Information Technology Career Decision Making: Validating Models of Self-Authorship in Middle and High School Students Enrolled in Upward Bound and Talent Search Programs in Rural Appalachia

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ABSTRACT

Information Technology (IT) jobs are in demand in the United States and rural Appalachian communities are attracting IT businesses. The need to fill IT jobs creates a workforce opportunity for these communities where students have limited access to academic and career resources. The Upward Bound and Talent Search programs respond to the academic and career needs of disadvantaged students and aim to educate students about high skills jobs but little is known about interest in IT careers among middle and high school students in rural Appalachia. This study validates models of IT career interest and parental support of IT careers in girls and boys enrolled in Upward Bound or Talent Search in rural communities in Virginia using the theoretical framework of self-authorship. The theory of self-authorship explores the development of meaning-making in individuals and offers a context-specific way to study interest in IT careers. Results indicate interest in IT careers but the path to IT career interest is different among girls and boys. Girls are relying on others for career advice more often than boys and there is direct association between the information sources and interest in IT careers. Parental support is important in IT career interest for both girls and boys. Other important variables indicating an interest in IT careers are computer use and positive attitudes toward IT workers. Receiving information from sources such as parents, teachers, counselors, and friends is especially important to girls. Findings from this study can be used to inform practices and policies for Upward Bound and Talent Search.

Dedication

This dissertation is dedicated to my parents Rick and Joye. From a young age they valued education, spent lots of time ensuring that I had the opportunity to learn, and instilled in me a love of working and thinking. Their parenting style provided the perfect amount of support and direction while giving me independence to make both good and bad decisions.

Although reading was a challenge for my younger self, my parents invested many (unpleasant) hours helping me learn. My dad gave me my first "job" when I was much too young to work but he understood my need to think. I am also privileged to have a mom who always encouraged me to set high goals and never give up. She modeled this advice by returning to school as a working adult with three children while beating cancer. There are not words to describe how lucky that I am to have these two as parents!

Knock-Out Tobacco Project team. In addition, I am thankful for my classmates and other faculty members in the Human Development department who encouraged and supported me through this process.

I recognize the valuable support from my family and close friends. Without these special people I would not have such a blessed and fun journey through life. I am especially thankful for my parents and brothers who have always believed in me.

In conclusion, I am thankful for my belief in God and his guidance through this process.

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Chapter 1

INTRODUCTION

In today's society, middle and high school students are expected to begin their career development process while in school. Yet students in rural Appalachia have limited access to academic and career resources (Ali & Saunders, 2008) and are shaped by the belief systems of their role models (Meszaros, Lee, & Laughlin, 2007). Parents are often the most influential source of career information and support for middle and high school students (Buikstra, Eley, & Hindmarsh, 2007; Creamer, Lee, & Meszaros, 2007; Ferry, 2006; Griffin, Huthins, & Meece, 2011; Keller & Whiston, 2008; Meszaros, Creamer, & Lee, 2009; Meszaros & Lane, 2010; Meszaros et al., 2007). However, family support may be biased if parents are unaware of the actual job opportunities that will be available for their children or have limited experience with the educational process. The Upward Bound and Talent Search programs in these communities fill a real need and provide vital support for disadvantaged students to focus on career and college opportunities. The goal of these programs is to prepare the future generations of workers for the global and technology-driven workforce (Campbell, 2010; McElroy & Armesto, 1998). This goal is especially important for students who grow up in rural Appalachian communities in which gendered messages strongly influence appropriate careers for men and women (Tang & Russ, 2007).

The Manpower's 2012 Talent Shortage Survey reported that United States (U.S.) employers indicate information technology (IT) jobs are one of the top three most difficult positions to fill. In a publication for the U.S. Bureau of Labor Statistics, Cover and colleagues (2011) estimated that approximately 8.65 million jobs in STEM (Science, Technology, Engineering, and Mathematics) will be available in the near future and approximately 404,000 of those jobs will be in Virginia. The majority (71%) of the STEM jobs will be in computing. The

Virginia Labor Market Information (2013) website estimates at least an additional 2,900 jobs will be available in computer and mathematics in the Southwestern Virginia, New River/Mt. Rogers, and West Piedmont workforce regions in Virginia. IT jobs are defined as "professional careers that are computer driven including those that involve web design and development, and hardware and software engineering, but exclude data processing" (Creamer et al., 2007, p. 16). The U.S. workforce currently faces high unemployment, job outsourcing, and international recruitment to fill IT positions. Individuals need to gain the skills to work in the jobs that are available (Gordon, 2009).

The need for a workforce with relevant IT skill sets is critical but these types of IT jobs are not traditional and may not be well known among students, nor supported by parents in Appalachian communities. Because parents are the primary source of career information for students, understanding the role of parental support and interest in IT career options is vital. When compared to boys, girls need more support to choose nontraditional career fields such as IT (Meszaros et al., 2007). Girls are less interested in IT and are less likely to pursue an IT career after talking to parents, teachers, and counselors (Meszaros et al., 2007). Women often receive gender stereotyped messages about IT jobs and are discouraged from pursuing such positions. Interest in an IT career is also impacted by other information processing variables (decision orientation, receptivity to career information, information credibility and information source) and computer-related variables (computer use and positive attitudes toward IT workers).

The expansion of IT jobs in rural Appalachia creates a workforce opportunity that is important for the students who plan to remain in their communities upon graduation. Remaining close to home and in the community is often preferred and expected in Appalachian communities because of the high value placed on family, isolation from mainstream culture, and distrust of the

education and government system (Chenoweth & Galliher, 2004; Elam, 2002; Tang & Russ, 2007). These common cultural values can create difficulty for programs that focus on teaching youth about jobs that are nontraditional or require students to put their own goals ahead of family responsibility. Parents in Appalachian communities are distrustful of the schools' goals and are often in conflict with the educational mission of the schools regarding the future of their children (Tang & Russ, 2007).

The Appalachian region is characterized as disadvantaged because of the high rates of poverty and unemployment, family incomes well below the national average, lack of educated adults, and limited financial resources to support public schools and community infrastructure (Alliance, 2010; Chenoweth & Galliher, 2004). The development of education in the Appalachian region, or lack thereof, has been strongly influenced by the characteristics of the culture. Specifically, the high rate of poverty has shaped the level of educational attainment in Appalachia (Elam, 2002). The persistence and acceptance of poverty creates an ongoing cycle that is passed down to the next generation (Chenoweth & Galliher, 2004; Elam, 2002).

In addition, the people of the Appalachian region are commonly stereotyped negatively. The persistent stereotypes and the geographic and social isolation of the communities in the region make it more difficult for outsiders to access the population and for insiders to leave the comfort and support of similar others. Chenoweth and Galliher (2004) identified three concepts that commonly characterize the Appalachian culture including localism, historicism, and familism. Localism suggests that people usually stay in their community to live, work, and have families. Historicism is the sense of one's place in the family and region, and familism refers to a strong bond among family relationships.

Despite the disadvantages facing students in rural Appalachia and other negative impacts of being considered high-risk, these students have career aspirations similar to students in other geographical areas but may prefer to remain close to home. Parents are the major and often only source of career information (Tang & Russ, 2007) and they often introduce their children to jobs that family members hold or to careers that are gender-specific. The breath of job exposure for Appalachian students is also limited because of the low level of educated adults in the communities and the lack of diversity in the types of jobs available.

Information on high-risk students in Appalachia has often been authored through a deficit perspective and fails to capture the strengths of these students in light of the constraints they experience. For example, it is possible that high-risk students enrolled in college preparation programs have started making decisions about their future career interests and are committed to using the support offered through the Upward Bound and Talent Search programs. The program counselors help students create a learning experience to overcome academic risks and succeed. Enrollment in the programs is not mandatory. Students choosing to participate typically recognize their academic risks (challenges) and take action to alleviate them. The academic risks students experience build resilience to help them create their desired future. Investigating the career decisions of these students may contribute to understanding their self-authorship development that is illustrated by the learning partnership model.

 The relationship between the program counselors and the students can serve as an example of the learning partnership model (Baxter Magolda, 2004) that connects challenge with support. The learning partnership model is visually illustrated by a tandem bicycle (Meszaros, 2007). In this analogy, the student rides on the front of the bike providing direction for career choices. The adult supporter rides on the back and provides the support and encouragement for

career choices.   The learning partnership model helps students learn to manage the stresses and challenges associated with pursuing a non-traditional career while maintaining a strong commitment to internal goals. Perhaps those at-risk students who receive support from adults tend to make more progress toward their future goals (Meszaros & Lane, 2010).

The concept of self-authorship is rooted in the work of Piaget (1952, 1965) and extends to adult populations through Kegan's (1982, 1994) research on self-evolution. Kegan's (1994) concept of self-authorship has received a considerable amount of attention by scholars of human development and by educators who work with late adolescents and adults in a variety of settings, including colleges and universities (Baxter Magolda, 1998, 2001, 2004; Baxter Magolda & King, 2004). Kegan found that the self-authoring capacity in individuals occurs when they are able to see socialization as an object and they have "co-construction of self with others and ideas" (Boes, Baxter Magolda, & Buckley, 2010, p. 4). Perry's (1970) work on dualism also informed the theory of self-authorship, as it was the first theory to address adult epistemological structures and the shifts from simply accepting knowledge to making one's own decisions.

The theoretical framework of self-authorship is an holistic perspective that explores development of meaning-making in individuals from diverse cultures and characteristics (Boes, et al., 2010) and "is more than an acquired skill" (Baxter Magolda, 2001, p. 14). Self-authorship is a complex concept that describes how individuals construct their beliefs (what and how they come to know), their sense of self (what and how they value, and how they use their values to guide choices and behaviors) and how they relate to other people and make choices in social situations. Self-authorship reflects how one interprets and makes meaning of experiences, a mature capacity for knowing, being, and relating to others. Individuals who have achieved self-authorship are able to act as authors of their lives.

Baxter Magolda (2008) defined self-authorship as "the internal capacity to define one's beliefs, identity, and social relations" (p. 269). Three dimensions and four phases of self-authorship determine how an individual makes meaning and, in order to be fully self-authored, one must make progress in each dimension. The cognitive or epistemological dimension considers how individuals come to identify their beliefs. The intrapersonal dimension describes one's sense of self, values, and beliefs. The interpersonal dimension explains how one relates to others and their values. Self-authored individuals have a sense of self, construct their own beliefs, negotiate situations with others when their beliefs are not mutual, and act as the authors of their own lives (Baxter Magolda, 2001). The four phases guide development in each dimension and will be discussed in chapter 2.

Self-authorship is developed as one achieves the ability to think independently on a complex level and move away from relying solely on the opinions and guidance of others to formulate their own knowledge, values, and relationships (Baxter Magolda, 2001). This is an important developmental concept because managing the transitions in adolescence and young adulthood is not only difficult, but vital to meeting the expectations of society. Making one's own decisions is an important developmental step in achieving maturity. While academic and career successes are demanding, self-authorship provides a perspective from which to consider the transitions toward these goals. For instance, individuals who are considered self-authored have the skills to overcome challenges in their lives and develop resilience that helps them navigate obstacles encountered in academic and career choices (Creamer & Wakefiled, 2009; Meszaros & Lane, 2010). In addition, the theory of self-authorship captures the influence of relationships with others such as family members. It is important to understand these

relationships because parents are consistently reported to be the primary people their children seek out for advice about career decisions (Dietrich & Kracke, 2009).

Career decision making is one area in which the theory of self-authorship can be applied. It is the area in which individuals integrate the advice, feedback, stereotypes, and reasoning received over time into behavior and life course decisions (Meszaros et al., 2009). Previous studies using the theoretical framework of self-authorship to examine IT career interest and choice employed conceptual models that provided some insight into IT career interest for girls and boys (Meszaros et al., 2007) and parental support of IT careers of girls and boys in high school and college (Meszaros et al., 2009). However, the results indicated that it is necessary to determine whether adolescents were forming an interest in IT careers at earlier ages because of the pressure to make career decisions while in school. The conceptual models of IT career decision making for girls (Figure 1) and boys (Figure 2), previously used in a study (Meszaros et al., 2007) of high school and college students, provided insight into the role of information processing variables (decision orientation, receptivity to career information, information credibility and information source) and computer-related variables (computer use and positive attitudes toward IT workers). Additional research is now needed with younger populations to determine the role of IT career interest and choice as students are required to make career decisions earlier (Meszaros et al., 2007). A modification of the previous model of parental support (Meszaros et al., 2009) is needed to examine the role of parental support in influencing selection of an IT career for both girls and boys. The modified model is presented in Figure 3 and the changes to accommodate middle and high school students will be discussed in chapter 3. As shown, key variables of parental support, decision orientation, and information sources are hypothesized to have direct associations with IT career interest and choice.
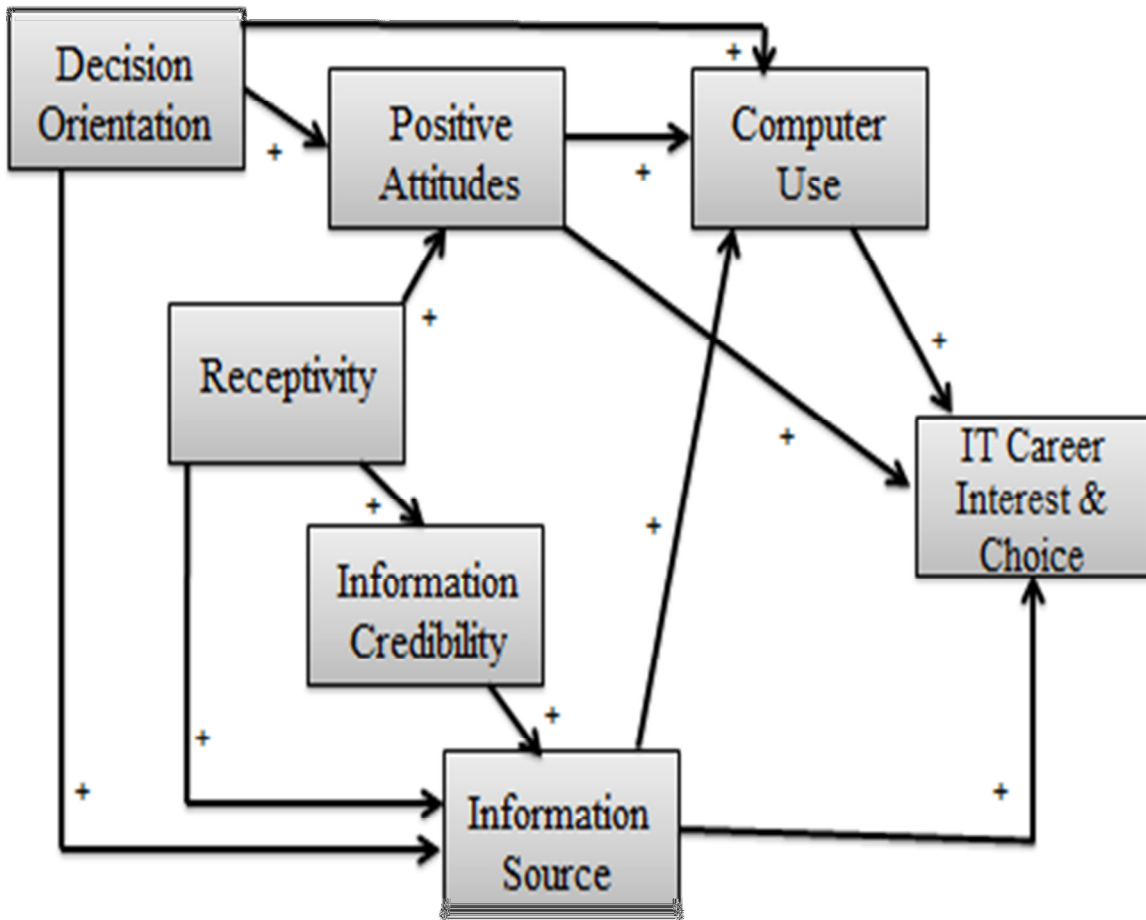
Figure 1. IT Career Interest and Choice (girls)

(Meszaros et al., 2007)
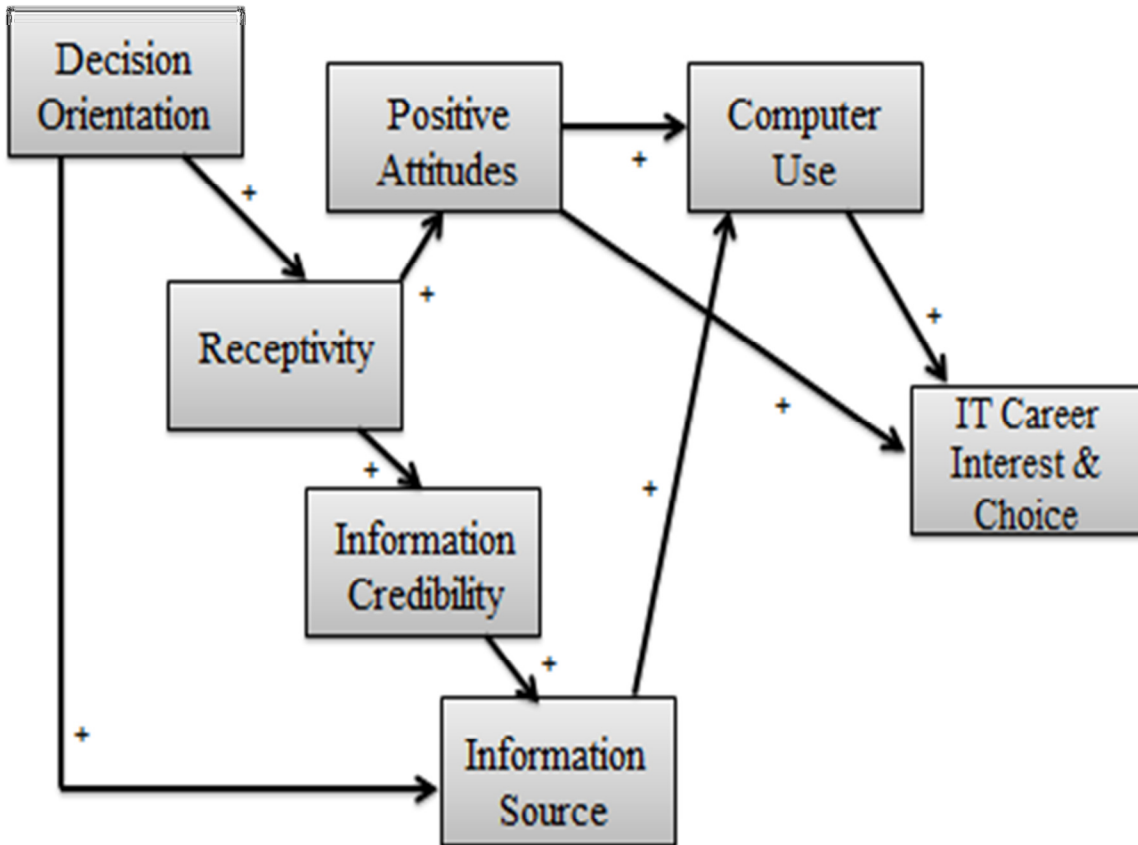
Figure 2. IT Career Interest and Choice (boys)

(Meszaros et al., 2007)
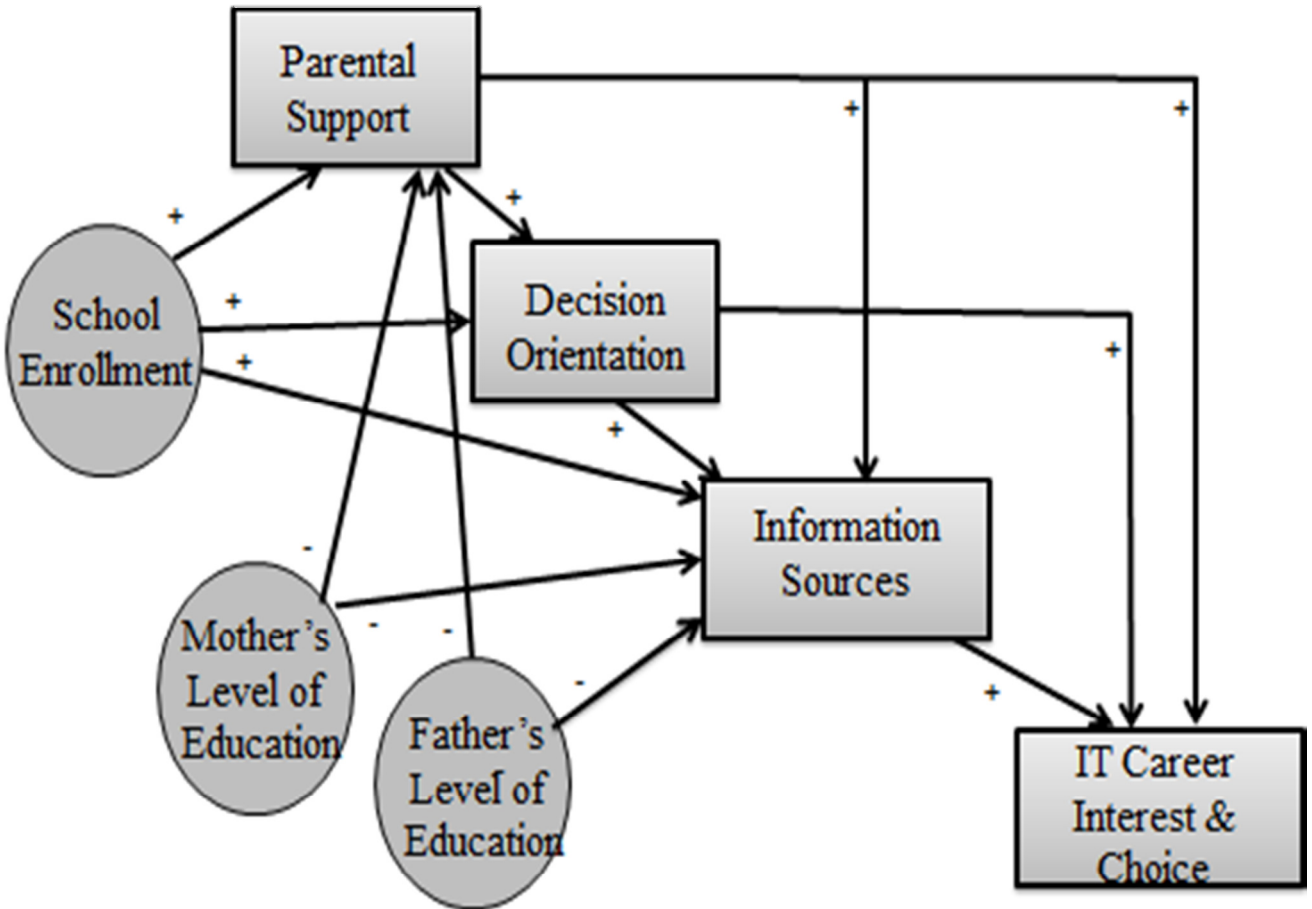
Figure 3. Parental Support for IT Career (girls and boys)

(Modified from Meszaros et al., 2009)

Examining IT career interest and choice for disadvantaged middle and high school students through the lens of self-authorship, using the variables of decision orientation, receptivity, information credibility, information sources, parental support, and IT career interest and choice, helps us understand how young people are developing their internal decision making skills and how this may influence their career choices. We can then translate these findings into programmatic and curriculum enhancements for college preparation, parental education programs, and activities for an underserved population and geographic location. This relationship is further explained in chapter 2. In addition, using the conceptual models (see Figures 1, 2, and 3) expands our understanding of the theoretical application of self-authorship and creates an opportunity to determine if these models (see Figures 1, 2, and 3) are applicable to a new population of middle and high school students.

Problem Statement

There is a talent crisis in IT in the U.S.: the high rate of unemployment and the growing need for highly skilled IT employees create an opportunity to re-examine modern career development (Gordon, 2009). Women are an especially important resource to investigate because so few females enter science, engineering, and technology fields. However, with proper training and mentoring they comprise a vital source of personnel to respond to the talent crisis (Sevo, 2009). Many IT companies are locating in Appalachia, which is one of the regions in the U.S. with the highest rates of poverty and unemployment. Many of the old industries of mining, timber, and manufacturing have died out and the communities have limited access to education and career training for regional middle and high school students (Appalachian Regional Commission, 2011). The federally funded TRIO programs including Upward Bound and Talent Search, are responding to the needs of disadvantaged students in these communities by

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introducing program participants to advanced educational opportunities and career development. To date, no published research on career development of students in rural Appalachia enrolled in the Upward Bound or Talent Search programs have been found. To create effective programming and career development interventions for this population it is necessary to understand their interest and choice of IT careers as well as the support they receive from their parents to pursue these careers.

Currently, we have evidence that college students are more self-authored and able to make clear choices after considering other opinions (Baxter Magolda, 2001). These students have the ability to examine issues from multiple perspectives and manage complex decisions. In addition, we have evidence that underrepresented college students who are equipped with self-authoring skills are better able to work through challenging decisions (Pizzolato, 2003, 2004; Torres & Baxter Magolda, 2004; Torres & Hernandez, 2007). A quantitative measure using the theoretical framework of self-authorship is available and is content-specific to IT career interest and choice. Previous research created models of IT career interest and choice using the available measure with high school and college students (Creamer, 2010; Creamer et al., 2007; Meszaros et al., 2009; Meszaros & Lane, 2010; Meszaros et al., 2007) but the models have not been extended to middle and high school students in rural Appalachian locations.

Purpose of the Study

Given the current research and the future demands for a highly skilled IT workforce, the purpose of this study is to apply and validate a theoretical model of self-authorship to disadvantaged middle and high school students in the Upward Bound and Talent Search programs to explore their interest and choice in IT careers and their parental support of IT careers by testing two models. The study uses the *Career Decision Making Survey Middle-High*

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School Version adapted from the *Career Decision Making Survey* (CDMS) (Creamer, Baxter

Magolda, & Yue, 2010; Creamer et al., 2007) and revised to be developmentally appropriate for

middle and high school students by Meszaros, Lane, and Baxter Magolda. The present study

validates models that examine whether and how underrepresented students in college preparation

programs make IT career decisions by using a model of IT career interest and choice that

includes computer use, information sources, information credibility, receptivity, decision

orientation, and positive attitudes about people who work in computer related jobs. In addition,

the investigation examines a model of parental support of IT careers using variables of parental

support, decision orientation, information source, grade level, and parent's education level.

Based on findings from this study, it may be necessary to modify the models to accommodate

students in rural Appalachia.

This knowledge is important to understand and interpret underrepresented students'

developmental processes and parental support in the context of career decision making and

specifically IT careers.

<div align="center">

Research Questions

</div>

1. What demographic (gender, race, and school enrollment) similarities or differences exist

   in the following scales:

    a. IT career interest and choice

    b. decision orientation

    c. receptivity

    d. information credibility

    e. information sources

    f. positive attitudes toward IT workers

g. computer use

h. parental support

2. Is the conceptual model of IT Career Interest and Choice supported by the theory of self-authorship an adequate fit for disadvantaged youth in rural Appalachia?

3. Is the conceptual model of Parental Support for IT Careers supported by the theory of self-authorship an adequate fit for disadvantaged youth in rural Appalachia?

Significance of the Study

This is the first known study to investigate the IT career interest and choice model and parental support of IT careers model in a population of youth enrolled in Upward Bound or Talent Search in rural Appalachia. The quantitative measures for the framework, initially developed by Creamer and colleagues (2007), were tested (Creamer, 2010; Creamer et al., 2007; Meszaros et al., 2009; Meszaros & Lane, 2010; Meszaros et al., 2007), but, as will be described in the next chapter, the population for these measures included college students and some high school students and did not include middle school students. Other studies that used the self-authorship framework to study career development of high-risk students did not include high school students and used qualitative measures (Pizzolato 2003, 2004, 2006). No studies using the theory of self-authorship have included middle school students or students enrolled in the Upward Bound and Talent Search programs.

Finally, the results of this study are significant for future educational policy. For example, this study will provide information about the career decision making of participants in the Upward Bound and Talent Search programs in one region. Federal program policy makers might use the results to inform their policies about funding, curriculum, programs, and activities

for the Upward Bound and Talent Search programs, and the goals for students in other rural Appalachian areas.

Key Terms

IT job/career: "professional careers that are computer driven including those that involve web design and development, and hardware and software engineering, but exclude data processing" (Creamer et al., 2007 p. 16)

Self-authorship: "the ability to collect, interpret, and analyze information and reflect on one's own beliefs in order to form judgments" (Baxter Magolda, 1998, p. 143)

Upward Bound: An early intervention program that serves high school students from low income families or whose parents do not have a college degree. These students are potential first-generation college students. The program aims to provide academic and career preparation to ensure students complete high school and prepare for higher education (U.S. Department of Education, 2013b).

Talent Search: An early intervention program that serves middle and high school students that have potential for college success from low income families or whose parents do not have a college degree. The program aims to provide academic and career preparation to ensure students complete high school and prepare for higher education (U.S. Department of Education, 2013a).

High-risk: "The term *high risk* is used here rather than *at-risk*, because *high-risk* suggests risk for withdrawal from school is a gradient scale, rather than a quality the student unequivocally has or does not have; thus, a student may be considered high-risk for withdrawal, but still be a high achiever" (Pizzolato, 2003, p. 798).

Disadvantaged: Defined in terms of the Upward Bound and Talent Search programs to mean students from low-income families or whose parents do not have a college degree.

Organization of the Study

The study is organized in five chapters. The first chapter establishes a foundation for the study through the introduction to the topic, purpose statement, research questions, and significance of the study. Chapter Two is a literature review of related topics. The third chapter describes the methodology of the study including the sample, data collection process, and data analysis techniques that were used. Chapter Four reports the results of the study. The final chapter provides a discussion of the results, and their implications for practice and future research.

Chapter 2

LITERATURE REVIEW

This study will explore IT career choice and interest, through the theoretical framework of self-authorship, among disadvantaged students who live in rural Appalachia and who are enrolled in the Upward Bound and Talent Search programs. Specifically, I am interested in determining the demographic differences and similarities in IT career choice and interest, the fit of a model of parental support of IT career interest and choice, and the fit of a model of IT career choice and interest.

Because there is an IT workforce problem in the U.S. (Meszaros et al., 2007), the study of IT career choice is important. The influence of parents on middle and high school students' career decisions is well known and documented (Creamer et al., 2007; Keller & Whiston, 2008; Meszaros et al., 2007; Meszaros & Lane, 2010) but less well known is the influence of parental support of IT careers. If parents are not acquainted with available IT jobs, it is likely that they do not encourage or support exploration of those careers for boys and girls and even more likely that students will not get exposed to IT as a possible profession. The theory of self-authorship provides a framework to study how individuals interpret and make meaning of experiences and offers one approach to study career decisions that is context-specific to IT. Self-authorship seeks to understand how students make career decisions and considers how advice and information from others positively or negatively affects decisions. The availability of a quantitative self-authorship instrument that is context-specific to IT makes generalizing and application of the findings more precise.

This chapter is organized in four sections. First, I review the current state of the U.S. workforce. Next, the Upward Bound and Talent Search programs are described. In the next section, I review literature about career decision making in the context of three topics: rural

location, Appalachian culture, and the theory of self-authorship. Finally, I discuss the literature on self-authorship including the developed measures and other relevant studies that used the theory.

Workforce

At the end of 2012, the Bureau of Labor Statistics reported 3.6 million open jobs nationally. The Bureau of Labor Statistics also reported the current unemployment rate as 7.9% and the number of unemployed persons as 12.3 million. Additionally, approximately 8 million people were working only part-time because their hours were cut or they could not find full-time employment. The number of unemployed or under-employed (part-time workers who desire full-time employment) persons is not expected to decrease in the near future. Unfortunately, the jobs that are available in the United States are not positions that most of those workers who are unemployed or under-employed are qualified to fill.

The problem facing the U.S. is the lack of trained workers for high-skill positions. Experts in government, education, and industry often refer to the global talent crisis (Gordon, 2009). The talent crisis is a result of the waning industrial age and rapid advances in technology that require workers to possess high-level skills. Manpower's 2012 Talent Shortage Survey reported that 34% of all global employers reported difficulty in filling critical positions. American employers reported an even higher rate of vacancy (49%) despite the high rate of unemployment. The U.S. employers ascribed the problem to the lack of adequate training. The survey identified trade workers, engineers, and IT workers as the top three most difficult types of positions to fill.

To accommodate the lack of available workers in the U.S. employers are outsourcing many high-skill jobs and recruiting international workers through H-1B visas (Gordon, 2009). In

the future the combined number of United States workers and international workers will not meet the demand for high skill-workers. The problem is exacerbated by decreased population in the U.S., the increased number of people retiring at earlier ages, and the aging and retirement of the baby boomer generation. Female workers, who enter and leave the workforce periodically throughout their careers to manage multiple roles, also impact workforce availability which contributes overall to the unavailability of workers in the U.S. labor force.

Sustaining the future of the economy is dependent upon the development of a highly skilled and knowledgeable workforce (Karoly & Panis, 2004). As technology continues to expand, skilled workers must maintain their competitive advantage through education. Future job training will be less traditional and more focused on specific skill sets, including team work, abstract thinking, communication, critical thinking, and problem solving (Karoly & Panis, 2004). Although the U.S. population continues to maintain high rates of educational attainment, the level of achievement is only in the middle when compared with that in other developed countries where individuals are achieving high rates of education in high-skill areas. In the future, education must be targeted on achievement and skills required to meet the demands of available jobs (Karoly & Panis, 2004).

To address these issues, *The President's Plan to Build a Strong Middle Class and a Strong America* (2013) outlines an initiative to build capacity for high-skill and high-wage jobs. The plan includes greater attention to STEM education, redesign of school curriculum to focus on real-world learning, and preparation of a strong workforce through post-secondary training for high skilled jobs. The plan aligns well with the need to advance educational attainment and achievement.

The TRIO programs, Upward Bound and Talent Search, comprise one means of addressing the talent crisis facing the U.S. These programs serve a growing population of individuals who need assistance to face the academic and job challenges in the global economy (Campbell, 2010; McElroy & Armesto, 1998). These programs are considered early interventions to help youth stay on course through college and prepare for career opportunities (Campbell, 2010). Both programs serve disadvantaged students and are specifically charged to remove barriers to academic success. The goal of these programs is to propel those students to post-secondary education (Campbell, 2010; McElroy & Armesto, 1998).

TRIO

History

The Economic Opportunity Act commissioned by President Lyndon Johnson in 1964 gave birth to the federally funded education outreach and student services TRIO programs (McElroy & Armesto, 1998). At present the TRIO programs are managed by the Council for Opportunity in Education (COE) and respond to the need for high academic standards and the historically high percentages of students who do not complete high school and go onto post-secondary education.

Since 1965 the TRIO programs have been credited with helping two million students earn college degrees. There are approximately 1,000 colleges, universities, and agencies that competitively apply for and receive grants from the COE to support approximately 2,800 TRIO programs that serve an estimated 850,000 students across the country (Campbell, 2010). These students are low-income, first-generation students, or students with disabilities, from sixth grade through college graduation. In addition to providing academic help and career counseling, the programs also give guidance to students in preparing, visiting, and applying to colleges. Yet,

despite the large number of participants in the program, the TRIO programs only serve approximately seven percent of all eligible Americans due to lack of resources and funding to expand the programs (Campbell, 2010).

Over time, the definition of educational disadvantage has sparked controversy within the programs (McElroy & Armesto, 1998). However, the common inclusions for this definition within the TRIO programs are students from low-income families, potential first-generation in college, and underrepresented populations in higher education. Specifically, two-thirds of the students served in the programs must be from low-income families or potential first-generation college students.

Upward Bound and Talent Search

Upward Bound was the first TRIO program created by the Economic Opportunity Act in 1964 (McElroy & Armesto, 1998). Upward Bound serves students who have low academic success or who are potential first-generation college students (Pitre & Pitre, 2009). The program offers enrichment programs, counseling, tutoring, cultural enrichment, and summer activities to high school students (grades 9-12) between the ages of 13 and 19 and seeks to help them graduate from high school and pursue postsecondary educational opportunities.

The second TRIO program, Talent Search, created in 1965 by the Higher Education Act of 1965, serves the largest number of participants and works with students between the ages of 11 and 27 who are from disadvantaged backgrounds but have the potential for success in higher education (Pitre & Pitre, 2009). A unique aspect of this program is that it does offer assistance as early as the sixth grade and extends throughout the transition to higher education. High school drop-outs are also included in this program in an effort to help them complete high school and pursue college. The program offers tutoring, career exploration, mentoring, counseling,

information about postsecondary education opportunities, assistance with the application processes for college and financial aid, and family workshops that encourage involvement, provides information on career and academic development, and college admissions.

Although the Upward Bound and Talent Search programs have similar goals there are a few differences. The distinction is that the Upward Bound program serves students in high school and extends programming through residential summer experiences. The Talent Search program starts in sixth grade but does not offer summer residential experiences. The Upward Bound and Talent Search programs work closely with middle and high schools to select participants and carry out programming. Program counselors travel to middle and high schools to meet with participants each month. The content of the program includes career exploration, personal and academic counseling, college entrance exam preparation, financial aid, and college exploration. Additional services are also provided for participants including weekend tutorials, college visits, and individual tutoring.

Characteristics of Upward Bound and Talent Search Programs at Virginia Tech

The Upward Bound and Talent Search programs at Virginia Tech are federally funded by the Department of Education and have been in existence since 1967. They comprise important additions to the school systems in Southwest Virginia because of the limited financial resources and the lack of other programs and supports currently available. The programs at Virginia Tech serve 14 counties including 24 high schools and 7 middle schools. The schools are geographically located in rural areas which presents numerous barriers. In addition to physical barriers, school administrators deal with lack of student achievement, low rate of high school graduation, limited financial and human resources to carry-out educational goals, and few resources to support and encourage college preparation (Alliance, 2010; Virginia Tech, 2011b).

The communities have limited access to public transportation and lack many of the educational and social opportunities of other communities in Virginia. Many textile and furniture industry jobs in these communities have been lost to off-shore factories (Virginia Tech, 2011b).

Of the 31 schools, 28 are located in the central Appalachian region. The 28 schools in the Appalachian region represent 12 counties that are designated as at-risk and transitional by the census which means the unemployment rate, market income, and/or poverty rates are worse than the national averages. Eight of the 12 counties are also designated as distressed areas meaning that the "at-risk and transitional counties have a median family income no greater than 67 percent of the U.S. average and a poverty rate 150 percent of the U.S. average or greater" (Appalachian Regional Commission, 2012). The remote geographic location and other barriers such as high rates of poverty, low levels of education among adults, lack of role-models, and lack of high-paying jobs with benefits currently facing the students and their families, make educational achievement and attainment even more difficult. The culture of many rural communities does not support postsecondary education and therefore, students have limited future goals that often do not include college (Alliance, 2010). In addition, the schools in the region do not meet the nationally recommended counselor/student ratio which leaves the counselors providing limited, if any, academic or career counseling (Virginia Tech, 2011a, 2011b).

The 40-year Upward Bound and Talent Search programs have gone through many adaptations to respond to the changing world, yet the basic needs of the participants in the programs have remained unchanged over time. The programs have worked to set attainable and realistic objectives for the participants. To maintain federal funding, the programs have objectives that include both process and outcomes related to the purpose of each of the programs.

Examples of the performance objectives and measureable outcomes for the Upward Bound Program include having a high percent of program participants pass standardized tests, having a high retention rate in the program from one budget period to the next, and graduating a sizeable enrollment to postsecondary education. The performance objectives and measureable outcomes for the Talent Search Program target a high percent of promotion to the next grade level each academic year, graduation from secondary school, application for financial aid and college admission during the students' senior year, and enrollment in postsecondary education after high school graduation. These objectives may be viewed as ambitious considering the constraints of the rural location, the limitations of the families' income, and inexperience of first-generation status facing participants.

TRIO counselors work one-on-one with students and often stay with the same students for the duration of their enrollment in the program (Campbell, 2010). Each year the program counselors begin by having students complete a client profile that is an evaluation of "academic strengths and weaknesses, career interest, college readiness and awareness and plans for the future" (Virginia Tech, 2011b, p. 19). In addition, each program participant completes a needs assessment "to assess the student's academic and test-taking needs and progress, study habits, time management, and career counseling needs" (Virginia Tech, 2011b, p. 19) which helps the student and counselor to create an individualized plan for academic success, college and career preparation, and to ensure the student completes the grade level successfully. The information from the needs assessment also informs program counselors about what students need for the upcoming year; workshops, tutorials, and school visits are created and tailored to the specific needs of the students. In addition, cultural programs, guest speakers, and summer enrichment opportunities are offered to all students. The Upward Bound and Talent Search programs

maintain databases that track participants' academic progress throughout their time in the programs as well as information about their transition into college including where the student applies, acceptance, and major selection.

The program services for career/college counseling is an important content area that addresses major objectives in the Upward Bound and Talent Search programs. The services include administering career exploration interest inventories, inviting professionals to make presentations and conduct educational activities, and creating opportunities for the participants to meet mentors and role-models that can support career goals and the transition to post-secondary education. Students also have multiple opportunities to visit college campuses. Parents receive support from the program through workshops that teach about the college admission and financial aid processes (Virginia Tech, 2011b).

The programs at Virginia Tech seek to attain the program objectives by recruiting and retaining qualified students, providing academic support, counseling, college and career planning, helping students individually to complete high school and postsecondary education, and developing realistic and attainable goals that meet the needs and demands of the target population. It is important to note that the graduation and post-secondary enrollment rates of the target area are considerably lower than the state averages. The area's percentage of retention in post-secondary education is also substantially lower when compared to the state and national rates because of the challenges including limited access to transportation, few supports from their school, community, and family to pursue additional education, and the additional difficulties placed on students who are first-generation college status and low SES.

Students from Rural Communities

Studying students in rural locations is important because there are currently over 11 million students in the US living in rural locations and the rate of increase has surpassed that of urban locations (Strange, Johnson, Showalter, & Klein, 2012). Approximately 25% of students attending American public schools is located in rural areas (Griffin et al., 2011). The Commonwealth of Virginia has approximately 360,000 students in rural schools yearly which are more than double the median for the U.S. Virginia is nationally ranked seventh in having the largest total rural enrollment; approximately 36% of schools in Virginia are considered rural. Virginia has some of the largest rural schools and districts in the country. In addition, 35% of students in Virginia rural schools are living in poverty (Strange et al., 2012). The growth of IT industries in rural communities provides a new path for employment and is one answer to the steady high rate of poverty. However, it is necessary to improve career and college preparation for students in rural communities in order to prepare them with high level skills needed for IT employment. Several studies on rural populations will be described next to create a better understanding of students in rural locations and their needs.

In a study of adolescents in rural Pennsylvania, the family, school, and community members all influenced the career choice of youth (Ferry, 2006). The study included students from several communities and found that the high school youth from less affluent communities received less career guidance and made fewer career decisions while in school when compared to other youth from more affluent communities. The students and parents perceived the school as responsible for assisting with career decisions and families did not participate in the process, yet had a strong role in shaping vocational interests.   Parents were as strong a factor in choosing a

career as the school and community environments. These findings suggest schools and communities must be proactive in helping youth make career choices and may require contacting youth and parents beyond the context of school to participate in programs designed to effectively assist with the career development process (Ferry, 2006).

Provasnik and colleagues (2007) found that students from rural communities experience a lower rate of college completion, although their parents held similar goals and expectations for their children as parents in other geographic locations. Parents in rural locations expected their children to achieve a two year or bachelor's degree (Provasnik et al., 2007). Students from rural locations did not receive the same access to academic resources including career counseling, college and work preparation programs, and courses suited for college entrance as their peers in other communities (Provasnik et al., 2007).

Hardre, Sullivan, and Crowson (2009), learned that students from rural areas were sensitive to the local community and its strong influence on career choice. Teachers in rural schools have a strong relationship with students and are more influential when compared with teachers in non-rural communities. It is important to conduct research that is specific to rural areas and not generalize findings from one rural area to all rural areas because of the vast differences and experiences of students (Hardre et al., 2009).

Griffin and colleagues (2011) found that students in rural locations approach different mentors for job advice depending on the students' gender, ethnicity, and grade level. Both boys and girls most often go to parents, friends, teachers, and school counselors for information. Students in 11th and 12th grade were more likely to seek information from counselors while younger students went to parents and friends for job information. Grade level also determined how often students sought information: students closer to graduation pursued information more

often than younger students. Boys reported conferring less with counselors but often with

coaches. In regards to ethnicity, Black and Hispanic students, more often than students of other

ethnicities, conferred with their teachers. In general, students from rural and lower income areas

reported seeking information from teachers often (Griffin et al., 2011). However, these teachers

and counselors may know little about the skills required for IT jobs, the availability of IT jobs in

the community, or the fast pace of change in the world of technology.

Buikstra and colleagues (2007) found that students most often sought vocational

guidance from family, friends, teachers, and guidance counselors in rural schools. However, the

major factor on their career decision making was self-interest and it is possible students in rural

locations were self-determined in their career decisions (Buikstra et al., 2007). This finding is

important to self-authorship because students are in the process of creating an identity and plan

for their future while seeking advice from others. If those who offer job information do not have

a complete and up to date picture about IT jobs, students may be less likely to pursue a job in IT.

Appalachia

The Appalachian region includes 13 states from Maine to Mississippi with Virginia

centrally located in the area. Although the Appalachian region has made great strides in

modulating the poverty rate over the years, the central region continues to experience economic,

social, and educational difficulties (Appalachian Regional Commission, 2011). The rate of

poverty in rural communities is especially intense in the central Appalachian region (Strange et

al., 2012).

Central Appalachian communities have faced major economic upheavals in recent years

as old industries are dying out resulting in significant demographic and economic repercussions

(Alliance, 2010; Griffin et al., 2011). These communities relied heavily on the mining,

agriculture, and manufacturing industries, which offered jobs that did not require higher education but offered good wages and benefits. The shift in the economy has resulted in more jobs that require postsecondary education (Alliance, 2010; Whitener & McGranahan, 2003). Newer industries, including professional and technical services, moved into the region, yet the communities do not have trained workers to fill the open positions. Thus, two-thirds of the residents in the Appalachian region experience unemployment rates higher than the national average (Appalachian Regional Commission, 2011). In addition, the central Appalachian region has low rates of college completion with only 12% of the population older than 18 having earned a college degree when compared to the national average of 27% (Appalachian Regional Commission, 2011). In Appalachian communities of Virginia approximately 17% of the population over age 25 have a bachelor's degree but this is considerably lower when compared to the higher rate of 34% across the state of Virginia (Appalachian Regional Commission, 2013). Poverty is highly correlated with lack of educational achievement and attainment and this is especially persistent in central Appalachia (Alliance, 2010; U.S. Department of Agriculture, 2005).

Rural schools in central Appalachia experience extreme difficulty when compared to other rural schools because of the high rate of poverty, low education level among adults, and low levels of student achievement (Alliance, 2010). Schools in rural communities have difficulty in recruiting and retaining highly qualified teachers. Teachers and counselors in rural school districts have infrequent access to professional development opportunities and often carry multiple role responsibilities at their schools. Moreover, a lack of qualified teachers impacts the type of course offerings and often eliminates opportunities for access to advanced courses that offer college credit.

The school districts do not receive adequate financial resources to support the schools and offer resources to carry out the educational mission of the US. The lack of resources and qualified teachers hobble efforts to achieve state educational standards. The tax base in rural communities and the lack of government funding result in persistent deficits in funding for education. The qualifications to receive Title I funding are difficult for communities to meet because awarded amounts are based on the size of the school system and as a result of smaller populations in rural communities, rural schools quality to receive substantially less than school districts in urban communities. Structural problems also limit access to libraries and technology, community services to assist with personal problems, and mentors (Alliance, 2010).

Students in rural communities are also limited in access to people and resources that promote postsecondary education. Rural schools receive fewer visits from college recruiters than urban schools and have limited access to information about financial aid. The role of college counselor is often not filled because school counselors are occupied with managing test taking. The presence of role models for possible careers is also limited in rural communities because of the low level of adult education and the past tradition of jobs in the communities (Alliance, 2010). Access to on-site learning opportunities through part-time employment or internships is limited in rural communities (Alliance, 2010).

The results of a study of youth in rural Appalachia indicate that self-efficacy and support may be more effective than parental education level, SES, and occupation in helping young people achieve their career goals (Ali & Saunders, 2006). Young people in Appalachian counties may encounter more difficulties because they do not have access to many role models with college experience and fewer resources and opportunities to prepare for college entrance. While parents were perceived as the major source of support and information regarding college

attendance, they may actually be a negative influence given that parents in those communities did not attend college (Ali & Saunders, 2006).

Bennett (2008) noted that rural Appalachian communities were prone to structural inequalities as a result of geographic isolation, resulting in limited job availability and poverty. Gender is also a powerful component in that women have lower educational attainment than men, despite their aspirations. Family ties are influential yet in the rural Appalachian communities the influence on girls and boys is often negative because of intergenerational poverty, the strong commitment to remain with family, and the lack of role models and access to resources to support development. Few changes in attitudes have occurred in the communities over time, resulting in intransigent negative Appalachian stereotypes. The study concluded with a plea for additional research on this population to understand their current vocational development (Bennett, 2008).

Theoretical Framework

Career development theories have been used to examine how people choose their career. Different theoretical perspectives are available in the literature. They include traditional models in which middle-class males dominated the workforce and organizations were hierarchical. Men remained committed to one organization and job for a long period of time and allowed the company or organization to manage their career trajectory. More recent models acknowledge the career development of women and their nonlinear career paths (Career, 2003). Women and men experience more transitions in their careers today. They accept positions with multiple organizations, and often manage their own career trajectory. The change in the way people manage their professional life and navigate the multiple roles in their personal life has demanded new models of career development.

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Theory of Self-Authorship

More recent research using the theoretical framework of self-authorship has provided insight into women's and men's interest in, choice of, and success in non-traditional career fields (Creamer et al., 2007; Creamer & Wakefield, 2009; Meszaros et al., 2009; Meszaros et al., 2007). The theory of self-authorship is rooted in the work of Perry (1970) and Kegan (1982) and is defined as "the ability to collect, interpret, and analyze information and reflect on one's own beliefs in order to form judgments" (Baxter Magolda, 1998 p. 143). Self-authored individuals are characterized as relying on themselves to define their knowledge, values, and relationships (Baxter Magolda, 2001).

This theory integrates three development areas (Figure 4) that are guided by questions, including epistemological ("How do I know?"), intrapersonal ("Who am I?"), and interpersonal ("How do I want to construct relationships with others?") (Baxter Magolda, 2001, p. 15). The process of becoming self-authored occurs through three dimensions of development that are used to understand the way people make meaning of their experiences (Baxter Magolda, 2008). Each dimension considers how individuals negotiate internal and external forces to ultimately achieve a sense of self while acknowledging others. Individuals who are more developed in the three dimensions are likely to have the decision-making skills to be effective in the world (Baxter Magolda & King, 2004).

Dimensions (3)

- Epistemological
  - people move from accepting knowledge from others to actually creating their own knowledge
- Intrapersonal
  - people develop identity and gain perspective that creates a framework to follow in life
- Interpersonal
  - how relationships with others are negotiated based on external or internal identities

Phases (4)

- Following Formulas
  - Individuals define their life plans through others and seek approval in relationships
- The Crossroads
  - individuals begin to question the plans others have made for them
- Becoming the Author of One's Own Life
  - Individuals establish a sense of self, clarify values, and negotiate relationships
- Internal Foundations
  - individuals have internal perspectives which they use for guidance

Figure 4. Dimensions and Phases of Self-Authorship

The epistemological dimension of self-authorship considers how individuals integrate internal with external forces in an effort to construct meaning and understanding of the world. In this dimension people move from accepting knowledge from others to actually creating their own knowledge. The intrapersonal dimension of self-authorship describes how individuals develop identity and gain perspective that creates a framework to follow in life. This dimension negotiates and redefines how to navigate relationships with others who are considered in the interpersonal dimension of self-authorship. The interpersonal dimension examines how relationships with others are negotiated based on external or internal identities. Re-negotiations of relationships are typically required if built from an externally defined identity that focuses on what others want. It is difficult to consider the dimensions separately because the dimensions

mutually inform. To understand how individuals create knowledge, develop identity, and navigate relationships with others are important components to consider (Baxter Magolda, 2001).

There are four phases (Figure 4) that guide the development of self-authorship in each dimension. Individuals progress through each stage to obtain a deep sense of self and goals. The journey begins with "following formulas" for life plans devised by family, mentors or others in their life. By so doing they define their life plans through others and seek approval in relationships. In the next phase, individuals recognize a need to define themselves and their own perspectives through a stage called "the crossroads."   Individuals in this phase begin to question the plans others have made for them; they want to establish their own internal identity, and bring themselves into relationships on their own terms. The following distinct phase is "becoming the author of one's own life" and is characterized by an individual's effort to establish a sense of self, clarify values, and negotiate relationships. The final phase in this sequence is "internal foundations" and reflects individuals who have internal perspectives which they use for guidance. Individuals at the final phase are considered grounded in their sense of self and belief system (Baxter Magolda, 2001).

Kegan's (1982) work guided Baxter Magolda's (2001) application of the theory of self-authorship to college students in a longitudinal study that spanned over 20 years and initially included 101 students. Despite the benefits of her research, the generalizability is limited because the longitudinal study was done with students at one university and during the final phase only 39 participants remained. Over time additional research with college students has been done and has been expanded to include some research on high school populations.

The theory of self-authorship has also included numerous studies on high-risk or disadvantaged populations which will be reviewed below. These studies inform this current

study on youth in rural Appalachia in Upward Bound and Talent Search programs because Appalachian youth are isolated geographically and at a disadvantage in their pursuit of post-secondary education and career opportunities. The challenges facing youth in rural Appalachia, combined with their enrollment and social support through the Upward Bound or Talent Search programs, create a potential moment for them to develop self-authorship or emerging internal decision-making skills as they consider careers. Applying the theory to this population is further supported by the use of the *Career Decision Making Survey: Middle and High School Version* that is grounded in the framework of self-authorship, designed for middle and high school students, and is context-specific to IT career decisions. Next, I will review the measures of self-authorship, including the development of the *Career Decision Making Survey: Middle and High School Version.*

Measure

Despite the expanded use of self-authorship in research among populations of college students, qualitative methods have primarily been used (Creamer & Wakefield, 2009). For instance, the advancement of knowledge about self-authorship began when Baxter Magolda (2001) started a longitudinal study of 101 college students using qualitative interviews. She conducted yearly interviews to follow the participants through their twenties and thirties (Baxter Magolda, 2001, 2004, 2008). Individual interviews were also used to evaluate self-authorship (Pizzolato, 2003, 2005, 2007, 2010; Torres & Baxter Magolda, 2004; Torres & Hernandez, 2007). In addition, the two-part measure of self-authorship by Pizzolato (2007) included both a qualitative and quantitative part. As will be discussed next, this measure was problematic. The development of a solely quantitative instrument of self-authorship, used in my study, is context-specific to career decision making (Creamer et al., 2007; Meszaros et al., 2007).

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Pizzolato (2007) created a two-part measure of self-authorship that included a questionnaire and an open-ended essay to measure beliefs and ability to act in self-authoring ways. The quantitative measure was the Self-Authorship Survey (SAS), a 24 Likert-scale questionnaire, and the qualitative measure was the Experience Survey that required participants to write narratives. The SAS was the first development of a quantitative instrument to measure self-authorship but was designed to be used with the qualitative survey. The two-part measure revealed differences in the participants' responses to the questionnaire and narratives, with only moderate correlations of self-authorship between the two measures. The author concluded by stating "until an even stronger measure of self-authorship is developed, using the two in conjunction seems best able to serve the diverse needs (such as program evaluation, student outcome assessment, or diagnostic testing)" (Pizzolato, 2007, p. 41).

Although Pizzolato's (2007) instrument found some moderate correlation between the quantitative and qualitative measures of self-authorship, additional work on a quantitative instrument to measure self-authorship was needed (Creamer et al., 2010). Through the Creamer, Lee, and Meszaros (2007) study, the creation and refinement of a quantitative instrument, the *Career Interest and Choice Questionnaire*, was completed. The instrument went through three revisions based on studies of high school and college students (Creamer et al., 2007; Laughlin & Creamer, 2007; Meszaros et al., 2007) and later became known as the *Career Decision Making Survey* (Creamer et al., 2010). The questionnaire included three major sections specific to career decision making and, therefore, was "described as domain specific because most of the questionnaire items were framed within the context of the career decision-making process" (Creamer et al., 2010, p. 554). In 2008 the instrument went through a minor revision to be more developmentally appropriate for middle and school students and became known as the *Career*

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Decision Making Survey: Middle and High School Version. This version was used for the first time in this study.

The variables of IT career interest and choice, parental support, socio-economic status, parental level of education, computer use, positive attributes of IT workers, decision orientation, receptivity, information credibility, information sources, and school enrollment were used in this study. Gender is discussed with IT career interest and choice because of the recommendation to have separate models for boys and girls (Creamer et al., 2004; Creamer et al., 2007; Meszaros et al., 2009; Meszaros et al., 2007). These variables will be briefly and independently reviewed below and will also be discussed later in the chapter when each study is discussed.

Variables.

Gender and IT Career Interest and Choice. Men and women differ in their interest and choice of IT careers (Creamer, Burger, & Meszaros, 2004; Creamer et al., 2007; Meszaros et al., 2007). Men report interest in IT careers more often than women (Creamer et al., 2004; Creamer et al., 2007; Meszaros et al., 2007) and previous studies have suggested studying career interest in IT separately for men and women (Creamer et al., 2004; Meszaros et al., 2007; Meszaros et al., 2009). Women are more receptive to advice, communicate with more people about possible careers, and have more positive attitudes about IT workers but typically use computers less often than men (Meszaros et al., 2007). In addition, women with an interest in IT careers report more positive views of IT workers and have sought advice from fewer sources (Creamer et al., 2007). Parental support of IT careers is also an important for men and women (Creamer et al., 2007; Meszaros et al., 2009).

Information Processing Variables

Decision Orientation. Decision orientation is a proxy for the theoretical framework of self-authorship and is context-specific to career decisions. It is used quantitatively to explore confidence in decision-making ability and career goals, and the likelihood of being influenced by the opinions of parents and others. The ways women and men handle opinions about career decisions differ with women often experiencing more difficulty when they receive different opinions (Creamer et al., 2007).

In two studies, women had a higher level of confidence in their decision-making ability than men which was reflected by their higher score of decision orientation. These women also received more advice from others regarding their career decisions and were more influenced by the opinions than men (Creamer et al., 2007; Meszaros et al., 2007).

In models of parental support of IT careers, the role of parental support was different in men and women. Decision orientation directly related to interest in IT careers in women but not in men. There was a significant indirect association of decision orientation in the model of men. These findings suggest the role of self-authorship in men and women supports the development of interest in IT careers (Meszaros et al., 2009).

Receptivity. Receptivity measures how agreeable individuals are to the input of others when making major decisions. Girls report more agreement in seeking and valuing opinions than boys and the level of receptivity was correlated with how likely participants report considering advice from people (information credibility) (Creamer et al., 2007). In a different study, receptivity was not significant in choice of an IT career for girls but was significant for boys (Meszaros et al., 2007). Receptivity was significant for girls and boys when considering how often they accept advice from others about careers (Meszaros et al., 2007).

Information Credibility. How likely individuals will consider advice from different groups of people, including parents, teachers, counselors, family members, friends, or employers, is measured through the variable information credibility. In two studies, no significant differences in boys and girls were found in how likely they report considering advice from others (Creamer et al., 2007; Meszaros et al., 2007). Information credibility was significant for both boys and girls in how likely they consider advice by others.

Information Sources. How often individuals talk about job options with different groups of people including parents, teachers, counselors, family members, friends, or employers is measured by the variable information sources. Differences in information sources exist between women and men. Women discuss career options with more sources more frequently than men (Creamer et al., 2007; Meszaros et al., 2007; Meszaros et al., 2009). The relationship of advice from multiple information sources on women's interest in IT careers is mixed. In one study, women who talked to fewer information sources about career choices were more interested in IT careers (Creamer et al., 2007) but this was not replicated in a different study by Meszaros and colleagues (2009). In the models of IT career interest and choice, information sources directly impacted IT career interest in women but not in men. The relationship was negative for women indicating that when they received more information about IT careers from information sources, they were less likely to pursue IT jobs.

Information sources were not significant in interest and choice of an IT job for men in the model of IT career interest and choice (Meszaros et al., 2007) but it was a significant variable in predicting IT career interest and choice in the initial conceptual model (Creamer et al., 2007). Unlike women, men who talk to more information sources about IT careers are encouraged to pursue IT jobs.

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Computer Related Variables

Positive Attitudes Toward IT Workers. In the past, individuals who work with computers have typically been characterized in a negative way. The stereotypical view of an IT worker is often contrasted as a "geek" or "nerd". The attitude one has about an IT worker does correlate with their interest in an IT career (Creamer et al., 2004). Creamer and colleagues (2007) found that students with positive attitudes about IT workers were more likely to be interested in IT careers than students with negative attitudes about IT workers. In their study, high school students had significantly more positive views of IT workers when compared to college students. Women in the study were more agreeable with the positive views of IT workers than men. This finding did not support previous research that found women are discouraged from pursuing IT careers when they carry strong stereotypical views. The researchers hypothesized this change is due to the growing presence and use of computers by both men and women (Creamer et al., 2007). Similar results were also found in testing the model of IT career interest in high school and college students. Women were more likely than men to agree with positive views toward IT workers but both women and men who had positive attitudes toward IT workers were more likely to indicate an interest in IT careers than those who had negative attitudes (Meszaros et al., 2007).

Computer Use. Technology is considered a powerful learning tool and students are exposed to a variety of technologies including computers at school. The growth of computer use in recent years has made it common for students to participate in computer-aided instruction in educational settings (Volman & van Eck, 2001). Access to computers and computer use are correlated and the more access a student has to a computer the more likely they are to use a computer and the more often they do so (Dresang, Gross, & Holt, 2007; Volman & van Eck,

2001). However, use of technology is not always equal between genders and does not appeal to girls and boys in the same manner.

Computer use is significant in encouraging interest in IT careers for women (Creamer et al., 2004; Creamer et al., 2007; Meszaros et al., 2007). Creamer and colleagues (2004) found that computer use was similar in men and women for work, educational, or social purposes, but men used computers more often for games. In another study, the amount of computer use was very important and the greater use of a computer was correlated with an interest in an IT career, but the type of computer use was not important (Creamer et al., 2007). Computer use was also greater in students that had more positive views of computer workers (Creamer et al., 2007). Meszaros and colleagues (2007) also found computer use as a strong predictor of interest in IT careers in women.

Parents

Parental Support. Parental support includes the perception of support of career choices and opportunities or encouragement provided by parents in the career exploration process. A number of studies demonstrate that parents are a major factor in their child's career decisions (Creamer et al., 2007; Keller & Whiston, 2008; Meszaros et al., 2009; Meszaros & Lane, 2010; Meszaros et al., 2007). This finding is also true of parents of students in rural locations (Buikstra et al., 2007; Ferry, 2006; Griffin et al., 2011). However, it is important to acknowledge that parents may actually be a negative influence given that parents in rural Appalachian communities often have limited experience with post-secondary education and limited opportunities to learn about available careers (Ali & Saunders, 2006). Even so, parents are a primary role model and available source of information to their adolescent children from whom

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children gain the majority of their knowledge about jobs, required job training, and the availability of jobs (Walls, 2000).

Parental support helps guide children through the career exploration process and is very important to students who have an interest in IT careers (Meszaros et al., 2009). In past studies, men and women perceived general parental support of their IT career interest and choice (Creamer et al., 2007; Meszaros et al., 2009). This support is considered especially important for women in having an interest in IT careers (Meszaros et al., 2009).

Father's Level of Education and Mother's Level of Education. Although the importance of the role of parents in career decision making is evident, the role of parental level of education does not receive the same consensus in research. Some findings show an effect of parental level of education such that parents with higher levels of education and higher income status provide their children with more opportunities and exposure to careers while parents with lower socioeconomic status have a more difficult time providing resources for their children to learn about and explore potential careers (Lareau, 2003).

In models of IT career interest and choice there is a significant effect for women whose mothers are college educated and provide support for IT careers but this was not found for men (Creamer et al., 2007). Specifically, the importance of mothers as a support for career exploration and IT careers is evidence of the need for mothers to have knowledge about IT careers to provide this support (Creamer et al., 2007). In models of parental support of IT careers, parents' level of education was only significant for males (Meszaros et al., 2009). Thus, it is also necessary for fathers to have knowledge of available IT careers.

School Enrollment

Previous studies of school enrollment used academic major and year. In this present study, enrollment in middle or high school is used because academic major and year are not applicable to the participants. The use of enrollment in middle and high school also makes the model of parental support of IT careers slightly different than the previous models that used academic major and year. The expansion of the model of parental support of IT careers to younger populations is important in understanding whether parents are supportive of IT careers for younger students and if differences in IT career interest exist between middle and high school boys and girls.

Career Decision-Making and Self-Authorship Relevant Literature

The study of women's interest in and choice of an IT career first used a sample of college and high school students (Creamer et al., 2004; Creamer et al., 2007). This study occurred in three phases. The first study used the initial version of the *Career Decision Making Survey* to examine similarities and differences in men's and women's interest in IT careers. Creamer and colleagues (2004) found that differences in interest in IT careers exist in men and women. Their study used the variables of computer use and positive attitudes of IT workers. Men were more interested in IT careers than women. Men and women used computers in similar ways for educational, social, and work purposes but women used computers for games less often than men. Men and women also had similar positive attitudes of IT workers but men had strong stereotypical views (geeks and male) of IT workers. Because men were more interested in IT careers but had similar attitudes of IT workers and used the computer as often as women, Creamer and colleagues (2004) suggested developing separate models of IT career interest for women and men.

The same participants were also interviewed using a protocol that includes questions for each dimension of self-authorship but only the interviews from 40 college women were analyzed in another study (Creamer & Laughlin, 2005). The college women reported parents most frequently as their main source of career support. Siblings and teachers or professors were reported as the next most influential people. The participants believed their parents want what is best for them and trust their advice regarding career decisions. The women reported that they would not accept advice that was in conflict with their own thoughts and goals. This finding supports the relationship of self-authorship in the decision making process and especially in the context of career decisions (Creamer & Laughlin, 2005).

The next study was designed to test a conceptual model of interest in an IT career and used self-authorship as the theoretical framework (Creamer et al., 2007). The conceptual model included five key variables that were statistically significant in predicting IT career interest and choice: race, parental support, computer use, positive attitudes about the attributes of IT workers, and information sources. This study found that men were more likely than women to indicate an interest in IT. Race was an important determinate of a student's interest in IT; both men and women members of minority groups were more likely to have an interest in IT. Women experienced a greater effect from parental support than did men and those women who had an interest in IT reported that their parents supported their career choice. Men and women were both influenced by their parents in regards to career-seeking behavior but parental level of education predicted the support of career exploration and support. Specifically, the mother's level of education was a strong predictor of exploration and support on women; mothers with college degrees were more likely to encourage career exploration. However the mother's level of education was not significant for men on career exploration and support. There was a direct

correlation between holding a positive attitude about IT workers and in the interest in IT career choices for both men and women with women were more likely to have positive views than men. High school students had more positive attitudes toward IT workers than college students. Positive attitudes were associated with frequency of computer use and receptivity to career advice. Participants reported more positive perceptions of computer workers with greater computer use and were more likely to be interested in possible IT careers. Frequency of computer use was linked to men's and women's interest in IT careers, both directly and positively. Decision orientation is the proxy for self-authorship and women scored higher than men. The higher the score on decision orientation, the more likely an individual would feel (or display) high confidence in making decisions. The degree of receptivity evaluated the direct link between receiving information and how credible participants perceived the advice. Women were more likely than men to report that it was helpful to seek job information from others, particularly in connection with their interest in IT careers. This finding supported the framework of self-authorship. Finally, the variable information sources indicated women with an interest in IT reported consulting fewer sources (Creamer et al., 2007).

Using the high school subset populations from the study (Meszaros et al., 2007), both males and females were tested on seven variables: decision orientation, receptivity, information sources, information credibility, positive attitudes toward IT workers, computer use, and IT career interest and choice. Men and women were tested separately concerning their IT career interest and choice as a result of hypothesized differences between women and men. Men and women alike made decisions based on the opinions of others, particularly in the early stages of their maturation toward self-authorship. Men were more likely to be encouraged and received more positive support. The findings from this study are important but additional research to

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validate the separate models in girls and boys is essential to support the use of the models in predicting IT career interest and helping to educate the broader community and adult supporters about how to promote IT career interest. Research is also needed to extend the models of IT career interest and choice to students at early ages to determine their stage of self-authorship and relationship with interest in IT careers (Meszaros et al., 2007).

Another study using the CDMS examined college and high school students' parental support in IT career choice and the differences and similarities in men and women (Meszaros et al., 2009). Parental support in career exploration and encouraging IT as an appropriate career choice had a positive direct effect on IT career interest and choice.   Young women's interest in and career choice of IT was further determined by their age, grade level, and decision orientation. Young men's IT career interest and choice were significantly impacted by their academic year, major, family support, and independent information sources. The data from this study show that parents guided males more than their female counterparts toward IT careers. Women interacted with others more often than men but a significant effect on their choice of an IT career was not found. Parental level of education was not significant for women in how often they explored careers but higher levels of parental education were negatively correlated with men, suggesting parents with higher levels of education were equipped to discuss careers with their sons (Meszaros et al., 2009).

The CDMS survey was also used in a study of 183 junior and senior college students (Creamer, 2010). The study found a link between the stage of self-authorship and openness to input but only connected the intrapersonal dimension as significant in the decision-making process. This finding suggests that the participants were developing self-authorship and if they were at an earlier stage in the development process the interpersonal dimension may have also

been significant. This study was limited because the majority of the responses were from men enrolled in a Computer Science major who had already selected an IT career path.

In 2010 a study conducted by Meszaros and Lane examined 113 academically at risk freshman and sophomore students from urban and rural Virginia who were enrolled in the Virginia Tech Summer Training Academy for Rising Students (VT-STARS), a youth development program. The purpose of the study was to examine the relationship between risk, resilience, and self-authorship. The researchers used the quantitative data from the CDMS and the qualitative data from the participants' short narratives about receiving career advice. The results from the quantitative analysis of the CDMS indicated participants were self-authored. However, the results from the qualitative analysis of the personal narratives indicated fewer participants were self-authored. The inconsistency in the quantitative and qualitative findings makes the determination of self-authorship development difficult.

Underrepresented Populations and Self-Authorship

Several studies have been conducted on underrepresented college populations of ethnic identities and sexual orientations, including Latino/a students, lesbian students, and high-risk college students. These studies yielded similar findings regarding the importance of meaning making. For example, the study on Latino/a students discovered that those students who experienced an increase in self-authorship reported lower levels of family influence and ability to overcome negative stereotypes (Torres & Baxter Magolda, 2004; Torres & Hernandez, 2007). In addition, the study of lesbian college students found that more self-authored participants who were comfortable with their identities were able to navigate multiple influences and integrate multiple identities more effectively than those participants with fewer self-authored ways (Abes & Jones, 2004, 2007).

The studies by Pizzolato (2003, 2004) examined high-risk college students in their freshman year. High-risk was defined as students "whose academic background, prior performance, or personal characteristics may contribute to academic failure or early withdrawal from college" (Pizzolato, 2003, p. 798). This included first generation college status and low socio-economic status which were considered personal characteristics that make a student high-risk. This population of students was studied because the research on this group had mainly focused on retention and persistence in college and had not examined how high-risk students know and make meaning about their life (epistemological beliefs).

The results of the 2003 study by Pizzalato were similar to the studies on lesbian and Latin students. The students who were more self-authored dealt with the challenges associated with being considered high-risk more successfully. Pizzalato determined that the students had already developed self-authoring characteristics prior to the study. The results of the 2004 study also found cases of high-risk college students who were self-authored but who found themselves at a crossroads upon matriculation and looked to external sources for information and guidance. The level of guidance students received during more difficult times determined whether they were able to restore their self-authoring ways (Pizzolato, 2004).

These studies on self-authorship specifically began the conversation regarding high-risk students. Additional research is needed particularly in regard to younger populations because of the important development that occurs in adolescence. Individuals experience developmental transitions throughout their lifespan but the transitions that individuals encounter during adolescence through early adulthood are distinct (Creamer & Wakesfield, 2009). Adolescent experiences are part of one's development of identity, relationships, and independence. According to Super (1990), adolescents are also in the exploration stage of career development

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and form preferences and narrow options to a few potential careers for detailed exploration. The theory of self-authorship studies the development of identity and navigating relationships with others and can be context-specific to career development. Studies on high school students have found some high school students are in the emerging stages of self-authorship and this finding may be related to their disadvantaged or at-risk status. It is important to expand this finding and consider in what other contexts a disadvantaged status may shape a student's choice of a non-traditional career choice such as IT.

Summary

This chapter reviewed the literature and theoretical foundation supporting this study. The challenges associated with economic and workforce development in modern times emphasize the hardships rural Appalachia communities face regarding education and access to career resources. Limited research is available regarding the career exploration and development of students in rural public school education, despite the growing number of students in rural locations, the transformation of available occupations, and the challenges faced in rural settings (Provasnik et al., 2007). Researchers have not given attention to the career development of this population (Ali & Saunders, 2006). Research regarding how students from this population make career decisions will help assess what encourages interest in IT careers.

One approach to study IT career interest is through the theoretical framework of self-authorship. Research indicates that marginalized students may develop self-authoring ways earlier than previously suspected, warranting research to develop a deeper understanding of middle and high school students. At the present time, only a few studies have included high school students and no studies have included middle school students using the theoretical framework of self-authorship.

The Upward Bound and Talent Search Programs provide an excellent setting to study these students. Since the fundamental goals of the programs involve providing services to disadvantaged students, the rural context of this study provides an excellent opportunity to address unanswered questions. Learning if students in college prep programs for disadvantaged students, such as Upward Bound and Talent Search, are interested in IT careers will be helpful for future programming and interventions.

In addition, the adapted version of the *Career Decision Making Survey: Middle and High School Version* presents a content-specific focus to review IT career interest and choice in a population that warrants additional research. That is the purpose of this study and the methods used in validating models of IT career interest and choice and parental support of IT careers in boys and girls are presented in the following chapter.

Chapter 3

METHODS

Although past research has examined career decision making and interest in IT career fields with models using the theoretical framework of self-authorship with high school and college students, it is necessary to replicate and expand the use of the models to other populations such as middle and high school students (Meszaros et al., 2007) enrolled in the Upward Bound and Talent Search programs in rural Appalachia. Other studies of disadvantaged high school students have shown evidence of self-authoring ways and expanding the research to include middle school subjects will help provide a better understanding of when self-authoring ways begin in the context of career decisions. In addition, studying IT career interest and choice in the context of the Appalachian region is an important topic because of the recent expansion of IT organizations into the region and because of the future potential workforce opportunities for local students who wish to remain in their communities. For the current study, I contribute to the literature by examining a unique population of students and testing models that have predicted IT career interest and choice and parental support of IT careers among older students.

Previous studies suggested the need to test the models separately in boys and girls because of gender differences (Creamer et al., 2004; Creamer et al., 2007; Meszaros et al., 2009; Meszaros et al., 2007). Thus, the model of IT career interest and choice was designed to test IT career interest in girls (Figure 1) and boys (Figure 2). The differences between the models for girls and boys were constructed based on significant paths found in the initial testing of the models (Meszaros et al., 2007) and supported by the theoretical framework of self-authorship. The + signs indicate the hypothesized direction of the path associations. The model of parental support of IT careers was designed to test parental support of IT career interest and choice in

girls and boys separately (Figure 3). The model is modified from the original that was used with high school and college students (Meszaros et al., 2009). The changes reflect different school and parent demographic information that was available in this study; it more accurately represents middle and high school students, yet maintains the theoretical framework of self-authorship. The +/- signs indicate the hypothesized direction of the path associations. The model of parental support is slightly modified because the original model (Meszaros et al., 2009) included a variable for academic year and major, but this information was not available for the students participating in this study. The participants in the current sample are middle and high school students who have not selected a college major, and, therefore, their enrollment in middle or high school is used to determine differences and similarities in middle and high school students. The previous model also included parents' level of education but the model for this study will look at mother's and father's level of education separately.

Testing the models in a new population expands the findings, contributes to the understanding of IT career interest and choice in Upward Bound and Talent Search students, and increases awareness of the need for more students to be guided toward IT careers to meet workforce needs in rural Appalachian communities. I used data collected as part of a larger project funded by the National Science Foundation (award #0436189) and in partnership with a research center that studies the impact of technology on children, youth, and families at a university in Virginia. These data had not been analyzed previously.

Research Questions and Hypotheses

1. Do demographic differences exist in the sample population (gender, race, and school enrollment) in the following scales?

    a. IT career interest and choice

b. decision orientation

c. receptivity

d. information credibility

e. information sources

f. positive attitudes toward IT workers

g. computer use

h. parental support

- Differences between boys and girls (gender) in the scales of IT career interest and choice, decision orientation, and information sources will be significant.

- Differences between majority and minority (race) participants in the scale of IT career interest and choice will be significant.

- Differences between middle and high school enrollment (school enrollment) in the scales of decision orientation and information sources will be significant.

2. Is the conceptual model of IT Career Interest and Choice supported by the theory of self-authorship an adequate fit for disadvantaged youth in rural Appalachia?

- Students with higher scores on decision orientation will also report speaking more often to sources (information sources).

- The more receptive to the input of others, the more likely the student will consider career advice offered by parents, teachers, counselors, family members, friends (information credibility).

- The more receptive to the input of others, the more likely the students will have positive attitudes about IT workers.

- The more likely students are to consider advice (information credibility), the more often they report speaking with those sources (information sources).

- Students receiving positive messages from information sources about IT careers will have higher rates of computer use (communication, games, surfing the Internet, general tasks, educational purposes).

- The more positive the attitudes students have about IT workers, the more likely they will have high rates of computer use.

- The more students use a computer, the more likely they are to have an interest in IT careers.

- The more positive the attitudes about IT workers that students have, the more likely they will have an interest in IT Careers.

- Girls and boys will have differences in the following paths:
  - Decision orientation will directly and significantly associate with positive attitudes about IT workers and computer use in girls but not boys.
  - Receptivity will directly and significantly relate to information sources in girls but not boys.
  - Information sources will directly and significantly influence IT career interest and choice in girls but not boys.

        o   Decision orientation will directly and significantly relate to

            receptivity in boys but not girls.

3. Is the conceptual model of Parental Support for IT Careers supported by the theory of

   self-authorship an adequate fit for disadvantaged youth in rural Appalachia?

- Students in higher grade levels will have more parental support, greater

  levels of decision orientation, and seek career information from more

  often.

- Students whose parents have higher levels of education will have more

  parental support and seek career information from more sources.

- Parental support, decision orientation, and information sources will have

  a direct and positive impact on IT career interest and choice.

- Decision orientation will have a direct and positive impact on how often

  students report seeking career information from information sources.

Participants and Procedure

The student sample for this study includes 399 rural youth enrolled in the Upward Bound

and Talent Search programs at a university in Virginia. The participants in the study completed

the *Career Decision-Making Survey Middle-High School Version* (Appendix A) during their

enrollment in the Upward Bound or Talent Search programs. A validity check was completed

and 34 participants who had missing responses to more than half of the questionnaire items were

removed. Because gender is an important variable in the models, 28 participants who did not

report gender were also removed. The final analytic dataset included 337 participants.

Participants were between the ages of 12 and 18, 64.1% were girls, and nearly two thirds

(64.4%) were Caucasian.

Participants completed the questionnaire when they gathered at their school for the

monthly Upward Bound or Talent Search meetings. Students participated in the study

voluntarily and at different points in their enrollment in the program when program counselors

used the survey to introduce the topic of career decision making. The data collection began in

2008 and ended in 2011. The program director maintained an ongoing list of students who

participated to ensure that no student participated on more than one occasion. The program

counselors distributed the paper questionnaire and read the instructions for completing the survey

aloud to the students. Participants did not receive an incentive for completing the survey.

Participants were enrolled in middle or high schools in southwest and central Virginia.

Talent Search serves 21 high schools and 7 middle schools. Upward Bound serves 16 high

schools. The service region meets economic, educational, and socio-cultural requirements for

TRIO programs. Regional schools have enrollments ranging from a low of 267 students to a

high of 2,222 students. The median household income in the target area falls below state and

national averages and the rate of poverty is higher than state and national averages. The

percentage of student enrollment in schools that are economically disadvantaged ranges from a

low of 23% to a high of 57%. Talent Search administrators estimate over 8,000 students are

eligible for the program in the target area (Virginia Tech, 2011a). Upward Bound administrators

estimate over 5,000 students are eligible for the program in the target area (Virginia Tech,

2011b).

Instrumentation

The *Career Decision Making Survey: Middle and High School* version used in this study

was adapted from the Career Decision Making Survey (Creamer et al., 2010; Creamer et al.,

2007) and revised to be developmentally appropriate for middle and high school students by

Meszaros, Lane, and Baxter Magolda. Originally, the 119 item paper-and-pencil instrument was developed in a study of high school and college students and referred to as *The Career Interest and Choice Questionnaire* (Creamer et al., 2004; Creamer et al., 2007; Laughlin & Creamer, 2007). It was revised in 2002, 2003, and 2004-2005 based on a study of high school and college students. The number of items increased to 176 (Creamer et al., 2007; Laughlin & Creamer, 2007; Meszaros et al., 2007). The survey scales were developed by a team of researchers studying career decision making in collaboration with Dr. Marcia Baxter Magolda who is an expert on the theoretical framework of self-authorship. The expertise of the researchers and the relevant literature used to create the survey items answered content and construct validities. Face validity tests were also completed (Creamer et al., 2007).

The questionnaire went through another revision in 2008 to become the *Career Decision Making Survey: Middle and High School Version*. Only minor changes were completed to make the language of the instrument developmentally appropriate for middle and high school students. For instance, the word "career" was changed to "job" throughout the questionnaire and included Upward Bound and Talent Search Counselors as options for job information and advice. To maintain construct validities, the changes were done in collaboration with Drs. Marcia Baxter Magolda, Meszaros, and Lane. The questionnaire includes 3 sections and 168 items. The first section focuses on computers and technology and assesses the attitudes toward IT workers, computer use, and IT career interest and choice. The second section includes general job-related questions and includes scales that are grounded in the theoretical framework of self-authorship. These scales assess parental support, information sources, information credibility, receptivity, and decision orientation. The final section contains demographic questions.

Variables

IT Career Interest and Choice

IT career interest and choice is assessed using the familiarity with and interest in computer-related jobs scale. Participants responded to the seven questions based on a 4-point Likert scale ranging from 1 (disagree) to 4 (agree). Questions include "I have a good idea about what people do in their computer-related jobs," "I feel a sense of satisfaction when I am able to use a computer to solve a problem," "If I choose to, I probably have the ability to be successful in a computer-related job," "I have family, friends, and/or people I know who work in a computer-related job," "I would be comfortable working in a male-dominated job," "Working in a computer-related job is one of the job options I am thinking about," "My parents would probably consider a computer job a good career choice for me" and "Most of my friends think that a career in a computer job is a good choice for me." The Cronbach's alpha is .759 for the 8-item scale.

Information Processing Variables

Decision Orientation. The making decisions and setting priorities scale includes 12 items to measure decision orientation, including confidence in decision making ability, clarity of career goals, and the possibility of being unduly influenced by the opinions of parents and close friends. This variable is a proxy for the theoretical construct of self-authorship although expert researchers do not agree on whether it measures all three dimensions of self-authorship adequately (Creamer et al., 2007). Participants responded to the 12 questions based on a 4-point Likert scale ranging from 1 (disagree) to 4 (agree). Items 4, 5, 6, 7, and 10 were recoded to have higher values representing more positive interpretations. Questions 1-5 and 11-12 ask about the

participant's confidence in decision making and clarity of career goals. The influence of parents and close friends is measured by questions 6-10. The Cronbach's alpha is .734 for the 12-item scale.

Receptivity. Receptivity to the input of others when making big or important decisions is assessed using five items. Participants responded to the five questions based on a 4-point Likert scale ranging from 1 (disagree) to 4 (agree). The questions include "I find it helpful to listen to the opinions of others before I make an important decision," "When I make an important decision, I often seek the opinion of members of my family," "When I make an important decision, I often seek the opinion of my friends," "I like to have my parents' input before I make a big decision," and "Even when the advice is not the same, I try to consider the information people give me before I make a big decision." The Cronbach's alpha is .820 for the 5-item scale.

Information Credibility. This variable examines how likely participants report considering advice by 11 different groups of people including parents, teachers, counselors, friends, and employers. Previous studies used 10 different groups of people but this study included Upward Bound and Talent Search counselors since the participants were enrolled in one of these programs. Participants responded to the 11 questions based on a 4-point Likert scale ranging from 1 (very unlikely) to 4 (very likely). The Cronbach's alpha is .884 for the 11-item scale.

Information Sources. This variable considers how often participants discuss job options or plans with 11 different groups of people including parents, teachers, counselors, friends, and employers. Previous studies used 10 different groups of people but this study also included Upward Bound and Talent Search counselors since the participants were enrolled in one

of these programs. Participants responded to the 11 questions based on a 4-point Likert scale ranging from 1 (never) to 4 (many times). The Cronbach's alpha is .809 for the 11-item scale.

 Computer Related Variables

       Positive Attitudes Toward IT Workers. This construct was assessed using the 7 item positive attitudes toward IT workers scale that measures extent of agreement with statements about the positive attributes of IT workers. Items 1, 2, and 3 were recoded to have higher values representing a more positive interpretation. Participants responded to the seven questions based on a 4-point Likert scale ranging from 1 (disagree) to 4 (agree). The items for the scale are "I think people who choose jobs using computers are: 1. Geeks, 2. Likely to be male, 3. Loners/antisocial, 4. Interesting, 5. Hard-working, 6. Smart, 7. Creative." The Cronbach's alpha is .659 for the 7-item scale.

       Computer Use. Frequency of computer use is measured using the 7-item computer use scale. Participants responded to the seven questions based on a 4-point Likert scale ranging from 1 (never) to 4 (several times a week or more). The questions for the scale ask "How often do you use a computer for the following activities?: 1. Communication, 2. Games, 3. General entertainment, 4. News and current events, 5. General tasks, 6. Development or design, 7. Educational purposes." Each item gives a description. For instance, communication includes email, instant messages, or chat rooms. The Cronbach's alpha is .764 for the 7-item scale.

Parents

       Parental Support. This variable is measured using perceptions of the parent's opinions or views on a 9-item scale. The scale includes questions about the perception of parental support for a career and career exploration and the perception that parents know an appropriate career choice for their child. Participants respond to the seven questions based on a 4-point Likert scale

ranging from 1 (disagree) to 4 (agree). The questions ask the participants' perceptions of their mother's/female guardian's or father's/male guardian's views of the importance of the participant having a job, approval of job choice, and encouragement of job exploration. The Cronbach's alpha is .831 for the 9-item scale.

Father's Level of Education. This categorical variable indexes the father's level of education according to six options including "less than high school", "high school or equivalent", associates/community college degree", "bachelor's degree", "masters, doctorate, professional degree", and "other."

Mother's Level of Education. This categorical variable assesses the mother's level of education along a continuum including "less than high school", "high school or equivalent", associates/community college degree", "bachelor's degree", "masters, doctorate, professional degree", and "other."

School Enrollment

This categorical variable assesses the participant's enrollment in either middle or high school.

Data Analysis

First, independent t-tests were used to examine group differences in key scales for the study by gender, race, and school enrollment using Statistical Package for Social Sciences (SPSS) Student Version 20.0. These scales were IT career interest and choice, decision orientation, receptivity, information credibility, information sources, positive attitudes toward IT workers, computer use, and parental support.   The results of the t-tests determined whether separate models for gender, race, or school enrollment were necessary.

Next, conceptual models that examine IT career interest and choice were tested for model fit using path analysis in MPlus Version 7.11. Separate models for girls and boys were tested, producing four models. The first model explores IT career interest and choice in girls and the second model in boys using information processing and computer related variables. The model of parental support for IT careers assesses girls and boys separately but uses the same model and the following measures: student's school enrollment, parent's level of education, parental support, decision orientation, and information sources. To conduct both analyses the same procedures described next were used.

First, missing values were handled using maximum likelihood estimation, which is a common approach in path analyses. The skewness and kurtosis as well as the multivariate normality were checked and followed Jöreskog's recommended values of +/-2. To assess overall fit of the model the chi-square statistics are reported. To evaluate the fit, a multiple-index strategy is used as suggested by Hu and Bentler (1998) to include one stand-alone fit index and one incremental fit index. First, the stand-alone Root Mean Square Error of Approximation (RMSEA) was used to measure the lack of fit of the model to the population data (Steiger, 1990). RMSEA values between 0.00 to 0.08 are considered a close to reasonable fit. The incremental fit index Tucker-Lewis Index (TLI) was used to compare the hypothesized model with target models. TLI values of 0.9 or higher are recommended. I also reported the Comparative Fit Index (CFI). A CFI score of 0.90 or greater indicates that 90% of the covariation in the data can be reproduced by the model. In addition, I also reported the standardized root mean square residual (SRMR) as suggested by Hu and Bentler (1998) when the sample size is below 250. A SRMR score of 0 indicates perfect fit and a score between 0.05 to 0.08 is considered a good fit.

Summary

The methods and analyses for validating models of IT career interest and choice in boys and girls are detailed in this chapter. Methods used in testing models of IT career interest and choice in girls and boys are discussed as well as the methods used in testing models of parental support of IT careers in boys and girls. Methods for addressing each of the research questions are also discussed. The results of the analyses described in this chapter are presented in Chapter 4, and those results are discussed in Chapter 5.

Chapter 4

RESULTS

This chapter presents the results of the analyses conducted for this study. First, description of the participants, psychometric properties of study measures, and correlation tables are presented. This is followed by testing demographic similarities and differences (R1). To examine the first objective of the study, the IT Career Interest and Choice models were used (Meszaros et al., 2007) to test associations among computer use, positive attitudes toward IT workers, information sources, information credibility, receptivity, decision orientation, and IT career interest and choice using path analysis (R2). To accomplish the second goal, the Parental Support for IT Careers models was used (Meszaros et al., 2009) to test associations among parental support, decision orientation, information sources, school enrollment, mother's level of education, father's level of education, and IT career interest and choice using path analysis (R3). Results indicate that the models presented below are more predictive of interest in IT careers in middle and high school students enrolled in Upward Bound or Talent Search than the models used with high school and college students.

Demographic Characteristics and Psychometric Properties

Sample Characteristics

Table 1 includes the demographic characteristics of the sample. The sample includes 216 girls and 121 boys (*N*=337). The majority of the sample was white students, attending high school, and enrolled in Talent Search. Nearly half of the mothers and fathers had a high school or equivalent level of education and less than 10% had a bachelor's, master's or advanced degree.

Table 1

Demographic Characteristics of Sample (N=337)

	Girls			Boys			Total Sample
Variable	(*n*=216)%	*M*	*SD*	(*n*=121)%	*M*	*SD*	(*N*=337)%
Gender	64.1			35.9			100
Race/Ethnicity		0.67	0.47		0.62	0.49	
Majority	64.4			61.9			64.9
Minority	32.4			38.1			35.1
School Enrollment		0.89	0.31		0.93	0.26	
High School	89.1			92.9			90.4
Middle School	10.9			7.1			9.6
Program Enrollment							
Talent Search	86.9			66.7			79.1
Upward Bound	13.1			33.3			20.9
Mother's Level of Education		2.75	3.83		2.64	1.06	
Less than high school	13.9			4.5			10.6
High school or equivalent	47.8			50.9			48.9
Associates/community college degree	22.9			32.7			26.4
Bachelor's degree	7.5			4.5			6.4
Master's or higher degree	5.0			2.7			4.2
Other	3.0			4.5			3.5
Father's Level of Education		2.43	1.26		2.58	1.16	
Less than high school	17.8			7.3			14.0
High school or equivalent	51.8			57.8			53.9
Associates/community college degree	14.2			16.5			15.0
Bachelor's degree	7.6			11.0			8.8
Master's or higher degree	3.6			2.8			3.3
Other	5.1			4.6			4.9

Psychometric Properties of Study Measures

Table 2 includes the psychometric properties of the study measures used in the models. Cronbach's alphas indicated scales had good internal reliability and consistency, with the lowest alpha levels for the measures of positive attitudes toward IT workers (girls: $\alpha = 0.68$, boys: $\alpha = 0.60$) and the highest alpha levels for the information credibility measures (girls: $\alpha = 0.88$, boys: $\alpha = 0.90$).

Table 2

Psychometric Properties of Study Measures

Measure			Range		
	M	*SD*	Potential	Actual	α
IT Career Interest & Choice					
Girls	2.66	0.64	1-4	1-4	0.77
Boys	2.55	0.63	1-4	1-4	0.75
Decision Orientation					
Girls	3.20	0.44	1-4	1.91-4	0.71
Boys	3.09	0.45	1-4	2-4	0.76
Receptivity					
Girls	3.14	0.70	1-4	1-4	0.82
Boys	2.99	0.69	1-4	1-4	0.81
Information Creditability					
Girls	2.87	0.63	1-4	1-4	0.88
Boys	2.83	0.67	1-4	1-4	0.90
Information Sources					
Girls	2.52	0.64	1-4	1-4	0.81
Boys	2.48	0.64	1-4	1-4	0.81
Positive Attitude					
Girls	3.29	0.52	1-4	1-4	0.68
Boys	3.18	0.50	1-4	2-4	0.60
Computer Use					
Girls	3.07	0.63	1-4	1-4	0.73
Boys	2.90	0.73	1-4	1-4	0.81
Parental Support					
Girls	3.07	0.83	0-4	0.11-4	0.85
Boys	3.07	0.70	0-4	0-4	0.79

       Correlations of the constructs for the boys and girls IT Interest and Choice models are represented in Appendix B combined. The correlations of the constructs for the models of Parental Support of IT are represented in Appendix C. The low to moderate correlations between the variables suggest the scales are not duplicating measurement of the same construct in the models. The results establish relationships among the constructs and supports including them in the models.

Research Questions and Model Fit

Research Question 1

Do demographic differences exist in the sample population (gender, race, and school

enrollment) in the following scales?

       a. *IT career interest and choice*

       b. *decision orientation*

       c. *receptivity*

       d. *information credibility*

       e. *information sources*

       f. *positive attitudes toward IT workers*

       g. *computer use*

       h. *parental support*

     T-tests were conducted to determine if there are demographic differences based on gender, race, and school enrollment within the measures of IT career interest and choice, decision orientation, receptivity, information creditability, information sources, positive attitude toward IT workers, computer use, and parental support. The results of the t-tests are presented below in Table 3 (gender), Table 4 (race), and Table 5 (school enrollment). Using the *Bonferroni* post hoc tests differences were verified in decision orientation (gender), computer use (gender), and information source (student enrollment). The differences in gender on the measures of decision orientation and computer use supports having separate models for girls and boys.

Table 3

Differences in IT Career Interest and Choice, Decision Orientation, Receptivity, Information Creditability, Information Source, Positive Attitude Toward IT Workers, Computer Use, and Parental Support by Gender (N=337)

	Gender	Girls	Boys
Measure	*t*	*M(SD)*	*M(SD)*
IT Career Interest & Choice	1.49	2.66(0.64)	2.55(0.63)
Decision Orientation	2.15*	3.20(0.44)	3.09(0.45)
Receptivity	1.80	3.14(0.70)	2.99(0.69)
Information Creditability	0.62	2.87(0.63)	2.83(0.67)
Information Sources	0.50	2.52(0.64)	2.48(0.64)
Positive Attitude	1.74	3.29(0.52)	3.18(0.50)
Computer Use	2.30*	3.07(0.63)	2.90(0.73)
Parental Support	-0.01	3.07(0.83)	3.07(0.70)

*$p < .05$.

Table 4

Differences in IT Career Interest and Choice, Decision Orientation, Receptivity, Information Creditability, Information Source, Positive Attitude Toward IT Workers, Computer Use, and Parental Support by Race (N=337)

	Race	Majority	Minority
Measure	*t*	*M(SD)*	*M(SD)*
IT Career Interest & Choice	0.51	2.63(0.62)	2.60(0.65)
Decision Orientation	-0.41	3.16(0.45)	3.18(0.44)
Receptivity	-0.77	3.06(0.71)	3.13(0.69)
Information Creditability	-1.65	2.82(0.65)	2.95(0.59)
Information Sources	-1.14	2.50(0.62)	2.58(0.65)
Positive Attitude	-1.52	3.22(0.51)	3.31(0.53)
Computer Use	-0.42	3.00(0.65)	3.04(0.69)
Parental Support	0.16	3.09(0.73)	3.07(0.86)

Table 5

Differences in IT Career Interest and Choice, Decision Orientation, Receptivity, Information Creditability, Information Source, Positive Attitude Toward IT Workers, Computer Use, and Parental Support by School Enrollment (N=337)

Measure	School Enrollment t	High School $M(SD)$	Middle School $M(SD)$
IT Career Interest & Choice	1.20	2.64(0.63)	2.50(0.62)
Decision Orientation	1.93	3.18(0.44)	3.02(0.43)
Receptivity	0.82	3.09(0.69)	2.98(0.75)
Information Creditability	1.78	2.86(0.63)	2.64(0.69)
Information Sources	2.45*	2.54(0.63)	2.24(0.69)
Positive Attitude	0.34	3.26(0.53)	3.23(0.45)
Computer Use	0.99	3.02(0.67)	2.89(0.65)
Parental Support	0.05	3.08(0.77)	3.07(0.98)

*$p < .05$.

The preceding tests indicated it was appropriate to move forward conducting path analyses. Path analyses were conducted using the statistical software package MPlus Version 7.11. To test the overall fit of the models, chi-square (χ^2) statistic was used to assess model fit. It is a test of the null hypothesis that the model fits the data; non-significant chi-square is desired, indicating that the model fits the data. Three alternative fit indices, RMSEA, SRMR, CFI, and TLI were also considered in the path analyses.

Research Question 2

Is the conceptual model of IT career interest and choice supported by the theory of self-authorship an adequate fit for disadvantaged youth in rural Appalachia?

The purpose of the model for girls (Figure 1) and model for boys (Figure 2) was to test IT career interest and choice in middle and high school girls and boys enrolled in Upward Bound or Talent Search, using the conceptual models presented in chapter 1. The models are segregated for boys and girls because initial tests support having separate models for boys and girls and past research supported using two separate models.

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IT Career Interest and Choice (Girls). In this model of IT career interest and choice for

girls the significant chi-square result (χ^2=19.56, *p*=.01) indicates that the null hypothesis should

be rejected and that the model does not fit the data. Although chi-square does not indicate model

fit, this model of fit measure should be considered with caution and it was determined that it was

necessary to consider more rigorous model fit indices to account for sample size inflation. The

fit indices RMSEA (0.08), SRMR (0.05), CFI (0.95) and TLI (0.87) fall within the appropriate

guidelines for model fit (see Table 6). Figure 5 presents the model with the standardized path

values, standard errors, and squared multiple correlations. Overall, the hypothesized paths were

supported in the model.

Table 6

IT Career Interest and Choice Chi-Square and Fit Indices

Model	χ^2	*df*	RMSEA	SRMR	CFI	TLI
Girls (n=216)	19.56	8	0.08	0.05	0.95	0.87
Boys (n=121)	20.14	12	0.08	0.08	0.94	0.89

In this model three key variables, positive attitudes toward IT workers (β=0.19, *SE*=0.08,

p<.01), computer use (β=0.23, *SE*=0.07, *p*<.01), and information sources (β=0.17, *SE*=0.06,

p<.01), directly and significantly related to IT career interest and choice. This indicates that

students who use computers often, have positive attitudes toward IT workers and seek out career

information from information sources (parents, teachers, counselors, and peers), are more likely

to report an interest in IT Careers. Positive attitudes toward IT workers was positively and

significantly associated with computer use (β=0.320, *SE*=0.08, *p*<.01) indicating that girls who

hold more positive attitudes of IT workers use the computer more often. Decision orientation

directly and significantly related to positive attitudes toward IT workers (β=0.38, *SE*=0.08,

p<.01) and information sources (*β*=0.21, *SE*=0.09, *p*<.01). The association between receptivity

and information sources and decision orientation and computer use were not significant.

Receptivity was positively and significantly associated with positive attitudes toward IT workers

(*β*=0.11, *SE*=0.05, *p*<.01) and information credibility (*β*=0.48, *SE*=0.05, *p*<.01). Students

receiving positive messages about IT careers from information sources had higher rates of

computer use (communication, games, surfing the Internet, general tasks, educational purposes)

(*β*=0.24, *SE*=0.07, *p*<.01). The association from information credibility to information sources

(*β*=0.35, *SE*=0.08, *p*<.01) was significant, indicating that students who consider advice often also

seek out career information from important sources.
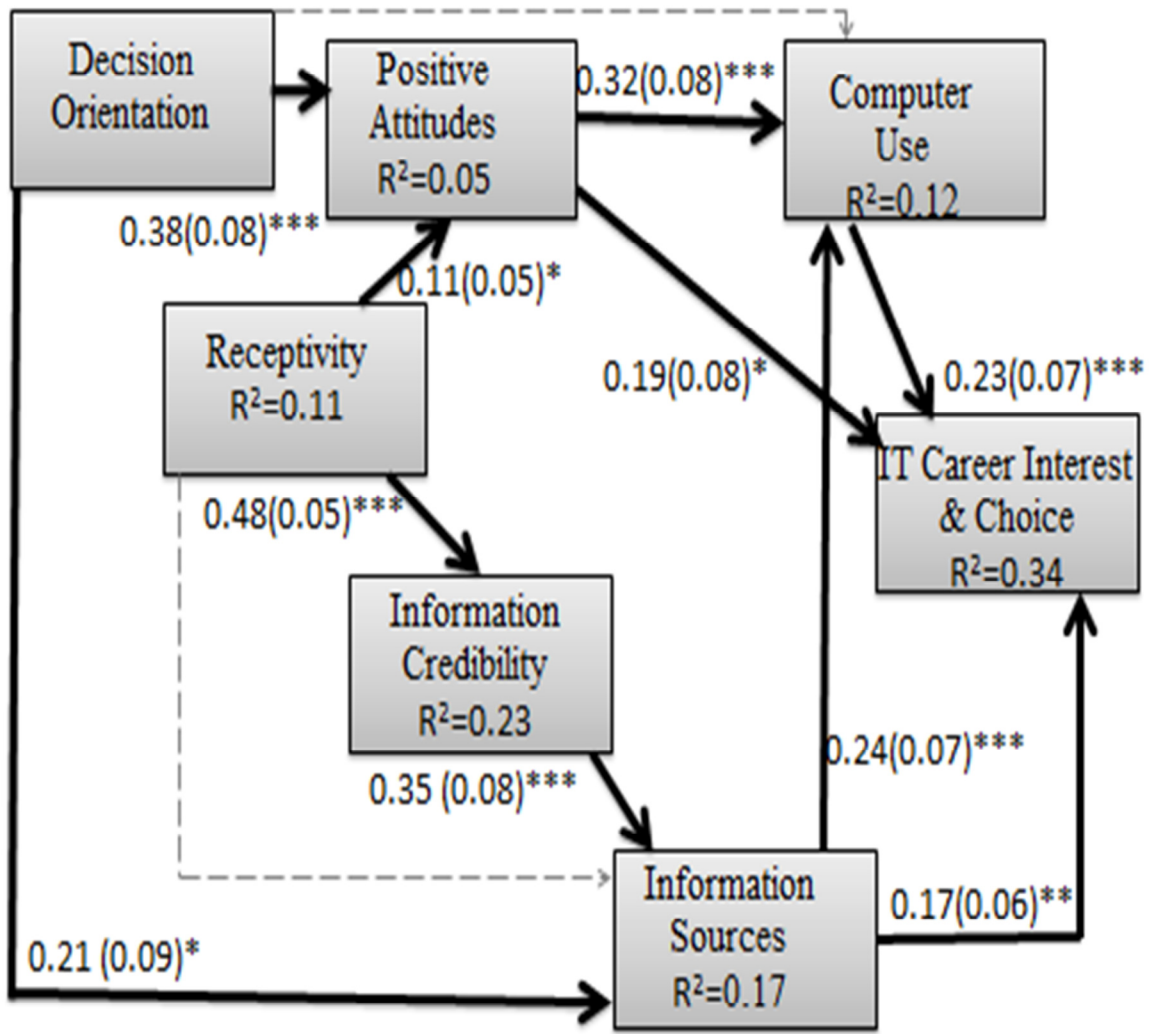
Figure 5. Results for IT Career Interest and Choice (girls)

IT Career Interest and Choice (Boys). In this model of IT career interest and choice for boys the non-significant chi-square result (χ^2=20.14, *p*=.06) indicates that the null hypothesis should not be rejected and that the model does fit the data. The other fit indices of RMSEA (0.08), SRMR (0.08), CFI (0.94), and TLI (0.89) also indicate this model fits the data appropriately (see Table 6). Figure 6 presents the model with the standardized path values, standard errors, and squared multiple correlations.

In this model two key variables, positive attitudes toward IT workers (β=0.19, *SE*=0.08, *p*<.01) and computer use (β=0.50, *SE*=0.07, *p*<.01) directly and significantly relate to IT career interest and choice. The association between positive attitudes about IT workers and computer use (β=0.28, *SE*=0.08, *p*<.01) was significant which indicates that boys who hold more positive attitudes of IT workers likely use the computer more often. Decision orientation is directly and significantly associated with receptivity (β=0.33, *SE*=0.08, *p*<.01) and information sources (β=0.19, *SE*=0.09, *p*<.01). Receptivity is positively and significantly related to positive attitudes toward IT workers (β=0.21, *SE*=0.09, *p*<.01) and information credibility (β=0.48, *SE*=0.07, *p*<.01). The association between information sources and computer use (β=0.19, *SE*=0.08, *p*<.01) was significant, as was the association between information credibility and information sources (β=0.34, *SE*=0.08, *p*<.01).

Non-significant – – – – – – – →

Significant ➡

χ^2=20.14, p=.06
RMSEA=0.08
CFI=0.94
TLI=0.89
SRMR=0.08
*$p < .05$
**$p <.01$
***$p<.001$
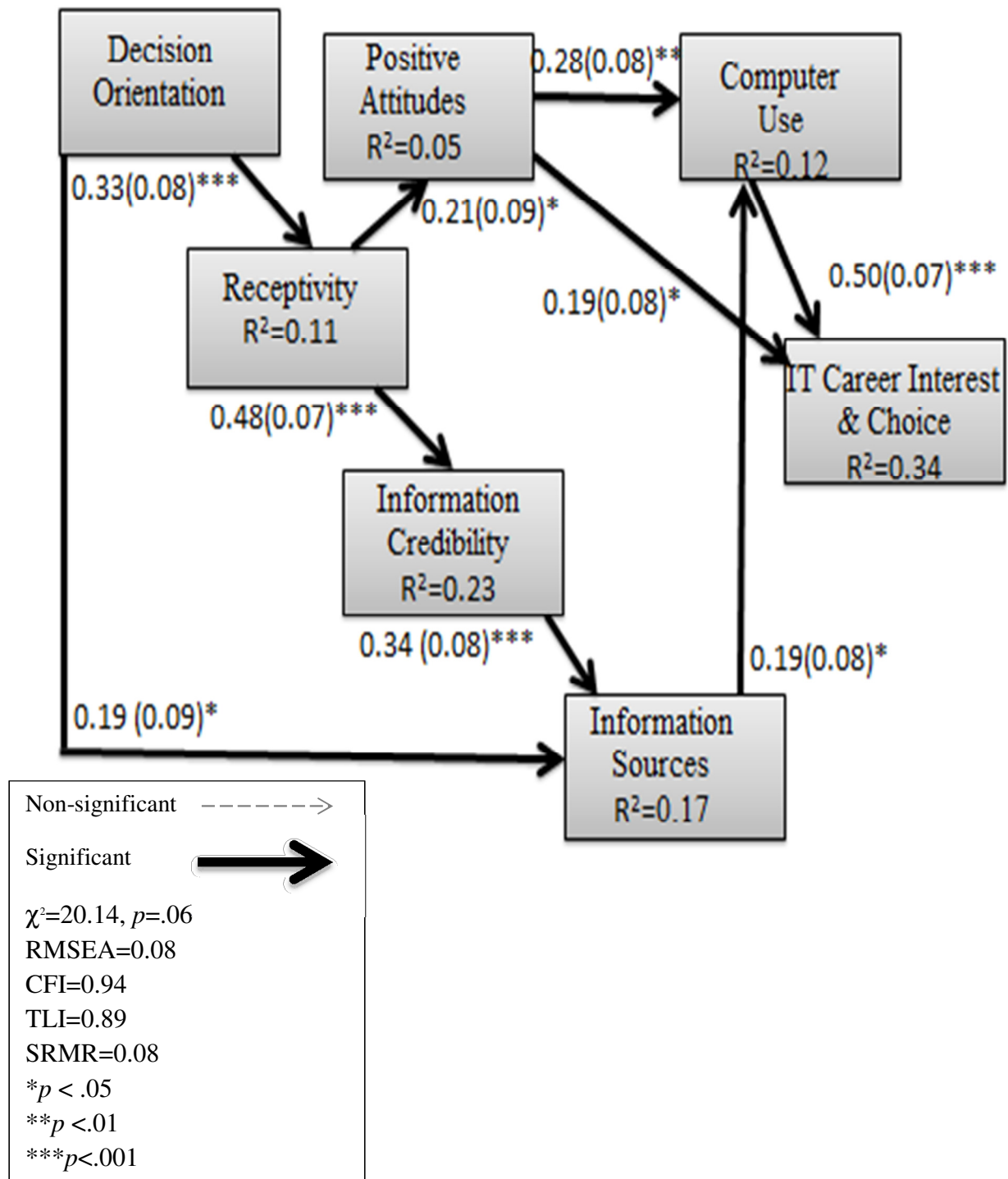
Figure 6. Results for IT Career Interest and Choice (boys)

Research Question 3

Is the conceptual model of parental support for IT careers supported by the theory of self-authorship an adequate fit for disadvantaged youth in rural Appalachia?

The purpose of the third model (Figure 3) was to test parental support of IT career interest and choice in girls and boys separately. Unlike the previous models of IT career interest and choice, the relationships between variables in the modified model of parental support of IT careers are the same for boys and girls. However, because the model of parental support is modified to accommodate middle and high school students, it was necessary to determine if school and parent demographic variables operate differently in boys and girls.

Parental Support of IT Career (Girls). In this model of parental support of IT career interest and choice for girls the non-significant chi-square result ($\chi^2=4.08$, $p=.537$) indicates that the null hypothesis should not be rejected and that the model does fit the data. The other fit indices of RMSEA (0.00), SRMR (0.02), CFI (1.00), and TLI (1.06) also indicate this model fits the data appropriately (see Table 7). Figure 7 presents the model with the standardized path values, standard errors, and squared multiple correlations. The bold lines represent significant paths and the grey lines represent paths that were not significant. Overall, the majority of the hypothesized paths were supported in the model.

Table 7

Parental Support for IT Career Chi-Square and Fit Indices

Model	χ^2	df	RMSEA	SRMR	CFI	TLI
Girls (n=216)	4.076	5	0.00	0.02	1.00	1.06
Boys (n=121)	3.33	5	0.00	0.04	1.00	1.24

In this model two key variables, parental support (β=0.14, SE=0.05, $p<.01$) and information sources (β=0.19, SE=0.08, $p<.01$), directly and significantly relate to IT career interest and choice. Decision orientation did not have a direct effect on IT career interest and choice for girls. Information sources was directly and significantly associated with parental support (β=0.24, SE=0.05, $p<.01$), decision orientation (β=0.19, SE=0.09, $p<.01$), and father's level of education (β=0.09, SE=0.03, $p<.01$). Mother's level of education was not a significant influence on the association between parental support and information sources nor was father's level of education. Enrollment in middle or high school was not a significant influence on parental support, decision orientation, or information sources. Parental support was not significantly related to decision orientation.

Parental
Support
R^2=0.00

-0.12(0.19)

0.53(0.04)

0.24 (0.05)•••

0.14(0.05)•

School
Enrollment

0.19(0.11)

Decision
Orientation
R^2=0.02

0.09(0.09)

0.24(0.19)

0.19(0.09)•

0.00(0.02)

-0.02(0.01)

Information
Sources
R^2=0.19

Mother's
Level of
Education

0.02(0.05)

Father's
Level of
Education

0.09(0.03)••

0.19(0.07)••

IT Career
Interest &
Choice R^2=0.11

Non-significant - - - - - - →

Significant

χ^2=4.08, *p*=.537
RMSEA=0.00
CFI=1.00
TLI=1.06
SRMR=0.02
p < .05
**p* <.01
***p*<.001

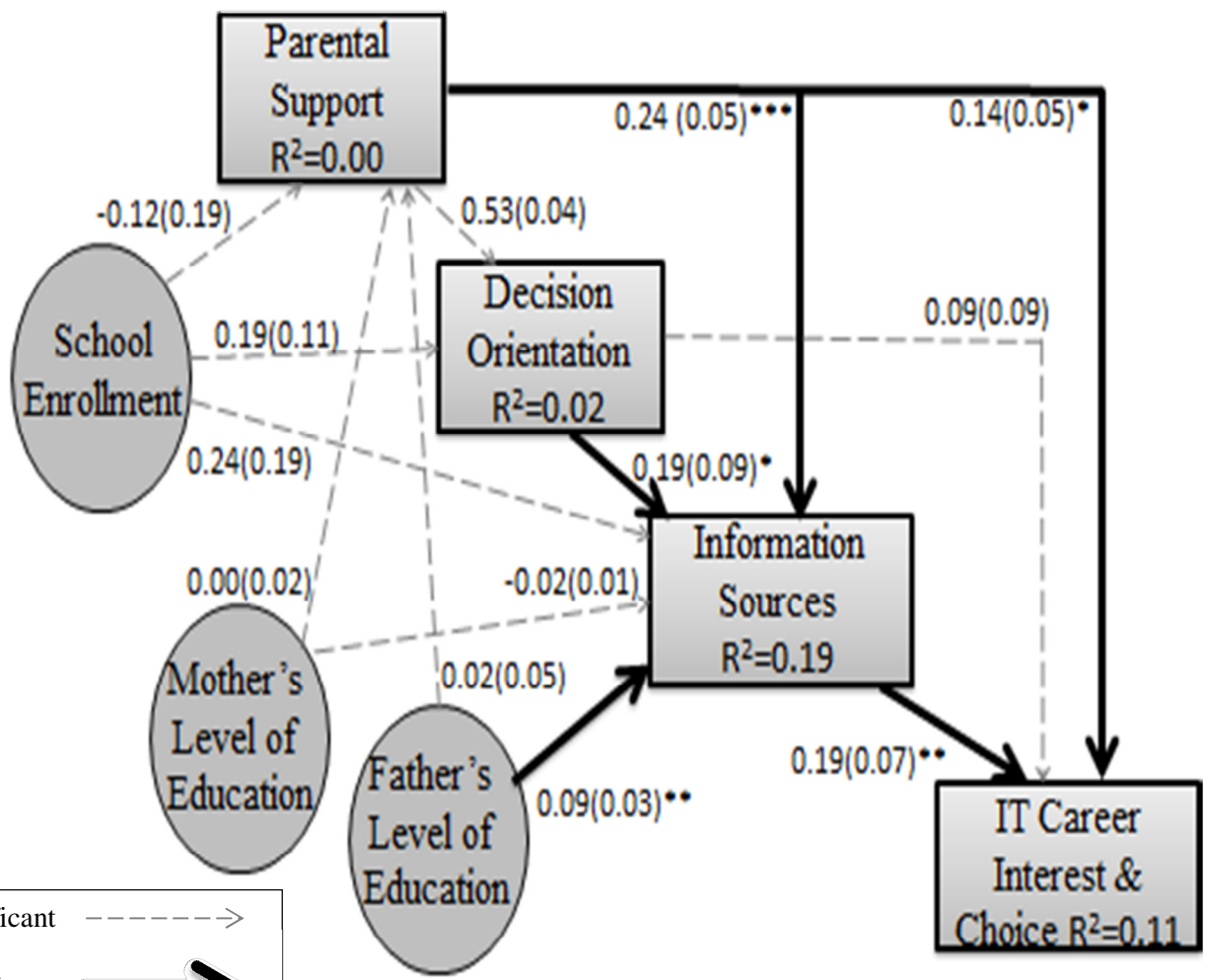*Figure 7. Results for Parental Support for IT Career (girls)*

Parental Support for IT Career (Boys). In this model of parental support of IT career interest and choice for boys the non-significant chi-square result (χ^2=3.33, *p*=.649) indicates that the null hypothesis should not be rejected and that the model does fit the data. The other fit indices of RMSEA (0.00), SRMR (0.04), CFI (1.00), and TLI (1.24) also indicate this model fits the data appropriately (see Table 7). Figure 8 presents the model with the standardized path values, t values, standard errors, and squared multiple correlations for the model. The hypothesized paths were supported in the model.

In this model two key variables, parental support (*β*=0.23, *SE*=0.09, *p*<.01) and decision orientation (*β*=0.32, *SE*=0.14, *p*<.01), directly and significantly relate to IT career interest and choice. Information sources did not have a direct effect on IT career interest and choice for boys. Decision orientation did not have a direct association with information sources. Parental support directly and significantly related to decision orientation (*β*=0.21, *SE*=0.06, *p*<.01) and information sources (*β*=0.21, *SE*=0.1, *p*<.01). School enrollment and father's and mother's level of education were not significant influences on any path.
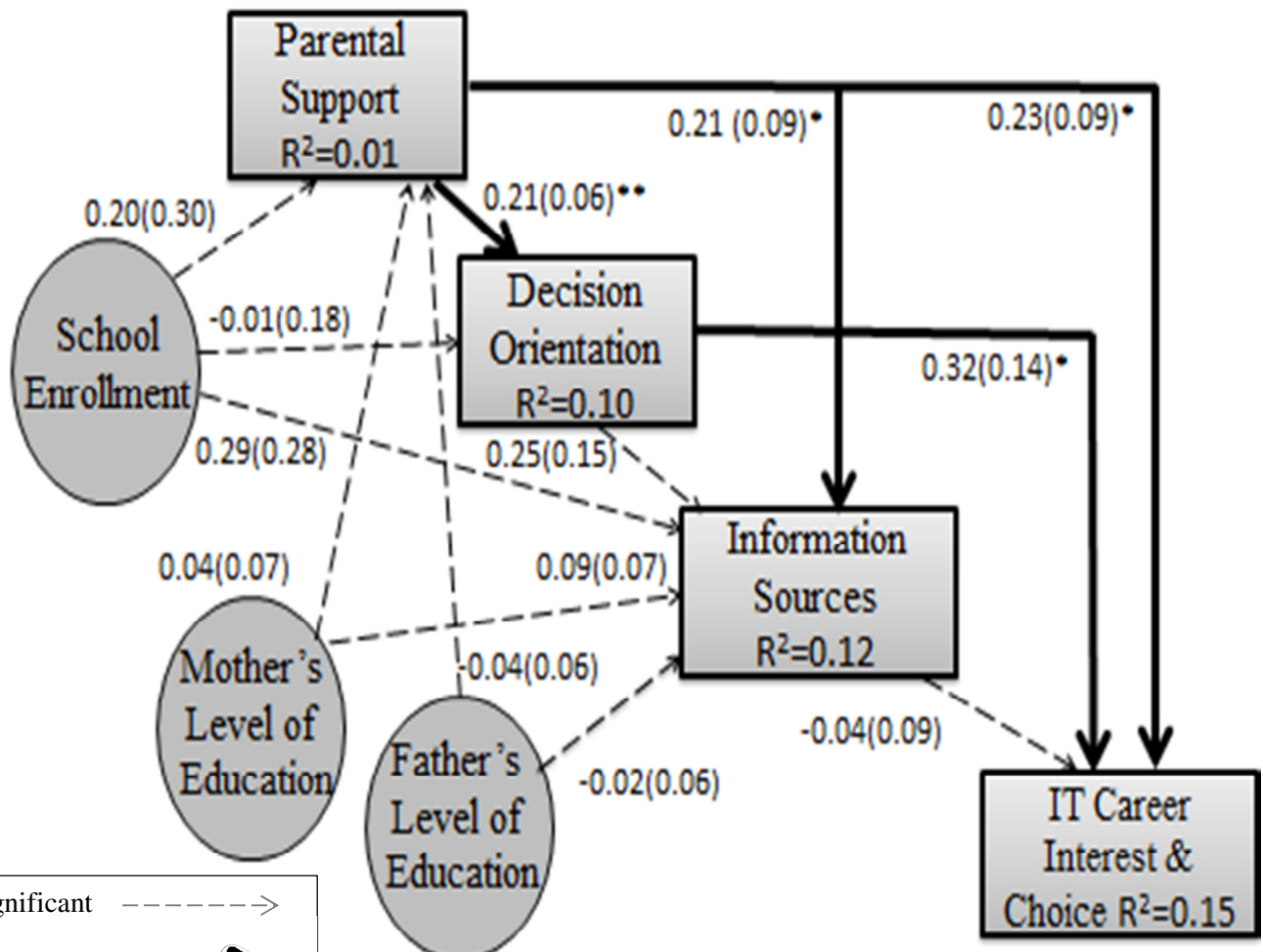
Figure 8. Results for Parental Support for IT Career (boys)

Summary

This chapter details the results of this study that was designed to validate models of IT career interest and choice and parental support for IT career in boys and girls. The results of initial tests (R1) found significant differences based on gender but not race and school enrollment. The models presented in this chapter fit the data appropriately and support the use of these theoretical models of IT career interest and choice (R2) and parental support of IT career (R3) in middle and high school girls and boys enrolled in Upward Bound or Talent Search. The results supported the hypotheses that differences in boys and girls in each model would exist. In addition, the hypotheses about the positive paths in the models of IT career interest in boys and girls were supported by the results. The hypotheses of the positive and negative paths in the models of parental support for IT in girls and boys were only partially supported by the results. The model of parental support was altered to accommodate the differences in middle and high school students that have not yet selected a college major. These results are discussed in the following chapter.

Chapter 5

DISCUSSION

Middle and high school students are expected to begin the lifelong process of making

career choices because the academic choices they make impact their long term plans to pursue

post-secondary education and specific career paths. Students in rural communities are often at a

disadvantage when making career decisions as a result of their limited access to academic

resources, career counselors, college recruitment fairs, college and work preparation programs,

advanced courses for college entrance, and role models who hold high skill jobs. These

limitations may delay students from making career decisions. Parents are an important influence

in career decisions, yet their guidance may be unconstructive if they are not familiar with in-

demand careers, including IT jobs. The theoretical framework of self-authorship is one approach

to understand the developmental process of this population's decision making, including career

decisions. The purpose of this study is to validate models of IT career interest and choice and

parental support of IT careers in Appalachian middle and high school girls and boys using a

content-specific instrument supported by the theory of self-authorship.

Population and Sample

As mentioned in chapter two, The U.S. is facing a talent crisis and there is a great need

for workers to fill jobs in IT. Central rural Appalachian communities are witnessing the death of

old industries while new IT jobs are expanding. Specifically, the rapid expansion of technology

has resulted in approximately 404,000 jobs available in Virginia and of those jobs 71% will be in

computing (Cover, Jones, & Watson, 2011). The availability of these jobs creates a workforce

opportunity for local citizens but little is known about interest in IT careers and parental support

of IT careers among middle and high school students.

The initial conceptual model of IT career interest and choice using a sample of high school and college students and supported by the theory of self-authorship included five variables that directly and significantly predicted IT career interest and choice; included were computer use, information source, race, positive attitude toward IT workers, and parental support (Creamer et al., 2007). In a subset of high school students from the same sample, an empirically supported model of IT career interest and choice was introduced. There were significant group differences between girls and boys in the variables of decision orientation, receptivity, information credibility, information sources, positive attitudes toward IT workers, computer use, and IT career interest and choice which supported having separate models for boys and girls (Meszaros et al., 2007). In addition, segregated models of parent support of IT careers supported the importance of parents in IT career decisions for both girls and boys (Meszaros et al., 2009).

Although these models provided insight into the development of IT career interest and choice, the small sample populations for the studies included high school and college students but did not include middle school students. In general, students are required to begin making career decisions at early ages. Yet, little is known about students' interests in jobs that will be available to them upon graduation from high school or college and located in their rural Appalachian communities, including IT jobs. Validating models of IT career interest and choice and parental support of IT careers using the theoretical framework of self-authorship is one way to address this problem. In addition, the findings from validating the models will inform the Upward Bound and Talent Search program leaders about IT career interest and parental support of IT jobs among students enrolled in their programs. This information can help the program counselors meet required goals of preparing students for future high skill jobs.

Findings

The present study was conducted to investigate the IT career interest and choice and parental support of IT careers among middle and high school girls and boys enrolled in Upward Bound and Talent Search to answer the following questions:

1. What demographic (gender, race, and school enrollment) similarities or differences exist in the following scales:

   a. IT career interest and choice

   b. decision orientation

   c. receptivity

   d. information credibility

   e. information sources

   f. positive attitudes toward IT workers

   g. computer us

   h. parental support

2. Is the conceptual model of IT Career Interest and Choice supported by the theory of self-authorship an adequate fit for disadvantaged youth in rural Appalachia?

3. Is the conceptual model of Parental Support for IT Careers supported by the theory of self-authorship an adequate fit for disadvantaged youth in rural Appalachia?

Validation of Segregated Models

Findings indicate that there are differences in girls and boys on the measure of decision orientation and confirm the need to have separate models for girls and boys in agreement with previous studies (Creamer et al., 2004; Creamer et al., 2007; Meszaros et al., 2009; Meszaros et al., 2007). Perhaps the girls and boys are at slightly different points in their journey of self-

authorship. The difference in computer use in girls and boys also supports having separate models for girls and boys. Although girls reported using computers slightly more often than boys, past studies support that girls and boys are using computers for different purposes (Creamer et al., 2004). Because no differences were found in the race variable, separate models for race were not necessary. It is possible that this finding reflects the lack of racial diversity available in the sample. The differences in school enrollment and information source are also supported. Students in middle school may discuss job options less often and with fewer sources while students in upper grades seek advice more often and from numerous sources.

IT Career Interest and Choice

In the models of girls and boys the differences and similarities in the paths to IT career interest and choice agreed with findings in previous studies (Creamer et al., 2007; Meszaros et al., 2007). In the early stages of the self-authorship journey, girls and boys are in the initial phase of following formulas; this means the students rely on others to shape their plans for the future. In both models this was supported by the direct and significant association between decision orientation and information sources. The major difference in the models of boys and girls is finding a direct association between information sources and IT career interest and choice. Consistent with previous studies this finding indicates that girls seek out job advice from parents, family members, teachers, counselors, and peers more often than boys. The direct association between information sources and computer use was also significant in models of boys and girls in this study. Because computer use is an important factor in IT career interest and choice, it is important for future studies to consider how information sources such as parents, family members, teachers, counselors, and peers support computer use.

Girls. The results suggest that girls in this sample may be more like boys in their interest in IT careers than in previous studies. The overall fit of the model for girls was only moderate and suggests that perhaps there is a better fitting model for middle and high school girls. For instance, in past studies the association from decision orientation to computer use and receptivity to information sources was significant (Meszaros et al., 2007) for girls but in this study it was not significant. It is possible that the expansion of the use of computers has made girls' use of computers more common and less dependent on others guiding and encouraging them to use computers. This finding also mimics the non-significance of the associations in the previous model for boys and in this study of boys. A better fitting model for girls will look very similar to the model for boys with the one exception being the strong association of information sources on IT career interest in girls but not in boys. The significant association between information credibility and information sources suggests that girls are considering and seeking advice offered by parents, teachers, counselors, family members, and friends often. This replicates previous findings in that girls may be receiving more negative messages from important sources about IT careers and are, therefore, discouraged from selecting IT as a career path. Yet, girls who receive positive messages about IT careers are much more likely to report an active interest in IT careers. Because individuals in the early stages of self-authorship are more receptive to information from others about career decisions and tend to rely on the advice from others when making decisions it is possible that students enrolled in Upward Bound and Talent Search are experiencing a transformational experience that is helping them to become more self-authored when considering how to handle advice that is contrary to their own beliefs.

In addition, computer use and positive attitudes about IT workers directly related to interest in IT careers and mirrors the results for boys. It is possible that the use of computers for

education and social experiences has opened the way for more girls to have interest and experience with computers. The use of computers is a major predictor in the choice of IT careers and perhaps a major influence in the way girls are reporting interest in IT careers. However, the initial interest does not dictate actual pursuit of IT jobs. It is also possible that these findings suggest that girls are as interested in IT careers during middle and high school as boys but at some point a threshold is created that either encourages or discourages them from actually pursuing IT careers.

Boys. The model of IT career interest for boys was considered a good fit and validates the model previously introduced (Meszaros et al., 2007). The more positive attitudes about IT workers held by boys and more frequent use of computers, the more likely they will have an interest in IT careers. The more boys rely on others for advice (decision orientation), the more likely they seek and value the input of others (receptivity). The more receptive to the input of others, the more likely the male student will consider career advice offered by parents, teachers, counselors, family members, friends (information credibility). Information credibility was significant for information sources, suggesting the more receptive to the input of others, the more likely the boy will consider career advice offered by parents, teachers, counselors, family members, and friends (information credibility).

It appears that some boys, like the girls in this sample, are interested in IT careers. As expected, the early stage ("following formulas") of self-authorship, reflects their receptivity to career information and reliance on considering advice and discussing career options with others including parents, teachers, counselors, and friends.

Parental Support of IT Career

The models of parental support of IT career for girls and boys were considered good fits to the data. The similarities and differences in girls and boys were different than found in the previous research by Meszaros and colleagues (2009); the most important differences occurred in the association of decision orientation, the proxy for self-authorship, and information sources on IT career interest. In this study the path for decision orientation was significant for boys but not for girls. The path for information sources was significant for girls but not for boys in this study. This was the direct opposite of the results from the previous study. The same is also true for the association between parent's level of education and information sources. In the previous study, the level of education for mother and father was measured by one variable and was not significant for girls but significant for boys. In this study level of education for mother and father was measured by two variables and the association between father's level of education and information sources was significant for girls but not for boys. This meant that girls who have fathers with higher levels of education seek out more career advice. Although this finding is different from previous studies, it is possible that measuring level of education in mothers and fathers separately more adequately assessed the relationship between fathers and girls in this model.

Girls. Parental support and information source were directly and significantly associated with IT career interest and choice. As in the previous study, parental support also was related to information sources suggesting that parents were an important source of job information for girls. Decision orientation predicted information sources suggesting that girls were at the beginning phase on the path to self-authorship. In this phase, individuals rely on others for advice and support as they plan their futures and career decisions. Decision orientation was not a

significant predictor on IT career interest at this point in the girls' lives. These findings indicate that girls who are interested in IT careers are supported by parents and are receiving information about career options but are less likely to be guided by their decision orientation which was not influenced by parents. This finding is both good and bad: it indicates the early phase of self-authorship does not deter girls from being interested in IT careers, but perhaps it is possible that their reliance on others for advice in the early phase could potentially positively or negatively sway the girls' choice of IT career. School enrollment and mother's level of education were not significant measures in the model. Father's level of education only significantly related to information sources. Girls with fathers who have higher levels of education tend to seek out more job information. Perhaps fathers with higher levels of education have access to more knowledge about jobs and can discuss these options with girls more frequently.

Boys. Parental support and decision orientation were directly and significantly associated with IT career interest and choice. Parental support was also related to information sources suggesting that parents are an important source of job information for boys. Boys of this age typically are at the beginning phase on the path to self-authorship but it appears that boys in this sample are more influenced by parents and their decision orientation than being receptive and to seeking out career advice from sources when making career decisions in this early stage. Perhaps this is because they are enrolled in a program that aims to prepare students for future careers and help guide them in making career decisions. Their choice to participate in the Upward Bound or Talent Search program may mean that the boys are interested in enhancing their future opportunities, thus, using the support provided to move further along the journey to self-authorship. School enrollment, father's level of education, and mother's level of education were not significant measures in the model for boys.

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Summary

The purpose of this study was to validate models that examined whether and how middle and high school students enrolled in Upward Bound or Talent Search are interested in IT careers. More specifically, this research analyzed models of IT career interest and choice and parental support of IT careers in girls and boys. The results indicate that the participants in the study are in the early stage of self-authorship development and are relying on others for advice and guidance. The models of IT career interest in girls and boys were validated and indicate that some girls and boys in Upward Bound and Talent Search are expressing interest in IT careers. The results indicate that girls may be more similar to boys in their move toward IT career interest than was shown in previous studies but this should be examined in a larger and more diverse sample. It may be that the model that will assess IT career interest in girls adequately requires further modification. The results of the modified models of parental support for an IT career were the beginning of validating the models in middle and high school students and proved to be adequate. Girls and boys equally perceive parental support of IT careers and some girls and boys in the study expressed interest in IT careers. Replication is necessary before these models can be generalized beyond students enrolled in Upward Bound or Talent Search in rural Appalachia.

Overall, the models examined IT career interest in boys and girls and confirmed that students enrolled in Upward Bound and Talent Search programs express interest in IT careers. The way students move toward an interest in IT careers is slightly different between girls and boys but overall there is almost equal interest in IT careers between them. To determine the general decline in interest in IT careers in women found in previous studies requires expanding future research to incorporate a longitudinal design because it is possible that some change in

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interest or support of IT careers occurs between high school and the transition to post-secondary education or the workforce.

Limitations

A major limitation of this study is the small sample of students enrolled in middle school. Eighty-nine percent of the girls and 93% of the boys in the study claimed enrollment in high school. The models need additional validation within a larger sample of middle school students.

The lack of geographic diversity of rural Appalachian communities is also a limitation. The sample population was enrolled in programs located in Virginia but the rural Appalachian region extends into others states including Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and West Virginia. Students from other rural Appalachian communities should be included in a future study of IT career interest.

The focus on one specific type of disadvantaged population, those students enrolled in Upward Bound and Talent Search, is a limitation. Though the Upward Bound and Talent Search programs are established in communities across the country, there are other types of programs that serve disadvantaged middle and high school students (e.g., GEAR UP, university-based summer programs, state-based programs, and community- and school-based programs). Studies incorporating other support programs can add to the validation of the models.

This study is limited in the inability to determine the participants' schools in the service region. Although the schools are very similar and the students meet the requirements for enrollment in the Upward Bound or Talent Search programs, it is possible students enrolled in schools with access to more resources and support may have a different experience than students enrolled in smaller schools with less access to resources. The Upward Bound and Talent Search

Director cautions that students from one specific high school within the service region may have different experiences because the school is located in a university community and has strong support from the community and access to more resources. While a question was included regarding enrollment in middle or high school, the name of each school was not requested. The Upward Bound and Talent Search administrators maintained records of names and school enrollment but were unable to reveal them due to privacy policies and time constraints. To remedy this issue privacy policies and time constraints should be addressed so that the *Career Decision Making Survey: Middle and High School Version* can be updated to include a question for students to name the school they currently attend.

The research in this study was cross-sectional, meaning that IT career interest from the perspective of the student was gathered at only one point in time. Replication of this study should include data collection over time in a longitudinal research design to capture the shifts in IT career interest in the transition to the workforce or post-secondary education. The development of self-authorship can also be obtained through a longitudinal design to learn how students make progress throughout middle and high school as well as the transition to the workforce or post-secondary education

Final limitations of this study are that data are the result of self-report from participants and did not survey parents or other important information sources in the students' social networks. Future studies should also include parents to capture accurately their perception of support and their knowledge of IT careers. Future studies should also survey other important information sources in the social networks of students including teachers, counselors, peers, and other role models within their communities.

Implications for Practice

The models support the important role of others including parents, family members, teachers, counselors, and peers as sources of information about jobs. These information sources directly and indirectly influence the development of IT career interest in girls and boys. In addition, the models of parental support of IT careers also confirmed the important guidance of parents on middle and high school students. These findings are consistent with previous studies and continue to be a major factor in the development of interest in IT careers. Thus, it is vital to create opportunities to educate the people who contribute to the environment supporting boys and girls. For instance, creating opportunities with parents, teachers, and counselors to learn about IT jobs, the availability of IT jobs in local communities, and the need for high-skilled workers to fill vacant jobs can help ensure that the influential people in the lives of middle and high school students are prepared to support and encourage interest in IT careers.

Another important practice to encourage IT career interest in middle and high school students is to provide access to computers at home, in school, or as a resource to students enrolled in Upward Bound and Talent Search and promote the use of computers for social, educational, and gaming activities. This recommendation is consistent with previous studies and continues to be a major factor in the development of interest in IT careers. Although the way girls and boys use computers may be different, creating intentional ways for students to have access to computers is an essential and relatively easy way to inspire students to pursue jobs in IT.

Upward Bound and Talent Search administrators have the opportunity to educate program counselors about IT jobs. One goal of these programs is to educate participants about career decision making and available careers to meet future workforce demands. To meet this

goal, program counselors have the opportunity to educate students about IT jobs and the

availability of positions in their local communities. In addition, role models from the local

communities can be identified and participate in question and answer sessions with students.

Perhaps the opportunity to meet individuals enrolled in IT jobs will also help create positive

attitudes about IT workers and the use of computers. Providing opportunities for students to

interact with role models will also provide important information sources for job advice and help

cultivate relationships that may offer hands on exposure to IT jobs. For instance, students who

interact with professionals in the community may learn about opportunities for shadowing,

internships, or part-time employment.

The Upward Bound and Talent Search counselors can also use the information from this

study to mold content for parent programs. They can educate parents about the need for IT

workers, the diversity of jobs available in IT, and the availability of jobs in the local

communities. This approach will help parents familiarize themselves about IT careers in order to

be informed sources when they discuss career decisions with their children. They can also

emphasize the role of parental support in the journey of their children's self-authorship

development. Counselors can use the metaphor of the tandem bicycle to make the theory more

easily understood and guide parents toward ways to help students move further along the path to

becoming self-authored.

Furthermore, the Upward Bound and Talent Search programs are uniquely situated to

implement outcome driven programming that supports the development of self-authorship

among students. The programming and counselors that support students through their voluntary

enrollment in the Upward Bound and Talent Search create an environment that can easily

implement learning through a lens of challenge and support. By providing adults to support and

encourage students in their goals and interests the programs can help students in the beginning stages of self-authorship to develop self-authoring ways. The use of the learning partnership model can guide programming that will help students move along the journey of self-authorship by learning how to make complex decisions, navigate relationships that offer diverse view points, and evaluate contradictory advice without necessarily changing one's personal beliefs.

The Upward Bound and Talent Search administrators and counselors and federal program policy makers may also benefit from the results of this study. First, the information can be used to inform practices for programs at the local level in rural Appalachian areas. For instance, creating programs that are tailored to the needs of the communities will help overcome some disadvantages that students in rural locations face but help them achieve stable employment while remaining close to home if that is desired. The counselors can use the knowledge from this study to create programs for participants and their parents that are context-specific to the needs of the local workforce. Teaching students about available jobs in the community and introducing role models will help students who may be in the beginning stages of self-authorship and relying on the advice and guidance of others. It is possible that providing a role model for students will help those who are interested in IT jobs sustain that interest throughout transitions to post-secondary education or the workforce.

The results can also be used at the federal level to inform policies about funding, curriculum, programs, and activities for the programs. As mentioned in Chapter Two, the programs are currently only serving seven percent of eligible Americans (Campbell, 2010). With over 11 million students being educated in rural America (Strange et al., 2012), the results of this study can be used as support for additional funding and resources to ensure more disadvantaged students have opportunities to learn about in demand IT jobs, complete high

school, and pursue post-secondary education. The results of the study may also be used to inform professional development policies for program counselors. It is important for program counselors to be aware of views that may be enforcing stereotypical views and behaviors that discourage girls from pursuing IT careers.

Future Research

The most apparent need for future research from this study is to conduct a longitudinal study that follows students' paths to self-authorship and their interest in IT careers throughout middle/high school, college, and into the workforce. This type of design will provide important information about the path to self-authorship and inform how changes in the stages of self-authorship relate to career decisions. A longitudinal design will also track changes in IT interest and how any such shifts affect the actual pursuit of IT jobs in girls and boys.

Additional research is needed on larger populations of girls that includes diversity in geographical location, age, race, and ethnicity. A larger and more diverse sample will allow the model of IT career interest for girls to be redefined and validated. This is very important to ensure more women are available to fill IT positions available in the US; currently only 25% of IT positions are held by women (NCWIT, 2013). Decreasing the gap in the percentage between men and women in IT careers will help fill the talent crisis in the US. In addition, IT is an excellent career choice for women and men who need to meet the demands of multiple role responsibilities because of the availability of flexible scheduling and the ability to work remotely.

Additional research is also needed with populations of students enrolled in programs that serve disadvantaged students and students located in other geographical areas of rural Appalachia. This study included students from communities in the Appalachian region of

Virginia but the Appalachian region extends to parts of Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and West Virginia. Inclusion of parents in rural Appalachia in future studies of IT career interest is important in order to gain a full picture of their perception of IT careers and support for their children to seek such careers.

A study of Upward Bound and Talent Search program counselors is also needed. This study will provide insight into the counselors' knowledge of IT careers, how career decision making is taught, and how their programming is designed to vacillate or possibly detract from the development of self-authorship.

Further study of youth using the theoretical framework of self-authorship would be very helpful to explore career decision making among this population of youth in rural Appalachia. How students make meaning of career advice influences their receptivity and ultimate choice of a career path. Educators can implement programming to promote complex decision-making and self-authorship as well as skills to handle diverse viewpoints and advice through the learning partnership model (Baxter Magolda, 2004). Because students in middle and high school are developing self-authoring ways, it is important to create outcome-driven programming that can be evaluated and redesigned to enhance effectiveness of approaches that help students develop self-authorship.

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Appendices

Appendix A

2008-2009

Career Decision-Making Survey Middle-High School Version

Appalachian Information Technology

Information Extension Services

IMPLIED CONSENT FORM FOR SOCIAL SCIENCE RESEARCH

Virginia Tech

Title of Project: *Career Decision-Making Survey*

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                                     Meszaros@vt.edu   Phone: 540-231-9428

1. **Purpose of the Study:** The purpose of this study is to identify the characteristics of students interested in a computer-related job.

2. **Procedures to be followed**: You are being asked to complete a paper and pencil questionnaire about career decision making.

3. **Discomforts and Risks**: There are no risks in participating in this research beyond those experienced in everyday life. Many of the questions involve personal opinion.

4. **Benefits:** The benefits of this project include that you might have a better idea about how to go about making difficult decisions. Information will help counselors and advisors to better understand factors that attract and deter students from technical majors and jobs involving computers.

5. **Duration**: It will take about 15 minutes to complete the questionnaire.

6. **Statement of Confidentiality**: This questionnaire is both anonymous and confidential.

7. **Right to Ask Questions**: You may ask questions about this research by contacting the investigators at Virginia Tech listed at the top of this form. In addition, you may contact Dr. David Moore, Assistant Vice Provost for Research Compliance at Virginia Tech (540) 231-4991 for questions about your rights as a research participant.

8. **Voluntary Participation**: Your decision is participate in this research is voluntary. You can stop at any time. You may skip questions you do not want to answer.

CTION 1: COMPUTERS AND TECHNOLOGY

The following questions are about how you use computers. Please check "No," or "Yes," and fill in the blank where indicated.

1-1. **In the <u>school</u> you attend, do you have access to functioning computers with Internet access on a regular basis? _____ No _____Yes**

1-2. **In your <u>home</u>, do you have access to a functioning computer with Internet access on a regular basis? _____ No _____Yes**

1-3. **Do you participate in a computer-related program in your school, like an after school class, club, or summer program? (Mark one)**
_____ No _____ Yes (If yes, please give name)_____

1-4 **At what age did you first use a computer? (Please fill in) _____**

1-5. REASONS FOR TAKING A COMPUTER COURSE

The following questions are about the reasons why you may **have already taken** a computer course. Circle 1 for Yes and 2 for No		
Have you taken a computer-related course for any of the following reasons?	**Yes**	**No**
1. Required by my school.	1	2
2. Recommended by my parent/guardian	1	2
3. Recommended by my school counselor, advisor, or teacher	1	2
4. Recommended by my Talent Search/Upward Bound Counselor	1	2
5. Offered by my Upward Bound summer program.	1	2
6. Will be needed to get a good job	1	2
7.General interest in computers and technology	1	2
8. Enjoyment	1	2

The following questions are about the reasons you might have for **planning to take a computer course**. Circle 1 for Yes and 2 for No.

Do you plan to take a computer-related course for any of the following reasons?	Yes	No
1. Required by my school.	1	2
2. Recommended by my parent/guardian.	1	2
3. Recommended by my school counselor, advisor, or teacher.	1	2
4. Recommended by my Talent Search/Upward Bound Counselor.	1	2
5. Offered by my Upward Bound summer program.	1	2
6. Will be needed to get a good job.	1	2
7. General interest in computers and technology.	1	2
8. Enjoyment.	1	2

1-6. ATTITUDES ABOUT PEOPLE WHO WORK IN COMPUTER–RELATED JOBS

The following questions concern attitudes about the characteristics of workers in computer jobs. Circle the number that indicates how much you disagree or agree with each of these statements.

I think people who choose jobs using computers are:	Disagree	Slightly Disagree	Slightly Agree	Agree
1. Geeks	1	2	3	4
2. Likely to be male	1	2	3	4
3. Loners /antisocial	1	2	3	4
4. Interesting	1	2	3	4
5. Hard-working	1	2	3	4
6. Smart	1	2	3	4
7. Creative	1	2	3	4

1-7. COMPUTER USE

The following questions are about how much you **use** a computer. Circle the number that reflects how often you do each of the following activities.				
How often do you use a computer for the following activities?	**Never**	**Once a month**	**Once a week**	**Several times a week or more**
1. Communication (such as email, instant messages, or chat rooms)	1	2	3	4
2. Games (any computer-based game)	1	2	3	4
3. General entertainment (such as Internet surfing or music downloads)	1	2	3	4
4. News and current events (news sites, online magazines)	1	2	3	4
5. General tasks (such as word processing)	1	2	3	4
6. Development or design (such as creating web pages, or participating in Facebook or My Space, and/or writing blogs)	1	2	3	4
7. Educational purposes (such as to conduct research or complete a homework assignment)	1	2	3	4

1-8. FAMILIARITY WITH AND INTEREST IN COMPUTER-RELATED JOBS

The following questions are about how familiar you are with the following computer-related jobs. Circle the number that reflects how familiar you are with each job.				
How familiar are you with each computer job?	**Not at All**	**Slightly Familiar**	**Somewhat Familiar**	**Quite Familiar**
1. Database administrator	1	2	3	4
2. Computer engineer	1	2	3	4
3. Network administrator	1	2	3	4
4. Computer programmer	1	2	3	4

5. Systems analyst	1	2	3	4
6. Systems engineer	1	2	3	4
7. Web administrator	1	2	3	4
8. Web developer/designer	1	2	3	4
9. Electrical engineer	1	2	3	4

1-9. FAMILIARITY WITH AND INTEREST IN COMPUTER-RELATED JOBS

The following questions are about how interested you are in a computer job. Circle the number that indicates how much you disagree or agree with each statement.

	Disagree	Slightly Disagree	Slightly Agree	Agree
1. I have a good idea about what people do in their computer-related jobs.	1	2	3	4
2. I feel a sense of satisfaction when I am able to use a computer to solve a problem.	1	2	3	4
3. If I choose to, I probably have the ability to be successful in a computer-related job.	1	2	3	4
4. I have family, friends, and/or people I know who work in a computer-related job.	1	2	3	4
5. I would be comfortable working in a male-dominated job.	1	2	3	4
6. Working in a computer-related job is one of the job options I am thinking about.	1	2	3	4
7. My parents would probably consider a computer job a good career choice for me.	1	2	3	4
8. Most of my friends think that a career in a computer job is a good choice for me.	1	2	3	4

SECTION 2: GENERAL JOB QUESTIONS

2-1. YOUR JOB INTERESTS

Please list the three jobs that you are most interested in. (Write in your replies)		
1.	2.	3.
What are the reasons these jobs interest you? (Write in your reply)		

2-2. IMPORTANT THINGS TO CONSIDER IN MY JOB CHOICE

The following questions are about things that influence your job choice. Circle the number that shows how important each item is in your choice of a job.

How important are the following things to consider in your choice of a job?	Completely Unimportant	A Little Important	Somewhat Important	Very Important
1. Helping people	1	2	3	4
2. Good salary/ Making a lot of money	1	2	3	4
3. Ability to balance work and family	1	2	3	4
4. Opportunity to interact with other people while working	1	2	3	4
5. Job security	1	2	3	4
6. Highly respected job/career	1	2	3	4
7. Solving interesting problems	1	2	3	4
8. Being creative	1	2	3	4
9. Good boss and friendly co-workers.	1	2	3	4
10. Flexible working hours, or being able to schedule working hours around personal life.	1	2	3	4

2-3. Of the following factors that may influence your job choice, which is the single most important one to you? (Mark only one).

_____1. Helping people

_____2. Good salary/Making a lot of money

_____3. Ability to balance work and family

_____4. Opportunity to interact with other people while working

_____5. Job security

_____6. Highly respected job

_____7. Solving interesting problems

_____8. Being creative

_____9. Good boss and friendly co-workers

_____10. Flexible working hours, or being able to schedule working hours around

personal life.

2-4. YOUR PARENTS' OPINIONS OR VIEWS

The following questions are about your parents' or guardians' attitudes. Circle the number that indicates how much you disagree or agree with the following items. Circle NA if the item does not apply to you.					
	NA	Disagree	Slightly Disagree	Slightly Agree	Agree
1. It is important to my **mother/female guardian** that I have a job	0	1	2	3	4
2. It is important to my **father/male guardian** that I have a job	0	1	2	3	4
3. My **mother/female guardian** has a clear idea about jobs that I would be good at.	0	1	2	3	4
4. My **father/male guardian** has a clear idea about jobs that I would be good at.	0	1	2	3	4
5. My parents/guardians encourage me to make my own decisions about my future job.	0	1	2	3	4
6. I would like my parents to approve of my	0	1	2	3	4

choice of job.				
7. My parents have encouraged me to talk to others about job options.	0	1	2	3	4
8. My parents have encouraged me to explore a variety of job options.	0	1	2	3	4
9. When we disagree about jobs for me, my parents will listen to my point of view.	0	1	2	3	4

2-5. SOURCES OF JOB INFORMATION

The following questions concern sources of job information. Circle the number that shows how often you have discussed job options with the following groups of people.				
How often have you discussed your job options or plans with others?	**Never**	**Once or twice**	**Several Times**	**Many Times**
1. Mother/female guardian	1	2	3	4
2. Father/male guardian	1	2	3	4
3. Teacher	1	2	3	4
4. School Counselor or advisor	1	2	3	4
5. Talent Search/ Upward Bound counselor	1	2	3	4
6. Other family members or friends	1	2	3	4
7. Male friends	1	2	3	4
8. Female friends	1	2	3	4
9. Girlfriend or Boyfriend	1	2	3	4
10. Employer or boss	1	2	3	4

2-6. Do you know someone who has a job that uses computers similar to what might interest you? If so, who is that person? Mark all that apply.

_____1. Mother

_____2. Father

_____3. Other family member-male

_____4. Other family member-female

_____5. Family friend

_____6. Friends or people I know

_____7. Other (Fill in) _____

_____8. I do not know anyone with this kind of job.

2-7. CONSIDERING ADVICE FROM PEOPLE

The following questions are about how you judge the advice you receive. Circle the number that shows how likely you are to consider advice about jobs offered by the following people.				
How likely are you to consider job advice when it is offered by these people?	**Very Unlikely**	**Unlikely**	**Likely**	**Very Likely**
1. Mother/female guardian	1	2	3	4
2. Father/male guardian	1	2	3	4
3. Other family members	1	2	3	4
4. Teacher or professor	1	2	3	4
5. School Counselor or advisor	1	2	3	4
6. Talent Search/Upward Bound Counselor	1	2	3	7
7. Male friends	1	2	3	4
8. Female friends	1	2	3	4
9. Family friends	1	2	3	4
10. Employer or boss	1	2	3	4
11. Girlfriend or Boyfriend	1	2	3	4

2-8. MY RESPONSE TO OPINIONS FROM PEOPLE

The following questions are about how important the advice of others is to you. Circle the number that shows how much you disagree or agree with each of the following statements.				
	Disagree	**Slightly Disagree**	**Slightly Agree**	**Agree**
1. I find it helpful to listen to the opinions of others before I make an important decision.	1	2	3	4
2. When I make an important decision, I often seek the opinion of members of my family.	1	2	3	4
3. When I make an important decision, I often seek the opinion of my friends.	1	2	3	4
4. I like to have my parents' opinion before I make a big decision.	1	2	3	4
5. Even when the advice is not the same, I try to consider the information people give me before I make a big decision.	1	2	3	4

2-9. MAKING DECISIONS AND SETTING PRIORITIES

The following questions are about setting priorities and making decisions. Circle the number that shows how much you disagree or agree with each of the following statements.				
	Disagree	**Slightly Disagree**	**Slightly Agree**	**Agree**
1. I am confident about my ability to set my own priorities about schoolwork.	1	2	3	4
2. I am confident about my ability to set my own priorities about my personal life.	1	2	3	4
3. I am confident about my ability to choose a job.	1	2	3	4
4. I am unsure about my ability to make my own decisions about a future job.	1	2	3	4
5. I am unsure about my ability to make my own decisions about my personal life.	1	2	3	4
6. If my parents disagree with a decision I have made, I am likely to change my decision.	1	2	3	4
7. If my close friends disagree with a decision I have made, I	1	2	3	4

	Disagree	Slightly Disagree	Slightly Agree	Agree
am likely to change my decision.				
8. I am most likely to trust the advice of people who know me best.	1	2	3	4
9. There are times when even authorities like parents, teachers, and counselors are uncertain about the right answer.	1	2	3	4
10. When it comes to choice of a job, my parents know what is best for me so I am inclined to go with what they suggest.	1	2	3	4
11. I have given a good deal of thought to choosing a job that agrees with my values, interests, and abilities.	1	2	3	4
12. I have a plan for what I would like to do as a career.	1	2	3	4

2-10. DIFFERING OPINIONS AND DECISION MAKING

The following questions are about your views toward different situations. Circle the number that shows how much you disagree or agree with each of the following statements.

My primary role in making an educational decision for myself like gaining more education for a job is to:	Disagree	Slightly Disagree	Slightly Agree	Agree
1-1 gather as much information as possible	1	2	3	4
1-2 seek direction from informed experts like my teachers, school counselors, and parents.	1	2	3	4
1-3 make a decision considering all the available information along with my own views	1	2	3	4
1-4 try to really focus on figuring out my needs and interests	1	2	3	4
If a teacher or advisor recommended a job in a field that I had never heard of before:	**Disagree**	**Slightly Disagree**	**Slightly Agree**	**Agree**
2-1. I would listen, but I probably wouldn't seriously consider it because I have already made that decision.	1	2	3	4
2-2. I would try to understand their point of view and figure out an option that would best fit my needs and interests.	1	2	3	4
2-3. I would give it some thought because they probably know better than I do about what might fit me.	1	2	3	4
2-4. I would listen but be careful not to let their idea overshadow my own needs and interests	1	2	3	4

2-10. DIFFERING OPINIONS AND DECISION MAKING – Continued

The following questions are about your views toward different situations. Circle the number that shows how much you disagree or agree with each of the following statements.

To make a good job choice I think that:	Disagree	Slightly Disagree	Slightly Agree	Agree
3-1. facts are the strongest basis for a good decision.	1	2	3	4
3-2. it is largely a matter of personal opinion.	1	2	3	4
3-3. experts like counselors, parents, or teachers are in the best position to advise me about a good choice.	1	2	3	4
3-4. I really have to work on identifying my needs and interests	1	2	3	4

In my opinion, the most important role of an effective counselor or advisor is to:	Disagree	Slightly Disagree	Slightly Agree	Agree
4-1. be an expert on a variety of job options.	1	2	3	4
4-2. provide guidance about a job choice that is appropriate for me.	1	2	3	4
4-3. help me to think through multiple options for a job	1	2	3	4
4-4. help me bring out my own needs and interests.	1	2	3	4

When I am in the process of making an important decision and people give me different advice,	Disagree	Slightly Disagree	Slightly Agree	Agree
5-1. I consider my own values.	1	2	3	4
5-2. I don't listen.	1	2	3	4
5-3. I try to listen and consider their advice carefully.	1	2	3	4
5-4. I try not to let their advice drown out my own needs and interests	1	2	3	4

When people have different opinions about a book, I think that,	Disagree	Slightly Disagree	Slightly Agree	Agree
6-1. people do not understand the true meaning of the book	1	2	3	4
6-2. some books are just that way. It is possible for all meanings to be correct.	1	2	3	4
6-3. only the expert(s) can really say which meaning is correct.	1	2	3	4
6-4. It is because everyone forms their opinions from their own experience.	1	2	3	4

Experts are divided on some scientific issues, like the causes of global warming. In a situation like this,	Disagree	Slightly Disagree	Slightly Agree	Agree
7-1. I rely on the experts to tell me.	1	2	3	4
7-2. I use my values as a base from which to weigh their advice.	1	2	3	4
7-3. I think it is best to accept the uncertainty and try to understand the principal arguments behind the different opinions.	1	2	3	4
7-4. I would use my own values about the issue to come to my own conclusion.	1	2	3	4

SECTION 3: GENERAL INFORMATION

The following questions are about your life. Please circle the appropriate response and fill in the blank where appropriate.

1. What is your gender?
 	
   1. Female
   2. Male
	2. What is your date of birth?
	
	_____ (mm/dd/yy)
	
	  (Fill in date of birth)

3. What is your race/ethnicity?
 	
   1. African American
   2. Asian American
   3. Caucasian (white)
   4. Hispanic American
   5. Multiracial
   6. Native American
Other _____ (Please fill in)
	4. Where are you currently enrolled as a student?
	
	  1. Middle school
	
	  2. High school

5. What grade are you in? 1. 6th 5. 10th 2. 7th 6. 11th 3. 8th 7. 12th 4. 9th	6. What do you expect to do after high school? 1. Go to college 2. Go to community college 3. Get a computer certification 4. Get a job 5. Other (please write in)_____
7. If your **father/male guardian** is employed outside of the home, what type of job does he currently hold? _____ (Fill in job title)	8. If your **mother/female guardian** is employed outside of the home, what type of job does she currently hold? _____ (Fill in job title)

9. What is the highest level of education completed by your **father/male guardian**?
 	
   1. Less than high school
 	
   2. High school or equivalent
 	
   3. Associates/community college degree
 	
   4. Bachelor's degree
 	
   5. Masters, doctorate, or professional degree like medical doctor, veterinarian, or lawyer
 	
   6. Other
	10. What is the highest level of education completed by your **mother/female guardian**?
	
	   1. Less than high school
	
	   2. High school or equivalent
	
	   3. Associates/community college degree
	
	   4. Bachelor's degree
	
	   5. Masters, doctorate, or professional degree like medical doctor, veterinarian, or lawyer
	
	   6. Other

11. Do you have access to a computer at the following places? (Circle all that apply)
 	
1. Home
 	
2. School
 	
3. Talent Search/Upward Bound Program
 	
4. Community Center
 	
5. Other (write in): _____
	12. Which of the following best describes where you currently live?
	
	   1. With parent (s) or guardian(s)
	   2. With other family member
	   3. Other _____ (Please fill in)

13. Which program are you enrolled in?
   (Circle all that apply)
 	
   1.   Talent Search
   2.   Upward Bound
	14. Please indicate how many of each sibling you have. (Include step, half, and foster siblings.)
	
	   1. Older brother_____
	   2. Twin brother_____
	   3. Younger brother_____
	   4. Older sister_____
	   5. Twin sister_____
	   6. Younger sister_____
	   7. Other _____

15. What kind of grades do you make overall? 1. All A's 6. Mostly C's 2. Mostly A's 7 Mostly C's and D's. 3. Mostly A's and B's 8. Mostly D's 4. Mostly B's 9. Mostly D's and F's 5. Mostly B's and C's 10.Mostly F's	16. What kind of grades do you make in your favorite subject? 1. All A's 6. Mostly C's 2. Mostly A's 7 Mostly C's and D's. 3. Mostly A's and B's 8. Mostly D's 4. Mostly B's 9. Mostly D's and F's 5. Mostly B's and C's 10.Mostly F's

17. What is the marital status of your parents?
 	
   8. Married
   9. Remarried
  10. Living with someone
  11. Divorced or living separately
  12. Never married
  13. Widowed or Widower
  14. Other _____ (Please specify)
	18. Are you employed?
	
	   1. YES
	
	   2. NO
	
	If yes, how many hours a week do you normally work?
	
	_____
	
	(Fill in the hours per week you generally work)

Appendix B

Correlations of Constructs in IT Career Interest & Choice Models: Boys and Girls Combined

Variables	1	2	3	4	5	6	7
1. IT Career Interest & Choice	--	0.08	0.29**	0.54**	0.19*	0.20*	0.34**
2. Information Sources	0.28**	--	0.27**	0.22*	0.34**	0.39**	0.83
3. Decision Orientation	0.18**	0.22**	--	0.32**	0.33**	0.25**	0.20*
4. Computer Use	0.37**	0.29**	0.13	--	0.22*	0.28**	0.30**
5. Receptivity	0.07	0.26**	0.17*	0.10	--	0.48**	0.21*
6. Information Credibility	0.31**	0.41**	0.22**	0.17*	0.55**	--	0.17
7. Positive Attitudes Toward IT Workers	0.26**	0.18**	0.33**	0.29**	0.21**	0.23**	--

*p < .05. **p < .01.

Appendix C

Correlations of Constructs in models of Parental Support of IT Careers: Boys and Girls
Combined

Variables	1	2	3	4	5	6	7
1. Father's Level of Education	--	0.42**	-0.03	-0.04	-0.02	0.01	-0.08
2. Mother's Level of Education	0.09	--	-0.34**	-0.10	0.02	0.010	-0.11
3. School Enrollment	0.06	-0.20**	--	0.03	0.08	0.04	0.02
4. IT Career Interest & Choice	-0.03	0.04	0.09	--	0.33**	0.08	0.29**
5. Parental Support	0.01	0.01	-0.03	0.26**	--	0.30**	0.40**
6. Information Sources	0.13	-0.09	0.18**	0.28**	0.35**	--	0.27**
7. Decision Orientation	-0.07	-0.09	0.16*	0.18**	0.13	0.23**	--

*p < .05. **p < .01.

Appendix D

Mplus Syntax for IT Career Interest and Choice (girls)

TITLE: IT Career Interest and Choice (girls)
DATA:
   FILE IS "C:\Users\Monica Kimbrell\Desktop\Dissertation\SPSS\ITCFemales.csv";
VARIABLE:
   NAMES ARE ATT USE ITC PS IS IF REC DO;
   USEVARIABLES ARE ATT USE ITC PS IS IF REC DO;
   MISSING ARE ALL (-9999);
ANALYSIS:
   TYPE IS MISSING;
   ESTIMATOR IS ML;
   ITERATIONS = 1000;
   CONVERGENCE = 0.00005;
   COVERAGE = 0.10;
  MODEL:
  ITC ON USE ATT IS;
  USE ON ATT IS DO;
  ATT ON REC DO;
  IF ON REC;
  IS ON IF DO REC;
OUTPUT: STANDARDIZED SAMPSTAT MODINDICES (ALL);
SAVEDATA:
   RESULTS IS FIG1;

Appendix E

Mplus Syntax for IT Career Interest and Choice (boys)

TITLE: IT Career Interest and Choice (boys)
DATA:
   FILE IS "C:\Users\Monica Kimbrell\Desktop\Dissertation\SPSS\ITCmales.csv";
VARIABLE:
   NAMES ARE ATT USE ITC PS IS IF REC DO;
   USEVARIABLES ARE ATT USE ITC PS IS IF REC DO;
   MISSING ARE ALL (-9999);
ANALYSIS:
   TYPE IS MISSING;
   ESTIMATOR IS ML;
   ITERATIONS = 1000;
   CONVERGENCE = 0.00005;
   COVERAGE = 0.10;
  MODEL:
  ITC ON USE ATT;
  USE ON ATT IS;
  ATT ON REC;
  REC ON DO;
  IF ON REC;
  IS ON IF DO;
OUTPUT: STANDARDIZED SAMPSTAT MODINDICES (ALL);
SAVEDATA:
   RESULTS IS FIG1;

Appendix F

Mplus Syntax for Parental Support of IT Career (girls)

TITLE: Parental Support of IT Career (girls)
DATA:
   FILE IS "C:\Users\Monica Kimbrell\Desktop\Dissertation\SPSS\PSFemales.csv";
VARIABLE:
   NAMES ARE FAED MOED ENROLL ATT USE ITC PS IS IF REC DO;
   USEVARIABLES ARE FAED MOED ENROLL ITC PS IS DO;
   MISSING ARE ALL (-9999);
ANALYSIS:
   TYPE IS MISSING;
   ESTIMATOR IS ML;
   ITERATIONS = 1000;
   CONVERGENCE = 0.00005;
   COVERAGE = 0.10;
 MODEL:
 ITC ON PS IS DO;
 IS ON ENROLL PS DO FAED MOED;
 DO ON ENROLL PS;
 PS ON ENROLL FAED MOED;
OUTPUT: STANDARDIZED SAMPSTAT MODINDICES (ALL);
SAVEDATA:
   RESULTS IS FIG1;

Mplus Syntax for Parental Support of IT Career (girls)

TITLE: Parental Support of IT Career (boys)
DATA:
   FILE IS "C:\Users\Monica Kimbrell\Desktop\Dissertation\SPSS\PSmales.csv";
VARIABLE:
   NAMES ARE FAED MOED ENROLL ATT USE ITC PS IS IF REC DO;
   USEVARIABLES ARE FAED MOED ENROLL ITC PS IS DO;
   MISSING ARE ALL (-9999);
ANALYSIS:
   TYPE IS MISSING;
   ESTIMATOR IS ML;
   ITERATIONS = 1000;
   CONVERGENCE = 0.00005;
   COVERAGE = 0.10;
 MODEL:
 ITC ON PS IS DO;
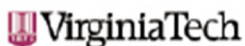 IS ON ENROLL PS DO FAED MOED;
 DO ON ENROLL PS;
 PS ON ENROLL FAED MOED;
OUTPUT: STANDARDIZED SAMPSTAT MODINDICES (ALL);
SAVEDATA:
   RESULTS IS FIG1;

Appendix H: IRB Approval Letter

VirginiaTech

Office of Research Compliance
Institutional Review Board
North End Center, Suite 4120, Virginia Tech
300 Turner Street NW
Blacksburg, Virginia 24061
540/231-4606 Fax 540/231-0959
email irb@vt.edu
website http://www.irb.vt.edu

MEMORANDUM

DATE: October 29, 2013

TO: Peggy Meszaros, Monica Renee Kimbrell

FROM: Virginia Tech Institutional Review Board (FWA00000572, expires April 25, 2018)

PROTOCOL TITLE: Career Decision Making Using Self-Authorship

IRB NUMBER: 13-977

Effective October 29, 2013, the Virginia Tech Institution Review Board (IRB) Administrator, Carmen T Papenfuss, approved the New Application request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

http://www.irb.vt.edu/pages/responsibilities.htm

(Please review responsibilities before the commencement of your research.)

PROTOCOL INFORMATION:

Approved As: **Exempt, under 45 CFR 46.110 category(ies) 4**
Protocol Approval Date: **October 29, 2013**
Protocol Expiration Date: **N/A**
Continuing Review Due Date*: **N/A**

*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals/work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

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