Socioeconomic Status, Higher-Level Mathematics Courses, Absenteeism, and Student Mobility as Indicators of Work Readiness

Lea D. Folds
The University of Georgia

C. Kenneth Tanner
The University of Georgia

ABSTRACT

The purpose of this study was to analyze the relations among socioeconomic status, highest-level mathematics course, absenteeism, student mobility and measures of work readiness of high school seniors in Georgia. Study participants were 476 high school seniors in one Georgia county. The full regression model explained 27.5% of the variance in participants' applied mathematics scores, 24.6% of the variance in their reading for information scores, and 25.8% 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.

Introduction

Work readiness has been discussed in the literature since the 1980s as economic difficulties and increasing competitiveness of global markets led American manufacturers to reconsider roles, responsibilities, and skills needed of workers (O'Neil, Allred, & Baker, 1992; U. S. Department of Education, 1983). Assessing the work readiness of high school students is important because they tend to be employed in entry-level jobs after graduation and increasingly these jobs require higher skills and knowledge than students may possess (Alvarez, Gillies, & Bradsher, 2003; Lippman & Keith, 2009; National Governors Association, 2010). This skills differential is important to career technical education (CTE) because CTE has been at the forefront of providing workplace skills training in secondary and postsecondary schools throughout the past century (Scott & Sarkees-Wircenski, 2008).

High school students were deficient in areas identified as basic skills (writing in English, mathematics, and reading comprehension), as well as applied skills (critical thinking/problem solving, and professionalism/work ethic) in Casner-Lotto and Barrington's (2006) study examining the work readiness of secondary and postsecondary students. Basic skills are those typically associated with academic courses while applied skills identified in this study have long been included in career and technical education curriculum (Partnership for 21st Century Skills, 2010). The *Up to the Challenge* report emphasized the importance of career and technical education in providing applied context for high school students' academic skills, as well as preparing them for lifelong learning and increasing their income potential (Partnership for 21st Century Skills, 2010). The disconnect between applicants' skills and those required by employers has been described in the literature as a skills gap; 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 (Cornelius, 2011; McNamara, 2009; Symonds, Schwartz, & Ferguson, 2011). If this situation continues unchecked, graduates' ability to find employment paying self- and family-supporting wages could be compromised.

High schools are now charged with the responsibility of ensuring that graduates are prepared for postsecondary education or the workforce and public policy currently refers to this as college and career readiness. Potential study variables were identified after a review of relevant literature. Gender, race, socioeconomic status, and career and technical education participation appear frequently in work readiness literature associated with high school students (Barnes, 2002; Hall, 2010; Parker, 2011; Reed, Jepsen, & Hill, 2007; Schultz, 2011; Stone, 2007; Stone & Aliaga, 2007; Sugiarti, 2008; and Wall, 2011). Other factors frequently found in literature related to high school students include the relation between factors such as taking higher levels of mathematics courses, student mobility, absenteeism, socioeconomic status, part-time work status, and students' academic achievement (Bottoms & Carpenter, 2003; Crowley, 2003; Donnelly, 2010; Fleischman, Hopstock, Pelczar, & Shelley, 2010; HOPE Program, 2011; Paik, 2002; Parke, 2006; Parke & Kanyongo, 2012; Rampey, Dion, & Donohue, 2009; Rumberger, 2002; Thompson, Myers, and Oshima, 2011; and Wilcher, 2005).

High school graduates' readiness for college and work impacts not only their individual outcomes but also directly impacts the communities and states in which they live and work. Communities and states may experience a loss of existing jobs or may lose new business development to areas with higher educational attainment. Employment within the study county has steadily declined since 2004 (Census Bureau, 2011), consequently, it was extremely important to assess the situation of a sample of Georgia students living in this county. Although prior work readiness research with high school students has focused on gender, race, socioeconomic status, and pathway participation, this study sought to extend and explore relations among variables frequently related to student achievement.

Conceptual Framework

Although it has been discussed in the literature for 30 years, work readiness as a construct lacks a consistent definition. Workplace skills, employability skills, workforce readiness, 21st century skills, and most recently college- and career-readiness are most frequently connected to work-readiness (Harris, 2008; McLarty & Vansickle, 1997; Overtoom, 2000; Saterfiel & McLarty, 1995; Secretary's Commission on Achieving Necessary Skills (SCANS), 1991).

The conceptual framework for this study is based on O'Neil, Allred, and Baker's (1992) review of five work readiness related reports (Carnevale, Gainer, & Meltzer, 1990; Committee on Science, 1984; Employability Skills Task Force, 1989; New York State Education Department, 1990; Secretary's Commission on Achieving Necessary Skills (SCANS), 1991) and

21st century skills identified through the collaborative effort of public and private business and education leaders (Partnership for 21st Century Skills, 2006).

Four categories of skills including basic academic skills, higher-order thinking skills, interpersonal and teamwork skills, and personal characteristics and attitudes were identified as essential for entry-level workers to be successful in their jobs (work ready) (O'Neil, et al., 1992). Since that time, the SCANS Commission report continues to be recognized as the leading framework when discussing skills associated with work readiness. The SCANS Commission's work identified competencies and a foundation of skills and personal qualities integral to workers' performance in high-performance workplaces (Secretary's Commission on Achieving Necessary Skills (SCANS), 1991). The competencies included resources, interpersonal skills, information, systems, and technology, and encompass characteristics used by effective workers to be productive in their jobs. Foundational skills represent basic skills, thinking skills, and personal qualities workers should possess to attain competency at work. Although the competencies and skills identified in the SCANS Report were first reported more than 30 years ago, they continue to provide momentum for current workforce development research, curriculum, and policy development.

More recently, policy makers have identified skills believed to be important for college and career readiness in the 21st century (Partnership for 21st Century Skills, 2006). The updated skills integrate many of those first identified in the SCANS Report (1991), core academic subjects, 21st century content, learning and thinking skills, information and communication technology skills, and life skills, (Partnership for 21st Century Skills, 2006).

Review of Related Literature

Most work readiness related literature has been descriptive in nature examining the relationship of gender, race, and career technical education pathway participation to students' level scores on ACT, Inc.'s WorkKeys® assessments (Barnes, 2002; Hall, 2010; Parker, 2011; Reed, Jepsen, & Hill, 2007; Schultz, 2011; Stone, 2007; Stone & Aliaga, 2007; Sugiarti, 2008; and Wall, 2011). Student achievement related literature included demographic variables but also examined the effects of taking higher-level mathematics courses, student mobility, and absenteeism on student achievement (Bottoms & Carpenter, 2003; Crowley, 2003; Donnelly, 2010, Fleischman et al, 2010; HOPE Program, 2011; Paik, 2002; Parke, 2006; Parke & Kanyongo, 2012; Rampey, Dion, & Donohue, 2009; Rumberger, 2002; Thompson, Myers, and Oshima, 2011; and Wilcher, 2005).

Rampey, Dion, and Donohue (2009) reviewed 2008 National Assessment of Educational Progress (NAEP) results and reported that taking higher level mathematics courses was associated with higher mathematics achievement scores for students between 13- and 17-years old. Specific descriptive information about the students taking higher-level mathematics courses was not discussed in the report. Any academic, social, or other differences that exist between students taking higher-level mathematics courses and those not taking the same level courses would enrich our understanding of this variable and its potential influence on students' work readiness. 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.

Bottoms and Carpenter (2003) examined mathematics achievement of 2,400-plus eighth graders and 1,900-plus high school seniors from rural schools to determine students' level of mathematics achievement and the relationship of mathematics achievement to course-taking patterns. The authors found that students' mean score was at the Basic level while high school seniors were at risk of falling below the Basic level of proficiency. Students who had taken a semester or more of algebra during middle school scored significantly higher than those who did not. Additionally, students taking one or more mathematics courses below college-preparatory Algebra I tended to have lower mathematics achievement than students taking higher-level mathematics courses.

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.

Donnelly (2010) sought to determine if reading and mathematics scores were different based on levels of student mobility. Differences were also examined among socioeconomic status and attendance groups. Study participants were all 9th grade students enrolled in a Tennessee high school that had taken the Tennessee Comprehensive Assessment Program (TCAP) with complete record information for all study factors. Study results indicated that students with higher levels of student mobility, absenteeism, and lower socioeconomic status had lower reading and mathematics achievement scores on the TCAP.

Engec (2006) studied the effects of student mobility on participants' Iowa Test of Basic Skills (ITBS) scores using data available for Louisiana kindergarten through twelfth-grade students in the 1998-1999 school year. Study results demonstrated statistically significant differences between students who were non-mobile and their mobile peers. As mobility increased, students' performance on the ITBS decreased.

In an article investigating the residential mobility of poor families and children, Crowley (2003) noted that children who moved most frequently tended to be from families with lower socioeconomic status and were members of racial minorities. Moves for these families were most often due to external factors, not parental choice. External factors might include family disruption, divorce, death, eviction, or others that can be associated with negative stress. Academic achievement is typically adversely affected for children experiencing frequent moves due to these factors.

In their review of the 2009 Program for International Assessment (PISA) results, Fleischman, Hopstock, Pelczar, and Shelly (2010) examined the relationship of the socioeconomic status of schools in the U.S. and students' reading literacy. The sample included students from 165 randomly selected public and private schools. Study results found that the average PISA scores for U. S. schools with free- or reduced price lunch participation rate of 50 to 75% were lower than U.S. schools with higher socioeconomic status. Schools in the Organisation for Economic Development (OECD) countries also outscored the lower SES study schools in the U.S.

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 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.

Purpose

The purpose of this study was to examine the relationships among certain personal characteristics (socioeconomic status, higher-level mathematics courses, absenteeism, and student mobility) of high school seniors in a Middle Georgia county and their work readiness. The research objectives for this study were to examine the relationships among SES, higher-level mathematics courses, absenteeism, and student mobility and participants' scale scores on each of the applied mathematics, reading for information, and locating information sections of ACT's WorkKeys® assessment.

Previous studies using WorkKeys® had focused on descriptive demographic variables. This study sought to broaden the scope of potential factors contributing to work readiness and examined factors related to student achievement. The predictor variables used in this study were selected based on their relationship to student achievement (Burkham, Lee, & Dwyer, 2009; Fleischman, Hopstick, Pelczar, & Shelley, 2010). The criterion variable of work readiness was defined as the combination of technical, employability, and academic skills necessary for occupations offering opportunities for advancement that pay family-sustaining wages (Association for Career and Technical Education, 2010). Work readiness was quantified using participants' scale scores on the applied mathematics, reading for information, and locating information sections of ACT's WorkKeys® assessment.

Method

Participants

A total of 476 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.

Table 1 contains a comparison of participants' race and socioeconomic status to that of high school seniors within the study county's Regional Education Service Agency (RESA) district and the state of Georgia. The RESA district is comprised of schools from eight contiguous counties in the state of Georgia. Data for all high school seniors throughout the state were gathered using adequate yearly progress (AYP) reports from the Georgia Department of Education's website (Georgia Department of Education, 2011). Participants were compared with students representing 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). Socioeconomic status for this study was categorized based on students' participation in the free and reduced price lunch program. A review of these data indicates that racial makeup of study participants was 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 revealed that the study county had a higher economically disadvantaged population of high school seniors for the 2010-2011 school year than the remaining counties in the RESA district or the state.

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 (2010-2011)		RESA High School Seniors (2010-2011)		Georgia High School Seniors (2010-2011)	
	Frequency	%-age	Frequency	%-age	Frequency	%-age
Asian	3	1%	132	2%	3,480	4%
Black	224	47%	2,499	39%	33,821	37%
Hispanic	7	1%	295	5%	7,272	8%
Mixed (two or more races)	6	1%	237	4%	2,283	2%
White	236	50%	3,131	49%	45,249	49%
Economically Disadvantaged	280	59%	2,201	35%	38,189	41%

Correlation coefficients were calculated to determine whether the components of the sample were significantly correlated with the population. Using data from Table 1 above, the calculations in Table 2 show that correlations range from .949 to .989, with $\alpha \leq .01$. All sample components were 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	7	1.00	.95**	.97**
RESA District HS Seniors	7	.95**	1.00	.99**
Georgia HS Seniors	7	.97**	.99**	1.00

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

Procedures

Permission for the study was obtained from the study school system, the doctoral committee, and the Institutional Review Board (IRB) at The University of Georgia. 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. The data was compiled in an Excel spreadsheet to be used for this study. All data vectors were available for each study participant; there was no missing data so the usable sample was 476 participants.

Data were exported from an Excel spreadsheet and into the Statistical Package for the Social Sciences (SPSS) version 20 for analysis. This analysis used descriptive statistics and multiple regression analysis (MRA). Multiple regression analysis was used to determine the relationships among the predictor and criterion variables using SPSS version 20. MRA was appropriate for this analysis because the study sought to examine the strength and direction of variable relations and it indicates the relative importance of the different predictor variables. The descriptive statistics included frequencies, percentages, means, and standard deviations. Assumptions necessary for appropriate analysis with multiple regression were checked and no violations were found.

Socioeconomic status was coded based on whether a student participated in the free or reduced price lunch program. Data for highest-level mathematics course included courses taught inside the study county as well as those courses students had taken out of county (while enrolled in other 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. Absenteeism was measured by the number of class periods a student was absent because this is how it is measured by the school system. During the 2010-2011 school year students were on a six-period day schedule. Descriptive information about the predictor variables is included in Table 3.

Table 3
Description of Predictor Variables Impacting Work Readiness of High School Seniors

Predictor Variable	Variable Type	Measurement	Measurement Scale
Socioeconomic status	ordinal	1 = Economically Disadvantaged 2 = Not Economically Disadvantaged 1 = Below Math 1 2 = Math 1	ordinal
Highest-level mathematics course	ordinal	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 Absenteeism (number of class periods absent from school during senior year) Student Mobility	ordinal
Absenteeism	ratio	(number of times student changed schools during high school after the initial enrollment)	scale
Student Mobility	ratio		scale

A review of appropriateness of the sample size was determined using guidelines from Green (1991). Assuming a medium-sized relationship between the predictor variables and the criterion variable, $N \geq \left(\frac{8}{f^2}\right) + (\mathrm{m} - 1)$ (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.

Instrumentation

WorkKeys® applied mathematics, reading for information, and locating information assessments were the instruments used for this study. The three assessments used are formatted with selected-response multiple-choice items. In the applied mathematics assessment, examinees set up and solve problems that occur in real-world work settings involving mathematical reasoning, critical thinking, and problem-solving skills. Items in the reading for information assessment require examinees to use documents including memos, letters, policies, and regulations to assess reading skills and abilities in authentic work situations. Graphs, charts, tables, etc. are used to assess an examinees' skill level as they find, compare, summarize, and analyze information contained in work-related graphics on the locating information assessment. WorkKeys® assessment scores are based on the number of correctly answered questions and the level score assessed in each question. Applied mathematics, reading for information, and locating information sample items are shown in Tables 4-6 (see Appendix). Scale scores range from 65 to 90 and are designed to show an individual's growth over time. They may be used for pretest-posttest information and to provide consistent measures for federal program accountability requirements (ACT Inc., 2005).

Results

The SCANS Report (Secretary's Commission on Achieving Necessary Skills (SCANS), 1991) has been used to identify a combination of skills workers need for occupations in high performance workplaces. It came about during the late 1980s and early 1990s in response to a growing realization that economic conditions in the U.S. and around the world were changing due to rapid technology advances. The competencies, skills, and personal qualities presented in the SCANS Report and measured in this study with WorkKeys® provide the foundation for the findings shown below.

Frequencies and percentages for study participants across economically disadvantaged status, and highest-level mathematics course passed are presented in Table 7. An alpha level of .05 was used for all statistical tests.

Table 7
Variables Categorized by Descriptor, Number, and Percentage of Participants

Variable	Descriptor	Number of Participants	Percentage of Participants
Socioeconomic Status	Free/reduced	280	59.0%
	Not free/reduced	196	41.0%
Highest Level Mathematics Course	Below Math 1	6	1.3%
	Math 1	1	0.2%
	Geometry	24	5.3%
	Math 2	3	0.7%
	Algebra II	75	16.4%
	Math 3	1	0.2%
	Algebra III	210	46.1%
	Adv. Algebra, Trigonometry or ACCEL Calculus	57	12.5%

	AP Calculus, AP Statistics, or Honors Analysis	79	17.3%

The work readiness of high school seniors was studied using three separate multiple regression models. Applied mathematics scale score was the criterion variable in the first model, reading for information in the second model, and locating information in the third model. Each model included socioeconomic status, highest-level mathematics course, absenteeism, and student mobility as the predictor variables. Assumptions necessary for multiple regression were tested and no violations were found. Table 8 summarizes the descriptive statistics for the criterion and predictor variables. Locating information had the highest mean scale score of the three criterion variables (78.62), followed by reading for information (78.28), and applied mathematics (77.17). Additionally, participants were slightly more likely to be members of the lower socioeconomic status group, have taken at least Math 3, been absent just under 64 class periods, and to have moved less than one time since their initial enrollment in high school.

Table 8
Means and Standard Deviations for Predictor Variables on Applied Mathematics, Reading for Information, and Locating Information

Variable	*N*	Mean	Standard Deviation
Applied mathematics	476	77.17	4.48
Reading for information	476	78.28	3.50
Locating information	476	78.62	2.96
Socioeconomic status	476	1.41	0.49
Highest-level mathematics course	476	6.83	1.72
Absenteeism	476	63.58	55.28
Student mobility	476	0.35	0.77

Correlations among the predictor variables and applied mathematics are shown in Table 9. Results indicated positive and significant correlations between socioeconomic status and highest-level mathematics course and applied mathematics. Students from families with higher socioeconomic status and students that had taken higher-level mathematics courses scored higher on the applied mathematics assessment. Absenteeism and student mobility were significantly negatively correlated with applied mathematics, which indicated lower scores for students with higher rates of absenteeism and household moves after initial high school enrollment.

Table 9

Variable Correlations for Applied Mathematics (AMSS)

	AMSS	SES	HLM	A	SM

AMSS	1.00	.27**	.55**	-.14*	-.17**
SES		1.00	.27**	-.12*	-.16**
HLM			1.00	-.12*	-.17**
Absenteeism				1.00	.31**
Student Mobility					1.00

$**p < 0.001$, two − tailed, $*p < 0.01$, two − tailed
Note: SES represents socioeconomic status; HLM represents highest-level mathematics course

Correlations between the predictor variables and reading for information, shown in Table 10, indicated positive and significant correlations between socioeconomic status and highest-level mathematics course and reading for information. Indications were that students from families with higher socioeconomic status and those who had taken higher-level mathematics courses had higher reading for information assessment scores. Absenteeism and student mobility were significantly negatively correlated with applied mathematics, which indicated that students with higher absenteeism levels and number of household moves after initial high school enrollment scored lower on the reading for information assessment.
Table 10

Variable Correlations for Reading for Information (RFISS)

	RFISS	SES	HLM	A	SM
RFISS	1.00	.27***	.48***	-.09*	-.11**
SES		1.00	.27***	-.12*	-.16***
HLM			1.00	-.12**	-.17***
Absenteeism				1.00	.31***
Student Mobility					1.00

$*p < 0.05$, two − tailed, $**\ p < .01$, $***\ p < .001$
Note: SES represents socioeconomic status; HLM represents highest-level mathematics course

Correlations between the predictor variables and locating information are shown in Table 11. Results indicated positive and significant correlations between socioeconomic status and highest-level mathematics course and locating information. Students from families with higher socioeconomic status and students that had taken higher-level mathematics courses scored higher on the locating information assessment. Absenteeism and student mobility were significantly negatively correlated with locating information, which indicated lower scores for students with higher rates of absenteeism and household moves after initial high school enrollment.

Table 11

Variable Correlations for Locating Information (LISS)

	LISS	SES	HLM	A	SM

LISS	1.00	.267***	.485***	-.091*	-.194***
SES		1.00	.273***	-.124**	-.160***
HLM			1.00	-.121**	-.171***
Absenteeism				1.00	.310***
Student Mobility					1.00

$*p < 0.05, \text{two}-\text{tailed},\ **\ p < .01,\ ***\ p < .001$

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

Analysis of correlations between predictor variables revealed that socioeconomic status was significantly and positively correlated with higher-levels of mathematics courses indicating that students from families with higher socioeconomic status tended to take higher-levels of mathematics courses than students from families with lower socioeconomic status. Absenteeism was significantly negatively associated with socioeconomic status and students taking higher-level mathematics courses, which indicated that students with higher absenteeism levels tended to be from families with lower socioeconomic status and had lower participation in higher-level mathematics courses. Student mobility had significant negative correlations with socioeconomic status and taking higher-level mathematics courses and significant positive correlation with absenteeism. Indications were that students with higher numbers of household moves after initially enrolling in high school tended to be from families with lower socioeconomic status, tended to have lower participation in higher-level mathematics courses, and had higher levels of absenteeism.

Applied Mathematics Model

Socioeconomic status and highest-level mathematics course were the only significant predictor variables in the applied mathematics model with positive regression weights indicating that students with higher economic status and those who took higher levels of mathematics courses tended to have higher scores on the applied mathematics test. The regression model was statistically significant $[F(4,471) = 46.059, p < .001]$, adjusted $R^2 = .275$. Highest-level mathematics course contributed the largest portion (20.89%) of the explained variance in applied mathematics scale scores and socioeconomic status contributed 1.61%. The full regression model for applied mathematics with all variables of interest is shown in Table 12.

Table 12

Full Regression Analysis for Applied Mathematics

Predictor	Coef	SE Coef	T	P	Beta	Beta Weight %
Constant	67.772	.865	78.375	.000		
Socioeconomic Status	1.151	.373	3.087	.002	.127	1.61
Highest-Level Mathematics	1.193	.107	11.128	.000	.457	20.89

Absenteeism	-.004	.003	-1.199	.231	-.049	0.24
Student Mobility	-.320	.243	-1.315	.189	-.055	0.30

Note. S = 3.82. R-Sq = 28.1%. R-Sq (adj) = 27.5%.

Reading for Information Model

Highest level mathematics course and socioeconomic status were the only significant predictor variables in the model with positive regression weights indicating that students with higher economic status and those who took higher levels of mathematics courses tended to have higher scores on the reading for information test. The regression model was statistically significant $[F(4{,}471) = 39.801, p < .001]$, adjusted $R^2 = .246$. Highest-level mathematics course contributed the largest portion (19.36%) of the explained variance in reading for information scores and socioeconomic status contributed 2.07%. The full regression model for reading for information with all variables of interest is shown in Table 13.

Table 13
Full Regression Analysis for Reading for Information

Predictor	Coef	SE Coef	T	P	Beta	Beta Weight %
Constant	70.791	.688	102.913	.000		
Socioeconomic Status	1.02	.297	3.439	.001	.144	2.07
Highest-Level Mathematics	.896	.085	10.513	.000	.440	19.36
Absenteeism	-.002	.003	-.314	.754	-.013	0.017
Student Mobility	-.038	.194	-.197	.844	-.008	0.006

Note. S = 3.04. R-Sq = 25.3%. R-Sq (adj) = 24.6%.

Locating Information Model

Highest-level mathematics course, socioeconomic status, and student mobility were the only significant predictor variables in the model. The regression model was statistically significant $[F(4{,}471) = 42.29, p < .001]$, adjusted $R^2 = .258$. Positive regression weights indicate that students with higher economic status and those who took higher levels of mathematics courses tended to have higher scores on the locating information test. Students with higher levels of mobility had lower locating information scores. Highest-level mathematics course contributed the largest portion (18.66%) of the explained variance in locating information scale scores. Socioeconomic status contributed 1.80%, and student mobility contributed 1.04% of the explained variance in locating information scale scores. The full regression model for locating information with all variables of interest is shown in Table 14.

Table 14
Full Regression Analysis for Locating Information

Predictor	Coef	SE Coef	T	P	Beta	Beta Weight %
Constant	70.751	.577	122.162	.000		
Socioeconomic Status	.804	.249	3.230	.001	.144	1.80
Highest-Level Mathematics	.744	.072	10.403	.000	.440	18.66
Absenteeism	.000	.002	.221	.825	-.013	0.01
Student Mobility	-.392	.162	-2.417	.016	-.008	1.04

Note. S = 2.548. R-Sq = 26.4%. R-Sq (adj) = 25.8%.

Discussion

Across the three criterion variables, students with higher socioeconomic status and those taking higher-level mathematics courses score statistically significantly higher than their peers who were economically disadvantaged and did not take higher-levels of mathematics courses. Student mobility was significantly and negatively correlated with the criterion variable locating information but not with applied mathematics and reading for information.

Socioeconomic status

Consistent with the findings in numerous studies, students' from lower socioeconomic status backgrounds had lower WorkKeys® scores than their peers from families with a higher socioeconomic status (Bottoms & Carpenter, 2003; Donnelly, 2010; Rampey, Dion, & Donohoe, 2009; Sirin, 2005). Socioeconomic status and participants' scores on all three WorkKeys® assessments had significant positive correlations, however SES only explained between 1.6 and 2% of the score variance contribution in any of the three models. 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, 2003; Rampey, Dion, & Donohoe, 2009). This study supports the previous findings that students taking higher-level high school mathematics courses have higher mathematics achievement scores. However, potential factors influencing students' participation in higher-level mathematics courses were not addressed in the NAEP report. It may be that students enrolled in higher-level mathematics courses have academic, social, or other differences that support their ability to successfully complete those courses. It is possible that those differences may contribute to students' higher work readiness 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 taking higher-level mathematics courses may continue to be important but more detailed investigation into the differences between students enrolled in higher-level mathematics courses and those not enrolled is needed.

Absenteeism and Student Mobility

Absenteeism and student mobility have been found to be problematic with high school students in several studies (Donnelly, 2010; Hinz, Kapp, & Snapp, 2003; Parke & Kanyongo, 2012; Wilcher (2005). Higher absentee and mobility levels are negatively related to 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). No statistically significant relationship was found among absenteeism and any of the criterion variables. Student mobility was significantly related to the criterion variable locating information but not to applied mathematics and reading for information. A review of the beta weights indicates a very small amount of variance in the dependent variables is explained by either absenteeism or student mobility.

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.

Summary

The study objectives were developed to examine the relation among socioeconomic status, higher-level mathematics courses, absenteeism, and student mobility and work readiness characteristics measured with ACT's WorkKeys assessments. Although study results indicate that completion of higher-level mathematics explained the largest portion of variance for the three test areas, caution should be used before prescribing a one-size-fits-all solution. Increasing the number and rigor of mathematics classes alone does not necessarily improve students' enrollment, engagement, or success in higher-level mathematics courses. Research points to several factors with the potential to positively influence students' mathematics scores, notably increasing opportunities for students to use mathematics in authentic ways through career and technical education classes (Bottoms & Carpenter, 2003; Stone, Alfeld, & Pearson, 2008). Stone and Alliaga (2007) contend that improving the availability and quality of high school career and technical education should be a focus of public education because these courses provide content and context enabling students to meld their interests with rigorous academic skills needed for a successful transition to work and postsecondary education.

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. Based on study results, students' continued involvement in higher levels of mathematics courses seems to be an important factor in their academic achievement and integration of rigorous academics within career and technical education courses provides an authentic work context for student learning (Bottoms & Carpenter, 2003; Stone & Alliaga, 2007). It is hoped that the results of this study can be used to develop intervention strategies aimed at improving high school students' work readiness. Intervention strategies based on improving academic achievement in reading and mathematics are important for students of all ages. Even though mathematics courses are required during all four years of high school in Georgia, 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. Educators should continue to build a solid foundation in students' mathematics skills, but more importantly the relevance and importance of these skills through integration with career and technical education classes needs 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. Administrators, faculty, and staff should be involved in implementing strategies aimed at increasing familial communication, and providing parents strategies and training to support student learning at home.

Potential confounding variables were examined during the literature review; however, post-study analysis revealed two variables, prior academic achievement and reading achievement, were inadvertently overlooked. It is possible that inclusion of these variables would have substantively enriched the results of this study. 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 prior achievement, reading achievement, student motivation, student's satisfaction with their educational environment, GPA, parent's highest level of education, 8th-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.

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APPENDIX
WorkKeys® Sample Questions

Table 4

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 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	• There are multiple steps of calculation. • Examinees must look up and use the formula for the volume of a cylinder. • Examinees must convert from cubic feet to gallons.

2. 59
3. 73 (Correct)
4. 230
5. 294

Table 4. ACT Inc. (2012). Applied mathematics sample items. Retrieved from http://www.act.org/workkeys/assess/math/sample7.html

Note: Assessment questions are hierarchically arranged from the lowest level of skill required in the workplace (Level 3) to the point at which specialized training would be required (Level 7).

Table 5
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. Employees may not get a cash refund for clothes they return to the store.	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.

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)	

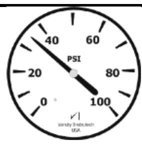
Level 7 sample problem	Rationale
You have hired a consultant to work with your firm. Based on the agreement shown, what will happen if the consultant's business is taken over by a major competitor? 1.The agreement will confidentially go into arbitration. 2.The agreement will not be enforceable and is 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 5. ACT, Inc. (2012). Reading for information sample Item. Retrieved from http://www.act.org/workkeys/assess/reading/sample3.html

Note: Assessment questions are hierarchically arranged from the lowest level of skill required in the workplace (Level 3) to the point at which specialized training would be required (Level 7).

Table 6
Locating Information Sample Item

Level 3 sample problem	Rationale

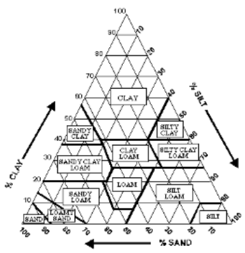


You regularly check the pressure gauge on a large tank. According to the gauge shown, what is the current pressure (in PSI)?

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

The problem contains an elementary workplace graphic. Examinees find one piece of information.

Level 6 sample problem



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

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 conclusions.

Table 6. ACT, Inc. (2012). Locating information sample items. Retrieved from http://www.act.org/workkeys/assess/locate/sample3.html

Note: Assessment questions are hierarchically arranged from the lowest level of skill required in the workplace (Level 3) to the point at which specialized training would be required (Level 6).

AUTHORS' NOTE

Dr. Lea D. Folds is a graduate of The University of Georgia's Career and Information Studies department. She teaches a secondary career and technical education pathway at Spalding High School, Griffin, GA. Her current teaching assignment includes early childhood education courses. Her research interests include factors affecting the preparation of high school students for college and careers and the transition of secondary students to college and careers. Additional research interests include the impact of school design on curriculum implementation and student engagement.

Dr. C. Kenneth Tanner, Professor of Career and Information Studies is a graduate of Florida State University. He teaches graduate courses in educational planning, policy, statistics, research, leadership and organizational studies. His most recent teaching assignment includes the application of UAVs in education and the work environments. His research chain takes into consideration how the physical environment influences behavior and productivity. He has recently completed a research project regarding characteristics of "green" schools. Most recently his research base has extended to defining drone technology to enhance STEM programs. Dr. Tanner has published and presented over 150 articles, book chapters, and academic papers. He is the primary author of four textbooks.