WORK READINESS CHARACTERISTICS OF HIGH SCHOOL SENIORS

by

LEA DEAN FOLDS

(Under the Direction of C. Kenneth Tanner)

ABSTRACT

Work readiness of the labor force and its importance has been a recurrent theme for almost 30-years. The landmark report What Work Requires of Schools: A SCANS Report for America 2000 was instrumental in identifying the skills and knowledge needed for potential employees to be considered work ready. The skills and knowledge required for jobs that pay self- and family-sustaining wages have increased considerably and it is now estimated that over 85% of current jobs require at least some postsecondary training. Consequently, high school students must have higher skill and knowledge levels than their predecessors to secure and maintain employment that pays self- and family-supporting wages.

The purpose of this study was to analyze the relationship of gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility to the work readiness of high school seniors in Georgia. Work readiness was defined as the combination of technical, employability, and academic skills necessary for occupations that offer opportunities for advancement and that pay family-sustaining wages. Work readiness was quantified using applied mathematics, reading for information, and locating information from the WorkKeys® Skills Assessments. Participants were 476 high school seniors who had taken the WorkKeys® assessments during February 2011.

Multiple regression and correlation analyses were used to examine the relationship of the predictor variables and the criterion variables in this study. The full regression model explained 36.3% of the variance in participants' applied mathematics scores, 35.6% of the variance in their reading for information scores, and 30.2% of the variance in their locating information scores. Race and highest-level mathematics course were significant in all three models with highest-level mathematics course explaining the largest portion of the variance in participants' scores. Gender was significant in explaining variance in the criterion variable in two models (reading for information and locating information), absenteeism was significant in the applied mathematics model, and student mobility was significant in the locating information model.

INDEX WORDS: WorkKeys®, Work Readiness, Employability Skills, Career Technical Education, Work Ready, High School, Career Education, Vocational Education, Highest-level Mathematics Course

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WORKPLACE READINESS CHARACTERISTICS OF HIGH SCHOOL SENIORS

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DEDICATION

“I dreamed a dream”… This dissertation is dedicated to my husband J and my son Nicholas. You are the best part of my life. I appreciate the love, support, and encouragement you’ve provided as I’ve completed my Master’s and now my doctorate. I truly couldn’t have done it without you. We have gone through this together and I think we make the best team ever! My mom, Barbara Smith, and my mother-in-love, Mary Alice Folds, have offered support and encouragement throughout this process. You made my trips back and forth to Athens much more enjoyable. I love you both very much! The completion of this dissertation marks the beginning of new dreams and time spent with my family whom I love very much. Praise to you Lord Christ!

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CHAPTER 1

INTRODUCTION

A common theme in numerous studies and policy reports for over 20-years has been that high school students lack the skills necessary for success in the workforce and postsecondary education (American Society for Training & Development, 2006, 2009; Business-Higher Education Forum, 2003; Casner-Lotto & Barrington, 2006; Junior Achievement USA, 2011; Partnership for 21st Century Skills, 2003). Skills students need to succeed in the economy have outpaced skills emphasized in schools (Achieve Inc., 2012; Carnevale, Rose, & Hanson, 2012; Levy & Murnane, 2006; Murnane & Levy, 1996; Partnership for 21st Century Skills, 2003; Robinson, 2001; Secretary's Commission on Achieving Necessary Skills (SCANS), 1991a).

This skills gap has been identified in the literature as the difference between skills required of workers for an organization to grow and remain competitive in its' industry and the skills possessed by the organization's workforce. A skills gap will be present in companies striving to innovate and stay ahead of the marketplace, but when the gap becomes too large it impacts an organizations' ability to be competitive in the marketplace (American Society for Training & Development, 2006). A report by the Business-Higher Education Forum (2003) contrasts a skills shift from the 1950s when 80% of available jobs required less than a college education (unskilled) to the present economic climate where 85% of jobs require at least a two-year degree (skilled). The jobs remaining require more education and skills of potential employees (Achieve Inc., 2012; American Society for Training & Development, 2006;

Carnevale, 2005; Carnevale et al., 2011; Cornelius, 2011; Partnership for 21st Century, 2010). In order to meet the needs of students, schools, and business communities, it is important to be able to assess work readiness of high school students.

Background of Problem

Government and business leaders recognized, during the 1980s, that manufacturing processes and industry competitiveness of American businesses were radically changing and the workforce did not possess skills to keep pace with the changes (Speraw & Donovan, 2012). Declines in low-skill manufacturing jobs, increases in service industry jobs, and rapid changes in manufacturing and other technologies combined to spur the increase in demand for workers to possess higher skill levels (American Society for Training & Development, 2006). The Secretary's Commission on Achieving Necessary Skills (SCANS Commission) was created in 1990 to develop work readiness competency guidelines on a national level. These guidelines focused on identifying the skills workers needed to be successful, acceptable proficiency levels, and effective assessment of workers skill levels in the new economy (Speraw & Donovan, 2012).

Alvarez, Gillies, and Bradsher (2003) define the new economy as "…the impact of a diverse set of technologies that fundamentally transforms the nature of work and the world of business (p. 35)." Instrumental in these new technologies are workers who use their brains more than their hands to accomplish their work. The authors state that skill requirements were higher for all levels of jobs. Management positions typically require more conceptual, analytical, and innovative skills and may require advanced degrees. The workplace will also change for the common worker in manufacturing, retail sales, service industries, and primary products e.g. agriculture, mining, petroleum, fishing, etc. Technology is used across all these industries to produce end products, analyze production, increase productivity, manage financial matters, market products, and increase manufacturing capabilities. Consequently, higher skill levels are required of workers at almost every job level (Alvarez et al., 2003).

Jobs not significantly impacted by technology are those at the lowest end of skills requirements, and although these service sector jobs may be growing, they generally do not pay wages sufficient to support families (Levy & Murnane, 2006). Consequently, high school graduates must have greater knowledge and skills than their predecessors to secure and maintain employment that provides self-sustaining, family-sustaining wages (Alvarez et al., 2003; Carnevale, 2009; Levy & Murnane, 2006; National Governors Association Center for Best Practices, 2010; Rickman & Goss, 2012). Unfortunately, many graduates pursuing entry-level positions are finding that they do not possess the skills employers are seeking (American Society for Training & Development, 2006; Business-Higher Education Forum, 2003; Casner-Lotto & Barrington, 2006; Cochran & Ferrari, 2008; Levy & Murnane, 2006). Skills most frequently found lacking in high school students are oral and written communication skills, mathematics, reading comprehension, work ethics, and professional conduct (Alvarez et al., 2003; Casner-Lotto & Barrington, 2006; Cornelius, 2011; Levy & Murnane, 2006). High school graduates without the necessary skills and postsecondary education may find it more difficult to qualify for and secure positions that pay self-sustaining wages. Unemployment rates are higher for workers who lack the skills employers are seeking and college graduation outcomes are substantially reduced for students who lack basic skills upon entering college (Bridgeland, Milano, & Rosenblum, 2011; National Governors Association Center for Best Practices, 2010). Skill gaps negatively impact the employment and earning potential of job seekers (American Society for Training & Development, 2006, 2009; Bridgeland et al., 2011).

Recruiting non-managerial employees with sufficient skills, training, and education was a major challenge reported by over 53% of business leaders and 67% of small companies in a recent survey (Bridgeland et al., 2011). This report echoes similar findings during the past nine years (American Society for Training & Development, 2006, 2009; Business-Higher Education Forum, 2003; Casner-Lotto & Barrington, 2006; University of Tennessee Center for Literacy Studies, 2011). These concerns are significant when considering the future of high school students who are typically the least skilled and least experienced members of the workforce.

Workers' skills impact their personal earning potential, lifestyle, and opportunities, and also the competitiveness of businesses, industries, and economies. Countries must produce highly-skilled workers to support innovation in information- and knowledge-intensive jobs and thrive in a global economy (Business-Higher Education Forum, 2003). Carnevale (2005) states that American employers have an advantage in that the governmental policies allow the importation of talented workers if enough home-grown talent is not available to meet employers needs. He cautions that although employers in other countries are hindered by job protection policies, that won't always be the case.

Given the globally competitive nature of business, it is important to evaluate how American students fare when compared to students from other countries. The Organisation for Economic Co-operation and Development, an international organization focused on economic and social policies around the world, coordinates the Program for International Student Assessment (PISA). PISA is an international assessment that measures literacy of 15-year olds in reading, mathematics, and science every three years. One area is assessed in depth while the other two are minor subjects during each assessment cycle. In the most recent PISA report, American students rank no higher than seventh in reading literacy, 18th in mathematics, and 13th in science when compared to 15-year olds from 60 countries and five other education systems (Fleischman, Hopstock, Pelczar, & Shelley, 2010). Though the report details the selection process including public and private schools for countries participating in the test, it does not address the variance in individual countries' school enrollment policies which could impact test results e.g., if school is not compulsory for all 15-year olds, important characteristics of the 15-year old students might vary from one country to another. Carnevale (2005) noted upon examination of 2001 PISA data that although scores of U. S. students on international assessments were lower than some other developed nations, when population size is examined, the number of high performing students in the U. S. is higher than the number of high performing students in other countries. Regardless of the issues in assessing international student achievement, PISA and other international assessments still form the basis of economic decisions for business and industry around the world. These scores compromise the United States ability to compete globally for jobs which in turn impacts states, communities, and families (Harris, 2008).

Gaps in worker's skills affect their readiness for work or work readiness (Speraw & Donovan, 2012). The concept of work readiness is described in the landmark report A Nation at Risk (U.S. Department of Education, National Committee on Excellence in Education,, 1983) and is referred to as "workplace know-how (p. vii)" in the SCANS Commission report (Secretary's Commission on Achieving Necessary Skills (SCANS), 1991b). The characteristics most frequently connected to work readiness have also been used to describe other terms occurring in the literature including workplace skills, employability skills, work readiness, workforce readiness, 21st century skills, and most recently college- and career-readiness (Harris, 2008; McLarty & Vansickle, 1997; Overtoom, 2000; Saterfiel & McLarty, 1995; Secretary's Commission on Achieving Necessary Skills (SCANS), 1991b).

Work readiness lacks a clear and consistent definition in the literature but for the purpose of this study will be defined as the combination of technical, employability, and academic skills necessary for occupations that offer opportunities for advancement and that pay family-sustaining wages (Association for Career and Technical Education, 2010). Skills most commonly identified with work-readiness include the five competencies (resources, interpersonal skills, information, systems, and technology) and three foundations (basic skills, thinking skills, and personal qualities) first identified in the SCANS report (Secretary's Commission on Achieving Necessary Skills (SCANS), 1991b). Although researchers and policy groups have developed other skills lists, most of these newer skill lists still include skills first identified in the SCANS report.

A variety of work-readiness assessment instruments have been developed for the purpose of determining and/or certifying work readiness of potential employees (Comprehensive Adult/Student Assessment System, (CASAS); Equipped for the Future (EFF); the National Work Readiness Credential (NWRC), and WorkKeys®). All have their own unique strengths and weaknesses but none have been universally adopted throughout the U.S. In fact, states' definitions of work-readiness are as inconsistent as the method with which the construct is measured.

This research will use applied mathematics, reading for information, and locating information as work-readiness constructs. These assessments are contained in WorkKeys® assessment developed by American College Testing Program, Inc. Since a 1996 name change, American College Testing Program, Inc. has been known simply as ACT Inc. (ACT Inc., 2009). Applied mathematics uses workplace related problems to assess examinees' mathematical reasoning, critical thinking, and problem-solving skills. Reading for information uses work-related documents including letters, memos, policies, regulations, etc. to assess examinees' skills to read and uses text to perform a job. Locating information uses work-related graphics to assess examinees' skill in comparing, analyzing, and summarizing information contained in those graphics (ACT Inc., 2011h). These constructs are being used because they were the basis of the Work Ready Georgia program from 2009 until 2011. Georgia high school seniors in participating counties took the WorkKeys® assessment during the spring of their senior year. Students who met the minimum scores were awarded a National Career Readiness Certificate.

A review of the literature identified several predictor (independent) variables commonly associated with achievement including gender, race, and socio-economic status (Fleischman et al., 2010; Rampey, Dion, & Donohue, 2009). Other variables including parent's education levels, hours spent on homework, hours spent reading for fun, computer access and usage, highest-level mathematics course taken in high school (Rampey et al., 2009), student mobility (Burkham, Lee, & Dwyer, 2009), and student enrollment in career technical education (CTE) courses (Bishop & Mane, 2004), have also been identified in the literature as related to achievement. In studies related to work readiness, Barnes (2002) studied the effects of gender, race, and differences in education level on the participants' scores in Applied Mathematics and Reading for Information from the WorkKeys® test. Stone (2007) studied the effects of race, gender, and age on work readiness using Applied Mathematics, Reading for Information, and Locating Information from ACT's WorkKeys® test. Sugiarti (2008) studied characteristics of successful secondary program completers including specific pathway completed, gender, race, attendance, grade point average (GPA), socioeconomic status, and student scores on ACT's Prepare Learn ACT Now (PLAN) test, KeyTrain scores, and WorkKeys® scores. Parker (2011) used WorkKeys® scores to determine if there was a statistically significant difference between the work readiness of high school students pursuing a Career, Technical, Agricultural Education (CTAE) diploma endorsement versus those pursuing a College Preparatory diploma endorsement. Although all of these variables potentially add meaning to this research, most of them could not be used in this study because they were not collected at the time of the initial assessment.

High school students' readiness for life after graduation has become a serious focus of education regardless of whether students choose work or continue to postsecondary schooling. Even though gaps exist in the skills high school students need for college or work, consistent data about students' performance on work readiness measures is sparse (American Society for Training & Development, 2009; Casner-Lotto & Barrington, 2006). This information could be valuable in determining work-readiness of high school students and identifying constructs that best describe work-readiness.

Purpose of the Study

This study examined the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility and the work readiness of high school seniors in one Middle Georgia county. The predictor variables used in this study were gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility (Burkham et al., 2009; Fleischman et al., 2010; Rampey et al., 2009). The criterion variable, work readiness, was defined as the combination of technical, employability, and academic skills necessary for occupations that offer opportunities for advancement and that pay family-sustaining wages (Association for Career and Technical Education, 2010). Work readiness was quantified using the following categories: applied mathematics, locating information, and reading for information scores from the

WorkKeys® assessment. These assessments are relevant for this study because they have been used by the state of Georgia in awarding Work Ready certificates to job seekers.

Research Objectives

The objectives for this study were to:

1. Examine the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, student mobility and the work readiness characteristic “applied mathematics” of high school seniors.
2. Examine the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, student mobility and the work readiness characteristic “reading for information” of high school seniors.
3. Examine the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, student mobility and the work readiness characteristic “locating information” of high school seniors.

Theoretical Framework

While theories related to career development may provide an acceptable framework from which to study work readiness, O'Neil, Allred, and Baker (1992) developed a theoretical framework for work readiness using reports from the Secretary’s Commission on Achieving Necessary Skills (Secretary's Commission on Achieving Necessary Skills (SCANS), 1991b), American Society for Training and Development (Carnevale, Gainer, & Meltzer, 1990), National Academy of Science (Committee on Science, 1984), the New York State Education Department (New York State Education Department, 1990), and the State of Michigan (Employability Skills Task Force, 1989). The authors examined the reports and compared the identified skill categories, skills, and the importance of the skills. Through their work, O'Neil et al. (1992)

identified four important categories essential for work-readiness (a) basic academic skills, (b) higher-order thinking skills, (c) interpersonal and teamwork skills, and (d) personal characteristics and attitudes. The identified skills were those considered necessary for entry-level workers to be successful in their jobs. Although some variation existed between the five reports, the SCANS Report became the benchmark for work readiness skills. For this reason, the SCANS Commission framework served as the theoretical framework for this study.

Importance of Study

For much of the twentieth century it was commonly believed by teachers, scholars, and policymakers that college bound students required different skills and knowledge than those directly entering the workforce (ACT Inc., 2011b). Today, policymakers and educators realize the same skills are needed regardless of the post-graduation path students select. Attaining financial stability and career satisfaction are important factors in the personal fulfillment of many people. This goal will be difficult to attain for high-school graduates without high-performance work skills.

In order to meet the needs of high school graduates entering college or the workforce, it is important to determine whether students are graduating from high school as work ready individuals. Nationally, high school students are deficient in the skills identified as important for postsecondary education and high-performance workplaces (Casner-Lotto & Barrington, 2006). Over 123,000 students have dropped out of Georgia's high schools (1,252 in the study county) since 2007 and are not ready for college or work (Rickman & Goss, 2012). Georgia's high school graduation rate using the new cohort formula developed by the U.S. Department of education is 67.4% and the study county's rate is 58.8% (Cardoza, 2012). Failure to address the readiness of our students not only impacts graduates outcomes but also local and state economies through stagnation or loss of existing jobs and the loss of potential new business development to areas with higher educational attainment, consequently, it is important to assess the situation of a sample of Georgia students.

This study sought to understand characteristics related to the work readiness of high school students in one Middle Georgia county school system. Implementation of Georgia's Work Ready initiative provided an opportunity to measure work readiness of the county's high school seniors. This task is important because it impacts students' financial and career success as well as the economic development of surrounding communities and the state of Georgia.

CHAPTER 2

REVIEW OF LITERATURE

This study focused on factors that contribute to work readiness of high school students. Relevant literature was examined to establish a theoretical and historical framework for studying work readiness of high school students. Topics are organized around the theoretical and historical framework, the work readiness construct, demographic variables, and the measurement of work readiness in Georgia.

Introduction

Much has been written in the past twenty years about the need improve the academic and work readiness skills of high school students. High school graduates must have greater knowledge and skills than their predecessors to secure and maintain employment that provides self-sustaining wages (Alvarez et al., 2003; Carnevale, 2009; Levy & Murnane, 2006; National Governors Association Center for Best Practices, 2010; Rickman & Goss, 2012). Unfortunately, many graduates pursuing entry-level positions are finding that they do not possess the skills that employers are seeking (American Society for Training & Development, 2006; Business-Higher Education Forum, 2003; Casner-Lotto & Barrington, 2006; Cochran & Ferrari, 2008; Levy & Murnane, 2006). Assessments for college entrance, the SAT and ACT, already existed but many students (particularly those not planning to pursue postsecondary education) do not take these tests; and the results are not used in employment screening. Identifying and measuring work readiness or occupational knowledge is a dilemma.

Career Development Theories

A review of relevant research literature revealed no single theory that best explains work readiness. Several theories, however, repeatedly emerge in literature related to work readiness, vocational skills, and college and career readiness. Those most pertinent to this study are identified in the career development theory literature and include social cognitive theory (Bandura, 1989), social cognitive career theory (Lent, Brown, & Hackett, 1994), life-span, life-space theory (Super, 1980), and theory of work adjustment (Dawis, 2000). Even though Bandura, Super, and Dawis' work has been in the literature for many years, their theories continue to be discussed, reviewed, and expanded (Brown, 2002; Leung, 2008). A discussion of these theories, work readiness literature, and measurement of work readiness in Georgia follows.

Though career development theory literature does not specifically include work readiness as a construct, counselors use skills associated with work readiness in identifying individuals' interests, aptitudes and abilities as they assist students with their career decisions. The aptitudes and abilities from career development theory are also represented in studies of work readiness skills including the SCANS report and others (Carnevale & et al., 1990; Casner-Lotto & Barrington, 2006; Secretary's Commission on Achieving Necessary Skills (SCANS), 1991a).

Social Cognitive Theory

Social cognitive theory (SCT), the work of Albert Bandura, is grounded in N. E. Miller and J. Dollard's work involving social learning theory. Social cognitive theory illustrates the interaction between three factors; personal, environmental, and behavioral that Bandura (1989) calls triadic reciprocal determinism. Bandura depicts these three factors as points on a triangle with arrows representing a relationship that moves in both directions. People's thoughts, affects, and actions form the basis of the interaction between personal and behavior factors. Personal characteristics and environmental influences are the foundation of the person-environment relationship. In this relationship, expectations, beliefs, bents, and cognitive competencies are acquired and adapted by social influences and structures within the environment. The interaction between the environmental and behavior factors involves behavior determining aspects of the environment and behavior being modified by the environment. The interactive nature of this relationship means that people control and are controlled by their environment.

Key concepts of SCT (Bandura, 1989) are humans' capacity for symbolizing, vicarious capability, fore-thought, self-regulation, and self-reflection. Via human's use of symbols to process and transform experiences into thought, they derive meaning, form, and continuity from life experiences. Vicarious capability includes humans' ability to learn through the modeled behaviors and consequences of others either deliberately or inadvertently. The use of forethought shows the purposive nature of most human behavior. Forethought gives humans the capacity to choose behaviors based on anticipated consequences. Self-regulation involves the ability of humans to control their own behavior through the use of self-demands and self-sanctions that are motivational, social, or moral in nature. Self-reflective capability provides an opportunity for humans to examine their experiences to gain understanding and to evaluate experiences for possible future use. The primary notion in self-reflection is self-efficacy. Self-efficacy involves a person's beliefs about their ability to control the events affecting their lives, which shapes their interests, goals, actions, and attainments.

Social Cognitive Career Theory

Social cognitive career theory (SCCT) (Lent et al., 1994; Lent, Hackett, & Brown, 1999, 2005) seeks to describe processes involved in the development of academic and career-related interests, choices, and performance. The framework is primarily based on Bandura's social cognitive theory (Bandura, 1986) but also includes theoretical elements from Super, Dawis and Lofquist, Holland, Krumboltz, and Gottfredson. The authors' intent was to develop a theory that contained common elements from the major theorists the field of career development.

Three primary factors examined in the SCCT models include self-efficacy, outcome expectations, and personal goals. These factors receive different focus in each theory but all are relevant as people exercise personal power (agency) in their career development. Self-efficacy is a belief set held by individuals related to their performances or abilities. It is not static, it responds to environmental influences, and may change via sources of learning experiences including personal performance accomplishments, vicarious learning, social persuasion, and physiological and affective states (Lent et al., 2005). The impact of these sources on self-efficacy is a function of how much attention and validity a person ascribes to the sources (Lent et al., 1994). Outcome expectations are beliefs about the results of chosen behaviors and derive from direct and vicarious learning experiences. The impact of self-efficacy and outcome expectations varies with individuals and their circumstances. Personal goals involve the intent to pursue specific actions or predetermined outcomes. Social cognitive career theory identifies two types of personal goals, choice-content and performance goals. Choice-content goals relate to the type of career or activity being pursued, and performance goals deal with how well the individual expects to perform in the career or activity. These goals are directly tied to a person's self-efficacy and outcome expectation beliefs.

Social cognitive career theory uses three segmented, interlocking models to describe career development. Each model deals with a different developmental time span (segmental), yet they interlock because the personal factor beliefs in one model impact the remaining models. The interest model includes childhood and early adolescence and examines the development of academic and vocational interests. During this time children and adolescents participate in varied activities through their home, educational, recreational, and peer connections. Feedback received during these experiences begins to inform a child's self-efficacy beliefs. Through practice, children and adolescents are able to refine skills, set personal performance standards, and shape their outcome expectations and self-efficacy beliefs about their abilities in various tasks (Lent et al., 2005).

The choices model covers the period from late adolescence to early adulthood and is concerned with the how people make decisions about potential careers. Career-related activities include selecting a vocational field and implementing an action plan. Feedback received from these experiences shape future courses of action. There are times, however, when people may not be able to pursue their primary interests due to environmental supports or barriers. Factors affecting a person's career choices may include cultural demands, family input, economic conditions, and prior education. Whether these factors are considered supports or barriers may vary with each person (Lent et al., 1994; Lent et al., 2005).

The performance model covers the time from a person's first employment through later life and is primarily concerned with two facets of academic and career performance, proficiency and persistence. Both persistence and level of proficiency are related to ability, self-efficacy, outcome expectations and performance goals (Lent et al., 1994).

Life-Span, Life-Space Approach to Career Development

Life-span, life-space, the work of Donald Super (1980), was built on his work involving career choice and development. It is based on his belief that career development occurs throughout the life-span of individuals and is heavily influenced by an individuals' self-concept. Life-span concerns the process of career development over an individual's lifetime and includes life-stages and developmental tasks from birth through disengagement from work. Life-space denotes the various roles, environments, and positions individuals play during the course of their lives. Super believed that a person's role self-concept was the product of their interaction with their environment (Super, 1992).

Life-span is characterized by five stages of development, growth, exploration, establishment, maintenance, and disengagement which occur between birth and death. Each stage includes characteristics, sub stages, and tasks pertinent to that particular time in life. Growth begins with birth and concludes around 14-years old. Learning about their world, gaining increased autonomy, and future thinking characterize this developmental stage. During the exploration stage (15- to 24-years old), adolescents are becoming young adults, developing vocational identities based on information, interests, and values, and selecting and implementing careers. In the establishment stage (around 25-years old), individuals secure employment, gain stability in their occupation, and consolidate their position. Maintenance begins around age 44 and includes maintaining their position, keeping up with changes, and innovating. It is possible for people to change organizations or occupations during this time causing them to cycle back through earlier stages to reach maintenance again. The final stage, disengagement, begins at approximately age 60 and includes the possible reduction of pace or workload, planning for retirement, and eventual retirement.

Life-space encompasses the roles and social positions held by individuals during their lives. Super (1980) identified nine roles that people may occupy during their lifetime (child, student, leisurite, citizen, worker, spouse, homemaker, parent, and pensioner), and four "theaters" where the roles are enacted, home, community, school, and workplace. Multiple roles may be held at any time and an individual may not play all roles. The roles may overlap meaning success or failure in one role may have a similar impact the other roles being played at the time.

Self-concept results from the interaction of physical and cognitive maturation, experiences, and environmental influences (Super, 1990). Super extended the study of self-concept to include vocational and later career development. Career development is the application of self-concept to occupational interests. Personalities, values, interests, traits, and self-concepts were unique for every individual and these attributes uniquely qualify them for certain occupations. A person's self-concept continually changes throughout their lifetime due to experiences in their various roles and theaters (environments). Super illustrates this change process through Life-Stages.

Theory of Work Adjustment

Developed by René Dawis, George England, and Lloyd Lofquist in 1964, theory of work adjustment (TWA) is a psychological theory rooted in the individual differences tradition that focuses on people's variability from one another. The theory of work adjustment is concerned with the person (P), their behavior, and their interaction with their environment (E). The theoretical assumptions include "(1) …P has requirements that have to be met, many of which can be met through E; (2) and that P has capabilities that enable it to meet these requirements; and (3) much of P's behavior in interacting with E is about meeting these requirements (p. 5)" (Dawis, 2005).

The interaction between P and E is predicated on the notion that both possess requirements that have to be met and each expects the interaction to fulfill some of their needs. The requirements of P are both biological (needs), and psychological (well-being), and many of these requirements (reinforcer requirements) can be met through the work environment (E).

Some examples of reinforcer requirements for P have been identified as pay, prestige, and working conditions. The ability of the P's requirements to be met by E is called satisfaction. The requirements of E concern P's possession and use of skills (cognitive, affective, motor, physical, and sensory perceptive) required to accomplish work, and maintain or improve the organization. The ability of P to satisfy E's requirements is called satisfactoriness. Through work, P and E interact because they both possess the potential to meet each other's requirements. When satisfaction exists between P and E both seek to maintain it by continuing existing behaviors. When dissatisfaction exists, one or both may attempt to reestablish the balance by adjusting. Either P or E may terminate the relationship when satisfaction cannot be reestablished (Dawis, 2005).

The theory of work adjustment (Dawis, 2005) quantifies P through two constructs, needs, and skills, and uses reinforcers and skill requirements to quantify E. The primary construct, P-E correspondence, is identified as the fit between P and E (in the predictive model), and alternately as the interaction, or correspondence, of P to E and E to P (in the predictive model).

In TWA (Dawis, 2005), skills are categorized as basic and higher order. Basic skills include sensory and perceptual, cognitive and affective, and motor and physical skills. Higher order skills represent combinations of the basic skills and are subdivided as general factors (general abilities), group factors (verbal ability, numerical ability, and spatial ability), and specific ability factors (reading comprehension, vocabulary, knowledge of grammar). The skill sets of individuals vary based on a variety of factors and the specific skill requirements vary for each type of job.

Although the theory of work adjustment has not been directly tied to work readiness, it provides a relevant structure for examining skills associated with work readiness. The link between TWA and my study is supported in Proposition III, the ability to of the person (P) to meet the ability/skill requirements of E (Satisfactoriness) (Dawis, 2005).

Theory of work adjustment (Dawis, 2005) incorporates a foundation in trait-approach with a focus on the correspondence between the person and their environment. This correspondence is important because it may be an appropriate vehicle in further research to understand high school students satisfaction with their educational environment and how their satisfaction leads to satisfactoriness in terms of work readiness or to use the more recent term college- and career readiness. Although TWA includes skills and abilities and examines them in light of occupation-specific requirements, a more appropriate framework for studying work readiness was developed by O'Neil et al. (1992).

Theoretical Framework

Economic difficulties during the 1980s and early 1990s coupled with increasing competitiveness of global markets led American manufacturers to rethink the role and responsibilities of workers, especially those involved in points of production, sales, or service (O'Neil et al., 1992). A series of reports called attention to an increased need for higher-level skills by American workers, particularly entry-level workers (Carnevale et al., 1990; Committee on Science, 1984; Employability Skills Task Force, 1989; New York State Education Department, 1990; Secretary's Commission on Achieving Necessary Skills (SCANS), 1991b). In each case, educators, business people, scholars, and policymakers were consulted for assistance in identifying work readiness skills needed by employees. All five reports identified a strong foundation in basic academic skills that included reading, writing, arithmetic, listening, speaking, higher-order thinking, interpersonal skills, and teamwork skills as necessary for the workforce (O'Neil et al., 1992). A theoretical framework for work readiness was developed by O'Neil et al.

(1992) that involved a thorough review of each report parsing the similarities and differences between the reports. The authors identified four categories consistently noted as essential for work-readiness (a) basic academic skills, (b) higher-order thinking skills, (c) interpersonal and teamwork skills, and (d) personal characteristics and attitudes. The identified skills were those considered necessary for entry-level workers to be successful in their jobs. Of the five reports, the SCANS Commission report has been recognized as the leading framework when discussing skills associated with work readiness.

Secretary's Commission on Achieving Necessary Skills (SCANS)

Encouraging development of a high-performance economy characterized by high-skill, high-wage jobs was the fundamental purpose of the SCANS commission (U.S. Department of Labor, Secretary's Commission on Achieving Necessary Skills, 1992). Commission objectives included defining skills needed for employment, proposing acceptable proficiency levels, determining effective ways to assess proficiency, and developing a strategy to disseminate the information to schools, businesses, and homes. Commission research involved discussions with business owners, public employers, managers, union officials, and line workers. After much research, commission members concluded (a) a new set of competencies and foundation skills would be necessary for high school students to have a fulfilling, productive life; (b) most businesses would need to adopt the high performance business models used by America's most competitive companies; and (c) American schools must adopt high-performance models to ensure graduates are competitive (Secretary's Commission on Achieving Necessary Skills (SCANS), 1991b).

The SCANS Commission's work resulted in the identification of five competencies and a three-part foundation of skills and personal qualities crucial to workers' job performance in high-performance workplaces (Secretary's Commission on Achieving Necessary Skills (SCANS), 1991b). The commission called these competencies and foundation skills "work-place know how (p. iii)." The competencies represented elements used by effective workers to be productive in their jobs:

- Resources--allocating time, money, materials, space, and staff;
- Interpersonal Skills--working on teams, teaching others, serving customers, leading, negotiating, and working well with people from culturally diverse backgrounds;
- Information--acquiring and evaluating data, organizing and maintaining files, interpreting and communicating, and using computers to process information;
- Systems--understanding social, organizational, and technological systems, monitoring and correcting performance, and designing or improving systems;
- Technology--selecting equipment and tools, applying technology to specific tasks, and maintaining and troubleshooting technologies. (Secretary's Commission on Achieving Necessary Skills (SCANS), 1991b)

Competency in the foundational skills required workers to possess the following:

- Basic Skills--reading, writing, arithmetic and mathematics, speaking, and listening;
- Thinking Skills--thinking creatively, making decisions, solving problems, seeing things in the mind's eye, knowing how to learn, and reasoning;
- Personal Qualities--individual responsibility, self-esteem, sociability, self-management, and integrity. (Secretary's Commission on Achieving Necessary Skills (SCANS), 1991b)

Competencies and skills first identified in the SCANS Report provided momentum for workforce development research, curriculum, and policy development during the past twenty years, and they form the basis for work by Equipped for the Future, Partnership for 21st Century Skills, The

New Commission on the Skills of the American Workforce, the National Work Readiness Council and others. This study sought to identify characteristics that affect the work readiness of high school students and a review of relevant literature failed to uncover any single theory that best explains work readiness. Consequently a theoretical framework was based on the work of the Secretary's Commissions on Achieving Necessary Skills (SCANS) (U.S. Department of Labor, 1991).

Work Readiness

The concept of work-readiness is described in the literature as early as the landmark report A Nation at Risk (U.S. Department of Education, National Committee on Excellence in Education,, 1983) but work-readiness as a construct lacks a clear and consistent definition in the literature. Characteristics most frequently connected to work-readiness have also been used to describe other terms occurring in the literature including workplace skills, employability skills, workforce readiness, 21st century skills, and most recently college- and career-readiness (Harris, 2008; McLarty & Vansickle, 1997; Overtoom, 2000; Saterfiel & McLarty, 1995; Secretary's Commission on Achieving Necessary Skills (SCANS), 1991b).

The University of Tennessee Center for Literacy Studies defines work readiness as subordinate skilled- or unskilled positions that provide opportunities for employees to learn job-specific skills at work (University of Tennessee Center for Literacy Studies, 2011). Though not defined in all states, 26 states identify work/career readiness using technical content standards, skill attainment, academic and technical coursework, or relevant assessments (Harris, 2008). Bottoms and Young (2008) describe work readiness as the ability to apply academic knowledge, technical knowledge, and skills in work settings. In a review of work readiness credentials, Rey-Alicea and Scott (2007) noted that employers considered potential employees work-ready when they demonstrated a combination of hard and soft skills that were transferable across industries. Career-readiness has been recently defined as the combination of technical, employability, and academic skills necessary for occupations that offer opportunities for advancement and that pay family-sustaining wages (Association for Career and Technical Education, 2010) and as the skills necessary to allow workers to attain employment which offers opportunity for advancement in the occupation and provides wages sufficient to support a small family (U.S. Department of Labor, 2000).

Although the definitions discussed above represent a variety of descriptions or definitions of work-readiness related terms, only the last two contain sufficient specificity and are quantifiable. Since ACTE's definition is the most recent, identifies academic, technical, and employability skills, and includes the components of providing opportunity for advancement and family-sustaining wages, it is the definition that will be used for this study.

Georgia Work Ready Program

In 2006, Georgia launched the Georgia Work Ready program in conjunction with the Georgia Chamber of Commerce to improve job training, economic development, and economic growth (Governor's Office of Workforce Development, 2011). The National Career Readiness certificate was identified as a key element of job seekers being work ready. The state implemented the Certified Work Ready Communities program that provided grants to assist communities in becoming work ready by building partnerships between community leaders, local technical colleges, school systems, and business owners with the goal of improving graduation rates, attracting new businesses, and improving the economic conditions for local citizens. The funding provided job-profiling assistance for employers, and free WorkKeys®

assessments for job seekers through the technical colleges (Governor's Office of Workforce Development, 2011).

The study county's business, education, and community leaders initiated the process of becoming a Certified Work Ready Community in 2009. In the spring of 2010 the WorkKeys® Assessment was administered to high school seniors in the study county for the first time. Over 92% of seniors earned a National Work Readiness Credential in 2010. The test was administered again in 2011 and was included in the high school accountability index as part of Georgia's original No Child Left Behind waiver application (Jones, 2011).

WorkKeys®

The WorkKeys® system developed by ACT, Inc. has been used since the early 1990s to measure an individual's workforce skills against those identified as necessary for specific jobs (ACT Inc., 2011g). The five-part system includes job analysis, assessment, training and curriculum, certification, and research and analysis. Job analysis involves job profiling and analyzing skill levels of applicants and current employees. Authorized job profilers work with companies to identify the required job tasks and skills levels for each position within the company. Job profiles can be used to identify examinee skill attainment levels to inform selection, hiring, and training. Employers can also use the data to determine individual and organizational needs to assist in professional development, and assist in communication between employers and educators/trainers. The WorkKeys® database currently contains job profiles for over 18,000 different jobs in industry sectors such as advanced manufacturing, aerospace, bioscience, construction, energy, financial services, healthcare, hospitality, information technology, retail, and transportation (ACT Inc., 2009).

WorkKeys® assessments (ACT Inc., 2011h) are criterion referenced exams testing skills in four critical areas, communication, problem solving, interpersonal skills, and personal skills. Scale scores are used to rank examinees' skill attainment in one of four categories corresponding to skill levels required for specific jobs. Companies and educators can use the skill levels to make hiring, training and advancement decisions. Assessment scores indicate an examinees' current skills level and can document and provide evidence of skills, identify areas needing improvement, identify jobs that are aligned with the examinees' current skill level, and document progressive skill development (ACT Inc., 2011h).

The training and curriculum portions of the WorkKeys® system uses ACT, Inc. developed products such as KeyTrain®, Career Ready 101®, and KeyTrain® Career Skills® to identify skill gaps and provide training to improve workplace skills (ACT Inc., 2012a). KeyTrain® is designed to assist in the mastery of applied workplace skills tested in the National Career Readiness Certificate. Career Ready 101® integrates with KeyTrain® and can be used for career exploration, workplace skill development, and life-literacy development including financial awareness and job searching skills. Career Skills® is used to develop soft skills in five areas including work habits, communication skills, workplace effectiveness, business etiquette, and the job search. Professional development can be targeted based on the specific needs of the organization and its' employees (ACT Inc., 2009).

Through the certification component of the WorkKeys® system (ACT Inc., 2011a), examinees' may earn the National Career Readiness certificate, a portable credential certifying skill attainment level in three areas, reading for information, locating information, and applied mathematics. Each of these assessments requires problem solving, critical thinking, reading and using work-related text, applying information from workplace documents to solve problems, setting up and performing mathematical calculations, and using workplace related graphics. The research and analytics components of the WorkKeys® system provide organizations data that can be used to analyze job requirements, current and needed skill levels of jobs and employees, and inform strategic planning (ACT Inc., 2007, 2011a, 2011c).

Purpose

WorkKeys'® purpose is to assist individuals, educators, and employers in the identification of critical workplace skills (ACT Inc., 2011h). Individuals can use the assessments to determine their skill level to aid with job search and skill development. Educators may use WorkKeys® to determine students foundational skill levels and to aid in curriculum development, and employers may use it in the identification of qualified candidates for available positions, provide training and development for current employees, and assist in the retention of high-quality employees. WorkKeys® supports workforce development initiatives by quantifying the skills needed and skill attainment level of the workforce in a state or community, and can be used to prepare students for the workforce by identifying skills gaps, providing training, and demonstrating relevance for academic work (ACT Inc., 2011h).

ACT, Inc. initiated development of the WorkKeys® assessment during the early 1990s after reviewing the literature to determine skills employers identified as necessary for their workers to be successful employees. WorkKeys® was designed to provide four distinct functions: establish skill scales representing skill levels from basic to complex across a wide variety of job types, assess skill levels of potential employees enabling employers to make better hiring decisions, profile job-skill requirements, and provide additional training for those workers needing to build skills. Educators and employers initially identified twelve skills for assessment (McLarty, 1992). These skills were refined in later research and today include applied mathematics, reading for information, locating information, applied technology, business writing, listening for understanding, teamwork, workplace observation, fit, performance, and talent (ACT Inc., 2011h).

The work readiness constructs, applied mathematics, reading for information, and locating information were developed by ACT, Inc. and incorporated in their WorkKeys® assessment to provide a consistent means of communication about a prospective workers' skill set relative to predetermined criteria (Vansickle, 1992). Applied mathematics, reading for information, and locating information were used in this study because they determine a test taker's eligibility for the National Career Readiness Certificate (ACT Inc., 2011h). This certificate indicates skill levels that transfer across occupations, workplaces, and geographic locations. It is a tool useful to employers who have profiled jobs at their workplace using the WorkKeys® approach. Certificates are awarded based on four score levels, bronze, silver, gold, and platinum. Bronze level certification indicates the examinee possesses the necessary foundational skills suitable for entry-level employment. Silver through platinum levels represent increasingly higher skill level attainment necessary for jobs requiring higher levels of foundational skills and technical performance (ACT Inc., 2011h).

Users. Currently over 30 statewide or regional programs are using WorkKeys® and the National Career Readiness Certificate (NCRC). Program participants include state and location government agencies, business, and school systems. Juniors enrolled in Alaska's public schools take WorkKeys® applied mathematics, reading for information, and locating information assessments as part of the Alaska Career Ready program. The program's goal is to improve work readiness skills of Alaska's students entering the workforce. Students who earn qualifying scores are awarded the National Career Readiness Certificate (Heard, 2011).

Illinois has integrated WorkKeys® applied mathematics and reading for information assessments into their state mandated testing program, Prairie State Achievement Exam (PSAE). The PSAE includes all five sections of the ACT Plus Writing, applied mathematics, reading for information, and a state developed science test. All public school students must take the PSAE in order to earn their high school diploma. Illinois will administer the locating information test to students beginning in 2013 to allow students the opportunity to earn the National Career Readiness Certificate (Illinois State Board of Education, 2012). Illinois workers have earned 17,792 NCRCs since January, 2006.

Juniors in Michigan take the Michigan Merit Exam (MME) which includes the five sections of the ACT Plus Writing test, WorkKeys® applied mathematics, reading for information, and location information assessments, and state developed mathematics, science, and social studies tests. Students who earn qualifying scores on all three WorkKeys® sections (applied mathematics, reading for information, and location information) may earn the National Career Readiness Certificate (Michigan Department of Education, 2012).

High school juniors in North Dakota must take either the four multiple-choice sections of the ACT test or WorkKeys® applied mathematics, reading for information, and location information assessments in order to graduate high school (North Dakota Workforce Readiness Council, 2010).

High school students in Wyoming may take WorkKeys® as an optional assessment. In previous years Wyoming's high school juniors could take WorkKeys® in lieu of the ACT, however state statute now requires ACT Plus Writing (Wyoming Department of Education, 2012). Students earning qualifying scores on all three assessments (applied mathematics, reading for information, and locating information) earn the National Career Readiness Certificate.

A review of assessment reports for Alaska, Illinois, Michigan, North Dakota, and Wyoming did not find information related to WorkKeys® scores for high school students. Information available through ACT's website indicates the number and type of NCRCs awarded. It is not possible to separate high school students from all WorkKeys® test takers but aggregate NCRCs earned between January 1, 2006 and September 30, 2012 are as follows: Alaska-20,479; Illinois-17,792; Michigan-141,039; North Dakota-116, and Wyoming-5,632. The number of jobs profiled by state are: Alaska-28; Illinois-38; Michigan-101; North Dakota-0; and Wyoming-2. Currently no businesses in these five states are using the NCRC as a means of qualifying applicants for open positions.

The most recent data available showed that 1,330,532 NCRCs have been issued across the United States between January 1, 2006 and September 30, 2012 (ACT, 2012c). Additionally, Oregon, Utah, Missouri, Kentucky, Virginia, Michigan, and South Carolina actively participate as WorkReady Communities which means the WorkKeys® program is a key part of the states' economic development initiative (ACT, 2012c). National Career Readiness Certificates earned for these states during the period January 1, 2006 to September 30, 2012 are: Oregon-20,379; Utah-1,209; Missouri-15,896; Kentucky-56,739; Virginia-674; Michigan-141,039, and South Carolina-172,612. Total number of jobs profiled during this period: Oregon-66; Utah-12; Missouri-204; Kentucky-99; Virginia-140; Michigan-101, and South Carolina-845.

Total number of businesses supporting the WorkKeys® program in each state during this period are: Oregon-848; Utah-0; Missouri-435; Kentucky-0; Virginia-0; Michigan-101, and South Carolina-54. Although Georgia no longer actively promotes the WorkReady Georgia program, it has the largest percentage of NCRCs earned by workers in the United States, accounting for 23% of the total NCRCs for the time period. ACT (2012c) data shows 305,694

NCRCs awarded, and 809 jobs profiled during the time period from January 1, 2006 to September 30, 2012. Due to the state's nonparticipant status in the WorkKeys® program, data on the number of businesses participating in the program are not available for Georgia.

Additionally, Midlands Education and Business Alliance in Columbia, South Carolina published case studies from work with eight businesses in their community. In a final evaluation at the conclusion of the study 71% of participants reported the profiling of jobs was significantly beneficial, and 75% believed WorkKeys® provided significant insight into examinees' skill levels (Midlands Education & Business Alliance, 2009). Bolin (2011) reported that all 50 states participate in the Career Readiness Certificate Consortium, a group established in 2004 whose purpose was to establish a nationally recognized, portable, common career readiness credential that certified recognized job skills. The consortium selected WorkKeys® as their official credential. The report indicates that the credential is being used in all 50 states, and is used in numerous high schools across the country to provide credentials for students as they graduate high school.

Prior WorkKeys® Research. As has been noted by Hendrick (2006) and Stone (2007), WorkKeys® implementation is relatively recent and research involving the effectiveness of WorkKeys® has been limited, particularly with respect to high school students. Prior to 2008 most WorkKeys® related research had centered on its' use by employers and adults to examine the relationship between participants' demographic data and assessment scores, as a placement tool for postsecondary reading and mathematics courses, as a pre- and post-employment screening tool by employers, and as a predictor of postsecondary academic achievement (Belton, 2000; Bowles, 2004; Buchanan, 2000; Greene, 2008; Hendrick, 2006; Lindon, 2010; Stone, 2007).

Foote (1997) studied 214 Tennessee high school seniors who were enrolled in vocational education courses and who took the WorkKeys® test in the spring of 1996. The study sought to determine if significant differences existed between applied mathematics, reading for information, and locating information scores and participant's gender, race, part-time job experience, and socioeconomic status. Study results found significantly higher applied mathematics scores for males than females, and that White participants scored significantly higher than Black participants on applied mathematics and reading for information tests. Statistically significant differences were not found for participants based on socioeconomic status.

Belton (2000) studied 670 one-year vocational completers and two-year technical completers from five satellite campuses of a Mississippi community college from spring 1997 through fall 1998. He examined the relationship between gender, age, weekly work hours, request for employment information, campus/center, and program enrollment and a students' status as a one- or two-year completer using level scores on WorkKeys® applied mathematics, reading for information, and locating information assessments. Study results found no statistically significant relationships for one-year vocational program completers between age, gender, hours worked per week, or requests for employment information and participants' reading for information score. No statistically significant relationship was found between age, gender, and participants' locating information score for one-year vocational completers. Significant differences were found between gender and applied mathematics scores for one-year vocational completers, and statistically significant differences on the assessment scores between one- and two-year completers. Two-year completers attained higher scores on the assessments than did one-year completers. Additionally, analyses of one-year completers found significant differences between campus/center and vocational/technical program and reading for information results, vocational/technical program for locating information results, and gender and vocational/technical program for applied mathematics.

Bowles (2004) examined the viability of using WorkKeys® scores instead of ASSET scores for student placement in postsecondary English and mathematics courses at a two-year technical college in South Carolina. Over 400 community and technical colleges in the United States use the ASSET assessment when advising and placing students in postsecondary English and mathematics courses (ACT, 2012d). Participants were 71 students who had taken both assessments. Study results determined that correlations between the two tests were insufficient to support WorkKeys® use for postsecondary academic course placement in lieu of the ASSET assessment.

In a study examining employee retention, Hendrick (2006) used a mixed methods approach to analyze quantitative data from applicants and qualitative data gathered from representatives of 12 North Carolina companies using WorkKeys® as an employment retention tool. Data was collected on 757 employees tested with WorkKeys® and 608 employees hired using traditional methods. The research indicated statistically significant increases in employee retention rates when WorkKeys® was used as a pre-employment screen tool in addition to applications, interviews, and references.

Stone (2007) studied scores and demographic data from 6,962 participants, age 19-years and older, collected from the testing center of a southeastern Alabama community college. Study participants had taken at least one of the WorkKeys® assessments at a southeast Alabama community college testing center between 1998 and 2005. The study examined the relationship between age, race, and gender and participant's scores on WorkKeys® applied mathematics, reading for information, and locating information assessments. Although sample sizes were different for each WorkKeys® assessment, study results determined males scored significantly higher than females on applied mathematics but scored significantly lower than females on reading for information. Black participants scored significantly lower on applied mathematics, reading for information, and locating information than White participants.

More recently, Greene (2008) examined managers' perceptions on the effect of WorkKeys® on employee turnover, amount of scrap materials, training time, overtime, and teamwork. Additionally, the study sought to determine perceptual differences between managers from large and small companies. Participants were managers from 23 companies in North Carolina whose companies use WorkKeys® as an employment screening and training tool. Surveys were used initially and follow-up qualitative interviews were used to gather additional information. Participants reported reductions in training time (60%), turnover (52%), scrap materials (36%), and overtime (17%), and an increase in teamwork (40%). No statistically significant differences were found between managers from large and small companies. Follow-up interviews with 10 participants indicated potential extraneous variables, which could impact study results. Union decisions could have impacted turnover rates and overtime hours increased with increased product demand. In interviews, some managers did indicate that WorkKeys® use as a screening tool produced workers who learned more quickly and reached desired production and quality levels more quickly.

In a study of postsecondary students from a Kentucky community and technical college, Lindon (2010) examined the relationship between WorkKeys® scores and students grades in college level English and mathematics courses, and students' cumulative grade point average (GPA). Study findings reported weak correlations between students' grades of C or higher in college-level reading and mathematics courses and WorkKeys® scores. Weak correlations were also found between cumulative GPA and students' scores on applied mathematics, reading for information, and locating information.

Possibly because of more widespread adoption of the WorkKeys® system, the number of studies has increased in the past five years and several have involved high school students (Barnes, 2002; Hall, 2010; Parker, 2011; Schultz, 2011; Sugiarti, 2008; Wall, 2011; Ward, 2007). Research topics have focused on employer related issues (Hendrick, 2006), the relationship between a variety of demographic variables and WorkKeys® scores (Barnes, 2002; Belton, 2000; Parker, 2011; Stone, 2007). WorkKeys® results of students in technical programs (Hall, 2010; Sugiarti, 2008; Ward, 2007), WorkKeys® scores as a predictor of academic success (Belton, 2000; Bowles, 2004; Lindon, 2010), perceptional studies and studies of incarcerated adults (Buchanan, 2000; Greene, 2008; Schultz, 2011) have been conducted in recent years.

In a 2002 research study of over 3,000 high school, technical, and 2-year college students, as well as industry employees, Barnes (2002) examined differences on WorkKeys® applied mathematics and reading for information scores by race, gender, and education level. Study results indicated statistically significant differences between the scores of Caucasian and African-American participants with Caucasian participants scoring higher. No statistically significant differences were found with regard to gender.

Sugiarti (2008) completed a study whose purpose was to profile and describe secondary school completers at Redbud Technology Center in Oklahoma. Participants were 100 secondary program completers during the 2005-2006 school year and 83 program completers during the 2006-2007 school year. Due to incomplete data sets information was analyzed on only 103 participants (65 from the 2005-2006 school years and 38 from the 2006-2007 school year). Data collected included program type, gender, attendance, grade, economic status, race, PLAN scores, Key Train scores, and WorkKeys® scores. Study results profiled a program completer across all the variables collected. No attempt was made to correlate any of the variables with program completion, only to describe the program completers in terms of the study variables.

Hall (2010) examined the effects of enrollment in a comprehensive high school career technical education program versus a career academy program on the work readiness of 501 high school students in Georgia. Study results indicated statistically significant but not practically significant differences in the applied mathematics and reading for information scores between the two groups. Both statistically and practically significant differences were found between the two groups for the locating information variable although both groups scored in the same level (Level 4).

Parker (2011) examined the effect of participating in either career and technical education or college preparatory program of study on the work readiness scores of 164 Georgia high school seniors. Student's WorkKeys® scores on applied mathematics, reading for information, and locating information assessments were compared based on their program of study enrollment. Study results indicated no statistically significant difference between either program of study on the work readiness scores of participants.

A study conducted by Schultz (2011) sought to describe college and career readiness perceptions of 178 urban high school juniors related to their scores on WorkKeys® applied mathematics, reading for information, and locating information assessments. Participant data was collected using a survey administered at the time students received their WorkKeys® results. Study findings showed that students' perceptions of their college and career readiness were much higher than their assessments indicated. Additionally, students believed WorkKeys® had value as a college and career planning tool.

In a 2012 study, Wall examined variables related to work ethic to determine which combination of gender, race, work-based learning, socioeconomic status, applied mathematics, reading for information, and locating information provided the best model for explaining variance on work ethic scores. The work ethic construct was defined using interpersonal skills, initiative, and dependability. Study participants were 533 high school seniors enrolled in career and technical education classes from a central Georgia school district who graduated in May 2011. Study results found a statistically significant relationship between socioeconomic status and initiative, and between reading for information and initiative and dependability. Work-based learning was determined to have a statistically significant relationship for all three work ethic constructs, interpersonal skills, initiative, and dependability.

Variables Importance to This Study

A literature review related to work readiness and academic achievement was undertaken to determine variables suitable for this study. Numerous studies have examined the relationship between gender, race, work readiness, and academic achievement (Barnes, 2002; Bottoms & Carpenter, 2003; Fleischman et al., 2010; Rampey et al., 2009; Reed, Jepsen, & Hill, 2007; Stone, 2007; Sugiarti, 2008; The HOPE Program, 2011; Wilcher, 2005). Gender and race are typically used to describe demographic information about the study participants and at times may be associated with other variables of interest.

Socioeconomic status, student mobility, and attendance have been included in several studies to determine their influence on academic achievement (Donnelly, 2010; Engec, 2006; Paik & Phillips, 2002; Parke & Kanyongo, 2012; Sugiarti, 2008; Wilcher, 2005; Xu, Hannaway,

& D'Souza, 2009). Parke and Kanyongo (2012) analyzed data for the 2004-2005 school year from 80 elementary, middle, and high schools in an urban Ohio school district. Students' mobility and attendance were examined for their influence on mathematics and reading achievement. Study results indicated negligible differences between attendees and ethnicity, but the Black subgroup was slightly more mobile than the White subgroup. When controlling for SES, the White subgroup had a higher percentage of its' population in the stable attendance category than did the Black subgroup. Statistically significant effects were found between attendance-mobility and mathematics achievement scores. The research literature reflects a strong connection between student mobility, attendance, and student achievement (Burkham et al., 2009; Donnelly, 2010; Hinz, Kapp, & Snapp, 2003; Paik & Phillips, 2002; Rumberger, 2002); it would be interesting to see if these relationship extended to work readiness. Attendance will be quantified in this study using the term absenteeism because the school system measures attendance using the number of class periods a student is absent.

Highest-level mathematics course is a variable used in the National Assessment of Education Progress (NAEP) test administered by the federal Department of Education. This assessment, also known as "The Nation's Report Card," is conducted at least every two years in schools throughout the U.S. Participation in the NAEP is voluntary; however, states receiving Title 1 funds are required to participate in the assessment. In their report of the 2008 NAEP results, Rampey et al. (2009) reported that taking high level mathematics courses was associated with higher mathematics achievement scores. Other achievement variables could be used including English, mathematics, science, and social studies scores on high stakes tests such as the Georgia High School Graduation Test (GHSGT) and End-of-Course tests (EOCTs). However, the GHSGTs are being phased out in Georgia and replaced with EOCTs which would make it difficult to acquire similar data for future research. For this reason highest-level mathematics course was used in this study. This will allow comparison of the level of mathematics course with the participant's score on the Applied Mathematics portion of the WorkKeys® test.

Pathway completion typically refers to a student's completing a sequence of related career and technical education courses. More recently, due to changes in the Carl D. Perkins Career and Technical Education Act of 2006, program completers are now required to take industry-approved end of pathway examinations to demonstrate minimum competency in a technical field (U.S. Department of Education, 2006). Pathway completion is one part of President Obama's plan for reauthorizing the Perkins Act. The changes for reauthorization focus on providing high-quality career technical education programs (CTE) that are aligned with industry standards, strong collaboration between secondary and postsecondary CTE programs, and improved accountability for building technical and employability skills (U.S. Department of Education, 2010). Sugiarti (2008) focused on describing and profiling demographic characteristics of pathway completers at Redbud Technology Center. Parker (2012) compared the work readiness of high school CTE pathway completers versus college preparatory program students. In a study by Castellano, Stone, Stringfield, Farley, and Wayman (2004) research results indicated students enrolled in CTE courses demonstrated higher levels of achievement in reading and mathematics than non-CTE students.

An additional variable of interest, work status, arose during research into academic achievement. It is not uncommon for high school students to seek part-time employment while they are enrolled in school for a variety of reasons. The effect of part-time employment during high school on academic achievement has been studied over the years. While working a few hours weekly has not been shown to negatively impact academic achievement, working beyond 12- to 15-hours weekly negatively impacted academic achievement (Green & Jaquess, 1987; Lillydahl, 1990; Quirk, Keith, & Quirk, 2001; Singh, 1998; Singh & Ozturk, 2000). In a study using data from the National Educational Longitudinal Study (NELS), Quirk et al. (2001) analyzed data from 15,551 eighth- through twelfth-grade participants to determine the effects, if any, part-time employment had on student's academic achievement. The researchers found that students employed twelve or fewer hours each week showed little negative effect on academic achievement while being employed. However, students working 12 or more hours weekly showed a significant decline in their academic achievement.

While many of the variables mentioned in this review are interesting and hold the potential to influence work readiness of high school students some will not be included in this study. Because this study used archival data, variables had to be readily accessible using information available through the school system's database. For future research, it would be possible to collect data during the testing time on some of the variables mentioned earlier. Consequently, the predictor variables used in this study included socioeconomic status, highest-level mathematics course, absenteeism, and student mobility.

CHAPTER 3

RESEARCH METHOD

This chapter describes the research method used to explain characteristics of high school seniors (gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility) and their scores on work readiness measures (applied mathematics, reading for information, and locating information) using WorkKeys®. The purpose and objectives of this study are restated below. The design, participants, instrumentation, procedure, and data analysis strategies for each research objective are also described.

Purpose of the Study

The purpose of this study was to examine relationships among certain personal characteristics of participants and work readiness of high school seniors in one Middle Georgia county. Personal characteristics examined included gender, race (white, non-white), pathway completion, socioeconomic status (determined by participation in the free/reduced price lunch program), highest-level mathematics course, absenteeism (the number of class periods absent), and student mobility (the number of times a student changed high schools after their initial enrollment from middle school). Work readiness, defined in the SCANS report (1991b), was determined using participants scores on the WorkKeys® assessments developed by ACT, Inc. Scale scores for the three assessments used for the National Career Readiness Certificate (applied mathematics, reading for information, and locating information) were examined. Applied mathematics, reading for information, and locating information were designed by ACT, Inc. to measure work-related skills considered essential for the workforce (McLarty, 1992). Examinees' scale scores on each subtest are converted to a level score. Level scores are compared and a National Career Readiness Certificate (ACT Inc., 2008) is awarded using the lowest level score for all three subtests.

Research Objectives

The objectives for this study were to:

1. Examine the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, student mobility and the work readiness characteristic "applied mathematics" of high school seniors.
2. Examine the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, student mobility and the work readiness characteristic "reading for information" of high school seniors.
3. Examine the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, student mobility and the work readiness characteristic "locating information" of high school seniors.

Research Design

A correlational research design was used in this study to determine which predictor variable or group of variables was more likely to explain scale score variance for the work readiness constructs applied mathematics, reading for information, and locating information. Data were retrieved from the school system's student information system databases and score reports for ACT's WorkKeys® assessments for the 2010-2011 school year. Data gathered from the student information system database included gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility.

Scale score data for applied mathematics, reading for information, and locating information were gathered from ACT's Score Report from the February 2011 test administration.

A correlational research design permits researchers to study the relationships between quantitative predictor and criterion variables (Johnson & Christenson, 2012). Correlational designs include nonexperimental designs that examine the strength and direction of relationships among two or more variables and provides researchers the ability to determine possible variable relationships to explain various phenomena (Fraenkel & Wallen, 2009). Research purposes used in correlational studies often seek to describe, explain, or predict relationships among the predictor and criterion variables (Fraenkel & Wallen, 2009). Correlational research is flexible; it may be used to examine linear and non-linear relationships among variables, use archival data, and does not require random sampling (Fraenkel & Wallen, 2009; Huck, 2008; Johnson & Christensen, 2012). Particularly useful in educational research, correlational research designs give educators the means to examine how individual variables or component variables affect the criterion variable being studied (Gall, Gall, & Borg, 2007).

A correlational research design was appropriate for this study because the study used archival data, a convenience sample, and did not involve variable manipulation. The criterion variables are pertinent to the current focus on work readiness/college and career readiness of high school graduates within economic development and education circles. Employers are requiring higher skills and knowledge levels of entry-level employees whether they come directly from high school or with some postsecondary education (Achieve, 2012; American Society for Training & Development, 2006; Partnership for 21st Century, 2010). Consequently, it is important to be able to adequately assess those skills.

Multiple regression analysis (MRA) is one example of correlational research using component variables. Multiple regression analysis assesses the presence and extent of a relationship between one continuous dependent/criterion variable and a group of independent/predictor variables that have been combined into a new component variable (Huberty, 2003; Tabachnick & Fidell, 2013). These predictor variables are then analyzed for their individual contribution, represented by beta weights, to the model. Beta weights (standardized regression coefficients) allow researchers to determine the relative importance of the different predictor variables regardless of their original unit of measure (Huck, 2008).

Multiple regression analysis was appropriate for this study because it sought to explain the strength and direction of the relationships between the work readiness constructs and gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility. Advantages of multiple regression research include (a) the ability to study the strength and direction of any possible relationships among two or more variables of interest, and (b) it permits researchers to examine relationships among a number of variables simultaneously (Goodwin & Goodwin, 1996). Disadvantages of this research design directly link to its advantages and include (a) inability to establish cause- and effect relationships because variables were not manipulated, (b) increased research expense and time required when the number of study variables increases, and (c) the temptation to infer cause- and effect relationships between the study variables (Goodwin & Goodwin, 1996; Johnson & Christensen, 2012; Moore, 2010). The expense involved in conducting this research study was minimal because the data existed in the school system's database and was queried relatively simply. Availability of the study variables was confirmed prior to the start of the study and the school system's Instructional Technology department supplied the student information for the variables.

Participants

Participants were 476 high school seniors enrolled in one Middle Georgia school system who took the WorkKeys® work readiness assessment in the spring of 2011. The three-section assessment was administered in one sitting on the same day at both schools. Students were tested using the pencil-paper test version in classrooms where time to complete the assessment had been set aside for testing purposes on that day. The sample comprised 195 male students (41%) and 281 female students (59%). Student race was 50% White, 47% Black, 1% Mixed, 1% Asian, and 1% Hispanic. Fifty-nine percent of the sample was described as economically disadvantaged, defined by a student's qualifying for the free and reduced price lunch program (Department of Agriculture, 2011). These data were collected and maintained in the school system's database because they are a required reporting category for determining the school's adequate yearly progress. The school system has established policies and procedures governing access to student data and the security of the data itself that comply with the Family Education Privacy Rights Act (FERPA, 2011).

The study school system is part of a Regional Education Service Agency (RESA) that includes schools in surrounding counties. Second indicator adequate yearly progress (AYP) data were reviewed for the counties in the RESA district (not including the study county) and the state of Georgia to determine if any similarities existed between the groups (Georgia Department of Education, 2011). Race and economically disadvantaged status were available through these reports. Comparisons are shown in Table 1. The racial makeup of study participants is not unlike 2010-2011 high school seniors from the remaining counties in the RESA district or Georgia high school seniors. A comparison of participants reported as economically disadvantaged reveals that the study county had a higher economically disadvantaged population of high school seniors for the 2010-2011 school year (59%) than the remaining counties in the RESA district (35%) or the state (41%).

Table 1

Comparison of Study County High School Seniors, RESA High School Seniors and Georgia High School Seniors

Race Economically Disadvantaged	Study County High School Seniors (2011)	RESA High School Seniors (2010-2011)	Georgia High School Seniors (2010-2011)
Asian	1%	2%	4%
Black	47%	39%	37%
Hispanic	1%	5%	8%
Mixed (two or more races)	1%	4%	2%
White	50%	49%	49%
Economically Disadvantaged	59%	35%	41%

It was important to determine whether or not these data were significantly related. Do the percentages in the sample correlate with the population percentages? Using the data in Table 1 above, the calculations in Table 2 show that correlations range from .949 to .989, with $\alpha \leq .01$ and the components of the sample are significantly correlated with those of the population.

Table 2

Correlations Between the 2011 RESA District, Georgia HS Seniors, and Study Sample

	N	Study County HS Seniors	RESA District HS Seniors	Georgia HS Seniors
Study County HS Seniors	6	1	.949**	.970**
RESA District HS Seniors	6	.949**	1	.989**
Georgia HS Seniors	6	.970**	.989**	1

Note: ** indicates Correlation is significant at the 0.01 level (2-tailed).

Sample

The study county is located south of Atlanta, Georgia. It is technically outside of the Atlanta metropolitan area with a commute time to downtown Atlanta of slightly more than one hour. A review of 2011 Census data was conducted to compare the study population to the county's population, the RESA district population of high school seniors, and the state's population of high school seniors. Census data revealed that 63.8% of the county's population categorized themselves as White, 33.2% responded that they were Black, .5% responded that they were American Indian or Alaska Native, 1.0% responded that they were Asian, and .1% categorized themselves as Native Hawaiian or Other Pacific Islander. The study county's population estimate for 2011 was 64,033, which represents a change of 9.6% since 2000. The home ownership rate in the study county is 64.6%, with the median household income of $41,100 in 2011. The percent of the population living below the poverty level is 21.2%.

Participants for this study graduated from the county's traditional high schools. A comparison of the student population to the county population is shown in Table 3. The sample mirrors the school system population and differs somewhat from the county population. The percentage of county citizens who reported their race as White was higher than the school system population and the percentage of county citizens who reported their race as Black was lower than the school system population. Other racial groups were similar across census data for the county, the school system, and the study participants.

Table 3

Comparison of Study County Population to School System Population and Study School System High School Seniors

Race	*Study County* (2011)*	*Study County Schools (2010-2011)*	*Study County HS Seniors (2010-2011)*
Asian	1%	1%	1%
Black	33.2%	45%	47%
Hispanic	4%	4%	1%
Mixed (two or more races)	1.5%	2%	1%
Native American/Alaska Native	.5%	0%	0%
Native Hawaiian/Other Pacific Islander	.1%	0%	0%
White	63.8%	48%	50%

*U.S. Census Bureau. (2011). County QuickFacts.

Of concern for this study was whether or not these data were significantly related. That is, are the percentages in the sample correlated with the percentages in the population? Using the data in Table 3, the calculations in Table 4 show that correlations range from .945 to .999, with $\alpha \leq .001$. Therefore, the components of the sample are significantly correlated with those of the population.

Table 4

Correlations Between the 2011 Study County, School System, and Study Sample

	N	*Study County*	*Study County Schools*	*Study County HS Seniors*
Study County	7	1	.947**	.945**
Study County Schools	7	.947**	1	.999**
Study County HS Seniors	7	.945**	.999**	1

Note: ** indicates Correlation is significant at the 0.01 level (2-tailed).

Convenience Sample. A convenience sample was used for this study due to sample availability and size. A convenience sample is acceptable and does not violate assumptions of a nonexperimental design (Johnson & Christensen, 2012; Kerlinger, 1986). The sample was defined as high school seniors from the county's two traditional high schools who participated in the Work Keys® assessment during the 2011 test administration. The study county school system piloted WorkKeys® in March 2010. Students were strongly encouraged to take the test, but not required to do so. Participants were selected from the 2011 test administration because testing procedures were established based on feedback from the previous year's test, and the test was required for all seniors.

Instrumentation

WorkKeys® applied mathematics, reading for information, and locating information assessments were the instruments used for this study. The three assessments used are formatted as selected-response multiple-choice items. They were developed after a review of the literature and surveying employers and educators from Iowa, Michigan, Ohio, Tennessee, Wisconsin, and a network of community colleges in California (ACT Inc., 2009). Once the skills were selected, skill scales were initially developed using the Guttman scaling technique, and later, Item Response Theory. Skill scales were developed to allow the hierarchical arrangement of skill attributes for each area. Guidelines for test development included ensuring that the generic skill being assessed was consistent with the way the skill is used in the workplace; the lowest level of skill required in the workplace is that which is assessed; the point that specialized training would be required is the highest level assessed; the steps in between represent meaningful differences in skills possessed; ensuring that the measures are reliable and valid; and are cost effective to develop and administer (McLarty & Vansickle, 1997).

WorkKeys® assessment scores are based on the number of correctly answered questions and the level score assessed in each question. Two types of scores are used with the assessments, level scores and scale scores. The purpose of level scores (3 – 7) is to aid in employee selection and promotion decisions; while scale scores may be used for pretest-posttest information and to provide consistent measures for federal program accountability requirements (ACT Inc., 2005). Scale scores range from 65 to 90 and were designed to show an individual's growth over time. WorkKeys® scale scores were developed using the equal standard error of measurement methodology developed by Kolen (1988) and transformed to stabilize error variance with the arcsine transformation described by Freeman and Tukey (1950). Scores may be ordered with respect to ability based on the number-correct; however, differences between numerical scores does not equate to equal intervals between abilities (ACT Inc., 2005).

WorkKeys® Applied Mathematics

In applied mathematics, examinees must set up and solve problems that occur in real-world work settings involving mathematical reasoning, critical thinking, and problem-solving skills. Thirty-three selected-response, multiple-choice items are included in this section. Pencil-paper administration of the test requires 45-minutes and computer administration requires 55-minutes. Table 5 (see Appendix) summarizes the level, scale score range, and skills examples for the applied mathematics test. Five skills levels ranging from three to seven are used to arrange skills from the basic level required for most workplaces to the most complex skills beyond which employers would expect job-specific training (ACT Inc., 2011d). Table 6 (see Appendix) provides examples of applied mathematics level three and seven items for comparison of skills assessed (ACT Inc., 2011d). Participant's raw score data was used as one of the criterion variables in this study.

WorkKeys® Reading for Information Section

Documents including letters, memos, policies, and regulations are used in reading for information to assess examinees reading skills and abilities to use written text in authentic work situations. Thirty-three selected-response, multiple-choice items are included in this section. Pencil-paper administration of the test requires 45-minutes and computer administration requires 55-minutes. Table 7 (see Appendix) summarizes the level, scale score range, and skills examples for the reading for information test. Five skills levels ranging from three to seven are used to arrange skills from basic to the most complex required for most jobs. Table 8 (see Appendix) provides examples of a reading for information level three item and level seven item for comparison of skills assessed (ACT Inc., 2011f). Participant's raw score data was used as one of the criterion variables in this study.

WorkKeys® Locating Information Section

Locating information uses graphs, charts, tables, etc. to assess an examinees skill level as they find, compare, summarize, and analyze information contained in work-related graphics. Thirty-eight selected-response, multiple-choice items are included in this section. Pencil-paper administration of the test requires 45-minutes and computer administration requires 55-minutes. Table 9 (see Appendix) summarizes the level, scale score range, and skills examples for the reading for information test. Four skills levels ranging from three to six are used to arrange skills from basic to the most complex. Table 10 (see Appendix) provides examples of a locating information level three item and level six item for comparison of skills assessed (ACT Inc., 2011e). Participant's raw score data was used as one of the criterion variables in this study.

Validity

Validity is the ability of an instrument to measure what it was intended to measure (i.e., accuracy) and it assumes reliability (Huck, 2008). An instrument must be reliable (consistent) in order to be valid (Gloekner et al., 2001). With regard to any test instrument, validity refers to the inferences made by researchers regarding the scores, not the validity of the test itself (Huck, 2008).

Construct-related Validity. Construct-validity is defined as the extent to which variables measures the construct they were designed to measure (Vogt & Johnson, 2011). ACT, Inc. supported construct-related validity for the Reading for Information test through comparison of scores on the ACT reading and English tests. Construct validity of the Reading for Information test was established using a sample of over 121,000 student scores each year from a Midwestern state in 2002 and 2003. Results indicated a moderate correlation between Reading for Information and ACT Reading at the .62 level and .66 when Reading for Information was compared to ACT English (ACT Inc., 2008). Similarly, ACT Mathematics test scores were compared to the applied mathematics assessment. Correlation coefficients indicated a strong relationship between ACT Mathematics and WorkKeys Applied Mathematics assessment (.71 and .81).

Criterion-related validity. Vogt and Johnson (2011) define criterion-related validity as the ability of a test to accurately predict some outside criterion. Criterion-related validity is generally established by comparing scores from a new test with scores on a relevant criterion variable (Huck, 2008). Criterion-related validity for the reading for information was established by administering WorkKeys® to current employees followed by supervisor's rating employees' job performance. The results were compared and correlations performed to determine the extent of the relationship between the variables. Results indicated a positive relationship between the variables with *r* ranging from a low of .12 to a high of .86. ACT, Inc. reported that correlations in the range of .20 to .30 are considered to be useful (ACT Inc., 2008). Criterion-related validity for the Applied Mathematics assessment was gathered through a study of the test scores and job performance ratings of existing employees. Correlations ranged from .23 to .41, which are consistent with the correlations needed to support criterion-related validity of .20 to .30. Correlations between Locating Information and Job Performance ratings were used to establish criterion-related validity with correlations ranging from .14 to .42. ACT, Inc. contends that although sample sizes are varied, because the correlations are positive and most are within the acceptable range, criterion-validity is supported (ACT Inc., 2008). Although ACT determined the correlation coefficients to be within an acceptable range, it is important to note that the research literature varies on its descriptions regarding the strength of the correlation between variables and no information was available regarding the statistical significance of the correlations. Correlation coefficients lower than .3 (whether positive or negative) are generally described as being very weak/low/small, moderate/medium between .35 to .70, and strong/large above .70 (Fraenkel & Wallen, 2009; Huck, 2008; Keppel & Wickens, 2004). Correlation coefficients in the range of .40 to .60 are not unusual in educational research and may have practical and/or theoretical significance (Fraenkel & Wallen, 2009).

Content-related Validity. Vogt and Johnson (2011) define content-related validity as the degree to which items in an instrument cover the material that is supposed to be measured. An analysis of WorkKeys® Job Profiling and the SkillMap Job Inventory was conducted to support content-related validity. Both instruments comply with federal guidelines for establishing content validity in high-stakes circumstances. Content-related validity of all three assessments, Reading for Information, Locating Information, and Applied Mathematics, was supported through the use of WorkKeys® Job Profiling and the SkillMap Job Inventory (ACT Inc., 2008).

Reliability

Reliability of research instruments is the ability to measure consistent performance over repeated administrations of a specific instrument and the instruments' ability to measure the constructs the research intends to measure (Gloekner, Gliner, Tochterman, & Morgan, 2001; Huck, 2008). Reliability coefficients range from zero to one with values close to one reflecting high reliability (Huck, 2008). Reliability for WorkKeys® was established using internal consistency and Kuder-Richardson (KR-20) scores were calculated for reading for information, applied mathematics, and locating information. Kuder-Richardson uses data from a single test administered to a single group of participants. It is considered an appropriate measure of reliability because it produces a result that is unaffected by the ordering of the test items (Huck, 2008). The KR-20 score for two forms of the reading for information assessment were .87 and

.90, both forms of applied mathematics yielded a .92, and three forms of locating information yielded .79, .83, and .79 (ACT Inc., 2008).

Average standard errors of measurement for scale scores were estimated for the variables reading for information, applied mathematics, and locating information using the three-parameter logistic item-response theory model (ACT Inc., 2008). Item-response theory (IRT) provides a researcher the ability to measure inconsistency in the number of correct scores on a test. It is appropriate for use with items of varying difficulty (Drasgow & Hulin, 1990). Scale score reliability estimates (based on IRT) for two forms of reading for information were .81 and .85; for two forms of applied mathematics were .91 and .89, and for three forms of locating information were .79, .79, and .82 (ACT Inc., 2008). The theoretical foundation for the selection of IRT was its' assumption of universality, or the concept that all test items work in concert to measure a test taker's skill mastery at any level of the test (McLarty & Vansickle, 1997). Reliability of the instrument for this study could not be replicated because raw vector data for each participant, needed to calculate Kuder-Richardson, was not available.

Potential issues affecting reliability may also include data collector characteristics and data collector bias (Fraenkel & Wallen, 2009). To minimize these risks, ACT, Inc. requires all test administrators be trained and tested in appropriate standardized testing procedures (ACT Inc., 2012b). Test administrators for the assessments included in this study were employees of an area technical college and school system certified employees who had been trained in accepted testing practices for the WorkKeys® assessment.

Study Variables

Study predictor variables included gender, race, pathway completed, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility. The criterion variables were applied mathematics, reading for information, and locating information. Gender and race have been used to describe participant demographic information in studies pertaining to academic achievement and work readiness (Barnes, 2002; Bottoms & Carpenter, 2003; Fleischman et al., 2010; Rampey et al., 2009). Socioeconomic status, student mobility, and attendance (absenteeism) have been studied to determine their influence on work readiness and academic achievement (Donnelly, 2010; Engec, 2006; Parke & Kanyongo, 2012).

Criterion variables were collected during a single test administration of the WorkKeys® assessment during February 2011. Tables 11 and 12 include the variable, classification, and coding information for the study variables. Because only 16 participants reported race as something other than White or Black, their data was removed from the study. Any significant findings would not be useful due to the small sample size compared to White or Black participants, and including their scores in a category such as non-white might skew results for Black students.

Table 11

Description of Predictor Variables Impacting Work Readiness of High School Seniors

Predictor Variable	Variable Type	Measurement	Measurement Scale
Gender	dichotomous	1=Female 2=Male	nominal
Race	dichotomous	1=White 2=Black	nominal
Pathway Completed	dichotomous	1=Non-completer 2=Completer	nominal
Socioeconomic status	dichotomous	1=Not Economically Disadvantaged 2=Economically Disadvantaged	nominal
Highest-level mathematics course	ordinal	1=Below Math 1 2=Math 1 3=Geometry 4=Math 2 5=Algebra II 6=Math 3 7=Algebra III 8=Adv. Algebra & Trigonometry or ACCEL Calculus 9=AP Calculus, AP Statistics, or Honors Analysis	ordinal
Absenteeism	ratio	Absenteeism (number of class periods absent from school during senior year)	scale
Student Mobility	ratio	Student Mobility (number of times student changed schools during high school after the initial enrollment)	scale

Table 12

Description of Criterion Variables Impacting Work Readiness of High School Seniors

Criterion Variable	Variable Type	Measurement	Measurement Scale
Applied mathematics	ratio	scale score 65-90	scale
Reading for information	ratio	scale score 65-90	scale
Locating information	ratio	scale score 65-90	scale
Composite *Y*	ratio	scale score 195-270	scale

Extraneous Variables. Extraneous variables, a potential problem in correlational research designs, are those not directly involved in the study but which cause changes in the variables being studied. The simplest way to control for the effects of extraneous variables is to randomly select the participant sample but that was not done in this study. Other methods of controlling for the effects of extraneous variables that were used in this study include holding variables constant through regression analysis in SPSS and building potentially related variables into the study design through a thorough examination of the literature (Fraenkel & Wallen, 2009). Gender, race, and socioeconomic status are found throughout educational research literature used as participant descriptor variables (Fleischman et al., 2010; Rampey, Dion, & Donohue, 2009). Highest-level mathematics course is used in the National Association of Education Progress study along with gender, race, and socioeconomic status in evaluating academic achievement (Rampey, Dion, & Donohue, 2009). The effects of mobility and nonattendance have been the subject of several studies (Donnelly, 2010; Engec 2006; Paik, 2002; Parke, 2012).

Procedure

Permission for the study was obtained from the study school system May 24, 2012, and from the doctoral committee on October 4, 2012. The Institutional Review Board (IRB) application was submitted to the Office of Human Subjects and approval was granted on October 22, 2012 (see Appendix A).

Seniors from the study county's high schools were administered all three sections of the ACT WorkKeys® test during the first two weeks of February, 2011 by employees from the area technical college and school system certified personnel. After being assigned to a testing area at each school, study participants were administered the three assessments in one-sitting following ACT, Inc.'s practices. All students present on testing day completed all portions of the test and no testing irregularities were reported.

Variables of interest used to explain relationships among students' test scores on applied mathematics, reading for information, and locating information were gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility. Selected characteristics were available via individual student records and were accessed by a school system employee for inclusion in the study database. WorkKeys'® scale scores were included in the official score report from ACT Inc. which was also available through the school system. Once the data was verified, unique student identification numbers were generated for each student. School system instructional technology personnel deleted any personally identifiable information from the data set to provide confidentiality of student information.

The school system archives are maintained on the systems' computer servers. These servers are linked to the Georgia Department of Education's computers for state reporting purposes. Protocols are in place to ensure that data are secure, accurate, and accessible only to authorized users (FERPA, 2011).

Cross-sectional Design. The study used a cross-sectional design, which involves collecting data from multiple participants at a single-point in time (Johnson & Christensen, 2012). One advantage of cross-sectional research is that data can be collected in a short period of time. Reduced time, expense, and absence of attrition are also advantages of cross-sectional research design (Ruspini, 2002). However, researchers must ensure that questions do not attempt to measure change over time (Johnson & Christensen, 2012). Cross-sectional design was appropriate for this study because the focus of this study was to examine the existence and strength of any relationships between work readiness scores from a single test administration date and gender, race, socioeconomic status, highest-level mathematics course, absenteeism, pathway completion, and student mobility.

Archival Data. This study used archival data from the study county's student information database. Archival/secondary data are collected by an original researcher and then used by other researchers seeking to answer different questions (Blaikie, 2003). Factors that should guide use of archival data include methodical collection of data, completeness of data archive, and accessibility (Whitlow, 2011). Use of archival data in research studies can result in both time and cost savings because the data may be more readily accessible. Hurdles to archival data use include data that may not be coded in a manner useful to secondary researchers and may require manipulation, data quality may be questionable, and data age may present problems (Blaikie, 2003; Whitlow, 2011).

Data Analysis

A variety of factors have been associated with work readiness or academic achievement in the literature (Barnes, 2002; Donnelly, 2010; Engec, 2006; Fleischman et al., 2010; Parke & Kanyongo, 2012). Relations among demographic characteristics and work-readiness indicators were examined in this study. Predictor variables included gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility. Criterion variables examined include students' scale scores for WorkKeys® applied mathematics, reading for information, and locating information (ACT Inc., 2011h). Table 13 illustrates the analysis strategy for the individual research objectives.

Table 13

Analysis Strategy

Research Objective	Predictor Variables	Criterion Variables	Statistical Procedures
1. Examine the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, student mobility and the work readiness characteristic "applied mathematics" of high school seniors.	Gender Race Pathway completion Socioeconomic status Highest-level mathematics course Absenteeism Student mobility	WorkKeys® applied mathematics	Multiple regression analysis
2. Examine the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, student mobility and the work readiness characteristic "reading for information" of high school seniors.	Gender Race Pathway completion Socioeconomic status Highest-level mathematics course Absenteeism Student mobility	WorkKeys® reading for information	Multiple regression analysis
3. Examine the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, student mobility and the work readiness characteristic "locating information" of high school seniors.	Gender Race Pathway completion Socioeconomic status Highest-level mathematics course Absenteeism Student mobility	WorkKeys® locating information	Multiple regression analysis

This study attempted to explain the variance in the WorkKeys® applied mathematics, reading for information, and locating information scale scores of high school seniors in one Middle Georgia school system. The research objectives sought to determine the significance of gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility in explaining participants scale scores on the WorkKeys® subtests.

There were a total of 498 seniors in study county for the 2010-2011 school year. Nineteen students were enrolled in the county's alternative school and were not included in this study. Three seniors were absent during the test administration and could not be included in the study. Sixteen students who reported their race as Mixed, Asian, or Hispanic were not included in the study. The small size of this group would prevent inferences about any potentially significant findings and might unintentionally skew results if included with Black students in a non-white category, leaving a population of 460 study participants. A review of appropriateness of the sample size was determined using guidelines from Green (1991). His guidelines include effect size and power in the calculation of sample size to guard against insufficient power when the sample size is too small or too much power when the sample size is too large. A medium-size relationship between the predictor variables and the criterion variable was assumed for this study, $\propto = .05$ and $\beta = .20$. Sample size was calculated using $N \geq 50 + 8m$ (where m is the number of predictor variables). Based on this guideline, a minimum sample size of 106 was indicated. Green (1991) also developed a more complex rule of thumb $N \geq \left(\frac{8}{f^2}\right) + (\mathrm{m} - 1)$ (where f^2 = .02, .15, and .35) for small, medium, and large effects. Using this guideline the sample size should be at least 362 for a medium-size relationship between the predictor and criterion variables. It is important that the sample size not be too large because as the number of cases becomes quite large almost any correlation will be significantly different from zero (Tabachnick, 2012). The data set was examined for any aberrant or missing data. The data set for this study was complete; no missing data points existed for any of the study participants.

Descriptive statistics such as frequencies, percentages, pie charts, and bar graphs are the most appropriate way to summarize nominal data (Moore, 2010). Descriptive statistics were run to facilitate data description and interpretation for the nominal variables and to provide some information regarding the study participants. They are reported with each research objective. The output was analyzed for any previously overlooked missing data points and an analysis conducted to determine if any potential outliers were in the data set.

Multiple Regression Analysis. Appropriate data analysis techniques for correlational research designs include multiple regression analysis. Multiple regression analysis is used when the purpose of the study is prediction or to determine how much of the variance in the criterion variable is explained by the independent variables and requires two or more continuous or categorical predictor variables and one continuous criterion variable (Huck, 2008; Lunt Research Ltd, 2013). Multiple regression is appropriate because this study sought to explain the significance of gender, race, pathway completion, socioeconomic status, highest-level mathematics courses, absenteeism, and student mobility in explaining WorkKeys® assessment scores. Assumptions necessary for MRA to be appropriate include (a) independence of errors (residuals), (b) linearity, (c) homoscedasticity of residuals (equal error variances) (d) absence of multicollinearity, (e) no significant outliers or influential points, and (f) errors (residuals) are normally distributed (C. J. Huberty & Petoskey, 1999; Keppel & Wickens, 2004; Lunt Research Ltd, 2013; Tabachnick & Fidell, 2013). Independence of errors was assessed using the Durbin-Watson statistic to determine if residuals were correlated. Durbin-Watson values range from 0 to

4, and a statistic near 2.0 indicates that residuals in a study are not correlated (Schwab, n.d.). Residual plots were used to check the assumptions of linearity and homoscedasticity. Correlation coefficients and tolerance values were used to assess multicollinearity. A search for outliers was conducted with SPSS version 20 using casewise diagnostics and studentized residuals and an inspection for influential points was conducted using leverage values and Cook's distance. Normality was assessed using a histogram, and P-P plot. Beta weights (coefficients of correlation) were calculated for significant models to show the percentage of variation that may be explained by the different predictor variables or their contribution to the overall model (Huck, 2008).

Significance levels (alpha levels) are used in statistical analysis procedures for hypothesis testing. The alpha level selected for a study represents the cutoff point researchers use to determine whether to retain or fail to retain the null hypothesis (Keppel & Wickens, 2004). A significance level alpha = .05 was selected to establish statistical significance because it is widely used in education, social, and behavior science research (Johnson & Christenson, 2012; Keppel & Wickens, 2004) and has been used in studies involving WorkKeys® (Hall, 2010; Hendrick, 2006; Wall, 2012).

CHAPTER 4

DATA ANALYSIS

Purpose of the Study

The purpose of this study was to examine relationships among several participant demographic attributes and work readiness of high school seniors from one Middle Georgia school system. Identified predictor variables were gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility. Criterion variables were scale scores for WorkKeys® applied mathematics, reading for information, and locating information. Findings for the following research objectives are discussed in this chapter:

The research objectives for this study were to:

1. Examine the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, student mobility and the work readiness characteristic “applied mathematics” of high school seniors.
2. Examine the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, student mobility and the work readiness characteristic “reading for information” of high school seniors.
3. Examine the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, student mobility and the work readiness characteristic “locating information” of high school seniors.

Background Information

Study participants were high school seniors from a Middle Georgia school system (2010-2011 school year) who took the applied mathematics, reading for information, and locating information sections of ACT's WorkKeys® assessment. Scale score information (criterion variables) for individual participants was obtained from the school system's copy of the WorkKeys® score report and predictor variables were obtained from school system instructional technology personnel by queries to the student data base system. Data was compiled in an Excel spreadsheet to be used for this study.

A total of 460 seniors representing a population of 498 seniors in the county participated in this study. Three students were absent on the test administration day and did not makeup the test. Nineteen students attended the county's alternative high school during the 2010-2011 school year and were not included in this study. Students at the alternative high school are there to work toward graduation but are behind their cohorts academically. Students enrolled in the alternative school were not included in this study. Sixteen students whose self-identified race was Mixed, Asian, or Hispanic were not included in this study. Creating a separate group for each was not practical because the sample size was very small compared to White and Black students. Additionally, if combined in a non-white category with Black students, their information would potentially skew Black student data. All data vectors were available for each study participant; there was no missing data so the usable sample was 460 participants. Tables 14 displays participant background information frequencies and percentages. Data for highest-level mathematics course included courses taught inside and outside of the study county or Georgia schools. School system personnel were consulted to provide a rank ordering of the mathematics courses so that it was possible to determine the highest-level mathematics course taken by each participant. A pathway (nonacademic program of study i.e., CTAE, Fine Arts, and World Languages) was considered to be complete if a student had successfully passed three full-years of a program of study. This variable was divided into the categories pathway completer and non-completer.

Table 14

Variables Categorized by Descriptor, Number, and Percentage of Participants

Variable	Descriptor	Number of Participants	Percentage of Participants
Gender	Female	269	59%
	Male	187	41%
Race	White	233	51%
	Black	223	49%
Pathway Completed	Non-completer	212	47%
	Completer	244	53%
Economically Disadvantaged Status	Free/reduced	264	58%
	Not free/reduced	192	42%
Highest Level Mathematics Course	Below Math 1	6	1.3%
	Math 1	1	.2%
	Geometry	24	5.3%
	Math 2	3	.7%
	Algebra II	75	16.4%
	Math 3	1	.2%
	Algebra III	210	46.1%
	Adv. Algebra, Trigonometry or ACCEL Calculus	57	12.5%
	AP Calculus, AP Statistics, or Honors Analysis	79	17.3%

Multiple regression analysis was performed on research objective four using SPSS version 20. A multiple regression analysis was conducted to determine which combination of the predictor variables best explained participant’s scores on the individual criterion variables. Multiple correlation coefficients (R^2) and adjusted R^2 as well as the standard error are reported for each model. Multiple correlation coefficients indicate the percentage of variance in the dependent variable explained by the predictor variables. Adjusted R^2 is also reported to explain the same concept, however R^2_{adj} is used because it accounts for the overestimate of the population R^2 based on the sample data. Larger samples tend to have smaller differences between reported R^2 and R^2_{adj} (Huck, 2008).

Results for Research Objective 1: Applied Mathematics

The first research objective was to examine the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, student mobility and the work readiness characteristic “applied mathematics” of high school seniors.

Multiple regression and correlation analyses were conducted to examine the relationship among the work readiness characteristic applied mathematics and the predictor variables. Tables 15 and 16 summarize the descriptive statistics and the correlation coefficient results. Socioeconomic status and highest-level mathematics course were positively and significantly correlated with applied mathematics. Students with higher socioeconomic status (coded as 1=economically disadvantaged and 2=not economically disadvantaged) tended to have higher applied mathematics scale scores. Highest-level mathematics course was an ordinal variable and students taking higher levels of mathematics courses tended to have higher applied mathematics scale scores. Race, absenteeism, and student mobility had significant negative correlations with applied mathematics scores. Correlation results for race (coded 1=White and 2=Black) indicated that Black students tended to have lower applied mathematics scores than White students, and applied mathematics scores tended to decrease as the number of absences and number of times a student changed schools during high school increased. Gender ($r =.036, p = .223$) and pathway completion ($r = .071, p = .064$) were not significantly correlated with applied mathematics.

Table 15

Means and Standard Deviations for Predictor Variables on Applied Mathematics

Variable	*N*	Mean	Standard Deviation
Applied Mathematics	456	77.09	4.385
Gender*	456	1.410	.492
Race*	456	1.489	.500
Pathway Completed*	456	1.535	.499
Economically disadvantaged	456	1.421	.494
Highest-level mathematics course	456	6.820	1.700
Absenteeism	456	63.290	51.90
Student Mobility	456	.340	.727

Note. Absenteeism is measured in the number of class periods a student missed during the year. Scale scores on all three assessments range from 65-90 and are converted to a level score to indicate examinees' skills as they related to profiled jobs.
*Means of these categorical variables are reported help illustrate the proportion of participants in the dichotomous categories; more female than male participants, more White than Black participants, and more pathway completers than non-completers.

Table 16

Variable Correlations for Applied Mathematics (AMSS)

	AMSS	G	R	PC	SES	HLM	A	SM
AMSS	1.000	.036	-.392**	.071	.292**	.521**	-.159**	-.210**
Gender		1.000	-.040	-.081*	.084*	-.069	-.117**	-.016
Race			1.000	.015	-.506**	-.222**	-.047	.134**
Path Comp				1.000	-.096*	.052	-.126**	-.060
SES					1.000	.284**	-.167**	-.204**
HLM						1.000	-.133**	-.171**
Absenteeism							1.000	.209**
Student Mobility								1.000

$^{**}p < 0.01, \text{two} - \text{tailed}, {}^{*}p < 0.05, \text{two} - \text{tailed}$
Note: SES represents socioeconomic status; HLM represents highest-level mathematics course

The full regression model for applied mathematics with all variables of interest is shown in Table 17. The regression model was statistically significant $[F(7{,}455) = 38.049, p = .000]$, adjusted $R^2 = .363$. The adjusted R^2 value of .363 indicates that the model explained more than one-third of the variability in participants' applied mathematics scores and is an index for overall accuracy should this be used in a prediction equation. The highest-level mathematics course was the only predictor variable in the model with significant positive regression weights indicating that students who took higher levels of mathematics courses tended to have higher scores on the applied mathematics test. Highest-level mathematics course contributed the largest portion (18.92%) of the explained variance in applied mathematics scores. Race and absenteeism were significantly negatively correlated with applied mathematics scores indicating that Black students tended to have lower applied mathematics scores than White students, and students with higher absences tended to have lower applied mathematics scores. Race contributed 8.59% and absenteeism contributed .81% of the explained variance in applied mathematics scores. Although socioeconomic status ($r = .292, p = .000$) and student mobility ($r = -.210, p = .000$) were significantly correlated with applied mathematics, they did not contribute significantly to the model.

Table 17

Full Regression Analysis for Applied Mathematics

Predictor	Coef	SE Coef	T	P	Beta	Beta Weight %
Constant	72.900	1.539	47.373	.000		
Gender	.416	.340	1.225	.221	.047	.22
Race	-2.568	.388	-6.615	.000	-.293	8.59
Pathway Completion	.352	.337	1.046	.296	.040	.16
Socioeconomic Status	-.093	.408	-.228	.820	-.010	.01
Highest-Level Mathematics	1.123	.103	10.890	.000	.435	18.92
Absenteeism	-.008	.003	-2.251	.025	-.090	.81
Student Mobility	-.459	.236	-1.942	.053	-.076	.58

Note. S=3.50. R-Sq=37.3%. R-Sq (adj)=36.3%. Coef=estimated slopes. SE Coef=standard deviation of the estimated intercept. The t-statistic and P-value is for testing the null hypothesis. The regression equation is:

Applied mathematics score = 72.900 +.416 Gender – 2.568 Race + .352 Pathway Completion - .093 Socioeconomic Status + 1.123 Highest Level Mathematics Course - .008 Absenteeism - .459 Student Mobility

Analysis of Variance

Source	Sum of Squares	DF	Mean Square	F	Sig.
Regression	3261.412	7	465.916	38.049	.000
Residual error	5485.902	448	12.245		
Total	8747.314	455			

Note. DF=degrees of freedom. F=SS/DF.

Assumptions necessary for multiple regressions were tested with the following results. Independence of observations indicates no correlation between the residuals. There is independence of observations, as assessed by a Durbin-Watson statistic of 1.963. A review of residual plots, shown in Figure 1, supported the assumption of linearity and homoscedasticity. No issues were found with multicollinearity as assessed using correlation coefficients (no $r > .7$) and tolerance (value < .1). The correlations for the applied mathematics regression model are shown in Table 16. A search for outliers was conducted with SPSS version 20 using casewise diagnostics and studentized residuals and an inspection for influential points was conducted using leverage values and Cook's distance. A review of the data for outliers identified four cases with influential values (residuals ≥ ±3). Outlier cases were found to have scale scores that equaled or approached the maximum or minimum scale scores, or had extremely high number of absences. Because the data set was sufficiently large, the four cases were removed from the data set and the regression rerun. Normality was assessed using a P-P plot of regression standardized residuals (shown in Figure 2). The assumption of normality was not violated.

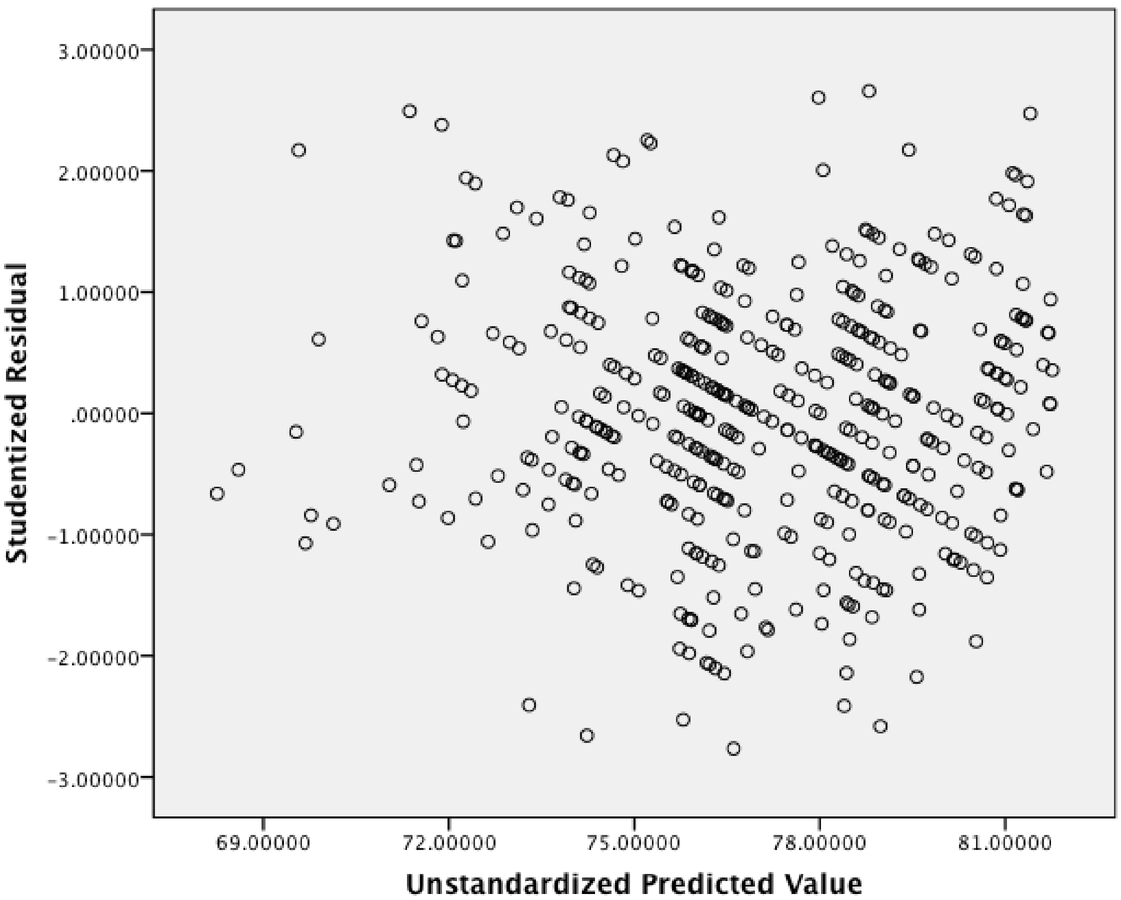

Figure 1. Residual Plot for Applied Mathematics Regression Model

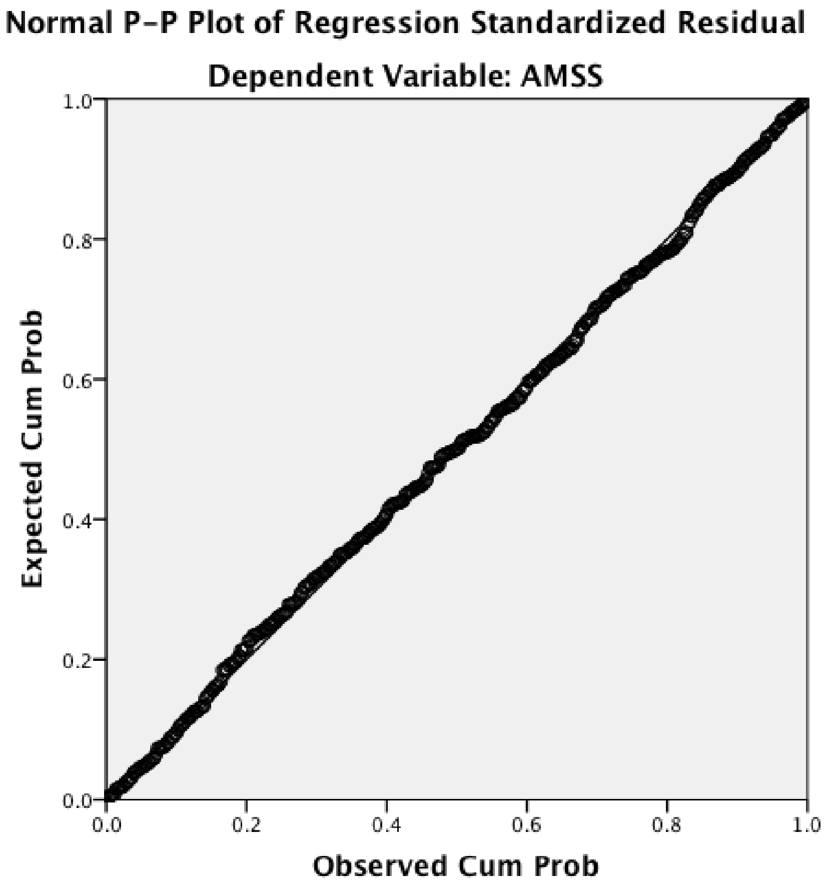

Figure 2. Normality Plot for Applied Mathematics

Results for Research Objective 2: Reading for Information

The second research objective was to examine the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, student mobility and the work readiness characteristic "reading for information" of high school seniors.

Multiple regression and correlation analysis were conducted to examine the relationship among the work readiness characteristic reading for information and gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility. Tables 18 and 19 summarize the descriptive statistics and the correlation coefficient results. All of the predictor variables were significantly correlated with reading for information (see Table 19). Gender, race, absenteeism, and student mobility were significantly negatively correlated with reading for information, while pathway completion, socioeconomic status, and highest-level mathematics course were significantly positively correlated with the criterion variable. Males (coded as gender=2) tended to have lower reading for information scores than females (coded as gender=1), and Black students (coded as race = 2) tended to have lower scores than White students (coded as race=1). As absenteeism and student mobility increased, students reading for information scale scores tended to decrease. Students who completed a pathway (coded as 1=non-completer and 2=completer), had higher socioeconomic status (coded as 1=economically disadvantaged and 2=not economically disadvantaged), and took higher-level mathematics courses tended to have higher reading for information scale scores.

Table 18

Means and Standard Deviations for Predictor Variables on Reading for Information

Variable	*N*	Mean	Standard Deviation
Reading for Information	456	78.3422	3.1971
Gender*	456	1.4000	.4904
Race*	456	1.4911	.5005
Pathway Completed*	456	1.5333	.4994
Economically disadvantaged	456	1.4200	.4941
Highest-level mathematics course	456	6.8200	1.7005
Absenteeism	456	63.2511	52.1191
Student Mobility	456	.3400	.7296

Note. Absenteeism is measured in the number of class periods a student missed during the year. Scale scores on all three assessments range from 65-90 and are converted to a level score to indicate examinees' skills as they related to profiled jobs.
*Means of these categorical variables are reported help illustrate the proportion of participants in the dichotomous categories. More female than male participants, more White than Black participants, and more pathway completers than non-completers.

Table 19

Variable Correlations for Reading for Information (RFISS)

	RFISS	G	R	PC	SES	HLM	A	SM
RFISS	1.000	-.130**	-.367**	.082*	.322**	.527**	-.106*	-.153**
Gender		1.000	-.031	-.082*	.086*	-.071	-.124**	-.014
Race			1.000	.010	-.503**	-.226**	-.040	.133**
Path Comp				1.000	-.079*	.056	-.124**	-.065
SES					1.000	.284**	-.176**	-.199**
HLM						1.000	-.132**	-.166**
Absenteeism							1.000	.210**
Student Mobility								1.000

$**p < 0.01, \text{two} - \text{tailed}, *p < 0.05, \text{two} - \text{tailed}$

Note: SES represents socioeconomic status; HLM represents highest-level mathematics course

The full regression model for reading for information with all variables of interest is shown in Table 20. The regression model was statistically significant $[F(7{,}449) = 36.483, p = .000]$, adjusted $R^2 = .356$. The adjusted R^2 value of .356 indicates that the model explained more than a third of the variability in participants' applied mathematics scores. Highest-level mathematics contributed the largest portion (18.49%) of the explained variance in reading for information scores, race (5.29%) was the next highest contributor, and gender explained 1.35% of the score variance. Although pathway completion $(r = .082, p = .041)$, socioeconomic status $(r = .322, p = .000)$, absenteeism $(r = -.106, p = .012)$, and student mobility $(r = -.153, p = .001)$ were significantly correlated with reading for information, they did not contribute significantly to the model.

Table 20

Full Regression Analysis for Reading for Information

Predictor	Coef	SE Coef	T	P	Beta	Beta Weight %
Constant	75.004	1.127	66.529	.000		
Gender	-.756	.252	-3.002	.003	-.116	1.35
Race	-1.468	.286	-5.135	.000	-.230	5.29
Pathway Completion	.324	.248	1.308	.192	.051	.26
Socioeconomic Status	.555	.300	1.850	.065	.086	.74
Highest-Level Mathematics	.808	.076	10.647	.000	.430	18.49
Absenteeism	-.003	.002	-1.146	.252	-.046	.21
Student Mobility	-.099	.174	-.570	.569	-.023	.05

Note. S=2.56. R-Sq=36.6%. R-Sq (adj)=35.6%. Coef=estimated slopes. SE Coef=standard deviation of the estimated intercept. The t-statistic and P-value is for testing the null hypothesis. The regression equation is:

Reading for information score = 75.004 - .756 Gender – 1.468 Race + .324 Pathway Completion + .555 Socioeconomic Status + .808 Highest Level Mathematics Course - .003 Absenteeism - .099 Student Mobility

Analysis of Variance

Source	Sum of Squares	DF	Mean Square	F	Sig.
Regression	1680.589	7	240.084	36.483	.000
Residual error	2908.709	442	6.581		
Total	4589.298	449			

Note. DF=degrees of freedom. F=SS/DF.

Assumptions necessary for multiple regressions were tested with the following results. Independence of observations indicates no correlation between the residuals. There is independence of observations, as assessed by a Durbin-Watson statistic of 2.117. A review of residual plots, shown in Figure 3, supported the assumption of linearity and homoscedasticity. No issues were found with multicollinearity as assessed using correlation coefficients (no $r > .7$) and tolerance (value < .1). The correlations for the reading for information regression model are shown in Table 19. A search for outliers was conducted with SPSS version 20 using casewise diagnostics and studentized residuals and an inspection for influential points was conducted using leverage values and Cook’s distance. A review of the data for outliers identified 10 cases with influential values (residuals ≥ ±3). Outlier cases were found to have scale scores that equaled or approached the maximum or minimum scale scores, or had extremely high number of absences. Because the data set was sufficiently large, the cases were removed from the data set and the regression rerun. Normality was assessed using a P-P plot of regression standardized residuals (shown in Figure 4). The assumption of normality was not violated.

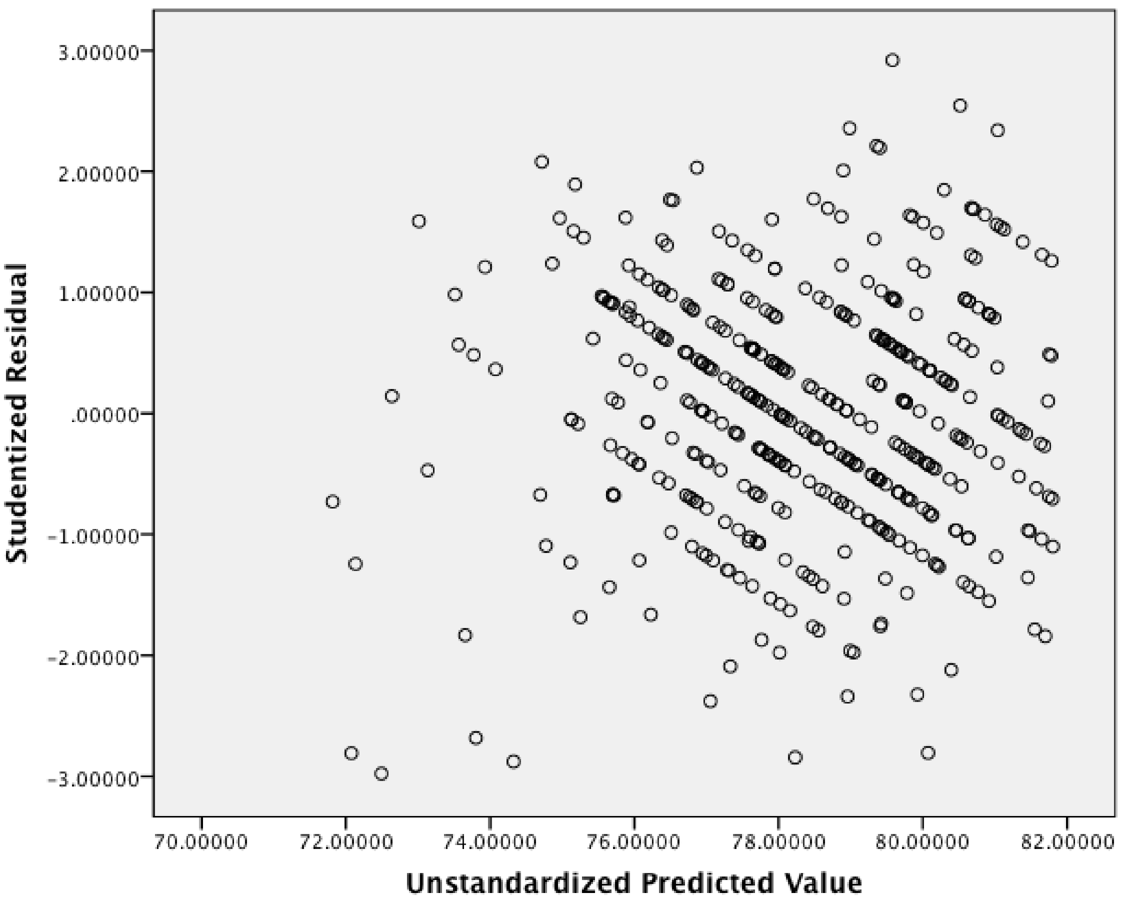

Figure 3. Residual Plot for Reading for Information Regression Model

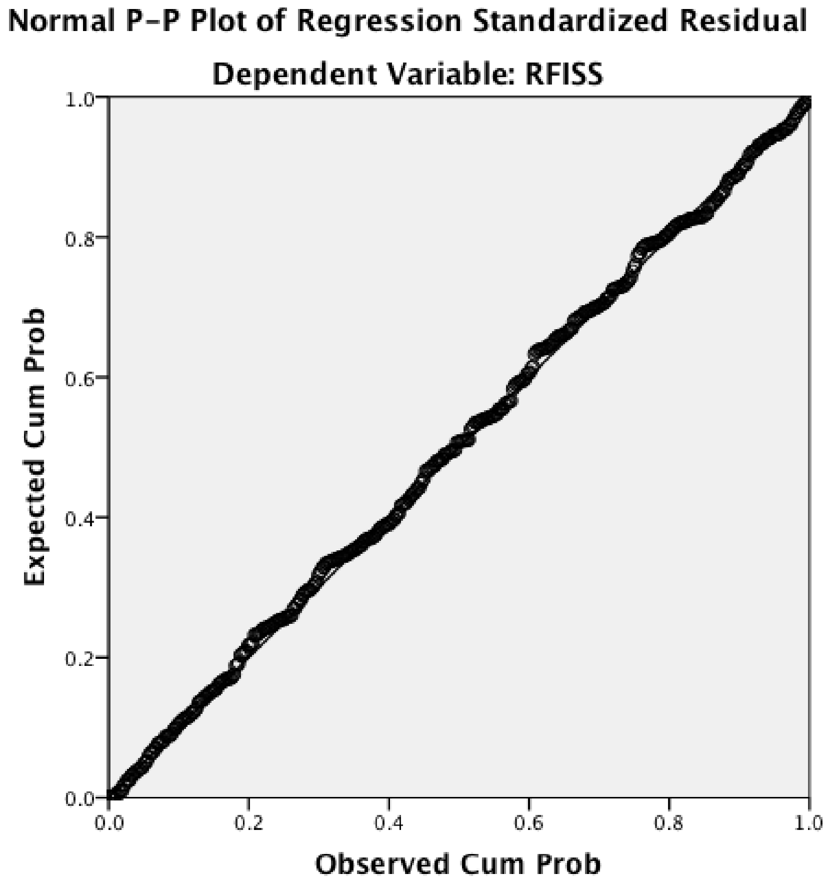

Figure 4. Normality Plot for Reading for Information

Results for Research Objective 3: Locating Information

The third research objective was to examine the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, student mobility and the work readiness characteristic "locating information" of high school seniors.

Multiple regression and correlation analyses were conducted to examine the relationship among the work readiness characteristic locating information and the predictor variables (gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility). Tables 21 and 22 summarize the descriptive statistics and the correlation coefficient results. All seven predictor variables were significantly correlated with applied mathematics (see Table 22). Gender (coded 1=female and 2=male), race (coded 1=White and 2=Black), absenteeism, and student mobility were significantly negatively correlated with locating information scores. Males tended to have lower locating information scale scores than females and Black students tended to have lower scores than White students. Students with higher levels of absenteeism and student mobility also tended to have lower locating information scale scores. Pathway completion, socioeconomic status, and highest-level mathematics course were significantly positively correlated with the criterion variable. Students who were pathway completers tended to earn higher locating information scores than non-completers, and students with higher socioeconomic status and higher-levels of mathematics courses also tended to have higher scale scores on the criterion variable.

Table 21

Means and Standard Deviations for Predictor Variables on Locating Information

Variable	*N*	Mean	Standard Deviation
Locating Information	448	76.7165	2.7914
Gender*	448	1.4107	.4925
Race*	448	1.4821	.5002
Pathway Completed*	448	1.5290	.4997
Economically disadvantaged	448	1.4263	.4951
Highest-level mathematics course	448	6.8460	1.6832
Absenteeism	448	64.6250	55.6299
Student Mobility	448	.3393	.7303

Note. Absenteeism is measured in the number of class periods a student missed during the year. Scale scores on all three assessments range from 65-90 and are converted to a level score to indicate examinees' skills as they related to profiled jobs.

*Means of these categorical variables are reported help illustrate the proportion of participants in the dichotomous categories. More female than male participants, more White than Black participants, and more pathway completers than non-completers.

Table 22

Variable Correlations for Locating Information (LISS)

	LISS	G	R	PC	SES	HLM	A	SM
LISS	1.000	-.117**	-.338**	.106*	.259**	.473**	-.102*	-.214**
Gender		1.000	-.061	-.085*	.088*	-.069	-.082*	.016
Race			1.000	.016	-.507**	-.222**	-.049	.102*
Path Comp				1.000	-.091*	.060	-.142**	-.101*
SES					1.000	.275**	-.136**	-.166**
HLM						1.000	-.118**	-.152**
Absenteeism							1.000	.344**
Student Mobility								1.000

$^{**}p < 0.01, \text{two} - \text{tailed}, {}^{*}p < 0.05, \text{two} - \text{tailed}$

Note: SES represents socioeconomic status; HLM represents highest-level mathematics course

The full regression model for locating information with all variables of interest is shown in Table 23. The regression model was statistically significant $[F(7,447) = 28.594, p = .000]$, adjusted $R^2 = .302$. The adjusted R^2 value of .302 indicates the model explained almost one-third of the variability in participants' applied mathematics scores. Highest-level mathematics contributed the largest portion (14.59%) of the explained variance in locating information scores, race explained 5.57%, student mobility explained 1.21%, and gender explained 1.04% of the score variance. Although pathway completion $(r = .106, p = .012)$, socioeconomic status $(r =.259, p = .000)$, and absenteeism $(r = -.102, p = .016)$ were significantly correlated with locating information, they did not contribute significantly to the model.

Table 23

Full Regression Analysis for Locating Information

Predictor	Coef	SE Coef	T	P	Beta	Beta Weight %
Constant	74.58	1.022	72.990	.000		
Gender	-.578	.228	-2.536	.012	-.102	1.04
Race	-1.316	.261	-5.040	.000	-.236	5.57
Pathway Completion	.369	.227	1.630	.104	.066	.44
Socioeconomic Status	.158	.271	.582	.561	.028	.08
Highest-Level Mathematics	.634	.070	9.106	.000	.382	14.59
Absenteeism	-.001	.002	-.593	.554	-.026	.07
Student Mobility	-.420	.164	-2.566	.011	-.110	1.21

Note. S=2.33. R-Sq=31.3%. R-Sq (adj)=30.2%. Coef=estimated slopes. SE Coef=standard deviation of the estimated intercept. The t-statistic and P-value is for testing the null hypothesis. The regression equation is:
Locating information score = 74.58 - .578 Gender – 1.316 Race + .369 Pathway Completion + .158 Socioeconomic Status + .634 Highest Level Mathematics Course - .001 Absenteeism - .420 Student Mobility

Analysis of Variance

Source	Sum of Squares	DF	Mean Square	F	Sig.
Regression	1089.027	7	155.575	28.594	.000
Residual error	2393.971	440	5.441		
Total	3482.998	447			

Note. DF=degrees of freedom. F=SS/DF.

Assumptions necessary for multiple regressions were tested with the following results. Independence of observations indicates no correlation between the residuals. There is independence of observations, as assessed by a Durbin-Watson statistic of 1.782. A review of residual plots, shown in Figure 5, supported the assumption of linearity and homoscedasticity. No issues were found with multicollinearity as assessed using correlation coefficients (no $r > .7$) and tolerance (value < .1). The correlations for the reading for information regression model are shown in Table 21. A search for outliers was conducted with SPSS version 20 using casewise diagnostics and studentized residuals and an inspection for influential points was conducted using leverage values and Cook's distance. A review of the data for outliers identified 12 cases with influential values (residuals ≥ ±3). Outlier cases were found to have scale scores that equaled or approached the maximum or minimum scale scores, or had extremely high number of absences. Because the data set was sufficiently large, the cases were removed from the data set and the regression rerun. Normality was assessed using a P-P plot of regression standardized residuals (shown in Figure 4). The assumption of normality was not violated.

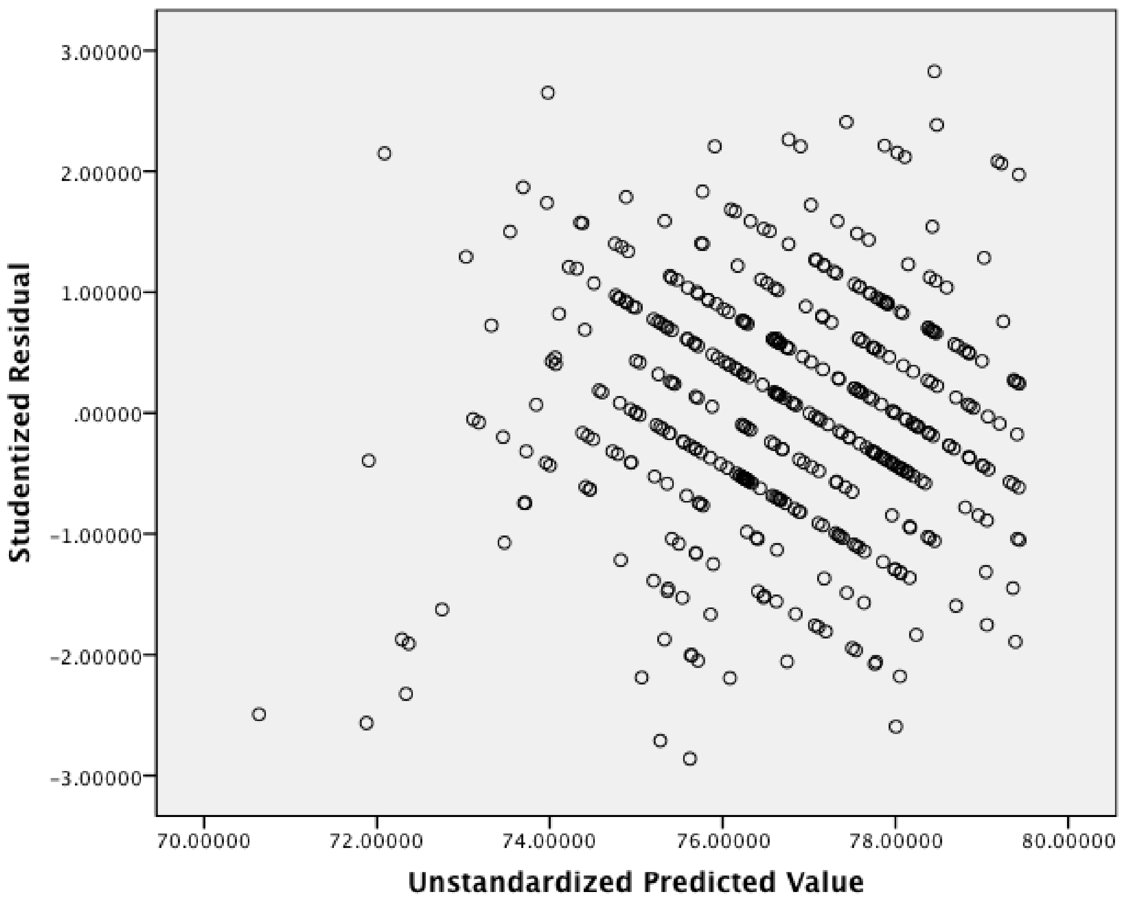

Figure 5. Residual Plot for Locating Information Regression Model

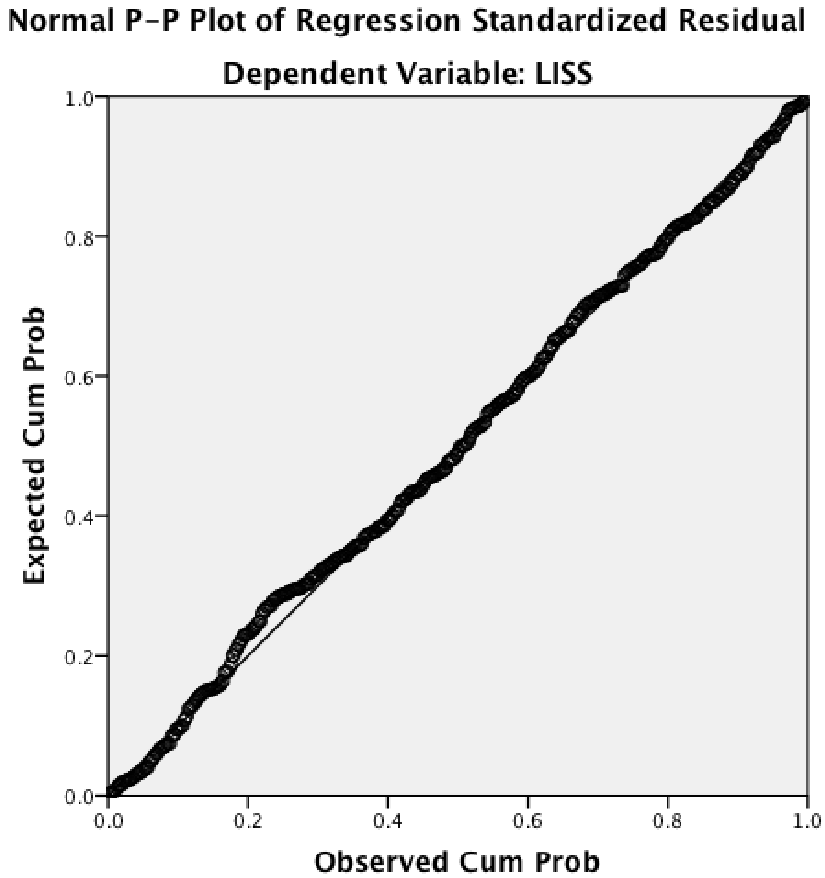

Figure 6. Normality Plot for Locating Information

Summary

Regressions for all three models were significant with each model explaining approximately one-third of the variance in the criterion variable scale scores. Race and highest-level mathematics course were significant in all three models. Gender was significant in explaining variance in the criterion variable in two models (reading for information and locating information), absenteeism was significant in the applied mathematics model, and student mobility was significant in the locating information model.

CHAPTER 5

DISCUSSION

Purpose of the Study

The purpose of this correlational study was to examine relationships among participants' personal characteristics and work readiness of high school seniors from one Middle Georgia school system. The study sample comprised 460 high school seniors from a Middle Georgia school system who had taken the WorkKeys® applied mathematics, reading for information, and locating information assessments in early February, 2011. The criterion variables were selected based on their use in the Georgia WorkReady program between 2009 to 2011 and were used to determine whether an examinee's skills were sufficient to be considered work ready (earn a National Career Readiness Certificate issued by ACT). The criterion variables were the applied mathematics, reading for information, and locating information sections of ACT's WorkKeys® assessment. Predictor variables used in this study are found in other work related to academic achievement and work readiness. Gender and race are frequently used to describe participant demographic attributes (Barnes, 2002; Bottoms & Carpenter, 2003; Rampey et al., 2009; Stone, 2007; Wilcher, 2005), and socioeconomic status, highest-level mathematics course, student mobility, and attendance have been included in several studies related to academic achievement (Donnelly, 2010; Engec, 2006; Paik & Phillips, 2002; Rampey et al., 2009; Sugiarti, 2008). Pathway completion has been used recently to compare demographic characteristics and academic achievement and work readiness of pathway completers versus non-completers, students enrolled in career academies versus comprehensive high school CTAE programs, and diploma endorsements (college prep versus CTAE), (Hall, 2010; Parker, 2010; Sugiarti, 2008). The predictor variables in this study (gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility) were contained in the school system's student information system database and were accessed with permission from the school system. School system employees constructed the study database to preserve participant anonymity. Study findings may contribute to an improved understanding of the factors affecting the work readiness of high school students that could guide intervention strategies designed to improve student achievement outcomes. The research objectives for this study were to:

1. Examine the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, student mobility and the work readiness characteristic "applied mathematics" of high school seniors.
2. Examine the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, student mobility and the work readiness characteristic "reading for information" of high school seniors.
3. Examine the relationship between gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, student mobility and the work readiness characteristic "locating information" of high school seniors.

Research Summary

The relationship between participants' gender, race, pathway completion, socioeconomic status, highest-level mathematics course, attendance, and study mobility and their work readiness (quantified using applied mathematics, reading for information, and locating information scale scores) was examined in this correlational study. Work readiness was defined as those academic, technical, and employability skills that provided opportunity for advancement and family-sustaining wages (Association for Career and Technical Education, 2010).

Study data were collected from the study school system's student information database and the system's WorkKeys® score report. The sample included 460 high school seniors enrolled in the study school systems' traditional high schools during the 2010-2011 school year. A convenience sample was used due to ease of access to the study variables. Representativeness with other schools in the Regional Education Service Agency and other high school seniors in the state of Georgia was established and reported in Chapter 3. Appropriate sample size was determined using a comparison between the available convenience sample, the number of study variables, and Green's (1991) minimum sample size rule of thumb. Based on Green's (1991) guidelines for estimating sample size, an appropriate minimum sample size for this study was 362 participants to detect a medium-size relationship between the predictor and criterion variables (medium effect size of .30, α = .05, and power of .80). Complete data was available for 460 participants.

Permission for the study was obtained from the study school system May 24, 2012, and from the doctoral committee on October 4, 2012. The Institutional Review Board (IRB) application was submitted to the Office of Human Subjects and approval was granted on October 22, 2012 (see Appendix A). Data collection took place during the first two weeks of November, 2012 through queries to the student information system database and an examination of the WorkKeys® score reports. The criterion variable, work readiness, was collected using the official score report from ACT, Inc. that was available through the school system. Reliability of the

WorkKeys® assessments could not be established for this study because participants' raw vector data were unavailable.

Seniors from the study county's high schools were administered all three sections of the ACT WorkKeys® test using pencil-paper administration during the first two weeks of February, 2011 by employees from the area technical college and school system certified personnel. The applied mathematics and reading for information subtests contain thirty-three selected-response, multiple-choice items. The locating information subtest contains thirty-eight selected-response, multiple-choice items. Each assessment required a 45-minute test administration time frame. Study participants were administered the three assessments during one day and students present on testing day completed all portions of the test with no testing irregularities reported.

Multiple regression and correlational analyses were used to explain the relationships between the predictor and criterion variables. Multiple regression and correlation analyses are appropriate because this study sought to explain the significance of gender, race, pathway completion, socioeconomic status, highest-level mathematics courses, absenteeism, and student mobility in explaining WorkKeys® assessment scores.

Results

This study's first research objective sought to explain the relationship between participant's gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility and their scale score on the applied mathematics assessment. Multiple regression and correlational analyses were used to determine relationships among the predictor and criterion variables. Race, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility had significant relationships at the .01 level (2-tailed test) with participants' applied mathematics scale score. Participants who were

Black tended to have lower applied mathematics scale scores (*R* = -.392) than White students. Participants with higher socioeconomic status (not economically disadvantaged) had higher applied mathematics scores (*R* = .292) than students who were economically disadvantaged. Participants taking higher-levels of mathematics courses had higher applied mathematics scores (*R* = .521) than students taking lower-level mathematics courses. Participants with higher absenteeism rates had lower applied mathematics scores (*R* = -.159) than students with lower absenteeism rates. Participants with higher numbers of moves during high school had lower applied mathematics scores (*R* = -.210) than students with lower numbers of moves during high school. An examination of the regression model for applied mathematics revealed a statistically significant model that explained just over 36% of the variance in participants' applied mathematics scores. Highest-level mathematics course (18.92%), race (8.59%), and absenteeism (.81%) were the only significant contributors to the model.

The second research objective sought to explain the relationship between participants' gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility and their reading for information scale score. Multiple regression and correlational analyses were used to determine relationships among the predictor and criterion variables. Pathway completion and absenteeism had significant relationships with reading for information scale scores at the $p = .05$ level (2-tailed test), and the remaining variables were significant at the $p = .01$ level (2-tailed test). A negative relationship was found between gender, race, absenteeism, and student mobility, and reading for information scale scores. Male participants scored lower than females (*R* = -.130), Black participants scored lower than White participants (*R* = -.367), and students with higher numbers of absences (*R* = -.106) and moves during high school (*R* = -.153) scored lower than those with fewer absences and numbers of moves. Being a pathway completer (*R* = .082), having higher socioeconomic status (*R* = .322), and taking higher-level mathematics courses (*R* = .527) was related to students having higher reading for information scale scores. The reading for information regression model was significant, explaining 35.6% of the variance in participants' scale scores. Gender (1.35%), race (5.29%), and highest-level mathematics course (18.49%) were the only significant contributors to the reading for information model.

Research objective three sought to explain the relationship between participants' gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility, and their locating information scale scores. Multiple regression and correlational analyses were used to determine relationships among the predictor and criterion variables. All predictor variables had significant relationships with participants' locating information scale scores. As with reading for information, pathway completion and absenteeism were significant at the $p = .05$ level (2-tailed tests), and the remaining predictor variables were significant at the $p = .01$ level (2-tailed tests). Gender (*R* = -.117), race (*R* = -.338), absenteeism (*R* = -.102), and student mobility (*R* = -.214) were negatively correlated with locating information scale scores. Participants who were male scored lower than females, Black participants scored lower than White participants, and students with higher absences and number of moves during high school scored lower than those with fewer absences and number of moves. Pathway completers had higher locating information scale scores than non-completers (*R* = .106), students with higher socioeconomic status scored higher than those with lower socioeconomic status (*R* = .259), and students who took higher-level mathematics courses scored higher than students taking lower-level mathematics courses (*R* = .473). The locating information regression model was significant at the $p = .01$ level and explained 30% of the variance in participants' scale scores. Gender (1.04%), race (5.57%), highest-level mathematics course (14.59%), and student mobility (1.21%) were the only significant contributors to the locating for information model.

Race and socioeconomic status has a significant moderate negative correlation for all three criterion variables (applied mathematics R = -.506; reading for information R = -.503; and locating information R = -.507). Additionally, highest-level mathematics course and race were significantly correlated for all three criterion variables (applied mathematics R = .284; reading for information R = .284; and locating information R = .275). Even though the correlation values were just under the .3 cutoff for a weak relationship, it appears that a positive relationship exists between race and participants who take higher-level mathematics courses.

Discussion and Implications

Gender

Some studies have found a significant relationship between gender and participants' applied mathematics scores while others have not. This study supports previous findings that gender was not significant in the explanation of participants' applied mathematics scores (Barnes, 2002). However, it contradicts the findings of other studies indicating male participants had higher applied mathematics scores than female participants (Stone, 2007; Foote, 1997; and Belton, 2000). This study's finding that female participants had higher reading for information scores than male participants is consistent with Stone (2007), but contradicts the findings of Foote (1997), Barnes (2002), and Belton (2000) who found no significant differences between the scores of male and female participants. This study found significant differences between the locating information scores of female and male participants (females scored higher than males) which is not supported by previous studies examined for this report (Stone, 2007; Foote, 1997; Barnes, 2002, and Belton, 2000).

In this study, knowing a participants' gender did serve to explain, in a small way, their scale score on the reading for information and locating information assessments; it did not, however, contribute to an understanding of their applied mathematics scale score. Effect sizes were calculated for the significant criterion variables using Cohen's *d*, to determine if the results had any practical significance; they assess the likelihood that the obtained value is beyond that obtained by chance (Huck, 2008). The results of this study indicate that female students score higher than male students on the reading for information and locating information assessments. The difference between female and male reading for information scores was a small effect with practical significance (d = .2594) but the difference between locating information scores (d = .1930) while statistically significant did not rise to the level generally accepted for practical significance.

Race

A review of studies involving both work readiness and academic achievement for this study found significant differences between race and participants' achievement scores. This study supports previous findings that Black participants' tend to have lower achievement scores than White participants whether the assessment is achievement related (NAEP) or WorkKeys® (Barnes, 2002; Bottoms & Carpenter, 2000; Foote, 1997; Stone, 2007). Contrary to this study's findings, Foote (1997) did not find significant differences between the scores of Black and White participants on the locating information assessment.

Knowing a participants' race had both statistical and practical significant in terms of explaining their variance on scale scores for applied mathematics, reading for information, and locating information. Effect sizes were calculated for all three criterion variables and there was at least a 70% better than chance value that the variance derived explains the relationship between race and applied mathematics (d = .8511), reading for information (d = .7875), and locating information (d = .7004) indicating a large effect size.

It is interesting to note that although the racial balance of the student population is almost 50/50 in this school system, 97 White students continued on to the highest-level mathematics courses offered to high school students in this school system, while only 37 black students enrolled in the same courses. Increasing enrollment of Black students in the highest-level mathematics courses may improve their academic outcomes but students must have success in the lower level mathematics courses to benefit from the placement. It may be necessary to increase supports and remediation at elementary and middle school levels so that students are better prepared for higher levels of mathematics before they reach high school.

Pathway Completion

Only three other studies were found that examined the relationship of pathway on students work readiness scores (Hall, 2010; Parker, 2011; Sugiarti, 2008). Hall (2010) examined the effects of participants' enrollment in either a CTAE program within a comprehensive high school or a career academy on their work readiness, and Parker (2011) examined the effect of participants' program of study (CTAE versus college preparatory) on their work readiness. Sugiari's (2010) study was only descriptive in nature and did not examine relationships between variables. This study examined pathway differently. The state Department of Education identifies a variety of pathways, not just CTAE, so the pathway identified by the state that are offered in this school system were included in the study. Ultimately the decision was made to quantify pathway completion as completers and non-completers because of the large number of participants who did not complete any of the identified pathways available in the study school system. In this study, knowing a students' status as a pathway completer or non-completer did not serve to explain the variance on their applied mathematics, reading for information, or locating information scale scores.

Socioeconomic status

Numerous studies have concluded over the years that students' from lower socioeconomic status backgrounds tend to have lower academic achievement and WorkKeys® scores (Bottoms & Carpenter, 2000; Donnelly, 2010; Rampey, 2009; Siris, 2005). However, this study supported Foote's (1997) findings that socioeconomic status was not related to WorkKeys® assessment scores. Socioeconomic status and participants' scores on all three WorkKeys® assessments had significant positive correlations, however socioeconomic status was not a significant contributor in explaining score variance in any of the three models. In this study, knowing a participants' socioeconomic status did not significantly explain score variances on any of the WorkKeys® assessments. A note of caution here is that the data set in this study only measured socioeconomic status as either low or high (coded as 1 and 2 respectively). Had this data set been enriched with actual measures such as actual family income and educational attainment levels, other than proxy data such as free and reduced price lunch, the SES variable might have shown a much different effect.

Highest-level Mathematics Course

Highest-level mathematics course taken by high school students is a variable used by the federal Department of Education in the National Assessment of Education Progress (NAEP) test administered biennially in schools across the United States. Students taking higher levels of high school mathematics courses generally have higher mathematics achievement scores (Bottoms &

Carpenter, 2000; Rampey, 2009). This study supports the previous findings that students taking higher-level high school mathematics courses have higher mathematics achievement scores. Of interest, was the significant and unexpected relationship found between highest-level mathematics course and students' scores on the reading for information and locating information assessments. It would seem that knowledge and practices learned in high school mathematics courses contribute to the processing and problem-solving skills needed to score well on this type of test. Reading and graphical interpretation skills are necessary in high-school level mathematics courses and these skills are also measured in WorkKeys®. It appears from the results of this study that it will be increasingly important for high school students to take higher levels of mathematics courses because they seem to significantly contribute to students' skills across all areas of the WorkKeys® assessments.

Absenteeism & Student Mobility

Absenteeism and student mobility have been found to be problematic with high school students in several studies (Donnelly, 2010; Hinz et al., 2003; Parke & Kanyongo, 2012; Wilcher (2005). Higher levels of absenteeism and mobility have negative effects on students' reading and mathematics achievement scores. Results from this study supported the significant negative relationship between absenteeism and student mobility and a participants' achievement (measured in this study by applied mathematics, reading for information, and locating information scale scores). However, a review of the three regression models found that only absenteeism contributed significantly to the applied mathematics model, neither contributed at a significant level to the reading for information model, and only mobility contributed significantly to the locating information model. A review of the beta weights show that the influence of these variables in the explanation of variance in students' scores is barely existent. Mean absences for students ranged from 63.25 (reading for information) to 64.63 (locating information). The highest number of absences during high school in the study sample was 369 class periods absent (equates to 61.5 days of school missed over a 4-year period), and the lowest number of absences reported was zero (perfect attendance). The highest number of moves reported for this study was 6 during high school (*n* = 2). One hundred eight of the 460 participants (23.4%) moved one or more times during high school while the remainder did not change schools during their high school career. It appears, at least with this study, that other factors are more important in explaining the relationship between student score variances.

Delimitations of the Study

A variety of measures have been developed for assessing work readiness including the Comprehensive Adult/Student Assessment System (CASAS); Equipped for the Future (EFF); the National Work Readiness Credential (NWRC), and ACT's WorkKeys®. WorkKeys® was used for this study because it had become the key assessment piece in Georgia's WorkReady program between 2009 and 2012. Examinees' who scored at least a level 3 in all three subtests, applied mathematics, reading for information, and locating information, were awarded a National Career Readiness Certificate. Students in participating counties (including the study county) across the state took the WorkKeys® assessment.

The study population was selected because data was readily available and due to existing relationships and proximity did not present a hindrance to data collection. The decision was made to exclude 19 participants enrolled in the study school system's alternative school due to their unique program of study and because these students are academically behind students at the traditional high schools. Additionally, the decision was made to exclude data from 16 students who reported their race as Asian, Hispanic, or Mixed. It is likely that the nature of the students at the alternative school would have caused their scores to be outliers. It is also possible that because the number of students other than Black or White was so small, any significant findings if they had been grouped together would not be useful, and their scores could have skewed results if included in a non-white type category.

Although efforts were made to compare the study population to high school seniors from other counties in the Regional Education Service Agency and high school seniors in the state of Georgia, it was not possible to generalize to a larger population due to the use of a nonexperimental design. An effort was made to identify variables with known relationships to not only work readiness but also to academic achievement. Because the criterion variables had already been collected, it was not possible to contact the participants; consequently certain variables of interest (student motivation/engagement, neighborhood, parent education levels, and work status) could not be examined. This study only measured socioeconomic status as either low or high (coded as 1 and 2 respectively). Had this data set been enriched with actual measures such as actual family income and educational attainment levels, rather than proxy data such as free and reduced price lunch, the SES variable might have shown a much different effect.

Recommendations for Future Practice

It is hoped that the results of this study can be used to develop intervention strategies aimed at improving the work readiness of high school students. A gap between participant's scores based on race highlights the need to continue to investigate and implement strategies aimed at improving the scores of black students. Interventions based on improving academic achievement in reading and mathematics should begin with the youngest students, but should also be a focus for older students. Because socioeconomic status, attendance, and student mobility have also be related in the literature to race (Donnelly, 2010; Hinz et al., 2003; Parke &

Kanyongo, 2012; Wilcher, 2005) it seems important they be addressed. School counselors, social workers, parent involvement coordinators, administrators, and teachers should all be involved in strategies aimed at increasing familial communication, student attendance, and providing parents strategies and training to support student learning at home.

Based on study results, students' continued involvement in higher levels of mathematics courses seems to be an important factor in their academic achievement in areas other than mathematics. The impact of higher levels of high school mathematics courses on participant's work readiness scores was a significant finding in this study. Participant's composite scale scores increased with each successive mathematics course they took. Even though mathematics courses are required during all four years of high school it seems prudent to suggest that educators continue to provide relevance and real world application to aid student engagement and that supports be in place to help students whose mathematics skills may not be at grade level. It is important that educators build a solid foundation in students' mathematics skills, but more importantly the relevance and importance of these skills need to be communicated to parents and students. Buy-in from parents and students is crucial to the success of any initiative aimed at student improvement.

Recommendations for Further Research

The inclusion of other predictor variables discovered but not used during this study might prove useful in future research. This study used archival data that limited the selection of variables to those available at the time participants took the assessments. However, future researchers could use additional variables associated with work readiness or academic achievement including student motivation, student's satisfaction with their educational environment, GPA, parent's highest level of education, 8^{th}-grade achievement scores, and work status of high school students. It would also be interesting to examine the relationship between teacher education levels, preparation methods, and attitudinal issues and the work readiness/academic achievement of students.

Summary

This study sought to examine the relationships of a set of predictor variables (gender, race, pathway completion, socioeconomic status, highest-level mathematics course, absenteeism, and student mobility) that had been used in previous research focused on academic achievement and work readiness. One finding of import in this study was the relationship between the highest-level mathematics course and a student's scores on the applied mathematics, reading for information, and locating information assessment. This variable explained the largest percentage of variance in each of the three dependent variables. Its' contribution was at least twice that of the next largest contributor. Although generalization is inhibited by the nonexperimental study design, it seems prudent to extend this research to examine the impact of studying higher levels of mathematics courses in high school on students' academic achievement and work readiness. It would also be important to ensure that students' receive appropriate instructional supports to help them be successful in these higher-levels of mathematics courses.

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APPENDICES

Appendix A

IRB Approval Letter

From: Megan Elizabeth McFarland [mailto:meganmcf@uga.edu]
Sent: Monday, October 22, 2012 10:20 AM
To: Charles KENNETH Tanner; Lea DEAN Folds **Subject:** IRB Approval--Tanner/Folds

PROJECT NUMBER: 2013-10322-0
TITLE OF STUDY: Work Readiness of High School Students
PRINCIPAL INVESTIGATOR: Dr. C. Kenneth Tanner

Dear Dr. Tanner and Ms. Folds,

The University of Georgia Institutional Review Board (IRB) has reviewed and approved your above-titled proposal through the exempt (administrative) review procedure authorized by 45 CFR 46.101(b)(4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

Please remember that any changes to this research proposal can only be initiated after review and approval by the IRB (except when necessary to eliminate apparent immediate hazards to the research participant). Any adverse events or unanticipated problems must be reported to the IRB immediately. The principal investigator is also responsible for maintaining all applicable protocol records (regardless of media type) for at least three (3) years after completion of the study (i.e., copy of approved protocol, raw data, amendments, correspondence, and other pertinent documents). You are requested to notify the Human Subjects Office if your study is completed or terminated.

Good luck with your study, and please feel free to contact us if you have any questions. Please use the IRB number and title in all communications regarding this study.

Regards,
Megan

____
Megan E McFarland, M.S.
IRB Coordinator, Human Subjects Office
624 Boyd Graduate Studies Research Center
University of Georgia, Athens, GA 30602
706.542.0798 (phone) | 706.542.3360 (fax)
meganmcf@uga.edu
http://www.ovpr.uga.edu/hso/

Appendix B

Permission Letter from Participating District

Human Subjects Review – System Approval Form

Employee's Name: Lea D. Folds

School:

Address:

Title of Research Project: Work Readiness Characteristics of High School Seniors

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Program and Degree of Study: Univ. of GA – Ed.D. Workforce Education

Project Proposed Start Date: Summer 2012 Project Proposed Completion Date: Summer 2013

Approval Signatures:

DO NOT PROCEED TO COLLECT DATA PRIOR TO RECEIVING IRB APPROVAL

Circle the following either "Yes" or "No":

a. Research involving minors or students: Circle **N** if the research only involved the observation of public behavior by the investigator. **Y** **N**

b. Research involving intellectually, mentally, or physically challenged members of protected groups. **Y** **N**

c. Research involving subject deception of any kind. **Y** **N**

Please complete:

1. Study Site and Participants:
   Study will involve collecting archived data from databases on students who participated in the WorkKeys assessment in Spring 2011. Students would include all seniors in the county that took the WorkKeys assessment.

2. Brief but detailed summary of the Project (attach extra page if needed).
   This study will seek to examine variables that contribute to the work readiness of high school seniors using the dependent variables reading for information, locating information, and applied mathematics from the WorkKeys assessment. The independent variables I intend to study include gender, race/ethnicity, socioeconomic status, highest level of English, mathematics, and science courses completed, student mobility (# times student switched high schools), EOCT and GHSGT scores for English, mathematics, and science.

   I will need access to information in the system's student databases to collect the data to be used in the study. I will work with and other personnel as needed to identify and collect the data necessary for this study.

3. Describe the nature of the involvement of human subjects in the project (personal interview, mailed questionnaire, observation, etc. (Attach copy of any instrument, chart, or questionnaire that will be used with subjects.)

   This study involves information already contained in the school system's student data bases. No contact with human subjects will be necessary for this study.

4. Describe how confidentiality will be maintained. Be specific if using secondary documents, audio/video tapes, etc.

   Each student record will be assigned a unique identifier that is not keyed to any student information. There will be no need to reference individual students. All personally identifying information will be redacted and the confidentiality of student's personal information will be preserved.

5. Signature and date of review:

   Student/Date Lea D. Folds 5/22/12

   Dissertation Committee Chair/Co-Chair/ Date C. Kenneth Tanner 5/15/2012

   Superintendent/Date 5·24·12

Attach any other forms, tests, institutional permission slips, etc., relative to this study. Failure to do so will result in delayed processing of the approval form.

9-1-04

Tables

WorkKeys® Level, Scale Score, Skill Examples, and Sample Questions

Table 5

WorkKeys® Applied Mathematics Level Score Contents and Scale Score Requirements

Level (scale score)	Skill Examples
Level 3 (71 – 74) (Bronze)	• Solve problems that require a single type of mathematics operation (addition, subtraction, multiplication, and division) using whole numbers • Add or subtract negative numbers • Change numbers from one form to another using whole numbers, fractions, decimals, or percentages • Convert simple money and time units (e.g., hours to minutes)
Level 4 (75 – 77) (Silver)	• Solve problems that require one or two operations • Multiply negative numbers • Calculate averages, simple ratios, simple proportions, or rates using whole numbers and decimals • Add commonly known fractions, decimals, or percentages (e.g., 1/2, .75, 25%) • Add up to three fractions that share a common denominator • Multiply a mixed number by a whole number or decimal • Put the information in the right order before performing calculations
Level 5 (78 – 81) (Gold)	• Decide what information, calculations, or unit conversions to use to solve the problem • Look up a formula and perform single-step conversions within or between systems of measurement • Calculate using mixed units (e.g., 3.5 hours and 4 hours 30 minutes) • Divide negative numbers • Find the best deal using one- and two-step calculations and then compare results • Calculate perimeters and areas of basic shapes (rectangles and circles) • Calculate percent discounts or markups
Level 6 (82 – 86) (Platinum)	• Use fractions, negative numbers, ratios, percentages, or mixed numbers • Rearrange a formula before solving a problem

	• Use two formulas to change from one unit to another within the same system of measurement • Use two formulas to change from one unit in one system of measurement to a unit in another system of measurement • Find mistakes in questions that belong at Levels 3, 4, and 5 • Find the best deal and use the result for another calculation • Find areas of basic shapes when it may be necessary to rearrange the formula, convert units of measurement in the calculations, or use the result in further calculations • Find the volume of rectangular solids • Calculate multiple rates
Level 7 (87 – 90) (Platinum)	• Solve problems that include nonlinear functions and/or that involve more than one unknown • Find mistakes in Level 6 questions • Convert between systems of measurement that involve fractions, mixed numbers, decimals, and/or percentages • Calculate multiple areas and volumes of spheres, cylinders, or cones • Set up and manipulate complex ratios or proportions • Find the best deal when there are several choices • Apply basic statistical concepts

Table 5. WorkKeys® Applied Mathematics Level Score Contents and Scale Score Requirements.
ACT Inc. (2005). WorkKeys® scale score interpretation guide. Iowa City, IA: Author.
ACT Inc. (2011d). What the WorkKeys® applied mathematics test measures. Iowa City, IA: Author.

Table 6

Applied Mathematics Sample Items

Level 3 sample problem	Rationale
In your job as a cashier, a customer gives you a $20 bill to pay for a can of coffee that costs $3.84. How much change should you give back? A. $15.26 B. $16.16 (Correct) C. $16.26 D. $16.84 E. $17.16	• Examinees must perform a single subtraction operation. • Numbers are presented in the logical order ($20 – $3.84). • Number of dollars must be converted to a decimal (dollars and cents: $20.00).

Level 7 sample problem	Rationale
The farm where you just started working has a vertical cylindrical oil tank that is 2.5 feet across	• There are multiple steps of calculation.

on the inside. The depth of the oil in the tank is 2 feet. If 1 cubic foot of space holds 7.48 gallons, about how many gallons of oil are left in the tank? 1. 37 2. 59 3. 73 (Correct) 4. 230 5. 294	• Examinees must look up and use the formula for the volume of a cylinder. • Examinees must convert from cubic feet to gallons.

Table 6. Applied Mathematics Sample Items. ACT Inc. (2011d). What the WorkKeys® applied mathematics test measures. Iowa City, IA: Author.

Table 7

WorkKeys® Reading for Information Level Score Contents and Scale Score Requirements

Level (scale score)	Skill examples
Level 3 (73 - 74) (Bronze)	• Identify main ideas and clearly stated details • Choose the correct meaning of a word that is clearly defined in the reading • Choose the correct meaning of common, everyday workplace words • Choose when to perform each step in a short series of steps • Apply instructions to a situation that is the same as the one in the reading materials
Level 4 (75 – 78) (Silver)	• Identify important details that may not be clearly stated • Use the reading material to figure out the meaning of words that are not defined • Apply instructions with several steps to a situation that is the same as the situation in the reading materials • Choose what to do when changing conditions call for a different action (follow directions that include "if-then" statements)
Level 5 (79 – 81) (Gold)	• Figure out the correct meaning of a word based on how the word is used • Identify the correct meaning of an acronym that is defined in the document • Identify the paraphrased definition of a technical term or jargon that is defined in the document • Apply technical terms and jargon and relate them to stated situations • Apply straightforward instructions to a new situation that is similar to the one described in the material • Apply complex instructions that include conditionals to situations

	described in the materials
Level 6 (82 – 84) (Platinum)	• Identify implied details • Use technical terms and jargon in new situations • Figure out the less common meaning of a word based on the context • Apply complicated instructions to new situations • Figure out the principles behind policies, rules, and procedures • Apply general principles from the materials to similar and new situations • Explain the rationale behind a procedure, policy, or communication
Level 7 (85 – 90) (Platinum)	• Figure out the definitions of difficult, uncommon words based on how they are used • Figure out the meaning of jargon or technical terms based on how they are used • Figure out the general principles behind policies and apply them to situations that are quite different from any described in the materials

Table 7. WorkKeys® Reading for Information Level Score Contents and Scale Score Requirements. ACT. (2005). WorkKeys® scale score interpretation guide. Iowa City, IA: Author. ACT. (2011f). What the WorkKeys® reading for information test measures. Iowa City, IA: Author.

Table 8

Reading for Information Sample Item

Level 3 sample problem	Rationale
ATTENTION CASHIERS: All store employees will now get 20% off the price of clothes they buy here. Please follow the new directions listed below. <u>Selling clothes to employees</u> Ask to see the employee's store identification card. Enter the employee's department code number into the cash register. Use the cash register to take 20% off the price. Then push the sales tax button. Write your initials on the sales receipt. Sell clothes to employees during store hours only. <u>Accepting clothing returns from employees</u> Employees receive a store credit certificate for clothes they return to the store. Store credit certificates are next to the gift certificates.	The sentences are simple and direct. Most put the subject first and the verb second. There are short paragraphs and short sentences. There are direct instructions for simple tasks. The vocabulary includes common everyday words. Individuals have to pick out a clearly stated detail. They do not need to draw any conclusions.

Employees may not get a cash refund for clothes they return to the store. You are a cashier. According to the notice shown, what should you write on a store employee's receipt? 1. The employee's identification number 2. The employee's department number 3. The amount of sales tax 4. The 20% discount price 5. Your initials (Correct)	

Level 7 sample problem	Rationale
You have hired a consultant to work with your firm. Based on the agreement shown, what will happen if the consultant's business is taken over by a major competitor? 1.The agreement will confidentially go into arbitration. 2.The agreement will not be enforceable and is void. 3.The consultant is bound by the agreement. (Correct) 4.The obligations will pass to the new owner. 5.You must renegotiate the agreement with the new owner.	• Sentences are longer, denser, and more complex. • The document uses a complex writing style. • The paragraphs and sentences are filled with details and information. • Less common meanings of words are used. • Individuals must apply the principles behind complicated instructions to new situations.

Table 8. Reading for Information Sample Item. ACT. (2011f). What the WorkKeys® reading for information test measures. Iowa City, IA: Author.

Table 9

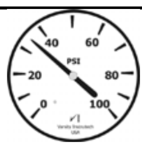
WorkKeys® Locating Information Level Score Contents and Scale Score Requirements

Level (scale score)	Skill Examples
Level 3 (72 - 74) (Bronze)	• Find one or two pieces of information in a graphic • Fill in one or two pieces of information that are missing from a graphic
Level 4 (75 – 79) (Silver)	• Find several pieces of information in one or two graphics • Understand how graphics are related to each other • Summarize information from one or two straightforward graphics • Identify trends shown in one or two straightforward graphics • Compare information and trends shown in one or two straightforward graphics

Level 5 (80 – 86) (Gold)	• Sort through distracting information • Summarize information from one or more detailed graphics • Identify trends shown in one or more detailed or complicated graphics • Compare information and trends from one or more complicated graphics
Level 6 (87 – 90) (Platinum)	• Draw conclusions based on one complicated graphic or several related graphics • Apply information from one or more complicated graphics to specific situations • Use the information to make decisions

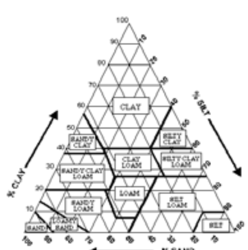
Table 9. WorkKeys® Locating Information Level Score Contents and Scale Score Requirements.
ACT, Inc. (2005). WorkKeys® scale score interpretation guide. Iowa City, IA: Author.
ACT, Inc. (2011e). What the WorkKeys® locating information test measures. Iowa City, IA: Author.

Table 10
Locating Information Sample Item

Level 3 sample problem	Rationale
	The problem contains an elementary workplace graphic. Examinees find one piece of information.

You regularly check the pressure gauge on a large tank. According to the gauge shown, what is the current pressure (in PSI)?

1. 30
2. 35 (Correct)
3. 40
4. 45
5. 100

Level 6 sample problem	Rationale
	• The problem is based on very complicated, detailed graphics in a challenging format. • Examinees must notice the connections between graphics. • Examinees must apply the information to a specific situation. • Examinees must use the information to draw

Soil name	Texture class	Depth (inches)	Shrink-swell potential
Sarpy	sandy loam	0–7 7–60	low low to moderate
Kennebec	silt loam	0–38 38–60	moderate low to moderate
Colo	silty clay loam	0–31 31–60	high high
Blend	silty clay	0–17 17–29 29–60	high moderate to high high
Nevin	clay loam	0–28 28–48 48–60	moderate to high moderate moderate
Kenmoor	loamy sand	0–24 24–60	low high

You are a road contractor and you have analyzed a soil

that you want to use for road fill. Your analysis shows that the soil contains 15% sand, 65% silt, and 20% clay. You need to know what the shrink-swell potential is for the soil because it will affect the durability of the road. Based on the diagram and table shown, what is the shrink-swell potential at a 30-inch depth for this soil? 1. Low 2. Low to moderate 3. Moderate (Correct) 4. Moderate to high 5. High	conclusions.

Table 10. Locating Information Sample Items. ACT, Inc. (2011e). What the WorkKeys® locating information test measures. Iowa City, IA: Author.