



## University of Tennessee, Knoxville Trace: Tennessee Research and Creative Exchange

---

Doctoral Dissertations

Graduate School

---

8-2018

# An Investigation of Gender Bias in a Career Assessment for a STEM Field

Shelby Morgan Reyes

*University of Tennessee, Knoxville, [sreyes1@vols.utk.edu](mailto:sreyes1@vols.utk.edu)*

---

### Recommended Citation

Reyes, Shelby Morgan, "An Investigation of Gender Bias in a Career Assessment for a STEM Field. " PhD diss., University of Tennessee, 2018.

[https://trace.tennessee.edu/utk\\_graddiss/4800](https://trace.tennessee.edu/utk_graddiss/4800)

This Dissertation is brought to you for free and open access by the Graduate School at Trace: Tennessee Research and Creative Exchange. It has been accepted for inclusion in Doctoral Dissertations by an authorized administrator of Trace: Tennessee Research and Creative Exchange. For more information, please contact [trace@utk.edu](mailto:trace@utk.edu).



To the Graduate Council:

I am submitting herewith a dissertation written by Shelby Morgan Reyes entitled "An Investigation of Gender Bias in a Career Assessment for a STEM Field." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Psychology.

Jacob J. Levy, Major Professor

We have read this dissertation and recommend its acceptance:

Shawn L. Spurgeon, Eric D. Sundstrom, Dawn M. Syzmanski

Accepted for the Council:

Dixie L. Thompson

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

---



# **An Investigation of Gender Bias in a Career Assessment for a STEM Field**

A Dissertation Presented for the  
Doctor of Philosophy  
Degree  
The University of Tennessee, Knoxville

Shelby Morgan Reyes  
August 2018



## Abstract

This study examined whether career counselors differ in their recommendations for a STEM (i.e., science, technology, engineering, mathematics) career (specifically, computer scientist) based on the gender of the client. In a randomized two group experimental design with a qualitative component, a fictitious student bio was created in order to understand the possible conceptualization differences seen between career counselors in regards to gender bias in the STEM fields. The primary research questions looked at whether participants were less likely to recommend the female student, compared to the male, to a STEM related career and to pursue graduate school. A secondary research question was utilized to investigate the thought process underlying counselors' recommendations. Participants ( $n=129$ ) ranged from ages 23-71, were primarily female (78.3%,  $n=101$ ), had a Master's degree in a helping profession (70.5%,  $n=91$ ), and were White (75.2%,  $n=97$ ). Results of the primary research questions through a one-way MANOVA were seen as non-significant ( $n=129$ ), Wilks'  $\lambda = .992$ ,  $F(3, 125) = 0.353$ ,  $p = 0.787$ , partial eta squared = .008. The qualitative themes identified in the participants' responses for their reasoning for the "top 3" and "bottom 3" careers recommended were: Student Profile Components, Strong Interest Inventory Results, Assumed Student Traits & Activities, and Further Exploration Needed. Interpretation of these results shows that the use of a standardized measure provides a protective factor against the implicit gender bias typically seen in other areas of academia and the workplace for women. The follow-up question also revealed, that while the majority of participants showed no gender bias differences in their recommendations, they also failed to consider gender in the conceptualization of the student profile. This shows a "gender blind" component that does not follow the multicultural awareness approach that counselors are currently trained in and what is necessary if counselors desire to help support females interested



in STEM. Future studies should investigate career counselor bias utilizing different STEM careers and possibly an in-person interaction in order to pull at different biases and more intersectional identity elements (i.e., race and gender).



## Table of Contents

Chapter 1 Introduction .....	1
Review of Literature .....	2
Gender Socialization .....	2
Stereotype Threat .....	3
Interests and Values .....	5
Barriers .....	6
Bias .....	7
Career Development for Women in College .....	9
Career Counseling with Women .....	10
Career Counseling in Action - Career Assessment .....	12
Current Study .....	14
Chapter 2 Methods .....	17
Pilot Study .....	17
Participants .....	18
Instrumentation .....	19
Holland Student Profile and Questions .....	19
Reliability Check .....	21
Demographic Questions .....	22
Procedure .....	22
Chapter 3 Results and Discussion .....	24
Results .....	24
Primary Research Questions .....	24
Qualitative Research Question .....	25
Top 3 Career Choice Reasoning .....	25
Table 3.2 .....	25
Student Profile Components .....	26
Strong Interest Inventory Results .....	27
Assumed Student Traits & Activities .....	28
Further Exploration Required .....	29
Special Considerations to Gender .....	29
Bottom 3 Career Choice Reasoning .....	30
Table 3.3 .....	31
Student Profile Components .....	31
Strong Interest Inventory Results .....	31
Assumed Student Traits & Activities .....	32
Further Exploration Required .....	33
Discussion .....	33
Limitations and Future Directions .....	37
Conclusion .....	39
References .....	41
Appendices .....	49
Appendix A – Profile .....	50
Appendix B – Table 3.1 .....	51
Appendix C – Qualitative Responses .....	53
Vita .....	96



## **Chapter 1**

### **Introduction**

Despite considerable progress in gaining workforce equity over the decades, women still lag behind men in many important respects. In particular, this deficit can be seen in the proportion of women versus men in science, technology, engineering, and mathematic (STEM) fields. Interestingly, this disparity is not found among young children (Vanderbrook, 2006; Weisgram & Bigler, 2006). Over the course of development, however, there appears to be a gradual decline in females' interest in math and science. This process has been deemed the "leaky pipeline" effect and occurs regardless of a female's aptitude and potential for a STEM major or career (Blickenstaff, 2005). Even into college, women's numbers in bachelor and graduate degrees are declining in mathematics, computer science, and engineering (Blickenstaff, 2005). Once out in the workforce, women only make up about 38% of those employed under science and engineering (National Science Foundation, 2012). That proportion decreases significantly when the field is broken down into particular subcategories (e.g. only 13% in engineering fields and 26% in computer and mathematical sciences) (National Science Foundation, 2012). It appears that once a girl reaches adolescence, the affinity she might once have had for math and science fades. Consequently, when she reaches college, STEM related majors and career paths are simply not considered or quickly abandoned.

Several points of influence that can help explain this "leaky pipeline" effect will be reviewed. I will begin by providing an overview of the impact of gender socialization across the lifespan (Freeman, 2007; Lawson, Crouter, & McHale, 2015; Leaper, Farkas, & Brown, 2012). Next, academic stereotype threat will be explored, especially as it relates to how young girls perceive their own math ability (e.g., Régner, Steele, Ambady, Thinus-Blanc, & Huguet, 2014);



how it impacts actual math performance (e.g., Van Loo & Rydell, 2014); and how it impacts a female's workplace well-being (e.g., von Hippel, Sekaquaptewa, & McFarlane, 2015). This will be followed by a review of general differences found within male's and female's values and interests, such as, a male's preference in working with things and a female's preference in working with people (e.g., Su, Rounds, & Armstrong, 2009), differing life priorities (e.g., Ferriman, Lubinski, & Benbow, 2009), and a female's preference in careers that have an emphasis in altruistic values (e.g., Weisgram & Bigler, 2006).

Next, external barriers that could impede a female's success in STEM will be reviewed. Specifically, recent research has explored a female college student's perception of career barriers (Watts, Frame, Moffett, Van Hein, & Hein, 2015). Looking further down the pipeline, researchers have also investigated gender differences in perceived career barriers (e.g., Cochran Hauschild, Elder, Neumayer, Brasel, & Crandall, 2013). Finally, the biases females encounter from others within their life will be explored. A comprehensive breakdown of this literature will reveal a relative void in the literature related to understanding the role career counselors play in women's career development—especially related to women in STEM fields. Specifically, the current study will investigate if gender bias exists within the use of a common tool in career assessment related to pursuing graduate school and careers in a STEM field.

## **Review of Literature**

**Gender Socialization.** Gender socialization can start impacting a person's interests from a very young age. Children are influenced to have certain beliefs about gender from their parents, friends, teachers, and other sources prevalent in their lives (i.e., social media). Even parents who believe they reject gender stereotypes are still susceptible to relaying messages to their children about what toys are gender appropriate (Freeman, 2007). Regardless of parental beliefs,



preschool children perceived approval or disapproval depending on their choice of gender-appropriate versus cross-gender toys.

Focusing on gender socialization in relation to the math and sciences, studies have shown that males' and females' desire to pursue these subjects is dependent on the support from those around them (Lawson et al., 2015; Leaper et al., 2012). Motivation for adolescent girls to pursue STEM fields has been found to positively associate with support from their mothers, support from peers, and having gender egalitarian beliefs and exposure to feminism (Leaper et al., 2012). Similarly, in their longitudinal study examining how family gender socialization impacted eventual career choice, Lawson et al. (2015) found an association between the family socialization experiences around age 10 and later (~26 years old) career attainment in gender-typed occupations. Specifically, females spending *more* time with their fathers in childhood were seen to be less likely to choose a gender-typed occupation. This suggests children's experiences with parents and friends influence what fields they perceive to be best suited or appropriate for them to pursue. Thus, it is important for caregivers to be aware of their own beliefs and actions in order to help females identify all of their potential career options and to offer necessary support, especially if that female's initial interests are in the STEM fields.

**Stereotype threat.** Overtime, beliefs that females form regarding which activities or careers are socially acceptable to pursue may lead to the formation of negative stereotypes in reference to their gender's abilities. Negative consequences can take shape when one feels like a target of a negative stereotype. The feelings that arise in these situations are known as a stereotype threat. An individual will start to worry their performance will confirm to the negative stereotype of the group to which they belong. Research findings suggest women have been



negatively impacted by stereotype threat in relation their abilities in the math and sciences (Régner et al., 2014; Van Loo & Rydell, 2014; von Hippel et al., 2015).

In an effort to examine etiology of stereotype threat, Régner et al. (2014) conducted a thorough analysis of the literature. One important finding they noted was the trend of implicit stereotypes females hold as they develop. Younger girls were shown to either believe females and males were equal in math ability or that females were better than males in math. Interestingly, young females tended to separate the image of a “girl” and a “woman.” Younger girls implicitly associated the gender stereotype that males are better at math than females only when looking at the image of a “woman,” not the “girl.” This could be seen as a protective factor at first, but what happens when a young female starts to transition into adulthood and associate her own ability in math with that of the “woman” and not the “girl”. One can see the “leaky pipeline” at work in this transition.

Next, Van Loo and Rydell (2014) conducted an experiment to examine how stereotype threat impacted women’s math performance after watching a video depicting a male and female interaction. Females who watched the video that portrayed a dominant male in a math related situation had poorer performance on a math task, and a greater sense of worry that they were confirming a negative stereotype about females than those in the control group. There were no detriments to math performance seen when the video displayed equal dominance between the genders or female dominance.

Stereotype threat has also been found to impact women in the workforce. von Hippel et al. (2015) examined women in the finance field to see how the perception of stereotype threat in their workplace setting impacted workplace well-being, and their likelihood to recommend the field to younger females. Women with higher levels of perceived stereotype threat were



significantly more likely to have lower levels of workplace well-being, and were less likely to recommend younger females to pursue a career in finance. These results suggest stereotype threat can have an impact on females at multiple levels of career development. From young girl's perception of older women (whom could be potential role models) (Régner et al., 2014) to actual performance on math-related tasks (Van Loo & Rydell, 2014) to an older female's perception of her workplace well-being and support of younger generations (von Hippel et al., 2015).

**Interests and Values.** The focus of this section is not to debate the etiology of gender differences in vocational interests and values, but rather to examine the impact such differences have on career field each gender pursues. Arguably, one of the more influential articles in this area comes from Su et al. (2009) who examined the interest differences between men and women using Holland's categories (Realistic, Investigative, Artistic, Social, Enterprising, and Conventional). These same categories will be used within the current study's career assessment portion and will be discussed in greater depth in the methods section. Su et al. (2009) performed a meta-analysis that analyzed approximately 500,000 respondents from technical manuals of vocational interest inventories and found men tend to prefer working with things, while women tend to prefer working with people. Men were also seen to have interests that favored careers in engineering, mathematic, and science over women. Of course, it is possible that these preferences account for some of the gap seen between men and women in the STEM fields. However, the aforementioned factors (e.g., gender socialization, stereotype threat) may likely account for why these preferences exist in the first place.

Another factor impacting the gender disparity in STEM fields has less to do with interest and more to do with values. The "leaky pipeline" appears to continue for those females who have an interest in the math and sciences and choose a career within STEM, but demonstrate different



life priorities from that of males (Ferriman et al., 2009). Men and women who are talented and have similar vocational interests, abilities, and education are seen to differ with men being more career-focused. This finding suggests men prioritize receiving compensation, taking risks, and gaining professional recognition, while women take a more holistic view of their life (e.g., wanting to find a balance between work, community, family, and friendships). This difference was seen to be even larger among parents.

Contrast in values between males and females can be seen within younger females as well (Weisgram & Bigler, 2006). Middle school girls were seen to better relate and have a stronger interest in scientific careers when they received an intervention from a female scientist who emphasized the altruistic value of scientific careers compared to those girls whose presentation excluded that value emphasis. Altruism is defined as the desire to help people. Going back to how youth are socialized, Weisgram and Bigler's (2006) findings suggest part of this "leaky pipeline" effect could be a result of the manner in which society presents STEM careers to males and females. If gender values truly do exist, the way STEM careers are presented to our youth must be tailored. Despite these studies' findings, there are still females who enter college with an interest in STEM majors and careers, but the "leaky pipeline" causes them to leave the field. It is important to understand all the avenues that can be utilized in order to keep females interested in STEM and to help slow down or stop this disparity.

**Barriers.** On top of the developmental components that shape a female's interest in pursuing a STEM career, external barriers also play a significant role. A career barrier is something that is perceived by an individual to block their progress in pursuing a particular career goal (Swanson et al., 1996; Swanson & Woitke, 1997). In general, women tend to perceive they have more career barriers than men do (Swanson & Woitke, 1997; Watts et al.,



2015). Additionally, some of these barriers may relate more to the experiences of being a woman in our society (e.g., sex discrimination, multiple role conflict, and conflict between children and career demands). Watts et al.'s (2015) found college aged females perceive they would have more barriers to their career advancement than their male counterparts. Another study examined perceived career barriers of men and women who were academic surgeons (one of the few STEM careers where the distribution between men and women is equal; Cochran et al., 2013). They found female academic surgeons perceive and anticipate significantly more career barriers in the form of active discrimination (i.e. being treated differently and experiencing negative comments about their sex). These sex-based negative attitudes were seen by the women to inhibit their career aspirations.

**Biases.** There have been vast numbers of studies that have examined the role gender has played in the workplace, in both STEM and non-STEM careers. The studies I have chosen to explore further will look specifically into the gender bias seen in academia (Milkman et al., 2015; Moss-Racusin et al., 2012; Steinpreis et al., 1999), and for the hiring process in relation to the STEM fields (Reuben et al., 2014), since these are the most relevant to the current study. In the world of academia, gender bias was found both in the relationship between professors and their students (Milkman et al., 2015; Moss-Racusin et al., 2012) and in the relationship between colleagues (Steinpreis et al., 1999). Milkman et al. (2015) did a nationwide study of approximately 6,500 professors representing almost 90 different disciplines and over 250 institutions. The researchers wanted to see what the professors would do if they were contacted by a student who was seeking mentorship for their future. The email sent to the professors was identical except for a name and gender change, which was randomly assigned to represent both genders and various races (White, Black, Hispanic, Indian, and Chinese). The results indicate



professors were significantly more likely to respond to a student who was a White male than any other gender/race combination. These results were found to be more likely within the higher paying disciplines and at the private institutions. The ability to obtain a mentor is one way females are supported in pursuing STEM fields, thus, the findings from Milkman et al.'s study demonstrate how gender bias might be holding females back in this aspect.

In examining gender bias in the hiring process, Moss-Racusin et al. (2012) had science faculty members rate résumés for a lab manager position. In this study the faculty members all rated the same résumé where the only randomized difference in the résumés was a change in the applicant's name (i.e., a name that was apparently male or female). The science faculty members tended to rate the male applicants significantly higher than female applicants on perceived competence and hireability. They were also more likely to give the males a higher starting salary and offer them more mentoring in their career field. This trend has been seen for years with Steinpres et al. (1999) showing similar results from a study almost two decades ago. Steinpres et al (1999) performed a similar double-blind study but asked academic psychologists to look at an application for a faculty position. Once again, the only difference between the applications was the gender name being male or female. The faculty participants were more likely to vote to hire the male job applicant than the female job applicant, as well as rate the identical records (i.e. teaching, research, and service experience) as more adequate for the male versus female applicant.

This trend is not just seen in the world of academia. Regardless of the job title surrounding the position, research suggests gender bias exists in the hiring process, especially for the STEM fields (Reuben et al., 2014). Taking a different approach, Reuben et al. (2014) created an experiment where the participants completed an arithmetic problem in which both females



and males have been found to solve equally well. The participants were then randomly chosen to be either two “candidates” or the “employers” who would “hire” one of the candidates to perform a second arithmetic problem. When the candidates were of opposite genders (one male and one female), and the employers had no information other than the candidate’s appearance, males were twice as likely to be hired than females. Reuben et al. (2014) speculated that this was due to the general perception that females are not as good at math as their male counterparts. The study also had a “self-report” condition where the candidates could disclose their ability, but this did not change the low-rates at which females were hired. The researchers stated that this is due to the fact that males tend to boast more about their abilities than females and that employers need to take this into consideration when hiring. Otherwise, they risk bias.

**Career Development for Women in College.** The process of the “leaky pipeline” is one that starts the moment a female is born and continues on into her adulthood (Blickenstaff, 2005). Extensive research has explored the impact of gender socialization on the early years of a female’s life and the unique variables that impede or support this process (Freeman, 2007; Su et al., 2009). It is important to note that development and decisions about future goals do not stop in young adulthood. As females reach the collegiate level, those that have a high-math and high-verbal ability tend to choose careers and majors that are outside of the STEM fields and thus continue the growing gender disparity seen within STEM (Wang, Eccles, & Kenny, 2013). This tends to happen more often to females than their male counterparts. Researchers suggest this could, in part, be due to the interplay of socialization, stereotype threat, perceived barriers, and biases encountered that leads females to find other occupations outside of STEM more appealing. Wang and Degol (2013) discussed the importance of understanding the internal and external experiences that occur within a female’s life that contribute to female’s choosing careers



outside of STEM. Interestingly, parents, grade school teachers, and peers are only factors mentioned as main influences over a female's major or career choice. Wang and Degol (2013) stated the decision of what major to choose is made internally before college—thus, this is where our efforts need to be concentrated. While one can agree on the fact that early childhood and adolescence experiences play important roles in career choice for females, there seems to be a lack of emphasis on those who do encounter college-aged females. One direct way that counselors have contact with these college-aged females is through career counselors.

**Career Counseling with Women.** To date, most of the research on career counseling has examined the impact that elementary and high school career counselors can have on a child's future occupational choices. Consequently, researchers have concentrated their work on helping develop programs to assist counselors in gender-balanced education (Burger & Sandy, 2002). However, these interventions miss the role a *college* career counselor may play in a young adult's decision making. A majority of college campuses have a career services center where students have the ability to meet with career counselors and take self-assessments. About 20-50% of students enter college under the status of “undecided” or “exploratory,” which means they have yet to decide on a major to pursue (Gordon, 2007). Also, Gordon (2007) estimated that 75% of students tend to change their major at least one time over the course of their undergraduate career. These types of students might find themselves within Career Services seeking guidance as to what majors or careers could be a good fit for them.

The impact a counselor can have on a student's decision making can either become a support or a barrier. The information the counselor communicates to a student must be as accurate as possible in order to help guide that student toward a satisfying career. If the counselor harbors some degree of bias against females pursuing STEM-related careers, then this



could influence the overall conversation between the counselor and student and, ultimately, the careers suggested to that student. Considering the other instances in which bias was seen to impact the gender disparity in STEM fields (Milkman, Akinola, & Chugh, 2012; Moss-Racusin et al., 2012; Reuben et al., 2014; Steinpreis et al., 1999), there is little research examining potential bias among career counselors. When it comes to asking career counselors about their specific attitudes in relation to a client's gender, there are some theories but little recent empirical research from the perspective of the counselor (Byars-Winston, 2014; Donahue & Costar, 1977; Flores & Heppner, 2002; Kahn & Schroeder, 1980).

Flores and Heppner (2002) focused on a practitioner's cultural competence as it relates to training vocational counselors. They combined race and gender and discussed how vocational counselors need to consider how one's culture might impact the process of career exploration. Byars-Winston (2014) took this multicultural approach a step further by applying it specifically to career interventions for the STEM-field. For example, this approach begins by discussing gender disparity trends and counselors are made aware of the implicit or explicit biases they may have about certain gender's participation in STEM careers. This article addressed the changes that need to be made within the realm of having a multicultural focus on STEM-focused career interventions, but there is a need to know if the training of counselors has them utilizing this multicultural approach when working with females entering STEM fields.

A thorough review of literature revealed only two studies that directly related to career counselor bias against females; and they are from about 40 years ago. Donahue and Costar (1977) conducted a study in the United States that looked at high school counselor bias against females across multiple career fields using randomized career profiles. The results suggest counselors selected jobs for females that paid less, were more closely supervised, and needed



less prerequisite education. This study was then replicated by Kahn and Schroeder (1980) in British Columbia and found the exact same results. There has been an emphasis over the past few decades that certain multicultural competencies should be expected from career counselors. For example, the American Psychological Association's ethical guidelines (2010) require an understanding that one will gain the necessary professional knowledge to be able to competently understand the impact factors such as age, race, gender, gender identity, culture, religion, and other multicultural components will have on a client. One would think that this emphasis on being more multiculturally competent would have some impact on the number of females entering nontraditional fields like the STEM fields. Considering how low the numbers remain, and how dramatically they continue to drop once a female enters college, further investigation is warranted as to whether or not career counselors play a part as yet another barrier.

**Career Counseling in Action – Career Assessments.** There is more to successful career counseling than just handing clients their self-assessment results. A career counselor will have to take those assessment results and provide meaningful interpretations; incorporating aspects of multiculturalism from their training, and then decide on further components that will help the student gain support, find information, and explore their options further (Brown & Krane, 2000; Whiston & Bouwkamp, 2003). If a career counselor holds a bias or has a lack of gender-sensitivity for females, this could impact their interpretation of assessment results.

Arguably, the most popular and widely used career assessment instrument is the Strong Interest Inventory (SII; Donnay, Morris, Schaubhut, & Thompson, 2004). The SII is grounded in Holland's vocational theory. This theory is a commonly used framework by career counselors and is well established in predicting occupational group membership, but also in a person's choice of academic major (Porter & Umbach, 2006). Holland (1996) subscribed to a trait-factor



approach to career development, which suggests that one's occupational choices should be based on one's abilities and interests. This is conceptualized using six main themes: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC). Realistic types are known as "doers" and are seen to enjoy work with their hands and are described as being more practical, stable, down-to-earth individuals. Investigative types are considered the "thinkers" and have described as having a curious nature that is more analytical, introspective, and intellectual. Artistic types tend to be considered the most independent in nature and are known as the "creators" whom are more unstructured, original, and innovative in their interests. Social types are known as the "helpers" which demonstrates their desire to be caring, cooperative, service-oriented, and drawn towards social interactions. Enterprising types are the "persuaders" who prefer more risk-taking, leadership roles, and the opportunity to influence others in their work. Conventional types are known, as the "organizers" who enjoy attention to detail, tend to be efficient, logical, and conscientious of the decisions they make.

Females and males tend to pursue different career directions, as is seen with the lower numbers of women in STEM fields and within the norms of Holland's scale (Farmer, 1995). Females tend to score lower on Realistic and Investigative themes in comparison to men (Su et al., 2009). There has been debate from researchers as to whether or not career assessments like the SII accurately evaluate a woman's interests, since these assessments were originally created with just men in mind (Burns, 2014). If females are being socialized to avoid certain nontraditional fields like those within STEM, then their RIASEC results might show up weaker than they would for a male in categories related to those fields. A career counselor needs to understand and take notice of other factors that could reflect that female's ability in math and science (i.e., past grades, SAT scores). The interpretation of individualized tests and feedback



has been identified as one of the five critical treatment ingredients with regard to career counseling outcomes (Brown & Krane, 2000). Brown and Krane (2000) have identified that utilizing assessment results and feedback in conjunction with other career counseling components, can have a marked impact on helping a student with his or her career choice. The past few decades have been marked with dramatic changes in the push for gender equality and multicultural training, but have these changes impacted the past biased results of career counselors towards females desiring to pursue a STEM-related field (Donahue & Costar, 1977; Kahn & Schroeder, 1980)?

### **Current Study**

Career counselors' assessment and conceptualization of high potential STEM female students could be impacting these students' potential choice in major and career and is contributing to the "leaky pipeline" effect. The current study used a randomized two group experimental design with a qualitative component. The study sought to mimic the real life process of a career counselor meeting with a student, while controlling some of the variables that might confound research results. An analog research design is a form of a true experiment, and thus allows for causal inferences about the impact of career counselor attitudes and behaviors towards females interested in STEM majors and careers. These types of studies have been utilized in the past to help look at examined biases people hold in a number of situations, from racial bias in domestic violence situations to sex bias in promotion decisions (Ferguson & Negy, 2004; Kemp & Mallinckrodt, 1996; Pazy, 1992) Analog studies help conduct research around areas where formulating studies using a real-world situations or interactions may not be as feasible due to the before mentioned reason of confounding variables, such as individual differences between clients. For example, Ferguson and Negy (2004) investigated



undergraduates' interpretations of a fictional scenario involving domestic violence where the one factor being altered was the race of the perpetrator. Similarly, Pazy (1992) utilized the analog design to assess sex bias in promotion decisions by simulating a job application decision by using fictional materials of a job candidate where the only differing components of the information provided were the gender (male or female) and job experience (relevant or irrelevant). In relation to counseling, analog studies have been used to study potential counselor bias as it influences the task of diagnosis and case formulation. Kemp and Mallinckrodt (1996) used a video simulation of a counseling session to examine differences in therapists' case conceptualizations of clients based on whether or not that client appeared to have a physical disability (e.g. using a wheelchair). This is also the common approach when looking at possible gender bias when assessing abilities from résumés, as seen in the previously discussed studies (Reuben et al., 2014; Moss-Racusin et al., 2012; Steinpreis et al., 1999). This approach helped the current study by using fictitious student bios to examine the possible conceptualization differences seen between career counselors in regards to gender bias in the STEM fields. Specifically, the current study investigated the impact of gender manipulation of a profiled student (independent variable) on three dependent variables (i.e., probability to recommending a STEM career, a non-STEM career, and graduate school). The following experimental hypotheses and qualitative question tested to see if practicing career counselors are properly interpreting assessments to encourage females to explore STEM related careers:

**Primary Research Question:** In response to a mock SII case designed to elicit the interpretation of a STEM career (i.e., with the gender of the mock client manipulated between two randomly assigned groups), Career Counselor participants will

Hypothesis 1: be less likely to recommend the female version of the mock client, as



compared to male version, to a STEM related career (e.g., computer scientist). This will be operationalized by examining the recommendation scores averaged from the 6 highest correlating careers and the 6 lowest correlating careers to the computer scientist SII theme code (see Instrumentation for more details).

Hypothesis 2: be less likely to recommend the female version of the mock client, as compared to male version, to pursue graduate education in a STEM field.

**Secondary (follow-up) Research Question:** How does the thought process underlying counselors' recommendations differ as a function of gender bias?

In addition to quantitative analysis to test the primary hypotheses, follow-up qualitative questions examined the rationale for the recommendations by soliciting answers to two open-ended questions. Specifically, open-ended responses were solicited regarding participants' reasoning for the "top 3" careers recommended and the second about the "bottom 3" careers recommended. Themes were identified among the participants' responses in an attempt to add some clarity to the results from the primary research questions.



## **Chapter 2**

### **Methods**

#### **Pilot Study**

The research design benefited from a pilot study in order to obtain feedback on the ease of understanding and completing the Holland profile measure (e.g., instruction clarity, recognition of careers suggested) and to assess the completion time. The outcome resulted in some changes to the measures utilized for this study. The pilot study included an assessment portion (i.e., Holland student profile and questions) and then measures from the Counseling Women Competencies Scale (CWCS; Ancis, Szymanski, & Ladany, 2008), Academic Stereotype Threat Inventory (ASTI; Pseekos, Dahlen, & Levy, 2008), and finally a set of demographic questions. Participants ( $n=4$ ) for this pilot study were recruited from the investigators doctoral program due to their knowledge in the experimental method and research design. They were asked to record their time at two different points (i.e., after assessment measure and then after additional measures). Research has shown that the completion rate is higher when participants are asked to complete a study that is 10-minutes long versus 20- or 30-minutes long (Galesic & Bosnjak, 2009). At the first time check the participants took between 8-15 minutes; and then the final time check responses ranged from 15-30 minutes to complete. Based off this information and research about response rates it was decided to exclude the additional measures (i.e., CWCS and ASTI) and focus on the assessment portion and demographic questions. Participants were also given an opportunity to provide feedback about the clarity of questions. The comments consisted of inquiries as to the definitions for some of the careers used within the assessment (i.e., actuary and radiologic technician) Since the careers represented opposite ends of the spectrum within the study they were both removed to improve



the clarity of the assessment measure. Further explanation on the formation of this measure can be found in the “Instrumentation - Holland Student Profile and Questions” section below.

### **Participants**

The sample consisted of 138 volunteer participants, both students and professionals in helping professions. Participants were recruited by utilizing personal connections with other university career centers through past graduate placement at University of Tennessee, Knoxville’s Center of Career Development, as well as contacting directors of college and university career centers and Counseling Psychology and Counseling Education programs, and through the National Career Development Association’s (NCDA) listserv. After an initial review of demographics gathered, 9 cases were removed because they did not have the appropriate education (i.e., Only Bachelor’s degree,  $n = 7$ ) or they were missing all of the demographic information ( $n = 2$ ), leaving a final sample of 129 participants. Also, review of the “Reliability Check” question saw no need to remove any other cases from the data set.

The final population of 129 participants was comprised of 101 females (78.3%), 27 males (20.9%), and 1 unknown (0.8%). In reference to highest degree obtained or to be obtained, the majority of participants indicated a Master’s degree in a helping profession (70.5%,  $n = 91$ ). The remainder indicated a doctoral degree in Counseling Psychology (15.5%,  $n = 20$ ), Counselor Education (6.2%,  $n = 8$ ), or related helping profession Ph.D. (7.8%,  $n = 10$ ). The age distribution ranged from ages 23 to 71, with 32.6% between the ages 23-29 ( $n = 42$ ); 24.8% between 30-39 ( $n = 32$ ); 14% between 40-49 ( $n = 18$ ); 17.8% between 50-59 ( $n = 23$ ); 8.5% between 60-71 ( $n = 11$ ); and 2.3% age unknown ( $n = 3$ ). The participants identified as predominantly White (75.2%,  $n = 97$ ), with the remainder identifying as Black or African American (8.5%,  $n = 11$ ), Asian or Asian American (7.8%,  $n = 10$ ), Hispanic-Latino (4.7%,  $n = 6$ ), American Indian or Alaskan



Native (3.1%,  $n = 4$ ), and other (1.6%,  $n = 2$ ). The professional breakdown showed that 34.9% ( $n = 45$ ) were still in school, while the other 65.1% ( $n = 84$ ) had graduated. Of those that had graduated, it had been 1-10 years since graduation for 57.1% ( $n = 48$ ), 11-20 years for 17.9% ( $n = 15$ ), and 20+ years for 25% ( $n = 21$ ). Also, of those who had graduated, 71.4% are working directly in Career Counseling ( $n = 60$ ), 14.3% in a Counseling Center ( $n = 12$ ), and 14.3% in Private Practice or Community Mental Health ( $n = 12$ ).

### **Instrumentation**

**Holland Student Profile and Questions.** The profile (see Appendix A) was developed using the *Strong Interest Inventory Manual* (SII; Donnay, Morris, Schaubhut, & Thompson, 2004) as guidance for the information provided. The aspect to be decided on was which SII RIASEC code to display with the profile, because there is not one overarching code to encompass STEM fields. The code refers to the 1-3 letters provided within a typical Strong profile that indicate the theme(s) to which a person identified with the most. These codes are then compared to occupational fields that have the same or similar themes matched to them according to a person's likes and dislikes. Based on research on STEM fields lacking female representation, a computer scientist is one of the fields with one of the smallest percentage of female employment (National Science Foundation, 2012). The RIASEC code, according to the SII manual (2004), for a computer scientist is IRC (for women) and ICR (for men). Even though the letter order is different, the general interests of these three themes (Investigative, Realistic, and Conventional) would not change for the profession. In the study student profile, a simple sentence stated that the Investigative, Realistic, and Conventional themes are the highest for the student presented. This kept from having to specify the order, since that differed by gender.



The descriptions of typical work activities, potential competencies, self-concept and values, environments, typical hobbies, and sample occupations are given for each theme in the manual. Since computer scientist was found under the Investigative theme description the main amount of information was taken from this particular theme. The manual continues with 30 categories that breakdown the basic areas of interest for individuals forming the Basic Interest Scales (BIS, SII; 2004). The description of the main BIS under each relevant theme for a computer scientist were also taken to help develop the profile: Computer Hardware & Electronics (R), Research (I), Mathematics (I), and Programming & Information Systems (C).

The goal of the student profile was to develop a narrative that represented a well-rounded student with a slight emphasis on interest areas related to a computer scientist. The rationale for this was to provide a profile with indicators for a computer scientist, but not to discount the other themes and have participants deduce the purpose behind the current study. The participants were be randomized to receive either the male or female student profile. There were brief instructions that made it seem like the participant just received one of a large number of different profiles. The deception had the participants think the study was looking at consensus across the entire updated Strong Interest Inventory protocol.

Following the profile there were three questions that focused on aspects a typical career counselor would then address with a student within an appointment. A Likert-type scale was used for each of these questions in order to provide a foundation for analyses that would allow a comparison of means. The first question asked the participants to rate a series of occupations (14 total in pilot study and 12 total for final measure) based on likelihood of recommendation on a scale from “Very Unlikely” to “Very Likely.” The occupations were chosen based off the correlation charts for the BISs related to a computer scientist that were mentioned above. Each



BIS had the 10 highest-correlating and 10 lowest-correlating occupations with that interest for both men and women. Out of the 14 occupations chosen, 3 were found in all 4 BISs (Computer Scientist, Network Administrator, and Engineer); 2 were found in 3 of the BISs (Buyer and Advertising Account Manager); 5 were found in at least 2 of the BISs (College Instructor, Social Worker, Physicist, Actuary, and Artist); and 4 were in at least 1 of the BISs (Science Teacher, Optometrist, Radiologic Technologist, and Speech Pathologist). These numbers are based off of each occupation being found in both the female and male correlation scale for a particular BIS, since some of them were found more than indicated here, but only in one of the gender's scales. Also, the occupations are split down the middle, with 7 from the highest correlating (Computer Scientist, Network Administrator, Engineer, Science Teacher, Optometrist, Physicist, and Actuary) and 7 from the lowest correlating (Buyer, College Instructor, Social Worker, Radiologic Technologist, Speech Pathologist, Artist, and Advertising Account Manager) occupations. The occupations listed in the first question were randomly assigned to an order that was the same for all surveys. Note: After the pilot study, the occupations were taken down to 12 total, with the removal of "actuary" and "radiologic technologist" due to confusion around their definitions.

The first question was followed up by two open-ended questions that asked the participant to justify their reasoning for choosing the top 3 and bottom 3 careers they rated as "Very Unlikely" or "Very Likely" to recommend. The final question asked about the perception of appropriateness of graduate/professional school for the student.

**Reliability Check.** After the participant finished their assessment of the profile and additional questions, there was a question to make sure that the premise behind the study (i.e., investigating gender bias) had not been impacted by the participant's thoughts about the purpose



of the study. The open response question, “What do you think this study is about?” was used to see if the participants felt they knew what this study was actually about beyond the deception previously given that think the study was looking at consensus across the entire updated Strong Interest Inventory protocol. These responses will be taken into consideration when analyzing the data.

**Demographic Questions.** Participants were asked to respond to a number of questions to gather information about their gender, age, ethnicity, and location. Additionally, there were some screener questions to make sure that the participants met the necessary requirements to take part in the study. A requirement for participation was the current or past enrollment in a graduate “helping” program (i.e., Masters or Doctoral programs in Counseling Psychology, Counselor Education, or Career Counseling). Other information gathered will include academic curriculum or training involving Holland’s RIASEC theory, a student’s desire to pursue a career involving career counseling in some capacity, and a professional’s experience working at a career center or counseling center. These questions will be identifying markers during the analysis so that comparisons can be made involving the training and experience of various types of programs and professional paths.

## **Procedure**

The packet of materials began with a brief review on Holland’s model in the form of a short paragraph description of the theory followed by a depiction of the hexagonal model with brief theme descriptions inside. Next, I developed the student profile measure in order to provide each participant with a streamlined profile and questions to assess. As previously discussed, this form of a measure was taken from the analog approach in order to help confound variables (such as students’ individual differences) from impacting the responses given by participants. The



profiles given to each participant were identical except for the one demographic change of gender (female or male) and name (Alice or Alex).

Random assignment (RA) made sure that the subjects that choose to participate in the study were given an equal chance of being placed in either of the two experimental groups. This process also helps minimize potential confound variables that could be present. For example, one program could have better multicultural training in career assessment over another program so RA will help make sure the participants of these program are spread evenly between the two groups. The two groups were established depending on which gender profile the participant randomly received. One group received a fictional female student's short profile and a RIASEC code that would represent a computer scientist, while the other group received the same profile with one change, it would be a male student's name and male pronouns (he/him). All the participants were then asked a series of questions that delved into what career options they would recommend to the student, an open-response asking them to explain their reasoning of top- and then bottom- 3 careers recommended, and their opinion for recommendation of graduate school. They will then be asked to complete the reliability question and finally the demographic questions. After the participants completed the study, they were re-routed to a page unassociated with their study results and asked to fill out their email in order to be entered into a raffle for a chance to win a \$20 Amazon gift card as compensation for taking the time to complete the study. Participants were given information during the informed consent as to how they could still enter the raffle even if they decided to not participate at any point during the administration.



## Chapter 3

### Results and Discussion

#### Results

**Primary Research Questions.** In order to assess the Primary Research Questions, a multivariate analysis of variance (MANOVA) was chosen to address the hypotheses in order to test if the independent variable of student profile (female or male) has an effect on the three dependent variable (DV1: Recommendation of STEM Careers; DV2: Recommendation of Non-STEM Careers; and DV3: Recommendation of graduate school pursuit). This analysis was chosen because it will take into account the inter-correlations among these dependent variables.

During the initial cleaning of the data set, it was noted that there were nine cases where one career field had not been rated (7 male profiles, 2 female profiles) and two cases where two career fields had not been rated (both female profiles). Since DV1 and DV2 are averages of the 6 careers in each category, the missing data was filled in by obtaining an average among each individual participants' ratings for the STEM or Non-STEM careers respectively. After the missing data was accounted for, new variables were created to establish the average rating for the STEM and Non-STEM Careers. Participants were randomized to receive one of the two gender profiles, and the final data set included 67 female profiles and 62 male profiles.

A one-way MANOVA revealed a no significant multivariate main effect for female or male profiles, Wilks'  $\lambda = .992$ ,  $F(3, 125) = 0.353$ ,  $p = 0.787$ , partial eta squared = .008. Power to detect the effect was 0.118. Thus the primary research questions (hypothesis 1 and 2) were not supported. An additional MANOVA analysis was conducted to see if there were any differences between gender profiles when looking at individual career fields. Once again, no significant main effect was detected, Wilks'  $\lambda = .852$ ,  $F(12, 116) = 1.610$ ,  $p = 0.112$ , partial eta squared



= .143. Power to detect the effect was 0.810. The recommended score means for each career by gender profile is displayed in Table 3.1 (Appendix B).

**Qualitative Research Question.** A thematic design was used to assess the two open-ended questions each participant was asked referencing their decision-making reasons behind the top three and bottom three careers they selected for their profile. Prior to conducting the thematic analysis, the researcher created a separate data file and altered all the pronouns (female and male) among the participants' original responses to gender neutral pronouns (them, they, their). This was done in order to keep the two research assistants blind to the gender profile each participant received. The research assistants were also blind to the research question regarding gender bias, and were just under the impression that they would be exploring for themes in relation to decision-making of the career counselor. In the 129 total cases, 5 participants left their open-ended questions blank.

**Top 3 Career Choice Reasoning.** The analysis for the participant's reasoning for the selection of their top 3 career choices produced four primary themes: Student Profile Components, Strong Interest Inventory Results, Assumed Student Traits & Activities, and Further Exploration Required (Table 3.2).

*Table 3.2 – Themes for Reasoning of Top 3 Career Choices Selected*

<b>Themes</b>	<b>Female Profile</b>	<b>Male Profile</b>	<b>Combined</b>
Student Profile Components	55	49	104
Strong Interest Inventory Results	30	33	63
<i>Utilized Both Profile and SII</i>	27	26	53
Assumed Student Traits & Activities	23	12	35
Further Exploration Required	5	2	7



*Student Profile Components.* This theme encapsulated the idea that participants specifically referenced keywords or characteristics that were mentioned within the student profile description that was given at the beginning of the assessment. The analysis revealed that the majority of participants (80.6%, n=103) referenced these student profile components at some point in their reasoning for the selection of the top 3 career choices. There were 5 keywords in particular that were referenced at a higher rate well above anything else: Problem-solving (female profile, n=34; male profile, n=30), Structure (female profile, n=38; male profile, n=27), Math & Science (female profile, n=32; male profile, n=29), and Curious (female profile, n=19; male profile, n=18). The following are some samples of the responses given where this theme is prevalent, but a list of every response organized by theme can be found in the Appendix C.

*“Alice's curiosity, interest in solving problems, and strength in math and science and desire for structure.”*

*“...In addition, I'd consider each of these careers to offer "structure" which is a value Alice listed as important to her in a career.”*

*“I chose science based fields since he looks for structure and is curious which goes along with his investigative quality. Science and fields such as that are very structured as well as curiosity based and I think he would enjoy it.”*

*“She is a problem-solver and likes math and science. She is also a "curious" person which would lend to jobs that allow her to seek problems and find solutions.”*

*“He likes Science, structure, curious, problem solver.”*

*“She enjoyed math and many people do not, so she should, theoretically, be attracted to those careers that have strong backgrounds in math.”*

*“They are all technical, intellectually challenging, not rote, and might offer some structure in certain settings. The emphasis in all of those is ideas and information and problem solving, not people.”*

*“Enjoyment with math and science, abstract thinking and problem solving, there is structure to the academic majors associated with my ‘very likely’ picks.”*



*Strong Interest Inventory Results.* This theme captured participants' mention of at least one of the student's SII codes given to them. The analysis showed that 48.8% (n=63) of participants referenced the SII codes in their explanation about selection of top 3 careers. The following are example where *only* the SII results are used in the participant explanation:

*"They seem to have the Investigative/Conventional/Realistic theme throughout."*

*"Close fit with interest data found on O\*NET for these occupations that match the client's interest profile."*

*"I would introduce him more to the I-C-R careers that seem to fit his interests."*

*"Holland code ICR."*

Solely mentioning the SII results in their reasoning was not the primary way in which this theme was seen to unfold. The researcher analyzed the use of the "SII Results" theme in conjunction with the primary "Student Profile Components" theme and found that 84.1% (n=53) of participants who utilized the SII results also referenced the student's profile to some extent.

Below are some examples where this combination was present:

*"Alice code was ICR. She states that an important element in her future career is structure. In addition, she mentions that she is a curious person. This subjective response matches with her one of her top 3 codes. Finally, Alice mentions that during high school that she enjoyed math and science courses because of the problem-solving element. Engineer, Physicist and Computer Science can have elements of structure as well as collaborate with her three highest scores Holland Code."*

*"Each of these occupations requires an interest in science and problem solving/curiosity (I), yet have qualities of practicality/hands-on that seem compatible with Alex's general interests at this time (R). They also are most like to provide the need for structure that he currently expresses (C). None of the top three occupations includes his three lowest Holland codes."*

*"The student enjoys mathematics and science, which part of his investigative theme code. He also likes structure and organization, the conventional theme code, which can be found in occupations like that of optometrist, speech pathologist, and network administrator."*



*“Alice's own interest in math and science and in playing chess and her interest in problem solving and her family describing her as "curious." This is all coupled with the ICR theme.”*

*“I chose physicist, engineer, and computer scientist because they all contain I and R and two of the three contain C. Based on her interest code and bio these seem like good fits for her.”*

*“This individual would value an Investigative career, which includes scientific and research types of work settings and environments. I focused heavily on the theme codes first and aligned heavily with the description provided. Each of these careers would tailored especially to investigating, research, and solving problems.”*

*Assumed Student Traits & Activities.* This theme embodied participants’ use of particular personality traits or student interest in activities that were not explicitly mentioned in the profile description. The results revealed that 27.1% (n=35) of the total participants utilized at least one assumption in their reasoning for career decision in the top 3 careers. A difference is seen when the participants are separated based off the gender of the profile they received, with the presence of this theme appearing in 34.3% (n=23) of the female profiles and 19.4% (n=12) of the male profiles. The following are some examples where the participant made an assumption about the student’s traits or desired activity involvement, with the key parts where the theme was identified in bold (bolding added for emphasis by the investigator, not the participant). A reminder that a full collection of responses by theme can be found in the Appendix B.

*“I could not decide which of these careers would be most fitting to recommend. Although the description states she enjoys problem solving and volunteering, Alice's actual interests in life are not really consider. Considering her Strong Interest Inventory scores, **I would imagine she may do well in more technical fields where she can work to solve problems, but potentially in an independent manner** since she scored high in areas that are more investigative and problem-solving oriented.”*

*“The top 3 careers I recommended would seem to fit with Alex's interests in problem solving, **research and analyzing things, and having tasks that involve doing something hands on with tools, machines or equipment.**”*



*“Alice appears to be an introvert. While she volunteers and plays soccer, she enjoys reading and playing chess - activities that involve quiet time alone, or contemplation and problem solving with one other person...”*

*“His interest, and his desire to have structure (and stereotypes of engineers).”*

*Further Exploration Required.* This final theme was used to distinguish a small number of participants who remarked on the need to not necessarily recommend a career to the student and a desire to work with the student to explore his or her options more in depth. The analysis showed 5.4% (n=7) of the participants expressed this theme within their reasoning response. The following are sample responses that where this theme was apparent:

*“I would be unlikely to ‘recommend’ a career to Alex, but I would let him know that these careers may be a match with his enjoyment of problem solving. I would ask more questions about his desired work environment--does he prefer to work alone or with others, as well as ask more questions about particular interests (i.e. does he hate computers, can't stand medical stuff/eyeballs, thinks the idea of working in a business setting might be enjoyable if he is getting to do problem solving, etc.)”*

*“While all of these careers have aspects which could appeal to an individual who can be described as ‘curious,’ I feel the occupations I would likely discuss with the student would be occupations which fall into her theme codes. I wouldn’t say that I ‘recommend’ careers to clients, I help them learn about their theme code and research careers within these areas. Then we start looking at how their values, interests, personality and skills all fit together and could affect their career choice.”*

*“First- and I think this is very important - I would not ‘recommend’ any of ‘the following professions.’ Based on our conversation/the information, I might suggest that some occupations make more sense to look into than others. ‘Recommending’ is too strong a word, IMO. The ones I marked as likely match her Strong type best.”*

*“I would not recommend any specific careers to Alex. Instead I would have Alex use his code to explore in the Occupational Outlook Handbook and O\*Net online and have Alex choose which career seem like a good fit.”*

*Special Considerations to Gender.* Due to the nature of the original research question there were 3 responses that stood out among all the responses given. These three responses were found among the participants given the female profile. They were also the only explanations that stated their reasoning was influenced by the student’s female gender or other socioeconomic



considerations. The three responses are given in full below and the possible implications will be discussed in the “Discussion” section:

*“1) The relative salience of her Holland Codes: 1) Opportunity for investigative pursuit C) Highly scientific careers include some semblance of routine/structure as it relates to scientific method, experimental methodologies, and the controlled sequence required to conduct research in engineering/physics. Moreover, computer science requires similar levels of structure/order to achieve computer related problems and technologies R) Opportunity to use materials or machinery to achieve answers to questions/problems 2) Her interests/abilities. She enjoys math and science, which all of these entail. Moreover, all of these require high GPA and she boasts a 3.75 3) Her social class/background. How likely is it that she would have the necessary support to pursue difficult coursework toward these degrees? How likely is she to come from a community in which these occupational roles are represented by people like her that she might seek out as role models/mentors? What is the likelihood that she can garner enough financial support/aid based on her background to complete her degree and potentially pursue a graduate degree if necessary.”*

*“As a “curious” person, Alice would benefit from researching career options that involve investigating things through the sciences. With her top three scores, she appears to be a problem-solver that may also need some gentle guidance in the direction of those fields. One incentive for the science/medical/engineering fields is that she may be able to receive scholarships based on her gender and the need for more women in those industries. The teaching fields, both in grade schools and colleges, may also be enticing; they'd offer both the structure of the school/university she'd work for while also giving her the opportunity for continued study.”*

*“While these professions are predominantly held by males, her three themes would suggest that these could be good fits based on the curiosity she would bring as well as the technical skill and structure that exists. I would make her aware of the male dominance of these professions, just for full disclosure.”*

**Bottom 3 Career Choice Reasoning.** Next, the analysis for the participant’s decision-making process for the selection of their bottom 3 career choices revealed the same four primary themes: Student Profile Components, Strong Interest Inventory Results, Assumed Student Traits & Activities, and Further Exploration Required (Table 3.3).



Table 3.3 – Themes for Reasoning of Bottom 3 Career Choices Selected

Themes	Female Profile	Male Profile	Combined
Student Profile Components	34	25	59
Strong Interest Inventory Results	37	31	68
<i>Utilized Both Profile and SII</i>	13	10	23
Assumed Student Traits & Activities	24	28	52
Further Exploration Required	6	1	7

*Student Profile Components.* The results indicated that this theme was not as prevalent among participants' reasoning of their bottom 3 career choices as was seen among the reasoning for the top 3 career choices. The student's profile was referenced in 45.7% (n=59) of the participants' responses about their decision process for the bottom 3 careers. The primary keyword of "unstructured" was seen in a majority of the participant responses (female profile, n=28; male profile, n=17). The following are a few sample responses where this theme was present (full response list, Appendix B):

*"Bottom three either needed to much enterprising or artistic. He likes problem solving and being curious which doesn't lend itself to conventional roles either."*

*"Alice appears to lack interest in occupations without structure (artist) and based in the enterprising field (buyer, advertising account manager)."*

*"Since he seems to like structure I do not think Alex would do well in a career that is artistic or not very black and white."*

*Strong Interest Inventory Results.* This theme, again, embodied the mention of at least one SII code. The results were seen at a relatively similar rate (52.7%, n=68) from what was seen among the responses for the top three career choices. The biggest difference was seen at the rate



which participants used both the “Student Profile Components” in conjunction the “SII Results”, with only 33.8% (n=23) of participants utilizing both for their bottom career choice reasoning.

The following represent some examples of participant responses where this theme was coded:

*“Based on Alice's lowest three RIASEC theme codes, Artist, Speech Pathologist, and Social Worker are congruent with SAE. These careers require a level of creativity and flexibility which are not values Alice cited as important to her.”*

*“Advertising account manager appears to be highly loaded in artistic and enterprising types, which she did not endorse. Social worker/speech pathologist seem to be highly loaded on the social type, which she did not endorse as highly. Artist appears highly loaded on Social, low on conventional, which is incongruent with her profile.”*

*“Given her low interest in enterprising, I don't think she'd enjoy being an optometrist, many of whom operate their own shops. I said very unlikely for advertising account manager because of the low interest in both Enterprising and Artistic. My instincts are similar for buyer.”*

*“Careers that involve helping people would not be a good match, given her low interest in the Social Theme.”*

*Assumed Student Traits & Activities.* This theme, again, captured the mention of traits and activities assumed about the student. In this case, the participants primarily discussed traits and activities that it was assumed the student *did not* have. The keyword/phrases “low social interaction” (female profile, n=14; male profile, n=16) and “creativity” (female profile, n=11; male profile, n=10) appeared at a higher rate among these responses. Here are few samples of responses that represented this theme with the assumptions highlighted by the investigator in bold:

*“The emphasis on **creativity, being social** and minimal structure associated with the careers.”*

*“The bottom three included **too much working with people/** service work and unstructured **creative or artistic** components.”*

*“The bottom three careers reflect more of a **flexible sense of personality or creative lens**, and provide less structure, which is what Alice mentioned she would prefer. They are more unpredictable.”*



*“Bottom careers meaning ones **she would not like=Lots of social/people interaction** especially requiring **empathy** all day and always having to create the vision or the big picture.”*

*Further Exploration Required.* This theme followed the same reasoning as mentioned in the top 3 careers section. Participants (5.4%, n=7) were coded with this theme when their responses voiced not wanting to recommend or not recommend any careers to the student and desiring to explore the career options further with the student. Of note, six of these responses were seen among female profiles and only one was in a male profile. The following are a couple examples where this theme was found in a response:

*“The bottom three careers I recommended do not seem to fit her interest areas. However, I would encourage her to more fully explore career paths in these areas as part of exploration.”*

*“These are either highly people oriented (I would want to look at her MBTI to help), or vastly unstructured.”*

## **Discussion**

The original purpose of this study involved examining the process of a career counselor's work with a student to assess whether or not he or she was contributing to the “leaky pipeline.” The continuous decline of females pursuing STEM interests, majors, and careers may start in early childhood with the establishment of gender stereotypes and gender appropriate behavior (Freeman, 2007), but it will also go on into adolescence and adulthood (Blickenstaff, 2005). Working to understand the career counselor process can assist in establishing if this profession is a support or detriment to females interested in STEM careers. There are also implications as to the training of career counselors and their utilization of career assessment results with students.

While past studies have indicated that there are multiple settings in academia (Milkman et al., 2015; Moss-Racusin et al., 2012; Steinpreis et al., 1999), and within the hiring process for STEM fields (Reuben et al., 2014) where gender bias has been present, results of the current



study suggest this does not hold true when examining the career counselor process. The current study found no significant differences between a male and female profile in the recommendation of STEM related and non-related careers or in the recommendation of graduate school. These results directly contradict the findings of gender bias that were originally found by Donahue and Costar (1977) in a sample of high school counselors.

At initial face value these results may be seen in a positive light for the work career counselors are doing with students and the importance of the Strong Interest Inventory (SII). As previously discussed, the SII was established from Holland's vocational theory and has a long history of accurately predicting the occupational field and academic major of individuals (Porter & Umbach, 2006). The SII has also been found to be one of the most widely used assessments by counselors (Peterson, Lomas, Neukrug, & Bonner, 2014). The career counselors in the current study were given a student's SII code and a brief student profile. The student profile described a well-rounded high-achieving individual with a slight leaning towards interests and activities that were representative of their SII code. Based off this information, it would seem as if the non-significant results in the quantitative analysis of the primary hypotheses support the use of objective and reliable measures (i.e., Strong Interest Inventory) when conducting a career counseling appointment with a female student interested in STEM careers.

While this interpretation holds true to some extent, one needs to then turn their attention to the qualitative theme results in order to fully understand that thought process of the participants in this study. The explicit mentioning of the SII results was identified as a primary theme, but when looking at the reasoning for the top 3 career fields chosen, over 84% of the time participants also mentioned specific traits that were discussed in the student's profile. This represents a model of career counseling that involves a counselor taking in information that they



learn about a student's interests and skills, and then using the assessment results to help support the careers or majors discussed (Bikos, Dykhous, Boutin, Gowen, and Rodney, 2013; Brown and Kane, 2013). Most of the participants were accurately using the assessment as a source of additional information and not as the primary source. A good example of type of integration can be seen in the following response:

*“Her **themecode of ICR** and her **professed interest in structure and problem-solving** indicate that she'd like analytic jobs - the realistic indicating hands on types of jobs including engineering might be enjoyable. Network administrator and computer scientist both involve structure and analysis, problem solving and math skills.”*

In the reasoning for the bottom 3 career fields these two themes did not unfold in the same way. Participants tended to rely more heavily on the SII results by either stating that the bottom careers were the opposite of the primary SII code or related more to the bottom 3 themes mentioned. Since the student profile did not necessarily address explicit interests and activities that the student *did not* enjoy, there was also an increase in the “Assumed Student Traits and Activities”. For instance, a participant stated they chose the bottom 3 careers due to “the emphasis on *creativity*,” which was considered an assumed trait since there was no mention of the student liking or disliking activities with this feature.

The support of this typical career counseling model can also be seen within the “Further Exploration Needed”. In the reasoning for the top and bottom careers, participants who were coded under this theme were still seen to acknowledge the student's profile and the careers found under the SII code. As is seen in the following response:

*“I would not ‘recommend’ any occupation is solely based on my knowledge of this client's top three Holland seen theme codes. Depending on my discussions with her, her scores on basic interest and occupational scales, and the results of any other assessment tools used, I might suggest investigation of certain occupations on the list that overlap with her interests.”*



This theme demonstrates a possible need to restructure the wording format of future studies in order to better encapsulate the career counselor process with a student.

Overall, it would appear as if the use of the SII code along with the student profile code acted as a protective factor and possibly prevented the implicit gender bias that is rampant in other areas of academia and workplace for women. This lack of gender bias in career counselors is only one piece of the puzzle in working with women interested in STEM. As Byars-Winston (2014) stated, there is a need for a level of multicultural competence in understanding the gender disparity present in STEM-fields and in the bias, both implicit and explicit, that a female might encounter in the pursuit of a STEM-field career. The qualitative results showed that only three out of the 67 participants who received the female profile indicated that gender or other sociocultural factors would play a role in their decision-making process and discussion with the student about careers. There is a need for our career counselors to not have gender bias, but we also do not want them to be blind to the disparities that already exist for females in STEM.

As research into the gender disparity in STEM grows, so does the emergence of this concept of individuals being “gender blind” (Blair, Miller, Ong, and Zastavker, 2017). This term resonates with what literature describes when discussing color blindness. Both of these terms are often well-intentioned viewpoints where one does “not see” race or gender but then in turn, also fails to acknowledge the ways at which racial/gender discrimination remain prevalent throughout society (Pollock, 2004). Ignoring the gender of students will only end up perpetuating the gender disparity within the STEM fields. Considering the American Psychological Association’s ethical guideline (2010) on gaining the professional knowledge to be able to competently understand the impact factors such as age, race, gender, gender identity, culture, religion, and other multicultural components, this should apply to the work of career counselors. This directly applies to



previously mentioned framework for a multicultural STEM-focused career intervention that was developed by Byars-Winston (2014). The results from this study demonstrate a disconnect between a research-based developed approach and the practice occurring in the field. If career counselors desire to be a protective factor against bias and a support to help decrease the gender disparity within STEM, additional steps will need to be taken. They will need to explicitly discuss with their female students interested in STEM about some of the challenges she might encounter and possibly help connect her with sources of support and mentorship in order to help her succeed.

**Limitations and Future Directions.** Generally, the results showed that participants accurately integrated the student profile traits with the SII code given. There were a few cases though where it appeared participants misinterpreted the information given to them. This problem centered around a participant's analysis of the "Social" theme and traits associated. As discussed in the "Measures" section under the formation of the student profile, a profile was developed to describe a well-rounded student. This included involvement in extracurricular activities that may not line up with SII codes given (i.e., varsity soccer and volunteer work). There were a few cases in which the participant interpreted this to mean that the student would prefer a career that was more "social" in nature or possibly even restructured what they believed the student's SII code was. A few examples of these responses are as follows:

*"It appears she may be interested in Investigative, Realistic and Social career fields due to her problem solving of math, sciences and chess interests which could indicate Investigative careers, varsity soccer and structure preference could indicate Realistic career preferences which would include the top 3 careers recommended."*

*"His Holland code seems to be Investigative, Social, and Realistic. I would guide toward science and/or problem solving jobs that still have a people interaction, but nothing too overwhelming."*



*“It appears to me Alice is both Investigative and social. She wants some interaction with people and notes she likes some structure. A network administrator has to use many of the communication skills that she has honed through her volunteer activities and leadership as a varsity soccer player. As an optometrist she can use her math science and people skills again. Although she probably does not score high on enterprising (being most dissimilar from investigative) she can choose to work in a setting as an employee and not as a business owner. As a science teacher or college instructor, again she can use her math and science skills, her social and communication skills, teach her students to be curious scientists and give them structure to work within while self-structuring herself. The college level may be a better level of teaching for her. As an engineer she would be analyzing and developing solutions to problems. This sounds like a good opportunity for her as well.”*

This particular misinterpretation was seen equally between male and female profiles. These few responses could be a result of the structure of how the profile and codes were provided to the participants or a signal of poor training for these particular participants. Future research should keep this error in mind when considering the format and development of the information provided for interpretation.

In addition, the current study could have benefited from utilizing the additional measures from the Counseling Women Competencies Scale (CWCS; Ancis, Szymanski, & Ladany, 2008), and Academic Stereotype Threat Inventory (ASTI; Pseekos, Dahlen, & Levy, 2008) as proposed in the original format of the study. As previously stated in the “Pilot Study” section, these measures were removed in order to shorten the length of time it took to complete this study to assist with increasing the potential completion rate (Galesic & Bosnjak, 2009). These measures could have provided an additional component of support into understanding the reasoning behind the participants’ responses.

Another area of concern involves the utilization of the Holland code of Computer Scientist (Investigative, Conventional, and Realistic) to represent all STEM-field careers. This career was chosen since it is a STEM career with one of the largest gender disparities (National



Science Foundation, 2012), but the generalization does not necessarily fit for all STEM-field careers. Future studies could improve this by examining the gender bias in other STEM-field careers by creating profiles for multiple STEM careers.

While this study was considered an analog approach, there are various formats to this type of study. A paper-and-pencil format was used by Pazy (1992) to look at bias in job applications, while Kemp and Mallinckrodt (1996) utilized a video simulation of a counseling session. Considering the career counseling usually occurs in a face-to-face session, future studies could benefit from creating a study involving a confederate client. This in-person interaction could pull at different biases and also allow for investigation for a more intersectional identity report (i.e., race and gender).

Another limitation of the current study involves the analysis capability with the population sample. Due to the number of participants, there was a low power to detect a multivariate difference. Also, the gender breakdown (78.3% female), while consistent with what is seen in the field, was disproportionate and thus reduced the power to detect a difference. The population was also special in their counseling affiliation, and there is a likelihood that they work more than most populations to avoid gender bias. A larger pool of participants could have helped look at some of these differences more in depth.

**Conclusion.** The results of this study suggests some positive and negatives in the work of career counselors. On one hand, there were no differences found in the recommendation rate of STEM careers for a female student in comparison to an identical male counterpart. In comparison to the substantial amount of research showing others demonstrating gender bias in multiple settings in academia (Milkman et al., 2015; Moss-Racusin et al., 2012; Steinpreis et al., 1999), and within the hiring process for STEM fields (Reuben et al., 2014), it would appear that



career counselors do not fall victim to this folly. This sheds a light of positivity for the work counselors do with students in a world where most other industries are showing gender bias. Further replication of this study could help support and show how gender bias has grown and changed in our society in the decades since Donahue & Costar's (1977) research.

Further analysis revealed a majority of the career counselors were at fault for another contributing factor of the STEM gender disparity, gender blindness. These counselors may have rated females and males similarly, but, with those who received the female profile, there was a failure to acknowledge some of the hardships and necessary supports for a female desiring to pursue a STEM career. The necessity of applying this multicultural framework in order to demonstrate competence has been explicitly stated by research into the gender disparity in STEM (American Psychological Association, 2010; and Byars-Winston, 2014). The current study brings to light the disconnect in this competency component. In order to assist in stopping the "leaky pipeline," future career counselors need to utilize multicultural training and acknowledge their student's various identities.



## References



- Ancis, J. R., Szymanski, D. M., & Ladany, N. (2008). Development and psychometric evaluation of the counseling women competencies scale (CWCS). *The Counseling Psychologist*, 36, 719-744. doi:10.1177/0011000008316325
- American Psychological Association (2010). 2010 amendments to the 2002 "Ethical principles of psychologists and codes of conduct". *The American Psychologist*, 65, 493. doi: 10.1037/a0020168
- Bikos, L. H., Dykhouse, E. C., Boutin, S. K., Gowen, M. J. and Rodney, H. E. (2013). Practice and Research in Career Counseling and Development—2012. *The Career Development Quarterly*, 61, 290–329. doi:10.1002/j.2161-0045.2013.00058.x
- Blair, E. E., Miller, R. B., Ong, M. and Zastavker, Y. V. (2017), Undergraduate STEM Instructors' Teacher Identities and Discourses on Student Gender Expression and Equity. *Journal of Engineering Education*, 106, 14–43. doi:10.1002/jee.20157
- Blickenstaff, J. C. (2005). Women and science careers: leaky pipeline or gender filter? *Gender and Education*, 17, 369–386. doi:10.1080/09540250500145072
- Braun, V. & Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3: 77-101. doi:10.1191/1478088706qp063oa
- Brown, S. D., & Krane, N. E. R. (2000). Four (or five) sessions and a cloud of dust: Old assumptions and new observations about career counseling. In S. D. Brown & R. W. Lent (Eds.), *Handbook of Counseling Psychology* (3rd ed., pp. 740–766). New York, New York City: Wiley.
- Burger, C. J., & Sandy, M. L. (2002). *A guide to gender fair counseling for science, technology, engineering, and mathematics*. Hampton, Virginia: Virginia Space Grant Consortium.



- Burns, S. T. (2014). Gender differences in the validity of career interest inventories. *Psychology*, 5, 785–797. doi:10.4236/psych.2014.58089
- Byars-Winston, A. (2014). Toward a framework for multicultural STEM-focused career interventions. *Career Development Quarterly*, 62, 340–357. doi:10.1002/j.2161-0045.2014.00087.x
- Cochran, A., Hauschild, T., Elder, W. B., Neumayer, L. A., Brasel, K. J., & Crandall, M. L. (2013). Perceived gender-based barriers to careers in academic surgery. *American Journal of Surgery*, 206, 263–268. doi:10.1016/j.amjsurg.2012.07.044
- Donahue, T. J., & Costar, J. W. (1977). Counselor discrimination against young women in career selection. *Journal of Counseling Psychology*, 24, 481–486. doi:10.1037//0022-0167.24.6.481
- Donnay, D. A. C., Morris, M. L., Schaubhut, N. A., & Thompson, R. C. (2004). *Strong Interest Inventory manual: Research, development, and strategies for interpretation*. Mountain View, CA: Consulting Psychology Press.
- Farmer, H. S. (1995). *Gender Differences in Adolescent Career Exploration*. Clearinghouse on Counseling and Student Services.
- Ferguson, C. J., & Negy, C. (2004). The influence of gender and ethnicity on judgments of culpability in a domestic violence scenario. *Violence and Victims*, 19, 203–220. doi:10.1891/vivi.19.2.203.64103
- Ferriman, K., Lubinski, D., & Benbow, C. P. (2009). Work preferences, life values, and personal views of top math/science graduate students and the profoundly gifted: Developmental changes and gender differences during emerging adulthood and parenthood. *Journal of*



- Personality and Social Psychology*, 97, 517–32. doi:10.1037/a0016030
- Flores, L. Y., & Heppner, M. J. (2002). Multicultural career counseling: Ten essentials for training. *Journal of Career Development*, 28, 181–202. doi:10.1023/A:1014018321808
- Freeman, N. K. (2007). Preschoolers' perceptions of gender appropriate toys and their parents' beliefs about genderized behaviors: Miscommunication, mixed messages, or hidden truths? *Early Childhood Education Journal*, 34, 357–366. doi:10.1007/s10643-006-0123-x
- Galesic, M., & Bosnjak, M. (2009). Effects of questionnaire length on participation and indicators of response quality in a web survey. *Public Opinion Quarterly*, 73, 349–360. doi:10.1093/poq/nfp031
- Gordon, V.N. (2007). *The undecided college student: An academic and career advising challenge* (3<sup>rd</sup> ed.). Springfield, IL: Charles C. Thomas.
- Holland, J. (1996) Exploring careers with a typology: What we have learned and some new directions. *American Psychologist*, 51, 397-406. doi: 10.1037/0003-066X.51.4.397
- Kahn, S. E., & Schroeder, A. S. (1980). Counsellor bias in occupational choice for female students. *Canadian Counsellor*, 14, 156–159.
- Kemp, N. T., & Mallinckrodt, B. (1996). Impact of professional training on case conceptualization of clients with a disability. *Professional Psychology: Research and Practice*, 27, 378–385. doi:10.1037/0735-7028.27.4.378
- Lawson, K. M., Crouter, A. C., & McHale, S. M. (2015). Links between family gender socialization experiences in childhood and gendered occupational attainment in young



- adulthood. *Journal of Vocational Behavior*, 90, 26–35. doi:10.1016/j.jvb.2015.07.003
- Leaper, C., Farkas, T., & Brown, C. S. (2012). Adolescent girls' experiences and gender-related beliefs in relation to their motivation in math/science and english. *Journal of Youth and Adolescence*, 41, 268–282. doi:10.1007/s10964-011-9693-z
- Milkman, K. L., Akinola, M., & Chugh, D. (2015). What happens before? A field experiment exploring how pay and representation differentially shape bias on the pathway into organizations. *Journal of Applied Psychology*, 100, 1–74. doi:10.2139/ssrn.2063742
- Moss-Racusin, C., Dovidio, J. F., Brescoll, V. L., Graham, M. J., & Handelsman, J. (2012). Science faculty's subtle gender biases favor male students. *Proceedings of the National Academy of Sciences*, 109, 16474–16479. doi:10.1073/pnas.1211286
- National Science Foundation. (2012). Science and engineering labor. In *Science & Engineering Indicators 2012* (pp. 1–66). Arlington, VA: National Science Board. Retrieved from <http://www.nsf.gov/statistics/seind12/c3/c3h.htm>
- Pazy, A. (1992). Sex-linked bias in promotion decisions: The role of candidate's career relevance and respondent's prior experience. *Psychology of Women Quarterly*, 16, 209–228. doi: 10.1111/j.1471-6402.1992.tb00251.x
- Peterson, C. H., Lomas, G. I., Neukrug, E. S., & Bonner, M. W. (2014). Assessment use by counselors in the United States: Implications for policy and practice. *Journal of Counseling & Development*, 92(1), 90-98. doi: 10.1002/j.1556-6676.2014.00134.x
- Pollock, M. (2004). *Colormute: Race talk dilemmas in an American school*. Princeton, NJ: Princeton University Press.
- Porter, S. R., & Umbach, P. D. (2006). College major choice: An analysis of Person–Environment Fit. *Research in Higher Education*, 47, 429–449. doi:10.1007/s11162-005-



9002-3

- Pseekos, A., Dahlen, E., & Levy, J. (2008). Development of the academic stereotype threat inventory. *Measurement and Evaluation in Counseling and Development*, 41, 2–12.
- Retreived from  
[http://go.galegroup.com.proxy.lib.utk.edu:90/ps/retrieve.do?sort=RELEVANCE&docType=Report&tabID=T002&prodId=AONE&searchId=R1&resultListType=RESULT\\_LIST&searchType=AdvancedSearchForm&contentSegment=&currentPosition=1&searchResultsType=SingleTab&inPS=true&userGroupName=tel\\_a\\_utl&docId=GALE%7CA177637059&contentSet=GALE%7CA177637059](http://go.galegroup.com.proxy.lib.utk.edu:90/ps/retrieve.do?sort=RELEVANCE&docType=Report&tabID=T002&prodId=AONE&searchId=R1&resultListType=RESULT_LIST&searchType=AdvancedSearchForm&contentSegment=&currentPosition=1&searchResultsType=SingleTab&inPS=true&userGroupName=tel_a_utl&docId=GALE%7CA177637059&contentSet=GALE%7CA177637059)
- Régner, I., Steele, J. R., Ambady, N., Thinus-Blanc, C., & Huguet, P. (2014). Our future scientists: A review of stereotype threat in girls from early elementary school to middle school. *Revue Internationale de Psychologie Sociale*, 27, 13–51. Retrieved from  
[http://www.yorku.ca/steeleje/research/PDF/Regner\\_et\\_al\\_IRSP\\_2014a.pdf](http://www.yorku.ca/steeleje/research/PDF/Regner_et_al_IRSP_2014a.pdf)
- Reuben, E., Sapienza, P., & Zingales, L. (2014). How stereotypes impair women's careers in science. *Proceedings of the National Academy of Sciences*, 111, 4403–4408.  
 doi:10.1073/pnas.1314788111
- Steinpreis, R. E., Anders, K. A., & Ritzke, D. (1999). The impact of gender on the review of the curricula vitae of job applicants and tenure candidates: A national empirical study. *Sex Roles*, 41, 509–528. doi:10.1023/A:1018839203698
- Su, R., Rounds, J., & Armstrong, P. I. (2009). Men and things, women and people: a meta-analysis of sex differences in interests. *Psychological Bulletin*, 135, 859–84.  
 doi:10.1037/a0017364
- Swanson, J. L., Daniels, K. K., & Tokar, D. M. (1996). Assessing perceptions of career-related



- barriers: The Career Barriers Inventory. *Journal of Career Assessment*, 4, 219–244.  
doi:10.1177/106907279600400207
- Swanson, J. L., & Woitke, M. B. (1997). Theory into practice in career assessment for women: Assessment and interventions regarding perceived career barriers. *Journal of Career Assessment*, 5, 443–462. doi:10.1177/106907279700500405
- Van Loo, K. J., & Rydell, R. J. (2014). Negative exposure: Watching another woman subjected to dominant male behavior during a math interaction can induce stereotype threat. *Social Psychological and Personality Science*, 5, 601–607. doi:10.1177/1948550613511501
- Vanderbrook, C. M. (2006). Intellectually gifted females and their perspectives of lived experience in the AP and IB programs. *The Journal of Secondary Gifted Education*, 17, 5–20. Retrieved from <http://files.eric.ed.gov/fulltext/EJ746051.pdf>
- von Hippel, C., Sekaquaptewa, D., & McFarlane, M. (2015). Stereotype threat among women in finance: Negative effects on identity, workplace well-being, and recruiting. *Psychology of Women Quarterly*, 39, 405–414. doi:10.1177/0361684315574501
- Wang, M.-T., & Degol, J. (2013) Motivational pathways to STEM career choices: Using expectancy–value perspective to understand individual and gender differences in STEM fields. *Developmental Review*, 33, 304–340. doi: 10.1016/j.dr.2013.08.001
- Wang, M.-T., Eccles, J. S., & Kenny, S. (2013). Not lack of ability but more choice: individual and gender differences in choice of careers in science, technology, engineering, and mathematics. *Psychological Science*, 24, 770–5. doi:10.1177/0956797612458937
- Watts, L. L., Frame, M. C., Moffett, R. G., Van Hein, J. L., & Hein, M. (2015). The relationship between gender, perceived career barriers, and occupational aspirations. *Journal of Applied Social Psychology*, 45, 10–22. doi:10.1111/jasp.12271



- Weisgram, E. S., & Bigler, R. S. (2006). Girls and science careers: The role of altruistic values and attitudes about scientific tasks. *Journal of Applied Developmental Psychology*, 27, 326–348. doi:10.1016/j.appdev.2006.04.004
- Whiston, S. C., & Bouwkamp, J. C. (2003). Ethical implications of career assessment with women. *Journal of Career Assessment*, 11, 59–75. doi:10.1177/106907202237460



## Appendices



## Appendix A

### **Profile #17:**

Name: Alice  
Age: 18 years old  
Gender: Female  
Ethnicity: White

Top 3 theme codes: Investigative, Conventional, and Realistic  
Lowest 3 theme codes: Social, Artistic, and Enterprising

Alice is an above average student with a high school GPA of 3.75. Currently, Alice is undecided about what major and career path she should pursue at college and has come to career services at the request of her academic advisor for an analysis of her Strong Interest Inventory results. Alice comes from a middle class family in an average sized town just outside of the city. When it comes to school, Alice says that she enjoyed classes that allowed her to figure out problems to situations, especially those within the math and sciences. In her free time, Alice is an avid reader and occasionally plays chess. She was involved in a number of volunteer and extracurricular activities as well, from helping out at the local retirement community to playing varsity soccer. One aspect of a future career that is important to Alice is that the career involves some level of structure. Alice states that her friends and family would describe her as a “curious” person.

Note: Male profile replaces “Alice” with “Alex”, “female” with “male”, and the female pronouns (i.e., she and her) with male pronouns (i.e., he and him).



## Appendix B

*Table 3.1 – Description of Means and Confidence Interval for the Male and Female Profiles of the Dependent Variables (n=129; female, n=67; male, n=62)*

Dependent Variables	Profile Gender	Means	99.9% Confidence Interval	
			Lower Bound	Upper Bound
Computer Scientist	Female	4.358	4.172	4.544
	Male	4.194	4.000	4.387
Network Administrator	Female	3.571	3.312	3.830
	Male	3.823	3.553	4.092
Engineer	Female	4.362	4.179	4.545
	Male	4.484	4.294	4.674
Science Teacher	Female	3.224	2.964	3.484
	Male	3.294	3.023	3.564
Optometrist	Female	3.645	3.417	3.873
	Male	3.532	3.295	3.769
Physicist	Female	4.313	4.116	4.511
	Male	4.113	3.908	4.318
Average STEM	Female	3.912	3.773	4.051
	Male	3.906	3.762	4.051
Buyer	Female	2.107	1.895	2.320
	Male	2.00	1.779	2.221



Table 3.1 Continued

Dependent Variables	Profile Gender	Means	99.9% Confidence Interval	
			Lower Bound	Upper Bound
College Instructor	Female	3.119	2.889	3.349
	Male	3.010	2.771	3.249
Social Worker	Female	1.925	1.682	2.168
	Male	1.810	1.557	2.062
Speech Pathologist	Female	2.701	2.437	2.966
	Male	2.516	2.242	2.791
Artist	Female	1.343	1.202	1.485
	Male	1.281	1.134	1.428
Advertising Account Manager	Female	2.030	1.809	2.251
	Male	2.032	1.803	2.262
Average Non-Stem	Female	2.204	2.070	2.339
	Male	2.108	1.969	2.247
Recommend Graduate School	Female	5.597	5.226	5.968
	Male	5.677	5.291	6.063



### Appendix C

<b>Student Profile Components</b>		
<b>Case Number</b>	<b>Male or Female</b>	<b>Reasoning for Top 3 Career Choices</b>
1	1	structure, math, science, problem-solving
2	0	Science-based, involve problem-solving and some structure.
3	0	The likely careers are more associated with being curious and pragmatic, which are characteristics associated with his high theme codes.
4	1	Alice's curiosity, interest in solving problems, and strength in math and science and desire for structure.
5	1	Based on Alice's top three RIASEC theme codes, Network Administrator, Engineer, and Computer Scientist are congruent with ICR. In addition, I'd consider each of these careers to offer "structure" which is a value Alice listed as important to her in a career.
6	0	stem content, pull for problem solving interest, lack of strong pull for helping, enterprising, artistic interests
7	0	Each of these occupations requires an interest in science and problem solving/curiosity (I), yet have qualities of practicality/hands-on that seem compatible with Alex's general interests at this time (R). They also are most like to provide the need for structure that he currently expresses (C). None of the top three occupations includes his three lowest Holland codes.
8	0	Curiosity, investigative, and structure.
9	1	The I and C profiles are really binding toward the more research structured activities, and her school background would make a good fit into those scientific fields.
10	0	I chose science based fields since he looks for structure and is curious which goes along with his investigative quality. Science and fields such as that are very structured as well as curiosity based and I think he would enjoy it.
11	0	His interest in math and science as well as his conventional, realistic, and investigative strengths.



12	1	She is a problem-solver and likes math and science. She is also a "curious" person which would lend to jobs that allow her to seek problems and find solutions.
13	0	After reviewing Alex's top 3 theme codes, I identified the careers that would be within those theme areas. Based on the information provided, it appears that Alex may enjoy working in a "stem" career that provides some flexibility between working with others and working alone. The 3 careers I marked as "very likely" give him this flexibility but also allow him to challenge his mind by figuring out the solutions to problems.
15	0	structure and numbers seem to be things he does well with...these careers involve those aspects
16	1	The top three careers I recommended were based on her top theme codes of investigative, conventional and realistic. Additionally, the top careers I recommend also fit her request of some sort of structure.
17	1	I could not decide which of these careers would be most fitting to recommend. Although the description states she enjoys problem solving and volunteering, Alice's actual interests in life are not really consider. Considering her Strong Interest Inventory scores, I would imagine she may do well in more technical fields where she can work to solve problems, but potentially in an independent manner since she scored high in areas that are more investigative and problem-solving oriented.
18	1	1. Whether each job would provide structure in the environment. 2. A job that would allow for problem solving, use of logic, and perhaps math and science. 3. While it seems that Alice has worked with people and probably doesn't mind it, she didn't specify that she likes to do so. Therefore, my top choices are careers that do not involve much of "social" aspect.
19	0	I would be unlikely to "recommend" a career to Alex, but I would let him know that these careers may be a match with his enjoyment of problem solving. I would ask more questions about his desired work environment--does he prefer to work alone or with others, as well as ask more questions about particular interests (i.e. does he hate computers, can't stand medical stuff/eyeballs, thinks the idea of working in a business setting might be enjoyable if he is getting to do problem solving, etc.)
21	1	1) The relative salience of her Holland Codes: I) Opportunity for investigative pursuit C) Highly scientific careers include some semblance of routine/structure as it relates to scientific method, experimental methodologies, and the controlled sequence required to



		conduct research in engineering/physics. Moreover, computer science requires similar levels of structure/order to achieve computer related problems and technologies R) Opportunity to use materials or machinery to achieve answers to questions/problems 2) Her interests/abilities. She enjoys math and science, which all of these entail. Moreover, all of these require high GPA and she boasts a 3.75 3) Her social class/background. How likely is it that she would have the necessary support to pursue difficult coursework toward these degrees? How likely is she to come from a community in which these occupational roles are represented by people like her that she might seek out as role models/mentors? What is the likelihood that she can garner enough financial support/aid based on her background to complete her degree and potentially pursue a graduate degree if necessary.
22	0	likes problem solving, strategy, is curious, likes some social interaction
23	1	As a "curious" person, Alice would benefit from researching career options that involve investigating things through the sciences. With her top three scores, she appears to be a problem-solver that may also need some gentle guidance in the direction of those fields. One incentive for the science/medical/engineering fields is that she may be able to receive scholarships based on her gender and the need for more women in those industries. The teaching fields, both in grade schools and colleges, may also be enticing; they'd offer both the structure of the school/university she'd work for while also giving her the opportunity for continued study.
24	0	From reading his description I immediately thought "engineer" so I chose that one as most likely. Being good at math/science, liking problem solving, and being high in investigative code made that career choice stand out. Computer scientist would probably be similar in that it would fit his interests, talents, and Holland code. The others in the Likely column are also in the science/math realm that would include being interactive and problem solving, but with some structure.
25	1	Alice stated she hopes to find structure in her future career and her Holland code of conventional reflects this as well. However, I am not familiar with what some of these jobs would require, which is why I did not rank some of them higher. I would want to do my research regarding some of these careers before suggesting these with more confidence.
27	1	While all of these careers have aspects which could appeal to an individual who can be described as "curious," I feel the occupations I would likely discuss with the student would be occupations which fall into her theme codes. I wouldn't say that I "recommend" careers to



		clients, I help them learn about their theme code and research careers within these areas. Then we start looking at how their values, interests, personality and skills all fit together and could affect their career choice.
28	0	His interest, and his desire to have structure (and stereotypes of engineers).
29	0	Based on my sense of those occupations, they include components of problem-solving, science, attention to details, potential for hands-on work, and the ability to work alone or in small groups; and they do not include wide-open artistic or creative endeavors nor a high degree of working with people or service work.
30	1	Thinking about structure in the position and her desire to "figure out problems to solutions", ability to be curious
31	0	His curiosity and preference for problem solving, as well as his need for a structured environment
32	0	He seems to like structure and things that make sense and are concrete.
33	0	I picked careers where I imagined they would do a lot of "figuring out problems" in math and sciences that matched Alex's interests.
34	1	The top three careers I would recommend would be an engineer, a physicist, or a computer scientist. I chose these based on her interest in math and science, along with her results from the Strong inventory being realistic, conventional, and investigative. I think these jobs lend well to having a structured environment that she desires while still filling the need for her curiosity.
35	1	Alice's top 3 theme codes include being realistic, investigative, and conventional. The top 3 careers recommended generally provide more structure while continuing to based on science or something one might perceive as realistic. Alice also mentioned she enjoys being in a position where she can figure out problems to situations.
37	1	The top three careers I would recommend all involve problem solving. They are also fields where one could have structured job.
38	1	Her interests, how her family would describe her and the fact that she wants something structured
39	1	In the article it says that she has a very high GPA who loves math and science. she reads a lot and studies hard in mind strategy games.



40	0	Alex is described as having interests in Math and Science so I figured he may lean towards the investigative side; Though Alex talked about helping others, it is also mentioned that he would prefer structure in his jobs.
41	0	The top three careers I recommended involved working with science in a investigative type setting as well as potentially working and helping others, such as an optometrist or science teacher may do. All the careers I picked as likely or very likely are typically structured and encourage curiosity, two things that was stated that fit Alex.
42	1	Enjoys math and sciences; Likes some level of structure; A "curious" person.
45	0	I currently work with STEM students and see similar traits
46	1	Her theme code of ICR and her professed interest in structure and problem-solving indicate that she'd like analytic jobs - the realistic indicating hands on types of jobs including engineering might be enjoyable. Network administrator and computer scientist both involve structure and analysis, problem solving and math skills.
47	1	She likes to read, she likes structure, and she is curious..she needs a major that allows her to use her curiosity to solve problems. With that kind of job burn out won't happen right away
48	0	Based on Alex's interest codes of ICR HIs desire to have a career with structure His interest and success in Math or Science
49	1	The top three all involve working with information and solving problems.
50	0	They align with his interests in math and science, provide the structure he likes and match the primary qualities of his ICR type.
51	1	Closely aligned with 2 of her highest interest areas; utilize math and/or science; more working with things than people; structured but challenging.
52	1	It appears she may be interested in Investigative, Realistic and Social career fields due to her problem solving of math, sciences and chess interests which could indicate Investigative careers, varsity soccer and structure preference could indicate Realistic career preferences which would include the top 3 careers recommended



53	0	He likes Math and Science, computer scientist and network administrator fit well. Engineer and Physicist also fit because of solving problems.
54	0	Problem solving is involved as well as interaction with people.
55	1	Alice enjoys math and science, as well as figuring out problems. She seems to like tangible concepts such as numbers, as well as wants a structured environment. She also clearly values intellect and using her mind to solve complex problems. Her Holland code demonstrates that she is interested in solving problems, figuring out solutions, utilizing concrete concepts, and working with her hands. It also demonstrates that she is less interested in working with people on interpersonal challenges, aesthetics, and managing/delegating individuals.
56	0	The top 3 careers I recommended would seem to fit with Alex's interests in problem solving, research and analyzing things, and having tasks that involve doing something hands on with tools, machines or equipment.
57	1	Self-report of enjoying math and science classes; combined with congruence on top three Holland codes. Self-report of enjoying figuring out problems and being "curious" when described by family and friends. Self-report of desiring a career which involves some level of structure, yet also has a leisure social component through involvement in volunteering at a retirement community and playing soccer.
58	0	Science, math, problem-solving, structured
59	1	Based on Holland Code results and her interest in solving problems within the math and science fields. Furthermore, she enjoys structure and solving problems.
60	1	Curious puts her into the investigative group which can apply to sciences and engineering. Problem solving fits well with engineering. Math and science skills fit with engineering and science. Also, her desire for some structure fits with a conventional theme and she has a realistic theme in her athletics.
63	1	The top 3 careers I choose fit the students investigative nature. They also fit her interests of math and science, solving problems, and working in a structured environment.
64	1	While these professions are predominantly held by males, her three themes would suggest that these could be good fits based on the curiosity she would bring as well as the technical skill and structure



		that exists. I would make her aware of the male dominance of these professions, just for full disclosure.
67	1	Enjoyment (and assuming achievement based on GPA) in the sciences, her curiosity/wanting to figure things out and references toward more structured jobs.
68	0	The student has an interest in math and science, and enjoys challenging himself (chess). Careers such as engineer and optometrist may appeal to his curious nature and interest in problem-solving, while also being more traditional "conventional" positions. Physicist may appeal to him, but might be too abstract for him. Science teacher may also be of interest, as it would appeal to the I C and R.
69	0	These are career that will require a person to come resolution of problems that need a narrowly focused "correctness" . They also require a context of thinking that is very structure and process oriented.
70	0	These involve some combination of his top three codes - these would also allow him to solve problems and work in an environment that allows for structure.
71	1	This individual would value an Investigative career, which includes scientific and research types of work settings and environments. I focused heavily on the theme codes first and aligned heavily with the description provided. Each of these careers would tailored especially to investigating, research, and solving problems.
72	1	Alice code was ICR. She states that an important element in her future career is structure. In addition, she mentions that she is a curious person. This subjective response matches with her one of her top 3 codes. Finally, Alice mentions that during high school that she enjoyed math and science courses because of the problem-solving element. Engineer, Physicist and Computer Science can have elements of structure as well as collaborate with her three highest scores Holland Code.
73	1	-Top 3 theme codes -Likes structure, to solve problems, and math and science -Lowest theme codes
74	1	The top 3 careers are primarily science, technology, engineering, and mathematics (STEM) roles that typically involve more analytical thinking, quantitative assessments, innovation, and exploration. Based on Alice's profile, she appears to like activities that allow her to analyze using numerical or other quantitative measures, draw conclusions and inferences based on that information, and then further her interest through other exploratory means. Also, given the nature of STEM careers in many organizations and the expectation of working on teams



		and collaborative projects, she would still get the opportunity to be interact and be social with others.
75	0	Based on his theme code, I would think that Alex would be most satisfied in careers that require him to utilize math and science on a fairly regular basis, such as engineering and physics. In addition, I would think that Alex would be happy working with data, computers, and objects as opposed to people. I do not think he would be satisfied in a career that is focused on helping people (such as social work, speech pathology, or teaching). A career in art also doesn't seem like a good fit for Alex since he desires to work in a structured environment.
76	1	The combination of ICR results in career themes wherein a focus in using abstract analysis (ideas over things or people: I) and structured (C) with using tools (R) is a strong match - thus computer networking/scientist and/or research scientist related (e.g.: physicist) .
77	0	Top Three" Engineer, Physicist, Computer Scientist and Network Administrator He likes math, science, and figuring out problems and he likes to read. He also said he liked structure.
79	0	he likes Science, structure, curious, problem solver.
80	1	Three fields that I would most recommend for Alice is the buyer position, physicist and computer science. I think Alice would be very good at problem solving and analyzing the needs of an agency against the proposal submitted by contractors. Being a buyer required good reading, analytical and comprehension skills. Ability to perform cost benefits analysis and with Alice's love reading, problem solving and math, this may be a good fit for her.
81	1	Network Administrator, Engineer and Computer Scientist match her Holland codes, ICR as those jobs require continuous learning and provide opportunities to explorer new things to fulfill Investigative code and her curiosity. Meanwhile all three provide some regular tasks within the jobs and mainly deal with things (CR).
82	0	Curiosity and enjoys math/science
84	1	Strengths, aptitude, logical reasoning skills



85	0	Alex is curious about things and likes problem-solving. With his preference to work in a structured environment, careers such as Engineering, Physicist, and Computer Scientist might appeal to him in terms of interests. These career fields are also tapping on Alex's strengths in his academic studies, and in particular, Math and Sciences.
86	0	Problem solving, solutions, exacting rules and regulations and hands on.
87	1	Alice enjoys classes that allow her to figure out problems especially in math and science which is why I chose physicist, computer scientist, and optometrist. She is also a curious person and those career fields require some level of curiosity to solve problems.
88	0	Alex enjoys math and science, problem solving but also being active. It seems that he doesn't enjoy working with people as much as ideas. I recommended engineering because it allowed Alex to solve real world problems using math and science.
89	1	It appears to me Alice is both Investigative and social. She wants some interaction with people and notes she likes some structure. A network administrator has to use many of the communication skills that she has honed through her volunteer activities and leadership as a varsity soccer player. As an optometrist she can use her math science and people skills again. Although she probably does not score high on enterprising (being most dissimilar from investigative) she can choose to work in a setting as an employee and not as a business owner. As a science teacher or college instructor, again she can use her math and science skills, her social and communication skills, teach her students to be curious scientists and give them structure to work within while self-structuring herself. the college level may be a better level of teaching for her. As an engineer she would be analyzing and developing solutions to problems. This sounds like a good opportunity for her as well.
90	1	She's "curious" and has a high GPA which demonstrates intellectual aptitude and academic potential. Not interested in "helping" professions, likely geared toward professions that require challenge, knowledge content, and more tangible problem solving aspects. Environment will be important; she could potentially teach at the college level, but more geared toward 4-year school versus community college.



91	0	I chose Network Administrator and Computer Scientist in particular due to their Investigative attributes. They require problem solving, using math/science skills, and are often found in settings in which there is structure. Additionally, realistic folks often are drawn to careers using computers (tools) to solve problems. I chose college instructor as well because of the investigative nature of the career and the hierarchical structure often found in higher education institutions (conventional).
92	0	Alex appears to be a problem solver who enjoy math and sciences. He likes being around people and volunteers with a retirement community. He likes structure, people and research. He would very likely enjoy working in the engineering or computer science fields since he likes to troubleshoot and problem solve. He would also enjoy working as a social worker or college instructor. His "curious" nature could suggest that he may enjoy working with people in social service capacity.
93	0	Careers that are focused on the sciences and research (he is naturally "curious"). Careers that have decent job security and are fairly structured in their day to day nature.
94	1	She enjoyed math and many people do not, so she should, theoretically, be attracted to those careers that have strong backgrounds in math.
95	0	By looking at his top 3 and low 3 themes although I did not have his scores. In his description he likes structure and others describe him as curious. The paragraph also stated he likes to figure out problems to situations especially in math and sciences.
96	1	Alice appears to be interested in concrete, logical types of activities. If she likes to figure out problems, then being just about any type of professional that has an "ist" at the end of the name is potentially a good fit.
97	0	The scores skew toward someone who is analytical and hands-on. However, the individual likes to volunteer and help individuals.
99	0	The student enjoys mathematics and science, which part of his investigative theme code. He also likes structure and organization the conventional theme code, which can be found in occupations like that of optometrist, speech pathologist, and network administrator.
100	0	All involved analytical skills and problem solving within a tangible, structured set of tasks and expectations. All have a realistic or conventional component.



103	1	Because she likes to think the cause-effect and prefer a clear instruction and conduct physical work, I think she will do a good job as an engineer, optometrist, or Speech Pathologist.
104	1	Physicist, Computer Scientist and Optometrist because they all provide some kind of structure which is important to Alice. Also her love of problem solving and math and science. She has a high GPA so would most likely be able to keep up with the difficult classes in these majors. She is not afraid of being with people since her volunteer experience dealt with helping others. Being curious and love of reading would do her well in the medical field.
105	0	theme codes, GPA, then his enjoyment of math and science, his preference for structure, his curiosity and lastly his activities (soccer, chess, reading, volunteering)
106	1	I chose physicist, engineer, and computer scientist because they all contain I and R and two of the three contain C. Based on her interest code and bio these seem like good fits for her.
109	1	They are all technical, intellectually challenging, not rote, and might offer some structure in certain settings. The emphasis in all of those is ideas and information and problem solving, not people.
110	1	The top 3 careers would seem to lead to work with objects/things, solving problems, through structured, systematic approaches. Physicist could encompass some of these aspects, but I also imagine writing to be a significant component of the job (b/c of the importance of publishing research for funding). I'm not quite as familiar with the tasks of the network administrator; thus, I marked it as "likely" rather than one of the top three.
111	1	Alice's own interest in math and science and in playing chess and her interest in problem solving and her family describing her as "curious." This is all coupled with the ICR theme
112	0	I believe that the top 3 I chose would keep him curious and allow his investigative side to grow.
115	1	Alice appears to be an introvert. While she volunteers and plays soccer, she enjoys reading and playing chess - activities that involve quiet time alone, or contemplation and problem solving with one other person. I looked for careers that involve problem solving, using math and science, and that have some structure. The careers are not necessarily team-work oriented and tend to rely on individual persistence. These careers would also challenge her which fits with her curious nature.



118	1	Interest in solving problems, math, sciences. Importance of structure in career. Describes as curious.
119	0	His Holland code seems to be Investigative, Social, and Realistic. I would guide toward science and/or problem solving jobs that still have a people interaction, but nothing too overwhelming.
121	0	I based my decision according to his top three theme codes and his interests in problem solving, math, and sciences. I thought he would find careers including all of those aspects appealing.
122	1	Enjoyment with math and science, abstract thinking and problem solving, there is structure to the academic majors associated with my "very likely" picks
124	0	The positions that involved working with others - whether in a helping or instructive role - would probably not be as satisfying to Alex based on his top 3 letter codes. ICR tells me that he likes data, working through problems (that have an answer), and structure. A bit more concrete in the sense that there is a beginning, a middle, and an end.
127	0	They are things that relate to his math and science ability and solving problems.
128	1	Alice seems to have an interest in math and science and is not afraid to take on the work it takes to work in these fields. She also seems to have a preference for learning independently as well as a preference for environments that are more structured.
129	1	Alice's appreciation of structure and possibly process in the C, the research-oriented nature of the high I, the physical properties aspect of the R.

<b>Strong Interest Inventory Results</b>		
<b>Case Number</b>	<b>Male or Female</b>	<b>Reasoning for Top 3 Career Choices</b>
3	0	The likely careers are more associated with being curious and pragmatic, which are characteristics associated with his high theme codes.



5	1	Based on Alice's top three RIASEC theme codes, Network Administrator, Engineer, and Computer Scientist are congruent with ICR. In addition, I'd consider each of these careers to offer "structure" which is a value Alice listed as important to her in a career.
6	0	stem content, pull for problem solving interest, lack of strong pull for helping, enterprising, artistic interests
7	0	Each of these occupations requires an interest in science and problem solving/curiosity (I), yet have qualities of practicality/hands-on that seem compatible with Alex's general interests at this time (R). They also are most like to provide the need for structure that he currently expresses (C). None of the top three occupations includes his three lowest Holland codes.
8	0	Curiosity, investigative, and structure.
9	1	The I and C profiles are really binding toward the more research structured activities, and her school background would make a good fit into those scientific fields.
10	0	I chose science based fields since he looks for structure and is curious which goes along with his investigative quality. Science and fields such as that are very structured as well as curiosity based and I think he would enjoy it.
11	0	His interest in math and science as well as his conventional, realistic, and investigative strengths.
13	0	After reviewing Alex's top 3 theme codes, I identified the careers that would be within those theme areas. Based on the information provided, it appears that Alex may enjoy working in a "stem" career that provides some flexibility between working with others and working alone. The 3 careers I marked as "very likely" give him this flexibility but also allow him to challenge his mind by figuring out the solutions to problems.
16	1	The top three careers I recommended were based on her top theme codes of investigative, conventional and realistic. Additionally, the top careers I recommend also fit her request of some sort of structure.
17	1	I could not decide which of these careers would be most fitting to recommend. Although the description states she enjoys problem solving and volunteering, Alice's actual interests in life are not really consider. Considering her Strong Interest Inventory scores, I would imagine she may do well in more technical fields where she can work to solve problems, but potentially in an independent manner since she



		scored high in areas that are more investigative and problem-solving oriented.
18	1	1. Whether each job would provide structure in the environment. 2. A job that would allow for problem solving, use of logic, and perhaps math and science. 3. While it seems that Alice has worked with people and probably doesn't mind it, she didn't specify that she likes to do so. Therefore, my top choices are careers that do not involve much of "social" aspect.
21	1	1) The relative salience of her Holland Codes: I) Opportunity for investigative pursuit C) Highly scientific careers include some semblance of routine/structure as it relates to scientific method, experimental methodologies, and the controlled sequence required to conduct research in engineering/physics. Moreover, computer science requires similar levels of structure/order to achieve computer related problems and technologies R) Opportunity to use materials or machinery to achieve answers to questions/problems 2) Her interests/abilities. She enjoys math and science, which all of these entail. Moreover, all of these require high GPA and she boasts a 3.75 3) Her social class/background. How likely is it that she would have the necessary support to pursue difficult coursework toward these degrees? How likely is she to come from a community in which these occupational roles are represented by people like her that she might seek out as role models/mentors? What is the likelihood that she can garner enough financial support/aid based on her background to complete her degree and potentially pursue a graduate degree if necessary.
24	0	From reading his description I immediately thought "engineer" so I chose that one as most likely. Being good at math/science, liking problem solving, and being high in investigative code made that career choice stand out. Computer scientist would probably be similar in that it would fit his interests, talents, and Holland code. The others in the Likely column are also in the science/math realm that would include being interactive and problem solving, but with some structure.
25	1	Alice stated she hopes to find structure in her future career and her Holland code of conventional reflects this as well. However, I am not familiar with what some of these jobs would require, which is why I did not rank some of them higher. I would want to do my research regarding some of these careers before suggesting these with more confidence.



26	1	Given Alice's ICR pattern, it seems like nearly all of the professions listed (with the exception of 'artist') may potentially be of interest to her; thus, I selected them all as 'likely.'
29	0	Based on my sense of those occupations, they include components of problem-solving, science, attention to details, potential for hands-on work, and the ability to work alone or in small groups; and they do not include wide-open artistic or creative endeavors nor a high degree of working with people or service work.
34	1	The top three careers I would recommend would be an engineer, a physicist, or a computer scientist. I chose these based on her interest in math and science, along with her results from the Strong inventory being realistic, conventional, and investigative. I think these jobs lend well to having a structured environment that she desires while still filling the need for her curiosity.
35	1	Alice's top 3 theme codes include being realistic, investigative, and conventional. The top 3 careers recommended generally provide more structure while continuing to based on science or something one might perceive as realistic. Alice also mentioned she enjoys being in a position where she can figure out problems to situations.
40	0	Alex is described as having interests in Math and Science so I figured he may lean towards the investigative side; Though Alex talked about helping others, it is also mentioned that he would prefer structure in his jobs.
41	0	The top three careers I recommended involved working with science in a investigative type setting as well as potentially working and helping others, such as an optometrist or science teacher may do. All the careers I picked as likely or very likely are typically structured and encourage curiosity, two things that was stated that fit Alex.
43	1	I would not recommend jobs who's interests align more with social, artistic or enterprising jobs such as, buyer, speech pathologist, or artist. Since Alice is more of an ICR type, I'm more likely to recommend jobs that has other individuals who's interests align with her interests.
46	1	Her themecode of ICR and her professed interest in structure and problem-solving indicate that she'd like analytic jobs - the realistic indicating hands on types of jobs including engineering might be enjoyable. Network administrator and computer scientist both involve structure and analysis, problem solving and math skills.
48	0	Based on Alex's interest codes of ICR HIs desire to have a career with structure His interest and success in Math or Science



50	0	They align with his interests in math and science, provide the structure he likes and match the primary qualities of his ICR type.
51	1	Closely aligned with 2 of her highest interest areas; utilize math and/or science; more working with things than people; structured but challenging.
52	1	It appears she may be interested in Investigative, Realistic and Social career fields due to her problem solving of math, sciences and chess interests which could indicate Investigative careers, varsity soccer and structure preference could indicate Realistic career preferences which would include the top 3 careers recommended
55	1	Alice enjoys math and science, as well as figuring out problems. She seems to like tangible concepts such as numbers, as well as wants a structured environment. She also clearly values intellect and using her mind to solve complex problems. Her Holland code demonstrates that she is interested in solving problems, figuring out solutions, utilizing concrete concepts, and working with her hands. It also demonstrates that she is less interested in working with people on interpersonal challenges, aesthetics, and managing/delegating individuals.
59	1	Based on Holland Code results and her interest in solving problems within the math and science fields. Furthermore, she enjoys structure and solving problems.
60	1	Curious puts her into the investigative group which can apply to sciences and engineering. Problem solving fits well with engineering. Math and science skills fit with engineering and science. Also, her desire for some structure fits with a conventional theme and she has a realistic theme in her athletics.
61	0	They seem to have the Investigative/Conventional/Realistic theme throughout
63	1	The top 3 careers I choose fit the students investigative nature. They also fit her interests of math and science, solving problems, and working in a structured environment.
64	1	While these professions are predominantly held by males, her three themes would suggest that these could be good fits based on the curiosity she would bring as well as the technical skill and structure that exists. I would make her aware of the male dominance of these professions, just for full disclosure.



68	0	The student has an interest in math and science, and enjoys challenging himself (chess). Careers such as engineer and optometrist may appeal to his curious nature and interest in problem-solving, while also being more traditional "conventional" positions. Physicist may appeal to him, but might be too abstract for him. Science teacher may also be of interest, as it would appeal to the I C and R.
70	0	These involve some combination of his top three codes - these would also allow him to solve problems and work in an environment that allows for structure.
71	1	This individual would value an Investigative career, which includes scientific and research types of work settings and environments. I focused heavily on the theme codes first and aligned heavily with the description provided. Each of these careers would tailored especially to investigating, research, and solving problems.
72	1	Alice code was ICR. She states that an important element in her future career is structure. In addition, she mentions that she is a curious person. This subjective response matches with her one of her top 3 codes. Finally, Alice mentions that during high school that she enjoyed math and science courses because of the problem-solving element. Engineer, Physicist and Computer Science can have elements of structure as well as collaborate with her three highest scores Holland Code.
73	1	-Top 3 theme codes -Likes structure, to solve problems, and math and science -Lowest theme codes
75	0	Based on his theme code, I would think that Alex would be most satisfied in careers that require him to utilize math and science on a fairly regular basis, such as engineering and physics. In addition, I would think that Alex would be happy working with data, computers, and objects as opposed to people. I do not think he would be satisfied in a career that is focused on helping people (such as social work, speech pathology, or teaching). A career in art also doesn't seem like a good fit for Alex since he desires to work in a structured environment.
76	1	The combination of ICR results in career themes wherein a focus in using abstract analysis (ideas over things or people: I) and structured (C) with using tools (R) is a strong match - thus computer networking/scientist and/or research scientist related (e.g.: physicist) .
81	1	Network Administrator, Engineer and Computer Scientist match her Holland codes, ICR as those jobs require continuous learning and provide opportunities to explorer new things to fulfill Investigative code



		and her curiosity. Meanwhile all three provide some regular tasks within the jobs and mainly deal with things (CR).
88	0	Alex enjoys math and science, problem solving but also being active. It seems that he doesn't enjoy working with people as much as ideas. I recommended engineering because it allowed Alex to solve real world problems using math and science.
89	1	It appears to me Alice is both Investigative and social. She wants some interaction with people and notes she likes some structure. A network administrator has to use many of the communication skills that she has honed through her volunteer activities and leadership as a varsity soccer player. As an optometrist she can use her math science and people skills again. Although she probably does not score high on enterprising (being most dissimilar from investigative) she can choose to work in a setting as an employee and not as a business owner. As a science teacher or college instructor, again she can use her math and science skills, her social and communication skills, teach her students to be curious scientists and give them structure to work within while self-structuring herself. the college level may be a better level of teaching for her. As an engineer she would be analyzing and developing solutions to problems. This sounds like a good opportunity for her as well.
91	0	I chose Network Administrator and Computer Scientist in particular due to their Investigative attributes. They require problem solving, using math/science skills, and are often found in settings in which there is structure. Additionally, realistic folks often are drawn to careers using computers (tools) to solve problems. I chose college instructor as well because of the investigative nature of the career and the hierarchical structure often found in higher education institutions (conventional).
95	0	By looking at his top 3 and low 3 themes although I did not have his scores. In his description he likes structure and others describe him as curious. The paragraph also stated he likes to figure out problems to situations especially in math and sciences.
98	1	First- and I think this is very important - I would not "recommend" any of "the following professions." Based on our conversation/the information, I might suggest that some occupations make more sense to look into than others. "Recommending" is too strong a word, IMO. The ones i marked as likely match her Strong type best.
99	0	The student enjoys mathematics and science, which part of his investigative theme code. He also likes structure and organization the



		conventional theme code, which can be found in occupations like that of optometrist, speech pathologist, and network administrator.
100	0	All involved analytical skills and problem solving within a tangible, structured set of tasks and expectations. All have a realistic or conventional component.
101	0	Close fit with interest data found on O*NET for these occupations that match the client's interest profile.
105	0	theme codes, GPA, then his enjoyment of math and science, his preference for structure, his curiosity and lastly his activities (soccer, chess, reading, volunteering)
106	1	I chose physicist, engineer, and computer scientist because they all contain I and R and two of the three contain C. Based on her interest code and bio these seem like good fits for her.
107	0	I would introduce him more to the I-C-R careers that seem to fit his interests.
108	0	I almost NEVER tell a student "I recommend....". We would go through the results together looking at how his six interests align with his code ICR... and also what careers came up as most similar with the empirical scoring method. I also always instruct students to do informational interviews and more research on their own. The jobs I selected "likely" above were related to the I interests primarily. I would point this out and ask what Alex already knows about these job titles and how he feels about them
111	1	Alice's own interest in math and science and in playing chess and her interest in problem solving and her family describing her as "curious." This is all coupled with the ICR theme
112	0	I believe that the top 3 I chose would keep him curious and allow his investigative side to grow.
114	0	Holland code ICR
115	1	Alice appears to be an introvert. While she volunteers and plays soccer, she enjoys reading and playing chess - activities that involve quiet time alone, or contemplation and problem solving with one other person. I looked for careers that involve problem solving, using math and science, and that have some structure. The careers are not necessarily team-work oriented and tend to rely on individual persistence. These careers would also challenge her which fits with her curious nature.



116	0	All three top careers involve being Investigative, conventional, and realistic.
117	0	With ICR as his top themes, I would talk with him more about engineering, sciences, or technology careers and see if any of that piques his interest.
119	0	His Holland code seems to be Investigative, Social, and Realistic. I would guide toward science and/or problem solving jobs that still have a people interaction, but nothing too overwhelming.
121	0	I based my decision according to his top three theme codes and his interests in problem solving, math, and sciences. I thought he would find careers including all of those aspects appealing.
124	0	The positions that involved working with others - whether in a helping or instructive role - would probably not be as satisfying to Alex based on his top 3 letter codes. ICR tells me that he likes data, working through problems (that have an answer), and structure. A bit more concrete in the sense that there is a beginning, a middle, and an end.
129	1	Alice's appreciation of structure and possibly process in the C, the research-oriented nature of the high I, the physical properties aspect of the R.

<b>Assumed Student Traits &amp; Activities</b>		
<b>Case Number</b>	<b>Male or Female</b>	<b>Reasoning for Top 3 Career Choices</b>
3	0	The likely careers are more associated with being curious and pragmatic, which are characteristics associated with his high theme codes.
9	1	The I and C profiles are really binding toward the more research structured activities, and her school background would make a good fit into those scientific fields.
13	0	After reviewing Alex's top 3 theme codes, I identified the careers that would be within those theme areas. Based on the information provided, it appears that Alex may enjoy working in a "stem" career that provides some flexibility between working with others and working alone. The 3



		careers I marked as "very likely" give him this flexibility but also allow him to challenge his mind by figuring out the solutions to problems.
14	1	Alice appears to appreciate tasks that involve analytical reasoning and mental challenges.
17	1	I could not decide which of these careers would be most fitting to recommend. Although the description states she enjoys problem solving and volunteering, Alice's actual interests in life are not really consider. Considering her Strong Interest Inventory scores, I would imagine she may do well in more technical fields where she can work to solve problems, but potentially in an independent manner since she scored high in areas that are more investigative and problem-solving oriented.
18	1	1. Whether each job would provide structure in the environment. 2. A job that would allow for problem solving, use of logic, and perhaps math and science. 3. While it seems that Alice has worked with people and probably doesn't mind it, she didn't specify that she likes to do so. Therefore, my top choices are careers that do not involve much of "social" aspect.
21	1	1) The relative salience of her Holland Codes: I) Opportunity for investigative pursuit C) Highly scientific careers include some semblance of routine/structure as it relates to scientific method, experimental methodologies, and the controlled sequence required to conduct research in engineering/physics. Moreover, computer science requires similar levels of structure/order to achieve computer related problems and technologies R) Opportunity to use materials or machinery to achieve answers to questions/problems 2) Her interests/abilities. She enjoys math and science, which all of these entail. Moreover, all of these require high GPA and she boasts a 3.75 3) Her social class/background. How likely is it that she would have the necessary support to pursue difficult coursework toward these degrees? How likely is she to come from a community in which these occupational roles are represented by people like her that she might seek out as role models/mentors? What is the likelihood that she can garner enough financial support/aid based on her background to complete her degree and potentially pursue a graduate degree if necessary.
22	0	likes problem solving, strategy, is curious, likes some social interaction



28	0	His interest, and his desire to have structure (and stereotypes of engineers).
32	0	He seems to like structure and things that make sense and are concrete.
46	1	Her themecode of ICR and her professed interest in structure and problem-solving indicate that she'd like analytic jobs - the realistic indicating hands on types of jobs including engineering might be enjoyable. Network administrator and computer scientist both involve structure and analysis, problem solving and math skills.
56	0	The top 3 careers I recommended would seem to fit with Alex's interests in problem solving, research and analyzing things, and having tasks that involve doing something hands on with tools, machines or equipment.
64	1	While these professions are predominantly held by males, her three themes would suggest that these could be good fits based on the curiosity she would bring as well as the technical skill and structure that exists. I would make her aware of the male dominance of these professions, just for full disclosure.
65	0	Engineer and Physicist work more with ideas than people, as well as areas of Computer Science or Network Administration.
71	1	This individual would value an Investigative career, which includes scientific and research types of work settings and environments. I focused heavily on the theme codes first and aligned heavily with the description provided. Each of these careers would tailored especially to investigating, research, and solving problems.
74	1	The top 3 careers are primarily science, technology, engineering, and mathematics (STEM) roles that typically involve more analytical thinking, quantitative assessments, innovation, and exploration. Based on Alice's profile, she appears to like activities that allow her to analyze using numerical or other quantitative measures, draw conclusions and inferences based on that information, and then further her interest through other exploratory means. Also, given the nature of STEM careers in many organizations and the expectation of working on teams and collaborative projects, she would still get the opportunity to be interact and be social with others.
76	1	The combination of ICR results in career themes wherein a focus in using abstract analysis (ideas over things or people: I) and structured (C) with using tools (R) is a strong match - thus computer networking/scientist and/or research scientist related (e.g.: physicist) .



78	1	I would not "recommend" any occupation is solely based on my knowledge of this client's top three Holland seen theme codes. Depending on my discussions with her, her scores on basic interest and occupational scales, and the results of any other assessment tools used, I might suggest investigation of certain occupations on the list that overlap with her interests.
80	1	Three fields that I would most recommend for Alice is the buyer position, physicist and computer science. I think Alice would be very good at problem solving and analyzing the needs of an agency against the proposal submitted by contractors. Being a buyer required good reading, analytical and comprehension skills. Ability to perform cost benefits analysis and with Alice's love reading, problem solving and math, this may be a good fit for her.
84	1	Strengths, aptitude, logical reasoning skills
86	0	Problem solving, solutions, exacting rules and regulations and hands on.
89	1	It appears to me Alice is both Investigative and social. She wants some interaction with people and notes she likes some structure. A network administrator has to use many of the communication skills that she has honed through her volunteer activities and leadership as a varsity soccer player. As an optometrist she can use her math science and people skills again. Although she probably does not score high on enterprising (being most dissimilar from investigative) she can choose to work in a setting as an employee and not as a business owner. As a science teacher or college instructor, again she can use her math and science skills, her social and communication skills, teach her students to be curious scientists and give them structure to work within while self-structuring herself. the college level may be a better level of teaching for her. As an engineer she would be analyzing and developing solutions to problems. This sounds like a good opportunity for her as well.
92	0	Alex appears to be a problem solver who enjoy math and sciences. He likes being around people and volunteers with a retirement community. He likes structure, people and research. He would very likely enjoy working in the engineering or computer science fields since he likes to troubleshoot and problem solve. He would also enjoy working as a social worker or college instructor. His "curious" nature could suggest that he may enjoy working with people in social service capacity.
93	0	Careers that are focused on the sciences and research (he is naturally "curious"). Careers that have decent job security and are fairly structured in their day to day nature.



96	1	Alice appears to be interested in concrete, logical types of activities. If she likes to figure out problems, then being just about any type of professional that has an "ist" at the end of the name is potentially a good fit.
97	0	The scores skew toward someone who is analytical and hands-on. However, the individual likes to volunteer and help individuals.
100	0	All involved analytical skills and problem solving within a tangible, structured set of tasks and expectations. All have a realistic or conventional component.
102	1	Of course, having MBTI scores along with this would make it so much easier! I suspect she is more of an INTJ which one would lean towards computer systems, research, scientist, and perhaps a college professor
103	1	Because she likes to think the cause-effect and prefer a clear instruction and conduct physical work, I think she will do a good job as an engineer, optometrist, or Speech Pathologist.
109	1	They are all technical, intellectually challenging, not rote, and might offer some structure in certain settings. The emphasis in all of those is ideas and information and problem solving, not people.
110	1	The top 3 careers would seem to lead to work with objects/things, solving problems, through structured, systematic approaches. Physicist could encompass some of these aspects, but I also imagine writing to be a significant component of the job (b/c of the importance of publishing research for funding). I'm not quite as familiar with the tasks of the network administrator; thus, I marked it as "likely" rather than one of the top three.
115	1	Alice appears to be an introvert. While she volunteers and plays soccer, she enjoys reading and playing chess - activities that involve quiet time alone, or contemplation and problem solving with one other person. I looked for careers that involve problem solving, using math and science, and that have some structure. The careers are not necessarily team-work oriented and tend to rely on individual persistence. These careers would also challenge her which fits with her curious nature.
122	1	Enjoyment with math and science, abstract thinking and problem solving, there is structure to the academic majors associated with my "very likely" picks
128	1	Alice seems to have an interest in math and science and is not afraid to take on the work it takes to work in these fields. She also seems to have



		a preference for learning independently as well as a preference for environments that are more structured.
129	1	Alice's appreciation of structure and possibly process in the C, the research-oriented nature of the high I, the physical properties aspect of the R.

Further Exploration Required		
Case Number	Male or Female	Reasoning for Top 3 Career Choices
19	0	I would be unlikely to "recommend" a career to Alex, but I would let him know that these careers may be a match with his enjoyment of problem solving. I would ask more questions about his desired work environment--does he prefer to work alone or with others, as well as ask more questions about particular interests (i.e. does he hate computers, can't stand medical stuff/eyeballs, thinks the idea of working in a business setting might be enjoyable if he is getting to do problem solving, etc.)
27	1	While all of these careers have aspects which could appeal to an individual who can be described as "curious," I feel the occupations I would likely discuss with the student would be occupations which fall into her theme codes. I wouldn't say that I "recommend" careers to clients, I help them learn about their theme code and research careers within these areas. Then we start looking at how their values, interests, personality and skills all fit together and could affect their career choice.
44	0	I would not recommend any specific careers to Alex. Instead I would have Alex use his code to explore in the Occupational Outlook Handbook and O*Net online and have Alex choose which career seem like a good fit.



66	1	Although she enjoyed helping with the seniors, she did not offer other examples of working with people. Rather she offered examples of enjoying working with puzzles, ideas, and things. I don't her skills or her personality so I can't say exactly what she might professionals might be recommended to her.
78	1	I would not "recommend" any occupation is solely based on my knowledge of this client's top three Holland seen theme codes. Depending on my discussions with her, her scores on basic interest and occupational scales, and the results of any other assessment tools used, I might suggest investigation of certain occupations on the list that overlap with her interests.
98	1	First- and I think this is very important - I would not "recommend" any of "the following professions." Based on our conversation/the information, I might suggest that some occupations make more sense to look into than others. "Recommending" is too strong a word, IMO. The ones i marked as likely match her Strong type best.
125	1	I never "recommend" specific majors/occupations. Instead, I ask what questions arise or what they want to know more about, based on their self-understanding after the SII interpretation.

Student Profile Components		
Case Number	Male or Female	Reasoning for Bottom 3 Career Choices
1	1	creativity, lack of structure
4	1	the emphasis on creativity, being social and minimal structure associated with the careers.
10	0	Speech pathologist and buyer I thought weren't aligned since they are very unstructured and standard jobs day to day. I didn't think he would enjoy them.
14	1	Alice appears to lack interest in occupations without structure (artist) and based in the enterprising field (buyer, advertising account manager).
18	1	1. Lack of structure 2. jobs that involve interests that Alice didn't mention and that weren't in her résumé (e.g. enterprising and artistic interests/abilities)



19	0	Based on what he already indicated to me, these careers are more unstructured and don't correspond with the subject matters or approaches he indicated interest in. He also didn't share anything indicating a desire to work in a "helping" type of career that involves work with solving "people problems" (more of an interest in solving "science" and/or "abstract" problems)
22	0	not enough structure, unpredictable if profession is too social (ex: social worker).
25	1	Alice's lowest three codes all fit in with aspects of the lower ranked careers. Also they may not reflect her preference for structure.
28	0	Schedule of jobs, inclusion of math and sciences, and low three theme codes.
29	0	The bottom three included too much working with people/ service work and unstructured creative or artistic components.
30	1	Thinking about lack of structure and not wanting to be in too much of a social environment all the time
31	0	They all require high social interaction and little structure.
32	0	Since he seems to like structure I do not think Alex would do well in a career that is artistic or not very black and white.
33	0	I picked the opposite of what I imagined would entail "figuring out problems" in math and sciences that did not match Alex's interests.
34	1	The bottom 3 careers I recommended were a science teacher, social worker, and artist. I chose these three because they were very opposite of her Strong results. The only thing that met her requirements was that it was specifically a science teacher. I think these jobs may not have the same structure that she desires, and are very people/social interaction heavy.
35	1	The bottom three careers reflect more of a flexible sense of personality or creative lens, and provide less structure, which is what Alice mentioned she would prefer. They are more unpredictable.
37	1	The bottom three careers I would recommend do not involve problem solving. Also, being a social worker or being an artist are not particularly structured.
38	1	The bottom three were more artistic or not as structured



39	1	I felt that the artist, speech pathologist, and social workers are not related to the math and science jobs that she has such a high interest for.
41	0	The three bottom careers I chose had nothing to do with science or math and were more design related, which is not something that was stated about Alex and an enjoyment.
42	1	Likes some level of structure; A "curious" person; The profile did not mention her interpersonal or artistic skills.
45	0	They are all careers with little structure and unrelated to his interests
47	1	An account manager main criteria is creative, not curious. Artist, very little structure. Buyer, limited curiosity opportunities
48	0	Careers which require a lot of social interaction, in a helping profession were excluded due to the fact that Alex did not express any interest in these, and his Holland Code does not align with these careers. Careers which lack structure or can be chaotic, due to Alex's request to be in a structured environment.
51	1	They are more aligned with 2 or more of her lowest interest areas; more people-focused and with less structure by nature of the work.
55	1	Artist would not provide the type of structure Alice is seeking in a career. She also scored low on Artistic in her Holland code and seems to appreciate math and science more. I also ranked social worker low because social, the helper, was in her bottom 3 themes. Problems that a social worker faces will not have a clear, solvable answer like math problems and chess and she may not be comfortable with this. I rated Advertising Account Manager low because it has a strong emphasis on collaborating with people. I also think that she would be less interested in the concept of advertising since she prioritizes science and math with solvable answers, more so than creativity.
56	0	I chose the bottom 3 careers because they involve a higher level of social interaction with others, managing others, and requiring more flexibility and creativity.
57	1	Social worker would likely be problematic for Alice as she self-reported she likes structure and social work has a lot of ambiguity. I see her desire to problem solve as more investigative from a science or math orientation rather than solving people's problems. Artist is low because she does not self-report any particular interest in these areas other than reading and she doesn't indicate what she reads (i.e. could be reference books versus fiction for example). The "Artistic" personality also desires freedom and creativity versus structure. Other ties for "Unlikely" professions are



		more social or enterprising in nature--two other low theme codes for Alice.
58	0	I excluded those occupations that were people-oriented, creative or unstructured
62	0	Roles that involve working heavily with people, unstructured environments, art and persuasion would not be good fits for this client.
63	1	The bottom careers that I selected were Artist and Social Worker. These careers reflect the Holland areas that were ranked the lowest. These positions also tend to operate in less structured environments.
66	1	The same as the top three.
67	1	Roles with less structure to their day and with less of the hard sciences or math component
69	0	Although he has had some helping volunteer activity does seem overly interested in the activities that require a high concentration of thinking and solving social problems with others.
73	1	Lowest theme codes -Would like career with structure -Top theme codes
74	1	Alice's propensity to migrate towards activities that involve problem-solving and especially those with math and science features. Alice's interest in the game of chess which requires the ability to think strategically within a structured, rule-based situation, and her involvement in community service and working with the elderly and playing sports.
77	0	Bottom three: Artist, Buyer, and Social worker. There is less structure in these jobs and not as much math and science. He does like helping people, but this need could be satisfied outside of his profession.
80	1	Alice may be social to a point due to her enjoyment of team sports like soccer. However, too much time in a helping field can have high rate of burn for those who like more problems solving activities.
82	0	Not structured or playing to clients strengths
84	1	Lack of interest, demonstrated attitude, aptitude



88	0	Even though Alex has volunteered in his past I rated social work low because of the lack of scientific and mathematical problem solving. He also rated low on the social scale which makes me want to ask him more questions about his past volunteering experiences. I don't believe that being an artist would give Alex the structure or quantitative rigor that would satisfy him.
90	1	Desires "structure" so artist/social work/speech pathologist will likely require some unpredictability due to the human elements and endless possibilities of "artist."
91	0	Advertising Account Manager and Buyer are low because those are typically careers that requires creativity and salesmanship, both areas that are low on his SII (A, E, and S). Artist is low because those folks prefer unstructured environments and to solve problems using unconventional means.
96	1	I don't really know what a speech pathologist does, though I suspect it has something to do with examining speech patterns? I think she could be a computer scientist, but is least likely to be an artist. She's curious, but the vignette doesn't say anything about artistic or creative interest.
100	0	Social and/or artistic without conventional or realistic aspects. Very unstructured and 2 have strong interpersonal relationship component of the work.
104	1	Artist, Buyer and Advertising were not my choices for Alice because as an Artist she would have very little structure. All would require creative skills that did not seem to factor into what she enjoyed or was good at. Also her desire to problem solve would not be as great with these positions as it would be with the top three that were chosen for her. Also because of her high GPA, I felt she could further than she would need to with these positions.
105	0	he likes structure and artist and buyer would have very little I think. Advertising account manager wouldn't tap into his curiosity well. minimal science and math
106	1	The bottom three were very social occupations that didn't provide structure.
107	0	He didn't seem to score or be involved with social and/or artistic activities other than soccer. So I am not sure how well he would enjoy teaching or working more closely with people on a daily basis.
109	1	These are either highly people oriented (I would want to look at her MBTI to help), or vastly unstructured.



110	1	Though the student might be attracted to variety in the Advertising Acct Manager, Buyer, and Social Worker roles, I think the student would struggle in the traditionally less-structured environments of social work and advertising. Being an Account Manager or Buyer would also seem more appropriate for someone with Enterprising as a top theme.
111	1	Same factors as above.
112	0	I do not think Alex would enjoy the lack of structure that an artist would have. I do not think he would enjoy being a Buyer since his enterprising and social interests are lacking. Social work would also go against his lack of social interest.
115	1	For the bottom 3, I chose careers that are fluid and unstructured. They also involve working directly with others. This would be difficult for Alice if that is the way her whole day would be. She would need some down-time or alone time which isn't easy in those bottom three.
118	1	Jobs have less structure, are more creative.
119	0	Bottom three either needed to much enterprising or artistic. He likes problem solving and being curious which doesn't lend itself to conventional roles either
122	1	buyer is a more "enterprising" career on the Holland hexagon, social worker is "social" on the Holland hexagon, and artist is a very unstructured career path on the "artistic" sector of Holland
124	0	Working closely with others (helping, buying), and spending a lot of time in a creative space where there is a higher likelihood of abstraction. Also, spending a great deal of time teaching and managing probably wouldn't fit very well with Alex - there are a lot of uncontrolled variables in those careers.
128	1	Alice does not seem to like unstructured environment or working closely with others. While Alice maybe a social person her preference for work would be with more concrete applications and in more independent ways.

Strong Interest Inventory Results		
Case Number	Male or Female	Reasoning for Bottom 3 Career Choices



3	0	The least likely careers are more associated with interacting with people or artistic, which are characteristics associated with his low theme codes.
5	1	Based on Alice's lowest three RIASEC theme codes, Artist, Speech Pathologist, and Social Worker are congruent with SAE. These careers require a level of creativity and flexibility which are not values Alice cited as important to her.
6	0	heavier loading on areas of little interest: helping, art, business
7	0	None contain his top three Holland codes. None are supported by his currently expressed interests, with the *possible* exception of social worker.
8	0	Non artistic, not social.
9	1	The S and A profiles definitely put the people driven and artistic related fields to the bottom of a list
11	0	His weaknesses of social, enterprising, and artistic.
12	1	She had some volunteer experience in a "helping" capacity, but did not indicate a big interest in that area. Therefore, I did not rate some of the high Social themed occupations for her.
13	0	Alex did not score as high in the artistic and social theme codes and the three bottom careers would fit within these categories.
14	1	Alice appears to lack interest in occupations without structure (artist) and based in the enterprising field (buyer, advertising account manager).
17	1	I would not suggest the three careers I listed above as her interests do not seem to lie as heavily in industries where you need to promote yourself or use your relationship with someone to your advantage.
18	1	1. Lack of structure 2. jobs that involve interests that Alice didn't mention and that weren't in her résumé (e.g. enterprising and artistic interests/abilities)
21	1	Advertising account manager appears to be highly loaded in artistic and enterprising types, which she did not endorse. Social worker/speech pathologist seem to be highly loaded on the social type, which she did not endorse as highly. Artist appears highly loaded on Social, low on conventional, which is incongruent with her profile.
22	0	not enough structure, unpredictable if profession is too social (ex: social worker).



23	1	The manager position may require more enterprising skills than she'd be interested in developing. For the buyer position, it may be more appealing if the mathematics are enough of a draw for her, but that would need to be assessed with her. Finally, the artistic category was also one of her lowest scored fields, so I wouldn't want to spend too much of our time together offering up a field that just doesn't interest her as much as others.
24	0	The four I put at the bottom are also arts or socially related, which does not fit his code or his general description of himself (i.e., talents, interests, abilities).
25	1	Alice's lowest three codes all fit in with aspects of the lower ranked careers. Also they may not reflect her preference for structure.
26	1	See above.
28	0	Schedule of jobs, inclusion of math and sciences, and low three theme codes.
29	0	The bottom three included too much working with people/ service work and unstructured creative or artistic components.
34	1	The bottom 3 careers I recommended were a science teacher, social worker, and artist. I chose these three because they were very opposite of her Strong results. The only thing that met her requirements was that it was specifically a science teacher. I think these jobs may not have the same structure that she desires, and are very people/social interaction heavy.
38	1	The bottom three were more artistic or not as structured
43	1	Speech pathologist are more of a artist and social job, which would not align with Alice's interests. However, computer science may be more likely to align since she would share similar interests in investigating ways to create programs, and understand coding. Also, artist would not align with her interest either.
46	1	Given her low interest in enterprising, I don't think she'd enjoy being an optometrist, many of whom operate their own shops. I said very unlikely for advertising account manager because of the low interest in both Enterprising and Artistic. My instincts are similar for buyer.
48	0	Careers which require a lot of social interaction, in a helping profession were excluded due to the fact that Alex did not express any interest in these, and his Holland Code does not align with these careers. Careers



		which lack structure or can be chaotic, due to Alex's request to be in a structured environment.
49	1	Careers that involve helping people would not be a good match, given her low interest in the Social Theme.
50	0	They were too socially or creative. focused
51	1	They are more aligned with 2 or more of her lowest interest areas; more people-focused and with less structure by nature of the work.
52	1	Typically, Advertising Account Manager, Buyer and Artist professionals include an Artistic interest pattern.
54	0	He is not artistic, and has not divulged and affinity for teaching.
55	1	Artist would not provide the type of structure Alice is seeking in a career. She also scored low on Artistic in her Holland code and seems to appreciate math and science more. I also ranked social worker low because social, the helper, was in her bottom 3 themes. Problems that a social worker faces will not have a clear, solvable answer like math problems and chess and she may not be comfortable with this. I rated Advertising Account Manager low because it has a strong emphasis on collaborating with people. I also think that she would be less interested in the concept of advertising since she prioritizes science and math with solvable answers, more so than creativity.
57	1	Social worker would likely be problematic for Alice as she self-reported she likes structure and social work has a lot of ambiguity. I see her desire to problem solve as more investigative from a science or math orientation rather than solving people's problems. Artist is low because she does not self-report any particular interest in these areas other than reading and she doesn't indicate what she reads (i.e. could be reference books versus fiction for example). The "Artistic" personality also desires freedom and creativity versus structure. Other ties for "Unlikely" professions are more social or enterprising in nature--two other low theme codes for Alice.
59	1	The lowest rankings (buyer, social worker, and artist) involved enterprising, artistic, and social fields, which were her lowest Holland themes.
60	1	Her volunteer work fits with the social theme but it is not very strong compared to the other themes. She did not show much in the way of artistic except for reading. The business careers don't fit as well for her investigative side.



61	0	They are high on the SEA side of things
63	1	The bottom careers that I selected were Artist and Social Worker. These careers reflect the Holland areas that were ranked the lowest. These positions also tend to operate in less structured environments.
65	0	Two of the areas related to the enterprising code (business) and the third was his second lowest area, Art.
68	0	As Artistic and Enterprising are at the bottom, careers that require more "thinking outside the box" or structure, such as Artist and Advertising Account Manager, would not be a good fit. Buyer also would require taking risks, which can be hard for Conventional individuals.
71	1	I based much of this decision on the theme codes, considering there was not much information to glean from the information.
72	1	Alice's lowest scores included SAE (In addition from the vignette, did not much mention much related to these codes). This most likely rules out Social Work and Artist. Other occupations I do not feel completely confident with labeling Very unlikely.
73	1	Lowest theme codes -Would like career with structure -Top theme codes
76	1	The SAE combination as scored career themes rules out a focus in serving people directly (S), promotions /buyer (E) and creativity (A)
78	1	See previous explanation.
81	1	Advertising Account Manager needs to meet various people and not defined tasks to each client, those factors are close to E and A. Social Worker is a very well known job for helping others (S), and Artist need is a typical job of A.
85	0	Given the lowest theme codes of SAE, which are typical of helping professions, teachers and creative careers, being an artist, instructor or a buyer would be less appealing to Alex.
86	0	Dealing with people (social) and creative concepts (artistic).
87	1	Her lowest theme codes are social, artistic, and enterprising so a career as an artist, social worker and college instructor are probably not going to hold her interest.
88	0	Even though Alex has volunteered in his past I rated social work low because of the lack of scientific and mathematical problem solving. He also rated low on the social scale which makes me want to ask him more questions about his past volunteering experiences. I don't believe that



		being an artist would give Alex the structure or quantitative rigor that would satisfy him.
89	1	As an Advertising Account Manager, Artist or Social Worker Alice would not be using the skills and interests she enjoys the most. She would have the social contact and communication but be missing the Investigative qualities she is extremely strong in.
91	0	Advertising Account Manager and Buyer are low because those are typically careers that requires creativity and salesmanship, both areas that are low on his SII (A, E, and S). Artist is low because those folks prefer unstructured environments and to solve problems using unconventional means.
92	0	Based on the synopsis above, Alex's traits fall into these three categories- Investigative, Conventional and Social. Based on those traits I cannot see him flourishing as a artist, buyer or advertising account manager
94	1	Being that social was in her bottom codes, I decided that any careers that had a high focus in the social area should not be for her.
97	0	The individual would not be align with a buyer, advertising, or artist. These jobs seem to not be align with the scores received. Also, the additional information provided some insight to the client needs.
98	1	They have very little SA or E in their work.
99	0	The student's lowest themes are Social , enterprising and Artistic, meaning that he doesn't have strong interest as an artist, social worker and buyer. All of these careers encompass some sort of creativity, selling or helping people.
100	0	Social and/or artistic without conventional or realistic aspects. Very unstructured and 2 have strong interpersonal relationship component of the work.
101	0	Poor fit; lack of congruence with client's interest code and that of occupations
103	1	Because "Social" is Alice's 4th code, she will not very enthusiastic to interact with people. I don't recommend her to choose teaching jobs. Also "Artistic" is her 5th code, I don't recommend her to choose jobs that require her to something about art.
107	0	He didn't seem to score or be involved with social and/or artistic activities other than soccer. So I am not sure how well he would enjoy teaching or working more closely with people on a daily basis.



110	1	Though the student might be attracted to variety in the Advertising Acct Manager, Buyer, and Social Worker roles, I think the student would struggle in the traditionally less-structured environments of social work and advertising. Being an Account Manager or Buyer would also seem more appropriate for someone with Enterprising as a top theme.
111	1	Same factors as above.
112	0	I do not think Alex would enjoy the lack of structure that an artist would have. I do not think he would enjoy being a Buyer since his enterprising and social interests are lacking. Social work would also go against his lack of social interest.
114	0	Holland least codes SAE
116	0	The bottom careers involved being artistic, social, and enterprising.
119	0	Bottom three either needed too much enterprising or artistic. He likes problem solving and being curious which doesn't lend itself to conventional roles either
121	0	Those careers did neither fit with his theme codes or interests.
122	1	buyer is a more "enterprising" career on the Holland hexagon, social worker is "social" on the Holland hexagon, and artist is a very unstructured career path on the "artistic" sector of Holland
129	1	The lack of the above in the bottom 3.

<b>Assumed Student Traits &amp; Activities</b>		
<b>Case Number</b>	<b>Male or Female</b>	<b>Reasoning for Bottom 3 Career Choices</b>
1	1	creativity, lack of structure
2	0	Too social in focus.
3	0	The least likely careers are more associated with interacting with people or artistic, which are characteristics associated with his low theme codes.
4	1	the emphasis on creativity, being social and minimal structure associated with the careers.



5	1	Based on Alice's lowest three RIASEC theme codes, Artist, Speech Pathologist, and Social Worker are congruent with SAE. These careers require a level of creativity and flexibility which are not values Alice cited as important to her.
6	0	heavier loading on areas of little interest: helping, art, business
12	1	She had some volunteer experience in a "helping" capacity, but did not indicate a big interest in that area. Therefore, I did not rate some of the high Social themed occupations for her.
15	0	selling does not seem to be an area where he would excel
19	0	Based on what he already indicated to me, these careers are more unstructured and don't correspond with the subject matters or approaches he indicated interest in. He also didn't share anything indicating a desire to work in a "helping" type of career that involves work with solving "people problems" (more of an interest in solving "science" and/or "abstract" problems)
29	0	The bottom three included too much working with people/ service work and unstructured creative or artistic components.
30	1	Thinking about lack of structure and not wanting to be in too much of a social environment all the time
31	0	They all require high social interaction and little structure.
32	0	Since he seems to like structure I do not think Alex would do well in a career that is artistic or not very black and white.
34	1	The bottom 3 careers I recommended were a science teacher, social worker, and artist. I chose these three because they were very opposite of her Strong results. The only thing that met her requirements was that it was specifically a science teacher. I think these jobs may not have the same structure that she desires, and are very people/social interaction heavy.
35	1	The bottom three careers reflect more of a flexible sense of personality or creative lens, and provide less structure, which is what Alice mentioned she would prefer. They are more unpredictable.
36	0	I think it would be unlikely for him to be an artist, advertising account manager or buyer. These seem to be solitary careers that may not align with his interests.



41	0	The three bottom careers I chose had nothing to do with science or math and were more design related, which is not something that was stated about Alex and an enjoyment.
42	1	Likes some level of structure; A "curious" person; The profile did not mention her interpersonal or artistic skills.
47	1	An account manager main criteria is creative, not curious. Artist, very little structure. Buyer, limited curiosity opportunities
48	0	Careers which require a lot of social interaction, in a helping profession were excluded due to the fact that Alex did not express any interest in these, and his Holland Code does not align with these careers. Careers which lack structure or can be chaotic, due to Alex's request to be in a structured environment.
49	1	Careers that involve helping people would not be a good match, given her low interest in the Social Theme.
50	0	They were too socially or creative. focused
51	1	They are more aligned with 2 or more of her lowest interest areas; more people-focused and with less structure by nature of the work.
55	1	Artist would not provide the type of structure Alice is seeking in a career. She also scored low on Artistic in her Holland code and seems to appreciate math and science more. I also ranked social worker low because social, the helper, was in her bottom 3 themes. Problems that a social worker faces will not have a clear, solvable answer like math problems and chess and she may not be comfortable with this. I rated Advertising Account Manager low because it has a strong emphasis on collaborating with people. I also think that she would be less interested in the concept of advertising since she prioritizes science and math with solvable answers, more so than creativity.
56	0	I chose the bottom 3 careers because they involve a higher level of social interaction with others, managing others, and requiring more flexibility and creativity.
57	1	Social worker would likely be problematic for Alice as she self-reported she likes structure and social work has a lot of ambiguity. I see her desire to problem solve as more investigative from a science or math orientation rather than solving people's problems. Artist is low because she does not self-report any particular interest in these areas other than reading and she doesn't indicate what she reads (i.e. could be reference books versus fiction for example). The "Artistic" personality also desires freedom and creativity versus structure. Other ties for "Unlikely" professions are



		more social or enterprising in nature--two other low theme codes for Alice.
58	0	I excluded those occupations that were people-oriented, creative or unstructured
62	0	Roles that involve working heavily with people, unstructured environments, art and persuasion would not be good fits for this client.
69	0	Although he has had some helping volunteer activity does seem overly interested in the activities that require a high concentration of thinking and solving social problems with others.
75	0	I think that Alex will not find job satisfaction in a career with high levels of human interaction and one that is focused on helping others. Careers in social work, speech pathology, and teaching would not be recommended for him.
77	0	Bottom three: Artist, Buyer, and Social worker. There is less structure in these jobs and not as much math and science. He does like helping people, but this need could be satisfied outside of his profession.
79	0	not creative, don't see him in helping careers
80	1	Alice may be social to a point due to her enjoyment of team sports like soccer. However, too much time in a helping field can have high rate of burn for those who like more problems solving activities.
81	1	Advertising Account Manager needs to meet various people and not defined tasks to each client, those factors are close to E and A. Social Worker is a very well known job for helping others (S), and Artist need is a typical job of A.
85	0	Given the lowest theme codes of SAE, which are typical of helping professions, teachers and creative careers, being an artist, instructor or a buyer would be less appealing to Alex.
90	1	Desires "structure" so artist/social work/speech pathologist will likely require some unpredictability due to the human elements and endless possibilities of "artist."
91	0	Advertising Account Manager and Buyer are low because those are typically careers that require creativity and salesmanship, both areas that are low on his SII (A, E, and S). Artist is low because those folks prefer unstructured environments and to solve problems using unconventional means.



93	0	Careers that involve creative expression and are flexible in nature. Careers that involve a strong social component.
95	0	Same as above. There was no information that stated he enjoyed helping or persuading people.
96	1	I don't really know what a speech pathologist does, though I suspect it has something to do with examining speech patterns? I think she could be a computer scientist, but is least likely to be an artist. She's curious, but the vignette doesn't say anything about artistic or creative interest.
99	0	The student's lowest themes are Social , enterprising and Artistic, meaning that he doesn't have strong interest as an artist, social worker and buyer. All of these careers encompass some sort of creativity, selling or helping people.
100	0	Social and/or artistic without conventional or realistic aspects. Very unstructured and 2 have strong interpersonal relationship component of the work.
102	1	bottom careers meaning ones she would not like=Lots of social/people interaction especially requiring empathy all day and always having to create the vision or the big picture
104	1	Artist, Buyer and Advertising were not my choices for Alice because as an Artist she would have very little structure. All would require creative skills that did not seem to factor into what she enjoyed or was good at. Also her desire to problem solve would not be as great with these positions as it would be with the top three that were chosen for her. Also because of her high GPA, I felt she could further than she would need to with these positions.
106	1	The bottom three were very social occupations that didn't provide structure.
109	1	These are either highly people oriented (I would want to look at her MBTI to help), or vastly unstructured.
115	1	For the bottom 3, I chose careers that are fluid and unstructured. They also involve working directly with others. This would be difficult for Alice if that is the way her whole day would be. She would need some down-time or alone time which isn't easy in those bottom three.
117	0	Based on his SII themes, it appears he may not enjoy work environments that include a high level of social contact. For this reason, it is unlikely that I would recommend healthcare, social work, or speech pathologist. It's also unlikely that I would recommend teaching, even within his



		interest areas like math and science, unless he displayed something that showed strong leadership or teaching ability.
118	1	Jobs have less structure, are more creative.
124	0	Working closely with others (helping, buying), and spending a lot of time in a creative space where there is a higher likelihood of abstraction. Also, spending a great deal of time teaching and managing probably wouldn't fit very well with Alex - there are a lot of uncontrolled variables in those careers.
127	0	Based on his results, he is unlikely to be interested in fields related to the creative arts, social services, and extensive human engagement in business.
128	1	Alice does not seem to like unstructured environment or working closely with others. While Alice maybe a social person her preference for work would be with more concrete applications and in more independent ways.

Further Exploration Needed		
Case Number	Male or Female	Bottom 3 Career Choices Indicated
16	1	The bottom three careers I recommended do not seem to fit her interest areas. However, I would encourage her to more fully explore career paths in these areas as part of exploration.
27	1	The bottom three careers are mainly in her areas of lower interest, so if the student really wanted to pursue them, we might discuss how she could differ from others in those fields.
44	0	I would not recommend any specific careers to Alex. Instead I would have Alex use his code to explore in the Occupational Outlook Handbook and O*Net online and have Alex choose which career seem like a good fit.
66	1	The same as the top three.
78	1	See previous explanation.



109	1	These are either highly people oriented (I would want to look at her MBTI to help), or vastly unstructured.
125	1	Same as above.



### **Vita**

Shelby Morgan Reyes was born in Miami, FL to parents Lisa and Jaime Reyes. She attended Gulliver Preparatory School for high school and was then recruited to play Division I water polo at the University of Maryland, College Park. While at the University of Maryland, she was a member of the Ronald E. McNair Post-Baccalaureate Achievement Program and the Scholars program, Advocates for Children. Shelby completed her Bachelor of Science degree with Honors in Psychology in 2008. During her final year at the University of Maryland she was also captain of her water polo team and received the Weaver-James-Corrigan ACC Postgraduate Scholarship Award to go toward furthering her education. Shelby was then accepted into the Counseling Psychology doctoral program at the University of Tennessee, Knoxville where she is currently completing her fifth and final academic year. She is completing this dissertation in accordance to the requirements to receive a doctoral degree in Psychology. In the following year, Shelby will continue her education through an internship at the Vanderbilt Psychological & Counseling Center.