low interest in several of the culturally stereotypically masculine careers, such as electrician, construction worker, factory owner, engineer, and auto mechanic. In addition, “computer builder” was found by Liben and Bigler (2002) to be stereotypically masculine. This is similar to “computer software developer” and “computer designer”, thus allowing us again to conjecture that each of those may potentially be stereotyped as masculine as well.

With regards to the STEM careers, none of the lowest ranked jobs of interest to males were among those categorized as STEM careers. On the other hand, 4 of the 10 lowest ranked jobs by females were STEM careers: automotive engineer, computer designer, computer software developer, and electrical engineer.

Spatial Needs of Jobs of Interest.

Of particular interest in this study is the whether the ratings of spatial skill needs for each job are related to participants’ reported interest in careers. As noted previously, a separate survey, *What Do You Think: Job Skills Survey*, was conducted with different participants that asked how much each job calls upon the use of spatial skills (as well as English, math, and science skills). The mean ratings and standard deviations of the need for spatial skills of each job can be found in Tables 6 and 7 in Appendix A. Due to the gender gap in the STEM careers and the need for spatial skills in STEM careers, it was expected that the jobs of highest reported interest to males would also be rated as requiring more spatial skills than those jobs for which females report a high interest.

Most Preferred Jobs. Beginning with the top ten jobs of highest interest to females, the mean ratings by females for the need for spatial skills of the jobs were as follows: psychologist (*M* =3.58, *SD* = 1.31), interior decorator (*M* = 4.84, *SD* = 0.45), pediatrician (*M* = 3.41, *SD* = 1.32), doctor (*M* = 4.12, *SD* = 1.01), school teacher (*M* = 3.97, *SD* = 1.03), physical therapist (*M* = 3.44, *SD* = 1.52), clothing designer (*M* = 4.19, *SD* = 1.03), baker (*M* = 3.47, *SD* = 1.22), nurse (*M* = 3.37, *SD* = 1.21), and nutritionist (*M* = 2.63, *SD* = 1.31). Tables 8 and 9 in Appendix A display the top 10 jobs of most interest to females, with the mean ratings of interest, the mean gender ratings (who the participants believe people in our culture think the jobs are typically for—males, females, or both), whether the job was added to the OAT (Liben & Bigler, 2002) list of jobs as a STEM job, and the average rating of how much each job calls upon spatial, science, math, and English skills from the *What Do You Think: Job Skills* survey. Table 8 displays the ratings of these variables by females, while Table 9 displays these ratings by males, as a way to compare and contrast the ratings between genders.

The mean ratings by males for the need for spatial skills for those jobs rated of most interest to males were as follows: professional athlete (*M* = 3.48, *SD* = 1.52), psychologist (*M* = 3.42, *SD* = 1.28), school teacher (*M* = 3.64, *SD* = 1.02), doctor (*M* = 3.74, *SD* = 1.05), engineer

(*M* = 4.27, *SD* = 0.88), lawyer (*M* = 3.06, *SD* = 1.26), surgeon (*M* = 4.36, *SD* = 0.86), nuclear engineer (*M* = 3.94, *SD* = 1.03), aerospace engineer (*M* = 4.53, *SD* = 0.72), and architect (*M* = 4.47, *SD* = 0.99). Tables 10 and 11 in Appendix A display the top 10 jobs of most interest to males, with the mean ratings of interest, the mean gender ratings (who the participants believe people in our culture think the jobs are typically for—males, females, or both), whether the job was added to the OAT (Liben & Bigler, 2002) list of jobs as a STEM job, and the average rating of how much each job calls upon spatial, science, math, and English skills from the *What Do You Think: Job Skills* survey. Again, to compare the ratings between genders, Table 10 displays the ratings of these variables by males, while Table 11 displays these ratings by females.

Contrary to the expectation, the perceived need for spatial skills in each of these sets of 10 jobs did not show a great deal of variation. In both the males' and females' highest ranked jobs, all but one job had a mean of the need for spatial skills that was higher than *M* = 3.00, demonstrating that males did not show interest in jobs that were thought to have a much greater need for spatial skills.

Least Preferred Jobs. The mean ratings by females for the need for spatial skills in the lowest ranked jobs of interest to females were as follows: elevator operator (*M* = 2.61, *SD* = 1.33), dishwasher in a restaurant (*M* = 1.11, *SD* = 1.19), electrician (*M* = 3.62, *SD* = 1.10), automotive engineer (*M* = 4.06, *SD* =0.93), computer designer (*M* = 3.72, *SD* =1.17), computer software developer (*M* = 3.58, *SD* = 1.26), construction worker (*M* = 3.97, *SD* = 1.12), auto mechanic (*M* = 4.22, *SD* = 0.98), electrical engineer (*M* = 3.84, *SD* = 1.05), and factory owner (*M* = 3.81, *SD* = 1.20).

As for the least rated jobs of interest for males, the mean ratings by males for the need for spatial skills in those jobs were as follows: manicurist (*M* = 2.58, *SD* = 1.35), dishwasher in a restaurant (*M* = 2.32, *SD* = 1.06), refrigerator salesperson (*M* = 2.61, *SD* = 1.14), elevator operator (*M* = 2.82, *SD* = 1.21), telephone installer (*M* = 3.44, *SD* = 1.13), plumber (*M* = 3.52, *SD* = 1.18), ballet dancer (*M* = 3.61, *SD* = 1.39), birth attendant (*M* = 3.18, *SD* = 1.13), hair stylist (*M* = 3.36, *SD* = 1.19), and librarian (*M* = 3.21, *SD* = 1.12).

Notable in these findings is the noticeably lower ratings of the need for spatial skills in the males' 10 least preferred jobs as opposed to the females' 10 least preferred jobs. The jobs of least interest to males also received lower ratings of the need for spatial skills than did the jobs of most interest to males. While some of the ratings are just as high as the jobs of highest interest, there are several more jobs that have a mean below *M* = 3.00, unlike the jobs of highest interest.

STEM Careers: Gender Ratings and Interest

In looking specifically at the STEM careers on the job list, of interest is participants' reported interest in these jobs and participants' subsequent ratings of the jobs as stereotyped in our culture as highly masculine or highly feminine. An independent samples T-test was conducted to examine the difference in ratings of interest in STEM jobs between males and females. Males reported a higher interest in all of the STEM careers than females, with the exception of food scientist and veterinarian. The means and standard deviations of these ratings can again be found in Table 4 in Appendix A. Of the 34 STEM careers, 20 of these differences in interest among males and females showed significance. The p-values are reported in Table 12 in Appendix A.

What's more, the gender ratings of the STEM jobs (i.e. the gender stereotypes participants believe our culture places on each job) are consistent with the gender differences in job interest. After the mean gender ratings of the 34 STEM careers were calculated, findings showed that all but two of the STEM careers were rated as more masculine in our culture.

Because the rating was based on a scale of 1-5, with one being only for men and 5 being only for women, mean ratings that were below a 3 (equally for men and women) can be thought of as masculine ratings, while mean ratings above a 3 can be thought of as feminine ratings. 32 of the 34 STEM careers showed a mean rating of below 3.00, while food scientist and veterinarian were the only two rated at a 3.00 or higher (*M* = 3.01, *SD* = 0.49; *M* = 3.16; *SD* = 0.60, respectively). These findings are consistent with the interest ratings of STEM jobs. Males reported higher interest in the same 32 STEM jobs that were rated by the participants as masculine in our culture, while females reported higher interest in the same 2 STEM jobs that were rated as either equally masculine and feminine or a bit more feminine in our culture.

Interest in Novel Jobs by Form

As can be seen in Table 5 in Appendix A, the participants did not report a great deal of interest in any of the novel jobs. Still, one of the questions of the current study examined whether the participants' interest in the novel jobs varied based on whether they received the spatial definition or non-spatial definition of the job. An independent samples T-test was run to compare the mean interest ratings of each novel job with the form that the participant received. Females' ratings of interest in each novel job did not differ a great deal with respect to the form received. Only 2 out of the 11 novel jobs showed a significant difference in interest between the spatial and non-spatial definitions. Females who received the spatial definition of a higgler reported a significantly higher interest in the job (*M* = 1.51, *SD* = 0.82) than females who received the non-spatial version, t (77) = -2.51, p = 0.01. On the other hand, females who received the non-spatial definition of a tenic reported a significantly higher interest in the job (*M* = 1.80, *SD* = 1.13) than females who received the spatial version, t (77) = -3.12, p = 0.003. For the other 9 jobs, there was no significant difference in the interest ratings based on the definition received. In addition, the significant differences found in the ratings of higgler and tenic do not follow any consistent trend, nor are they consistent with the prediction that females will show more interest in the jobs presented as non-spatial than those presented as highly spatial.

Similar results were found for the males' ratings of interest of novel jobs. There was no significant difference in the ratings of interest of any of the novel jobs and the form received. There also was not a trend in rating certain jobs of more interest than others depending on the definition. That is, the jobs defined as highly spatial were not rated higher in interest than jobs defined as non-spatial, or vice versa. There seemed to be a random trend of which jobs were rated of high interest to the participant for both males and females.

DISCUSSION

Domain-Relevant Skills, Values, and Interests: Gender Differences

A very interesting, yet expected result that emerged from this study was the gender differences between males and females ratings of domain-relevant skills, values, and interests. Females consistently reported their skills, values, and interests in English and foreign language higher than males reported. Likewise, the male participants rated their skills, values, and interests in the athletic, science, math and spatial domains as higher than females. While a few of these results did not produce significance, it is important to note the implications of these ratings. The finding that females do not value math, science, and spatial skills as highly as males do points to the underrepresentation of women in the fields that call upon those skills. Showing a lack of self-efficacy, interest, and value in the STEM subject areas may cause women to feel that they cannot succeed in the fields, would not be interested in a job in those areas, and would not be doing work that is important to them. All of these thoughts could influence women to avoid the spatial, science, and math domains.

Further research should examine the skill-relevant ratings of self-efficacy, value, and interest of a larger sample of females to investigate whether greater statistical significance between male and female ratings would emerge. In addition, it would be interesting to examine in greater detail why participants report the ratings of self-efficacy, value, and interest. For instance, future research could examine these factors with measures that are less definitive, rather than on a Likert scale.

Self-Concept of Spatial Skills and Performance on Spatial Task

One of the most interesting findings is that of the gender differences among ratings of spatial skills and actual spatial task performance. In the initial analysis of the participants' self-concept of their spatial skill level and their actual performance on the WLT spatial task, there seemed to be a significant positive correlation between participants' reported spatial skill level and performance on the WLT. After conducting a second correlation to account for the non-normative distribution, it was evident that a relationship does in fact exist. In addition, gender differences in the relationship became apparent. While males who were scoring high (13-15 correct answers) on the WLT were also rating themselves high on spatial skill level, with a correlation of $r = 0.41$, females seemed to be less aware of their spatial skill level, with a much weaker correlation of $r = 0.26$. That is, females did not have as accurate of a self-concept of their spatial skill abilities as males.

Further research is needed to understand why females are not as attuned to their ability level. Perhaps this could be a result of what Britner and Pajares (2006) called *mastery experiences.* That is, when completing the part of the survey inquiring about spatial skill level, females may have considered previous experiences in spatial tasks (such as the use of maps, constructing shapes or structures, or mental rotation tasks) when they were unsuccessful (or successful). The water level task may not have been as difficult (or easy) to complete as the previous experiences, hence creating somewhat of a disjunction between the students' confidence level in spatial abilities and actual performance on this particular water level task. Perhaps the use of additional and different types of spatial tasks could better examine this relationship. A second possible factor in the weaker relationship between perceived skill level and actual skill level in females may be Britner and Pajares' (2006) notion of *social persuasion*. Perhaps if the female participants in this study have received messages or judgments from others that point to a negative spatial skill ability or cause them to feel a lack of confidence, their ratings of their own abilities may have been affected.

This finding is contrary to the theory of self-efficacy leading to increased performance. The findings regarding females indicate that females' self-efficacy of their spatial skills does not exclusively affect their performance on spatial tasks. There was a great deal of variance in the relationship between females' reports of spatial ability and actual performance level, which does not allow for the concrete conclusion that high self-efficacy predictably leads to high performance. On the other hand, the moderate correlation of males' reported spatial skills with performance on the spatial task is supportive of the expectancy-value theory of motivation and achievement (Wigfield & Eccles, 2000; Denissen et al., 2007; DeBacker & Nelson, 2000) in that they did show a higher awareness of and accuracy in their actual ability level. Though there was also much variation in the relationship between self-efficacy and performance on the spatial task, it seems that males expect to do well in and value spatial skills and subsequently perform well on spatial tasks.

Because of the differences in the findings of self-efficacy among males and females, it does not suffice to say that merely expecting to do well or possessing a high self-concept of ability is wholly predictive of performance. There are other factors that influence ones' ratings of domain-specific skills and performance on domain-specific tasks, and further research should aim to understand the factors that affect these.

A potential implication of this finding in females' involvement and success in the STEM and other fields that require spatial skills is the effects that a lack of confidence may have. If the females were reporting a lower self-concept of ability in spatial skills due to a lack of confidence in their abilities, they may also lack the confidence to enter fields that require spatial skills, regardless of their actual ability. This has immense implications for the future of the STEM fields. The STEM arena may be missing the opportunity to benefit from females' skills. The resources that females can provide to the STEM fields, such as their spatial skill abilities, may be remaining untapped. Improving females' *confidence* in their skills, as well as striving to improve their actual skill level in the spatial domains should be an aim of researchers' and teachers' future endeavors.

A further limitation in the present study is the single focus on the relationship between these factors in the spatial skills domain. It would also be interesting to examine in future research if this finding also emerges for other domains, such as math, science, English, or athletics. Because this study did not include any other tasks to measure actual skill, it is currently unknown if females' lower cognizance of their actual skill level is limited to only spatial skills, or to other skills as well.

Job Interest

In looking at the most preferred jobs of males and females, a few interesting trends emerged. As can be seen in Tables 8, 9, 10, and 11 in Appendix A, the majority of the jobs of most interest to females were rated as primarily believed by our culture to be for females. Aside from doctor and physical therapist, which were both rated as more masculine (although barely), all of the jobs were rated by both males and females as more feminine. In much the same way, the 10 most preferred jobs by males were mostly rated as stereotyped by our culture as mainly for men. Again, two of the jobs—psychologist and school teacher—were rated a bit toward the feminist end of the spectrum, though narrowly. The other 8 jobs were rated as masculine. These findings demonstrate that individuals do tend to endorse careers that are stereotyped as consistent with their gender. These results are support for the existing research that stereotypes of careers do exist in our culture, and provide an illustration of the effects of those gender stereotypes.

Of particular concern in this study was the effect of individuals' beliefs about their skill level and the existence of gender stereotypes on their interest in STEM careers. The study found that the participants generally believed that our culture stereotypes the STEM careers as masculine. Moreover, males reported higher interest in the STEM careers than females; pointing to a possible relationship between the participants' perception of stereotypes of the job and their self-endorsement of the job. The highly gendered ratings of the STEM jobs along with the finding that the participants show interest in jobs that are stereotypically consistent with their gender allow for the conclusion that females will not show interest in the STEM jobs. In order to increase females' interest in STEM fields, the gendered stereotypes of the jobs must be diminished. As discussed previously in this paper, DeBacker and Nelson (1999) found that boys were more likely than girls to report mathematics as stereotypically masculine. This would suggest that the gender gap in the STEM fields does not result from females being uninterested in the careers, but rather from males being *more* inclined to pursue the "masculine" careers. The results of the present study, however, seem to indicate that females also believe stereotypes of the STEM careers as masculine exist in our culture and that they act in accordance with these stereotypes. Reducing the recognition of the gendered stereotypes may influence females to become more inclined or motivated to pursue careers that have typically been viewed as masculine in our culture. Of course, a change such as this is extremely complex and multifaceted; however, recognizing the implications of gender stereotyping in our culture can be a catalyst for the change to begin.

In addition to decreasing the prominence of the gendered stereotypes, the findings indicate that females' self-efficacy in the subjects need to be improved. As was evident by the correlation among females' self-concept of spatial skill ability and their performance on the spatial task, females seem to be less attuned to their actual spatial abilities. The variance showed that this may result from either a lack of confidence in their skills or a poor performance on the spatial task. Perhaps a lack of confidence in their skills in the spatial areas, as well as science and math, discourages them from pursuing these areas. It is even possible that this dissuasion is on females' subconscious level; that is, they may not intentionally decide that their lack of confidence in an area leads them to avoid careers in that area. This notion implies that measures that increase females' confidence in certain areas, as well as their skill level, could be taken to aid in increasing their pursuit of the STEM fields.

A limitation of this study is that due to the method in which it was designed and distributed—a survey mainly composed of Likert scales—it did not allow the participants to justify their responses. That is, simply indicating ones' interest in a job or level of skill on a scale of 1-5 does not allow for the discernment of *why* the participant answered in the way he/she did. We are unable to detect the reasoning behind the participants' interests in certain jobs or perceived level of skill. Because the participants in the current study were college students in the process of earning a Bachelor's degree, the motives behind their interest in pursuing certain careers may be complex. As evident by the lack of interest in the novel jobs and the nature of the 10 most preferred and least preferred jobs, the students may be interested in pursuing jobs that are recognized as prestigious, lucrative, and consistent with their major. The novel jobs and the 10 least preferred jobs of each gender may all be seen as entry-level, disreputable jobs. The participants seemed to not show interest in the entry-level jobs, regardless of the spatial skills involved, as evidenced by the insignificant differences between the interest ratings of the novel jobs based on the differential spatial emphasis in the definitions. Rather than the participants being motivated to pursue jobs that either require or do not require spatial skills, they may instead show interest in jobs that are of high-status, profitable, and necessitate knowledge of their major. Further research should examine in more detail the personal motives behind students' interest in and pursuit of careers before concrete conclusions can be drawn. This study does, however, provide a strong starting point for examining in further detail the gender gap in self-efficacy, value, and interest in the STEM subjects, and the effects that these may have on the gender gap in the STEM fields. These findings, in conjunction with future research, may provide suggestions or implications for measures or interventions that can be taken to increase females' representation in the STEM fields.

REFERENCES

Britner, S. L. & Pajares, F. (2006. Sources of science self-efficacy beliefs of middle school students. Journal of Research in Science Teaching, 43(5), 485-499. doi: 10.1002/tea.20131

Career Clusters: Science, Technology, Engineering, and Mathematics (2009). In *State of Washington: Office of Superintendent of Public Instruction*. Retrieved February 2, 2011, from http://www.k12.wa.us/careerTechEd/clusters/STEM.aspx

DeBacker, T. K. & Nelson, R. M. (2000). Motivation to learn science: Differences related to gender, class, type, and ability. *Journal of Educational Research*, *93*(4), 245-254.

Denissen, J. J. A., Zarrett, N. R., & Eccles, J. S. (2007). I like to do it, I'm able, and I know I am: Longitudinal couplings between domain-specific achievement, self-concept, and interest. *Child Development, 78* (2), 430-447. doi: 10.1111/j.1467-8624.2007.01007.x

Fennema, E., & Sherman, J.A. (1977). Sexual Stereotyping and mathematics learning. *The Arithmetic Teacher, 24*(5), 369-372.

Higher Education: Federal Science, Technology, Engineering, and Mathematics Programs and Related Trends [Electronic version]. (2005, October). *Report to the Chairman, Committee on Rules, House of Representatives, 06*(114), 1-103.

Liben, L. S. (2006). Education for spatial thinking. In W. Damon & R. Lerner (Series Eds.) and K. A. Renninger & I. E. Sigel (Vol. Eds.), *Handbook of child psychology, sixth edition, volume four: Child psychology in practice* (pp. 197-247). Hoboken, NJ: Wiley.

Liben, L. S. & Bigler, R. S. (2002). The developmental course of gender differentiation. *Monographs of the Society for Research in Child Development, 67* (2, Serial no. 269)

Liben, L. S., Bigler, R. S., & Krogh, H. K. (2001). Pink and blue collar jobs: Children's judgments of job status and job aspirations in relation to sex of worker. *Journal of Experimental Child Psychology, 79*, 346-363.

Linn, M.C., & Petersen, A.C. (1985). Emergence and characterization of sex differences in spatial ability: A meta-analysis. *Child Development, 56*, 1479-1498.

National Research Council (2006). *Learning to think spatially: GIS as a support system in the K-12 curriculum.* Washington, DC: National Academy Press.

National Science Board (2003). *The science and engineering workforce: Realizing American's potential.* Arlington, VA (NSF 03-69). http://www.nsf.gov/nsb/documents/2003/nsb0369/nsb0369.pdf

Newcombe, N.S., Ambady, N., Eccles, J., Gomez, L., Klahr, D., Linn, M., et al. (2009). Psychology's role in mathematics and science education. *American Psychologist, 64*(6), 538550. doi: 10.1037/a0014813

Quinn, P. C., & Liben, L. S. (2008). A sex difference in mental rotation in young infants. *Psychological Science, 19*, 1067-1070.

Simpkins, S. D., Davis-Kean, P. E., & Eccles, J. S. (2006). Math and science motivation: A longitudinal examination of the links between choices and beliefs. *Developmental Psychology*, 42(1), 70-83. doi: 10.1037/0012-1649.42.1.70

Spatial Intelligence and Learning Center (2011). In *NSF Science of Learning Center*. Retrieved March 13, 2011, from http://spatiallearning.org/

Terrell, N. (2007, April). STEM Occupations. *Occupational Outlook Quarterly*, 26-33.

Retrieved February 2, 2011

Wai, J., Lubinski, D., & Benbow, C. P. (2009). Spatial ability for STEM domains: Aligning over 50 years of cumulative psychological knowledge solidifies its importance. *Journal of Educational Psychology*, *101*(4), 817-835

Wigfield, A., & Eccles, J. S. (2000). Expectancy-Value Theory of Achievement Motivation. *Contemporary Educational Psychology*, *25*, 68-81. doi:10.1006/ceps.1999.101

Appendix A

Table 1

Average Rating of Participant Skill Level in Each Domain

Domain	Female		Male		Combined		Significance
	M	SD	M	SD	M	SD	*p-value*
English	5.40	1.15	5.13	1.31	5.27	1.23	= 0.19
Foreign Language	4.48	1.57	4.12	1.48	4.31	1.53	= 0.15
Athletic	4.48	1.56	5.09	1.50	4.77	1.56	= 0.02
Science	4.47	1.49	5.12	1.47	4.77	1.51	= 0.01
Mathematics	4.48	1.76	5.43	1.20	4.93	1.59	< .001
Spatial	4.91	1.14	5.27	1.04	5.08	1.11	= 0.04

Table 2

Average Rating of Participant Interest Level in Each Domain

Domain	Female		Male		Combined		Significance
	M	SD	M	SD	M	SD	*p-value*
English	4.34	1.58	4.10	1.56	4.22	1.57	= 0.36
Foreign Language	4.64	1.65	3.95	1.58	1.32	1.65	= 0.01
Athletic	5.01	1.55	5.16	1.60	5.08	1.57	= .560
Science	4.16	1.69	4.83	1.68	4.48	1.71	= 0.02
Mathematics	3.66	1.93	4.55	1.61	4.08	1.83	< .001
Spatial	4.59	1.14	4.72	1.11	4.65	1.12	= 0.50

Table 3

Average Rating of Participant Value in Each Domain

Domain	Female		Male		Combined		Significance
	M	SD	M	SD	M	SD	*p-value*
English	6.05	1.00	5.45	1.39	5.77	1.23	< .001
Foreign Language	5.64	1.29	4.66	1.59	5.18	1.51	< .001
Athletic	5.05	1.55	5.21	1.54	5.12	1.54	= .538
Science	4.82	1.75	5.15	1.63	4.98	1.70	= .242
Mathematics	4.66	1.84	5.52	1.44	5.07	1.71	< .001
Spatial	5.08	1.19	5.36	1.14	5.21	1.18	= 0.15

Table 4

Job Interest Ratings: Percentages and Mean Responses by Gender

Job Title	*N*	Percentage of responses (%)					Mean Response	St. Dev.
		Not at all (1)	A little (2)	Some (3)	Pretty much (4)	Very much (5)		
Accountant*								
Female	78	62	15	13	6	4	1.76	1.14
Male	70	46	17	27	7	3	2.04	1.14
Actuary*								
Female	79	72	15	8	1	4	1.49	0.97
Male	70	56	21	14	7	1	1.77	1.04
Aerospace engineer*								
Female	79	76	13	10	0	1	1.38	0.77
Male	70	33	26	21	7	13	2.41	1.36
Airplane pilot								
Female	78	67	15	12	3	4	1.62	1.05
Male	70	37	21	27	7	7	2.26	1.24
Architect								
Female	76	47	24	13	8	8	2.05	1.28
Male	70	34	23	21	14	7	2.37	1.29
Architectural engineer*								
Female	78	70	13	8	8	1	1.56	1.01
Male	70	37	23	23	13	4	2.24	1.21
Artist								
Female	78	36	27	13	12	13	2.38	1.41
Male	70	49	23	13	9	7	2.03	1.27
Astronaut*								
Female	79	57	18	15	4	6	1.85	1.20
Male	69	42	19	17	10	12	2.30	1.41
Astronomer*								
Female	79	60	19	15	4	2	1.71	1.23
Male	69	35	23	25	10	7	2.32	1.25
Auto mechanic								
Female	79	85	8	5	0	2	1.28	0.78
Male	70	53	19	20	6	3	1.87	1.10
Automotive Engineer*								
Female	79	86	8	4	2	0	1.23	0.64
Male	69	49	20	13	10	7	2.06	1.30
Babysitter								
Female	79	37	25	18	9	11	2.33	1.36
Male	70	67	17	13	3	0	1.51	0.83
Baker								
Female	79	22	29	27	10	13	2.63	1.24
Male	70	57	27	11	4	0	1.63	0.85

Table 4

Job Interest Ratings: Percentages and Mean Responses by Gender

Job Title	*N*	Percentage of responses (%)					Mean Response	St. Dev.
		Not at all (1)	A little (2)	Some (3)	Pretty much (4)	Very much (5)		
Ballet dancer								
Female	79	51	10	16	10	13	2.24	1.48
Male	70	81	6	6	6	1	1.40	0.94
Biologist*								
Female	79	48	20	15	9	8	2.08	1.30
Male	70	39	20	19	11	11	2.37	1.40
Birth attendant								
Female	79	57	14	23	2	4	1.82	1.11
Male	70	77	7	14	1	0	1.40	0.79
Chemist*								
Female	78	70	17	9	4	0	1.46	0.82
Male	70	39	19	24	14	4	2.27	1.24
Civil Engineer*								
Female	79	80	9	8	2	1	1.37	0.84
Male	70	41	20	23	14	1	2.14	1.16
Clothing designer								
Female	79	28	18	23	22	10	2.68	1.35
Male	70	64	14	9	10	3	1.73	1.15
Comedian								
Female	79	44	18	23	10	5	2.14	1.24
Male	70	41	21	13	13	11	2.31	1.42
Company treasurer*								
Female	79	72	6	10	9	2	1.63	1.13
Male	70	49	26	13	6	7	1.97	1.23
Computer Designer (Hardware)*								
Female	79	80	15	5	0	0	1.25	0.54
Male	70	41	11	21	20	6	2.37	1.35
Computer Scientist*								
Female	79	77	9	13	0	1	1.39	0.81
Male	70	44	17	17	16	6	2.21	1.32
Computer Software Developer*								
Female	79	81	11	8	0	0	1.27	0.59
Male	70	36	26	16	13	10	2.36	1.35
Construction Worker								
Female	79	86	4	8	1	1	1.28	0.77
Male	70	56	20	17	4	3	1.79	1.06
Cook in a restaurant								
Female	79	49	15	19	10	6	2.09	1.29
Male	70	54	24	14	7	0	1.74	0.96

Table 4

Job Interest Ratings: Percentages and Mean Responses by Gender

Job Title	*N*	Percentage of responses (%)					Mean Response	St. Dev.
		Not at all (1)	A little (2)	Some (3)	Pretty much (4)	Very much (5)		
Dental Assistant								
Female	79	58	18	16	8	0	1.73	1.00
Male	70	63	24	11	1	0	1.51	0.76
Dentist								
Female	79	60	10	19	5	6	1.89	1.25
Male	70	51	21	16	10	1	1.89	1.10
Dietician								
Female	79	34	22	25	10	9	2.38	1.29
Male	70	60	21	13	4	1	1.66	0.96
Dishwasher in a restaurant								
Female	79	92	4	4	0	0	1.11	0.42
Male	70	80	10	9	1	0	1.31	0.69
Doctor								
Female	79	32	15	14	13	27	2.87	1.62
Male	69	29	22	17	13	19	2.71	1.49
Electrical engineer*								
Female	79	82	8	9	0	1	1.30	0.74
Male	68	41	24	16	15	4	2.18	1.24
Electrician								
Female	79	89	6	5	0	0	1.16	0.49
Male	70	53	27	14	6	0	1.73	0.92
Elevator Operator								
Female	79	96	0	4	0	0	1.08	0.38
Male	70	80	9	10	1	0	1.33	0.72
Engineer*								
Female	79	73	14	10	1	1	1.43	0.83
Male	70	31	19	21	11	17	2.64	1.46
Environmental scientist*								
Female	79	66	16	11	5	1	1.59	0.97
Male	70	40	14	27	13	6	2.30	1.28
Factory owner								
Female	79	77	14	8	1	0	1.33	0.67
Male	70	43	19	21	11	6	2.19	1.27
Farmer								
Female	79	76	14	9	1	0	1.35	0.70
Male	70	57	20	17	3	3	1.74	1.03
Financial analyst*								
Female	79	66	10	14	10	0	1.68	1.06
Male	70	47	17	20	9	7	2.11	1.29

Table 4

Job Interest Ratings: Percentages and Mean Responses by Gender

Job Title	*N*	Percentage of responses (%)					Mean Response	St. Dev.
		Not at all (1)	A little (2)	Some (3)	Pretty much (4)	Very much (5)		
Financial clerk*								
Female	78	72	9	9	10	0	1.58	1.03
Male	70	59	11	20	9	1	1.83	1.12
Florist								
Female	78	40	27	22	8	4	2.09	1.13
Male	70	67	17	13	3	0	1.51	0.83
Food scientist*								
Female	78	50	10	22	14	4	2.12	1.28
Male	70	46	29	17	7	1	1.90	1.02
Gardener								
Female	79	60	18	19	2	1	1.68	0.96
Male	67	64	16	15	4	0	1.60	0.91
Geographer*								
Female	79	80	8	8	2	2	1.41	0.93
Male	69	58	23	17	1	0	1.62	0.82
Geologist*								
Female	79	76	9	11	1	2	1.46	0.93
Male	70	46	29	20	5	0	1.86	0.94
Hair Stylist								
Female	79	44	13	28	10	5	2.19	1.25
Male	70	73	16	7	4	0	1.43	0.81
Interior Decorator								
Female	79	19	20	24	23	14	2.92	1.33
Male	68	68	13	13	2	4	1.62	1.06
Laboratory technologist/technician*								
Female	79	62	8	20	8	2	1.81	1.16
Male	70	43	17	24	16	0	2.13	1.14
Landscape architect								
Female	79	56	22	14	4	5	1.81	1.13
Male	70	46	29	14	10	1	1.93	1.07
Lawyer								
Female	79	38	18	14	15	15	2.52	1.50
Male	70	23	33	24	10	10	2.51	1.24
Librarian								
Female	77	58	12	27	3	0	1.74	0.95
Male	70	73	14	10	1	1	1.44	0.84
Loan officer*								
Female	78	77	10	12	1	0	1.37	0.74
Male	70	64	19	11	6	0	1.59	0.91

Table 4

Job Interest Ratings: Percentages and Mean Responses by Gender

Job Title	*N*	Percentage of responses (%)					Mean Response	St. Dev.
		Not at all (1)	A little (2)	Some (3)	Pretty much (4)	Very much (5)		
Manicurist								
Female	76	75	13	10	1	0	1.39	0.78
Male	70	83	4	13	0	0	1.30	0.69
Mathematician*								
Female	79	66	18	9	6	1	1.59	0.98
Male	70	36	26	24	10	4	2.21	1.17
Medical laboratory technician*								
Female	79	51	23	16	8	2	1.89	1.10
Male	70	44	17	23	14	1	2.11	1.17
Meteorologist*								
Female	79	63	11	16	6	2	1.73	1.11
Male	70	43	26	30	1	0	1.90	0.89
Nuclear engineer*								
Female	79	80	9	9	0	2	1.37	0.85
Male	70	39	13	24	13	11	2.46	1.41
Nurse								
Female	79	34	19	13	19	15	2.62	1.50
Male	70	51	21	19	7	1	1.86	1.05
Nutritionist								
Female	79	32	18	25	15	10	2.54	1.35
Male	70	39	29	26	4	3	2.04	1.04
Pediatrician								
Female	79	29	20	9	16	25	2.89	1.60
Male	70	49	17	20	9	6	2.06	1.25
Physical therapist								
Female	79	25	18	27	20	10	2.72	1.32
Male	70	36	20	30	11	3	2.26	1.15
Physicist*								
Female	79	75	14	10	1	0	1.38	0.72
Male	70	47	17	20	7	9	2.13	1.32
Plumber								
Female	79	95	0	5	0	0	1.10	0.44
Male	70	73	14	13	0	0	1.40	0.71
Police officer								
Female	79	60	18	11	8	4	1.78	1.15
Male	70	39	24	21	10	6	2.20	1.22
Professional athlete								
Female	79	47	16	11	13	13	2.28	1.48
Male	70	31	11	13	6	39	3.09	1.73

Table 4

Job Interest Ratings: Percentages and Mean Responses by Gender

Job Title	*N*	Percentage of responses (%)					Mean Response	St. Dev.
		Not at all (1)	A little (2)	Some (3)	Pretty much (4)	Very much (5)		
Psychologist								
Female	79	10	10	23	20	37	3.63	1.34
Male	70	20	17	23	21	19	3.01	1.40
Rancher								
Female	79	81	5	10	1	2	1.39	0.91
Male	70	60	19	16	4	1	1.69	0.99
Refrigerator salesperson								
Female	79	91	5	4	0	0	1.13	0.44
Male	69	81	9	7	3	0	1.32	0.74
School teacher								
Female	78	24	22	19	17	18	2.82	1.44
Male	70	20	19	33	20	9	2.79	1.23
Secretary								
Female	79	38	29	27	5	1	2.03	0.99
Male	70	70	11	14	4	0	1.53	0.90
Ship captain								
Female	79	71	16	9	2	1	1.47	0.86
Male	70	50	17	23	6	4	1.98	1.17
Space scientist*								
Female	79	66	9	16	5	4	1.72	1.14
Male	70	39	13	33	4	11	2.37	1.34
Statistician*								
Female	77	68	12	14	4	3	1.62	1.04
Male	70	50	26	11	13	0	1.87	1.06
Supermarket owner								
Female	79	66	16	11	5	1	1.59	0.97
Male	70	51	20	20	9	0	1.86	1.03
Surgeon*								
Female	79	48	9	13	13	18	2.43	1.60
Male	70	36	20	20	9	16	2.49	1.45
Systems analyst*								
Female	79	84	6	6	2	1	1.32	0.81
Male	70	49	19	19	13	1	2.00	1.16
Telephone installer								
Female	79	95	1	4	0	0	1.09	0.40
Male	70	77	9	14	0	0	1.37	0.73
Truck driver								
Female	78	91	3	6	0	0	1.15	0.51
Male	70	67	19	11	3	0	1.50	0.81

Table 4

Job Interest Ratings: Percentages and Mean Responses by Gender

Job Title	*N*	Percentage of responses (%)					Mean Response	St. Dev.
		Not at all (1)	A little (2)	Some (3)	Pretty much (4)	Very much (5)		
Umpire								
Female	79	76	8	13	2	1	1.46	0.90
Male	70	50	19	21	7	3	1.95	1.13
Veterinarian*								
Female	78	46	14	15	13	11	2.29	1.45
Male	69	58	10	20	10	1	1.87	1.15
Welder								
Female	79	86	5	8	1	0	1.24	0.64
Male	70	59	23	13	3	3	1.69	1.00
Writer								
Female	79	37	19	23	8	14	2.43	1.41
Male	70	51	17	17	7	7	2.01	1.28

*Job categorized as a STEM career as listed in Higher Education (2005), National Science Board (2003), Terrell (2007), and Career Clusters (2009).

Table 5

Novel Job Interest Ratings: Percentages and Mean Responses by Gender and Definition Type

Job Title	N	Percentage of responses (%)					Mean response	St. Dev.
		Not at all (1)	A little (2)	Some (3)	Pretty much (4)	Very much (5)		
Chandler								
Female								
Non-Spatial	35	43	26	26	6	0	1.94	0.97
Spatial	44	59	20	16	2	2	1.68	0.98
Male								
Non-Spatial	37	68	16	14	3	0	1.51	0.84
Spatial	33	79	15	6	0	0	1.27	0.57
Higgler								
Female								
Non-Spatial	44	91	7	0	2	0	1.14	0.51
Spatial	35	69	11	20	0	0	1.51	0.82
Male								
Non-Spatial	33	79	12	9	0	0	1.30	0.34
Spatial	37	70	19	8	3	0	1.43	0.77
Benster								
Female								
Non-Spatial	35	60	23	14	3	0	1.60	0.85
Spatial	44	77	18	4	0	0	1.27	0.54
Male								
Non-Spatial	36	61	17	17	3	3	1.69	1.04
Spatial	33	61	24	12	3	0	1.58	0.83
Ginner								
Female								
Non-Spatial	44	89	7	4	0	0	1.16	0.48
Spatial	35	86	3	9	3	0	1.29	0.75
Male								
Non-Spatial	33	73	9	18	0	0	1.45	0.79
Spatial	37	70	11	11	8	0	1.57	0.99
Milliner								
Female								
Non-Spatial	34	53	15	21	12	0	1.91	1.11
Spatial	42	55	24	17	5	0	1.71	0.92
Male								
Non-Spatial	36	56	28	11	6	0	1.67	0.89
Spatial	33	61	33	6	0	0	1.45	0.62
Cilpster								
Female								
Non-Spatial	43	77	14	7	0	2	1.37	0.82
Spatial	35	63	23	11	3	0	1.54	0.82
Male								
Non-Spatial	33	42	33	21	3	0	1.85	0.87
Spatial	36	56	22	17	6	0	1.72	0.94

Table 5

Novel Job Interest Ratings: Percentages and Mean Responses by Gender and Definition Type

Job Title	N	Percentage of responses (%)					Mean response	St. Dev.
		Not at all (1)	A little (2)	Some (3)	Pretty much (4)	Very much (5)		
Cartoner								
Female								
Non-Spatial	34	41	18	26	12	3	2.18	1.19
Spatial	42	50	29	12	10	0	1.81	0.99
Male								
Non-Spatial	36	42	28	19	11	0	2.00	1.04
Spatial	33	54	27	12	6	0	1.70	0.92
Heigist								
Female								
Non-Spatial	43	65	23	9	2	0	1.49	0.77
Spatial	35	54	23	17	6	0	1.74	0.95
Male								
Non-Spatial	33	42	27	24	6	0	1.94	0.97
Spatial	36	44	22	22	11	0	2.00	1.07
Tenic								
Female								
Non-Spatial	35	60	11	20	6	3	1.80	1.13
Spatial	44	84	11	4	0	0	1.20	0.51
Male								
Non-Spatial	36	67	8	22	3	0	1.61	0.93
Spatial	33	76	15	6	3	0	1.36	0.74
Limner								
Female								
Non-Spatial	44	43	27	20	9	0	1.95	1.01
Spatial	35	54	23	11	6	6	1.86	1.19
Male								
Non-Spatial	44	43	27	20	9	0	1.73	0.91
Spatial	35	54	23	11	6	6	1.62	1.01
Silter								
Female								
Non-Spatial	35	40	34	20	3	3	1.94	1.00
Spatial	44	27	43	16	14	0	2.16	0.99
Male								
Non-Spatial	35	40	34	20	3	3	1.81	0.97
Spatial	44	27	43	16	14	0	1.66	0.74

Table 6

Jobs' Need for Spatial Skills: Mean Ratings by Gender

Job Title	Spatial Skills Mean Rating (1 = Not at all, 5 = A lot)	Standard Deviation
Accountant		
Female	2.72	1.37
Male	2.85	1.02
Actuary		
Female	3.14	1.22
Male	2.77	0.88
Aerospace engineer		
Female	4.55	1.03
Male	4.53	0.72
Airplane pilot		
Female	4.50	0.92
Male	4.24	0.99
Architect		
Female	4.78	0.55
Male	4.47	0.99
Architectural engineer		
Female	4.34	1.21
Male	4.67	0.64
Artist		
Female	4.75	0.51
Male	4.21	1.15
Astronaut		
Female	4.41	1.01
Male	4.36	0.82
Astronomer		
Female	3.91	1.25
Male	3.88	1.01
Auto mechanic		
Female	4.22	0.98
Male	3.97	1.03
Automotive Engineer		
Female	4.06	0.93
Male	4.12	0.86
Babysitter		
Female	2.81	1.38
Male	2.24	1.28

Table 6

Jobs' Need for Spatial Skills: Mean Ratings by Gender

Job Title	Spatial Skills Mean Rating (1 = Not at all, 5 = A lot)	Standard Deviation
Baker		
Female	3.47	1.22
Male	2.76	1.06
Ballet dancer		
Female	4.34	0.90
Male	3.61	1.39
Biologist		
Female	3.37	1.04
Male	3.41	1.05
Birth attendant		
Female	3.47	1.14
Male	3.18	1.13
Chemist		
Female	3.22	1.31
Male	3.41	0.89
Civil Engineer		
Female	4.38	0.94
Male	4.29	0.97
Clothing designer		
Female	4.19	1.03
Male	4.03	0.97
Comedian		
Female	2.66	1.12
Male	2.61	1.37
Company treasurer		
Female	2.87	.1.26
Male	2.91	1.04
Computer Designer (Hardware)		
Female	3.72	1.17
Male	3.59	1.18
Computer Scientist		
Female	3.47	1.32
Male	3.55	1.00
Computer Software Developer		
Female	3.58	1.26
Male	3.81	0.90

Table 6

Jobs' Need for Spatial Skills: Mean Ratings by Gender

Job Title	Spatial Skills Mean Rating (1 = Not at all, 5 = A lot)	Standard Deviation
Construction Worker		
Female	3.97	1.12
Male	3.85	1.00
Cook in a restaurant		
Female	3.33	1.40
Male	2.97	1.38
Dental Assistant		
Female	3.44	1.19
Male	3.06	0.95
Dentist		
Female	4.03	1.06
Male	3.91	0.93
Dietician		
Female	2.72	1.35
Male	2.79	1.17
Dishwasher in a restaurant		
Female	2.25	1.19
Male	2.32	1.06
Doctor		
Female	4.12	1.01
Male	3.74	1.05
Electrical engineer		
Female	3.84	1.05
Male	4.09	0.80
Electrician		
Female	3.62	1.10
Male	3.36	1.14
Elevator Operator		
Female	2.61	1.33
Male	2.82	1.21
Engineer		
Female	4.09	1.12
Male	4.27	0.88
Environmental scientist		
Female	3.63	1.13
Male	3.41	1.02

Table 6

Jobs' Need for Spatial Skills: Mean Ratings by Gender

Job Title	Spatial Skills Mean Rating (1 = Not at all, 5 = A lot)	Standard Deviation
Factory owner		
Female	3.81	1.20
Male	3.44	1.12
Farmer		
Female	4.03	1.06
Male	3.94	0.89
Financial analyst		
Female	2.87	1.26
Male	2.79	1.14
Financial clerk		
Female	2.71	1.27
Male	2.58	1.12
Florist		
Female	4.00	1.02
Male	3.52	1.12
Food scientist		
Female	3.28	1.37
Male	3.12	0.99
Gardener		
Female	4.03	0.97
Male	3.45	1.20
Geographer		
Female	3.94	1.19
Male	3.91	0.98
Geologist		
Female	3.59	1.27
Male	3.71	1.03
Hair Stylist		
Female	3.81	1.08
Male	3.36	1.19
Interior Decorator		
Female	4.84	0.45
Male	4.29	0.87
Laboratory technologist/technician		
Female	3.32	1.22
Male	3.62	0.82

Table 6

Jobs' Need for Spatial Skills: Mean Ratings by Gender

Job Title	Spatial Skills Mean Rating (1 = Not at all, 5 = A lot)	Standard Deviation
Landscape architect		
Female	4.56	0.76
Male	4.35	0.77
Lawyer		
Female	3.35	1.33
Male	3.06	1.26
Librarian		
Female	3.19	1.18
Male	3.21	1.12
Loan officer		
Female	2.78	1.16
Male	2.82	1.06
Manicurist		
Female	3.13	1.33
Male	2.58	1.35
Mathematician		
Female	3.48	1.31
Male	3.30	1.40
Medical laboratory technician		
Female	3.48	1.18
Male	3.48	1.03
Meteorologist		
Female	3.47	1.34
Male	3.70	1.04
Nuclear engineer		
Female	3.84	1.32
Male	3.94	1.03
Nurse		
Female	3.37	1.21
Male	3.30	1.04
Nutritionist		
Female	2.63	1.31
Male	2.58	1.06
Pediatrician		
Female	3.41	1.32
Male	3.18	1.11

Table 6

Jobs' Need for Spatial Skills: Mean Ratings by Gender

Job Title	Spatial Skills Mean Rating (1 = Not at all, 5 = A lot)	Standard Deviation
Physical therapist		
Female	3.44	1.52
Male	3.33	1.14
Physicist		
Female	3.84	1.42
Male	4.09	0.91
Plumber		
Female	3.74	1.15
Male	3.52	1.18
Police officer		
Female	3.70	1.18
Male	2.88	1.27
Professional athlete		
Female	4.06	1.27
Male	3.48	1.52
Psychologist		
Female	3.58	1.31
Male	3.42	1.28
Rancher		
Female	3.37	1.31
Male	2.97	1.33
Refrigerator salesperson		
Female	2.97	1.20
Male	2.61	1.14
School teacher		
Female	3.97	1.03
Male	3.64	1.02
Secretary		
Female	2.84	1.19
Male	2.84	1.14
Ship captain		
Female	4.40	0.81
Male	3.64	1.14
Space scientist		
Female	4.20	1.16
Male	4.06	1.03

Table 6

Jobs' Need for Spatial Skills: Mean Ratings by Gender

Job Title	Spatial Skills Mean Rating (1 = Not at all, 5 = A lot)	Standard Deviation
Statistician		
Female	2.84	1.30
Male	2.85	1.21
Supermarket owner		
Female	3.84	1.08
Male	3.12	1.02
Surgeon		
Female	4.28	0.99
Male	4.36	0.86
Systems analyst		
Female	3.03	1.17
Male	3.34	0.90
Telephone installer		
Female	3.77	0.92
Male	3.44	1.13
Truck driver		
Female	3.63	1.31
Male	3.24	1.08
Umpire		
Female	3.94	1.16
Male	3.64	1.43
Veterinarian		
Female	3.59	1.16
Male	3.15	1.03
Welder		
Female	3.52	1.06
Male	3.59	1.10
Writer		
Female	2.88	1.18
Male	2.91	1.20

Table 7

Novel Jobs' Need for Spatial Skills: Mean Ratings by Gender and Definition Type

Job Title	Spatial Skills Mean Rating (1 = Not at all, 5 = A lot)	Standard Deviation
Chandler		
Female		
Non-Spatial	3.53	1.02
Spatial	2.62	0.96
Male		
Non-Spatial	3.13	1.06
Spatial	2.78	1.06
Higgler		
Female		
Non-Spatial	3.11	1.33
Spatial	2.46	0.97
Male		
Non-Spatial	2.80	1.21
Spatial	2.00	1.03
Benster		
Female		
Non-Spatial	3.74	0.99
Spatial	3.46	1.13
Male		
Non-Spatial	3.07	1.14
Spatial	3.41	1.12
Ginner		
Female		
Non-Spatial	3.16	1.17
Spatial	3.69	1.11
Male		
Non-Spatial	2.86	1.35
Spatial	3.00	1.28
Milliner		
Female		
Non-Spatial	3.84	0.83
Spatial	2.00	1308
Male		
Non-Spatial	3.40	0.99
Spatial	2.56	1.04

Table 7

Novel Jobs' Need for Spatial Skills: Mean Ratings by Gender and Definition Type

Job Title	Spatial Skills Mean Rating (1 = Not at all, 5 = A lot)	Standard Deviation
Cilpster		
Female		
Non-Spatial	2.68	1.25
Spatial	3.69	1.18
Male		
Non-Spatial	2.47	0.92
Spatial	3.39	1.19
Cartoner		
Female		
Non-Spatial	4.26	0.73
Spatial	2.62	1.26
Male		
Non-Spatial	3.87	1.06
Spatial	2.47	1.18
Heigist		
Female		
Non-Spatial	2.78	1.06
Spatial	4.00	1.00
Male		
Non-Spatial	2.60	1.40
Spatial	3.76	1.30
Tenic		
Female		
Non-Spatial	3.58	1.39
Spatial	2.77	1.24
Male		
Non-Spatial	3.53	0.92
Spatial	2.71	1.31
Limner		
Female		
Non-Spatial	4.21	0.98
Spatial	2.46	1.39
Male		
Non-Spatial	3.93	1.22
Spatial	2.29	1.26

Table 7

Novel Jobs' Need for Spatial Skills: Mean Ratings by Gender and Definition Type

Job Title	Spatial Skills Mean Rating (1 = Not at all, 5 = A lot)	Standard Deviation
Silter		
Female		
Non-Spatial	3.37	1.34
Spatial	3.38	1.04
Male		
Non-Spatial	2.93	1.49
Spatial	3.22	1.44

Table 8

Female's Most Preferred Jobs: Interest Ratings, Gender Ratings, and Job Skill Needs Ratings by Females

Job Title	*What Do You Think* Survey Ratings			*What Do You Think: Job Skills* Survey Ratings			
	Mean Interest Ratings*	STEM Career*** 0 = No 1 = Yes	Mean Gender Ratings**	Mean Spatial Rating*	Mean Math Rating*	Mean Science Rating*	Mean English Rating*
Psychologist	3.63	0	3.30	3.58	2.81	4.61	4.39
Interior Decorator	2.92	0	3.89	4.84	3.09	1.94	2.66
Pediatrician	2.89	0	3.33	3.41	3.66	4.84	3.56
Doctor	2.87	0	2.70	4.12	3.97	4.84	3.66
School teacher	2.82	0	3.61	3.97	4.16	4.19	4.38
Physical therapist	2.72	0	2.99	3.44	3.22	4.31	3.16
Clothing designer	2.68	0	3.87	4.19	3.06	1.78	2.77
Baker	2.63	0	3.58	3.47	3.16	3.19	2.48
Nurse	2.62	0	4.00	3.37	3.59	4.38	3.41
Nutritionist	2.54	0	3.48	2.63	3.55	4.66	3.03

Table 9

Females' Most Preferred Jobs: Interest Ratings, Gender Ratings, and Job Skill Needs Ratings by Males

Job Title	*What Do You Think* Survey Ratings			*What Do You Think: Job Skills* Survey Ratings			
	Mean Interest Ratings*	STEM Career*** 0 = No 1 = Yes	Mean Gender Ratings**	Mean Spatial Rating*	Mean Math Rating*	Mean Science Rating*	Mean English Rating*
Psychologist	3.01	0	3.07	3.42	2.79	3.91	4.06
Interior Decorator	1.62	0	3.62	4.29	2.88	2.26	2.82
Pediatrician	2.06	0	3.00	3.18	3.35	4.58	3.47
Doctor	2.71	0	2.69	3.74	3.59	4.65	3.44
School teacher	2.79	0	3.27	3.64	3.88	3.76	4.03
Physical therapist	2.26	0	2.86	3.33	2.82	3.75	3.06
Clothing designer	1.73	0	3.59	4.03	2.68	2.00	2.91
Baker	1.63	0	3.24	2.76	2.58	2.70	2.21
Nurse	1.86	0	3.67	3.30	3.24	4.03	3.33
Nutritionist	2.04	0	3.21	2.58	3.09	4.18	3.00

Table 10

Males' Most Preferred Jobs: Interest Ratings, Gender Ratings, and Job Skill Needs Ratings by Males

Job Title	*What Do You Think* Survey Ratings			*What Do You Think: Job Skills* Survey Ratings			
	Mean Interest Ratings*	STEM Career*** 0 = No 1 = Yes	Mean Gender Ratings**	Mean Spatial Rating*	Mean Math Rating*	Mean Science Rating*	Mean English Rating*
Professional athlete	3.09	0	2.56	3.48	1.91	1.64	2.18
Psychologist	3.01	0	3.07	3.42	2.79	3.91	4.06
School teacher	2.79	0	3.27	3.64	3.88	3.76	4.03
Doctor	2.71	0	2.69	3.74	3.59	4.65	3.44
Engineer	2.64	0	2.60	4.27	4.76	4.45	3.3
Lawyer	2.51	0	2.76	3.06	2.97	2.61	4.42
Surgeon	2.49	1	2.62	4.36	3.94	4.61	3.33
Nuclear engineer	2.46	1	2.27	3.94	4.79	4.79	3.27
Aerospace engineer	2.41	1	2.47	4.53	4.31	4.59	3.22
Architect	2.37	0	2.62	4.47	4.32	3.79	2.94

Table 11

Males' Most Preferred Jobs: Interest Ratings, Gender Ratings, and Job Skill Needs Ratings by Females

Job Title	*What Do You Think* Survey Ratings			*What Do You Think: Job Skills* Survey Ratings			
	Mean Interest Ratings*	STEM Career*** 0 = No 1 = Yes	Mean Gender Ratings**	Mean Spatial Rating*	Mean Math Rating*	Mean Science Rating*	Mean English Rating*
Professional athlete	2.28	0	2.48	4.06	2.03	1.94	2.50
Psychologist	3.63	0	3.30	3.58	2.81	4.61	4.39
School teacher	2.82	0	3.61	3.97	4.16	4.19	4.38
Doctor	2.87	0	2.70	4.12	3.97	4.84	3.66
Engineer	1.43	0	2.27	4.09	4.81	4.91	2.81
Lawyer	2.52	0	2.73	3.35	3.16	2.68	4.65
Surgeon	2.43	1	2.42	4.28	4.09	4.81	3.32
Nuclear engineer	1.37	1	2.09	3.84	4.75	4.91	2.91
Aerospace engineer	1.38	1	2.18	4.55	4.55	4.84	3.10
Architect	2.05	0	2.44	4.78	4.72	3.81	2.78

*Job interest and job skills rating scales: (1) Not at all, (2) A little, (3) Some, (4) Pretty much, (5) A lot

**Gender rating scale: (1) Only for men, (2) Mostly for men and a few women, (3) Equally for men and women, (4) Mostly for women and a few men, (5) Only for women

***As listed in Higher Education (2005), National Science Board (2003), Terrell (2007), and Career Clusters (2009).

Table 12

Gender Differences in Interest in STEM Jobs: Independent Samples T-Test

STEM Job Title	Female Mean Rating of Interest	Male Mean Rating of Interest	*p-value*
Accountant	1.76	2.04	0.13
Actuary	1.49	1.77	0.09
Aerospace engineer	1.38	2.41	0.00
Architectural engineer	1.56	2.24	0.00
Astronaut	1.85	2.30	0.04
Astronomer	1.71	2.32	0.00
Automotive engineer	1.23	2.06	0.00
Biologist	2.08	2.37	0.18
Chemist	1.46	2.27	0.00
Civil engineer	1.37	2.14	0.00
Company treasurer	1.63	1.97	0.08
Computer designer	1.25	2.37	0.00
Computer scientist	1.39	2.21	0.00
Computer software developer	1.27	2.36	0.00
Electrical engineer	1.30	2.18	0.00
Engineer	1.43	2.64	0.00
Environmental scientist	1.59	2.30	0.00
Financial analyst	1.68	2.11	0.03
Financial clerk	1.58	1.83	0.16
Food scientist	2.21	1.90	0.26
Geographer	1.41	1.62	0.14
Geologist	1.46	1.86	0.01
Laboratory technologist/technician	1.81	2.13	0.09
Loan officer	1.37	1.59	0.12
Mathematician	1.59	2.21	0.00
Medical laboratory technician	1.89	2.11	0.22
Meteorologist	1.73	1.90	0.32
Nuclear engineer	1.37	2.46	0.00
Physicist	1.38	2.13	0.00
Space scientist	1.72	2.37	0.00
Statistician	1.62	1.87	0.16
Systems analyst	1.32	2.00	0.00
Veterinarian	2.29	1.87	0.05

Appendix B: *Novel Jobs: Spatial and Non-Spatial Definitions*

Job Title	Spatial Definition	Non-Spatial Definition
Chandler	A person who makes and sells candles in a shop. A chandler must determine the various shapes and sizes of the candles and how to measures and design holders for the candles. A chandler understands how the shapes of the candles will fit into the containers without wasting space or materials. A chandler determines how best to store the candles in minimal amounts of space.	A person who makes and sells candles in a shop. A chandler makes attractive candles of different sizes, shapes, and colors. A chandler decides which scents smell the best for the candles and makes new candles with different fragrances and purposes. A chandler manages the store that the candles are sold in.
Higgler	A person who sells items such as watches or candy on the street. A higgler must measure and design a cart with various compartments to store the merchandise efficiently. To ensure maximum business, a higgler understands the map of the city and the least distance path to certain areas. A higgler knows how to travel to certain areas in the city in the least amount of time.	A person who sells items such as watches or candy on the street. A higgler carries things to sell in a cart so that it's easy to move up and down the street. A higgler decides which items are the best sellers and sets the cart up on the most populated street corner, so as to make the most sales.
Benster	A person who studies deer to keep them off the highway. A benster must consult the maps of the area and know the lay of the land to track where the most populated areas are likely to be. By knowing the geography and layout of the area, a benster can attract deer to certain regions or vicinities. In order to protect deer and minimize automobile accidents, a benster determines where the ramps for entrances and exits of highways need to be placed.	A person who studies deer to keep them off the highway. A benster collects information about where deer live, how much food they need, and how to attract them to new places. A benster studies the interactions of deer in groups and determines how food sources affect their tendency to graze near roads to protect deer and minimize automobile accidents.
Ginner	A person who runs a cotton gin. A ginner understands the mechanics of the machines and decides how the parts fit together to create the most efficient machine. A ginner must also design the factory to fit all of the equipment and to have minimal distances possibly between the raw cotton and the machines. A ginner decides how to store the cotton efficiently in a certain amount of space, as well as the most efficient way to fit and ship the maximum amount of cotton in the trucks.	A person who runs a cotton gin. A ginner runs cotton through a small machine to clean it so that it can be used to make cloth. A ginner makes sure that the cotton gin is running smoothly, and ensures that others operating the machines are using safety precautions. A ginner understands how to transform the raw cotton into fabric and ensures that there are sufficient supplies to make as much cotton as necessary.

Job Title	Spatial Definition	Non-Spatial Definition
Milliner	A person who makes hats. A milliner designs the shapes of hats in a way that will use the available material efficiently. A milliner must measure various sizes and forms of hats in order to create hats that fit heads of different shapes and sizes. A milliner also decides how to form the stands used to display the hats on in order to maximize the amount of shelf and storage space.	A person who makes hats. A milliner makes new and attractive hats of many different styles. A milliner designs fashionable hats with various designs and color schemes. A milliner understands the types of material needed to make different styles of hats and purchases enough material to make the hats in a cost effective way. A milliner is usually involved in finding ways to market different hat styles to the buying public.
Cilpster	A person who tests batteries to see how powerful they are and how long they will run. A cilpster decides which sizes and shapes of the different batteries will fit best in the different various toys and appliances. A cilpster consults with the company that manufactures the batteries to give input on the most efficient and effective sizes and shapes of the batteries. A cilpster also suggests ways to modify the shapes of the toys and appliances to make their structures sturdier and to reduce the space needed to store them.	A person who tests batteries to see how powerful they are and how long they will run. . A cilpster determines which types of batteries will work best in things like toys and radios. A cilpster decides how powerful batteries need to be to run certain appliances, machines, or toys. A cilpster consults with toy and machine manufacturers to sell them the batteries that will work best for their products.
Cartoner	A person who designs packages for things that you buy in stores. . A cartoner creates packages of different shapes and sizes with several compartments so that different size toys and other products fit efficiently. A cartoner understands the measurements and number of folds necessary to create a package without wasting any material. A cartoner must know how each product fits together so as to create the various sections in the package. A cartoner must also create packages of shapes and sizes that maximize the number of packages that can be shipped together in a single shipping carton.	A person who designs packages for things that you buy in stores. A cartoner creates packages of attractive shapes and colors to attract customers to the product. A cartoner also determines the text that will appear on the packages and designs eye-catching displays of the packages for the stores. A cartoner sells the packages to manufacturers that need to package and ship their products.
Heigist	A person who tests the quality of the water in a city. A heigist must know where the water supply is coming from and how the pipes fit together. When there is a problem in a pipe, the heigist must understand what areas in the city are affected and how to reroute the water supply through other pipes. A heigist must also know the layout and landscape of the city so as to be able to travel efficiently to the areas having water problems.	A person who tests the quality of the water in a city. A heigist makes sure the water is safe to use and drink. The heigist needs to examine reservoirs, water tanks, and pipe systems to determine if there are problems at any location, and if so, why. When problems are found, the heigist reports the issue to authorities who treat the water chemically or who alert citizens to boil their water.

Job Title	Spatial Definition	Non-Spatial Definition
Tenic	A person who is in charge of creating handicapped parking places. A tenic decides how far the parking spaces should be from the entrance and the easiest path for the handicapped individuals to travel on. A tenic measures the square footage of the parking lot and decides the number and size of the parking spaces accordingly. A tenic also designs and maps the parking lots' intersections and wheelchair ramps so the materials may be used efficiently without waste.	A person who is in charge of creating handicapped parking places. A tenic decides how many handicapped parking spaces there should be for the population in the surrounding area. A tenic determines how many handicapped parking spaces are needed at hospitals, shopping malls, supermarkets, schools, restaurants, and office buildings.
Limner	A person who paints pictures of people. A limner concentrates on the individual's facial structure and how their anatomy fits together. A limner understands how a person would look from different angles, perspectives, and distances. A limner is able to draw an accurate portrait of a person at varying distances and perspectives. A limner turns views of a 3 dimensional person into a 2 dimensional image on paper, creating a real-looking image through shading, geometry, and perspective drawing.	A person who paints pictures of people. A limner paints a picture of the person's face while the person poses quietly. A limner paints with various colors and types of paint to make the portrait aesthetically pleasing and realistic. A limner paints groups or individual portraits for families, museums, art galleries, and interior decorators. A limner must be a skilled artist who can paint portraits in a short amount of time.
Silter	A person who checks pearls from the ocean. A silter examines the size and shape of the pearls from every angle. A silter has good mechanisms for making the task efficient, such as creating machinery that will effectively move the different pearls to different piles depending on their size and shape. A silter also determines how best to pack the pearls in containers so as to take up the least amount of space and materials in shipments, while also keeping the high quality pearls safe from damage.	A person who checks pearls from the ocean. A silter sorts the pearls into those that are the best in quality and those that have cracks or brown spots. A silter tries to determine why certain pearls are of better quality than others , learning what elements of the surrounding environment seem to be associated with different quality pearls. A silter sends the pearls of highest quality to the finest jewelers throughout the world.

Academic Vita

Melanie Angle
412-759-0478
melanieangle3@gmail.com

Current Address
501 East Beaver Avenue, Apt. 401
State College, PA 16801

Permanent Address
642 Elm Street
Bridgeville, PA 15017

Education

Schreyer Honors College, The Pennsylvania State University
B.S. Psychology, The Pennsylvania State University, 2011
Minor, Business, The Pennsylvania State University, 2011
Thesis: What Drives Students to STEM Careers? The Role of Skill-Relevant Interests, Values, and Skills.

Research

Cognitive and Social Development Lab: Research Assistant, 2009 – Present

Honors and Awards

The President's Freshman Award
The President Sparks Award
The Evan Pugh Scholar Junior Award
The Evan Pugh Scholar Senior Award
Psi Chi National Honor Society
Dean's List

Leadership

Teaching Assistant, Sociology and Criminology Course, August 2008 – December 2008

> Aided Professor Darrell Steffensmeier in classroom operations, evaluations, and review sessions.

Social Chair, Volé The Penn State Ballet Club, 2009-2010

> Organized and implemented performance, community, and social events and opportunities for the club.

Tutor, The Pennsylvania Literacy Corps, January 2010 – May 2010

> Tutored adult learners of English as a second language.

President, Volé, The Penn State Ballet Club, 2010-Present

> Manage the overall functioning, activities, and finances of the Ballet club consisting of 145 members.

Academic Vita

Activities

College Friend Mentor, The Second Mile, 2009-2010

Mentored underprivileged children, ages 5-15, by facilitating the development of social skills and guiding mentees to produce ambitious goals in the face of personal tribulations.

Collegiate Challenge Volunteer, Habitat For Humanity, 2009-2010

Employment History:

Teach For America, *Operations Coordinator*, June 2010 – July 2010

Managed the logistics and functions of the residential operations at the 2010 Delta institute.

Lion Line, *Student Caller*, January 2011 – April 2011

Contacted alumni of The Pennsylvania State University to discuss developments within the university and gain alumni support and involvement with Penn State.

References

References are available upon request.

Activities

College Friend Mentor, The Second Mile, 2009-2010

Mentored underprivileged children, ages 5-15, by facilitating the development of social skills and guiding mentees to produce ambitious goals in the face of personal tribulations.

Collegiate Challenge Volunteer, Habitat For Humanity, 2009-2010

Employment History:

Teach For America, *Operations Coordinator*, June 2010 – July 2010

Managed the logistics and functions of the residential operations at the 2010 Delta institute.

Lion Line, *Student Caller*, January 2011 – April 2011

Contacted alumni of The Pennsylvania State University to discuss developments within the university and gain alumni support and involvement with Penn State.

References

References are available upon request.