2008

The role of occupational values and social support in career choice: An emphasis on women in science

Heather Meikle
University of South Florida

The Role of Occupational Values and Support in Career Choice:

An Emphasis on Women in Science

by

Heather Meikle

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Arts
Department of Psychology
College of Arts and Sciences
University of South Florida

Major Professor: Walter Borman, Ph.D.
Tammy D. Allen, Ph.D.
Douglas Rohrer, Ph.D.

Date of Approval:
May 1, 2008

Keywords: gender, decision-making, vocational development, stem, education

Table of Contents

List of Tables

The role of occupational values and social support in career choice:

An emphasis on women in science

Heather Meikle

ABSTRACT

The purpose of this study was to determine how occupational values and social support for career pursuits influenced career choice, with a specific focus on women in science, technology, engineering, or mathematics (STEM). A sample of 62 college graduates participated in telephone interviews that addressed gender differences in seven occupational values and three sources of social support. Results showed that differences in occupational values differ by both gender and between individuals in STEM and non-STEM careers. The strength of STEM values better predicted a career in STEM than did gender. Finally, women in STEM received the least amount of social support for their career pursuits. These results underscore the need to encourage women's interest in STEM, and develop interventions for career counselors that specifically address the unique needs of women in non-traditional careers.

Introduction

Over the last quarter century, there has been dramatic growth in women's labor force participation and with it a rise in research focusing on women's career choices and vocational behavior. This expanding body of literature reveals a couple of themes about women's roles in the workforce. Many occupations today continue to be sex-stereotyped. Some are commonly characterized as historically male dominated, such as electrical engineering, mathematics, and chemistry, whereas others tend to be viewed as more appropriate for women, like administrative positions and nursing. Ideas about gender-typed occupations can be found in a range of places, from images in textbooks of male scientists to antiquated notions about work expressed by a family member from an older generation. In fact, these occupational stereotypes are so pervasive in our society that they are even learned by children as young as three years old (Stockard & McGee, 1990). Internalizing these beliefs about gender-typed jobs at such a young age makes it that much more difficult to expand a young adult's view of their own career potential twenty years later. Although there is evidence that these stereotypes may be declining among college students (White, Kruczek, Brown, & White, 1989), these out-dated conceptualizations of gender-typed jobs continue to play an important role in the development of many career pathways.

Women tend to gravitate toward occupations that provide an opportunity to interact in a social environment and those that play useful roles in society. This can

include jobs in fields such as healthcare or social services. In fact, when women in traditionally male-dominated fields were asked about their career plans, many reported they were more likely to consider changing to a career in medicine or law because it would allow them to give back to the community in a way that their current field of study would not (Lightbody, Siann, Tait, & Walsh, 1997). Moreover, the occupations held mostly by women (offering the opportunity to give back or to make a contribution) are also often in the service sector. These jobs often provide lower pay, offer little prestige, and require only modest training and educational preparation compared to most male dominated occupations (Betz & Fitzgerald, 1987).

Women in Science, Technology, Engineering, and Math

Although women's presence in the workforce continues to rise, the expansion is unevenly distributed across occupations. Women continue to be under-represented in most science-related fields; especially those termed the "hard" sciences, such as chemistry and physics. A recent assessment of the science and engineering (S&E) workforce (NSF, 2007) revealed that in 2003, while women made up approximately half of the population and 47% of the college-degreed workforce, they occupied only 24% of the science and engineering jobs. Within these fields, the largest percentage of women can be found in the biological/life sciences (43%). Women are well represented in this partly because it serves as a pipeline to careers in the healthcare, an industry that tends to be popular among women. The smallest percentage of women employed in S&E occupations can be found in engineering (11%). This is due mostly to the vast overrepresentation of men in the electrical and mechanical engineering specialties. This under-representation can also be found at the postsecondary education level in the choice

of college major (Astin, Korn, Sax, & Mahoney, 1994), indicating that these disparities in the workforce are being developed long before entry into the job market occurs. For example, only 14% of female freshman at four-year institutions reported intentions of majoring in any S&E field, compared to 34% of their male counterpart (NSF, 2007). In 2005, women made up only 17% of all students enrolled in engineering programs at four-year institutions and received 19% of the bachelor's degrees awarded for engineering. However, the number of engineering degrees conferred to women has increased by four percentage points in the past fifteen years, providing evidence that slowly, women's participation in engineering is growing.

It is vital to attract and maintain women's interest in science, technology, engineering and mathematics (STEM) education and careers; it is in these fields that there are the fastest growing employment opportunities (NSB, 2003). Employment in STEM fields is projected to increase three times faster than employment in all other occupations by 2010 (Fassinger & Asay, 2006). In fact, the National Science Board (2000) identified the supply of scientists, engineers, and science teachers as one of the top 10 priorities of the early 21st century. This increase in opportunity is coupled with a decreasing number of white men in the STEM workforce, who traditionally have constituted most of the STEM professionals. This decrease is partly due to large numbers of retirees and decreased numbers of white men currently entering STEM fields. One example of this trend in hiring can be found among academic STEM positions. The percentage of white males hired for these positions dropped from 80% in the early 1970s to 40% in 1999. It is reasonable to expect that many of the resulting employment gaps would be filled with women, as their participation in the overall labor force has seen

dramatic increases. Therefore, we are faced with the need to enhance student interest and retention in STEM programs, and to guide more of our newly graduated workforce, especially women, towards those fields. Increasing women's participation in these fields can promote a healthy economy by ensuring a diverse and well-qualified STEM workforce.

Considering the unique experiences of women in contemporary society, the study of women's careers deserves special attention. Historically, much of women's career behavior has been interpreted using an arguably male perspective (Gallos, 1989; Powell & Mainiero, 1992). For example, many theories of career choice and development are based on masculine models of identity formation (Brown & Brooks, 1990). There is much debate over the issue of describing and interpreting women's career behavior using a male framework, as these models may not accurately reflect the processes that women undertake to select and build their career. For example, Gutek and Larwood (1987) believe that current theories of careers and career development do not fit the experiences of women due to the vast differences in socialization, opportunities and barriers women currently face in society. However, others believe that women and men share a very similar career development process (Fitzgerald & Crites, 1980). Although an agreement has yet to be reached on the efficacy of applying traditional theories of career choice and development to women, they continue to provide a necessary framework for examining individuals' careers.

Occupational Choice

There are four themes of occupational choice that can help explain the processes underlying how people select an occupation. Career choice can be characterized as 1) a

matching process, 2) a developmental process, 3) a decision-making task, and 4) and a product of social and cultural influences (Greenhaus, Callanan, & Godshalk, 2000).

The first way to conceptualize career choice is by viewing it as a matching process. Individuals each have their own unique set of needs, abilities and interests. According to the matching explanation, an individual assesses these needs, abilities and interests, develops one or more career goals, collects information about potential occupations, and decides on one they feel to be compatible. While this is rarely carried out in such an orderly manner, the process of reflecting on abilities and interests before selecting an occupation can be a valuable exercise.

Proponents of the occupational choice as matching process include John Holland and Donald Super. Holland's work centers around the idea that people have a combination of six basic traits which can be matched to occupations based on their associated personality characteristics (Holland, 1966). Individuals' personality can be classified as Realistic, Investigative, Artistic, Social, Enterprising, and Conventional. Each of these personality types can be characterized by a common set of interests and preferences. For example, Investigative personalities are thought to be analytical, cautious and independent, and are suited to occupations such as an economist or engineer. Enterprising personalities tend to be ambitious, energetic and self-assured, and excel in careers such as real estate sales or law. Like people, occupational environments can also be classified into the same six categories. Holland believed that people will search for and select an occupation that matches their personality type.

Super's work also represents the occupational choice as a matching process. Super (1963) believed that a key variable in selecting an occupation was the individual's

self concept, or the combination of attributes they possess, including their abilities, interests and needs. Occupations are chosen based in part by how well they fit into the individual's self-concept. For example, a student who believes he is to be understanding, empathetic and patient may select a career as a social worker, an occupation which would require the same set of attributes.

The second way to conceptualize occupational choice is as a developmental process, one that occurs over a life span. In fact, an occupational decision can be thought of as a long series of small decisions, all of which steer the individual towards one career or another. Many small decisions can help shape the interests and skills of an individual. Consider the potential engineer who makes the decision to enter a science fair in middle school, who joins the physics club in high school, and who works summers at a civil engineering firm. Each of these small decisions allowed the exploration of new ideas and challenges, and helped build the foundation of knowledge and confidence needed to select a career in engineering. In this example, the process started during middle school, but these developmental experiences can start at any time. It takes time and experience for talents and interests to emerge. Potential occupations are pursued and replaced as new information becomes available and skills are honed. In this way, career choice is essentially a gradual, unfolding process. Super describes this process as occurring in five stages: growth, exploration, establishment, maintenance, and disengagement (Super, Savickas & Super, 1996). The growth stage, generally experienced during the time before adolescence, is marked by concern for the future, increasing personal control over one's own life, placing value on scholastic achievement, and developing good work habits. The next stage is exploration, beginning in adolescence and continuing into early adulthood.

During this time, individuals begin to formulate their self-concept and develop a vocational identity. An occupation or field of study is selected and the appropriate educational and vocational choices are implemented. The exploration stage is of most relevance to the current study, as it is during this time that individuals begin to crystallize their occupational values, incorporate their skills and abilities into a self-concept (such as the development of mathematics self-efficacy), and make choices that build the foundation of their occupational future (such as choosing to enter an engineering program). The establishment phase occurs after exploration. Establishment is characterized by assimilating the organizational culture, exhibiting acceptable performance, and developing healthy relationships with co-workers. This is also the time during which advancement is a priority. Individuals generally experience the establishment phase from young adulthood to mid-life. Approaching the next phase of career development can prompt an individual to re-evaluate their career choices (a common catalyst for the ubiquitous mid-life crisis). If an individual is content to stay on their current path, they enter the maintenance phase. During this period energy is focused on updating skills and finding innovative ways to complete routine tasks. However, if individuals change organizations, occupations or fields, they must cycle through the exploration and establishment phase once again. As time in the workforce comes to a close, individuals enter the disengagement phase. During this time, responsibilities begin to wind down, and there is an emphasis on delegating tasks, mentoring others, and planning for (and ultimately beginning) retirement.

The third way to conceptualize occupational choice is as a decision-making task. Assuming that there are multiple career options for any one individual, how does one

choose from among these alternatives, and what are the psychological processes that guide these decisions? Most ideas about career decision making are based on a trade-off model of decision theory, such as Vroom's (1964) expectancy theory. Expectancy theory characterizes decision-making (including those decisions related to career choice) as a rational process by which a course of action is chosen based on the expected rewards and consequences. To succeed, one must have a clear set of desired outcomes specified in advance, and determine which outcomes or rewards are the most highly valued. An example of these expected rewards might include being challenged by the job and providing a sense of adventure. Then, potential occupations are considered and the likelihood that they will provide the aforementioned rewards is determined. This information is combined with the likelihood that each job is actually attainable, and a decision is made. The final choice is predicted to be one that maximizes the expected rewards while also qualifies as an attainable career goal. For example, the individual who wants to be challenged and adventurous may choose not to pursue a career in the FBI, a highly coveted position with few openings, but decide to work with the local police force instead, where there are more positions available. However, a drawback to this, as well as the matching explanation, is that decisions made about careers are rarely carried out in such a rational, calculated manner.

The last theme of occupational choice acknowledges that fact that there are external forces influencing an individual's decision, and addresses the impact of these social and cultural forces. After all, career choices are not made in a vacuum! Behavior is thought of as a function of the person and the environment, and career decisions are no exception. Most of the research on career development focuses on the individual as the

active agent in the development of career plans, as evidenced by the emphasis placed on goal setting, developing an awareness of skills and interests, and information seeking (Greenhaus, et. al., 200). However, as the choice-is-developmental discussion indicated, the environment a person is surrounded by can significantly shape the available options, as well as the way values and interests are formed. A person's environment can include past influences, such as family of origin, place of residence or social class, and present influences, like the current political, social, and cultural climate. Each of these factors can influence individuals' world view and how they define their place in it. For example, growing up the child of an accountant is likely to expose one to a different lifestyle and set of role models than growing up the child of a policeman. The accountant's child may grow up to value a career with a stable routine whereas the policeman's child may grow up wanting a new and exciting challenge each day. Scientists may encourage their children to pursue a life of education and learning, while entrepreneurs encourage competition and success. Parents who lived during the depression may teach their child to value job security above all else. In each of these family environments, many opportunities are present for these messages about careers and values to be internalized by the children. These messages can shape the way various careers are considered and decided upon. However, the immediate family environment is not the only force at play. The larger social and political environment influences the way in which we consider different careers. For example, the economy can promote the growth of certain industries. Technological advances have spurred an influx of new jobs, and widened the range of opportunities for people with technical backgrounds. Our cultural environment reinforces certain work values and legitimizes certain career aspirations, including the persisting

ideas about gender-appropriate career choices. While it is important that the role of environmental influences on career choice is recognized, the ability of an individual to weigh options and select an appropriate career should not be underemphasized. Essentially, the process of career choice, like many behaviors, can be thought of as the interaction of a person and his or her environment.

Each of these themes of occupational choice can help to explain the processes by which these decisions are made, yet no one theme can solely account for the entire process. In reality, there are forces at work from each of the above themes that work together to guide and shape the choice process.

Theories of Career Choice

There are several theories that specifically consider the centrality of occupational values to the process of selecting a career.

Brown's valued-based model of career choice. The origin of this model began with a desire to identify the factors that lead to satisfying career choices. After a review of the literature on major models of career decision-making and their efficacy, Brown (1995) determined that most successful models expect outcomes to be the primary basis of motivation in the decision-making process. The central role of values as a motivation for decision-making has been well-supported (Vroom, 1964; Janis & Mann, 1977; Feather, 1992). Brown took this one step further by questioning how individuals decided upon which outcomes were most important. For Brown, the answer had its basis in values. Values are cognitive structures that allow individuals to meet their needs in socially acceptable ways. They serve as standards for behavior and provide the basis on which to understand behavior. For example, an individual who values altruism can easily

explain why it is important to donate time and money to help other people in need. Values are generally stable, exist beyond specific situations, and are influenced by socialization processes. Values, like interests, are developed as a result of the interaction between inherited characteristics and personal experience. The results of one study (Keller, Bouchard, Arvey, Segal & Dawis, 1992) suggest that 40 percent of the variance in the development of work values can be attributed to genetic influences, and the remaining 60 percent is related to environmental influences.

The basic proposition of Brown's value-based model is that each person develops a relatively small number of values, and these values are prioritized in his or her personal values system. The values having the highest priority are the most important determinants for career choices, in that a choice will be made to maximize the satisfaction of high priority values, or minimize the conflict between highly prioritized values and career choice, if no ideal option is available. Similar to Keller, et al. (1992), Brown believes that values are acquired through the combination of value-loaded information provided by the environment and inherited characteristics of the individual. Finally, Brown's model recognizes that a range of opportunities and social environments are available to individuals based on their gender, cultural background, and socioeconomic level, and predicts that this disparity in environment will lead to differences in values between men and women, both within and across cultural subgroups.

The gender-socialization approach to career choice. This model of career development picks up where Brown left off, and asserts that women bring different values and traits to their work roles than men do. This approach, however, focuses mainly on earlier gender training as the differentiating factor in the development of values

(O'Connell & Betz, 1996). These values and traits shape subsequent work-related interests, career decisions, and behaviors. Within this model, predictions are made as to which specific values will be prioritized by men and women, a topic that Brown does not address. Proponents of this approach believe that men are socialized to be more aggressive and to exhibit a competitive interpersonal style, whereas women are taught to be less aggressive and to show a more relationship-oriented interpersonal style. This differential socialization starts at an early age as young girls are encouraged to be reserved and polite, while boys' aggressive or rowdy behavior is often rewarded (Eisenhart, 1996). These influences are pervasive and can impact a child long into adulthood. They come from a range of sources, including family, peers and within the school system. Continued encouragement to participate primarily in gender-appropriate activities may reduce the opportunity and desire to branch out and participate in non-traditional experiences. This lack of opportunity and exposure can dampen a young woman's interest in traditionally male subjects. By the time students select high school coursework and college majors, they have already been subjected to these socialization pressures for many years, and their effects have been imprinted onto student's behaviors and values. Exposure to a lifetime of primarily gender-appropriate activities and experiences will shape an individual's distinct set of interests, skills and values to reflect that environment, just as a childhood filled with non-traditional activities would. These interests and values are later translated into the selection of a college major or a career that provides the opportunity to refine and enhance that set of traits. For example, the woman who excelled at developing relationships as child may select a major in the social sciences and pursue a career in social work; the woman who worked summers at an

electronics shop may register for courses in physics and pursue a career as an electrical engineer. If women in college are making traditionally female career plans, it is in part because their parents, their schools, and their society have taught them to believe that in those fields they are most likely to succeed and find happiness.

It is apparent that social influences play a large role in the career choice behaviors of women, whether it is through the establishment of gender-appropriate norms and values, gender segregation in the workforce, or barriers to educational achievement. The present research focuses on the role that occupational values and support from others play in career choice, particularly for women who have chosen STEM careers. It is important to develop and support women's interest in STEM so they can contribute in a wider range of fields, and promote a healthy, diverse workforce.

Occupational Values

Occupational values (often referred to as work values) refer to what a person wants out of work in general and what specific components of a job are important to attaining satisfaction (Duffy & Sedlacek, 2007). Occupational values, along with interests and preferences, are relatively stable characteristics based on affective judgments about life events (Dawis, 1991). Although these constructs are similar and have overlapping qualities, a distinction should be made between interests and values. Interests tend to refer to the like or dislike of activities, whereas values refer to an evaluation of the importance of characteristics in a work environment (Sager, 1999). Values serve as a standard for behavior, which also distinguishes them from interests (Brown, 1996).

Career choice and satisfaction are generally thought to be a function of ability and motivation; values being a large precursor of motivation (Vroom, 1964; Janis & Mann,

1977; Feather, 1992; Dawis, 1991; Brown, 1995). In general, occupational values have been shown to predict career choice, and the congruence between values and work environment has been shown to significantly predict job satisfaction and job performance (Guastello, Rieke & Guastello, 1992; Knoop, 1994; Schulenberg, Vondracek & Kim, 1993). For example, Judge and Betz (1992) investigated the proposition that the acceptance of job offers would be related to the candidates' values and their perceptions of the values likely to be satisfied by the job. Their hypothesis was supported with one exception: agreement between the degree of honesty expected on the job and the individuals' honesty value did not seem to influence the acceptance process. Ben-Shem and Avi-Itzhak (1991) studied the relationship between work values and career choices and their results also supported the proposition that, when there are options available that will satisfy highly prioritized values, those options are selected. Another study sought to examine the work values of a small population of students enrolled in mortuary science programs (Shaw & Duys, 2005). The dominant work values expressed by these students were, in order of importance, economic security, achievement, personal development, ability utilization and economic rewards.

Determining the values typical of individuals in specific occupations is a worthy endeavor as this information can help guide career counselors in an effort to successfully match people with occupations in which they are likely to be satisfied and successful. In fact, one of the many goals of the Occupational Information Network, or O*NET was to document and organize the work characteristics typical of a wide range of occupations. This allows researchers, organizations, and job seekers to examine the match between an

individual's occupational values and the occupations that offer an opportunity to satisfy those values (Sager, 1999).

It is useful to categorize these occupational values by common themes so a better understanding of how they interact with career choice is possible. Early research divided occupational values into four categories: extrinsic, intrinsic, social, and prestige. Extrinsic values refer to an importance placed on making money and having job security, whereas intrinsic values refer to an importance placed on autonomy and interest. Social values include a desire to work with people and make a contribution to society. Prestige refers to a desire for an occupation that is respected in society (Duffy & Sedlacek, 2007).

Within these broad categories, there are several specific work values that commonly appear in the literature. One feature of the O*NET is the application of 21 job reinforcers from the Minnesota Importance Questionnaire (MIQ; Dawis & Lofquist, 1984) to specific occupations. These 21 job reinforcers were factor analyzed and six common work values were revealed. These were achievement (the importance of an environment that encourages accomplishment), comfort (the importance of an environment that is comfortable and not stressful), status (the importance of an environment that provides recognition and prestige), altruism (the importance of an environment that fosters harmony and service to others), safety (the importance of an environment that is predictable and stable), and autonomy (the importance of an environment that stimulates initiative (Sager, 1999)).

Proponents of the gender-socialization approach to career choice, one which takes into account the importance of social influence on career attitudes, have a broader list of occupational values, selected for their predicted gender differences. Under this

framework, the most relevant to the current study, there are nine commonly identified occupational values. These nine values are job security, occupational skills, opportunity to help people, income benefits, working with people, opportunity to work independently, advancement into administration, and freedom from supervision. Recall that advocates of this approach believe that women bring different values and traits to their work roles than men because of their earlier gender "training" or socialization. Men are thought to be socialized to be more aggressive and to exhibit a competitive style, whereas women are taught to suppress aggression and develop a relationship-oriented style (Statham, 1987). Using this framework, each of these commonly identified occupational values can be considered male-oriented (competitive or dominance values) or female-oriented (interpersonal values). Betz and O'Connell (1989) examined this proposed gender categorization of work values by conducting a meta-analysis of 22 value studies to compare the values of men and women in the same field. They obtained gender differences in the pattern predicted by the gender-socialization approach. Men reported placing greater emphasis on the values related to competition and dominance and women reported valuing those related to social relationships. Men were more concerned than women about income, job security, and advancement; they wanted to avoid being supervised and to work independently and were more likely to seek self-employment and to value the opportunity to exercise leadership. Women more than men were concerned with finding a job that allowed them to display their esteemed occupational skills and wanted to help people and work with people. There were a total of 22 studies included in the analysis, and the gender-socialization approach correctly predicted the direction of mean gender differences in 90% of the individual value comparisons.

Based on this body of research, it is reasonable to predict that men and women develop different occupational values, and that these differences arise in part from early socialization to gender norms. Furthermore, these differences in values will play a large role in leading men and women down distinct career paths.

Social Support of Career Choice

What do you want to be when you grow up? The decision concerning what to do with your professional life can be a daunting one. It is a decision that will, in part, define you as a person and your place in society, in many cases can lead to a lifelong commitment, and can impact every other aspect of your life. It is only logical that a decision that large is often made with the guidance of a support system. Most people require some encouragement and support during the process of choosing an occupation or a career path. This is especially true for women who are pursuing or considering a career in a non-traditional field such as STEM. In traditionally male dominated fields where there are few established women, aspiring young women must look elsewhere for guidance and advice about what opportunities are available to them. Often parents, guidance counselors and peers fill this gap by providing resources about careers and offering encouragement and support. In fact, when asked about the sources of influence on their career choices, over a quarter of young women enrolled in a STEM preparation program reported peers were their greatest source of information and influence (Madill, Montgomerie & Stewin, 2000). Family members, guidance counselors and teachers also ranked highly in helping shape career interests. In a recent qualitative study, undergraduate women in science majors frequently reported that support from family and friends played a large role in influencing their choice of major (Madill, Ciccocioppo,

Stewin, Armour & Montgomerie, 2004). Family members, especially parents and siblings, were looked to for guidance and often provided a model for the students' own interests and career choices. One individual reported feeling assured she could succeed in engineering because both her brother and sister had already excelled in their respective engineering programs. Studies have repeatedly shown the significant influence that parental support has on women's selection of non-traditional careers (Auster & Auster, 1981, Fitzpatrick & Silverman, 1989).

However, not everyone has a supportive network of family, friends and teachers to help guide them. In some instances, women who express interest in non-traditional fields may be discouraged by the inherent difficulties that come with being one of the few women in a historically male dominated environment. Early research has shown that female managers in MBA programs receive less career-counseling from their professors than do their male counterparts (Gordon & Strober, 1978). It has been suggested that school and career counselors may still be providing little support and encouragement to women who may want to consider nontraditional occupations, may be misinformed about opportunities for women, and may hold their own biases against women who intend to pursue non-traditional careers (Keierleber & Hansen, 1992).

It is evident that support from family, friends, and teachers can play a large role in the career choice process, and the importance of these factors is clearly evident among women considering non-traditional careers and programs of study. When social influence is positive, it can support persistence toward a career goal; when negative, it can thwart an individual's exposure to new ideas and activities.

Hypotheses

Based on this body of literature and grounded in the gender-socialization approach to work orientation, the present research seeks to better understand how two factors, occupational values and social support, effect women's career decisions. Several hypotheses are put forth below to examine the relationships that exist between these two factors, gender, and career choice.

Hypothesis 1: Consistent with the gender-socialization approach to career choice, men and women will differ significantly in the importance of certain central work-related values. (a) Specifically, men place greater importance than women on the occupational values related to dominance, including a high salary, job security, leadership and independence. (b): Women place greater importance than men on the occupational values related to relationships, including helping others, relationships with co-workers, and maintaining work-life balance.

It is arguable that STEM occupations have a unique set of rewards and foster a certain set of values. People choose STEM careers in part to fulfill or express their work-related values.

Hypothesis 2: Individuals in STEM and non-STEM fields differ significantly in the importance of some central work-related values (high salary, job security, leadership, independence, relationships with co-workers, helping others, work-life balance).

Hypothesis 3: Because STEM careers are a non-traditional choice for women, the amount of support they receive for pursuing a career in STEM will differ from the support others receive. (a) Women pursuing STEM careers will report having received less career choice support than women pursuing non-STEM careers. (b): Women

pursuing STEM careers will report less career choice support than men pursuing STEM careers.

Hypothesis 4: The extent to which an individual has STEM-oriented occupational values (i.e., values similar to other persons in STEM careers) will account for differences in career choice beyond the effects of gender.

Hypothesis 5: Among STEM women, there will be an inverse relationship between having STEM-oriented occupational values and receiving career choice support. That is, women with strong STEM related values will require less social support in order to successfully pursue STEM careers.

Relationship to the ROLE Grant

The Careers and Educational Experiences Survey, which is a retrospective survey designed for telephone administration, was developed for use in a multi-year project funded by the National Science Foundation, entitled "Understanding Factors that Sustain Science, Technology, Engineering, and Mathematics Career Pathways" (award #0337543). The goal of this project was to develop a thorough understanding of how students' careers in science, technology, engineering and mathematics (STEM) are sustained or inhibited during secondary and post-secondary school. This research endeavor included two interrelated studies, the cohort study of STEM career outcomes and the retrospective survey of career attitudes and behaviors.

The cohort study used information collected and maintained by the Florida Department of Education (DOE) to examine the career pathways of several cohorts of Florida high school and college graduates. The aim of this facet of the project was to understand demographic and structural variables associated with outcomes related to

STEM careers. The retrospective survey allowed a more in-depth examination of the social and psychological factors associated with STEM career choice and supplemented the archival data in order to provide a richer understanding of career choice.

Method

Sample Identification

The Florida DOE maintains student-tracking databases that provide an excellent resource for the current study. The Florida Education and Training Placement Information Program (FETPIP) database tracks student outcomes after high school and college for all Florida public high school and college graduates. FETPIP collects data annually, and has been tracking all high school graduating cohorts since 1991. FETPIP records contain important information related to student's outcomes, such as students' further education, placement and employment, and military enlistments. This data set is the only one of its kind in the nation. The post-secondary education information is less complete for earlier FETPIP cohorts. For recent cohorts, college degree status and major is available for all high school graduates, even those who attend college out of state.

Because the FETPIP database contains information on hundreds of thousands of students, a sub-sample was identified for participation in the retrospective survey. Two cohorts of graduates were selected to participate, the first having graduated from a public Florida university in 1997 and the second having graduated in 2003. Relatively recent cohorts of graduates were selected so that respondents would be better able to remember and report their experiences in high school and college, and their career decision making process. However, individuals who graduated very recently were not included because they would not have had time to obtain work experience and settle into a career. These

two cohorts were expected to have had time to obtain a moderate amount of work experience while still able to reflect on school experiences.

Because STEM majors are only a small portion of all college graduates, and women a small portion of STEM majors, women with STEM majors were over-sampled in order to ensure an adequate representation of the population of interest in the final sample. An individual is considered to have earned a STEM degree if they majored in any of the engineering subfields, computer science, mathematics or the physical sciences. Those students who graduated with a degree in anything other than a STEM major were classified as non-STEM.

Limited information was provided by the Florida DOE to assist in the location of the selected individuals. This information included name, gender, race, date and city/state of graduation. With this information, telephone numbers and in some cases addresses were obtained using several web-based search programs (such as privateeye.com).

Participants

There were approximately 3,200 names of Florida college graduates originally selected from the FETPIP database. Valid contact information was gathered for 812 persons, and of that group, 62 individuals were successfully contacted and agree to complete the survey. The final sample of 62 participants was evenly divided by gender. Due to the over-sampling of STEM graduates, 74% of the sample had chosen careers in STEM (n=26 men, 20 women) and 26% were non-STEM (n=5 men, 11 women). Respondents received their degrees between the years 1970 to 2003, with the most common graduation years being 1996 (24%, n=15), 1997 (20%, n=13) and 2003 (23%, n=14). This bimodal distribution reflects the purposeful sampling of two distinct cohorts

of graduates. As for the current employment status of the sample, 84% were currently working (n=52) and 21% were attending school (n=13).

Survey Development

The goal of the survey development was to create an instrument to address a wide range of topics related to STEM career choice as well as topics that cut across disciplinary boundaries. In order to create a survey that represented multiple disciplines and ideologies, research on career decision-making and outcomes conducted by anthropologists, sociologists and psychologists was considered. These perspectives involve different theoretical foundations (person-centered on the psychological side, structural/organizational from the sociological perspective and cultural from the anthropological perspective) and different research methods. However, when integrated, they provide complementary sources of information on career decision-making and STEM careers. Topics addressed in the survey included work centrality and values, social support, obstacles and barriers to educational attainment, role models, academic engagement, and participation in STEM-oriented leisure activities. The focus of the current study, however, was limited to those questions focused on occupational values and social support as they relate to women's STEM career choices (for a complete list of items included on the survey, see Appendix A).

Variables

Occupational values. Seven occupational values were identified for the purposes of this study and included in the survey. These were drawn primarily from the gender-socialization framework and specifically the work of Betz and O'Connell (1989) on gender differences in occupational values. The values included are helping others,

income, autonomy, job security, relationships with co-workers, leadership and work-life balance. Respondents were asked to rate how important each value was to them when choosing a career on a five-point Likert-type scale (1-very unimportant; 5-very important).

Career choice support. Three survey questions addressed the issue of social support for career pursuits: one each for the influence of (1) family, (2) peers, and (3) teachers or counselors respectively. An example of a support question is "To what extent did your family members encourage you to pursue your career choice?" Respondents were asked to indicate the level of encouragement they received on a five-point Likert-type scale (1 - strongly discouraged; 5 - strongly encouraged). Responses to each of the three support questions were summed to obtain an overall support score, ranging from 3 (highly discouraged) to 15 (highly encouraged).

Field of pursuit. This variable represents an individual's career choice, but is limited to the field in which their occupation and/or college degree lies. Respondents were asked to describe their occupation as they would to a layperson. If they were currently enrolled in school, they reported the program of study, degree type, and school in which they were enrolled. These responses were coded into STEM or non-STEM fields by the researcher and a second graduate student. Agreement on STEM or non-STEM occupation type and program of study was 100% between the two coders.

Because approximately one quarter of the sample had recently graduated (2003), there is the potential for some respondents to be in their first jobs, jobs that may not be representative of the careers they intend to pursue (e.g., their first job out after graduation is in retail or customer service but their degree is in Chemistry). For this reason,

respondents were also asked how well their current occupation fit into their chosen career. Individuals who reported a strong fit between their current occupation and career plans were directed to refer to their current occupation in answering the survey questions about career choice. Individuals who reported a weak fit or no fit were directed to think about their college major when answering survey questions about career choice. Of the 62 participants, 42 reported a satisfactory fit between occupation and career. There were no significant differences between these two groups of participants on key study variables (gender, occupational values and career choice support) so they were pooled for the subsequent analyses.

Survey Administration

Participants were located, contacted and surveyed by Westat. This organization was contracted to conduct the data collection over the telephone as part of the parent grant to this study, and has a long history in conducting social science research. Prior to data collection, Westat collaborated with the first author to refine the survey protocol for clarity. A team of Westat interviewers was familiarized with the survey and attended a four-hour training session which was tailored to the specific needs of the study and supervised by the first author. Data collection began November 10, 2006 and continued through January 31, 2007. Westat interviewers began with a list of approximately 800 valid names and telephone numbers, and attempted to contact each participant up to 34 times to maximize the final number of respondents. Each interviewer followed a scripted introduction which included the rights of the respondent to skip questions or to discontinue the survey at any time (for the full introduction and survey instructions, see Appendix A). When the data collection period was over, data preparation staff key

entered all the collected data. Each case was entered twice to ensure accuracy. Westat examined response frequencies to ensure that skip patterns were properly followed and all missing data was properly accounted for (for a complete review of the Westat data collection process, see Appendix B).

Results

To test the first hypothesis that the mean importance of each value will differ between men and women, each value was compared individually between the groups using an independent samples t-test. Means and standard deviations of the importance of each value by gender are detailed in Table 1. Five of the seven occupational values differed significantly between men and women. Men placed more importance than women on salary, $t(60)=2.37$, $p<.05$; and independence, $t(60)=5.84$, $p<.05$. Women more than men valued helping others, $t(60)=-4.33$, $p<.05$; work-life balance, $t(60)=-3.13$, $p<.05$ and relationships with co-workers, $t(60)=-3.27$, $p<.05$. There were no significant gender differences in the importance placed on leadership and job security. These results provide support for hypothesis one.

The second hypothesis addressed the same mean value differences, but between STEM and non-STEM individuals instead of by gender. Each value was compared individually between the groups using an independent samples t-test. Means and standard deviations for the importance of each value by STEM/non-STEM are detailed in Table 1.

Table 1

Means and Standard Deviations of Values by Gender and Degree

Occupational Value	Gender				Degree			
	Men		Women		STEM		Non-STEM	
	M	SD	M	SD	M	SD	M	SD
Salary	4.45	.51	4.00	.63	4.24	.77	4.19	.83
Job security	4.71	.46	4.42	.67	4.65	.53	4.31	.70
Leadership	4.00	.93	3.58	.96	4.00	.82	3.19	1.11
Independence	4.81	.41	3.94	.73	4.50	.69	4.00	.73
Relationships w coworkers	3.83	.90	4.52	.72	4.04	.89	4.56	.73
Work-life balance	4.29	.82	4.84	.52	4.46	.81	4.88	.34
Helping others	3.55	1.03	4.48	.63	3.83	.85	4.56	1.09

Five of the seven occupational values differed significantly by field. STEM individuals placed more importance on independence than non-STEM individuals, $t(60)=2.46$, $p<.05$; on leadership, $t(60)=3.12$, $p<.05$; and on job security, $t(60)=2.03$, $p<.05$. Conversely, non-STEM respondents more than their STEM counterparts valued helping others, $t(60)=-2.74$, $p<.05$; and relationships with co-workers, $t(60)=-2.09$, $p<.05$.There was no significant difference between groups in the importance of work-life balance or salary by career field. These results provide support for hypothesis two.

Hypothesis three compares women in STEM with their female non-STEM counterparts, as well as their male STEM counterparts on the variable of career choice support. As described in the Methods section, the three support items (referencing family, peers and teachers) were summed to generate a support scale to be used in these analyses. Group differences in support were calculated with a series of independent samples t-tests.

Women reported a significantly lower overall level of encouragement for pursing a STEM career than women pursuing a non-STEM, $t(29)=-5.41$, $p<.05$. Women pursuing careers in STEM also reported significantly lower levels of encouragement than did men pursuing a career in STEM, $t(44)=4.99$, $p<.05$. Means and standard deviations for social support by gender and field are in Table 2. These results provide full support for hypothesis three.

Table 2

Means and Standard Deviations of Social Support by Gender and Degree

Source of Support	Gender				Degree			
	Men		Women		STEM		Non-STEM	
	M	SD	M	SD	M	SD	M	SD
Family support	4.10	.83	4.13	1.03	4.04	.99	4.31	.70
Peer support	3.74	.73	3.74	.93	3.59	.83	4.19	.66
School support	3.68	.75	3.81	.79	3.65	.77	4.00	.73

Although no predictions were made about specific sources of support, the relationship between these three sources of support were examined. There was a significant positive correlation between support received from friends and family ($r=.274$, $p<.05$) and friends and school personnel ($r=.616$, $p<.05$). There was no relationship between the amount of support between family and school personnel. Correlational data for social support are in Tables 3.

Table 3

Means, standard deviations, and intercorrelations of sources of support.

Source of Support	Mean	S.D.	N	1	2	3	4
1. Support from family	4.11	.93	62	1			
2. Support from friends	3.74	.83	62	.274*	1		
3. Support from school	3.74	.77	62	.134	.616**	1	
4. Social Support Scale	11.19	2.02	62	.516**	.679**	.553**	1

*Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Hypothesis four examined the extent to which differences in career choice could be accounted for by gender and occupational values. Specifically the question addressed was whether values would improve the prediction of STEM career choice after gender was taken into account. To test this hypothesis, a values index was first computed to create one continuous variable to take into account all relevant occupational values simultaneously. Correlational data for occupational values are presented in Table 4.

Table 4

Means, standard deviation, and intercorrelations of occupational values

Occupational Values	Mean	S.D.	N	1	2	3
1. Gender			62	1	-.293*	-.248
2. Value: salary	4.22	.78	62	-.293*	1	.146
3. Value: job security	4.56	.59	62	-.248	.146	1
4. Value: leadership	3.79	.96	62	-.220	.108	.212
5. Value: independence	4.37	.73	62	-.602**	.023	.229
6. Value: relationships with coworkers	4.18	.88	62	.389**	-.228	-.038
7. Value: helping others	4.02	.97	62	.488**	-.092	.013
8. Value: work-life balance	4.56	.74	62	.374**	-.169	-.104
9. STEM Value Scale	.82	.43	62	-.483**	.157	.389**

*. Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Table 4 (continued)

Means, standard deviation, and intercorrelations of occupational values

Occupational Values	4	5	6	7	8	9
1. Gender	-.220	-.602**	.389**	.488**	.374**	-.483**
2. Value: salary	.108	.023	-.228	-.092	-.169	.157
3. Value: job security	.212	.229	-.038	-.104	-.104	.389**
4. Value: leadership	1	.370**	-.208	-.279*	-.177	.791**
5. Value: independence	.370**	1	-.309*	-.288*	-.243	.444**
6. Value: relationships with coworkers	-.208	-.309	1	.518**	.323*	-.436**
7. Value: helping others	-.279*	-.288*	.518**	1	.309*	-.749**
8. Value: work-life balance	-.177	-.243	.323*	.309*	1	-.312*
9. STEM Value Scale	.791**	.444**	-.436**	-.749**	-.312*	1

*. Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

This values index represented the degree to which an individual possesses STEM-oriented values (that is, values similar to those reported by those in STEM careers on average), and was calculated by regressing all significant values (determined in hypothesis two) on career choice. These values were independence, leadership, job security, helping others, and relationships with co-workers. Independence and relationships with co-workers were subsequently removed from the analysis due to their low beta weights. Due to the low sample size, the alpha level for the regression analyses only was raised to 0.10. All other analyses were conducted using an alpha level of 0.05. The resulting model was significant ($r = .237$, $p<.05$) and the equation for calculating the STEM-oriented values score was 0.256 (leadership) + 0.203 (job security) – 0.267 (helping others). The score on this value index can be interpreted as representing the extent to which an individual possesses typically STEM-oriented occupational values, with higher values indicating a greater degree of STEM-oriented values.

This values index was then used to test the hypothesis that possessing STEM-oriented values will improve prediction of career choice after gender is taken into account. Gender was regressed on career choice, and the resulting model was significant ($r^2 = .049$, $p<.05$). However, when the STEM values index was entered into the model, r^2 rose sharply to .232, $p<.05$, and gender was no longer a significant predictor of career choice, $\beta = -.015$. Additionally, these two variables have a strong inverse relationship with one another ($r = -.483$. $p<.05$). Data for this analysis are in Table 5. These results provide full support for hypothesis four.

Table 5

Regression analyses for occupational values and gender.

	R^2	ΔR^2	B
Model 1	.049*		
Gender			.221*
Model 2	.232*	.183*	
Gender			-.015
STEM Values			-.488*

*Correlation is significant at the 0.10 level (2-tailed).

The fifth and final hypothesis predicted a negative relationship between the degree to which an individual possesses STEM-oriented values and the level of career choice support they received from family, friends and school personnel. This analysis was limited only to STEM women; men and non-STEM women were excluded from the sample (n=20). To test this hypothesis, the STEM-oriented values index (calculated in hypothesis four) was correlated with the career choice support index (calculated for hypothesis three) using the Pearson correlation. A moderate, negative relationship was found, r= -0.441, p<.05. A separate correlation was conducted for men, although no prediction was made about its directionality. No significant relationship between STEM-oriented values and career choice support was found. These results provide support for hypothesis five.

Discussion

Value differences between men and women were significant and in the expected direction. Men valued salary and independence more highly than women, and women valued helping others, maintaining a healthy work-life balance, and developing healthy relationships with colleagues. There were no significant differences in the priority placed on leadership and job security. However, the mean differences in these values indicated that men tended to place a slightly higher value on both leadership and job security. These results support the predictions of Brown's value-based model of career choice, in that gender differences were found in the importance placed on different occupational values. This pattern of results also supports the gender-socialization model of career choice. Men are expected to show preference for competitive or dominance-oriented values, whereas women are predicted to choose interpersonal-oriented values. The current results indicate men placed importance on salary and independence, which are associated with the dominance-orientation. Women valued helping others, maintaining work-life balance and developing relationships with co-workers, all of which can be considered to have an interpersonal-orientation. These results are also congruent with the work values meta-analysis conducted by Betz and O'Connell (1989).

In addition to the gender differences in occupational values, differences between those in STEM and non-STEM were examined. Individuals in STEM fields valued independence, leadership and job security significantly more than individuals in non-STEM fields. Those in non-STEM fields valued helping others and relationships with co-

workers significantly more than their STEM counterparts. There was no significant difference between groups in the importance of work-life balance or salary by career field. However, the mean differences suggest that individuals in STEM value salary slightly more than non-STEM individuals and work-life balance slightly less than non-STEM individuals. There was no prediction made as to the direction of these mean value differences. However, the fact that differences do occur between STEM and non-STEM fields supports the research by Ben-Shem and Avi-Itzhak (1991), who believe that certain occupations will satisfy the values of an individual better than others, and that it is mainly due to this satisfaction of values that a career choice is based.

The pattern of value differences by gender is similar to, but does not mirror, the differences found between STEM and non-STEM individuals. Because of the vast over-representation of men in STEM, a logical assumption would be that male values should parallel STEM values, but this is not the case. Independence was valued significantly higher by both men and STEM individuals, but the similarity ends there. Individuals in STEM also place a significantly higher value on leadership and job security, values that did not distinguish between genders. Men also highly valued salary, which did not discriminate between STEM and non-STEM.

The results for hypothesis four showed that while gender could significantly account for STEM vs. non-STEM career choice, the addition of the STEM values score rendered gender an insignificant predictor of STEM vs. non-STEM career choice. Moreover, the strength of STEM values accounted for approximately a quarter of the variability in career choice, and allowed for better prediction of choosing a STEM career. These results suggest that people with more traditionally STEM values are more likely to

choose STEM careers regardless of gender. This underscores the importance of influences other than gender on career choice. It is not gender, but these value differences which are often associated with gender, that help drive career decisions. While individuals are not in control of their gender, a variety of outside influences and environmental conditions interact with gender to shape the development of occupational values (Keller, et al., 1992; Brown, 1995). These results strengthen the need for continuing study of the under-representation of women in STEM.

With regard to social support for career decisions, results showed that women pursuing STEM careers received significantly less support for their career pursuits than their female non-STEM counterparts received for pursuing non-STEM careers. In addition, STEM women also received less overall social support for their STEM career aspirations than did men for pursuing STEM careers. A closer look at the different sources of support revealed a positive relationship between the amount of support received from friends and family, as well as a positive relationship between that of friends and school personnel. Overall, these results indicate that women who pursue non-traditional careers may be doing so without the support and guidance of friends, family, or the educational system. These results coincide with early evidence that women in STEM are not being supported to the extent that their male counterparts are, such as reports of MBA students receiving differential treatment (Gordon & Strober, 1987), and it seems that the potentially misinformed school counselors may still be falling victim to traditional gender biases and providing antiquated career advice (Keierleber & Hansen, 1992). Encouraging women to enter non-traditional career fields such as STEM is increasing as a national priority, as evidenced by the National Science Foundations

mission to ensure a diverse, well-qualified STEM workforce (www.nsf.gov). If cultivating a diverse workforce and encouraging more women into STEM is truly a priority, then the messages that are being sent to young women need to reflect that.

In order to further the investigation of this differential support given to women, the relationship between support and occupational values was considered specifically for women in STEM fields. Women who scored high on STEM values received less social support than women who possess mainly non-STEM values. Overall, both values and support appear to be important in women's choice of a STEM career, and their influences are somewhat complementary. For women, having more traditionally STEM values may at least partially compensate for a lack of STEM career support. It is possible that, for women, developing a strong set of STEM values may buffer the negative impact of never having received adequate social support, and these values will bolster the ability to persist in a STEM field.

Limitations of the study and implications for future research

There is an ongoing effort to further our understanding of why women choose to enter non-traditional career fields. This study provides the foundation to continue this investigation, with a specific focus on the importance of developing occupational values, and identifying and maintaining a healthy support system of friends, family, and educators. The next steps in this pursuit should reflect diverse methodology and incorporate multiple disciplines. Because occupational values have been shown to strongly influence career decisions, a more detailed examination of these values is warranted. Longitudinal research could address the effects of socialization on the development of values, and identify successful strategies for fostering the development of

these values. For example, if the relationship between the socialization of women and the development of their occupational values were examined, that would allow the design of interventions to positively socialize young women to the benefits of non-traditional careers. In addition, by sampling cohorts of high school and college students in a longitudinal design, it would be possible to gather real-time information about the type and amount of support being offered before, during, and after a career choice is decided upon, and measure the development of their occupational values as the mature during the educational process.

Research in career choice can also benefit from the application of qualitative methods. Collecting life histories or conducting unstructured interviews can reveal a wealth of information that would not otherwise be available, and allows for an in-depth examination of individuals as they navigate their career decisions. Furthermore, with the changing landscape of the workforce and the emergence of the protean career, traditional topics such as career choice are becoming increasingly complex, and new and innovative methods are needed to fully examine these changes (Lee, Mitchell & Sablynski, 1999). Qualitative methodology can serve to fill in the gaps in our knowledge base as the concept of a career continues to develop.

Future research in this area should include larger samples of college graduates. The current sample was limited in size and had an uneven distribution of women by occupation; there were very few non-STEM women due to the vigorous over-sampling of STEM graduates. Additional participants and a more current cohort of college graduates would add to the generalizability of the conclusions that were reached, and allow for a more complex investigation of the relationships between these variables. By including

more recent cohorts of students, issues related to memory, such as the ability of participants to recall past events and decisions can also be improved.

Finally, more robust measures of occupational values should be included. The current survey was limited to one item per value, which constrains the ability to determine the reliability of the items. More detailed scales of occupational values will allow for a more reliable assessment of STEM women. Ultimately, the goal of understanding barriers to women's STEM workforce participation is to use this knowledge to guide the design of interventions that organizations can implement in the recruitment, retention, and advancement of women, and that career counselors can use to help women engage in more vigorous and effective investigation of a STEM career.

List of References

Astin, A., Korn, W., Sax, L., & Mahoney, K. (1994). *The American freshman: National norms for fall 1994.* Los Angeles: Higher Education Research Institute, University of California, Los Angeles.

Auster, C. & Auster, D. (1981). Factors influencing women's choice of nontraditional careers: The role of family, peers, and counselors. *Vocational Guidance Quarterly, 29,* 253-263.

Ben-Shem, I. & Avi-Itzhak, T. (1991). On work values and career choice in freshman students: The case of helping vs. other professions. *Journal of Vocational Behavior, 39*, 369-379.

Betz, N., & Fitzgerald, L. (1987). *The career psychology of women*. San Diego, CA: Academic Press.

Betz, M. & O'Connell, L. 1989. Work orientations of males and females: Exploring the gender socialization approach. *Sociological Inquiry, 59*, 318-330.
Brown, D. (1995). A values-based model for facilitating career transitions. *Career Development Quarterly, 44,* 4-11.

Brown, D. (1996) Brown's values-based, holistic model of career and life-role choices and satisfaction. In D. Brown and L. Brooks, (Eds.), *Career Choice and Development* (3rd ed., pp. 337-372). San Francisco, CA: Jossey-Bass Pubishers.

Brown, D., & Brooks, L. (1990). *Career choice and development: Applying contemporary theories to practice* (2nd ed.). San Francisco, CA: Jossey-Bass.

Brown, D., & Crace, R. (1996). Values in life role choices and outcomes: A conceptual model. *The Career Development Quarterly, 44,* 211-223.

Dawis, R. (1991). Vocational interests, values, and preferences. In M. Dunnette & L. Hough (Eds.), *Handbook of Industrial Organizational Psychology* (Vol. 2, pp. 833-871). Palo Alto, CA: Consulting Psychologists Press.

Dawis, R. & Lofquist, L. (1984). *A psychological theory of work adjustment.* Minneapolis: of Minnesota Press.

Duffy, R., & Sedlacek, W. (2007). The work values of first-year college students: Exploring group differences. *The Career Development Quarterly, 55,* 359-364.

Eisenhart, M. (1996). Contemporary college women's career plans. In P. Dubeck & K. Borman (Eds.), *Women and Work: A Handbook* (pp. 232-235). New York, NY: Garland Publishing, Inc.

Fassinger, R & Asay, P. (2006). Career counseling for women in science, technology, engineering, and mathematics (STEM) fields. In B. Walsh & M. Heppner (Eds.), *Handbook of Career Counseling for Women* (2nd ed., pp. x). Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.

Feather, N. (1992). Values, valences, expectations, and actions. *Journal of Social Issues,48,* 109-124.

Fitzgerald, L., & Crites, J. (1980). Toward a career psychology of women: What do we know? What do we need to know? *Journal of Counseling Psychology, 27,* 44-62.

Fitzpatrick, J & Silverman, T. (1989). Women's selection of careers in engineering: Do traditional - nontraditional differences still exist? *Journal of Vocational Behavior, 34,* 266-278.

Gallos, J. (1989). Exploring women's development: Implications for career theory, practice, and research. In M. Arthur, D. Hall, & B. Lawrence (Eds.), *Handbook of Career Theory* (pp 110-132). New York, NY: Cambridge University Press

Gordon, F. & Strober, M. (1978). Initial observations on a pioneer cohort: 1974 women MBAs. *Sloan Management Review, 19*, 15-23.

Greenhaus, J., Callanan, G., & Godshalk, V. (2000). *Career Management* (3rd ed.). Orlando, FL: The Dryden Press.

Guastello, S., Rieke, M., & Guastello, D. (1992). A study of cynicism, personality, and work values. *Journal of Psychology: Interdisciplinary and Applied, 126*, 37-48.

Gutek, B., & Larwood, L. (1987). Working towards a theory of women's career development. In B. Gutek & L. Larwood (Eds.), *Women's Career Development* (pp. 170-183). Thousand Oaks, CA: Sage Publications, Inc.

Holland, J. (1966). *The psychology of vocational choice: A theory of personality types and model environments*. Oxford, England: Blaisdell.

Janis, I. & Mann, L. (1977). *A psychological analysis of conflict, choice and commitment.* New York: Free Press.

Judge, T. & Bretz, R. (1992). Effects of work values on job choice decisions. *Journal of Applied Psychology, 77,* 261-271.

Keierleber, D., & Hansen, L. (1992). A coming of age: Addressing the career development needs of adult students in University settings. In D. Lea, & Z.

Leibowitz (Eds.), *Adult Career Development* (pp. 312-339). Alexandria, VA: National Career Development Association.

Knoop, R. (1994). Work values and job satisfaction. *Journal of Psychology: Interdisciplinary and Applied, 128*, 683-690.

Lee, T., Mitchell, T., & Sablynski, C. (1999). Qualitative research in organizational and vocational psychology, 1979-1999. *Journal of Vocational Behavior, 55,* 161-187.

Lightbody, P., Siann, G., Tait, L., & Walsh, D. (1997). A fulfilling career? Factors which influence women's choice of profession. *Educational Studies, 23,* 25-37.

Madill, H., Montgomerie, T., & Stewin, L. (2000). Young women's work values and role salience in grade 11: Are there changes three years later? *The Career Development Quarterly, 49*, 16-28.

Madill, H., Ciccocioppo, A., Stewin, L., Armour, M. & Montgomerie, T. (2004). The potential to develop a career in science: Young women's issues and their implications for careers guidance initiatives. *International Journal for the Advancement of Counseling, 26,* 1-19.

National Science Board. (2000). *Science and engineering indicators.* Arlington, VA. National Science Foundation, Division of Science Resources Statistics, *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2007*, NSF 07-315 (Arlington,VA; February 2007).

O'Connell, L., & Betz, M. (1996). Gender differences in work interests. In P. Dubeck & K. Borman (Eds.), *Women and Work: A Handbook*. New York, NY: Garland Publishing, Inc.

Powell, G., & Mainiero, L. (1992). Cross-currents in the river of time: Conceptualizing the complexities of women's careers. *Journal of Management, 18,* 215-237.

Sager, C. (1999). Occupational interests and values. In N. Peterson, M. Mumford, W. Borman, P. Jeanneret & E. Fleishman (Eds.), *An Occupational System for the 21st Century: The Development of O*NET.* Washington, DC: American Psychological Association.

Schulenberg, J., Vondracek, F., & Kim, J. (1993). Career certainty and short-term changes in work values during adolescence. *Career Development Quarterly, 41,* 268-284.

Shaw, T. & Duys, D. (2005). Work values of mortuary science students. *Career Development Quarterly, 53*, 348-352.

Statham, A. (1987). The gender model revisited: Differences in the management styles of men and women. *Sex Roles*, *16,* 409–429.

Stockard, J., & McGee, J. (1990). Children's occupational preferences: The influence of sex and perceptions of occupational characteristics. *Journal of Vocational Behavior, 36,* 287-303.

Super, D. (1957). *The Psychology of Careers.* New York: Harper & Row.

Super, D., Savickas, M., & Super, C. (1996). The life-span, life-space approach to careers. In D. Brown and Brooks, L. (Eds.), *Career Choice and Development* (3rd ed., pp. 337-372). San Francisco, CA: Jossey-Bass Pubishers.

Vroom, V. (1964). *Work and Motivation.* New York: Wiley.

White, M., Kruczek, T., Brown, M., & White, G. (1989). Occupational sex stereotypes among college students. *Journal of Vocational Behavior, 34,* 289-298.

Appendix A: *Careers and Educational Experiences* Survey Protocol

Appendix A

CAREERS IN SCIENCE (8271)
QUESTIONNAIRE

ID: |___|___|___|___|

INTRODUCTION: Hello, may I speak with [**RESPONDENT NAME**]?

[**IF NOT AVAILABLE, ASK**]: When would be a good time to reach [**RESPONDENT**]? **RECORD BEST DAY AND TIME ON CALL RECORD.**

IF SOMEONE OTHER THAN RESPONDENT ASKS REASON FOR CALL:
My name is [**INTERVIEWER NAME**]. I'm calling from Westat, a survey research company located in Rockville, Maryland. We are conducting a study for a research team at the University of South Florida about the career choices of college graduates.

IF RESPONDENT IS AVAILABLE:
Hello, my name is [INTERVIEWER NAME] and I'm calling from Westat, a survey research company in Rockville, Maryland. We are conducting a study for a research team at the University of South Florida. The purpose of the research is to find out more about what influences the career choices of college graduates. You were carefully selected to participate in this study because of the unique insight you can provide to us.

INFORMED CONSENT:
In order to protect your confidentiality, there are some things I have to tell you before the interview begins. First, your participation in the interview is voluntary and poses no risk to you. You may refuse to answer any question. You may stop your participation at any time. If you agree to participate, all of your responses will be kept confidential, and no one outside of the research team will have access to your responses.

Should you have any questions about this interview or your rights as a participant, please feel free to contact Heather Meikle, the University of South Florida project director, 813-974-4082. This is not a toll-free call.

This interview should take approximately 20 minutes.

CONSENT:

May I continue with the interview?

a. YES ……..01
b. NO ……..02 [**THANK AND END**]
c. CB ……..03 [**SCHEDULE CB**]

Q1. First, I'd like to check some information with you. According to our records, you earned a bachelor's degree from a public institution. Is that correct?

a. YES 01
b. NO 02
c. REFUSED 98
d. DON'T KNOW 99

Q2. What degree did you earn?

[SPECIFY]: _____

Q3. From what school did you earn the degree?

[SPECIFY]: _____

Q4. In what program was the degree earned?

[SPECIFY]: _____

Q5. In what year was the degree earned?

[SPECIFY]: _____

Q6. Have you earned any other post-secondary degrees, such as a master's degree or other graduate degree?

a. YES 01
b. NO ..... 02 **[GO TO Q9]**
c. REFUSED ..... 98 **[GO TO Q9]**
d. DON'T KNOW ..... 99 **[GO TO Q9]**

Q7. What are they?

[SPECIFY]: _____

Q8. From what school did you earn **{it/them}**?

[SPECIFY]: _____

Q9. Are you currently enrolled in school?

a. YES 01
b. NO ..... 02 **[GO TO Q13]**
c. REFUSED ..... 98 **[GO TO Q13]**
d. DON'T KNOW ..... 99 **[GO TO Q13]**

Q10. What is the name of the school?
[SPECIFY]: _____

Q11. What degree are you working towards?

[SPECIFY]: _____

Q12. Are you enrolled full-time or part-time?

[SPECIFY]: _____

Q13. Are you currently employed?

a. YES 01
b. NO 02
[GO TO Q18 INTRO]
c. REFUSED 98
[GO TO Q18 INTRO]
d. DON'T KNOW 99
[GO TO Q18 INTRO]

Q14. Are you employed full-time or part-time?

a. FULL-TIME 01
b. PART-TIME 02
c. REFUSED 98
d. DON'T KNOW 99

Q15. What is your occupation? Please describe your job as you would to a layperson.

[SPECIFY]: _____

Q16 INTRO:
Now I would like to ask you a few questions about your attitudes towards your job.

Q16. Overall, how satisfied are you with your current job? Would you say you are…

a. Very satisfied, ... 01
b. Somewhat satisfied, ... 02
c. Neither satisfied nor dissatisfied, ... 03
d. Somewhat dissatisfied, or 04
e. Very dissatisfied? 05
f. REFUSED 98
g. DON'T KNOW 99

Q17. How important is your job to who you are? Would you say it is…

a. Very important, ... 01
b. Somewhat important, ... 02
c. Neither important nor unimportant, ... 03
d. Somewhat unimportant, or 04
e. Very unimportant? 05
f. REFUSED 98
g. DON'T KNOW 99

Appendix A (Continued)

Q18 INTRO:
I am going to read a list of factors someone might consider in choosing a career. Please tell me whether each factor is very important, somewhat important, neither important nor unimportant, somewhat unimportant, or very unimportant. How important to you in choosing a career is……

		Very Important	Somewhat Important	Neither Important Nor Unimportant	Somewhat Unimportant	Very Unimportant	RF	DK
Q1	Helping others?	01	02	03	04	05	98	99
Q1	A challenging or intellectually stimulating environment?	01	02	03	04	05	98	99
Q20.	(How important to you in choosing a career is) A high salary?....	01	02	03	04	05	98	99
Q21.	Independence?	01	02	03	04	05	98	99
Q22.	Recognition? ..	01	02	03	04	05	98	99
Q23.	Job security? ..	01	02	03	04	05	98	99
Q24.	Adventure?.....	01	02	03	04	05	98	99
Q25.	(How important to you in choosing a career is) Interpersonal relations with coworkers?.....	01	02	03	04	05	98	99
Q26.	Leadership opprotunities?	01	02	03	04	05	98	99

Q27. The ability to balance your job and family responsibilities?	01	02	03	04	05	98	99

Q28 INTRO:
Next I have some questions about the pursuit of your career goals.

[IF Q13 = NO, GO TO Q29 AND USE "COLLEGE MAJOR" IN Q29 THROUGH Q48 AND Q52 THROUGH Q60]

Q28. Consider your career goals, and the job you would ultimately like to hold. How does your current occupation fit on the path to achieving this goal? Would you say…

a. You are in your goal career already, ... 01
b. It fits very well, ... 02
c. It fits somewhat well, ... 03
d. It does not fit very well, or 04
e. It does not fit at all? 05
f. REFUSED 98
g. DON'T KNOW 99

[IF Q28 = A, B, OR C, USE "CURRENT CAREER" IN SUBSEQUENT QUESTIONS.

IF Q28 = D OR E, OR IF Q13 = B, USE "COLLEGE MAJOR." THIS APPLIES TO Q29 THROUGH Q48 AND Q52 THROUGH Q60]

Q29. When you decided on your {college major/current career}, how accurate was your expectation of what would be involved? Would you say your expectation was…

a. Very accurate, ... 01
b. Somewhat accurate, ... 02
c. Neither accurate nor inaccurate, ... 03
d. Somewhat inaccurate, or 04
e. Very inaccurate? 05
f. REFUSED 98
g. DON'T KNOW 99

Q30. To what extent did your <u>parents or immediate family members</u> encourage you to pursue your {college major/current career}? Did they…

a. Encourage you a lot,..... 01
b. Encourage you somewhat,..... 02
c. Neither encourage nor discourage you, ... 03
d. Discourage you somewhat, or..... 04
e. Discourage you a lot?..... 05
f. REFUSED 98
g. DON'T KNOW 99

Q31. To what extent did your <u>peers</u> encourage you to pursue your {college major/current career}? Did they…

a. Encourage you a lot,..... 01
b. Encourage you somewhat,..... 02
c. Neither encourage nor discourage you, ... 03
d. Discourage you somewhat, or..... 04
e. Discourage you a lot?..... 05
f. REFUSED 98
g. DON'T KNOW 99

Q32. To what extent did your <u>teachers or other school personnel</u> encourage you to pursue your {college major/current career}? Did they…

a. Encourage you a lot,..... 01
b. Encourage you somewhat,..... 02
c. Neither encourage nor discourage you, ... 03
d. Discourage you somewhat, or..... 04
e. Discourage you a lot?..... 05
f. REFUSED 98

g. DON'T KNOW 99

Q33 INTRO:
These next questions are about things that may have affected you as you pursued your {college major/current career}**.** First, I am going to read a list of obstacles that you may have faced.

		Yes	No	RF	DK
Q33.	Did you experience financial constraints?.....	01	02	98	99
Q34.	(Did you experience) A lack of social support?.....	01	02	98	99
Q35.	(Did you experience) Work that was too challenging?.....	01	02	98	99
Q36.	(Did you experience) A lack of the guidance and information you needed to progress?	01	02	98	99
Q37.	(Did you experience) Discrimination based on your race?.....	01	02	98	99
Q38.	(Did you experience) Discrimination based on your gender?.....	01	02	98	99
Q39.	**[College Major Only]** (Did you experience) Not enough time to go to class?	01	02	98	99

Q40. Where there other obstacles you faced in pursuing your {college major/current career}?

[SPECIFY]: _____

Q41 INTRO:
The next questions are about the kinds of support you may have received in pursuing your {college major/current career}?

		Yes	No	RF	DK
Q41.	Did you receive financial support from public sponsors such as grants or scholarships?.....	01	02	98	99
Q42.	Did you receive financial support from private sponsors such as family members?.....	01	02	98	99
Q43.	Did you receive social support and encouragement?.....	01	02	98	99
Q44.	Did you receive support such as formal mentoring or apprenticeships?.....	01	02	98	99
Q45.	Did you participate in study groups or receive academic assistance?	01	02	98	99
Q46.	Did you receive academic or career counseling?.....	01	02	98	99

Q47. Did you receive other kinds of support while pursing your {college major/current career}?

[SPECIFY]: _____

Q48. People can be important examples and provide inspiration in career decisions. How important were role models and mentors in your choice of {college major/current career}? Were they…

a. Very important, ... 01
b. Somewhat important,..... 02
c. Neither important nor unimportant,..... 03
d. Somewhat unimportant,..... 04
e. Very unimportant, or..... 05
f. Did you not have a role model or mentor? 06

[GO TO Q50]

g. REFUSED 98

[GO TO Q50

h. DON'T KNOW 99

[GO TO Q50

Q49. What was your relationship to this role model or mentor? Were they…

a. A member of your family,..... 01
b. A peer, ... 02
c. A teacher or guidance counselor,..... 03
d. A member of your community,..... 04
e. Someone in a formal mentoring program, ... 05
f. Someone famous, or 06
g. Someone else?..... 07

[SOMEONE ELSE SPECIFY]:_____

h. REFUSED 98
i. DON'T KNOW 99

Q50. How would you describe your science classes in high school? Were they

a. Highly engaging,..... 01
b. Somewhat engaging,..... 02
c. Neither engaging nor boring, ... 03
d. Somewhat boring, or 04
e. Extremely boring?..... 05
f. REFUSED 98
g. DON'T KNOW 99

Q51. How would you describe your math classes in high school? Were they…

a. Highly engaging,..... 01

b. Somewhat engaging, ... 02
c. Neither engaging nor boring, ... 03
d. Somewhat boring, or 04
e. Extremely boring? 05
f. REFUSED 98
g. DON'T KNOW 99

Q52 INTRO:
I have just a few more questions, and these are about activities that may be related to your {college major/current career} that you may have participated in when you were younger.

		Yes	No	RF	DK
Q52	Did you participate in science or technology fairs?	01	02	98	99
Q53.	(Did you participate in) Science clubs, teams, or honor societies?	01	02	98	99
Q54.	(Did you participate in) Math clubs, teams, or honor societies?	01	02	98	99
Q55.	(Did you participate in) Technology-oriented programs (such as A/V club)?	01	02	98	99
Q56.	(Did you participate in) Summer camps?	01	02	98	99
Q57.	(Did you participate in) Volunteer organizations?	01	02	98	99
Q58.	Did you subscribe to any science or technology magazines?	01	02	98	99
Q59.	(Did you) Work on any home science or technology kits such as chemistry or model building?	01	02	98	99
Q60.	(Did you) Take trips to "hands-on" museums or displays of science, math or technology applications?	01	02	98	99

Q61. Are there any <u>other</u> science, technology, or math related hobbies or activities you participated in while growing up?

[SPECIFY]: _____

Q62. How frequently did you participate in any science, technology or math related hobbies or activities when you were growing up? Was it…

a. Very frequently, ... 01
b. Somewhat frequently, ... 02

c. Neither frequently nor infrequently, ... 03
d. Somewhat infrequently, ... 04
e. Very infrequently, or 05
f. Never? 06
f. REFUSED 98

g. DON'T KNOW 99

That's all the questions I have. The information you have provided is valuable and I appreciate your time. If you have questions, please call Heather Meikle at 813-974-4082. Thank you.

Appendix B: Westat Interview Administration Report

Appendix B

Careers in Science Study Telephone Survey Methods

Final Report

February, 2007

Prepared for:

University of South Florida
Alliance for Applied Research in Education and Anthropology
Tampa, Florida

Prepared by:

WESTAT
Rockville, Maryland

Project Overview

High schools and universities in the United States are not producing sufficient numbers of students who pursue and persist in science, technology, engineering, and mathematics (STEM) careers to keep up with demand in those fields. Under a grant from the National Science Foundation, the University of South Florida (USF) is working to understand how student career aspirations in STEM fields are either nourished or inhibited during high school and college. The project involves an extensive literature review, a cohort study of STEM career outcomes (examining the career paths of 82,000 1993/94 Florida high school graduates) and a retrospective study of STEM career outcomes, conducted with graduates of Florida post-secondary institutions who pursued majors in science, technology, engineering, or mathematics.

The purpose of the retrospective study, called the Careers in Science Study, is to provide a better understanding of influences on students' choice or avoidance of STEM fields. It also examines whether different factors enhance or impede participation in STEM education and occupations. The findings will help provide a foundation for new policies concerning classroom, school, college, employer and societal supports likely to increase motivation and opportunities to participate in STEM. Under a subcontract to USF, Westat conducted telephone data collection for the Careers in Science Study.[1]

This methods report summarizes the results of the telephone data collection effort. The report is organized into the following areas:

- **Questionnaire design**
- **Sample design**
- **Interviewer training**
- **Data collection**
- **Data collection results and response rates**
- **Data preparation and delivery**

Questionnaire Design

The Careers in Science Study questionnaire asked about respondents' high school, college, and work experiences, including what kinds of extracurricular activities they participated in while in high school, what kinds of support (or lack thereof) they received while in college, and what factors they consider when choosing their career. It also asked who has influenced them in their decision-making and their level of interest in math and science subjects.

The initial questionnaire was designed for unstructured in-depth qualitative interviews. It contained mostly open-ended items and no interviewer script. The Westat and USF

[1] This study was approved by the Westat Institutional Review Board on April 25, 2006 under expedited authority.

teams worked together to shape the questionnaire into an instrument suitable for telephone interview administration. Table 1 lists the changes that were made to the original questionnaire and provides examples of some of them.

Table 1. Changes made to the original Careers in Science Study questionnaire

Type of questionnaire revision	Example
Reduced the number of open-ended items	
Developed introductory language at the beginning of the questionnaire and scripted statements throughout the questionnaire that helped segue from one section to the next	
Inserted likert-type scales where appropriate	**Original item** Do you feel your parents or other family members played a major role in your career decisions? How so? **Revised item** To what extent did your parents or immediate family members encourage you to pursue your {college major/current career}? Did they encourage you a lot, encourage you somewhat, neither encourage nor discourage you, discourage you somewhat, or discourage you a lot?
Created preset response lists for selected items (with an "other specify" option at the end of each list)	**Initial item** Did you participate in any science or math related extracurricular activities either at school or in the community? What were they? **Revised items** Did you participate in science or technology fairs? Science clubs, science teams, or science honor societies? Math clubs, math teams, or math honor societies? Technology-oriented programs (such as A/V club)? Summer camps? Volunteer organizations? Did you subscribe to any science or technology magazines? Work on any home science or technology kits such as chemistry or model building? Take trips to "hands-on" museums or displays of science, math or technology applications? Are there any other science, technology, or math related hobbies or activities you participated in while you were growing up?
Clustered items together by topic	**Questionnaire topic areas** • Post-secondary education information (number and type of degrees, schools at which the degrees were earned) • Current enrollment and employment status, including type of program enrolled in and/or type of job held • Job attitudes • Factors influencing pursuit of educational and career goals • Obstacles to and support for educational and career goals • Interest and participation in science- and math-related classes and activities

Updated selected items with clearer explanations and simplified wording	**Initial item** Briefly describe your primary job duties. **Revised item** What is your occupation? Please describe your job as you would to a layperson.

After the Westat and USF team agreed on a final set of items, Westat converted the questionnaire into a format suitable for paper-and-pencil telephone administration. This means the questions and scripts had to be organized in such a way that interviewers could move through the survey instrument quickly and naturally. This phase of questionnaire development included formatting the response options with space for indicating which the respondent had chosen, adding the unread response options of "refused" and "don't know," and creating simple skip pattern instructions. A contact script and informed consent language at the beginning of the questionnaire completed the instrument.

Sample Design

Careers in Science Study respondents were randomly selected from a list of students who graduated from the Florida state university system within the past 6 years. USF received from the Florida Department of Education a list of 3,200 sample members, which included first and last name, along with a few demographic variables (e.g., date of birth, race, and gender). The USF research team, in turn, used internet search engines (e.g., PrivateEye.com and Intelius on Bigfoot.com) to look up addresses and phone numbers for the sample members. Among the 3,200 sample members, USF identified a total of 164 phone numbers at which they were able to reach someone with the sample member's name and 309 addresses without phone numbers. In some cases, multiple addresses were found for one sample member. USF provided the 473 names to Westat in two waves.

USF delivered the Wave 1 list prior to the start of data collection. It consisted of 365 names, 84 with phone numbers and addresses and 281 with addresses but no phone numbers. Once the file was received, Westat performed some cleaning activities on it, including deleting duplicates and parsing contact information from one column into four columns (street address, city, state, and zip) for loading into the sample tracking system. Westat then used a subscription internet service for telephone look up to verify or identify additional phone numbers for 77 of the 84[2] and find phone numbers for 181 of the 281.

USF provided the Wave 2 list about halfway through data collection. This list contained 28 names with phone numbers but no addresses and 80 names with addresses but no phone numbers (for a total of 108). After cleaning and performing a telephone look up on these cases, a list containing 81 cases with phone numbers was released for calling. The total sample size for the Careers in Science Study was 339. Table 2 depicts the steps taken during sampling and the sample size at each.

[2] Seven phone numbers had to be deleted from the sample because they had no area code and the accompanying address information was not reliable or complete enough to deduce the correct area code. The possibility that these numbers could be for cell phones further hindered efforts to assign a correct area code.

Table 2. Sample size at each sampling step

Step	Sample Size
USF receives from FLDOE sample list without contact information	3,200
USF identifies contact information	473
Phone (with or without address)	164
No phone (address only)	309
Westat identifies phone numbers	339
Wave 1	258
Wave 2	81

Interviewer Training

On November 9, 2006, Westat conducted a four-hour interviewer training with 6 experienced interviewers. A training agenda appears in Exhibit 1.

Appendix B (Continued)

Exhibit 1. Careers in Science Study Training Agenda

Topic	Time	Lecturer
1. Introduction/Background……	6:00pm to 6:15pm	Project Director
2. Voice Quality Demonstration…….	6:10pm to 6: 40pm	Operations Manager
3. Frequently Asked Questions……	6:40pm to 6:50pm	Group participation
4. Call Record……	6:50pm to 6:55pm	Group participation
5. Response Code List……	6:55pm to 7:00pm	Group participation
6. Toll-Free Number/Inbound Calls…..	7:00pm to 7:05pm	Operations Manager
7. Answering Machine Message……....	7:05pm to 7:10pm	Operations Manager
8. Non-Interview Report Form……	7:10pm to 7:15pm	Operations Manager
9. Avoiding Refusals……	7:30pm to 7:40pm	Operations Manager
10. Contact Role Plays……..	7:00pm to 7:15pm	Operations Manager
11. Question by Question Review…….	7:15pm to 7:55pm	Project Director
BREAK ------- 15 minutes		
12. Interactive 1……..….	8:10pm to 8:30pm	Group participation
13. Interactive 2 ……..……	8:30pm to 8:45pm	Group participation

14. Interactive 3 ……..…… participation	8:45pm to 9:00pm	Group
15. Roleplay 1 …… participation	9:00pm to 9:30pm	Group
16. Roleplay 2……. participation	9:30pm to 10:00pm	Group

Data Collection

Data collection began on November 10, 2006 and ended on January 31, 2007. The original 8-week field period was extended by 4 weeks. Shortly after data collection began, Westat noticed that a high number of sample members were refusing or hanging up before interviewers could finish explaining the purposes of the study. To alleviate this problem, Westat shortened the study introduction. Exhibit 2 shows the initial and revised study introduction wording. Refusal conversion efforts began on November 17, 2006. This is a procedure where highly experienced interviewers call back respondents who initially refused to participate, further explain the importance of the study and seek participation.

Exhibit 2. Original and revised Careers in Science Study questionnaire introduction

Original

Hello, my name is [INTERVIEWER NAME] and I'm calling from Westat, a survey research company in Rockville, Maryland. We are conducting a study for a research team at the University of South Florida. The purpose of the research is to find out more about what influences the career choices of college graduates. You were carefully selected to participate in this study because of the unique insight you can provide to us.

Revised

Hello, my name is [INTERVIEWER NAME] and on behalf of the University of South Florida. Through a grant from the National Science Foundation, we are conducting research about the career choices of college graduates.

Supervisors regularly monitored interviewer performance during data collection. Monitoring sessions lasted a minimum of 10 minutes and interviewers were provided with feedback on their performance and pointers for improvement, if needed. Approximately 10 percent of cases were monitored.

Data collection results and response rates

Of the 339 sampled respondents for whom USF and Westat were able to obtain contact information, 62 completed an interview. Table 2 shows the outcome or disposition of each case.

Table 2. Number of cases assigned to each final disposition category

Final disposition	Number of cases
Complete (C)	62
Language problem -- interview cannot be conducted in English (LP)	2
Non-response – human or answering machine contact made (MC, NM)	50
Non-response – no contact ever made (NA, NC)	7
Non-response – sample member is deceased (ND)	2
Sample member cannot be located (NL)	115
Sample member is not available during the field period (NP)	1
Non-working telephone number (NW)	45
Refusal (RB)	55
Total	**339**

Response rates were calculated using the Council of American Survey Research Organizations (CASRO) response rate calculation guidelines, published in 1982. Survey disposition codes are central to the calculation of response rates because they help establish a case's eligibility. For cases where eligibility is unknown, CASRO recommends distributing them between eligible and ineligible respondents in the same proportion as those of known eligibility are distributed. Following these guidelines the Careers in Science Study final disposition codes were distributed across four categories – eligible respondents, eligible nonrespondents, unknown, and ineligible – as presented below.

- Eligible respondents (ER) – C (62)
- Eligible nonrespondents (ENR) -- MC, NA, NC, NM, RB (112)
- Unknown (UNK) -- NL, NW (160)
- Ineligible (IE) = ND, NP, LP (5)

Westat then calculated the proportion of eligible respondents and eligible nonrespondents among the population of known eligibility using the following formula:

ER+ENR/ER+ENR+IE

The results of this calculation showed that 97.2 percent of cases were known to be eligible and 2.8 percent were known to be ineligible. This proportion was then applied to the unknown cases and the result (156 assigned to the eligible nonrespondent category and 4 assigned to the ineligible category) added back into the ER and ENR cases. The response rate formula is:

ER / ER + ENR + UNK cases assigned to ENR category

Appendix B (Continued)

Applying this formula, the response rate is 23 percent.

Data preparation and delivery

At the conclusion of data collection, all cases were closed out with the assignment of a final disposition code. Data preparation staff key entered all the collected data. Each case was keyed twice to ensure accuracy. Westat produced a frequency on the keyed dataset and conducted a frequency review to ensure that all skip patterns were properly followed and all missing data properly accounted for. The frequency review included the following steps:

Appendix B (Continued)

1. Check that responses fell within the allowable range for each question.
2. Verify that the relationships of responses across individual questionnaires were logical.
3. Ensure that the data accurately reflected the instrument's skip patterns.

A few data updates were made as a result of this review. For example, some open-ended responses were coded into an appropriate preset response category and a few missing responses were filled based on other information in the questionnaire. After the frequency review and data updates, the final dataset was provided to USF February 21, 2007 in SPSS format, along with frequencies and a content listing.