2013

Adult learners and student engagement: A study of the influence of student engagement on community college students and their intention to transfer

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Adult learners and student engagement: A study of the influence of student engagement on community college students and their intention to transfer

by

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A dissertation submitted to the graduate faculty

in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Education (Educational Leadership)

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Iowa State University

Ames, Iowa

2013

Dedication

This huge milestone in my life is dedicated to my family. To my wife, Lesley—without your nonstop patience, support, love and understanding, finishing this dissertation would not have been possible. To Tobey—you may not understand this point right now, but I hope that you have gained the desire and persistence to get through life's many obstacles and to never stop learning! To my parents, Mike and Sherri—thank you for instilling in me the importance of education and, more specifically, the love of reading. I love you all.

Life is an opportunity, benefit from it.
Life is beauty, admire it.
Life is a dream, realize it.
Life is a challenge, meet it.
Life is a duty, complete it.
Life is a game, play it.
Life is a promise, fulfill it.
Life is sorrow, overcome it.
Life is a song, sing it.
Life is a struggle, accept it.
Life is a tragedy, confront it.
Life is an adventure, dare it.
Life is luck, make it.
Life is too precious, do not destroy it.
Life is life, fight for it.
—Mother Teresa

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ACKNOWLEDGEMENTS

To my major advisor, Dr. Soko Starobin, you are the most powerful type of mentor: academically rigorous and supportive. Thank you for taking me under your wings and allowing me the opportunity to join your research team. This process has been full of emotional ups and downs, but I have learned much under your sage guidance. I also want to thank my committee members: Dr. Larry Ebbers, Dr. Frankie Santos Laanan, Dr. Jan Friedel, and Dr. Brad Shrader. I sincerely appreciate the guidance and encouragement to enter this program and for all your assistance throughout this journey.

To others within the department who have so willingly offered their time and expertise—Judy Weiland, Holly Ryan, Dr. Aurelia Kollasch, and Dr. Marisa Rivera—you are awesome. Thank you for all you do to help make sure we are all successful. To fellow graduate students, Tushi Baul and April Chen, thank you for all the work you have done as part of our research team.

Last, but certainly not least, thanks to my colleagues in the cohort. Each one of you has added to the richness and depth of this program. I especially want to thank Kip Bottenfield, Jerome Hilscher, Tom Johnson, Tracy Kruse, Bianca Myers, Mark Peltz, Jennifer Sabourin, and Chrystal Stanley. You all have truly made a mark in my life. Thank you for all the fun times we had and for all the great memories we shared. This program would not have been the same without everyone one of you characters.

ABSTRACT

Community colleges serve as the postsecondary college of choice for many adult students. Community colleges are aware of their increased role in postsecondary education and understand that they must continue to analyze student populations and adapt to their needs as well as maintain their open access philosophy.

This study was conducted at the 15 community college districts in the state with the intention to develop a deeper understanding of the influence of student engagement on adult community college students' transfer intentions and STEM aspirations. The study utilized the new STEM Student Success Literacy survey instrument. The purpose of this study included: (a) to understand the demographics characteristics and engagement practices of adult students attending community colleges, (b) to understand the influence of engagement on students' intentions to transfer to a 4-year institution and on students' STEM degree aspirations, and (c) to add to the current body of literature on engagement.

This research sought to understand how engagement factors impact adult learners at community colleges. The experiences, skills, and attitudes of adult students are different than that of the traditional-age student. Without effective practices to serve adult students, colleges will not adequately meet the needs of these students. Faculty and administrators need to take responsibility for this important student population.

CHAPTER 1. INTRODUCTION

Overview

The great recession had far-reaching impacts on higher education, specifically the number of adult learners entering the academy. Many adult learners have re-entered community colleges due to harsh economic realities. At the same time, the recession has led to a decrease in public funding for community colleges across the nation. The community college system is at an economic crossroads due to smaller state and federal appropriations that have resulted from the economic downturn. The creation of the No Child Left Behind legislation in 2001 called for increased accountability at all levels of education, and many states are moving toward a performance-based funding system.

Amid the struggling economy, there has been a current dearth of qualified workers in the science, technology, engineering, and mathematics (STEM) fields. Both unemployed and underemployed adult learners are looking to gain new professional skill sets that can help them find a job in STEM fields. There is a pressing economic need for highly trained scientists and engineers; community colleges can provide an important gateway for adult learners who are entering career pathways in the STEM disciplines. Economic trends forecast growth in the STEM professions. The Bureau of Labor Statistics estimated that, between 2008 and 2018, STEM occupations would grow by 17% whereas non-STEM occupations would grow by 9.8% (Costello, n.d.).

To better understand STEM fields, it is imperative to appropriately define the list of disciplines associated with this term. For this study the researcher used the National Science Foundation's (2006) description of STEM fields of study, which includes the following academic fields: biological sciences, computer and information science, engineering,

environmental research, geoscience, mathematical and physical sciences, and other areas of science-oriented disciplines. Additionally, Malcolm's (2010) generally recognized definition of adult learners as those over the age of 25 was used to segregate the student population.

The number of adult students enrolling at community colleges has grown. The U.S. Department of Education reported that "43% (or 14 million) of all community college students are older than the age of 24 (National Center for Education Statistics [NCES], 1996, cited in Council for Adult and Experiential Learning [CAEL], 2000 p. 3). Many of these students were classified as nontraditional adult students with familial and professional responsibilities outside of the classroom. John Levin (2004) examined the increasing impact of adult learners attending community colleges and noted increased enrollment trends in community colleges throughout the nation. Community college students are entering the classroom with excessive work and familial responsibilities and many students face other challenges inhibiting their success, including low socioeconomic status and/or being the first in their family to attend college.

Statement of the Problem

Due to outside time constraints and responsibilities many adult learners are limited in their ability to invest time in studying and in interacting with peer, staff, and faculty. The primary problem this study researched was the impact of faculty/staff interaction and individual orientation of adult learners as related to their intention to transfer to a 4-year institution.

Adult students often are categorized by their nonacademic responsibilities; they have both familial and professional responsibilities. These responsibilities mitigate adult students' ability to engage in their academic environment. Time spent working at their jobs,

commuting to school, and home responsibilities often detract from their school engagement. Community colleges have a direct opportunity to provide programmatic offerings that cater to this large student population and also mitigate the challenges unique to adult students. With 43% of U.S. students reported as being age 25 years or older in 1996 (NCES, 1996, as cited in CAEL, 2000, p.3), many students in higher education today are considered adult students.

An increasing number of adult students have college degrees, but it's not enough to meet the needs of a knowledge-based economy. "As of last March, 30.4 percent of people over age 25 in the United States held at least a bachelor's degree, and 10.9 percent held a graduate degree, up from 26.2 percent and 8.7 percent 10 years earlier (Jacobs, 2012, para. 2).

Community colleges provide the most direct and efficient route for this retraining to occur. "Broad access to higher education has long been a hallmark of the American postsecondary system . . . the U.S. postsecondary system has often fallen short of its ideals in terms of access for various demographic groups" (Pusser et al., 2007, p. 1). The higher education system is not adequately meeting the needs of adult students due to a shortage of programs that are geared toward their unique needs. Many adult students at community colleges face dilemmas that include: reductions in work hours, forced retirement, layoffs, shrinking job market, and declining retirement accounts. Understanding adult students' re-entry process (opportunities and challenges) into community colleges can help institutions provide customized programmatic needs, academic and financial support services, and concentrated opportunities to interact with faculty and fellow students in a holistic social learning community.

Community colleges have an inherent advantage when it comes to retraining people—they are more affordable than 4-year colleges, and they are more flexible in their programmatic offerings. The ability to customize courses and programs based on both worker and employer needs is an added value for community colleges. One of the challenges that these institutions face is that their programming is designed for traditional students. The Lumina Foundation spoke to this critical issue facing adult learners: "Whether enrolled in community colleges or four-year institutions, adults often follow nontraditional pathways, such as continuing-education and extension programs, contract education arrangements and programs offered online, at satellite campuses, or at for-profit colleges" (Pusser et al, 2007, p. 2). This study examined the engagement practices that positively influence community college outcomes and provides administrators and faculty with best practices to increase student retention, completion, and simultaneously increase intention to transfer to a 4-year STEM program.

Background of Study

This research study focused on community colleges in the state of Iowa, a largely rural Midwest state. The paradox at rural colleges can be seen at West Iowa Technical Community College (WITCC) in Sioux City, Iowa. WITCC is providing opportunities for adults who have been laid off to go back and get training for a new career path. The state of Iowa provided a grant to help support adult learners who have been displaced and need retraining. The *Sioux City Journal* reported that "Western Iowa Tech Community College said today it has been awarded an $8,000 state grant to assist displaced workers at Midwest Industries" (Dreeszen, 2008, para. 1). Midwest Industries, a manufacturer of marine products, laid off 80 people in their Ida Grove location. Dreeszen (2008) stated, "Western

Iowa Tech's Early Intervention Grant from Iowa Workforce Development will be administered by WITCC's Dislocated Worker Program, which has an extensive record of helping dislocated workers re-enter the local job market" (para. 3).

The need to invest in community colleges and the STEM fields also was recognized at the national level. In 2011, the U.S. Department of Labor and the Obama Administration announced nearly $500 million in grants for community college training. This large investment by the federal government was intended to assist community colleges and employers in providing pathways to high quality jobs in the STEM fields. According to Secretary of Labor Hilda L. Solis,

> Making it possible for unemployed Americans to return to work is a top priority of President Obama's. This initiative is about providing access to training that leads to real jobs. These federal grants will enable community colleges, employers and other partners to prepare job candidates, through innovative programs, for new careers in high-wage, high-skills fields, including advanced manufacturing, transportation, health care and STEM occupations. (U.S. Department of Labor, 2011, para. 3)

Many adult learners who have been laid off later in their careers have seen their retirement accounts eroded. Many members of the Baby Boomer generation witnessed their 401(k) and pension plans hurt in the economic recession. Economic factors, such as layoffs and massive decreases in retirement accounts, are increasing the numbers of older adults looking for retraining at community colleges.

Many of these older students are looking for new opportunities to use their talents to remain in or return to the workforce. This is where community colleges can provide an invaluable service to people who have aspirations to transfer to a 4-year institution and

complete a STEM major. The NCES (2008) found that the percentage of adults age 45 and older who attend career- or job-related courses at community colleges had increased from 1995 to 2005. The increase was from 39.6 to 45% for ages 45 to 49, 34.4 to 36% for ages 50 to 54, and 26.7 to 44.7% for ages 50 to 59.

Many adult learners have either recently been laid off or are being required to upgrade their skill sets through higher education courses. Rather than retiring, Baby Boomers are remaining in the workforce due to financial incentives or benefits of socialization (Charness & Czaja, 2006). Many adult learners are requiring coursework that is directly related to their career goals and pathways. The Portland West Coast Community College Survey of Students changed the previously considered profile of mature student learners. Rather than looking for enrichment classes, four out of five students reported they were taking classes to upgrade their skills with the purpose of re-entering the workforce or pursuing a new career (Portland Community College Taskforce on Aging, 2007).

To accommodate this demand, community colleges need to know what engagement challenges adult learners face once they step onto campus. The issue is not limited to just handling the increasing population numbers, but also how to better accommodate their unique needs. This requires a focused effort on updated curriculum and programs designed for adult learners.

There is a convergence of opportunities and dilemmas for community college administrators as they try to address the needs of adult learners. Many adult learners are finding themselves in a tough fiscal position due to layoffs and salary reductions. Without ample time to recover financial losses, many adults need to extend their working career by remaking themselves and learning new skills.

Purpose of the Study

The purpose of this study considered the effect of student engagement factors on adult learners within the community college system. The focus of this study was to determine if adult community college students' interaction with faculty/staff and their own academic engagement impacts their aspirations to transfer to a 4-year institution or to major in a STEM field.

The lack of engagement for adult learners can often create issues with academic persistence and success. George Kuh (2003) defined engagement as "the time and energy students devote to educationally sound activities inside and outside the classroom, and the policies and practices that institutions use to induce students to take part in these activities" (pp. 24–25). Engagement has directly to do with the quality and quantity of time students invest in their educational activities. Kuh further defined engagement as:

> the more students study a subject, the more they learn about it. Similarly, the more students practice and get feedback from the faculty and staff members on their writing, speaking, and collaborative problem solving, the more adept they become at those skills" (cited in Harper & Quaye, 2009, p. 313).

The importance of engagement often has been researched and analyzed by scholars in the context of 4-year degree programs. There is a large body of research on engagement and its effects on adult STEM students at 4-year institutions, but there is not as much research on adult engagement within the context of community colleges. According to Starobin, Laanan, & Burger (2010), the influences of academic success among students in STEM fields at community colleges have not been thoroughly explored.

One purpose of this study was to add to the current body of literature on engagement research, specifically community college engagement. The influence of adult students attending community colleges is an emerging field where more research is needed. The engagement of adult learners at community colleges with STEM aspirations also has not been extensively analyzed by scholars. There has been much research on adult learners at 4-year institutions, but there is a lack of scholarly work related to this population at 2-year institutions.

This research sought to answer if adult students are impacted by certain engagement factors more so than by other variables. The results of this analysis were connected to existing scholarly literature that has focused on adult learners, student engagement, and community college students in the STEM academic areas.

Research Questions

The following research questions served as the focus of this study:

1. What are the demographics of adult students at community colleges?
2. How are student engagement constructs measured by variables in the STEM Student Success Literacy (SSSL) instrument?
3. To what extent do engagement and other student variables predict adult learners' intention to transfer to a 4-year institution?
4. To what extent do engagement and other student variables predict adult learners' intention to major or not major in STEM fields?

Hypotheses

Based on the review of the literature, two null hypotheses were established regarding the influence of adult student engagement on students' intention to transfer to a 4-year institution.

H_0^1: Student engagement factors will have no influence on the intention of adult community college students to transfer to a 4-year institution .

H_0^2: Student engagement factors will have no influence on the intention of adult community college students to major in a STEM discipline.

Methodological Approach

For this study, quantitative techniques and a corelational research design was used. Data were taken from the results of a questionnaire administered by researchers at Iowa State University. This survey was piloted at community colleges in the state of Iowa and also administered at 15 community colleges in the state of Iowa. The researchers used self-reported information on intention to transfer and student engagement factors to conduct the research.

This study analyzed the intention of adult students to transfer. Researchers typically use the age of 25 years as the line of demarcation for adult students; this standard was used in this research project. The primary goal of this analysis was to explore engagement variables and their impact on STEM transfer aspirations. The secondary goal of this study was to examine what student engagement factors impact adult learners in their journey through higher education.

Conceptual Framework

This study was guided by two theoretical frameworks: Malcolm Knowles's (1980) andragogy and Alexander Astin's (1993) theory of involvement. Much research has been conducted and continues to be conducted in the areas of student engagement and involvement, but Astin's (1993) theory of involvement served as the overarching framework for the study. Knowles's (1980) pioneering work on adult learners also served as the theoretical basis for this study. Both theories focus on the influence of the variables associated with student background characteristics as well as the student engagement, campus life, and outside influences on students' educational outcomes.

Astin's Theory of Involvement

Astin's (1993) theory of involvement may be better known to some as the I–E–O (input–environment–output) model of student engagement. The inputs in this theory are the characteristics that each individual student brings to college with them, more specifically their demographics. Some of those input variables included in this model are the following: age, ethnicity, gender, sexual orientation, native language, intended college major, high school grade point average (GPA), and financial status. To help ascertain Astin's (1993) theoretical framework, it's important to explore the potentially arcane term of involvement. In his book, *What Matters in College: Four Critical Years Revisited,* Astin (1993) discussed the underlying tenets of his framework:

> Inputs refer to the characteristics of the student at the time of initial entry to the institution; environment refers to various programs, policies, faculty, peers, and educational experiences to which the student is exposed; and outcomes refers to the students characteristics after exposure to the environment. (p. 7)

Environmental variables in Astin's (1993) theory are the experiences that shape a student's perspective during their educational track. Possible environment variables include the following: amount of time spent living in a residence hall, amount of time spent working part time or full time, peer relationships, participation in extracurricular athletics, joining on campus organizations, or developing a relationship with staff or faculty.

The outputs outlined in Astin's (1993) theory include students' characteristics after leaving college. Possible output variables are: degree attainment, college GPA, career goals, and employment status. "The basic purpose of the model is to assess the impact of various environmental experiences by determining whether students grow or change differently under varying environmental conditions" (Astin, 1993, p. 7).

Astin's (1993) framework is applicable to research on adult learners. This model depicts the relationships between variables. The interaction of the variables is influenced by the interaction within the higher education environment. Adult learners' ability to invest time, energy, and money into their academic surroundings has a profound impact on their ability to matriculate to a 4-year degree program. This theorem helps conceptualize the relationship between the amount of time and energy students invest in academic endeavors and their ultimate ability to matriculate at a 4-year institution. The present study analyzed such variables as peer interaction and staff/faculty coursework engagement to determine if the environmental factors have any influence on the output variable—STEM aspirations.

Andragogy

The study of adult learners has existed for centuries. Knowles popularized and formalized the study of adult learners in the 1960s with the formal term "andragogy." Scholars often forget that Knowles did not single-handedly create this conceptual framework.

"Knowles did not coin the term 'andragogy,' rather it goes back to 19th-century Germany" (Moberg, 2006, p. 5).

The historical framework on adult learners was synthesized by Knowles. He aggregated the work done by organizational design researchers and operationalized the term andragogy into a respected construct within academic circles. Adults are largely defined by their social and cultural roles and positions. Knowles (1980) authored the book, *The Modern Practice of Adult Education*, which helps shed light on his definition of an adult.

> A person is adult to the extent that individual is performing social roles typically assigned by our culture to who it considers to be adults—the roles of worker, spouse, parent, responsible citizen, soldier, and the like. . . . A person is adult to the extent that the individual perceives herself or himself to be essentially responsible for her or his own life. (p. 24)

Adult students are commonly defined as undergraduate students who are 25 years and older and enrolled in credited academic programs (Compton, Cox, & Laanan, 2006; CAEL, 2008; Kasworm, 1990). Defining adult by using the age of 25 helps simplify a complex and sometime obtuse way of classifying adult students. CAEL (2008) acknowledged the complexity of defining by adults by age but maintained that "due to how data on students are currently collected in the U.S. and at the state level, most of the measures used in this report rest on the age-based definition (25 years and older)" (p. 19).

Knowles (1980) maintained that adults need a separate and unique framework to capture their distinct needs and characteristics. He intimated that pedagogy, which is geared for young learners, is not adequate for adult students. "One problem was that pedagogy was premised on conception of the purpose of education—namely, the transmittal of knowledge

and skills that had stood the test of time-that adult learners seemed to sense was insufficient" (Knowles, 1980 p. 40). The focus of andragogy is on the learner versus the educator. Knowles (1980) provided a separate educational framework that validates the importance of adult students. "Since adult learning theory focuses on teachers as facilitators of learning, it emphasizes interpersonal and adult relational skills in addition to subject knowledge" (Blanchard, Hinchey, & Bennett, 2011, p. 6).

Knowles' (1984) initial research found four underlying commonalities among adult learners:

1. They are self-directed, take responsibility for their own actions, and resist having information arbitrarily imposed on them.
2. They have an extensive depth of experience, which serves as a critical component in the foundation of their self-identity.
3. They are ready to learn. As most adult learners return to college voluntarily, they are likely to actively engage in the learning process.
4. They are task motivated. Adult students returning to college attend for a specific goal and the primary component of their motivational drive tends to be internal.

Significance of the Study

The intention of this study was to provide administrators with an understanding of adult students at Iowa community colleges and the engagement practices that influence students' intentions to transfer. This study used exploratory and confirmatory factor analyses to help establish a conceptual model of community college student engagement. The student engagement model can provide administrators and policymakers with an overview of how

adult community college students in the state of Iowa interact with faculty/staff and their individual study habits.

Higher education is serving an influx of adult learners who require a formal education to remain in the workforce or to start a new career. This study is significant because it sought to help administrators and educators better understand the unique needs of adult learners. Adult learners often bring a level of dedication and work ethic that is not found in all traditional students. An extensive amount of research has not been conducted on what influences adult community college students who seek to transfer to a 4-year institution and major in the STEM disciplines. Additional scholarly information is needed to strengthen existing programs and plan for those wanting to re-enter the market. To close that gap, new educational pathways must be formed and re-engineered at community colleges. Strengthening existing programs for the growing number of adults who wish to overcome a deficit in their education also provides a strong financial incentive for community colleges. Ignoring this opportunity leads to a risk of losing significant sources of revenue (Yankelovish, 2005). Community college funding levels are decreasing at both the state and the national level. The creation of the No Child Left Behind legislation in 2001 called for increased accountability at all levels of education, and many states are moving toward a performance-based funding system. At a time when many states are cutting funding for community colleges, it is imperative for these institutions to diversify and increase revenue streams.

Community college access for adult students is imperative for those who intend to pursue jobs in the STEM sectors. The STEM disciplines are dealing with a dearth of qualified professionals pursuing careers in the physical sciences. Community colleges, with

their focus on access, have a great opportunity to help solve the growing gap between the supply of STEM professionals and the current demand. "Million refers to the number of new professionals needed to enter science, technology, engineering, and mathematics-related (STEM) fields by 2010 just to replace Baby Boomers retiring from the STEM workforce" (Malcolm, 2010, p. 28).

Many of those people needed to replace retiring STEM workers will be over the age of 25. Enrollment of adult students at colleges has increased faster than that of their younger counterparts. Between 2000 and 2010, the enrollment of students under age 25 increased by 34%; however, enrollment of students 25 years of age and older rose 42% during the same period. NCES (2012) has projected a rise of 11% in enrollments of students under 25 from 2010 to 2020 and a rise of 20% in enrollments of students 25 and over.

Adult learners who have chosen to re-enter the academy are creating opportunities for community colleges to develop programs that meet the needs of a competitive technologically oriented marketplace. Community colleges are in a position to connect with older students in a meaningful way by being the primary vehicle to unleash their social capital and talent that our communities and employers need (Zeiss, 2006). If access is going to be increased for adult learners, community colleges must better understand the engagement factors specific to this population.

Further analyses through the use of two logistic regression models were used to establish what demographic and engagement variables influence students' intentions to transfer or students' STEM aspirations. The analysis of the logistic regressions provides community college administrators and faculty with best practices in engagement to pass on to

their deans and instructors so that these best practices may be implemented in the classroom environment.

The significance of this study centers on the analysis of student engagement factors specific to students over the age of 25. The premise surrounding this study was that faculty/ staff interaction and individual study habits impact the intention of adult learners to transfer to a 4-year institution. The inability of these students to invest not only psychologically, but also physically, in their campus setting has an impact on their intention to transfer. Many adult students hold down a job while attending college, but the older, nontraditional student populations of community colleges certainly reflect a higher percentage of student/job holders that are deserving of an institution's attention.

Definitions of Terms

Adult student (learner): An undergraduate student who is 25 years old or older and enrolled in credited academic programs (Kasworm, 1990).

Andragogy: The art and science of helping adults learn (Knowles, 1980).

Construct: A set of interrelated concepts or variables (Creswell, 2009).

CCSSE: An acronym for the Community College Student Survey of Engagement.

Intention to transfer: A student's plans to continue his or her education by moving from a community college and enrolling in courses at a 4-year public or private college or university.

SSSL (STEM Student Success Literacy) survey: The survey instrument used in this research project.

STEM: An acronym for science, technology, engineering, and mathematics.

Student engagement: The time and energy students devote to educationally sound activities inside and outside the classroom, and the policies and practices that institutions use to induce students to take part in these activities (Kuh, 2003).

Student involvement: The quantity and quality of the physical and physiological energy that students invest in college experience (Astin, 1999).

Traditional learner: An undergraduate student who is 24 years of age or younger and enrolled in credited academic programs.

URM: An acronym for underrepresented minorities, which includes the following ethnic groups: Blacks, Mexican Americans, Native Americans (that is, American Indian, Alaska Natives, and Native Hawaiians), and mainland Puerto Ricans (Association of American Medical Colleges [AAMC], n.d.).

Summary

The intent of this research study was to help community college administrators and faculty members create policies that best serve adult learners. Adult students are an important part of higher education. They are a growing segment of the population of students who are entering colleges and have many unique needs compared to their traditional-age counterparts. As community colleges attempt to enhance student engagement and foster adult learners, it is important to understand the significance of student engagement among adult students.

This study built upon existing research in student engagement and added new knowledge of adult student engagement. Important practical implications for this investigation exist as institutional officials and faculty members continue to strive to improve success for community college students, especially adult learners. Chapter 2 provides a

review of the literature on community colleges, andragogy, STEM education, and student engagement. Chapter 3 presents the methodology and research design of the study. Chapter 4 presents the results of the study. Finally, chapter 5 summarizes the results of the study and presents the discussion, conclusions, implications, and recommendations for future research, policy, and practice.

CHAPTER 2. LITERATURE REVIEW

Introduction

President Obama has recognized that the only way for the United States to improve its economy is through a strong investment and commitment to higher education. A report released by the Lumina Foundation (2013) entitled, *A Stronger Nation Through Higher Education*, discusses this issue at length. Further, "as a nation this means we must continue to focus on approaches that make higher education more accessible and affordable to all" (Lumina Foundation, 2012, para. 2). Increasing the level of college degree attainment is imperative, as today's business world demands innovative education and training programs that prepare employees to thrive in a global workplace. If higher education is able to successfully recruit and retain adult learners, many of these socioeconomic advances can be accomplished.

The current recession is providing opportunities for higher education. As Kistler (2011) noted,

> Since a lot of the unemployed will be looking at education and training programs to help them to be more marketable and competitive in the current job market, it is important for us to look at the principles or characteristics of adult learners and how we can incorporate these into our education and training programs. (p. 3)

Because of the bad economy, adult learners are more likely to be unemployed than are younger adults. In 2010 in the United States, the largest percentage of the total unemployed (58.7%) were persons 25 to 54 years of age with an additional 13.7% in the 55 years of age and older category (U.S. Census Bureau, as cited in Kistler, 2011). A press release by the Lumina Foundation provides validation that educators need to be made aware

of this socioeconomic trend: “Lumina’s big goal is to have 60 percent of Americans hold high-quality, two or four year college degrees and credentials by 2025” (“Meeting President,” 2009, para. 2). The impetus for this goal is to create a knowledge-based economy that will keep the United States at the forefront of global innovation. To realize this lofty goal, it is imperative that institutions of higher education invest in programs and courses of study that will be specifically marketed toward adult students.

Adult learners are an integral part of the higher education system. These students present a specific set of opportunities and needs for every academic institution. They have many work–life balance and financial issues that are unique to this demographic group. As a nation, the United Stated is getting older and more diverse. Current demographic trends present an opportunity for the academy and, more specifically, the community college system. Community colleges need to pay attention to the needs of adult learners. Adult learners require specific programmatic and financial needs that traditional day students may not. For example, many adult learners require additional income, outside of loans and grants, to help pay for tuition and books. As a result, many of them work either full- or part-time jobs to help them pay their tuition bills.

Most students (58%) attend college part time and are forced to work part time (47%) or full time (40%) to fund their education. Many students also are forced to rely on outside funding to attend college. In 2008, approximately 46% of all community college students received some sort of financial assistance. About 21% received federal grants, whereas others accessed state aid (13%), institutional aid (11%), and federal loans (10%) (American Association of Community Colleges, 2012). Research has shown that these external responsibilities may detract from their ability to engage in their academic surroundings.

Andragogy

The theme of adult learners and their unique perspectives has a long, rich history in higher education. The focused study of adult learners has been around for centuries. Knowles (1984) popularized and formalized the study of adult learners in the 1960s with the formal term andragogy and gave a historical account of the beginnings of andragogy in the United States. "Between 1929 and 1949 the *Journal of Adult Education*, published by the American Association of Adult Education, carried articles that deviated from pedagogical model" (Knowles, 1980, p. 41). In the 1960s a seminal study by Cyril Houis focusing on adult learners was conducted. Houlis wrote the book, *The Inquiring Mind*, which categorized his research participants into three distinct groups:

> The first . . . the goal oriented, are those who use education as a means of accomplishing fairly clear cut objectives. The second, the activity-oriented, are those who take part because they find in the circumstances of the learning a meaning which has no necessary connection . . . with the content or the announced purposes of the activity. The third, the learning-oriented seek knowledge for its own sake. (Knowles, 1980, p. 42)

Going back to the 1950s and 1960s, Knowles's work was pre-dated by research conducted by organizational design (OD) practitioners.

> In the 1950s and 1960s, OD practitioners created new learning models because traditional higher education pedagogical models did not translate well into the workplace training environment. OD practitioners work eventually helped coin the term andragogy to recognize the needs and features of this distinct learning population and to separate adult learning theory from traditional pedagogy. A great

> deal of Knowles and other OD practitioners' research about adult learning was conducted during the 1960's. (Kenner & Weinerman, 2011, p. 88)

This historical framework was synthesized by Knowles (1980), who aggregated the work done by OD researchers and operationalized the term andragogy into a respected construct within academic circles. The term andragogy and the scholar Malcolm Knowles are fundamental to the scholarly understanding of adult learners.

Definition

Knowles (1980) authored the book, *The Modern Practice of Adult Education*, which helped shed light on the definition of an adult:

> A person is adult to the extent that individual is performing social roles typically assigned by our culture to who it considers to be adults—the roles of worker, spouse, parent, responsible citizen, soldier, and the like. . . . A person is adult to the extent that the individual perceives herself or himself to be essentially responsible for her or his own life. (p. 24)

Knowles (1980) has provided an educational framework that validates the importance of adult students. He is "the best-known modern interpreter and advocate of andragogy as both a word and a philosophically-rooted methodology" (Rachel, 2002, p. 210). Knowles (1980) argued that adult learners have a disparate set of needs from those of traditional students. The article elaborates on the foundation of andragogy. Knowles's (1984) initial research found four underlying commonalities among adult learners:

1. They are self-directed, take responsibility for their own actions, and resist having information arbitrarily imposed on them.

2. They have an extensive depth of experience, which serves as a critical component in the foundation of their self-identity.
3. They are ready to learn. As most adult learners return to college voluntarily, they are likely to actively engage in the learning process.
4. They are task motivated. Adult students returning to college attend for a specific goal and the primary component of their motivational drive tends to be internal.

Nontraditional Student Versus Adult Learners

Sometimes in academic research, the terms nontraditional and adult learners are used interchangeably, but for purposes of this study a distinction must be made between these two groups. CAEL (2008) acknowledged the similarities with the "nontraditional" definition, but acknowledged that adults have disparate needs and characteristics. Adult learners are a defined subset of the nontraditional group with separate characteristics. Given the lack of clarity and precision, the terms "nontraditional" and "nontraditional student" have been considered problematic by both scholars and practitioners (Levin, 2007). CAEL (2008) has used a variety of factors to identify the differences between nontraditional students and adult learners. CAEL(2008) has stated that adult students have a variety of nontraditional characteristics including part-time enrollment, full-time employment, financial independence, and parental responsibilities that create needs that differ from those of a traditional student (Flint, 2005).

Common Characteristics of Adult Learners

To distinguish between nontraditional and adult learners it is important to explore the characteristics most commonly found in older students. For many years, academic

researchers relied on the original underlying characteristics to guide their studies on adult learners, but after additional research was conducted, the commonalities were further clarified and expanded. Researchers further operationalized Knowles's (1980, 1984) work to develop five common traits among adult learners:

1. Adults have a high need to know why they need to know something. They learn best when they self-discover learning gaps through real and simulated experiences.
2. Adults have an independent self-concept, take responsibility for their life, are increasingly self-directed, and have a deep psychological need to control learning.
3. Adults enter into learning with a greater volume and quality of experiences. They vary in learning styles, backgrounds, motivational factors, and needs; this fund of knowledge provides rich resources for learning through activities such as simulation, group discussion, and case method, but can form biases that inhibit the integration of new material.
4. Readiness to learn results from real-life problems and entry into new developmental stages and changing social roles. These stages can be jumpstarted through such activities as career counseling and simulation.
5. Adult learning is life-centered rather than subject-centered; the greatest motivation is internal and when an activity presents new knowledge, values, and skills readily applicable to real-life. (Blanchard et al., 2011, p. 3)

Some of those common characteristics that define adult students also present academic challenges for them. The U.S. Department of Education (NCES, 1998) identified four primary hurdles for students enrolling in higher education: time, lack of money, child

care concerns, and transportation (or location of the program). "We have seen that time is usually listed as a major barrier to more participation in a variety of worthwhile endeavors" (NCES, 1998, p. 52).

Bean and Metzner (1985) concluded that students 25 years of age or older were more likely to have lower parental educational attainment. In a report on nontraditional students, NCES (1995) found that older students (24 years of age or older) tended to have less educated parents than did their younger counterparts. Older students were much less likely than were younger students to have a parent with a bachelor's degree (25% compared with 43%, respectively).

One primary characteristic that is relevant to adult learners involves the way that educational content is delivered. Adult learners are concerned with content that is focused on solving problems versus abstract and theory-driven material. Coursework, regardless of program, must be designed to incorporate their current life activities. "In order for adult learners to make a connection with the materials being presented, information should be as individualized and personalized as much as possible" (Holyoke & Larson, 2009, p. 9). If assignments are designed to incorporate real life situations, adult learners are more likely to respond positively.

One of the most pervasive characteristics often associated with adult learners is self-direction. Many adult learners are self-motivated and do not need much prodding from faculty and staff. This inherently high level of work ethic, which is pervasive in adult learners, is a strong value-add to any higher education institution. Many faculty and staff benefit from the sense of integrity that many adult learners pour into their educational workload. Kistler (2011) referred to this characteristic of adult learners:

> [They] are motivated to learn when they perceive that learning will help them to address their own problems, needs, or concerns and ultimately, improve their quality of life. In addition, the most effective learning occurs when the change in behavior (i.e., knowledge, attitude, skills and practices) is presented in the context of their application to their own life. Therefore, it is critical for educators to use real-world examples and scenarios that the learners can understand and relate to their own life situations. (p. 3)

Research has shown that adult learners are typically self-motivated. They do not need instructors to patronize them to get them to complete and submit their work on time. These students are typically intrinsically motivated relative to traditional students.

> Adults are more responsive to internal motivators than external motivators. Yes, most adults do respond to external motivators like better jobs, promotions and higher salaries; however, internal motivators like increased self-esteem, job satisfaction and quality of life are the most persuasive. (Kistler, 2011, p. 2)

The role of experience is a key aspect of andragogy. Adults enter into undertaking courses with a different background of experience from that of their youth. Having lived longer, they have accumulated a greater volume of experience (Knowles, 1980, p. 50). Children and teenagers have not had the kind of tacit experience as their adult counterparts. "Children have not had the experience of making their own living, marrying, having children, taking real community responsibility, or being responsible for the welfare of others" (Knowles, 1980, p. 51).

The typical adult learner is very concerned about the cost/benefits associated with going back to college. This means that colleges of all types must recognize the importance

of investing in programs that place students on a specific career path. It is imperative that colleges recognize this key trait among adult students "Most adult learners enroll in professional programs such as business, health care, or education" ("Adult Learners," 2004, p. 8).

Another characteristic that is relevant to adult learners revolves around the way that educational content is delivered. The research has suggested that content can be made more relevant through the following manner: "Materials should be delivered focusing on problems as opposed to just context" (Holyoke & Larson, 2009, p. 9). Coursework, regardless of program, must be designed to incorporate their current life activities. "In order for adult learners to make a connection with the materials being presented, information should be as individualized and personalized as much as possible" (Holyoke & Larson, 2009, p. 9). If assignments are designed to incorporate real-life situations, adult learners are more likely to positively respond. Moreover, Knowles (2005) maintained that educators must "help the learners become aware of the 'need to know'" (Blanchard et al., 2011, p. 7).

To appreciate the specific needs of adult learners, one must also look at their demographic profile. Adult learners have many work–life demands because many are married or in significant relationships and are employed either part time or full time. This creates scheduling conflicts for many adult learners. Karen Milheim (2005) discussed these external mitigating factors that impact their academic trajectory and indicated that higher education is not the "central feature of their lives, but just one of a multiplicity of activities in which they are engaged every day" (p. 124). Research has shown that the demographic trends indicate that many adults struggle with work–life balance. Nearly half of all college students are age 25 or older, with that proportion expected to increase. About 70 percent of

these students seek a degree; an almost equal number are part-time. The addition of college coursework to their schedules makes for significant time demands – nearly 80 percent of adult learners are employed, and about two-third are married (Hoover, 2009).

It is important to ensure that the more common characteristics of adult learners are not ignored by educators. Lee Bash, Dean of Lifelong Learning at Baldwin-Wallace in Ohio pointed out that many students bring a large amount of tacit experience into the classroom. Bash commented, "These students have accumulated a wealth of life experiences that they wish to connect with their learning" (cited in "Adult Learners," 2004, p. 8). These same students demand curriculum that will help them attain their educational and professional goals. The article purports that "adult learners seek relevancy in their studies, having little patience for assignments or courses that they don't feel relate to their life or their goal" ("Adult Learners," 2004, p. 8). Effective adult educators incorporate the prior experiences of their learners. "Because adults are themselves richer resources for learning than is true of children, greater emphasis can be placed on techniques that tap the experience of adult learners, such as group discussions" (Knowles, 1980, p. 50). This emphasis on experiential techniques is salient for adult learners.

The higher the level of educational attainment, the more likely individuals are to succeed in their professional track. The U.S. Department of Education statistics showed that workers with an associate's degree, for example, typically earn 20 percent more over their lifetime than those with only a high school education and 40 percent more than high school dropouts (Baum, Ma, & Payea, 2010, p. 12). Adult learners with a college degree not only make more money than do their nondegree counterparts, they also are more likely to be gainfully employed than their non-degree holding counterparts and are likely to enjoy more

job stability. "Moreover, future labor market demand is expected to favor workers with higher levels of education" (Sommers & Franklin, 2012, cited in Tolbert, 2012, p. 1)

The demographic trend of more adult students means more students may need help balancing multiple competing responsibilities in their lives. Community colleges must acknowledge these issues and create policies and programs that address them. To prepare adult learners for re-entry, community colleges need to invest in transition support, access to financial aid, and academic and college-readiness skills.

Student Engagement Theories

To better understand adult learners, it is important to analyze how student engagement affects adult learners and their academic success. Andragogy is the primary academic framework this research study employed, but student engagement theories were also a critical component of this analysis.

Astin's (1993) theory of student engagement is the theoretical framework that was selected to analyze adult learners within the context of postsecondary education. The ability of adult learners to invest time, energy, and money in their academic surroundings has a profound impact on their ability to persist toward degree completion. Astin is one of the original scholars who led the study of student engagement as it relates to academic success. Astin (1968) originally posited a new way of understanding how students engage in their academic surroundings. He labeled this theorem the "student characteristics approach." This theory is "based on the assumption that environments are transmitted by people and that college environment depends on the personal characteristics of the students, faculty, administration, and staff of the institution" (Astin, 1968, p. 7). Astin (1968) defined environment in terms of eight characteristics of the student body, namely, average

intelligence, size, and six personal orientations based on the proportions of the students in six broad areas of study: realistic, scientific, social, conventional, enterprising, and artistic (p. 8). Engagement was further defined as "the amount of physical and psychological energy that the student devotes to the academic experience" (Junco, Heiberger, & Loken, 2010, p. 2). This theorem helps conceptualize the relationship between the amount of time and energy students invest in academic endeavors and their ultimate academic success.

One of the most widely researched areas of higher education is student involvement. To grasp Astin's (1968, 1999) theoretical framework, one must understand the potentially arcane term of involvement. "Involvement is a complex concept that encompasses the 'amount of [both] physical and psychological energy' that a student invests in college" (Astin, 1999, p. 513). According to the research, the more vested students are in their institutional community, the greater the chance for positive academic outcomes. "Research has consistently shown that the more students are active on campus and the more they feel a part of campus life, the more likely they are to have positive outcomes such as cognitive gains, satisfaction, and retention" (Sharkness & DeAngelo, 2010, p. 480).

Astin's Input–Environment–Outcome Model

Astin's (1993) I–E–O framework is applicable to research on adult learners. This model depicts the relationships among variables. Examples of some input variables from students' background that they bring to the institution include: age, traditional/ nontraditional student status, ethnicity, number of hours worked, and intention to transfer. The interaction of the variables is influenced by the students' engagement within their academic environment.

One of the most widely researched areas of higher education is student involvement. To grasp Astin's (1993) theoretical framework, it is imperative to better understand the potentially arcane term of involvement. Astin (1993) developed his I–E–O conceptual framework 40 years ago. In the book, *What Matters in College: Four Critical Years Revisited,* he discussed the underlying tenets of his framework:

> Inputs refer to the characteristics of the student at the time of initial entry to the institution; environment refers to various programs, policies, faculty, peers, and educational experiences to which the student is exposed; and outcomes refers to the students characteristics after exposure to the environment. (Astin, 1993, p. 7)

Input and student involvement. The I–O–E framework involves the amount of change or growth that students experience during their collegiate path. "The basic purpose of the model is to assess the impact of various environmental experiences by determining whether students grow or change differently under varying environmental conditions" (Astin, 1993, p. 7). The more experience that adult students bring with them to the classroom, the more likely they are to persist. "Students having 'significant' college experience before enrolling were more likely to succeed and students receiving financial aid were three to four times more likely to persist" (Wlodkowski, Mauldin, & Gahn, 2001, p. 3).

Astin (1993) posited a pre- and posttest methodology to assess the growth that college may have provided students. For example, the Graduate Record Examination (GRE) is of little value without a proxy against which to compare it. Astin (1993) cited the importance of having a pre- and a posttest to evaluate the growth of the student, stating that "a GRE score takes on much greater significance when we can compare it to the student's performance on a similar measure, such as the SAT" (p. 13). In general, when an outcome measure is

compared with an input performance, this framework can help evaluate the impact of growth for that student.

Environment and student involvement. Environmental variables are critical in evaluating the direct and indirect impacts that an institution has on a student's growth. Institutional characteristics are an imperative part of the I–E–O model. In the United States, institutions of higher education typically have been categorized by two distinct characteristics: type and control. Astin (1993) explained this categorization: "Type ordinarily refers to the level of highest degree offered (four year college, university), whereas control usually refers to the principal source of governance or control (public, Protestant, Roman Catholic, nonsectarian)" (p. 33). In addition, another variable that impacts the environment is the research orientation of the institution. Astin (1993) clarified this variable by stating, "Research orientation is defined primarily by the faculty's publication rate, time spent conducting research, and personal commitment to research and scholarship" (p. 37).

"Involvement is a complex concept that incorporates the 'amount of [both] physical and psychological energy' that a student invests in college" (Astin, 1999, p. 513). According to previous research, the more vested students are in their institutional community, the greater the chance for positive academic outcomes. Research has consistently shown that, the more students are active on campus and the more they feel a part of campus life, the more likely they are to have positive outcomes such as cognitive gains, satisfaction, and retention (Astin, 1993).

In Astin's (1968) book, *The College Environment*, he discussed the most important aspect of his early research on engagement—peer engagement. From the point of view of the prospective college student, the stimuli provided by his or her peers may represent the most

significant aspect of the college environment (Astin, 1968, p. 15). Astin (1968) actively recognized the importance of peer involvement as it relates to student engagement:

> The potential impact of the peer environment becomes apparent when one realizes the great variety of roles that the student and his classmates can play with respect to each other: friend, competitor, adviser, or confidant, sexual partner, intellectual companion and so on. (p. 15)

One of the quintessential aspects of engagement is the impact of faculty interaction on student outcomes. The institutional profile of the school has a direct impact on the relationship between faculty and students. If adult students do not take the time to engage with faculty members outside of the classroom, their academic success may be put in jeopardy. Adult students traditionally do not have as much time to invest in their academic surroundings due to work and family obligations. Faculty members must recognize adult learners as people first and students second to properly assign the necessary time to ensure their academic success. Astin's (1968) earlier research found that faculty interaction is necessary for positive student engagement: "One of the most interesting patterns of relationships observed in the analysis of the classroom environment is the positive association between involvement in class and the teachers knowing the student's names, encouraging class discussion, giving pop quizzes, and taking roll" (p. 13). Further, "faculty believe that enhancing self-understanding, developing moral character, and helping students develop their personal values should be either essential or very important goals of undergraduate education" (Astin, Astin, Chopp, Delbanco, & Speers, 2007, p. 28). Researchers have maintained the importance of academic freedom when it comes to faculty

mentoring of students. This mentoring should develop organically as opposed to forcing a relationship due to time and proximity.

Higher education is supposed to prepare students for success, not just professionally, but also as greater global citizens. "Education, in its most basic sense, prepares students to understand the self and the world" (Astin et al, 2007, p. 30). The efforts of the academy are imperative in helping students find their vocation in life. Institutional characteristics have a direct influence on a student's life well after graduation. "The influence of institutional characteristics on student engagement extends well beyond global characteristics such as size and institutional mission" (Pike & Kuh, 2005, p. 187). The level of student engagement goes beyond any utopist community college strategic plan or mission statement but requires the investment of both student and faculty to attain positive learning outcomes.

Studies and research on student involvement have specifically intimated that engagement is related to increases in academic achievement and critical thinking skills. Research has validated the importance of students investing in their educational surroundings. Pike & Kuh (2005) stated, "Research has strongly supported this assumption, indicating that engagement is positively related to objective and subjective measures of gains in general abilities and critical thinking" (p. 186). According to Astin's (1968, 1999) theoretical premise, student engagement is directly related to academic achievement.

Instrumentation

For this study, it was important to understand the instrumentation that researchers utilize when analyzing student engagement. One of the most important sources of student engagement information is the survey issued by the National Survey of Student Engagement (NSSE). Much of the research conducted on student engagement is derived from the data

collected using this research instrument. "NSSE instruments . . . develop and examine a variety of involvement/engagement scales that measure everything from academic challenge and student-faculty interaction to diversity experiences" (Sharkness & DeAngelo, 2010, p. 481).

Because this study focused on 2-year institutions, the researcher analyzed the Community College Survey of Student Engagement (CCSSE) in terms of instrumentation. A theoretical underpinning of this research project involved the pioneering work of the CCSSE. This survey was created over a decade ago and has been used by community college administration across the nation to validate the engagement factors that impact such topics as academic achievement, retention, and transfer readiness. Because this instrument has been so widely used, a study on its validity was conducted.

> In 2004, the Lumina Foundation for Education approved a generous grant to support validation research to explore and document the validity of the Community College Student Report (CCSR), add to the higher education field's understanding of student engagement, and help to identify research or institutional practices that require further attention. (McClenney & Marti, 2006, p. 4)

The study was conducted because so much of the existing scholarly research on student engagement has been focused on 4-year institutions. There has been minimal investigation of the impact of student engagement in samples of community college students. Attempts to quantify the proportion of higher education literature that utilize community college samples consistently estimated the proportion of literature on community college samples at 10% or less (McClenney & Marti, 2006, p. 6)

The CCSSE instrument was of paramount importance to this research project because it has been widely researched. This survey instrument has been widely used to analyze student engagement factors in the community college system. The pattern of results obtained from this study has broadly confirmed positive relationships between the construct of student engagement as measured by CCSSE and community college outcomes. "CCSSE benchmarks and item clusters show a consistent pattern of significant association with academic outcomes like GPA, degree completion, and attainment of important academic milestones, after controlling for student characteristics and entering ability" (McClenney & Marti, 2006, p. 6). The CCSSE instrument incorporates self-reported GPAs to act as benchmarks for academic success. The authors have maintained that self-reported academic gains on CCSSE also are significantly related to actual academic achievement measures, both directly (confirmed through bivariate correlation analysis) and after controlling for student ability and background (McClenney & Marti, 2006, p. 6). This finding has helped validate CCSSE's use as a proxy measure for student academic success.

Many discussions of student engagement are attributable to the data and analysis of CCSSE. The survey

> was established in 2001 as part of the Community College Leadership Program at the University of Texas at Austin. With initial funding from The Pew Charitable Trusts and the Lumina Foundation for Education, the survey also has been co-sponsored by the Carnegie Foundation for the Advancement of Teaching and the Pew Forum on Undergraduate Learning. (McClenney, 2007, p. 137)

The CCSSE provides critical information that community college administrators utilize when reformulating programming. McClenney (2007) stated, "CCSSE's central mission is to

provide information about effective educational practice in community colleges and assist institutions and policymakers in using that information to promote improvements in student learning and retention" (p. 138). The CCSSE seeks to increase discourse and the quality of educational delivery on community college campuses. The data that are gleaned from these surveys can be used to better serve community college students.

The CCSSE has found that student engagement does matter for community colleges. McClenney (2007) has purported that "this study confirms several decades of research on effective practice in undergraduate student learning (Pascarella & Terenzini, 2005) but extends that research for the first time to large-scale samples of community college students" (p. 141). McClenney confirmed the importance of the survey for understanding student engagement at the community college level, saying that the "results validate CCSSE's use of student engagement as a proxy for student academic achievement and persistence" (p. 141).

The CCSSE found positive relationships with collaborative learning on campus related to higher GPAs and completion rates.

> CCSSE benchmarks consistently exhibited a positive relationship with outcome measures. For example, Active and Collaborative Learning, the most consistent predictor of student success across the three validation studies and across outcome measures, was linked with higher grades, higher course completion rates, number of terms enrolled, credit hours completed, long-term persistence, and degree completion. Similarly, results indicated that the Student-Faculty Interaction benchmark is related to academic and persistence outcomes. (McClenney, 2007, p. 139)

The amount of time that community college students interact with faculty positively impacts their academic success.

CCSSE also found that community colleges lose their students typically early in the transition process. "CCSSE's analyses documents the reality that community colleges lose large numbers of students during their first term and first year of college" (McClenney, 2007, p. 143). The premise of these findings is that community college faculty and administrators should focus institutional attention toward the task of engaging students the second they step on campus. This focus should start in the first few weeks and months as students enter the academy to improve retention and achievement rates.

Adult Learners in Postsecondary Education

Adult learners are inexorably linked to the community college system because of its open access and flexibility. Oftentimes adult students are not adequately prepared for the re-entry into higher education, which is why they require adult basic education courses to help with the transition into the academy. Many adult students—defined here as students 24 years of age or older—attending community college for the first time are inadequately prepared, both academically and socially, for college-level learning (Howell, 2001).

Student involvement is a cornerstone of successful integration for adult students. "Defining what can constitute involvement activities for college students in the classroom, in particular, is crucial for establishing a legitimate space for operationalizing curricula that are appropriate for adult students (Chaves, 2006, p. 138). There has been little research conducted on adult student retention and engagement at community colleges. The vast majority of research on student retention has been situated at 4-year institutions of higher education that typically enroll White, residential, and traditional-age students (Chaves, 2006, p. 140). This dearth of information presents an opportunity for scholarly work on the specific needs of adult learners in the community college system. Scholars have maintained

that adult community college students face unique challenges and require new forms of academic and institutional support.

To understand the needs of adult students, community college faculty and administrators need to evaluate where they are in terms of academic preparedness. The following steps can be used in helping assess the needs of adult students:

> First, as Sanford (1966) pointed out, it is essential to consider adult students' level of precollege readiness, challenges in college, and the support mechanisms necessary for academic success. Next, to preempt the sense of marginalization that many adult students experience during the early stages of college, administrators and adult educators must recognize that adults' presence and contributions actually matter to the institution's success (Schlossberg, 1989). Third, as Rendón (1994) has shown, one of the best ways to accord a sense of mattering to adult students is through active forms of validation, both within and outside the classroom. (Chaves, 2006, p. 141)

Kolb's (1984) theory on experiential learning and adults helped further the research on adult student engagement. His theoretical construct assumes that learning is a journey, not an outcome; that learning is best facilitated when students apply their own beliefs and ideas to a topic; and that learning involves feeling, thinking, perceiving, and behaving. Kolb (1984) maintained that experiential learning pulls together the importance of prior experience into classroom activities. Chavez (2006) stated,

> Kolb's experiential learning model connects two dialectically related modes of learning: engaging experiences and transformative experiences. He promoted classroom activities that include concrete experiences (for example, article discussions), reflective observations (such as brainstorming), abstract

> conceptualizations (hypothesizing, for example), and active experimentation (such as case studies). (p. 149)

Student engagement and prior knowledge is essential to understanding the needs of adult students. New learning experiences enrich the tacit knowledge that adult learners already possess.

> Adults create new knowledge through the transformation of experience. Although Knowles argued for self-directed learning and incorporating old knowledge and experiences, and Kolb asserted that learning in community actually facilitates the creation of new experiences and new knowledge, the two constructs—taken together—can greatly inform how community college educators design curricula and classroom activities for adult students. (Chavez, 2006, p. 145)

The transfer of classroom learning, and the immediate application of that learning, will result in greater adult student success.

Financial Aid Needs

Adult learners need readily available access to various forms of communication about financial aid. Communication regarding financial aid packages is an important part of the process of recruiting adult students back toward degree attainment. The timeliness of financial aid and detailed communication are key to adult students' success. Often adult learners are not educated on the important nuances of applying for financial aid and the associated ramifications. Financial-aid offices work to give students a breakdown of tuition, fees, and estimated aid eligibility as soon as possible. (Supiano, 2010). The method of communication is also very important to nontraditional students. It is important for financial aid offices to provide multiple methods of communication for adult students. Supiano (2010)

mentioned "Not all adult learners are comfortable using technology. While some students are savvy about doing everything online, others will call the aid office to walk them through an electronic form or are completely uncomfortable using a computer" (para. 4).

Many initiatives have provided students the ability to afford higher education. Noftsinger and Newbold (2007) spoke to these financial aid initiatives: "With the success of federal programs such as the G.I. Bill, federal efforts to enhance access to higher education were expanded to include subsidized student loans, work-study programs, and scholarship programs" (p. 10). One of the most successful federal programs has involved need-based low-interest student loans. The goal has been to "bring college within the reach of people who might not otherwise be able to enroll" (Noftsinger & Newbold, 2007, p. 11).

Programmatic Needs

Another issue of relevance to many adult students is lack of institutional programs that address their unique work and familial demands. Many programmatic needs of adult learners require a customized approach to designing courses and plans of study. This requires educators to engage in creative curriculum development. Higher education institutions must be prepared to provide a variety of course options outside of the standard classroom dynamic. Vangen (1998) discussed a variety of types of nontraditional education programs including:

- Independent learning, allowing students to work completely free of the classroom setting at their own pace;
- Open learning, which combines the benefits of independent learning with opportunities for group discussion;

- Contract programs, which merge the needs of businesses to train employees with a college's teleconferencing capabilities;
- Satellite classrooms, which lease off-site classroom space to provide educational facilities to students outside the general radius of the college; and
- Distance-learning centers, which allow students to work from course plans through the use of the Internet and to access class curriculum from anywhere. (p. 68)

Another issue that involves the programmatic needs of adult learners is access to remedial education. Many adult learners require foundational courses to advance through their degree program. Many of these courses need to be offered in the evening or on weekends so that they are conducive to an adult's schedule. If faculty and staff approach adult learners as the unique set of learners they are, these students will progress through their degree programs with a greater degree of success and fulfillment.

Adult learners require curriculum instruction that draws on their tacit experience. Research has shown that adult learners prefer instructors who have coursework that is applicable to the tangible and based on real world experiences.

> From a positive standpoint, their learning experiences provide a great resource from which to draw on. Tapping into these experiences utilizing techniques like group discussions, problem solving, case studies and simulations can enhance and benefit learning. Peer activities, where adults learn from each other, and other experiential techniques are also beneficial to learning. Adults are life-centered (or problem centered) in their orientation to learning. (Kistler, 2011, p. 13)

Adult learners tend to draw on their experiences to help them make sense of the concepts and theories in class.

Underrepresented Minorities in Postsecondary Education

The community college system presents a place for underrepresented minorities (URM) students to gain access to higher education. Two-year colleges provide a venue where many adult learners and various other URM groups are able to gain access to the academy. The traditional definition of a URM does not work well for this specific research study because the population resided in a rural, agriculturally oriented, largely Caucasian state—Iowa. The traditional definition of URM also does not typically consider specific populations, such as adult students and veterans, which are pervasive in the rural agricultural states. Adult learners make up a large portion of this nontraditional method of categorizing URMs.

Definition

Traditionally within academic research, the term URM is used in a very narrow fashion, with much emphasis placed on ethnicity and cultural background. According to the Association of American Medical Colleges (AAMC), there are many concerns regarding admissions processes into the academy based on the traditional definition of URM. The demographics of United States have changed dramatically over the last 30 years. Federal guidelines on collecting race and ethnicity data has increased to account for the changing trends.

> The Association of American Medical Colleges (AAMC) has been carefully considering its definition of "underrepresented minority" (URM) in consultation with a wide array of stakeholders. The current URM definition consists of: Blacks, Mexican Americans, Native Americans (that is, American Indian, Alaska Natives, and Native Hawaiians), and mainland Puerto Ricans. (AAMC, n.d., p. 2)

The group's myopic definition of URM is not congruent with the present study because Iowa is highly homogenous. It is imperative to consider other demographic factors such as age, veterans, and employment status. The traditional definition of URM focusing on gender, ethnicity, and socioeconomic status is antiquated and not representative of a largely rural state.

The National Institutes of Health (NIH) also considers issues of URMs in rural areas within a narrow perspective. The NIH has developed a policy for recruiting and sustaining diversity in rural areas of the United States. The NIH looks at several populations of people labeled as URMs that are in special need of recruiting in clinical and social sciences workforces in underserved areas. The NIH categorizes individuals by race, ethnicity, and socioeconomic status as with the traditional definition of URM. The following verbiage clarifies how the NIH defines URM in underserved areas:

A. Individuals from racial and ethnic groups that have been shown by the National Science Foundation to be underrepresented in health-related sciences on a national basis. . . . The following racial and ethnic groups have been shown to be underrepresented in biomedical research: American Indians or Alaska Natives, Blacks or African Americans, Hispanics or Latinos, Native Hawaiians or other Pacific Islanders. In addition, it is recognized that under-representation can vary from setting to setting and individuals from racial or ethnic groups that can be convincingly demonstrated to be underrepresented by the grantee institution should be included in the recruitment and retention plan.

B. Individuals with disabilities, who are defined as those with a physical or mental impairment that substantially limits one or more major life activities.

C. Individuals from disadvantaged backgrounds (NIH, 2009, para. 3A–3C)

Many adult learners across the nation fall into the NIH's categorization of URM, but Iowa demographics do not explicitly align with the more traditional way of analyzing URMs. For purposes of this study it is important to consider armed service status of adult students. Many adult learners in the Midwest who are entering community colleges have previous backgrounds in manufacturing or have previous military experience. See Tables 2.1 and 2.2 for a breakdown of traditional definitions of URM and the context used for this research study.

Table 2.1.

Traditional Versus Iowa Community College URM Definition Components

Common characteristics	Traditional URM definition	Iowa Community College URM definition[a]
Ethnicity (minority status)	X	X
Socioeconomic (annual income)	X	X
Employment status		X
Disability	X	X
Veteran status		X
Sexual orientation	X	X
Cultural background	X	X

[a]This literature review uncovered two unique characteristics (i.e., veteran and employment status) that were utilized to further define URMs in the Iowa Community college system.

Table 2.2.

Literature Sources for Defining Underrepresented Minorities (URM)

Author	Published	Sample/Analysis	Results
Association of American Medical Colleges (2012)	AAMC website	Not applicable	Traditional definition of underrepresented minorities
Aslanian (2001)	*Community College Journal*	Describes a study conducted by the College Board to examine what motivates adults to return to school and profile their patterns of learning as they enter and re-enter the educational system.	Found that most adults return to school to improve their careers. Forecasts the future of adult education and its implications for community colleges.
Barnard-Brak et al (2011)	*Journal of Vocational Rehabilitation*	Due to the authorization of the GI bill and continued military presence in Iraq and Afghanistan, U.S. institutions of higher education are expected to experience an influx of returning student-veterans, many of whom may have symptoms of post-traumatic stress disorder (PTSD). The purpose of the study was to examine faculty perceptions of returning student-veterans who may have symptoms of PTSD; 596 faculty members were surveyed as to their views of serving in the military, U.S. involvement in the Iraq/Afghanistan wars, and perceptions of their ability or self-efficacy to address the special needs of combat veterans in the classroom.	Results indicate that faculty perceptions about current military conflicts and the military itself may be associated with their self-efficacy to teach and work with returning student-veterans in the classroom.
Cook and Kim (2009)	American Council on Education	This report offers a national snapshot of the programs, services, and policies that campuses have in place to serve veterans and military personnel and assesses the current state of programs and services for veterans on campuses across the nation, based on survey results from 723 institutions.	The study will help campus leaders understand “the state of the art” among the most veteran-friendly campuses, recognize factors that appear to influence the level of service campuses provide, and identify gaps in their own offerings
Diramio et al. (2009)	*New Directions for Student Services*	Interviewed 25 students who had served in Iraq or Afghanistan.	Findings suggest that combat veterans are a student population with special needs and require support from both policymakers and program providers.
Kasworm (2003)	*New Directions for Student Services*	Reanalyzed the data set (NCES, 1995, 2002) relative to adult learner trends and educational practices	Older students have brought with them an increase in student diversity, although minorities were still underrepresented.

Table 2.2 (continued)

Author	Published	Sample/Analysis	Results
National Center of Educational Statistics ([NCES] 2005, 2011)	U.S. Dept. of Ed.; NCES	Survey information	For many adult students one or more factors—low literacy rates, employment status, armed services status, educational background and lower socioeconomic status—are barriers to academic achievement and advancement.
National Institutes of Health (NIH)	NIH website	Not applicable	Traditional definition of underrepresented minorities
O'Herrin (2011)	Peer review	The American Council on Education and four other higher education associations administered a national survey. More than 700 colleges and universities responded, detailing veteran-specific programs and services (or lack thereof) at their institutions.	Legislative enhancements to the Post-9/11 GI Bill passed in December 2010 will expand benefits to service members and veterans previously excluded
Radford (2010)	American Council on Education	This *Statistics in Brief* draws upon two nationally representative studies of postsecondary students, the 2007–08 National Postsecondary Student Aid Study (NPSAS:08) and the 2004/09 Beginning Postsecondary Students Longitudinal Study.	Key findings include: (1) In 2007–08, ~4% of all undergraduates and ~4% of all graduate students were veterans or military service members; ~40% of military undergraduates and 20% of military graduate students used GI Bill education benefits. (2) Unlike their nonmilitary counterparts, a majority of military undergraduates and military graduate students were male. Military students also were more likely than their nonmilitary peers to be married. (3) Military undergraduates studied at private nonprofit 4-year institutions, pursued bachelor's degrees, took a distance education course, and studied computer and information sciences more often than their nonmilitary peers. The percentage of military undergraduates who received financial aid (including GI Bill benefits) and the amount they received (including GI Bill benefits) generally exceeded or was not measurably different from those of nonmilitary independent undergraduates. (4) A larger percentage of military graduate students than nonmilitary graduate students waited 7+ years between completing their bachelor's degree and starting graduate school, were enrolled in master's degree programs, attended part time, and took a distance education course.

Table 2.2 (continued)

Author	Published	Sample/Analysis	Results
Snead & Baridon (2012)	White House Summit on Community Colleges	"This generalization is borne out by Office of the Undersecretary of Defense voluntary education statistics which document that 376,759 service members enrolled in more than 736,000 undergraduate courses funded by federal Tuition Assistance in FY 2009.	When asked why they joined the military, enlisted personnel consistently answer that the opportunity to get a college education along with the funds to pay for it is one of their top three reasons for entering military service
U.S. Census Bureau (2000, 2010)	U.S. Census Bureau	Census Bureau survey	Regional demographics in the Midwest are becoming more diverse.

Intersection of Underrepresented Minorities and Adult Learners

Because adult learners are so diverse in nature, Knowles (1980) created a separate conceptual framework in which to analyze and contextualize them. Adult students are more diverse than their traditional student counterparts are. Because adult learners are less homogenous than their younger peers are, it is imperative to understand the nuances associated with this student population. For this study, URM was not defined solely within the traditional context of ethnicity, race, or gender. Adult learners at Iowa community colleges are diverse in a nontraditional sense of the word—including veteran's status.

Veterans returning from their tours of duty and adults trying to re-enter the job markets are making up larger percentages of community college populations. Kasworm (2005) found that many adults are enrolled in community colleges. She indicated that the community college environment historically has offered a dominant collegiate place for adult students, which is reflected in classroom settings with a significant representation of adult students (25 years of age and older). Studies have reported that 60% of enrolled college adults in higher education institutions are studying at 2-year institutions and that approximately 44% of community college students are 25 years of age or older (Aslanian, 2001). The adult populations at community colleges are increasingly diverse in nature. In a research study, Kasworm (2003) found that an increase in older students has brought with it an increase in student diversity, although minorities were still underrepresented. Minority adult students represented about 24% of the adult student population according to a 1995 NCES report (Kasworm, 2003).

For many adult students, one or a combination of factors—low literacy rates, employment status, armed services status, educational background, and lower socioeconomic

status—are barriers to academic achievement and advancement. Socioeconomic backgrounds also impact adult learners within the URM context. According to the NCES (2005), this scenario is especially true for students whose families earn under $20,000 per year. This group includes "students in poverty, students whose parents have less than a high school credential, Black (non-Hispanic) and Hispanic students and students in households where Spanish is the only language spoken" (NCES, 2005, p. 3). All of those factors can be disadvantageous for student participation in higher education (NCES, 2005).

One traditional way of looking at URMs is through cultural perspectives. The present study took place in Iowa where traditionally there has been less cultural diversity compared to other parts of the United States. O'Banion (1997) acknowledged "significant learning differences" between genders and also among cultural groups" (p. 87). Educators in the Midwest, for example, are facing rapidly changing regional demographics, including a 32% increase in the Latino/Hispanic populations (U.S. Census Bureau, 2001). For those institutions showing a marked change in multicultural enrollments, the challenge may be to find a delivery methodology that works across all or many cultural groups. It also will be important for faculty to not stereotype learners within a cultural group as having similar learning preferences (O'Banion, 1997), irrespective of the age of the student.

Veteran Students

Community colleges act as an entry point for many adult learners who return from active duty. Many adult learners, some of whom are veterans, enroll in community colleges as their point of entry. Nationally, 58.7% of adult undergraduate students participate in 2-year or under institutions (that is, community colleges, technical institutes, and certain proprietary schools; NCES, 1997, as cited in Kasworm, 2003, p. 3). Adult students have

continued to increase in number, but represent a smaller percentage of the undergraduate population. Nonetheless, it is projected that the undergraduate adult student enrollments will continue to represent 35 to 38% of the undergraduate population for the next 15 years (NCES, 1995, 2002). Most of these adults enroll in college as a result of life transitions such as coming back from war or being displaced from their professional endeavors.

> Most adults enroll in college based on these personal life transitions or catalysts reflecting environmental forces, life changes, or external life-transition events. For example, adults may enter college because of a divorce, children entering school, a recent job loss, or a denied job promotion due to the lack of a college degree (Kasworm, 2002). (as cited in Kasworm, 2003 p. 6)

One of the life transitions that bring adult learners back to higher education is veteran status, more specifically, those who qualify for educational benefits. Many of these combat veterans are now eligible for expanded educational benefits under the G.I. Bill funding that started in 2009. These benefits have the potential to increase the number of returning veterans who represent a nontraditional population of students.

> The Post-9/11 Veterans Educational Assistance Act of 2008 intends to provide active duty and honorably discharged veterans four years of tuition and other financial benefits at a public or private college of their choice. The enrollment of these post-9/11 student-veterans into higher education is expected to reach record numbers within the next few years. (Barnard-Brak, Bagby, Jones, & Sulak, 2011, p. 30)

Veteran Adult Students in Postsecondary Education

An article by Green and Van Dusen (2012) spoke to the increasing number of veterans coming back from active duty who enroll in higher education. Currently, there are

over 660,000 veterans within the United States attending postsecondary educational institutions including 329,000 using their educational benefits (NCES, 2011; Radford, 2010). "With these numbers, almost 4% of U.S. undergraduate students are veterans, and 38% of the veterans are utilizing their veterans' educational benefits" (Radford, 2010, p. 4). This number could increase as more veterans become eligible for benefits. These adult learners add diversity to higher education with their unique experiences in the armed services and as students with possible disabilities, both physical and mental.

Adult learners choose to return to community colleges for a variety of reasons. Community colleges have been on the forefront of policy leadership when it comes to addressing the needs of nontraditional students, including veterans (Snead & Baridon, 2010). Dr. Stacie Hitt (2012), Operation Diploma Director for the Military Family Research Institute at Purdue University, postulated that "the nation's community colleges have traditionally provided leadership in addressing the postsecondary needs of non-traditional students" (p. 79). Looking at the statistics above, it is evident that community colleges are a key resource and access point for service members, veterans, and their families pursuing postsecondary education. The same article reflected on how a large percentage of veterans returning to higher education are choosing community colleges to start their educational journey. It has been reported that 43% of all military undergraduates and 39% of those receiving veterans' education benefits have selected public, 2-year institutions as the place to achieve their academic and career goals (Alvarez, 2008; NCES, 2009). Some of the reasons that community colleges are attractive places for veterans starting their transition back into higher education include characteristics such as affordability, program flexibility (certificates,

diplomas, career training), geographical convenience, and offerings of night and weekend classes.

> For adult learners who have no experience in a postsecondary educational setting or have been out of school for several years, community colleges also provide a variety of support services, refresher courses, and readiness programs to prepare them for the academic rigors of college-level education. (Snead & Baridon, 2010, p. 79)

Financial affordability and retention issues are pervasive challenges that impact veterans returning to higher education. Financial aid and student retention/persistence toward degree completion are the two most pressing issues facing military/veteran students (Cook & Kim, 2009).

Many veteran students deal with difficult transition issues as they re-enter higher education. Ackerman, DiRamio, & Mitchell (2009) examined the potential transition issues that affected veterans of the Iraq and Afghanistan conflicts. They identified the transition issues as follows: "connecting with peers, blending in, faculty, the campus veterans' office, financial concerns, disability services, and mental health" (p. 80). The work of Ackerman et al. (2009) addressed issues related to college administrators:

> Administrators should aid veterans through the implementation of a personalized, holistic approach. Institutions could train veteran-friendly mentors across campus. These advocates can meet with students to direct participants to appropriate services such as: financial aid, counseling, student organizations, disability services, academic advising, faculty members, and institutional research. (p. 4)

Mental Health and Veteran Students

To more effectively serve these returning veterans, faculty and staff must be prepared for disparate challenges and opportunities in the classroom. Some educators mistake students' level of social intelligence with their academic ability. Faculty need to recognize this misnomer when dealing with veteran students. Many times, veterans with psychological disorders may not exhibit high degrees of self-efficacy or social intelligence. Faculty and staff need to consider their respective backgrounds when interacting with them.

> Instructors may choose to build relationships with students who exhibit difficulties associated with PTSD or the instructor may forgo this process in favor of building relationships with students who more fit the instructor's model of learning. In this way social competence may be linked to intellectual competence, so a student, such as war veteran with PTSD symptoms, may not receive optimal guidance from an instructor who exhibits a low level of self-efficacy toward atypical student behaviors, and subsequent student achievement may decrease. (Barnard-Brak et al., 2011, p. 30)

Given that so many veterans are returning to higher education, administrators must create policies and programs that cater to this specific population of adult learners. Institutional initiatives, such as committees and training, can help raise institutional awareness of veteran student needs. Some ways for community colleges to optimize the success of veteran students include institution-wide committees, dedicated student groups, on-campus mentors, and increased faculty and staff training about their unique needs. Community college administrators and faculty should work to establish a collaborative relationship with both on-campus and off-campus military support programs to help veterans with disabilities make a successful transition into the classroom. O'Herrin (2011) has

suggested that colleges should establish specific points of contact in each department to help student veterans navigate the institution.

Science, Technology, Engineering and Math Programs

The STEM fields have been at the political forefront in the last few years. Through the passage of the America Competes Act of 2007 (ACA), Congress authorized several governmental agencies to create additional STEM programs. The act was reauthorized three years later through the America Competes Reauthorization Act of 2010 with additional requirements to increase the number of underrepresented minorities in STEM fields. President Obama has been a big proponent of investing in the STEM fields. In November of 2009, President Obama announced the Educate to Innovate campaign to move "our country from the middle to the top of the pack in science and math education over the next decade" (Office of the Press Secretary, 2009, para. 11).

The ACA was established to analyze STEM programs at the national level. One of the primary goals of this legislation was to create new programs that encourage STEM student retention and persistence. Various federal departments, including the U.S. Department of Education and the NSF, established new programs under the ACA. The U.S. Department of Education focused on the improvement of K–12 teaching in STEM disciplines and called for aligning K–12 standards with workforce needs and higher education requirements. Some new programs also established through the NSF concentrated on postsecondary STEM education.

The National Science Foundation programs provided funding for the STEM Talent Expansion program to increase the number of STEM students completing post-secondary degrees, the Graduate Research Fellowship program that provides funding

> for research-based master's or doctoral degrees in STEM fields and several other programs that focus on the retention of STEM students. (Kuenzi, 2008, p. 31)

A variety of stakeholders across the nation have identified the need for additional investment in the STEM disciplines. In the 21st century, government and business officials have identified the need for technological and scientific advancement to be recognized as innovative and competitive within the global economy (Hill, Corbett, & Rose, 2010). The ability for the United States to maintain its long-standing global economic advantages is predicated on people trained in the physical sciences. Similarly, the U.S. economy depends greatly on citizens who possess scientific and technical skills in STEM fields for economic growth (Hill et al., 2010).

The history of STEM education is deeply entrenched in the academy. American innovation and ingenuity was built on a foundation of science and engineering fields. A report released by the NSF found that the most innovative countries and individuals have strong connections within the STEM disciplines.

> STEM fields . . . have led our country to the forefront of innovation and discovery in the 19th and 20th centuries and has changed the basis of our economy. In the 21st century, scientific and technological innovations have become increasingly important as we face the benefits and challenges of both globalization and a knowledge-based economy. (National Science Board, 2007, p. 2)

If students are going to succeed in an information economy, they must develop capabilities that focus on STEM-related skill sets. Many stakeholders in the United States are recognizing the need for greater investment in STEM programs.

> Business and industry leaders, governors, policy makers, educators, higher education officials, and our national defense and security agencies have repeatedly stated the need for efforts to reform the teaching of STEM disciplines in the nation so that the United States will continue to be competitive in the global, knowledge-based economy. (National Science Board, 2007, p. 2)

The shortages in the STEM fields are due not only to a dearth of people entering science and engineering tracks, but also to pay and other compensation factors. Many individuals who are educated in STEM fields have chosen not to take positions in their respective science-related fields. A later study provided rationales as to why the STEM employment gap persists despite the larger pool of trained STEM workers (Salzman & Lowell, 2007). Hagedorn and Purnamasari (2012) posited that a number of STEM graduates opt to work in non-STEM areas because of the higher salaries, greater prestige, and better career prospects offered by financial, health care, and law firms (p. 146).

Parental involvement plays a critical factor in the perceptions of STEM students. Students' attitudes toward STEM classes (and higher education) often are influenced by their parents' perception of the physical sciences. Self-efficacy that develops in individuals as a result of positive home experiences assists them in effectively interacting with their environment (Bandura, 1997; Schunk & Pajares, 2002). Research has suggested that family influence on confidence is bidirectional between parent and child. Researchers have strongly advised that parents encourage their kids to invest in skills and knowledge related to science education. Research has recommended that parents not only teach skills and knowledge but also focus on nurturing children's beliefs about STEM.

Perception can become reality for many community college students contemplating an entry into the STEM fields. Many students who have chosen this academic path already had a proclivity toward math and other physical science backgrounds. "In regard to non-traditional career choice, academic proficiency was identified as the most influential educational factor, and math self-efficacy was identified as the most influential personal factor for student persistence" (Mau, 2003, p. 235).

Negative attitudes toward math and science can decrease the likelihood that students will entertain entering the STEM fields. Smist and Owen (1994) stressed the importance of improving self-efficacy in students; if the self-efficacy of students in the area of science improves, the students are more likely to pursue an interest in that area. Research has shown that students are more likely to enter the math and science fields if they have positive learning experiences in their early educational track. The likelihood that students will pursue science at the secondary and postsecondary level increases greatly when they are exposed to early learning experiences with science (Liu, Hsieh, Cho, & Schallert, 2006). As children become adolescents, a reciprocal relationship emerges between their choices and beliefs; therefore, when elementary students make choices concerning activities that are math/science-related, their beliefs about their ability in such activities greatly affect the academic subject choices that they make later in life (Liu et al., 2006). These researchers also suggested that academic success impacts students' choices; however, students' self-concept and beliefs about their abilities have a stronger influence on the choices that they make.

For a long period of time researchers have been calling for a re-engineering of STEM courses. Many instructors have maintained the status quo when it comes to their teaching

strategies. Research has validated that there are significant limitations of traditional lecture-based instruction. An improvement in student learning has occurred when instructors evolve the way they disseminate their class content. Substantial empirical research has shown that student learning can be improved when instructors move from traditional transmission-style instruction to more student-centered, interactive instruction (Handelsman et al., 2004).

Even though much research has been conducted on this topic, many instructors have yet to embrace changing their delivery mechanisms. For example, in 2003 the National Research Council Committee on Undergraduate Science Education pointed to the strong research base on effective teaching approaches and then questioned "why introductory science courses in many colleges and universities still rely primarily on lectures and recipe-based laboratory sessions where students memorize facts and concepts, but have little opportunity for reflection, discussion, or testing of ideas" (p. I).

There are many reasons why STEM instructors do not embrace the needed change to better engage their students. Common environmental features, such as content-coverage expectations, lack of instructor time, departmental norms, student resistance, class size and room layout, and time structure, can impede an instructor's ability to implement innovative instruction (Henderson & Dancy, 2007). For instructors to embrace, this they must be included in the change process. "An important feature of change strategies in this category is that the faculty member(s) being impacted have an important role to play by bringing their knowledge and experiences to the change process" (Henderson, Finkelstein, & Beach, 2010, p. 22).

It takes more than just faculty members to evaluate the effectiveness of STEM content. Researchers have suggested including a variety of stakeholders in the process.

"Krockover et al. (2002) provided an example of a change strategy in this category; the authors described an approach in which teams consisting of a scientist, a science educator, a K–12 teacher, a preservice teacher, and a graduate teaching assistant were created to work on the reform of three individual courses (Henderson et al., 2010, p. 22). Using a collaborative development approach at the local level, along with incorporating personal instructor preferences, has improved outcomes. Many instructors chose not to invest the time in these collaborative processes, because participating in this project required a substantial time commitment from faculty without a reduction in other responsibilities

Adult Students in the STEM Disciplines

Adult students are less likely to enter STEM disciplines than are their traditional-age peers. A study conducted by the NCES (2009) found that percentages of students entering STEM fields were higher for younger (age 19 or younger) and dependent students than for older (age 24 or older) and independent students. One potential reason for these numbers might be that adult learners do not see the advantages of a STEM degree to their chosen professional path. In addition, they may not feel that they have the time to dedicate to the more rigorous coursework that is associated with the STEM fields.

Although adult students are less likely to enter the STEM disciplines than are their younger counterparts, it is noteworthy to mention that many students have received their start in the community college system. Community colleges have played a significant role in training the STEM workforce. As highlighted in NSF's (2013) National Survey of Recent College Graduates, a surprisingly large proportion (44% overall) of those earning a degree in science and engineering (bachelor's and master's) reported that they had attended a community college (Tsapogas, 2004). Many of the students who started their STEM studies

at community colleges earned an associate's degree. Hagedorn and Purnamasari (2012) maintained, "Of all of the respondents who reported community college attendance, 28% reported earning an associate's degree, a surprisingly high proportion" (p. 153).

Underrepresented Minorities in the STEM Disciplines

Another need in the STEM disciplines has to do with the growing gap between underrepresented populations in science-related fields. There is a misconception that women do not perform as well in science-related fields as do their male counterparts. This is simply not true. "Despite the stereotypes and the presumptions that girls do not perform well in mathematics, most comparisons show that girls now score as high as their male counterparts on standardized tests" (Hyde, Lindberg, Linn, Ellis, & Williams, 2008, p. 494). Women are now entering STEM fields at increasing rates, but there is still a gender gap. "Despite the large number of women college students, the gender gap remains for participation in many STEM fields, such as engineering, manufacturing, construction technology, aviation technology, and automotive technology (Hyde et al., 2008, p. 494). Women make up only 26% of the science and engineering workforce as defined by the NSF (National Science Board, 2010).

There is uneven access to STEM fields for minority and female students. Community colleges could play a significant role in mitigating this gap. The open access philosophy is a huge attractor for minority and female STEM students. The community college system appears to be the most appropriate channel for the training needed to alleviate shortages in minority and female STEM students.

Summary

By using the research on student involvement (specifically the I–E–O model), the academy can further understand the factors that help adult students in their path through higher education. The student engagement factors that are unique to adult learners provide additional opportunities for research. Due to Astin's (1993) framework and other scholarly studies, the researcher concluded that engagement factors are wide in scope and are more complex for adult students (versus traditional-age students). Any initiative to attract adult students will bring with it a unique set of challenges and opportunities. These initiatives will need to involve research regarding student engagement framework as a foundation for deciphering both unique programmatic and financial aid programs. Adult students have a disparate set of needs and skills different from that of traditional students. The readings indicated that this paradigm shift will necessitate many programmatic and financial changes to higher education as it is currently known.

Traditional methods for attracting and retaining students will not suffice if colleges and universities are going to recruit more adult learners into the academy. Many creative strategies and programs will need to be re-evaluated if higher education is going to be made accessible to adult students. To attract adults back into higher education, scholars must conduct research to find out how faculty and staff can best assist adult learners matriculate to 4-year degree programs.

CHAPTER 3. METHODOLOGY

Introduction

This study examined the influence that engagement has on adult student intention to transfer to a 4-year institution and on students' STEM degree aspirations. The purpose of this study was threefold: (a) to understand the demographic characteristics and engagement practices of adult students attending Iowa community colleges; (b) to understand the influence, if any, of engagement on students' intention to transfer to a 4-year institution and on students' STEM aspirations; and (c) to add to the current body of literature on engagement, specifically community college engagement. The findings of the study have the potential to have a significant effect on the research related to adult student success at community colleges and their intention to transfer to a 4-year institution.

Research Questions

Each research question for the study was carefully selected as it related to the theoretical framework and extrapolates off findings from previous research and the pilot study. The following research questions served as the focus of this study:

1. What are the demographics of adult students at community colleges?
2. How are student engagement constructs measured by variables in the SSSL instrument?
3. To what extent do engagement and other student variables predict adult learners' intention to transfer to a 4-year institution?
4. To what extent do engagement and other student variables predict adult learners' intention to major or not major in STEM fields?

Hypotheses

Based on the review of the literature, two null hypotheses were established regarding the influence of adult student engagement on students' intention to transfer to a 4-year institution:

H_0^1: Student engagement factors will have no influence on the intention of adult community college students to transfer to a 4-year institution.

H_0^2: Student engagement factors will have no influence on the intention of adult community college students to major in a STEM discipline.

Research Design

Pilot Study

A new survey instrument was constructed and finalized by the research team for a spring 2012 pilot study (see Appendix A). This instrument includes 171 items that examine specific variables of interest in the thematic areas of student engagement, self-efficacy, social capital, financial literacy, and general student demographics within the context of student transfer readiness.

A research team led by Dr. Soko Starobin, Iowa State University Associate Professor and Director of the Office of Community College Research & Practice, reviewed and analyzed well-known survey instruments, including the CCSSE, NSSE, Laanan Transfer Student Questionnaire, Transfer and Retention of Urban Community College Students, Survey of Undergraduate Research Experiences, and Cooperative Institutional Research Program to establish survey questions that would fall within the three SSSL study constructs of self-efficacy, social capital, and transfer knowledge. A listing of possible survey questions was established and then reviewed by the research team. All rights to use these questions, in

full or in part, were obtained from the various sources. The team also consulted the Integrated Postsecondary Education Data System (IPEDS) and the U.S. Census to assist in establishing appropriate survey response items that have been widely used in higher education and national reporting.

Survey methodology was used in the research design. "Survey design provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population" (Creswell, 2009, p. 145). A self-administered questionnaire was used as the form of data collection. The research project used primary data collected from the SSSL instrument.

The final instrument used in the pilot project was a compilation of components from these surveys. All rights to use these questions, in full or in part, were obtained from the various resources. Upon finalization of the instrument, permission for the pilot study was sought and granted by the Iowa State University Institutional Review Board (IRB) on March 23, 2012 (Appendix B).

Five community colleges in the state of Iowa were selected as testing sites for the survey instrument, which was administered during 3 weeks, from mid-April through early May 2012. This provided the research team an opportunity to formally test the survey instrument and review potential issues/challenges as they related to the administration of the survey as well as its validity and reliability. In total, the pilot study was administered electronically to 5,448 students who were enrolled in a STEM-related course in the Fall 2011 or Spring 2012 semester. A total of 565 students completed it for a 10.4% response rate.

Following the collection of the survey responses and the subsequent analysis, it was apparent that several issues and problems existed with the survey instrument, delivery of the

survey, and length of the instrument. Overall student response rates were considered low; the length of the survey instrument led to many students to not complete all the questions.

Instrumentation

Prior to the implementation of the full Iowa study, the results from the pilot project were analyzed to test the validity and reliability of the survey instrument as well as to assess the appropriateness and validity of individual questions. To determine whether the tool was useful in drawing meaningful inferences from the data, a CFA was run on various constructs measuring self-efficacy, social capital, transfer knowledge, and demographics, among others. Questions that guided the CFA included: "Is there multi-collinearity among questions within the survey constructs?"; "Do questions within the constructs correlate highly with each other?"; and "If high correlations exist, could that correlation warrant the removal of a specific question?"

The CFA revealed high factor loadings within the previously established constructs, suggesting that a number of the survey questions were very similar in nature. The results of the analysis were then used to remove survey items that produced high factor loadings within each of the constructs. If a question presented as an outlier, a factor loading below .6, the item was removed from the construct (Aron, Aron, & Coups, 2005; Mertler & Vannatta, 2010; Tabachnick & Fidell, 2012).

To test the reliability of the instrument, the pilot study responses were randomly divided into two subsets and a CFA was conducted using each subset of data. The CFA produced very high, and at times identical, alpha reliability coefficients and factor loadings between the two subsets. This indicated a high reliability of the instrument.

The final survey design contains four sections related to (a) self-efficacy, (b) social capital/financial literacy, (c) transfer knowledge, and (d) demographics. To review the entire survey, see Appendix C.

The primary data for the study were information obtained from the SSSL survey. The survey was created and compiled by the principal investigator and associated research team. As mentioned earlier, this survey was constructed after reviewing the survey design of several respected instruments used in academic areas of interest to the research team. In addition, items from the Integrated Postsecondary Education Data System (IPEDS; NCES, n.d.) also were analyzed to develop the survey instrument.

Specifically, the SSSL survey was composed partially of selected items from the existing CCSSE and the IPEDS items and adopted for research purposes by the researcher; links to institutional data provided student classification, gender, retention information, college GPA, age, ethnic code, and other demographic information. The instrument consists predominantly of questions with Likert-type scale responses such as strongly disagree, disagree, slightly disagree, slightly agree, agree, and agree strongly.

IPEDS is a system of interrelated surveys conducted each year by the U.S. Department of Education's NCES (n.d.). IPEDS gathers information from every college, university, and technical and vocational institution that participates in the federal student financial aid programs and is required of all institutions receiving financial aid from the government. The completion of all IPEDS surveys is mandatory for institutions that participate in or are applicants for participation in any federal student financial aid program (such as Pell grants and federal student loans) authorized by Title IV of the Higher Education Act of 1965 (as amended). The IPEDS website (NCES, n.d.) includes information on the

mandatory nature of this instrument. The IPEDS survey was a good instrument to analyze when creating the research team's proprietary survey because it collects information from a wide variety of sources. According to the IPEDS website, "IPEDS collects data on postsecondary education in the United States in seven areas: institutional characteristics, institutional prices, enrollment, student financial aid, degrees and certificates conferred, student persistence and success, and institutional human and fiscal resources" (NCES, n.d., para. 5).

Survey Instrument

The final version of the SSSL Survey (Appendix C) was developed after reviewing national surveys, conducting a pilot study, and reviewing pilot study data for reliability and validity. Selected items from previous academic surveys were combined to create a new, adapted instrument for use in this study, the SSSL, which is organized (based on the research focus) into four main sections: self-efficacy, social capital, transfer knowledge and demographic information. The survey instrument is divided into these sections based on the research focus.

Self-efficacy. The self-efficacy section includes items related to students' perceived academic confidence and motivation, their ability to adjust to their environment, and their ability to overcome academic obstacles. This portion of the survey includes items regarding students' level of commitment; their ability to make friends; their level of anxiety; and encouragement or advice received from peers, faculty, and staff members. It includes statements such as: "If I can't do a job the first time, I keep trying until I can," "I often make a list of things to do," and "If something looks too complicated, I will not even bother to try it." Questions in this section were answered using primarily a Likert-type scale. However,

level of anxiety was measured on a scale of 1–10, and number of hours spent studying and the most challenging class responses were categorized.

Social capital. The social capital part of the survey seeks to attain information about students' parental income, level of parents' education, number of hours worked, number of dependents supported, the influence of family and friends to this point in the students' education, and the students' future educational goals. Some questions include verbiage such as: "During high school, how often did your parents or other adults 'work with you on your homework?' 'participate in school related activities?' and 'spend time just talking to you?' Responses to items in this section also are given on a Likert-type scale ranging from *never or very rarely* to *several times a week.*

Transfer knowledge. The third section, transfer knowledge, intends to better ascertain the students' level of engagement with peers, staff, and faculty members; use of academic services; and intention to transfer to another institution. This portion includes items about students' interactions with counselors/advisors, their interactions with faculty members outside of the classroom, their transfer intentions, and their degree aspirations.

Some items measure institutional fit by asking for responses to statements such as: "Instructor or students made prejudiced comments that made me feel uncomfortable" and a question about whether or not the respondent felt that faculty, staff, or administration treated them poorly due to gender, race, language, sexual orientation, religion, social class, or another reason that they could specify.

Another part of this section has statements that focus on the transfer process for students. These statements include: "I visited the 4-year institution at least once to learn where offices and departments were located," "I spoke to former community college transfer

students to gain insights about their transfer experiences," as well as asking "how often [they] discussed career plans and ambitions with a faculty member."

The majority of questions in this section were answered on a Likert-type scale, except for the categorical questions.

Demographics. The final section of the survey seeks to provide basic demographic data about the respondents, including: gender, race, age, marital status, religion, and native language. The demographic portion of the survey also includes questions about the students' earned academic credentials, their enrollment status, the number of math and science courses they had previously completed, and the number of miles that they were living from their current college.

Question format. The majority of items in the first three sections of the survey have responses given on a Likert-type scale. Students indicate the level they agree or disagree to each item on a 7-point scale: 1 = *strongly disagree*, 2 = *disagree*, 3 = *slightly disagree*, 4 = *neither agree nor disagree,* 5 = *slightly agree*, 6 = *agree,* and 7 = *agree strongly*. They are not able to indicate that the item does not apply.

In addition, students are asked to indicate how important nine factors are in their decision to enroll in the institution. Students indicate the level of importance for each factor on a 7-point Likert-type response scale: 1 = *not important at all*, 2 = *not very important*, 3 = *somewhat unimportant*, 4 = *neutral*, 5 = *somewhat important*, 6 = i*mportant*, and 7 = *very important*. They also may indicate that the item does not apply.

The demographic section includes several questions types, but most are most are categorical. For example, some are open-ended, such as: "What is your age? Please specify." Other demographic questions are close-ended in nature. For example, the question

"What is your marital status?" provides the following response options: married, living together, single (never married), and divorced/separated/widowed. Another question regarding how many miles the institution is from the participant's residence provides the following response options: 5 miles or less, 6–10 miles, 11–50 miles, 51–100 miles, 101–500 miles, and over 500 miles.

Setting

This study was regional in scope and was administered at all community colleges in the state of Iowa. This included institutions that vary based on geographic setting; size; ethnic, gender, and age diversity; and socioeconomic demographics. All 15 community college systems in the state of Iowa were contacted to be involved, including the following: Des Moines Area Community College, Eastern Iowa Community College, Ellsworth Community College, Hawkeye Community College, Kirkwood Community College, Indian Hills Community College, Iowa Central Community College, Iowa Lakes Community College, Iowa Western Community College, Marshalltown Community College, North Iowa Community College, Northeast Iowa Community College, Northwest Iowa Community College, Southeastern Iowa Community College, and Western Iowa Tech Community College.

Population and Sample

Members of the SSSL research team worked to establish criteria for the master student data file. The SSSL research team worked with institutional researchers at each of the 15 Iowa community college districts to establish a listing of courses that enroll mostly second term students; courses offered only in the 2012 Fall semester that count toward

degree attainment, financial aid, or institutional credit; and courses specifically related to NSF grant programs.

The researchers used a scholarly definition of population when creating and administering the survey instrument. Population is "a set of all the individuals of interest in a particular study" (Gravetter & Wallnau, 2007, p. 5), and a sample is "a set of individuals selected from a population, usually intended to represent the population in a research study" (Gravetter & Wallnau, 2007, p. 5).

The study population was made up of currently enrolled students from all of Iowa's 15 community colleges who had been previously enrolled for at least one semester. Colleges were asked to exclude remedial, dual credit, and noncredit coursework when determining previous enrollment. Students under 18 years of age also were removed from the population sample.

The *Annual Condition of Iowa's Community Colleges 2011* (Iowa Department of Education, 2011) report provides an overview of Iowa community college students during the 2011–12 academic year. When the academic year began in Fall 2011, 105,975 students had enrolled in the 15 Iowa community college districts. Of those students, more than half (51.8%) were enrolled on a part-time basis. Students enrolled in Iowa's community colleges were in one of three academic tracks. The majority (64.1%) of students were enrolled in Associate of Arts or Associate of Sciences programs, also known as college parallel programs and which prepare students to transfer to a 4-year college or university. The next largest cohort (30.7%) of community college students were enrolled in career and technical education programs, which prepare students to directly enter the workforce upon completion of a degree, certificate, or diploma. A small percentage (4.9%) also were enrolled in career

options programs that provide them the opportunity to transfer to a 4-year institution or pursue a career in their chosen field upon completion of the program (Iowa Department of Education, 2011).

Students attending Iowa community colleges have a unique demographic makeup that is not generalizeable to community colleges nationwide but compare favorably to rural midwestern community colleges of similar sizes. During the 2011–12 academic year, the majority of Iowa community college students were female (55%) and between the ages of 19 and 25 (72%). The average age for Iowa community college students was 23 years. An overwhelming majority (92%) of students attending Iowa community colleges were residents of the state of Iowa. Of the Iowa community college students who reported their ethnicity during the 2011–12 academic year, 86% of students were Caucasian, 7% were African American, 5% were Hispanic, 2% were Asian/Pacific Islander, and 1% were of two or more races (Iowa Department of Education, 2011).

In total, 43,964 Iowa community college students (over 40% of total enrollment) were invited to participate in the study. More than 6,000 students responded to at least some of the survey questions for a response rate of 13.7%. Individual community college response rates were as follows: Northeast Iowa Community College (CC), 20%; North Iowa Area CC, 13.4%; Iowa Lakes CC, 11.7%; Northwest Iowa CC, 32.8%; Iowa Central CC, 11.5%; Marshalltown CC, 8.6%; Ellsworth CC,7.1%; Hawkeye CC, 43.5%; Eastern Iowa CC District, 12.4%; Kirkwood CC, 10.5%; Des Moines Area CC, 14.4%; Western Iowa Tech CC, 21.5%; Iowa Western CC, 17.8%; Southwestern CC, 7.8%; Indian Hills CC, 9%; and Southeastern CC, 9.6%. After removing the students who logged into the study but did not complete the study, the final sample size was 5,140 students.

Data Collection

Permission was received from each study institution to distribute the SSSL survey via e-mails to students enrolled in certain courses. The specific courses chosen for participation was done with the help of the contact at each college. Care was taken to identify courses that were not likely to have first-semester students in them. This convenience sampling design was used to ensure high-quality response and participation rate. The decision on which collection method to use was based on the needs of the institution, the desire of the faculty member administering the survey, and the demographics of the students involved. Whenever possible, class time was given to get the maximum response rate. Electronic surveys were e-mailed to the students whenever class time could not be allocated. In these instances, it was requested that faculty make announcements of the survey in class to encourage participation. According to Porter (2004), multiple contacts about a survey, perception of scarce opportunity to be involved, and requests for help have been found to increase survey response rates. Students were given instructions on how to complete the survey in Qualtrics. They also were informed that all data would be stored in a password-protected computer with the password known only to the researcher and that all individual information would be kept confidential and results presented in a manner that would not allow for individual participant identification. Instructors and/or administrators were asked to send out introductory and reminder e-mails to encourage participation in the survey. In addition, to help encourage high participation rates, a drawing was also held to win an iPad.

The following timeline was utilized for survey distribution:

- October–November: Introductory e-mail with instructions and link to web-based survey; begin administration of survey in classes
- One week later: Reminder e-mail #1
- Two weeks later: Reminder e-mail #2
- Three weeks later: Survey closed
- December: Data cleanup/initial analysis and recoding

Hawkeye Community College was the first college to participate in the survey, and it opened on October 1, 2012. Each survey was open for 2 weeks. Indian Hills Community College was the last college to complete the survey, and it closed on December 3, 2012 (see Appendix D).

In addition to in-class administration of the survey, instructors and/or administrators were asked to send out introductory and reminder e-mails as needed and post on their college's intranet as appropriate. To encourage high participation, a drawing was also held to win an iPad. The research team decided that providing an opportunity for the survey participant to win prizes would lead to an increase response rates. Research has shown that more contact can improve response rates. According to Porter (2004), multiple contacts about a survey, perception of scarce opportunity to be involved, and requests for help have been found to increase survey response rates.

Methodological Approach

This quantitative study utilized a constructivist framework with a postpositivist theoretical perspective. As this was quantitative research study, it is imperative to note that because there were many variables and subjective factors that impacted this study, a

postpositivist perspective was used. This perspective portends that one cannot be completely positive about the absolute truths or knowledge when studying humans. The postpositivist method assumes that the researcher starts with a hypothesis and collects and analyzes data that either confirm or disconfirm the original premise. The accepted approach for postpositivist research is that an individual begins with a theory, collects data that support or refute the theory, and then makes revisions before additional testing.

A dataset was created from the administered survey, linked with institutional data, and statistically analyzed (Creswell, 2009). Creswell (2009) maintained that "quantitative research is a means for testing objective theories by examining the relationship among variables" (p. 4). These variables were measured using instruments and data were analyzed using statistical procedures. A deductive approach was utilized within quantitative research.

The epistemology that undergirded this study was based on constructivism, which holds that the creation of meaning is not simply waiting to be discovered by humans but is constructed as they engage with life's activities and their environmental surroundings. Meanings are constructed through an interaction of human beings and their world (Crotty, 1998). Reality is constructed through the interaction of people and their social worlds (Merriam, 2002). The epistemology fit this study because adult learners create new meaning based on external and internal influences as they return to higher education.

Conceptual Model

This study utilized theoretical models and research to examine conceptual models that explore the relationship of adult student engagement characteristics with their intention to transfer to 4-year institutions. Detailed information regarding these conceptual frameworks

is included in chapter 2. The model hypothesizes that student engagement factors influence the intention to transfer and academic success of students.

The conceptual framework that was used for this study is Astin's (1993, 1999) I–E–O model. His model assesses "the impact of various environmental experiences by determining whether students grow or change differently under varying environmental conditions" (Astin, 1993, p. 7). According to Astin (1993), student outcomes are functions of three basic elements: inputs (characteristics of the student at the time of initial entry to the institution), environment (various programs, policies, faculty, peers, and educational experiences to which the student is exposed), and outcomes (students' characteristics after exposure to the environment). For the model to work properly, it is critical to specify relevant inputs, environmental experiences, and outcomes to be assessed.

Variables in the Study

This study sought to analyze variables related to student engagement and adult participants, identifying causal models rather than linear models to describe both the explicit relationship on intention to transfer and the implicit relationships among the variables. For more information on the variables in the study and how they were coded, see Appendix E.

Independent Variables

To answer the research questions for this study a number of independent and mediating variables were employed for the descriptive, comparative, and logistic regression analyses. The independent variables were categorized into four blocks. Block one (B^1) included demographic and background information, block two (B^2) consisted of staff transfer engagement variables, block three (B^3) included variables associated with faculty coursework

engagement, and block four (B^4) consisted of variables associated with individual coursework engagement on coursework.

The following independent variables in B^1 were used to help analyze the influence of student demographic characteristics on students' intention to transfer and STEM aspirations:

- *Age* was analyzed using Question 57. The information was recoded into age ranges 1824, 25–39 and ≥40 and was coded as 1 = ≤24, 2 = 25–39 and 3 = ≥40. Students between the ages of 18 and 24 was considered traditional-aged students. Students age 25 and over were categorized as adult students.
- *Gender* was studied using Question 55; the variable was dummy coded 0 = male and 1 = female.
- *Ethnicity* was evaluated utilizing Question 56 and was coded 1 = American Indian/Alaskan Native, 2 = Asian, 3 = Black/African American, 4 = Hispanic, 5 = Native Hawaiian/Pacific Islander, 6 = White, 7 = two or more races, and 8 = unknown.
- *Mother's education* was analyzed using Question 17_1. The variable was coded 1 = elementary or less, 2 = some high school, 3 = high school graduate, 4 = some college, 5 = associate's degree from 2-year college, 6 = bachelor's degree, 7 = some graduate school, 8 = graduate degree, 9 = I don't know.
- *Father's education* was studied using Question 17_2 and was coded 1 = elementary or less, 2 = some high school, 3 = high school graduate, 4 = some college, 5 = associate's degree from 2-year college, 6 = bachelor's degree, 7 = some graduate school, 8 = graduate degree, 9 = I don't know.

- *Marital status* was analyzed using Question 58 and was coded as 1 = married, 2 = living together (not married), 3 = single, never married and 4 = divorced/separated/ widowed.
- *Distance from home* was studied utilizing Question 61. The variable was computed and recoded as 1 = 0–50 miles, 2 = 51–100 miles, 3 = 101–500 miles, and 4 = more than 500 miles.
- *Employment status* was studied using Question 23. The variable was coded as 1 = yes, I am currently working on campus; 2 = yes, I am currently working off campus; 3 = no, I am not looking for working opportunities; and 4 = no, I am currently unemployed, but I am looking for working opportunities.
- *Number of hours worked for pay (weekly)* was analyzed using Question 24 and was coded as 1 = 1–10 hours per week, 2 = 11–15 hours per week, 3 = 16–20 hours per week, 4 = 21–30 hours per week, and 5 = more than 30 hours per week.
- *Level of math completed* was evaluated using responses to questions 50_1_1, 50_1_2, 50_2_1, 50_2_2, 50_3_1, 50_3_2, 50_4_1, 50_4_2, 50_5_1, 50_5_2, 50_6_1, 50_6_2, 50_7_1, 50_7_2, 50_8_1, 50_8_2, 50_9_1, and 50_9_2. The questions were computed and then recoded into three categories: low, medium, and high math. Low math (zero to six math courses taken) was coded as 1, medium math (seven to 12 math courses taken) was coded as 2, and high math (13 to18 math courses taken) was coded as 3.
- *Level of science completed* was analyzed using responses to questions 51_1_1, 51_1_2, 51_2_1, 51_2_2, 51_3_1, 51_3_2, 51_4_1, 51_4_2, 51_5_1, 51_5_2, 51_6_1, and 51_6_2. The questions were computed and then recoded into three

categories: low, medium, and high science. Low science (zero to four science courses taken) was coded as 1, medium science (five to eight science courses taken) was coded as 2, and high science (nine to 12 science courses taken) was coded as 3.

The premise behind most of the research questions centered on student engagement. The research study focused on analyzing the various types of engagement experiences (referred to here as constructs) that influence students' academic experience while attending community college. This study focused on three distinct constructs, consisting of 13 specific questions, related to Individual Coursework Engagement (B^2), Faculty Coursework Engagement (B^3), and Staff Transfer Engagement (B^4).

- *Individual coursework engagement* (B^2) was evaluated utilizing Questions 14_1, 14_2, 14_3, and 14_6. This construct was analyzed on a Likert-type scale ranging from 1 (*did not use or receive/not applicable*) to 4 (*used/received, very helpful*).
- *Faculty coursework engagement* (B^3) was studied using Questions 40_1, 40_2, 40_5, and 40_6. Faculty coursework engagement was analyzed on a Likert-type scale ranging from 1 (*never or very rarely*) to 5 (*several times a week*).
- *Staff transfer engagement* (B^4) was evaluated utilizing Questions 38_1, 38_2, 38_3, 38_4, 38_5, and 38_6. Staff transfer engagement was analyzed on a Likert-type scale ranging from 1 (*neither agree nor disagree*) to 8 (*strongly agree*).

Dependent Variables

The first dependent variable, intention to transfer, sought to measure the students' intention to transfer to a 4-year college or university. This variable was studied using student responses for Question 45 and was recoded as 0 = students who did not intend to transfer to a 4-year college or university and 1 = students who did intend to transfer to a 4-year college or

university. This variable was used to analyze the difference in engagement practices for students who intended to transfer to a 4-year institution and those students without transfer intentions.

The second dependent variable, STEM aspirations, was intended to analyze students' aspirations to major in a STEM-related field. This variable was studied using student responses for Question 46 and was recoded as 0 = students who did not have STEM aspirations and 1 = students who had STEM aspirations. The STEM aspirations variable was used to identify the differences in engagement between students who do not have STEM aspirations and those who do.

Data Analysis

Descriptive Analysis

The first research question sought to identify background and demographic characteristics of the students who participated in the study. The second question was related to the significance between the chosen independent variables and the dependent variable, intention to transfer, and was analyzed using a Pearson correlation chi-square test.

Background and demographic data were analyzed using frequencies and cross-tabulations to provide a better understanding of community college adult students. Background and demographic variables included: age, race, gender, parents' education, employment status, and number of hours worked (weekly). The variables associated with student engagement also measured the frequency at which students engage in the collegiate learning environment.

Exploratory Factor Analysis/Confirmatory Factor Analysis

An exploratory factor analysis (EFA) was used to verify the validity and structure of the composite variables and to determine if any intercorrelations existed between variables related to engagement. Multiple variables associated with engagement were included in the EFA. The factor analysis produced engagement constructs that were utilized in the regression analysis. The meaningful factors that emerged to form the composite variables were then utilized in a CFA.

Fourteen variables were entered into the EFA using SPSS 21.0. The variables included in the EFA that produced factor loadings greater than .50 were retained in the model (Mertler & Vannatta, 2010). The 13 variables included in the EFA produced three engagement constructs, which were then used in the CFA.

A CFA then helped to examine the degree to which the covariance among the tested items was explained by the models underlying the factor structure. The decision to use CFA was based on the identification of theoretical relationships between the observed and latent variables associated with student departure and the desire to test the ability of the hypothesized model to fit the observed data. Using SPSS 21.0 and Amos 20.0, CFA was utilized to determine if the hypothesized set of constructs influenced responses in a predicted way.

Logistic Regression Analysis

To determine the extent to which engagement can be used to predict the level of adult students' intention to transfer to a 4-year institution and major in a STEM field, a regression analyses was conducted. Two logistic regression analysis were conducted using intention to transfer and STEM aspirations as the dependent variables. In addition, there were four

blocks of independent variables. The first block of independent variables included the demographic, or input, characteristics. The other three blocks in the study were based on the constructs identified and confirmed through the exploratory and confirmatory factor analyses. Logistic regression analysis was chosen as the type of inferential statistics included in this study because the dependent variables, intention to transfer and STEM aspirations, were dichotomous variables (Aron et al., 2005; Mertler & Vannatta, 2010).

Ethical Considerations

Studies of this type must be conducted in compliance with IRB policies (Creswell, 2009). An application to conduct research involving human participants was approved by the Iowa State University IRB on March 23, 2012 (Appendix B).

Each of the participating institutions was provided a copy of the Iowa State University IRB approval letter and protocol prior to the onset of the survey administration. All questions regarding IRB status by the participating institutions were answered prior to conducting the survey.

Limitations and Delimitations

The study was conducted with the following acknowledged limitations. The intent of this research was to contribute to the knowledge base on how the U.S. education system can better create a scientific workforce. The researcher was an educator, but not specifically in a STEM educational field. The researcher had only 3 years of full-time experience in higher education. Although the researcher could not eliminate investigator bias completely, significant effort was made to mitigate researcher bias.

Preconceived notions or tacit experiences of survey respondents may have influenced both data collection and data analysis. The information provided by the participants was

based upon their own disparate views and perceptions and may have been subject to bias. The participants' interpretation of the questions may have impacted constructed meaning and influenced the quality of responses.

Another limitation of this study relates to the narrow geographical nature of the data. Only data from community colleges in Iowa—a largely Caucasian rural state—were collected. This geographic limitation could have influenced the findings on adult learners based on the sample population. The findings in this situation cannot be considered generalizeable due to the limited geographic scope of the students.

Another limitation to this study is that Astin's (1993) research focused on 4-year institutions, and thus, the I–E–O conceptual framework is based on the findings of students from baccalaureate institutions. The data collected for this research project were from students at community colleges. The type of student experience at a 4-year institution can vary greatly from that at a 2-year institution.

Surveys were administered electronically, and the majority of communications encouraging the adult learners to complete this survey were done via e-mail. Not all adult learners read their e-mail and, therefore, were not guaranteed to have had the opportunity to participate. Students who did not have ready access to the Internet may have been less likely to participate. The response rate from participants may have been impacted by this limitation.

Intention to transfer and other variables were analyzed from an institutional perspective and considered the enrollment status and transfer aspiration at the time of survey administrations. This short timeframe of analyzing retention and achievement does not reflect the more common practice of adult learners having gaps in their academic journey.

Prior to re-entry, many adult students take semesters or whole academic cycles off for personal and professional reasons.

Summary

The purpose of this research was to examine the relationship between the engagements of adult learners at community colleges and their intention to transfer. The student information was obtained from the SSSL survey, which was administered in fall 2012. Students' demographic and enrollment characteristics was obtained from their respective institutions' admissions and registrar's office. An adult learner model proposed with Knowles (1984; see chapter 1 and 2) and a student engagement conceptual model proposed by Astin (1993) provided the framework for the research design. Enrollment and demographic data for the semester and subsequent semester during SSSL participation determined retention. Descriptive statistics were used to compare the study participants with the adult learner population at community colleges. Factor analysis was conducted to reduce and focus the list of engagement and efficacy responses. Linear regression was performed to determine the predictive model for intention to transfer.

CHAPTER 4. RESULTS

This chapter provides an overview of the results of the data analysis. These data analysis results are provided in separate sections that correspond to the research questions and the hypotheses that guided this study. The first section provides a summary of the demographic and background characteristics of all adult students in the SSSL study, all adult students who intended to transfer and all adult students with STEM aspirations. The second section summarizes the results of the EFAs and establishes the engagement constructs used throughout the study. The third section includes the findings of the CFA and confirms the Anderson community college student engagement model. This section examines what impact engagement factors have on adult SSSL participants. The fourth section discusses the results of the binary logistic regression analysis and provides a summary of the extent to which adult student background and engagement predicts students' intention to transfer from their current community college. The fifth section summarizes the results of the binary logistic regression analysis and provides an overview of the extent to which background and engagement variables predict adult students' STEM aspirations.

Descriptive Statistics

The demographics of students participating in the SSSL study were descriptively analyzed based on gender, ethnicity/URM, highest level of mother's education, highest level of father's education, marital status, distance from campus to residence, employment status, hours worked, level of math completed, level of science completed, staff transfer engagement, faculty coursework engagement and individual coursework engagement. A summary of the descriptive analysis of all variables is provided in Table 4.1.

Table 4.1

Demographic Descriptive Analysis

Variable	All adult students		Adult students with intention to transfer		Adult students with STEM aspirations	
	n	% valid	*n*	% valid	*n*	% valid
Gender						
Male	651	25.3	384	27.0	193	34.4
Female	1,925	74.7	1,040	73.0	368	65.6
Missing (nonresponse)	320		263		80	
Ethnicity/underrepresented minority						
American Indian/Alaskan Native	21	0.8	14	1.0	4	0.7
Asian	41	1.6	27	1.9	16	2.8
Black/African American	135	5.2	101	7.1	37	6.6
Hispanic	47	1.8	26	1.8	11	2.0
Native Hawaiian or Pacific Islander	5	0.2	3	0.2	2	0.4
White	2,221	86.2	1,191	83.4	470	83.6
Two or more races	91	3.5	55	3.9	15	2.7
Unknown	17	0.7	11	.8	7	1.2
Missing (nonresponse)	318		259		79	
Marital status						
Married	1,185	46.0	632	44.5	257	45.9
Living together (not married)	308	12.0	166	11.7	61	10.9
Single, never married	561	21.8	340	23.9	126	22.5
Divorced/separated/ widowed	521	20.2	283	19.9	116	20.7
Missing (nonresponse)	321		266		81	
Current employment						
Working on campus	152	5.4	99	6.2	43	7.0
Working off campus	1,582	56.5	941	58.5	337	55.0
Not working/not looking for work	451	16.1	230	14.3	91	14.8
Unemployed, but looking for work	617	22.0	339	21.1	142	23.2
Missing (nonresponse)	94		78		28	
Number of hours worked per week						
1–10	207	12.2	117	11.5	45	12.0
11–15	134	7.9	82	8.1	42	11.2
16–20	195	11.5	110	10.8	44	11.7
21–30	310	18.2	194	19.1	74	19.7
>30	855	50.3	512	50.4	171	45.5
Missing (nonresponse)	1,195		672		265	100.0

Table 4.1 (continued)

Variable	All adult students		Adult students with intention to transfer		Adult students with STEM aspirations	
	n	% valid	*n*	% valid	*n*	% valid
Highest level of education completed by father						
Elementary school or less	149	5.2	73	4.4	24	3.8
Some high school	316	11.1	167	10.1	67	10.7
High school graduate	1,105	38.9	619	37.6	221	35.2
Some college	423	14.6	262	15.9	114	18.2
Associate's degree from 2-year college	258	8.9	159	9.7	95	15.2
Bachelor's degree	282	9.9	183	11.1	77	12.3
Some graduate school	28	1.0	20	1.2	11	1.8
Graduate degree	134	4.7	87	5.3	35	5.6
Don't know	145	5.1	76	4.6	22	3.5
Missing (nonresponse)	56		41		14	
Highest level of education completed by mother						
Elementary school or less	104	3.7	66	4.0	30	4.8
Some high school	288	10.1	150	9.1	57	9.1
High school graduate	1,033	36.4	555	33.8	206	32.9
Some college	497	17.5	303	18.4	113	18.0
Associate's degree from 2-year college	423	14.9	261	15.9	95	15.2
Bachelor's degree	278	9.8	176	10.7	77	12.3
Some graduate school	38	1.3	18	1.1	8	1.3
Graduate degree	131	4.5	91	5.5	34	5.4
Don't know	47	1.6	23	1.4	7	1.1
Missing (nonresponse)	57		44		14	
Level of math completed						
Low	2,354	81.3	1,356	80.4	467	72.9
Medium	528	18.2	324	19.2	168	26.2
High	14	0.5	7	0.4	6	.9
Missing (nonresponse)	0		0		0	
Level of science completed						
Low	2,123	73.3	1,205	62.1	402	62.7
Medium	722	24.9	454	26.9	216	33.7
High	51	1.8	28	1.7	23	3.6
Missing (nonresponse)	0		0		0	
Number of miles from college to permanent home						
<50	2,355	92.1	1,307	91.6	513	91.5
51–100	173	6.7	80	5.6	33	5.9
101–500	33	1.3	24	1.7	7	1.2
>500	22	.9	15	1.1	8	1.4
Missing (nonresponse)	313		261		80	

The total number of adult respondents to the SSSL survey was 2,896 Iowa community college students. Background demographic data on the adult learners were analyzed in two subcategories: background demographics and engagement characteristics.

Overall Sample

Background demographics. Out of the 2,896 adult learners who replied to this question, 74.7% were female and 25.3% were male. An overwhelming majority of the total sample of adult students (86.2%) identified as White/Caucasian, 5.2% reported their ethnicity as Black/African American, 3.5% identified as two or more races, 1.8% responded as being Hispanic, 1.6% as being Asian, 0.8% as being American Indian/Alaskan Native, and Native Hawaiians/Pacific Islanders made up 0.2% of the sample population.

Almost half (46.0%) of those who responded indicated that they were married. Another 12.0% indicated that they were not married, but living together. Just over one fifth (21.8%) were single, never married; 20.2% are divorced, separated or widowed. The large majority (92.1%) of the adult participants lived less than 50 miles away from their community college campus. Another 6.7% students lived between 51 and 100 miles from college. The remaining 2.2% lived over a 100 miles from their college.

Engagement characteristics. In terms of the education of the parents of the adult students in this study, the highest level of mother's education broke down as follows: 10.1% had some high school, 36.4% had graduated from high school, 17.5% had some college, 14.9% had a 2-year associate's degree, 9.8% had a bachelor's degree, and 4.5% held a graduate degree. The rest of the categories related to mother's education made up less than 4% of the respondents.

The breakdown of the highest level of education of the adult students' fathers was the following: 5.2% had elementary school or less, 11.1% had some high school, 38.9% had graduated from high school, 14.6% had some college, 8.9% had a 2-year associate's degree, 9.9% had a bachelor's degree, and 4.7% held a graduate degree. The rest of the categories related to father's education made up 2% of the responses.

Most of the adult students (55.6%) were working off campus, 5.4% were working on campus, 16.1% were not looking for work opportunities, and 22.0% were not employed, but looking for work. Of the students who indicated that they were working, 50.3% were working more than 30 hours per week, 18.2% between 21 and 30 hours per week, 11.5% between 16 and 20 hours per week, 12.2% were working 10 or fewer hours per week and 7.9% between 11 and 15 hours per week.

The majority of adult students indicated that they had taken six or fewer math (81.3%) and four or fewer science courses (73.3%), placing them in the "low math" and "low science" categories, respectively. Approximately one in four students indicated that they had taken seven to 12 math courses (18.2%) and five to eight science courses (24.9%), placing them in the "medium math" and "medium science" categories, respectively. Less than 2% of students responded that they had taken 13–18 math courses (0.5%) and nine to 12 science courses (1.8%), placing them in the "high math" and "high science" categories, respectively.

Adult Students with STEM Aspirations

A total of 641 adult community college respondents to the SSSL survey indicated that they had STEM degree aspirations. Background demographic data of the SSSL respondents was analyzed in subcategories: background demographics and engagement characteristics.

Background demographics. Nearly two-thirds (65.6%) of the adult students with STEM aspirations were female; 34.4% were male. The overwhelming majority (83.6%) of adult students in the STEM aspirations group responded as being White/Caucasian, and 6.6% of students identified as Black/African American. No other ethnicity (Asian, Hispanic, American Indian/Alaskan Native and Native Hawaiian/Pacific Islander, two or more races) accounted for more than 3.0% of the sample.

Nearly half (45.9%) of adult students with STEM aspirations were currently married; 22.5% were single and had never been married; 10.9% were living together but not married; and 20.7% were divorced, separated, or widowed. The large majority of students with STEM aspirations (91.5%) were living less than 50 miles away from their community college campus. Another 5.9% students were living between 51 and 100 miles from college. The remaining 2.6% were living over a 100 miles from their college.

Engagement characteristics. Adult students working off campus accounted for 55.0% of the current employment status of STEM aspirants, whereas 23.2% were currently unemployed but were looking for work, 14.8% were not working and not currently looking for work, and 7.0% were working on campus. Of the students who were currently working, 45.5% were working more than 30 hours per week, 19.7% were working 21–30 hours per week, 11.7% were working between 16 and 20 hours per week, 12.0% were working 10 or fewer hours per week, and 11.2% were working 11–15 hours per week.

Nearly one third (32.9%) of adult students with STEM aspirations indicated that their mother's highest level of completed education was high school graduate, 18.0% responded that their mother completed some college as her highest level of education, 15.2% reported that their mother's highest level of education was an associate degree, 9.1% reported that

their mother had some high school education, and 12.3% indicated that their mother completed a bachelor's degree as her highest level of education. No other level of education accounted for more than 6% of the adult STEM aspirational population.

More than one third of adult STEM aspirants (35.2%) indicated that the highest level of education completed by their father was high school graduate, 18.2% indicated that their father's highest level of education was some college, 12.3% reported that their father had completed a bachelor's degree as his highest completed education, 10.7% reported that their father had some high school education, and 15.2% responded that their father's highest completed education was an associate's degree. No other level of education accounted for more than 6% of the sample population.

The majority of adult STEM aspirants indicated that they had taken six or fewer math (72.9%) and four or fewer science courses (62.7%), placing them in the "low math" and "low science" categories, respectively. More than one in four adult students indicated that they had taken seven to 12 math courses (26.2%) and five to eight science courses (33.7%), placing them in the "medium math" and "medium science" categories, respectively. Less than 4% of adult students with STEM aspirations responded that they had taken 13–18 math courses (0.9%) and nine to 12 science courses (3.6%), placing them in the "high math" and "high science" categories, respectively.

Adult Students with the Intention to Transfer

A total of 1,687 adult respondents to the SSSL survey indicated they intended to transfer to another institution. Background demographic data on the SSSL adult respondents with the intention to transfer was analyzed in two subcategories: background demographics and engagement characteristics.

Background demographics. Out of all participants who replied to this question approximately 73% were female and 27% were male. A strong majority of the students identified as White/Caucasian (83.4%), 7.1% reported their ethnicity as African American/ Black, 3.9% identified as two or more races, and 1.8% responded as being Hispanic, 1.9% as being Asian, 1.0% as being American Indian/Alaskan Native, and 0.2% of the sample population reported being Native Hawaiians/Pacific Islanders.

Almost half (44.5%) of the sample population indicated that they were currently married; another 11.7% reported living together; and 19.9% were divorced, separated or widowed. Almost one fourth (23.9%) of the students indicated that they were single or never married. The large majority (91.6%) of students were living less than 50 miles away from their community college campus. Another 5.6% students were living between 51 and 100 miles from college. The remaining 2.8% were living over a 100 miles from their college.

Engagement characteristics. In terms of the highest level of education of the students' mothers, 9.1% had some high school, 33.8% had graduated from high school, 18.4% had some college, 15.9% had a 2-year associate's degree, 10.7% had a bachelor's degree, and 5.5% held a graduate degree. The remaining categories related to mother's education were reported by less than 4% of the respondents.

In terms of the highest level of education of the students' fathers: 10.1% had some high school, 37.6% had graduated from high school, 15.9% had some college, 9.7% had a 2-year associate's degree, 11.1% had a bachelor's degree, and 5.3% held a graduate degree. The remaining categories related to father's education were reported by less than 5% of the respondents.

Over half (58.5%) of the adult students who intended to transfer were working off campus, 6.2% were working on campus, 14.3% were not looking for work opportunities, and 21.1% were unemployed but looking for work. Of the students who indicated that they were working, 50.4% were working more than 30 hours per week, 19.1% were working between 21 and 30 hours per week, 10.8% were working 16–20 hours per week, 11.5% were working 10 or fewer hours per week, and 8.1% were working 11–15 hours per week.

The majority of adults who intended to transfer indicated that they had taken six or fewer math (80.4%) and four or fewer science courses (62.1%), placing them in the "low math" and "low science" categories, respectively. More than one in four adult students indicated that they had taken seven to 12 math courses (19.2%) and five to eight science courses (26.9%), placing them in the "medium math" and "medium science" categories, respectively. Less than 2% of adult students who intended to transfer responded that they had taken 13–18 math courses (0.4%) and nine to 12 science courses (1.7%), placing them in the "high math" and "high science" categories, respectively.

Factor Analysis

Exploratory and confirmatory factor analyses were conducted to establish the constructs surrounding student engagement for adult community college respondents. The EFA was run using IBM SPSS 21.0, and the CFA was analyzed using AMOS Graphics 21.0. Both the EFA and CFA were conducted using the SSSL dataset of 2,896 adult students.

Exploratory Factor Analysis

Based on a review of the literature and statistical analysis, 14 observed variables were identified as potential engagement factors. Prior to conducting the EFA, the assumptions were verified and validated. The sample size to variable ratio of "30 cases for the first

observed variable and 10 cases for each additional observed variable" (Urdan, 2010) required that the sample size consist of at least 210 cases. The sample size of 2,896 cases was more than adequate to conduct the EFA.

Constructs with eigenvalues greater than 1.0 were accepted as constructs of engagement. Factors with loadings greater than 0.50 were accepted as adequate factors of the construct (Mertler & Vannatta, 2010). The EFA using Varimax rotation produced three engagement constructs with eigenvalues greater than 1.0. Analysis of the three engagement constructs was conducted using reliability analysis. All constructs producing a Cronbach's alpha of greater than .70 were accepted (Urdan, 2010). A Cronbach's alpha reliability coefficient of around .90 is excellent, .80 is very good, .70 is adequate, .60 is questionable (Kline, 2011).

Staff Transfer Engagement. The construct Staff Transfer Engagement produced an eigenvalue of 4.543 while explaining 14.89% of the variance. The results of the EFA for the construct Staff Transfer Engagement are displayed in Table 4.2. The variables in the construct reflected impact on adult students of engagement with advisors or counselors at the community college. The construct explicitly measured the impact of assistance from advisors in the matriculation process. The variables were analyzed using responses on a seven-point Likert-type scale ranging from 1 (*neither agree nor disagree*) to 7 (*strongly agree*).

All factors of the construct produced loadings greater than .50: question 38_5 (I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor), .788); question 38_1 (I consulted with academic advisors/counselor regarding transfer), .786; question 38_2 (Information received from academic advisors/

Table 4.2

Exploratory Factor Analysis: Staff Transfer Engagement

Factor: Faculty Transfer Engagement (α = .860)	Factor loading
I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor	.788
I consulted with academic advisors/counselors regarding transfer	.786
Information received from academic advisors/counselors was helpful in the transfer process	.752
Advisors/counselors identified courses needed to meet the general education/major requirements of a 4-year college or university I was interested in attending	.750
I met with academic advisors/counselors on a regular basis	.582
I talked with an advisor/counselor about courses to take, requirements, and education plans	.552

Note. Responses scored on a seven-point scale: 1 = strongly disagree, 2 = disagree, 3 = slightly disagree, 4 = neither agree nor disagree, 5 = slightly agree, 6 = agree, 7 = strongly agree.

counselors was helpful in the transfer process), .752; question 38_6 (advisors/ counselors identified courses needed to meet the general education/major requirements of a 4-year college or university I was interested in attending), .750; question 38_3 (I met with academic advisors/counselors on a regular basis), .582; and question 38_4 (I talked with an advisor/counselor about courses to take, requirements, and education plans), .552. The reliability analysis revealed that the Staff Transfer Engagement construct produced a Cronbach's alpha reliability coefficient (α = .860) that is considered to be good.

Faculty Coursework Engagement. The Faculty Coursework Engagement construct produced an eigenvalue of 2.73 while explaining 11.25% of the variance. The results of the EFA for the construct Faculty Coursework Engagement are displayed in Table 4.3. The variables in the construct reflected the frequency with which students engaged with their professors. The variables were analyzed using responses on a five-point scale ranging from 1 (*never or very rarely*) to 5 (*several times a week*). All factors in the construct produced

loadings greater than .69: question 40_2 (Felt comfortable approaching faculty outside of class), .735; question 40_5 (Discussed career plans and ambitions with a faculty member), .733; question 40_6 (Asked my instructor for comments and criticisms about my work), .717; and question 40_1 (Visited faculty and sought their advice on class projects such as writing assignments and research papers), .699. The Cronbach's alpha reliability coefficient (α = .828), produced through the reliability analysis, is considered to be good.

Table 4.3

Exploratory Factor Analysis: Faculty Coursework Engagement

Factor: Faculty Engagement (α = .828)	Factor loading
Felt comfortable approaching faculty outside class	.735
Discussed career plans and ambitions with a faculty member	.733
Asked my instructor for comments and criticisms about my work	.717
Visited faculty and sought their advice on class projects such as writing assignments and papers	.699

Note. Responses scored on a 5-point scale, 1 = never or very rarely, 2 = a few times per semester, 3 = about once a month, 4 = several times a month, 5 = several times a week.

Individual Coursework Engagement. The results of the EFA for the construct Individual Coursework Engagement are displayed in Table 4.4. The construct produced an eigenvalue of 2.15 and explained 10.73% of the variance. The variables in the construct analyzed the impact of individual efficacy on engagement. The variables were analyzed using responses on a four-point scale ranging from 1 (*did not use/receive—not applicable*) to 4 (*used/received, very helpful*). All factors in the construct produced factor loadings of at least .599: question 14_1 (Spent more time studying), .791; question 14_2 (Taught myself to study more effectively), .669; question 14_6 (Studied by myself), .629; and question 14_3

Table 4.4

Exploratory Factor Analysis: Individual Coursework Engagement

Factor: Individual Engagement (α = .632)	Factor loading
Spent more time studying	.791
Taught myself to study more effectively	.669
Studied by myself	.629
Did all of the assigned readings	.607

Note. Variables scored on a 4-point scale: 1 = did not use/receive, not applicable, 2 = used/received, not helpful, 3 = used/received, somewhat helpful, 4 = used/received, very helpful.

(Did all of the assigned readings), .607. The Cronbach's alpha reliability coefficient (α = .632), produced through the reliability analysis, is considered to be acceptable.

Confirmatory Factor Analysis

To determine if the results of the EFA were an accurate fit for the Anderson community college engagement model, a CFA was conducted following the EFA. IBM Amos (version 20.0) was utilized to conduct the CFA. Missing data is impermissible in conducting the CFA with the Amos software, therefore the full information maximum likelihood imputation method was used to replace missing values with imputed data. The 14 observed variables were loaded into the three engagement constructs and entered into the CFA. It was determined that the sample size of 2,896 respondents was adequate to complete the CFA.

Due to the large sample size, the model fit was analyzed utilizing a variety of statistical measures: chi-square (χ^2), CMIN/DF(χ^2/df), comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). There are numerous suggestions as to the recommended thresholds for the goodness-of-fit indicators (Hair, Black, Babin, Anderson, & Tatham, 2006, Hu & Bentler,

1998, Tabachnick & Fidell, 2007), but the following standards were used: $\chi^2/df < 10$, CFI > 0.95, RMSEA < 0.06, and $p \leq 0.01$.

Cross-loading between variables is also an important aspect of model fit analysis. Other evidence for model fit includes the correlation among the constructs, the presence of cross-loadings of the items in relation to the construct, as well as the substantive amounts of error in the variance of the items (LaNasa, Cabrera, & Transgrud, 2009). The assessment of goodness of fit and the estimation of parameters of the hypothesized model are the primary goals of conducting a CFA. One of the most popular ways of evaluating model fit involves the CFI statistics and fit indexes. The goodness-of-fit statistic assesses the magnitude of discrepancy between the sample and adjusted covariance matrices. However, the chi-square statistic may not be a very good fit index, as it is affected by larger sample size which produces larger chi-squares that are more likely to be significant (Type I error). Some scholars have proposed a cutoff of 5 for the chi-square, but with larger sample sizes a higher number can be acceptable. Another way to assess goodness of fit is to utilize fit indices. Fit indices can be either absolute or incremental fit indexes (Hu & Bentler, 1999).

This research study used an absolute fit index (RMSEA) and an incremental fit index (Bentler's Comparative Fit Index). The analysis also included the SRMR value and the chi-square test for model fit evaluation. Kline (2011) advocated the use of the chi-square test, RMSEA, CFI, and SRMR to confirm model fit. RSMEA is scaled as a badness-of-fit index for which a value of zero indicates best fit (Kline, 2011, p. 205). In addition, some scholars have suggested using CFI together with an index based on the correlations residuals—SRMR (Kline, 2011, p. 208). A CFA can be sensitive to miss specified factor loadings, whereas SRMR seems most sensitive to misspecified covariances in CFA when testing measurement

models. Their combination threshold for concluding "acceptable fit" based on these indexes was SRMR < .08 (Kline, 2011, p. 208).

The proposed model for the CFA can be found in Figure 4.1. The proposed model consists of three factors: Faculty Coursework Engagement, Staff Transfer Engagement, and Individual Coursework Engagement. Each of the three factors consist of between four and six questions related to the nature of engagement. The 14 observed variables that were loaded into the three engagement constructs were entered into the CFA.

The initial analysis of the proposed student engagement construct revealed one variable with a factor loading below .50 (question 14_6). Even though that one individual variable had a weak factor loading, it was left in the final community college engagement model due to high levels of overall significance and aggregate model fit.

Further analysis revealed that five variables within the Staff Transfer Engagement factor produced extremely high covariances with other variables in that portion of the model. The initial model found four relationships among variables with high covariances. The following intrafactor variables had high covariances: (question 38_1 and question 38_2, question 38_2_and question 38_5, question 38_1 and question 38_6, and question 38_5 and question 38_6). The initial model had the following model fit indicators: χ^2/df = 22.163, CFI = .946, and RSMEA = .064. Due to these high covariances among question 38 variables and overall model fit, a second CFA was conducted on the model to improve overall fit. Using the Amos 20.0 modification indices, covariance paths were added among the error terms to improve the model fit. Numerous variations of the model were analyzed and covariances among multiple variables were established to determine the best model fit for the community college student engagement model.

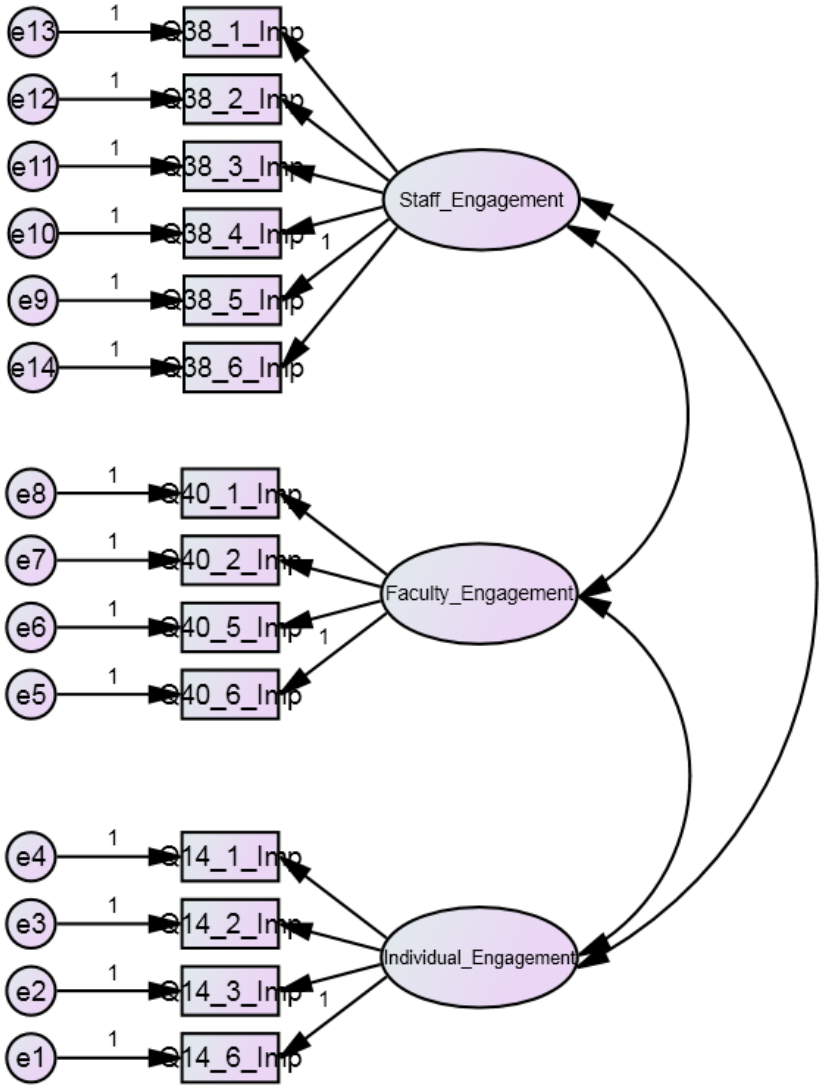

Figure 4.1. Proposed community college student engagement model.

The final results of the CFA are displayed in Table 4.5 and Table 4.6, and the final community college student engagement model is displayed in Figure 4.2. The CFA produced a final community college student engagement model that had a very good model fit and was accepted based on the standards for this study: $\chi^2/df = 10.660$, CFI = 0.975, RMSEA = 0.043, and $p < .001$.

Table 4.5

Goodness-of-Fit Indicators

Model	*N*	χ^2	*df*	χ^2/df	CFI	RMSEA	RSMR	*p*
Community college student engagement	2,896	735.1520	69	10.660	0.975	0.043	0.0391	<.001

Table 4.6

Confirmatory Factor Analysis: Community College Student Engagement Model

Construct	Variable	Factor loading
Staff Transfer Engagement		
	I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor	.83
	I consulted with academic advisors/counselor regarding transfer.	.79
	Advisors/counselors identified courses needed to meet the general education/major requirements of a 4-year college or university I was interested in attending	.79
	Information received from academic advisors/counselors was helpful in the transfer process	.74
	I met with academic advisors/counselor on a regular basis.	.58
	I talked with an advisor/counselor about courses to take, requirements, and education plans.	.57
Faculty Coursework Engagement		
	Discussed career plans and ambitions with a faculty member	.77
	Asked my instructor for comments and criticisms about my work	.75
	Felt comfortable approaching faculty outside class	.75
	Visited faculty and sought their advice on class projects such as writing assignments and research papers	.71
Individual Coursework Engagement		
	Spent more time studying	.78
	Taught myself to study more effectively	.76
	Did all the assigned reading	.56
	Studied by myself	.21

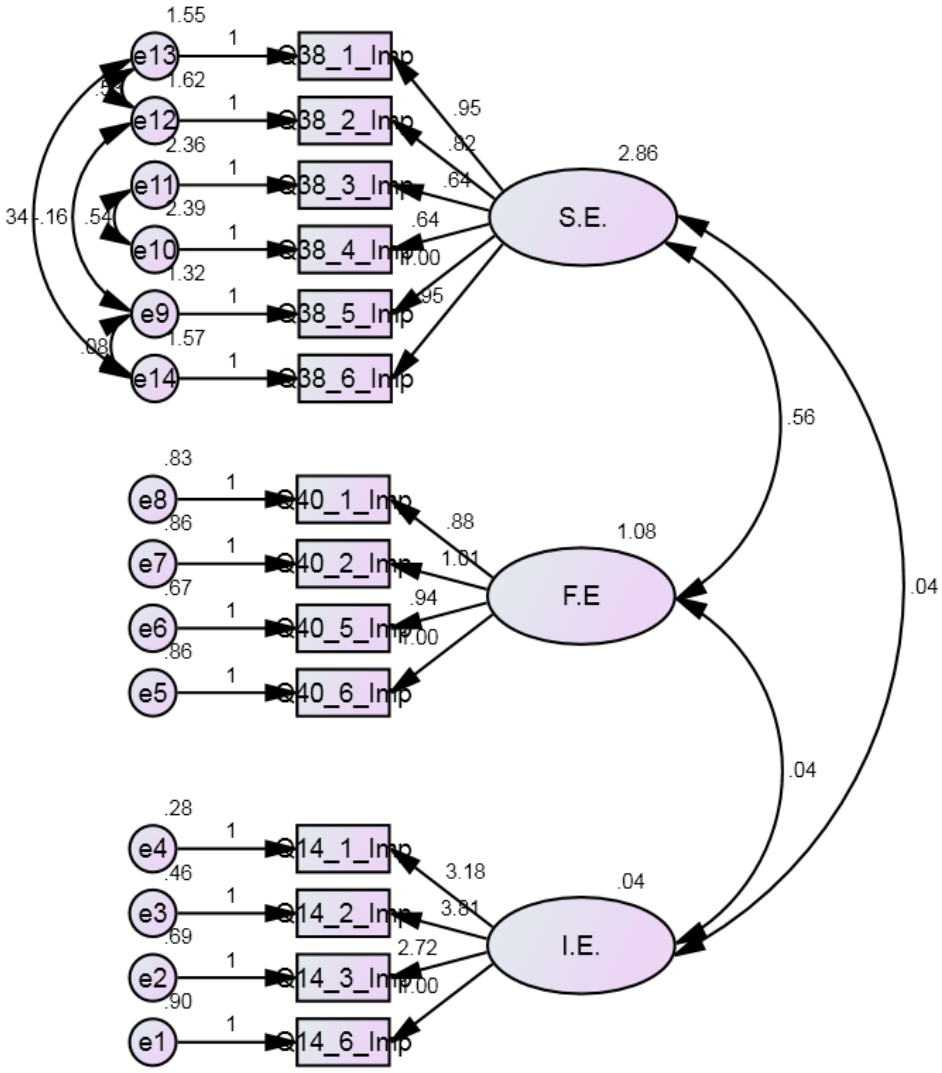

Figure 4.2. Confirmatory factor analysis: Community college student engagement model.

The three constructs produced through the EFA and confirmed in the CFA were utilized to guide the logistic regression analysis. Each construct was entered as a block into the logistic regression analysis along with a separate block for demographic characteristics.

Logistic Regression Analysis

A binary logistic regression analysis was used to analyze the probability that the independent variables (gender, ethnicity, mother's highest level of education, father's highest level of education, marital status, level of science completed, level of math completed,

distance of college from permanent home, employment status, number of hours worked for pay (weekly), level of math, level of science, question 14_1, question 14_2, question 14_3, question 14_6, question 38_1, question 38_2, question 38_3, question 38_4, question 38_5, question 38_6, question 40_1, question 40_2, question 40_5, and question 40_6) predict the dependent variables (intention to transfer and STEM aspirations).

Binary logistic regression was selected because of the type of variables relevant to the study. A dichotomous dependent variable coupled with a variety of normal/scale factors and dichotomous independent variables is best analyzed through the use of a binary logistic regression. In addition, logistic regression was chosen because it does not require a large degree of statistical assumptions. The logistic regression does not require the data to meet the general assumptions of normality, linearity, and equal variances (Mertler & Vannatta, 2010; Tabachnick & Fidell, 2007).

In the study, two binary logistic regressions models were ran. The first logistic regression analysis focused on the ability of the three engagement factors to predict adult students' intentions to transfer, and the second logistic regression analyzed the likelihood of the three engagement factors to predict adult students' STEM aspirations.

Variables included in binary logistic regression must be either dichotomous or scale. This required that any nominal variables be recoded. Dummy coding provides a statistically direct way of using categorical predictor variables in various kinds of estimation models (i.e., linear regression). "Dummy coding uses only ones and zeros to convey all of the necessary information on group membership" (Institute for Digital Research and Education, 2013, para 1). The rationale for utilizing dummy coding is due to lack of variability in certain variables. For instance, there was very little variability in the survey results in the ethnicity/URM

variable due to the geographical setting of the survey. Due to this lack of variability, the variable ethnicity/URM (question 56) was recoded into two disparate groups: URM and non-URM students. Because the study took place at community colleges in the state of Iowa, a large majority (89.9%) of the survey participants were White or Asian. Those students who indicated that they were White or Asian were coded as being the non-URM category, whereas all other ethnicities were coded as being in the URM group. NSF (2011) has provided a definition of URM as "three racial/ethnic minority groups (Blacks, Hispanics, and American Indians) whose representation in science and engineering is smaller than their representation in the U.S. population" (p. 13). For the sake of this study, URM was defined as: ethnic minority groups that are significantly underrepresented in STEM-related fields at postsecondary institutions, specifically in the state in the Iowa. Underrepresented ethnic groups in STEM fields include: Blacks, Hispanics, Native Americans, Alaskan Natives, and Native Pacific Islanders (NSF, 1991, 2011).

Marital status (question 58) was recoded into two groups: married and not married. Students who responded that they were currently married were grouped as being in the married category, whereas students who indicated that they were living together (not married); single, never married; or divorced, separated, or widowed were coded as being in the nonmarried group.

Employment status (question 23) was recoded into employed and unemployed groups. Students who indicated that they currently were working on campus or off campus were recoded as being employed, and students who responded that they were not working and not looking for work or that they currently were unemployed but looking for work were coded as unemployed.

If the regression variables had a negative coefficient (β) the inverse odds ratio was used to analyze those results. The inverse odds ratio is calculated as 1/odds ratio (DesJardins, 2001).

Intention to Transfer

The binary logistic regression run to establish the probability that engagement predicts adult students' intentions to transfer was based on four blocks, as defined and confirmed by the EFA/CFA. The four blocks are shown in Figure 4.3 and include background characteristics, staff transfer engagement, individual coursework engagement, and faculty coursework engagement. Each block consists of between four and 14 variables that were entered into the logistic regression analysis using IBM SPSS 20.0 software.

The logistic regression analysis produced a model that consisted of nine predictors of students' intention to transfer: employment status; gender; ethnicity/URM; mother's highest level of education; father's highest level of education; I consulted with academic advisors/ counselor regarding transfer; I met with academic advisors/counselors on a regular basis; I talked with an advisor/counselor about courses to take, requirements, and educational plans; and I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor. According to the –2 log likelihood for goodness of fit, the results of the logistic regression indicate that the predictors are statistically reliable in distinguishing between students who intended to transfer and those students without transfer intentions, –2 log likelihood = 2918.343, $\chi^2(8) = 39.620$, $p < .05$. The model correctly classified 69.9% of the cases. The specificity revealed that 71.5% of the students without intending to transfer were correctly identified as not intending to transfer. The sensitivity indicated that 68.2% of the students who were intending to transfer were correctly identified as intending to transfer.

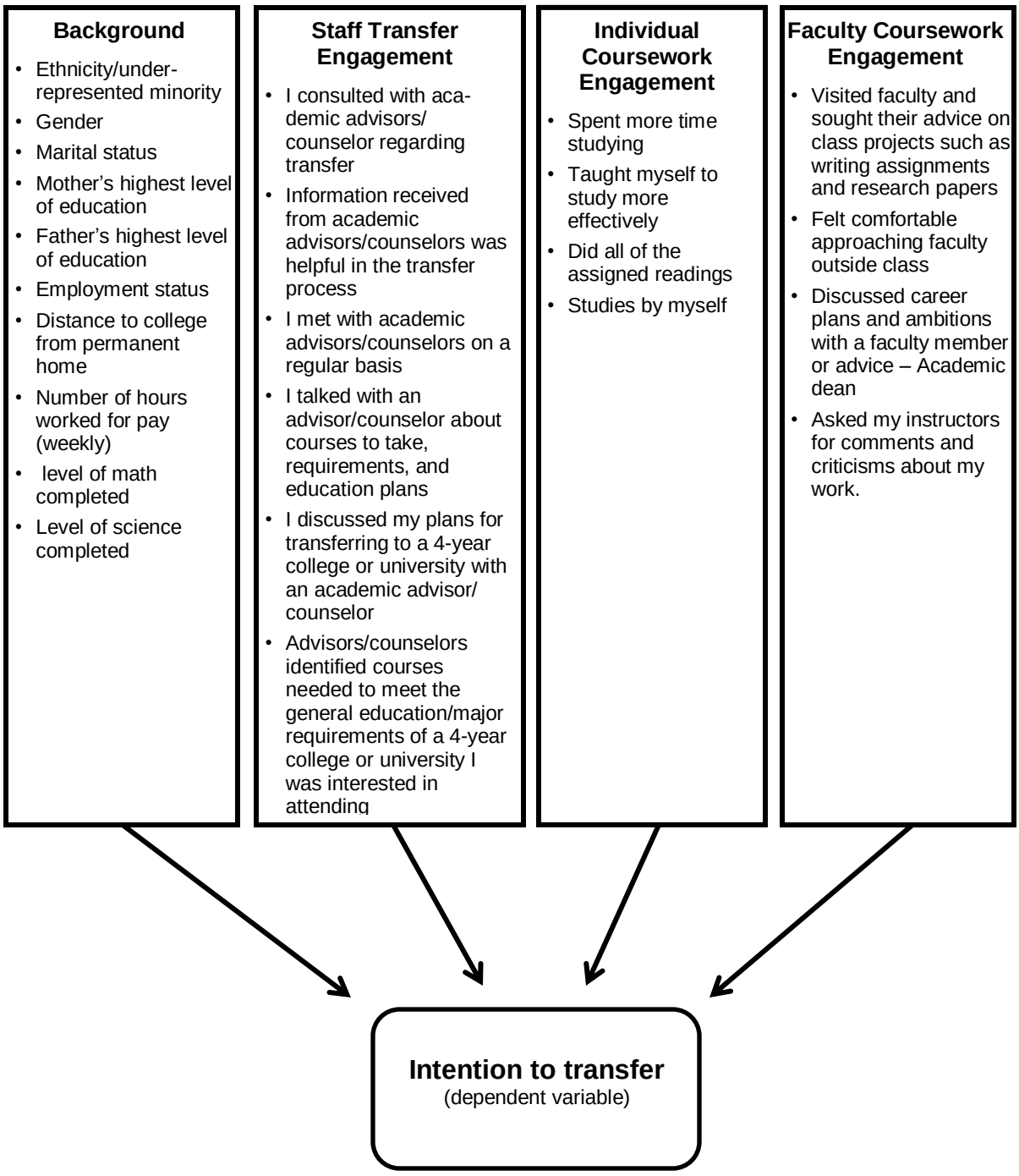

Figure 4.3. Anderson's predictive model for adult community college students' intentions to transfer.

The Hosmer-Lemeshow test was shown to be significant (p = .000) for this regression model. Normally a nonsignificant value is preferred, but the overall model fit was high by all other indicators. Sometimes a large sample size (N = 2,896) can skew the Hosmer-Lemeshow results.

> Caution should be used in interpreting the calibration of predictive models developed using a smaller data set when applied to larger numbers of patients. A significant Hosmer-Lemeshow test does not necessarily mean that a predictive model is not useful or suspect. (Marcin & Romano, 2007, p. 2212)

The chi square and other indicators showed good overall model fit. "A non-significant chi-square indicates that the data fit the model well" (Wuensch, 2009, p. 26). After careful consideration, this model was not rejected due to a significant chi square, –2 log, and overall omnibus indicators.

The results of the logistic regression for all variables retained in the model can be found in Table 4.7, and the results of the logistic regression analysis for all variables can be found in Appendix F. The variable I discussed my plans for transferring to a 4-year college or university with an academic counselor/advisor had the highest predictive value (β = .558) on intention to transfer. Although still statistically significant, the variables I consulted with academic advisors/counselor regarding transfer (β = .158), I met with academic advisors/ counselors on a regular basis (β = –.224), I talked with an advisor/counselor about courses to take, requirements and educational plans (β = –.179), employment status (β = –.106), gender (β = –.314) and ethnicity (β = –.140) had predictive values above β = .100 and thus also are statistically significant predictors of intention to transfer (Aron et al., 2005; Mertler & Vannatta, 2010).

The results for the mother's highest level of education variable indicated that students whose mothers completed more education responded that they were 1.08 times more likely (p = .017) to intend to transfer than did students whose mothers completed very little education. Students who indicated that they had discussed their plans for transferring to a 4-year institution with an academic advisor/counselor and found those discussions to be more helpful were 1.75 times more likely ($p < .001$) to have transfer aspirations than were students who indicated that discussions about transferring to a 4-year college or university were unhelpful. Students who responded that they were more likely to consult with an academic advisors/counselor regarding transfer were 1.17 times more likely ($p < .001$) to have transfer intentions than were those students who did not frequently consult with academic advisors/

Table 4.7

Logistic Regression Coefficients: Intention to Transfer

Variable	*B*	Wald	*df*	*p*	Odds ratio
Gender	–.314	8.555	1	.003**	0.731
Employment status	–.106	4.307	1	.038	0.899
Mother's highest level of education	.078	5.646	1	.017	1.081
Father's highest level of education	.066	4.298	1	.038	1.068
Ethnicity/URM	–.140	8.822	1	.003**	0.869
I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor.	.558	193.383	1	.000*	1.746
I talked with an advisor/counselor about courses to take, requirements, and education plans.	–.179	32.392	1	.000*	0.837
I met with academic advisors/counselors on a regular basis	–.224	40.751	1	.000*	0.800
I consulted with academic advisors/counselor regarding transfer	.158	15.662	1	.000*	1.171
Constant	–.161	.096	1	.757	0.851

*$p \leq .001$. **$p \leq .005$.

counselors on the transfer process. The results for the variable I met with academic advisors/counselors on a regular basis revealed that students who met less frequently with academic advisors were 1.25 more likely ($p < .001$) to intend to transfer than were those students who met with academic advisors/counselors and used their services on a regular basis. The results for the variable I talked with an advisor/counselor about courses to take, requirements, and education plans revealed that students who frequently spoke with advisors about their courses, requirements, and educational plans were 1.19 more likely ($p < .001$) to intend to transfer than were those students who spoke with advisors on a more regular basis. Students who identified as non-URM were 1.15 times more likely to intend to transfer than were those categorized as URM.

Twenty-four independent variables were entered into the logistic regression analysis in four blocks and analyzed on the dependent variable intention to transfer. Of the 24 variables entered into the analysis, nine variables were retained in the final model. The results of the chi-square analysis and –2 log likelihood test indicate that the model is statistically significantly reliable in distinguishing between students with the intention to transfer and those students without transfer intentions.

STEM Aspirations

The logistic regression to establish the probability that engagement predicts students' STEM aspiration was based on four blocks. The four blocks are shown in Figure 4.4 and include background characteristics, staff transfer engagement, individual coursework engagement, and faculty coursework engagement on coursework. Each block was entered into the logistic regression analysis using IBM SPSS 20.0 software.

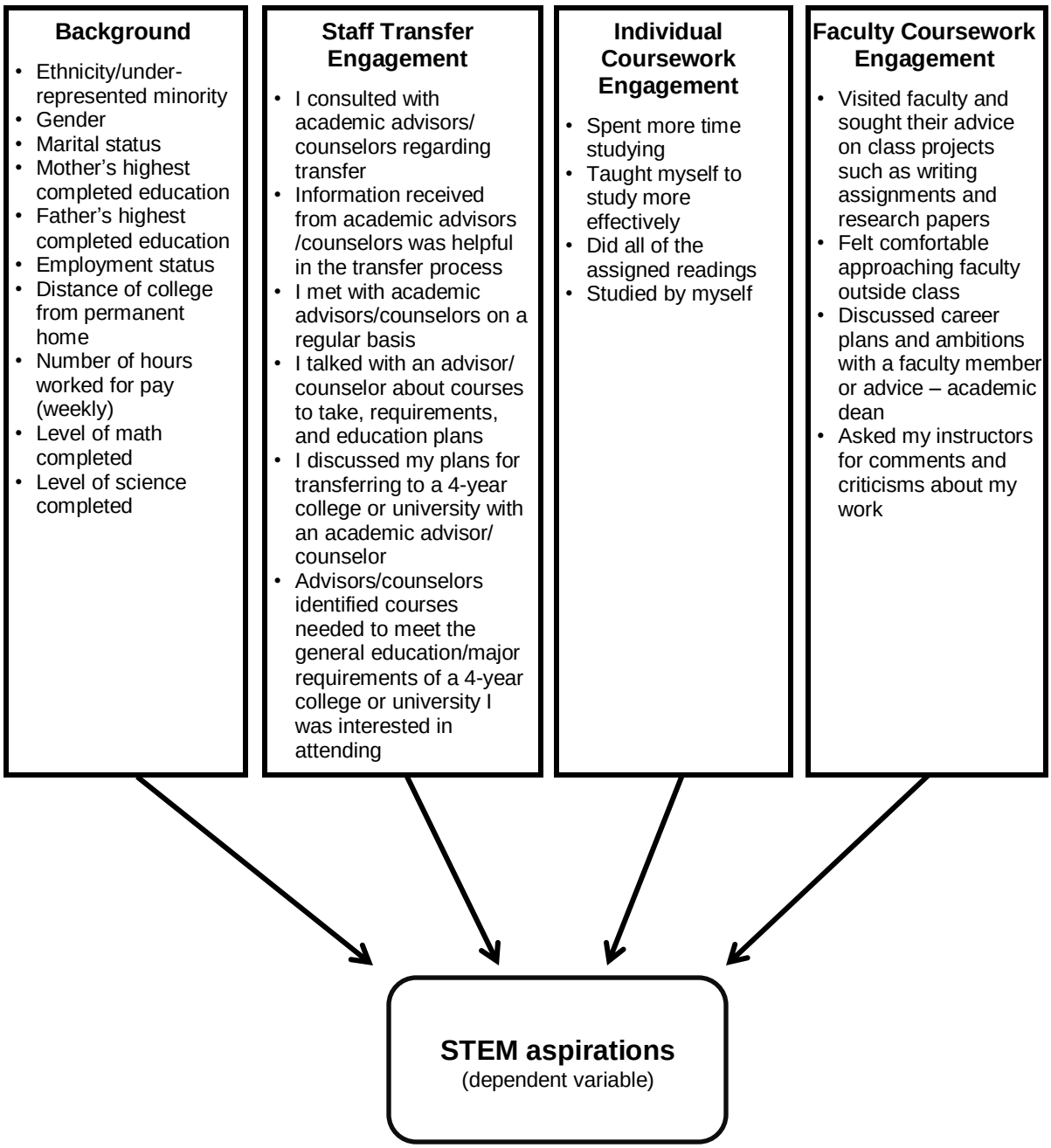

Figure 4.4 Anderson's predictive model for adult community college students' STEM aspirations.

The logistic regression analysis produced a model that included seven predictors of STEM aspirations: I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor; I talked with an advisor/counselor about courses to take, and requirements, and education plans; spent more time studying; hours worked per week, gender; level of math completed; and level of science completed. According to the Hosmer-Lemeshow test and the –2 log likelihood for goodness of fit, the results of the logistic regression indicate that the predictors are statistically reliable in distinguishing between students with STEM aspirations and those without STEM aspirations (–2 log likelihood = 2881.939, $\chi^2(8) = 4.613$, $p < .05$). The Hosmer-Lemeshow test significance came to .798 for this model, indicating a good model fit for the data. The specificity revealed that 72.9% of the students without STEM aspirations were correctly identified as not having STEM aspirations. A cut value of .25 revealed that the model correctly identified 68.1% of the cases. The cut value of .25 was utilized for this model as the empirical proportion of successes for students with STEM aspirations is close to the .25 cutoff. The sensitivity indicated that 51.3% of the students with STEM aspirations were correctly identified as a STEM aspirant.

The results of the logistic regression for all variables retained in the model can be found in Table 4.8, and the results of the logistic regression analysis for all variables can be found in Appendix G. The variable I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor ($\beta = –.198$); spent more time studying ($\beta = –.180$); I talked with an advisor/counselor about courses to take, requirements, and education plans ($\beta = –.094$); hours of hours worked for pay ($\beta = –.075$); level of math completed ($\beta = .279$); level of science completed ($\beta = .428$); and gender ($\beta = –.458$) have predictive values

above β =.100 and thus are also statistically significant predictors of STEM aspirations (Aron et al., 2005; Mertler & Vannatta, 2010).

The values for the variable level of science completed ($p < .001$) indicated that students who completed more science courses were 1.53 times more likely to have STEM aspirations than were students who completed fewer science courses. Students who indicated that their gender was male were 1.58 times more likely ($p < .001$) than were female students to respond that they had STEM aspirations. The values for the variable level of math completed indicated that students who completed more math courses were 1.32 times more likely ($p < .001$) to have STEM aspirations than were students who had completed fewer math courses. The values for the variable I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor revealed that students in this category were 1.22 times more likely ($p < .001$) to have STEM aspirations than were students

Table 4.8

Logistic Regression Coefficients: STEM Aspirations

Variable	*B*	Wald	*df*	*p*	Odds ratio
Level of science completed	.428	5.624	1	.000****	1.535
Level of math completed	.279	18.395	1	.018*	1.322
Spent more time studying	.180	5.824	1	.0016***	1.197
Gender	–.458	19.907	1	.000***	0.633
I talked with an advisor/counselor about courses to take, requirements, and education plans.	–.094	9.032	1	.003****	0.910
I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor.	.198	29.282	1	.000****	1.218
Number of hours worked per week	–.075	4.840	1	.028**	0.928
Constant	–2.163	16.630	1	.000****	0.115

*$p \leq .05$. **$p \leq .01$. *** $p \leq .005$. **** $p \leq .001$.

who did not have STEM aspirations. Students who indicated they talked with an advisor/ counselor about courses to take and requirements and educational plans were 1.09 times more likely ($p < .001$) to have STEM aspirations than were those students who did not intend to transfer. Those students who identified as having worked a lot of hours per week were 1.07 times more likely to have STEM aspirations than were those adult STEM aspirants who worked fewer hours per week.

Twenty-four independent variables were entered into the logistic regression analysis in four blocks and analyzed on the dependent variable intention to transfer. Of the 24 variables entered into the analysis, seven variables were retained in the final model. The results of the omnibus indictor, chi-square analysis and –2 log likelihood test indicate that the model is statistically significantly reliable in distinguishing between students with STEM aspirations and those students without STEM aspirations.

Summary

This chapter includes descriptive, between groups, construct measurement, and prediction analyses of adult students in the SSSL dataset. The chapter also presents results of the analysis of students who intended to transfer to a 4-year college or university and those students who had STEM aspirations. All data analysis was conducted using IBM SPSS 21.0 and IBM SPSS AMOS 20.0 software.

The findings of the data analysis were presented in a manner to correspond with the four research questions that guided this study. The first section presented the results of the demographic descriptive statistics for all SSSL participants as well as all adult students who responded to the survey.

The second section included the findings of the exploratory and confirmatory factor analyses. The EFA produced three constructs (Individual Coursework Engagement, Staff Transfer Engagement, and Faculty Coursework Engagement) of student engagement that included 14 factors associated with engagement. The three constructs and all related factors were analyzed using a CFA. The final community college student engagement model retained the three constructs resulting from the EFA. This final model produced good model fit as compared to the benchmarks established in this study.

The third section reported the results for the logistic regression analysis for the dependent variable intention to transfer. Demographic and multiple engagement variables were entered into the binary logistic regression analysis in four disparate blocks. Variables that were significant at the $p \leq .05$ level were retained in the model. The significant predictors of students' intentions to transfer were shown to be employment status; gender; ethnicity/URM; mother's highest level of education; father's highest level of education; I consulted with academic advisors/counselor regarding transfer; I met with academic advisors/counselors on a regular basis; I talked with an advisor/counselor about courses to take, requirements and educational plans; and I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor.

The fourth section revealed the logistic regression results for the dependent variable STEM aspirations. The binary logistic regression was conducted using four disparate blocks consisting of demographic and multiple engagement variables. Variables that produced statistically significant results at the $p \leq .05$ level and retained in the model as predictors of students' STEM aspirations are: level of science; gender; number of hours worked per week; level of math; I discussed my plans for transferring to a 4-year college or university with an

academic advisor/counselor; I talked with an advisor/counselor about courses to take, requirements, and education plans; and spent more time studying.

The results of the analyses presented in Chapter 4 will be described in depth in Chapter 5. A discussion of the implications of the results; recommendations for policy and practice, future research; and conclusions of the study also can be found in Chapter 5.

CHAPTER 5. DISCUSSION, CONCLUSIONS, AND IMPLICATIONS

Introduction

Community college administrators, faculty, and educational policymakers are recognizing the importance of adult students in postsecondary education. The community college system can lead the charge in helping the United States become a world leader in higher education and, specifically, STEM-related fields. In order to follow through on this lofty goal, community college leaders must identify the unique needs of the adult student population. Adult students and traditional students have different academic objectives and different programmatic needs. As noted in the literature review, adult students are often characterized by the responsibilities they carry outside of the classroom, specifically their professional and familial obligations. These tasks can interfere with adult students' engagement in activities at their academic institution. Time spent working at jobs and commuting often cuts into their academic preparation time.

The United States has fallen behind in the global rankings when it comes to STEM education. As recent studies have shown that the United States now lags behind other nations in the number of college graduates and graduates in STEM majors, the federal and state governments are taking note and developing and implementing strategies to begin to return the nation's educational system to the world-wide competitive level it once held (Kuenzi, 2008).

There are a few issues facing the STEM fields that community colleges may help to mitigate. For example, more jobs are being created in STEM-related fields, and the number of STEM graduates graduating from colleges in the United States has not kept pace. In the nearly 40-year period between 1971 and 2010, there was no increase in the percentage of

undergraduate students who indicated that they intended to major in a STEM-related field (Hurtado, Chang, Eagan, & Gasiewski, 2010).

The adult student population can play a large role in helping narrow the shortage of undergraduate students in the STEM disciplines. Unfortunately, adult students also have unique engagement challenges that community college STEM educators and staff need to address in order to narrow the supply/demand gap. Adult students often are categorized by the responsibilities they carry outside of the classroom, including family responsibilities and employment. Unfortunately adults don't always have an abundance of time to put into their studies and other activities because of responsibilities at home and time spent at work or commuting. If these engagement challenges can be overcome, then adult students may be redirected to transfer to a 4-year institution and possibly major in a STEM field.

This study, seeking to explore the unique needs of adult students, had two primary purposes. First this study examined the student engagement constructs that exist among community college adult students. The second purpose was to examine the effect of background and engagement factors on two academic outcomes: intention to transfer and STEM aspirations. The literature review of adult students and engagement theories guided the research questions and methodology. This study also analyzed characteristics of both adult and traditional-age students to establish a contextual framework to better understand how adult students navigate the community college system. Scholarly research has indicated that adult students and traditional students differ in participation by demographic variables. Adults tend to attend part time versus full-time and transfer from other academic institutions. Adult students have increased work and family responsibilities and, subsequently, less time for overall campus participation and classroom preparation. Moreover, adults tend to live

farther away from campus and commute to classes. In addition, the level of education of adult students' fathers and mothers has been shown to be lower than that of traditional-age students. Many adult students, because of their work/life balance issues, may be less likely to matriculate to a baccalaureate institution. Adult students also may not be as inclined to have STEM aspirations, similar to their traditional-age peers, due to preconceived notions about technical abilities.

Given the academic importance of engagement research, it is important that policymakers and community college administrators across the nation work to increase the number of college graduates and specifically those enrolled in STEM majors. With the creation of the Iowa STEM Education Roadmap and, most recently in July 2011, the Governor's STEM Advisory Council, the state of Iowa has begun to focus its resources on improving the overall success of STEM education.

A review of the literature surrounding STEM education, adult students, and student engagement led to the development of the four research questions that guided this study:

1. What are the demographics of adult students at community colleges?
2. How are student engagement constructs measured by variables in the SSSL instrument?
3. To what extent do engagement and other student variables predict adult learners' intention to transfer to a 4-year institution?
4. To what extent do engagement and other student variables predict adult learners' intention to major or not major in STEM fields?

This chapter discusses the results of the SSSL survey that was administered to students attending community college in the 15 Iowa community college districts. The data were

analyzed with a focus on two dependent variables: intention to transfer and STEM aspirations. In addition, this chapter also includes recommendations for policy and practice, as well as suggestions for future research, and closes with conclusions of the study.

Discussion of Results

Descriptive Analysis

The descriptive analysis was conducted using frequency statistics. The descriptive analysis was divided into three sections: all adult students who responded to the SSSL survey, adult students with STEM aspirations, and adult students who intended to transfer. The results indicated that the students in each group responded to questions regarding their background and demographic characteristics at roughly the same rate. Further, the adult students demographics found in this study align with the statewide community college population. According to *The Condition of Iowa Community College* (2012) report, "the typical community college student, as with prior years, is female, under 25, and white (p. 20).

The all adult student group was characterized by a majority of students who were female, White/Caucasian, married, employed off campus, and working more than 30 hours per week. In general, these characteristics are indicative of the community college population in the state of Iowa. The percentage of females in the overall adult student sample (74.7%) and the intention to transfer sample (74.7%) were slightly higher than those with STEM aspirations (65.6).

The majority of adult participants in all three groups indicated they were married. The results broke down as follows: adult students, 46%; STEM aspirants, 45.9%, and those who intended to transfer, 44.5%. The survey findings confirm the statewide trends of community college students in Iowa. Bean and Metzner (1985) concluded that students 25

years of age or older were more likely to be married, have greater family responsibilities, and have lower parental educational attainment.

A large majority (greater than 83%) of students in all three categories of adult students identified as White/Caucasian. Less than 7% of community college students identified as African American. In addition, less than 2% identified as Hispanic in all three groups. The survey results are similar to statewide demographics. Kasworm (2003) found that the increase in adult student enrollees has brought with it an increase in student diversity, although minorities are still underrepresented. NCES (1995) reported that minority adult students represented about 24% of the adult student population. In the state of Iowa, "more minorities are enrolling into community colleges: with the exception of the FY 2012, when the number of minorities slightly declined, it was steadily growing for the past five years, with average annual growth of 14.7 percent (Iowa Department of Education, 2012, p. 20)

Students in all three groups also responded similarly to questions regarding their parents' highest level of completed education. The majority of adult students indicated that both their mothers and fathers had completed a high school diploma as their highest level of completed education. Students indicating that both their mother and father were high school graduates accounted for at least 30% of survey participants for all three groups. Those students indicating their mother and father had an associate's degree from a 2-year college ranged from 8.9% to 15.2% of the responses for all groups of students. Bean and Metzner (1985) concluded that students 25 years of age or older were more likely to be married, have greater family responsibilities, and have lower parental educational attainment.

A large majority of students (all adults, 82.1%; intention to transfer, 91.6%; STEM aspirants, 91.5%) indicated that their permanent home was less than 50 miles from the

institution that they currently were attending. These results parallel that of the statewide demographics of community college students; most Iowa students are residents and live within driving distance of their college. The Iowa Department of Education (2011) indicated that "almost 92% of students attending Iowa's community colleges are residents of Iowa" (p. 9).

Research has shown that adult students are more likely than are their traditional-age counterparts to be commuters. Commuters have life circumstances that are diverse and may indicate that a student is married, in a long-term relationship, having to care for a child or other dependent, or supporting a family (Silverman, Sarvenaz, & Stiles, 2009). Unfortunately, the number of external responsibilities negatively impacts adult students' abilities to engage in their campus. "It appears that the further away from campus (walking distance, driving distance) the less likely a student is to take advantage of the educational resources the institution provides" (Kuh et al., 2001, p. 9).

The majority of students in all three groups indicated that they had completed a low level of math and science. The percentage of students who indicated a low level of science courses completed was as follows: all adults, 81.3%; STEM aspirants, 72.9%; and those who intend to transfer, 80.4%. The percentage of adult participants indicating a low level of completed math courses was the following: all adults, 73.3%; STEM aspirants, 62.7%; and those who intend to transfer, 62.1%. The study revealed that the majority of STEM-aspiring students had completed only a few math and science courses. The low level of math courses completed and the lower level of science completed was significant, possibly due to adult students being out of higher education for longer periods of time than their traditional aged peers.

Factor Analysis

The EFA produced three engagement constructs: Individual Coursework Engagement, Staff Transfer Engagement, and Faculty Coursework Engagement. These three constructs each consisted of four to six variables with factor loadings between .552 and .791. The constructs produced alpha reliability coefficients between .632 and .860. The engagement constructs were then entered into a CFA.

The CFA was run using IBM SPSS Amos 20.0 software. The CFA produced a community college student engagement model with the following measurements of fit: χ^2/df = 10.660, CFI = 0.975, and RMSEA = 0.043 ($p < .001$), indicating that the model has a very good fit. No variables were removed from the EFA. One variable in the Individual Coursework Engagement construct, studied by myself, produced a low factor loading (.21). Due to high intra-inter covariances and strong aggregate goodness-of-fit indicators, it remained in the final community college engagement model. The remaining factor loadings that were retained in the CFA ranged from .56 to .83. The final three constructs in the community college student engagement model each consisted of four to six variables associated with engagement.

The results of the CFA show that engagement variables were grouped into three distinct engagement factors. The first factor was Staff Transfer Engagement. The set of engagement variables associated with this factor validate that, in analyzing transfer and STEM options, the more interaction that adult students maintain with advisors and counselors the more significant the effect is on these outcome variables. These variables were shown to significantly impact adult students' academic achievement.

Another set of engagement variables shown to impact the level of engagement of adult students aligns with the amount and intensity of individual time invested in coursework. These variables included doing all of the assigned reading and studying outside of class hours. This study shows that adult students do not rely on peer interaction and group studying as much as do traditional-age students. Due to outside family and work responsibilities, adult students are unlikely to have as much time to invest on campus as do their younger cohorts. This study validates the importance of adult students' intrinsic work ethic as related to their matriculation and STEM aspirations.

The final set of engagement variables has to do with faculty interaction. This study found that faculty interaction with adult students is critical to their academic engagement. The more direct feedback and time faculty invest in their adult students, the more inclined these students are to be engaged in their academic environment.

The results of the factor analyses differed slightly from the constructs produced through research conducted using the CCSSE. The CCSSE focuses on five constructs: Active and Collaborative Learning, Student Effort, Academic Challenge, Student–Faculty Interaction, and Support for Learners (McClenney, 2006). The constructs produced in the present study (using the SSSL survey) are moderately similar to those produced through the widely utilized CCSSE.

The SSSL construct, Faculty Coursework Engagement, is similar to the group of variables in the CCSSE Student–Faculty Interaction construct. Those portions of the two survey instruments, CCSSE and SSSL, are similar in nature because they address the importance of student–faculty engagement. Both constructs focus on student–faculty engagement outside of the normal class environment. Some specific variables that overlap

between the two constructs include: discussing coursework and assignments with instructors, working collaboratively with instructors, and receiving feedback on coursework.

The SSSL construct Staff Transfer Engagement does not directly align with any of the constructs developed through the CCSSE instrument. Staff Transfer Engagement focuses on the interactions students have with academic advisors and counselors throughout their academic career. These specific interactions can include meetings to discuss future transfer plans, discussions about current academic coursework, and regularly meeting with advisors or counselors.

The SSSL construct Individual Coursework Engagement is similar to the Student Effort construct utilized by CCSSE. Both constructs include variables that have to do specifically with the amount of physical and psychological investment students have in their coursework and related assignments and exams. Some examples of students' investment in their academic courses include spending more time studying, teaching themselves to study more effectively, doing all the assigned reading, and studying by themselves. Adult students are intrinsically motivated to learn rather than depending on external factors prompting them to study. This statistic supports Knowles (1980) assumption. Adult students will use discretionary time to prepare for class.

Knowles (1980) also suggested that adult students are self-directed. Self-directed learning activities are critical to helping guide adult students toward academic success. These self-directed activities must be intensive and allow for work to be done on the student's own time. Each project must be transparent and have a straightforward set of learning objectives associated with it. A learning project was defined as "a series of related episodes, adding up to at least seven hours. In each episode more than half of a person's total

motivation is to gain and retain certain fairly clear knowledge and skill" (Tough, 1971, p. 6). Tough (1971) discovered was that almost three-fourths of adult students' learning projects are completely self-directed (Cross, 1981). Merriam (2001) also validated the importance of self-directed projects in terms of adult's academic success. The descriptive understanding of self-directed learning is that, as people mature, learning becomes more self-directed. Current models of self-directed learning describe goals of adult students, the nature of self-direction, and different ways of assessing self-directed learning (Merriam, 2001).

Logistic Regression Analysis

Logistic regression analyses were conducted using 24 independent variables and two dependent variables: intention to transfer and STEM aspirations. The variables were entered into the logistic regression in four blocks: Background Characteristics, Individual Coursework Engagement, Staff Transfer Engagement and Faculty Coursework Engagement.

Intention to transfer. The logistic regression analysis on the dependent variable intention to transfer retained nine variables in the community college student engagement model: employment status; gender; ethnicity/URMs; mother's highest level of education; father's highest level of education; I consulted with academic advisors/counselor regarding transfer; I met with academic advisors/counselors on a regular basis; I talked with an advisor/counselor about courses to take, requirements, and educational plans; and I discussed my plans for transferring to a 4-year college or university with an academic advisor/ counselor. This indicates that student demographics play a large role in predicting students' intentions to transfer, but variables associated with staff transfer engagement also influence students' transfer intentions.

In this study, students who were female, White/Caucasian, working more than 30 hours a week, and whose parents completed higher levels of education were more likely to intend to transfer. The results show that the variables gender and ethnicity/URM have a significant negative impact on adult students' intention to transfer. The results of the study also indicated that the highest level of completed education of both adult students' fathers and mother's positively influenced students' transfer intentions. This indicates that students whose parents completed more education have a positive impact on adult students who intend to transfer.

Astin (1993) and Pascarella and Terenzini (1991, 2005) noted that students' background characteristics play a large role in their educational outcomes. Students whose parents are actively involved in their educational lives often are more likely than are students of noneducationally active parents to have high academic aspirations. Laanan (2003) found similar results in his study of the variables associated with predicting community college students' degree aspirations. In that study, he found that the highest level of education of a student's mother and student age predicted students' highest degree aspirations.

The relationships students develop with academic staff and the time they spend discussing their academic goals with them can influence students' transfer intentions. The questions that showed a positive influence in students' transfer intentions focused on meeting with academic advisors/counselors specifically about the transfer process. The questions include: (a) consulting with advisors/counselors about transferring and (b) discussing plans for transferring with an academic advisor/counselor. These results suggest that students who already intend to transfer to a 4-year institution typically have positive engagement experiences with academic staff regarding their plans for transferring. The interaction of

adult students meeting with academic advisors is critical to their intention to matriculate from their current community college.

The findings of the logistic regression analysis for the dependent variable intention to transfer indicated that there is a statistically significant relationship between engagement and students' intention to transfer to a 4-year college or university and resulted in the acceptance of the first null hypothesis (H_0^1).

STEM aspirations. The logistic regression analysis on the dependent variable STEM aspirations retained seven variables in the community college student engagement model: level of science completed; gender; number of hours worked per week; level of math completed; I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor; I talked with an advisor/counselor about courses to take, requirements, and education plans; and spent more time studying. In general, these results indicate that students' STEM aspirations are influenced more by background and demographic characteristics than by engagement variables.

The variables level of science completed and level of math completed have positive influences on students' STEM aspirations. This indicates that the more courses that adult students take in math and science, the more likely they are to want to major in the STEM fields. Likewise, the amount of time spent studying by adult students also positively influences STEM aspirations. This indicates that as students' amount of time students study increase, so do their STEM aspirations. Similarly, discussing plans for transferring to a 4-year college or university with an academic advisor/counselor positively influences adult students' STEM aspirations, suggesting that students who discuss transferring to a 4-year

college with an advisor are more likely to have STEM aspirations than are students who do not.

The gender variable revealed a negative influence on students' STEM aspirations. This indicates that adult male students are more likely to have STEM aspirations than are female students. Similarly, the number of hours working for pay weekly also revealed a negative influence on STEM aspirations, indicating that students who spend more hours working are less likely to have STEM aspirations than are students who work a minimal number of hours each week. Likewise, the variable I talked with an advisor/counselor about courses to take, requirements, and education plans had a negative impact on adult STEM aspirants. This finding indicates that adult students who talked with an advisor about requirement and educational plans were less likely to be a STEM aspirant than were those adult students who did not discuss their plans with advisors/counselors.

The results of the logistic regression analysis for STEM aspirations confirmed what previous literature suggested: Male students who excel in science and math and have high degree aspirations are more likely to have STEM aspirations (Chen, 2009; Laanan et al., 2010). The results of the logistic regression analysis for the dependent variable STEM aspirations, indicating that there is no statistically significant relationship between engagement and adult students' STEM aspirations, resulted in the retention of the second null hypothesis (H_0^2).

Implications for Policy and Practice

The results of the descriptive analysis revealed that all Iowa adult community college students, Iowa adult community college adult students with transfer intentions, and Iowa adult community college STEM aspirants have similar background characteristics. All three

groups of adult students engage with faculty members and advisors/counselors at similar rates. A greater understanding of the factors that affect adult students' college success can assist policymakers, community college administrators, faculty members, and staff to parlay those variables to increase student success, specifically adult students' transfer intentions and STEM aspirations. Community colleges need to capitalize on their practice of open access to help improve transfer rates to 4-year institutions and specifically for students majoring in STEM-related fields. By scaling up and replicating successful partnerships with K–12 districts, business and industry, and community colleges, students can become engaged in STEM curricula.

Adult students are more likely to be married, spend a significant amount of time at work, commute, have parents with less formal education, and spend less time on campus activities. Even though adult students have increased time constraints, they still spend a significant amount of time on their own volition preparing for classes. Knowing what kinds of engagement obstacles prevent adults from achieving academic success will assist faculty, administrators, and staff to increase the likelihood they will transfer on from their community college institution.

Adult students require quality financial aid programs (grants and scholarships), as well as understanding faculty and academic advisors, to help increase their transfer rates to 4-year colleges and specifically into STEM programs. Some general examples of how community colleges can assist adult learners include:

- Develop childcare assistance programs in order to allow adult students to attend classes and tutoring in order to promote adult student engagement with faculty, staff, and other students during nighttime and weekend hours.

- Have advisors and staff assist students with administrative tasks that traditional students would normally complete themselves during daytime hours. For example, advisors could accept checks for university bills, order textbooks, and help with financial aid applications. This assists adult students who work long hours and live off campus.
- Create a dedicated learning space on campus (possibly a lounge with computers) for adult learners. Some adult students do not have reliable transportation to get to campus, which limits their schedule and ability to engage in campus activities. The space would need to be open extended hours after 5:00 pm and possibly later weekend hours.
- Schedule extended office hours for academic advisors/counselors to meet with all adult students, especially those students who reside away from the institution and have to drive to campus.
- Establish special parking passes and areas for commuter students only in order to accommodate those students who live away from campus. In addition, offer free or reduced bus passes to assist students who cannot afford vehicles. This helps accommodate students who live off campus.
- Require that staff and faculty pursue professional development training specific to adult learners. The professional development component would contain two pieces: initial orientation and annual continuing education.
- Require faculty to utilize more self-directed learning activities. Requiring more individual assignments and less group work allows more freedom and the autonomy

that adult students desire. This will increase the overall academic engagement of adults.

The logistic regression on the dependent variable STEM aspirations revealed that both students' demographic and engagement characteristics have positive and negative influences on adult students' STEM aspirations. By further understanding the factors that influence students' STEM aspirations, policymakers, administrators, faculty members, and college staff can help provide students with accessible paths to furthering their education. Some possible examples of how institutions can encourage adult students to pursue furthering their education or majoring in STEM fields include:

- Promote transfer opportunities and STEM careers in marketing materials on campus visit days and new student orientations.
- Host specific career and service fairs that focus on professions and organization in the STEM fields.
- Create specific admissions and academic advisor positions focused on recruiting and retaining STEM students.
- Provide diversity training to administrators, STEM instructors, and advisors to discuss the specific needs of adult students who fall into URM categories. Encourage all staff and faculty members to promote STEM careers to adult students, specifically non-White and non-Asian students.
- Encourage instructors in STEM disciplines to speak to their classes about the possible careers in STEM-related fields. Many community college instructors have real-world professional experience that adult students value. Speaking to them about the breadth of professional opportunities can add a personal perspective on

potential STEM careers. These instructors should utilize project-based learning so students can apply class theory to their real-life experiences.

- Offer specific and new scholarship opportunities for students interested in majoring in a STEM field. Knowledge of grants and scholarship opportunities could persuade students who are uncertain about STEM fields to entertain majoring in them.
- Offer STEM-related internships or job shadowing by partnering with local and regional companies. Many adult learners yearn for hands-on tangible experiences, and this could satisfy their unique educational needs.
- Encourage the community college assessment committee and/or faculty assessment leaders to conduct workshops with STEM instructors. These seminars can focus on developing consistent learning objectives across STEM courses. A collaborative approach on curriculum development and consistent objectives across STEM courses could increase academic achievement.
- Given that an often overlooked portion of the URM adult population is veteran students, community colleges should create an on-campus veterans organization focusing on the disparate needs of veteran students. This organization should also provide both academic and mental health support to veteran students. The reintegration from armed services to college can be a challenge, and a group such as this could act as a catalyst for championing veteran students unique needs.

The logistic regression analysis also revealed that independent variables associated with both engagement and students' demographics do influence adult students' intentions to

transfer. Examples of ways that colleges can encourage students to continue their education after their community college experience include:

- Require academic advising for all adult students. This mandatory advising orientation can provide the students with an academic plan of study time at the community college, and the advisor can begin an early discussion about transferring to a 4-year institution. An early meeting with an academic counselor can help smooth the transition from community college to a baccalaureate degree-granting institution.
- Provide and encourage academic fairs that promote 4-year colleges and universities in the surrounding region. Adult community college students may be unsure as to the discipline they would like to major in, where they would like to transfer to, or who to go about the transfer process. Transfer fairs regarding local 4-year institutions can provide students with the knowledge needed to make the decisions about furthering their postsecondary education.
- Create an articulation agreement with 4-year institutions throughout the region and state making student transfer, especially in STEM fields, easier for community college students. Transfer agreements regarding general education courses and discipline-specific courses would help lower some of the financial and educational boundaries for adult students who are looking for the most efficient pathway to graduation.

There is no magic bullet that will increase the rate that adult students transfer to 4-year institutions and then major in a STEM discipline, but a combination of financial and programmatic changes can increase student engagement. It is recommended that community

college administration, faculty, and staff evaluate their current policies and practices to more actively promote STEM education and matriculation at 4-year institutions.

Recommendations for Future Research

This dissertation study was not intended to be generalizable to all adult community college students in the United States. This research was conducted across 15 community college districts in the state of Iowa and, therefore, the results should be interpreted with caution in terms of applying these findings to community colleges outside of a rural Midwest state. Any future studies looking to build upon this engagement research should consider a national sample of adult students from which more generalizable results may be drawn.

Another reason that this study may not be generalizable on a national scale is the way that veteran status pervasively impacts the adult population in rural Midwest states. The geographic location of this study, the state of Iowa, tends to have a large number of veterans who make up adult student populations. There is an increasing number of veterans coming back from active duty who are enrolling in higher education. Currently, there are over 660,000 veterans within the United States attending postsecondary institutions, 329,000 of whom are using their educational benefits (NCES, 2011; Radford, 2010). The level of students taking advantage of this benefit could increase as more veterans become eligible for benefits. This specific set of adult learners has a disparate set of challenges and opportunities that community colleges will need to address for them to matriculate and persist. It is not uncommon for veteran students to suffer from post-traumatic stress disorder. Many of these veteran students need access to support groups and tutoring for academic and mental health issues. These adult learners add diversity to higher education with their unique experiences in the armed services and as students with possible disabilities, both physical and mental. A

follow-up study specifically on the engagement needs and challenges of adult veteran students could be advantageous for community college leaders.

This study used cross-sectional data from one academic semester. A follow-up study spanning several years, possibly tracking students through the transfer process and STEM aspirations rates, could add to the body of engagement research.

In addition, future analysis could focus on why a student's intention to transfer is critical to retention within STEM educational pathways. Future research on adult students could focus on aggregate degree attainment after transferring from a community college. Further analysis on the relationships between STEM degree attainment and STEM job placement could yield important long-term results. This study indicates the need for a long-term longitudinal study of engagement factors and adult students.

Further analysis of the community college student engagement model developed in this study could be utilized to study other student outcomes that are imperative to the community college system. Some longer term academic proxies for success also could be measured using engagement variables. For example, the student engagement model could be used to study engagement's influence on adult retention and graduation rates.

Conclusion

Community colleges are emerging as the college of choice for a large number of adult students due to these colleges' affordability and flexibility. Many students who enroll at a community college have the intention to transfer to a 4-year college or university. The community college system needs to provide customized and increased financial aid and programmatic services for adult students. These adult students may lack the confidence to complete a degree, the knowledge or questions to ask in order to seek advice from

counselors/advisors, or an understanding of the transfer process. Overcoming this will take more personalized attention from advisors/counselors and faculty members.

Adult students are an important part of higher education. They have many specialized needs and different expectations than do traditional-age students. They are a growing segment of the community college population. Having this understanding will allow community colleges to develop policies and programs that can help adults transfer to 4-year institutions at greater rate.

This study, conducted with Iowa community college students, found that adult students' demographic characteristics, along with staff, faculty, and individual student coursework engagement, influences these students' intentions to transfer to a 4-year institution. It also found that, although engagement does partially influence adult students' STEM aspirations, their demographic characteristics largely influence their STEM aspirations. This study also found relationships between certain demographic characteristics and engagement variables. For example, the survey results indicate that adult students who identify as Caucasian/Asian are more likely to have STEM aspirations than are URMs. There is more research needed on the influence of engagement on community college adult student outcomes, especially in terms of students' intentions to transfer and STEM aspirations.

The implications of this study are that engaging with and receiving encouragement from faculty members, discussing opportunities for STEM careers with academic advisors/counselors, and a high degree of individual work ethic can help those undecided students make the decision to pursue degrees in STEM majors. There is more research needed on the influence of engagement on community college student outcomes, especially

in terms of students' intentions to transfer and STEM aspirations. This study is one small but vital addition to the body of literature on adult community college students.

APPENDIX A. PILOT STUDY SURVEY

Default Question Block

Section 1: Self-Efficacy

The following questions are a series of statements about your personal attitudes and traits. For each item below, please indicate the extent to which you disagree or agree with the statement.

	Disagree strongly	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Agree strongly
When I make plans, I am certain I can make them work.	O	O	O	O	O	O	O
If I can't do a job the first time, I keep trying until I can.	O	O	O	O	O	O	O
When I have something unpleasant to do, I stick to it until I finish it.	O	O	O	O	O	O	O
When I decide to do something, I go right to work on it.	O	O	O	O	O	O	O
Failure makes me try harder.	O	O	O	O	O	O	O
I often make lists of things to do.	O	O	O	O	O	O	O
I usually mark important dates on my calendar.	O	O	O	O	O	O	O

	Disagree strongly	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Agree strongly
I know the subjects where I am academically weak and I try to improve them.	O	O	O	O	O	O	O
When I set important goals for myself, I rarely achieve them.	O	O	O	O	O	O	O
When unexpected problems occur, I don't handle them well.	O	O	O	O	O	O	O
I feel insecure about my ability to do things.	O	O	O	O	O	O	O
I do not seem capable of dealing with most problems that come up in life.	O	O	O	O	O	O	O
If something looks too complicated, I will not even bother to try it.	O	O	O	O	O	O	O
When trying to learn something new, I soon give up if I am not initially successful.	O	O	O	O	O	O	O

	Disagree strongly	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Agree strongly
I avoid trying to learn new things when they look too difficult for me.	O	O	O	O	O	O	O
I know what I want to be doing 10 years from now.	O	O	O	O	O	O	O
I wish I could have more respect for myself.	O	O	O	O	O	O	O
On the whole, I am satisfied with myself.	O	O	O	O	O	O	O
I certainly feel useless at times.	O	O	O	O	O	O	O

The following questions are a series of statements about your personal attitudes and traits in various social aspects. For each item below, please indicate the extent to which you disagree or agree with the statement.

	Disagree strongly	Disagree	Slightly disagree	Neither disagree	Slightly agree	Agree	Agree strongly

					nor agree			
It is difficult for me to make new friends.	O	O	O	O	O	O	O
If I see someone I would like to meet, I go to that person instead of waiting for him or her to come to me.	O	O	O	O	O	O	O
If I meet someone interesting who is hard to make friends with, I'll soon stop trying to make friends with that person.	O	O	O	O	O	O	O
When I'm trying to become friends with someone who seems uninterested at first, I don't give up easily.	O	O	O	O	O	O	O
I do not handle myself well in social gatherings.	O	O	O	O	O	O	O

Since attending this college, how often do you engage in the following?

	Never	Rarely	Sometimes	Often	Always
Not telling my friends when I get good grades	O	O	O	O	O
Acting less intelligent than I really am	O	O	O	O	O
Worrying about what others think of me	O	O	O	O	O
Doing things so that others will like me	O	O	O	O	O
Worrying about being called a "nerd" or "braniac"	O	O	O	O	O
Worrying about being accused of "acting white" or being a "sell out"	O	O	O	O	O

Please think about the most challenging class you have taken in this college, and answer the following questions based on your experiences in this class.

What was the class title or number for this most challenging class?

Why was this class the most challenging?

	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
Did not know how to study for the exams	O	O	O	O	O	O	O
Did not know how to develop a plan of action to learn the material	O	O	O	O	O	O	O
Had not taken a course in this subject before	O	O	O	O	O	O	O
Course material was different than course material covered in high school	O	O	O	O	O	O	O
Did not get enough feedback from the professor	O	O	O	O	O	O	O
Difficult to understand the professor because of language proficiency	O	O	O	O	O	O	O
Professor was not available to answer questions	O	O	O	O	O	O	O
Professor did not encourage interaction with him/her	O	O	O	O	O	O	O
Professor expected a low performance from me	O	O	O	O	O	O	O

		Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
Factors outside of the course interfered with my ability to complete the work		○	○	○	○	○	○	○
The course required a large amount of work		○	○	○	○	○	○	○

On a scale of zero to ten (0: No Anxiety - 10: Extreme anxiety), what was your level of anxiety in this class?

	0	1	2	3	4	5	6	7	8	9	10
Anxiety (0: No Anxiety - 10: Extreme Anxiety)											

What negative impact did your anxiety have on your class performance?

- ○ No negative impact
- ○ Small negative impact
- ○ Moderate negative impact
- ○ Significant negative impact
- ○ Extremely significant negative impact

Compared with other students in this class, would you say your abilities were:

- ○ Very much above average
- ○ Above average
- ○ Average
- ○ Below average
- ○ Very much below average

When you were working at a challenging task in that class, how confident were you that you would succeed?

- ○ Extremely confident
- ○ Very confident
- ○ Confident
- ○ Somewhat confident
- ○ Not at all confident

If you succeeded at a challenging part of this class, would you say it was because of:

		Strongly disagree	Disagree	Slightly disagree	Neither disagree nor agree	Slightly agree	Agree	Strongly agree
Your high ability		○	○	○	○	○	○	○
Good luck		○	○	○	○	○	○	○
The task was easy		○	○	○	○	○	○	○
You worked hard		○	○	○	○	○	○	○

If you failed (or less successful) at a challenging part of this class, would you say it was because of

		strongly disagree	Disagree	Slightly disagree	Neither Agree nor disagree	Slightly agree	Agree	Strongly Agree
Your low ability		O	O	O	O	O	O	O
Bad luck		O	O	O	O	O	O	O
the task was hard		O	O	O	O	O	O	O
You didn't work hard enough		O	O	O	O	O	O	O

Please indicate the things you did to address the challenges in this class, and how useful they were in improving your performance.

		Did not use/not applicable	Used, not helpful	Used, somewhat helpful	Used,very helpful
Spent more time studying		O	O	O	O
Taught myself to study more effectively		O	O	O	O
Did all of the assigned reading		O	O	O	O
Did supplemental reading or assignments		O	O	O	O
Increased lecture attendance		O	O	O	O
Received a previous year's test from a friend or club/organization to study		O	O	O	O
Studied by myself		O	O	O	O
Cheated on assignments or exams		O	O	O	O
Withdrew from the course		O	O	O	O
Studied with other students in the class		O	O	O	O
Studied with people outside the class		O	O	O	O
Received informal tutoring		O	O	O	O
Received professional tutoring from Academic Success Center		O	O	O	O
Used organized review sessions		O	O	O	O
Used feedback from teacher Assistant or professor on a regular basis		O	O	O	O

For this most challenging class, did you receive encouragement or helpful advice from any of the following?

		Strongly disagree	Disagree	Slightly disagree	Neither Agree nor Disagree	Slightly disagree	Agree	Strongly Agree	Not applicable
Family member or friend		O	O	O	O	O	O	O	O
Fellow resident or Resident Assistant		O	O	O	O	O	O	O	O
Fellow classmate		O	O	O	O	O	O	O	O
Upper-class student who had taken the class		O	O	O	O	O	O	O	O
Staff person or administrator		O	O	O	O	O	O	O	O
Professional counselor		O	O	O	O	O	O	O	O
Advisor		O	O	O	O	O	O	O	O
Professor or Teacher's Assistant for this class		O	O	O	O	O	O	O	O
Academic dean		O	O	O	O	O	O	O	O
Another faculty member		O	O	O	O	O	O	O	O

In a typical week (not exam week), how many hours did you spend studying and preparing for this class?

- ○ 0, or none
- ○ Less than 1 hour
- ○ 1-2 hours
- ○ 3-5 hours
- ○ 6-10 hours
- ○ 11-20 hours
- ○ 21-35 hours
- ○ 36-45 hours
- ○ 46 hours or more

Section 2: Social Capital

What is the highest level of education completed by your parents?

	Elementary school or less	Some high school	High school graduate	Some college	Associate degree from two year college	Bachelor's degree	Some graduate school	Graduate degree	Don't know
Mother	○	○	○	○	○	○	○	○	○
Father	○	○	○	○	○	○	○	○	○

What is your best estimate of your parents' total income last year? Consider income from all sources before taxes.

- ☐ If you are independent check here
- ☐ Less than $20,000
- ☐ $20,000---$39,999
- ☐ $40,000---$59,999
- ☐ $60,000---$79,999
- ☐ $80,000 or more
- ☐ I don't know

How much of your first year's educational expenses (room, board, tuition, and fees) do you expect to cover from each of the sources listed below?

	None	Less than $1,000	$1,000 to $2,999	$3,000 to $5,999	$6,000 to $9,999	$10,000+	Don't know
Family resources (parents, relatives, spouse, etc.)	○	○	○	○	○	○	○
My own resources (savings from work, work-study, other income)	○	○	○	○	○	○	○
Employer contributions	○	○	○	○	○	○	○
Aid which need not be repaid (grants, scholarships, military funding, etc.)	○	○	○	○	○	○	○
Aid which must be repaid (loans, etc.)	○	○	○	○	○	○	○
Other than above	○	○	○	○	○	○	○

Do you have any concern about your ability to finance your college education?

○

None (I am confident that I will have sufficient funds)

- Some concerns (but I probably will have enough funds)
- Major concerns (not sure I will have enough funds to complete college)

Excluding yourself, how many people (children, grandchildren, brothers, sisters, parents, etc.) are you financially supporting?

- None
- 1 - 2
- 3 - 4
- 5 or above

During high school, how often did your parents or other adults:

	Never or very rarely	A few times a year	About once a month	Several times a month	Several times a week
Check if you'd done your homework					
Help you with your homework					
Participate in a parent-school organization (e.g., PTA)					
Participate in other school related activities					
Spend time talking with your friends					

During high school, in general, how often did your parents:

	Never or very rarely	A few times a year	About once a month	Several times a month	Several times a week
Discuss political or social issues with you					
Discuss books, films, or television programs with you					
Listen to music with you					
Eat the main meal with you around a table					
Spend time just talking to you					
Work with you on your homework					
Discuss your progress in school with you					

What is your mother's occupation

What is your father's occupation

What is your probable career occupation

Since arriving at this college, has your occupational expectation changed?

- Yes
- No

Please indicate why your career choice changed.

		Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
Lack of high school preparation for career choice requirements								
Academic difficulty in the major course requirements for the career								
Academic interests and values have changed since arriving at this college								
Career interests have changed since arriving at this college								
Career values have changed since arriving at this college								
Lack of pre-professional learning opportunities available (e.g., internships, research opportunities)								

If there were no obstacles, what is the highest academic degree you would like to attain in your lifetime?

- Will take classes, but do not intend to earn a degree
- Vocational certificate/Diploma
- Associate degree (A.A. or equivalent)
- Bachelors' degree (B.A., B.S., etc.)
- At least a Bachelor's, maybe more
- Master's degree (M.A., M.S., etc.)
- Doctoral degree (Ph.D., Ed.D., J.D., etc.)
- Medical degree (M.D., D.D.S., D.V.M., etc.)

Realistically, what do you expect will be your pre-tax annual income in the first full year after leaving this college?

- Less than $20,000
- $20,000—$39,999
- $40,000—$59,999
- $60,000—$79,999
- $80,000 or more

Section 3 Transfer knowledge

About how many hours a week do you usually spend on the community college campus, not counting time attending classes?

-

None

- 1 to 3 hours
- 4 to 6 hours
- 7 to 9 hours
- 10 to 12 hours
- more than 12 hours

Have you taken any developmental courses in the following subjects?

- Math
- Reading
- Writing
- None

About how many hours a week do you usually spend studying or preparing for your classes?

- 1 to 5 hours
- 6 to 10 hours
- 11 to 15 hours
- 16 to 20 hours
- more than 20 hours

During your time at the community college, about how many hours a week did you usually spend working on a job for pay?

- None
- I didn't have a job
- 1 to 10 hours
- 11 to 15 hours
- 16 to 20 hours
- 21 to 30 hours
- more than 30 hours

The following items address your use of academic advising/counseling services at your community college. Please indicate the extent to which you disagree or agree with each statement.

	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
I consulted with academic advisors/counselor regarding transfer.	O	O	O	O	O	O	O
Information received from academic advisors/counselors was helpful in the transfer process.	O	O	O	O	O	O	O
I met with academic advisors /counselors on a regular basis.	O	O	O	O	O	O	O
I talked with an advisor/counselor about courses to take, requirements, and education plans.	O	O	O	O	O	O	O
I discussed my plans for transferring to a four-year college or university with an academic advisor/counselor.	O	O	O	O	O	O	O
Advisors/counselors identified courses needed to meet the general education/major requirements of a	O	O	O	O	O	O	O

	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree
four-year college or university I was interested in attending.							

The following items pertain to your perceptions about the "transfer process" while you were enrolled at the community college. Please indicate the extent to which you disagree or agree with each statement.

	Strongly disagree	Disagree	Slightly disagree	Neither disagree nor agree	Slightly agree	Agree	Strongly Agree
I researched various aspects of 4-year institutions to get a better understanding of the environment and academic expectations.	O	O	O	O	O	O	O
I knew what to expect at 4-year institutions in terms of academics	O	O	O	O	O	O	O
I visited the 4- year institutions at least once to learn where offices and departments were located.	O	O	O	O	O	O	O
I spoke to academic counselors at 4-year institutions about transferring and major requirements.	O	O	O	O	O	O	O
I visited the admission office at 4-year institutions at least once.	O	O	O	O	O	O	O
I spoke to former community college transfer students to gain insight about their transfer experiences.	O	O	O	O	O	O	O

How often did you do each of the following at your community college?

	Never or very rarely	A few times per semester	About once a month	Several times a month	Several times a week
Visited faculty and sought their advice on class projects such as writing assignments and research papers.	O	O	O	O	O
Felt comfortable approaching faculty outside class.	O	O	O	O	O
Asked my instructor for information related to a course I was taking (grades, make-up work, assignments, etc.)	O	O	O	O	O
Visited informally and briefly with an instructor after class.	O	O	O	O	O
Discussed career plans and ambitions with a faculty member.	O	O	O	O	O
Asked my instructor for comments and criticisms about my work.	O	O	O	O	O

Have you ever felt that the faculty, staff, or administration in this college treated you poorly?

- O yes
- O No

Have you ever felt that the faculty, staff, or administration in this college treated you poorly because of your: (Check all that apply).

- ☐ Gender

- [ ] Race or ethnicity
- [ ] English-language proficiency
- [ ] Sexual orientation
- [ ] Religion
- [ ] Social class
- [ ] Other, please specify

To what extent do the following generally characterize the classroom environment you have experienced at this college?

	Never	Rarely	Sometimes	Often	Always
I felt I was treated respectfully in class	O	O	O	O	O
Class size made it difficult to ask questions	O	O	O	O	O
I felt isolated in class	O	O	O	O	O
Instructor expressed a lack of confidence in my ability to succeed in class	O	O	O	O	O
Instructor or students made prejudiced comments that made me uncomfortable	O	O	O	O	O
I felt like I did not fit in	O	O	O	O	O
I was ignored when I tried to participate in class discussions or ask questions	O	O	O	O	O

In your opinion, how successful has this college been at providing:

	Not at all successful	Somewhat successful	Successful	Very successful	Extremely successful
Faculty role models similar to you	O	O	O	O	O
Administrative/staff role models similar to you	O	O	O	O	O
Clubs and organizations that match your interest	O	O	O	O	O
Classroom environments that encourage your academic success	O	O	O	O	O
A sense of being a valued member of the community	O	O	O	O	O
Opportunities to interact socially with your friends	O	O	O	O	O

As things stand today do you intend to transfer to a:

- O 4-year public univeristy
- O 4-year private college or university
- O Private 2-year college
- O Public 2-year college
- O None

Are you planning to major in STEM upon transfer?

- O Yes
- O No

Section 4: Demographic information

Thinking about this current academic term, how would you characterize your enrollment at this college?

- ○ Full-time (12 or more credit hours)
- ○ Part-time (less than 12 credits)

Including this semester, what mathematics courses have you taken? Include courses in high school or previous college work. (Check all that apply)

- ☐ Basic math, Business math, or Pre-algebra
- ☐ Algebra I
- ☐ Geometry
- ☐ Algebra II
- ☐ Trigonometry
- ☐ Pre-calculus
- ☐ Calculus

Including this semester, what science courses have you taken? Include courses in high school or previous college work. (Check all that apply)

- ☐ General Biology
- ☐ Chemistry
- ☐ Physics
- ☐ Biology specialty (i.e., microbiology, genetics, botany, cell biology, marine biology, etc.)
- ☐ Other Earth science (i.e., geology, meterology, etc.)

What academic credentials have you earned? (Check all that apply)

- ☐ None
- ☐ High school diploma or GED
- ☐ AA (Associate of Arts)
- ☐ AS (Associate of Science)
- ☐ AGS (Associate of General Studies)
- ☐ AAA (Associate of Applied Arts)
- ☐ AAS (Associate of Applied Science)
- ☐ Diploma
- ☐ Certificate
- ☐ Other

What is your gender?

- ○ Male
- ○ Female

What is your ethnic background? (Check all that apply)

- ☐ American Indian or Alaska Native
- ☐ Asian

Black or African American

- [ ] Hispanic
- [ ] Native Hawaiian or Other Pacific Islander
- [ ] White
- [ ] Two or more races
- [ ] Race/Ethnicity Unknown

What is your age? Please specify.

What is your marital status?

- ○ Married
- ○ Living together (not married)
- ○ single, never married
- ○ divorced/separated/widowed

Do you have children who live with you?

- ○ Yes
- ○ No

Are your parent(s):

- ○ Both alive and living with each other
- ○ Both alive
- ○ Divorced or living apart
- ○ One or both deceased

What is your current religions preference?

- ○ Catholic
- ○ Protestant
- ○ Jewish
- ○ Islam
- ○ Hindu
- ○ Buddhist
- ○ Other, please specify
- ○ None

How many miles is this college from your permanent home?

- ○ 5 miles or less
- ○ 6—10 miles
- ○ 11—50 miles
- ○ 51—100 miles
- ○ 101—500 miles
- ○ Over 500 miles

Currently, what is your citizenship status?

- ○ U.S. Citizen, native born
- ○ U.S. Citizen, naturalized
- ○ Non-U.S. Citizen, with a permanent resident visa/green card
- ○ Non-U.S. Citizen, with a temporary U.S. resident visa
- ○ Living outside the United States
- ○ Prefer not to answer

If you were not born in the U.S., in what country were you born? Please specify.

At what age did you first come to the U.S. for an extended period of time (i.e., more than 1 month)? Please specify.

Is English your native language?

- ○ Yes
- ○ No

Section 5: Institution questions

Are you taking this survey in class?

- ○ Yes
- ○ No

Thank you very much for completing this survey.

Soko S. Starobin, Ph.D.
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APPENDIX B. INSTITUTIONAL REVIEW BOARD APPROVAL

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Researc
Vice President for Research
1138 Pearson Hall
Ames, Iowa 50011-2207
515 294-4566
FAX 515 294-4267

DATE: March 23, 2012

TO: Soko Starobin
N243 Lagomarcino Hall

FROM: Office for Responsible Research

TITLE: **Measuring Constructs of STEM Student Success Literacy: Community College Students' Self-Efficacy, Social Capital, and Transfer Knowledge**

IRB ID: **12-124**

Submission Type: New **Exemption Date:** March 23, 2012

The project referenced above has been declared exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b) because it meets the following federal requirements for exemption:

Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey or interview procedures with adults or observation of public behavior where information obtained is recorded in such a manner that human subjects cannot be identified directly or through identifiers linked to the subjects.

The determination of exemption means that:

- **You do not need to submit an application for annual continuing review.**
- **You must carry out the research as described in the IRB application.** Review by IRB staff is required prior to implementing modifications that may change the exempt status of the research. In general, review is required for any *modifications to the research procedures* (e.g., method of data collection, nature or scope of information to be collected, changes in confidentiality measures, etc.), modifications that result in the *inclusion of participants from vulnerable populations*, and/or any *change that may increase the risk or discomfort to participants. Changes to key personnel* must also be approved. The purpose of review is to determine if the project still meets the federal criteria for exemption.

  Non-exempt research is subject to many regulatory requirements that must be addressed prior to implementation of the study. Conducting non-exempt research without IRB review and approval may constitute non-compliance with federal regulations and/or academic misconduct according to ISU policy.

  Detailed information about requirements for submission of modifications can be found on the Exempt Study Modification Form. A Personnel Change Form may be submitted when the only modification involves changes in study staff. If it is determined that exemption is no longer warranted, then an Application for Approval of Research Involving Humans Form will need to be submitted and approved before proceeding with data collection.

Please note that you must submit all research involving human participants for review. **Only the IRB or its designees may make the determination of exemption**, even if you conduct a study in the future that is exactly like this study.

Please don't hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.

ORR 08/2011

APPENDIX C. FINAL STEM STUDY SUCCESS LITERACY SURVEY

Default Question Block

Q1.
Dear Student,

On behalf of the research team, our sincere thank you for your time in responding to the following questions.

This survey will take approximately 15 minutes to complete. Your responses will inform research that will guide instructional practice, student services, and academic support programs to maximize student success! Your participation is critical to the project. We thank you for your attention to the questions and for completing of the survey.

Directions for filling out the survey:
- **The survey is divided into four sections. Scroll through each section to answer the questions.**
- **Please complete the entire survey (Plan on approximately 15 minutes).**
- **When reviewing questions, respond to each with what first comes to mind as the appropriate responses.**
- **Please click on NEXT at the bottom of each page to advance to the next page.**
- **If you need to leave the survey temporarily, simply close your web browser. You can come back to complete the survey through the same link within 7 days.**
- **Please click on NEXT at the end of the survey to submit your answers. You will NOT be able to make any changes once you submit.**

Upon completion of the survey, you will be automatically entered in a lottery for a random drawing. If you are selected as one of the winners in the lottery, you will be required to sign a receipt form documenting receipt of the prize. Please know that payments are subject to tax withholding requirements, which may vary depending upon whether you are a legal resident of the U.S. or another country. If required, taxes will be withheld from the prize you receive. You will need to provide your social security number (SSN) and address on a receipt form. This information allows the University to fulfill government-reporting requirements. Confidentiality measures are in place to keep this information secure. You may forgo receipt of the prize and continue in the study if you do not wish to provide your SSN and address.

All answers will become part of a larger data set, and responses are not identifiable to you as a student responder.

Again, we thank you for your time and effort.
Best Regards,
Soko S. Starobin, Ph.D.
Assistant Professor, School of Education
Director, Office of Community College Research and Policy
starobin@iastate.edu

Q2. **Section 1: Self-Efficacy**

The following questions are a series of statements about your personal attitudes and traits. For each item below, please indicate the extent to which you disagree or agree with the statement.

	Disagree strongly	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Agree strongly
If I can't do a job the first time, I keep trying until I can.	O	O	O	O	O	O	O
When I have something unpleasant to do, I stick to it until I finish it.	O	O	O	O	O	O	O
Failure makes me try harder.	O	O	O	O	O	O	O
I often make lists of things to do.	O	O	O	O	O	O	O
I usually mark important dates on my calendar.	O	O	O	O	O	O	O

	Disagree strongly	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Agree strongly
I do not seem capable of dealing with most problems that come up in life.	O	O	O	O	O	O	O
If something looks too complicated, I will not even bother to try it.	O	O	O	O	O	O	O
When trying to learn something new, I soon give up if I am not initially successful.	O	O	O	O	O	O	O
I wish I could have more respect for myself.	O	O	O	O	O	O	O
On the whole, I am satisfied with myself.	O	O	O	O	O	O	O

Q3. **The following questions are a series of statements about your personal attitudes and traits in various social aspects. For each item below, please indicate the extent to which you disagree or agree with the statement.**

	Disagree strongly	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Agree strongly
It is difficult for me to make new friends.	O	O	O	O	O	O	O
If I see someone I would like to meet, I go to that person instead of waiting for him or her to come to me.	O	O	O	O	O	O	O
I do not handle myself well in social gatherings.	O	O	O	O	O	O	O

Q4. Since you began attending this college, how often do you engage in the following?

	Never	Rarely	Sometimes	Often	Always
Worrying about what others think of me	O	O	O	O	O
Doing things so that others will like me	O	O	O	O	O
Worrying about being called a "nerd" or "braniac"	O	O	O	O	O
Worrying about being accused of not being myself (e.g."acting white" or being a "sell out")	O	O	O	O	O

Q5. Compared to the students at your campus, where the average student is at the 50th percent, rate your confidence about your level of skill according to the following scale.

	I'm in the bottom 10%	I'm below average but not in the bottom 10%	I'm about average	I'm above average but not in the top 10%	I'm in the top 10%	Not applicable
Math skill	O	O	O	O	O	O
Writing skill	O	O	O	O	O	O
Public speaking skill	O	O	O	O	O	O
Social skill	O	O	O	O	O	O
Computer skill	O	O	O	O	O	O

Q6. Please think about the most challenging class you have taken in this college, and answer the following questions based on your experiences in this class.

Q7. What subject does this most challenging class belong to?

- O Biology
- O Chemistry
- O English
- O Mathematics
- O Physics
- O Other, please specify

Q8. Why was this class the most challenging?

	Strongly Disagree	Disagree	Slightly Disagree	Neither agree nor disagree	Slightly Agree	Agree	Strongly Agree
Did not know how to study for the exams	○	○	○	○	○	○	○
Did not get enough feedback from the professor	○	○	○	○	○	○	○
Professor was not available to answer questions	○	○	○	○	○	○	○
Professor did not encourage interaction with him/her	○	○	○	○	○	○	○
Professor expected a low performance from me	○	○	○	○	○	○	○
The course required a large amount of work	○	○	○	○	○	○	○

Q9. On a scale of zero to ten (0: No Anxiety - 10: Extreme anxiety), what was your level of anxiety in this class?

	0	1	2	3	4	5	6	7	8	9	10
Anxiety (0: No Anxiety - 10: Extreme Anxiety)											

Q10. What negative impact did your anxiety have on your class performance?

- ○ No negative impact
- ○ Small negative impact
- ○ Moderate negative impact
- ○ Significant negative impact
- ○ Extremely significant negative impact

Q11. When you were working at a challenging task in that class, how confident were you that you would succeed?

- ○ Extremely confident
- ○ Very confident
- ○ Confident
- ○ Somewhat confident
- ○ Not at all confident

Q12. **If you succeeded at a challenging part of this class, would you say it was because of:**

	Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly agree
Your high ability	O	O	O	O	O	O	O
Good luck	O	O	O	O	O	O	O
The task was easy	O	O	O	O	O	O	O
You worked hard	O	O	O	O	O	O	O

Q13. **If you failed (or were less successful) at a challenging part of this class, would you say it was because of:**

	Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly agree
Your low ability	O	O	O	O	O	O	O
Bad luck	O	O	O	O	O	O	O
The task was hard	O	O	O	O	O	O	O
You didn't work hard enough	O	O	O	O	O	O	O

Q14. **Please indicate the things you did to address the challenges in this class, and how useful they were in improving your performance.**

	Did not use/ not applicable	Used, not helpful	Used, somewhat helpful	Used, very helpful
Spent more time studying	O	O	O	O
Taught myself to study more effectively	O	O	O	O
Did all of the assigned reading	O	O	O	O
Increased lecture attendance	O	O	O	O
Received a sample test from a friend or club/organization to study	O	O	O	O
Studied by myself	O	O	O	O
Cheated on assignments or exams	O	O	O	O
Withdrew from the course	O	O	O	O
Studied with other students in the class	O	O	O	O
Received informal tutoring	O	O	O	O
Received academic support outside the class	O	O	O	O
Used feedback from Teacher Assistant or professor on a regular basis	O	O	O	O

Q15. **For this most challenging class, how helpful was the encouragement or advice you received from the following?**

	Did not receive/ not applicable	Received, not helpful	Received, somewhat helpful	Received, very helpful
Family member or friend	○	○	○	○
Fellow resident or Resident Assistant	○	○	○	○
Fellow classmate	○	○	○	○
Upper-class student who had taken the class	○	○	○	○
Staff person or administrator	○	○	○	○
Professional counselor	○	○	○	○
Advisor	○	○	○	○
Professor or Teacher's Assistant for this class	○	○	○	○
Academic dean	○	○	○	○
Another faculty member	○	○	○	○

Q16. **In a typical week (not exam week), how many hours did you spend studying and preparing for this class?**

- ○ 0 or None
- ○ Less than 1 hour
- ○ 1-2 hours
- ○ 3-5 hours
- ○ 6-10 hours
- ○ 11-20 hours
- ○ 21-35 hours
- ○ 36-45 hours
- ○ 46 hours or more

Q17. **Section 2: Social Capital**

What is the highest level of education completed by your parents?

	Elementary school or less	Some high school	High school graduate	Some college	Associate degree from two year college	Bachelor's degree	Some graduate school	Graduate degree	Don't know
Mother	○	○	○	○	○	○	○	○	○
Father	○	○	○	○	○	○	○	○	○

Q18. **Are you financially independent (your college expenses are paid by someone other than your parents, e.g., yourself, your employer.)?**

- ○ Yes
- ○ No

Q19. **What is your best estimate of your parents' total income last year? Consider income from all sources before taxes.**

- ○ Less than $20,000
- ○ $20,000---$39,999
- ○ $40,000---$59,999
- ○ $60,000---$79,999
- ○ $80,000 or more
- ○ I don't know

Q20. **How much of your first year's educational expenses (room, board, tuition, and fees) do you expect to cover from each of the sources listed below?**

	None	Less than $1,000	$1,000 to $2,999	$3,000 to $5,999	$6,000 to $9,999	$10,000+	Don't know
Family resources (parents, relatives, spouse, etc.)	○	○	○	○	○	○	○
My own resources (savings from work, work-study, other income)	○	○	○	○	○	○	○
Employer contributions	○	○	○	○	○	○	○
Aid which need not be repaid (grants, scholarships, military funding, etc.)	○	○	○	○	○	○	○
Aid which must be repaid (loans, etc.)	○	○	○	○	○	○	○
Other sources than above	○	○	○	○	○	○	○

Q21. **Do you have any concern about your ability to finance your college education?**

- ○ None (I am confident that I will have sufficient funds)
- ○ Some concerns (but I probably will have enough funds)
- ○ Major concerns (not sure I will have enough funds to complete college)

Q22. **Excluding yourself, how many people (children, grandchildren, brothers, sisters, parents, etc.) are you financially supporting?**

- ○ None
- ○ 1 - 2
- ○ 3 - 4
- ○ 5 or above

Q23. **Are you currently working?**

- ○ Yes, I am currently working on campus.
- ○ Yes, I am currently working off campus.
- ○ No, I am not looking for working opportunities.
- ○ No, I am currently unemployed, but I am looking for working opportunities.

Q24. **During your time at the community college, about how many hours a week did you usually spend working on a job for pay?**

- ○ 1 to 10 hours
- ○ 11 to 15 hours
- ○ 16 to 20 hours
- ○ 21 to 30 hours
- ○ more than 30 hours

Q25. **During high school, how often did your parents or other adults:**

	Never or very rarely	A few times a year	About once a month	Several times a month	Several times a week
Discuss book, films, or television programs with you	○	○	○	○	○
Eat the main meal with you around a table	○	○	○	○	○
Spend time just talking to you	○	○	○	○	○
Work with you on your homework	○	○	○	○	○
Discuss your progress in school with you	○	○	○	○	○
Participate in school related activities (e.g., Parent-Teacher Association)	○	○	○	○	○
Spend time talking with your friends	○	○	○	○	○

Q26. If you were to compare yourself to your parents or guardian, would you say that you are:

- ○ Much more thrifty and likely to save what I can
- ○ Somewhat more thrifty and likely to save what I can
- ○ About as thrifty
- ○ Somewhat less thrifty and more likely to spend what I can
- ○ Much less thrifty and much more likely to spend what I can

Q27. What is your mother's occupation?

Q28. What is your father's occupation?

Q29. What is your probable career occupation?

Q30. Since arriving at this college, has your occupational expectation changed?

- ○ Yes
- ○ No

Q31. **Please indicate WHY your career choice changed:**

	Strongly Disagree	Disagree	Slightly Disagree	Neither agree nor disagree	Slightly Agree	Agree	Strongly Agree
Lack of high school preparation for career choice requirements	O	O	O	O	O	O	O
Academic difficulty in the major course requirements for the career	O	O	O	O	O	O	O
Academic interests and values have changed since arriving at this college	O	O	O	O	O	O	O
Career interests have changed since arriving at this college	O	O	O	O	O	O	O
Career values have changed since arriving at this college	O	O	O	O	O	O	O
Lack of pre-professional learning opportunities available (e.g., internships, research opportunities)	O	O	O	O	O	O	O

Q32. **How likely would each of the following be to prevent you from obtaining your college degree?**

	Not at all likely	Probably not likely	Somewhat likely	Very likely
Child care issues	O	O	O	O
Health issues	O	O	O	O
Debt-need to work more hours because of bills	O	O	O	O
Inability to balance home and school responsibilities	O	O	O	O
Inability to balance work and school responsibilities	O	O	O	O
Insufficient financial aid	O	O	O	O
Lack of money	O	O	O	O
Poor or failing grades	O	O	O	O
Transportation issues	O	O	O	O
Unprepared for college coursework	O	O	O	O
Lack of support services or resources, i.e. tutoring/mentoring/counseling	O	O	O	O

Q33. **If there were no obstacles, what is the highest academic degree you would like to attain in your lifetime?**

- ○ Will take classes, but do not intend to earn a degree
- ○ Vocational certificate/Diploma
- ○ Associate degree (A.A. or equivalent)
- ○ Bachelors' degree (B.A., B.S., etc.)
- ○ At least a Bachelor' degree, maybe more
- ○ Master's degree (M.A., M.S., etc.)
- ○ Doctoral degree (Ph.D., Ed.D., J.D., etc.)
- ○ Medical degree (M.D., D.D.S., D.V.M., etc.)

Q34. **Realistically, what do you expect will be your annual income in the first full year after leaving this college?**

- ○ Less than $20,000
- ○ $20,000---$39,999
- ○ $40,000---$59,999
- ○ $60,000---$79,999
- ○ $80,000 or more

Q35. **Section 3: Transfer knowledge**

About how many hours a week do you usually spend on the community college campus, not counting time attending classes?

- ○ None
- ○ 1 to 3 hours
- ○ 4 to 6 hours
- ○ 7 to 9 hours
- ○ 10 to 12 hours
- ○ more than 12 hours

Q36. **Have you taken any developmental courses in the following subjects? (check all that apply)**

- ☐ Math
- ☐ Reading
- ☐ Writing
- ☐ None

Q37. **About how many hours a week do you usually spend studying or preparing for your classes?**

- ○ 1 to 5 hours
- ○ 6 to 10 hours
- ○ 11 to 15 hours
- ○ 16 to 20 hours
- ○ more than 20 hours

Q38. **The following items address your use of academic advising/counseling services at your community college. Please indicate the extent to which you disagree or agree with each statement.**

	Strongly Disagree	Disagree	Slightly Disagree	Neither agree nor disagree	Slightly Agree	Agree	Strongly Agree
I consulted with academic advisors/counselor regarding transfer.	○	○	○	○	○	○	○
Information received from academic advisors/counselors was helpful in the transfer process.	○	○	○	○	○	○	○
I met with academic advisors /counselors on a regular basis.	○	○	○	○	○	○	○
I talked with an advisor/counselor about courses to take, requirements, and education plans.	○	○	○	○	○	○	○
I discussed my plans for transferring to a four-year college or university with an academic advisor/counselor.	○	○	○	○	○	○	○
Advisors/counselors identified courses needed to meet the general education/major requirements of a four-year college or university I was interested in attending.	○	○	○	○	○	○	○

Q39. **The following items pertain to your perceptions about the "transfer process" while you were enrolled at the community college. Please indicate the extent to which you disagree or agree with each statement.**

	Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly Agree
I researched various aspects of 4-year institutions to get a better understanding of the environment and academic expectations.	○	○	○	○	○	○	○
I visited the 4-year institutions at least once to learn where offices and departments were located.	○	○	○	○	○	○	○
I spoke to academic counselors at 4-year institutions about transferring and major requirements.	○	○	○	○	○	○	○
I spoke to former community college transfer students to gain insight about their transfer experiences.	○	○	○	○	○	○	○

Q40. **How often did you do each of the following at your community college?**

	Never or very rarely	A few times per semester	About once a month	Several times a month	Several times a week
Visited faculty and sought their advice on class projects such as writing assignments and research papers.	O	O	O	O	O
Felt comfortable approaching faculty outside class.	O	O	O	O	O
Discussed career plans and ambitions with a faculty member.	O	O	O	O	O
Asked my instructor for comments and criticisms about my work.	O	O	O	O	O

Q41. **Have you ever felt that the faculty, staff, or administration in this college treated you poorly?**

- O Yes
- O No

Q42. **Have you ever felt that the faculty, staff, or administration in this college treated you poorly because of your: (Check all that apply).**

- ☐ Gender
- ☐ Race or ethnicity
- ☐ English-language proficiency
- ☐ Sexual orientation
- ☐ Religion
- ☐ Social class
- ☐ Other, please specify

Q43. **To what extent do the following generally characterize the classroom environment you have experienced at this college?**

	Never	Rarely	Sometimes	Often	Always
I felt I was treated respectfully in class	O	O	O	O	O
Class size made it difficult to ask questions	O	O	O	O	O
I felt isolated in class	O	O	O	O	O
Instructor expressed a lack of confidence in my ability to succeed in class	O	O	O	O	O
Instructor or students made prejudiced comments that made me uncomfortable	O	O	O	O	O
I felt like I did not fit in	O	O	O	O	O
I was ignored when I tried to participate in class discussions or ask questions	O	O	O	O	O

Q44. In your opinion, how successful has this college been at providing:

	Not at all successful	Somewhat successful	Successful	Very successful	Extremely successful
Faculty role models similar to you	○	○	○	○	○
Administrative/staff role models similar to you	○	○	○	○	○
Clubs and organizations that match your interest	○	○	○	○	○
Classroom environments that encourage your academic success	○	○	○	○	○
A sense of being a valued member of the community	○	○	○	○	○
Opportunities to interact socially with your friends	○	○	○	○	○

Q45. As things stand today, do you intend to transfer to a:

- ○ 4-year public univeristy
- ○ 4-year private college or university
- ○ Private 2-year college
- ○ Public 2-year college
- ○ Not intend to transfer

Q46. Are you planning to major in STEM (Science, Technology, Engineering, and Mathematics) upon transfer?

- ○ Yes
- ○ No

Q47. Which STEM major are you planning to choose upon transfer?

Q48. Section 4: Demographic information

Is this your first semester in this college?

- ○ Yes
- ○ No

Q49. **Thinking about this current academic term, how would you characterize your enrollment at this college?**

- ○ Full-time (12 or more credit hours)
- ○ Part-time (less than 12 credits)

Q50. **Including this semester, what mathematics courses have you taken? Include courses in high school or previous college work. (Check all that apply)**

	High School	College
Basic math, Business math, or Pre-algebra	☐	☐
Algebra I	☐	☐
Geometry	☐	☐
Algebra II	☐	☐
Trigonometry	☐	☐
Pre-calculus	☐	☐
Calculus	☐	☐
Integrated/Applied Mathematics	☐	☐
Probability/Statistics	☐	☐

Q51. **Including this semester, what science courses have you taken? Include courses in high school or previous college work. (Check all that apply)**

	High School	College
General Biology	☐	☐
Chemistry	☐	☐
Physics	☐	☐
Biology specialty (i.e., microbiology, genetics, botany, cell biology, marine biology, etc.)	☐	☐
Other Earth Sciences (i.e., geology, meterology, etc.)	☐	☐
Physical Science	☐	☐

Q52. **Have you participated in Project Lead The Way (PLTW)?**

- ○ Yes
- ○ No

Q53. Have you ever attended a four-year college/university?

- ○ Yes
- ○ No

Q54. What academic credentials have you earned? (Check all that apply)

- ☐ None
- ☐ High school diploma or GED
- ☐ AA (Associate of Arts)
- ☐ AS (Associate of Science)
- ☐ AGS (Associate of General Studies)
- ☐ AAA (Associate of Applied Arts)
- ☐ AAS (Associate of Applied Science)
- ☐ Diploma
- ☐ Certificate
- ☐ Other

Q55. What is your gender?

- ○ Male
- ○ Female

Q56. How would you identify your race/ethnic background?

- ○ American Indian or Alaska Native
- ○ Asian
- ○ Black or African American
- ○ Hispanic
- ○ Native Hawaiian or other Pacific Islander
- ○ White
- ○ Two or more races
- ○ Race/Ethnicity Unknown

Q57. What is your age?

***Q58.* What is your marital status?**

- ○ Married
- ○ Living together (not married)
- ○ Single, never married
- ○ Divorced/separated/widowed

***Q59.* Are your parent(s):**

- ○ Both alive and living with each other
- ○ Both alive
- ○ Divorced or living apart
- ○ One or both deceased

***Q60.* What is your current religious preference?**

- ○ Catholic
- ○ Protestant
- ○ Jewish
- ○ Islam
- ○ Hindu
- ○ Buddhist
- ○ Other, please specify
- ○ None
- ○ Prefer not to answer

***Q61.* How many miles is this college from your permanent home?**

- ○ 5 miles or less
- ○ 6---10 miles
- ○ 11---50 miles
- ○ 51---100 miles
- ○ 101---500 miles
- ○ Over 500 miles

Q62. **Currently, what is your citizenship status?**

- U.S. Citizen, native born
- U.S. Citizen, naturalized
- Non-U.S. Citizen, with a permanent resident visa/green card
- Non-U.S. Citizen, with a temporary U.S. resident visa
- Living outside the United States
- Prefer not to answer

Q63. **If you were born outside of the U.S., in what country were you born? Please specify.**

Q64. **At what age did you first come to the U.S. for an extended period of time (i.e., more than 1 month)? Please specify.**

- Birth to 3
- 4 to 7
- 8 to 12
- 13 to 17
- 18 to 21
- older than 21
- Not applicable

Q65. **Is English your native language?**

- Yes
- No

Q66. **Section 5 Institution Question**

Are you taking classes fully on-line?

- Yes
- No

Q67. **Please click the "NEXT" button to submit the survey. By submitting the survey, you will be automatically entered in a lottery for a random drawing for winning one of the five iPad 2. Good Luck!**

Thank you very much for taking the time to complete this survey.

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APPENDIX D. STEM STUDENT SUCCESS LITERACY STUDY TIMELINE

College	Survey Opened	Reminder e-mail	Survey Closed
Hawkeye Community College	October 1, 2012	October 8, 2012	October 15, 2012
Northeast Iowa Community College	October 9, 2012	October 15, 2012	October 24, 2012
North Iowa Area Community College	October 10, 2012	October 15, 2012	October 25, 2012
Iowa Western Community College	October 9, 2012	October 16, 2012	October 23, 2012
Marshalltown Community College	October 15, 2012	October 22, 2012	October 29, 2012
Ellsworth Community College	October 15, 2012	October 22, 2012	October 29, 2012
Des Moines Area Community College	October 15, 2012	October 22, 2012	October 29, 2012
Southwestern Community College	October 22, 2012	October 29, 2012	November 5, 2012
Iowa Central Community College	October 22, 2012	October 29, 2012	November 5, 2012
Iowa Lakes Community College	October 22, 2012	October 29, 2012	November 5, 2012
Western Iowa Tech Community College	October 29, 2012	November 5, 2012	November 12, 2012
Northwest Iowa Community College	November 13, 2012	November 19, 2012	November 30, 2012
Southeastern Community College	November 14, 2012	November 19, 2012	November 30, 2012
Eastern Iowa Community College District	November 13, 2012	November 19, 2012	November 30, 2012
Kirkwood Community College	November 13, 2012	November 19, 2012	November 30, 2012
Indian Hills Community College	November 27, 2012	December 3, 2012	December 11, 2012

APPENDIX E. CODE BOOK

Variable	Label	Description	Code
Q_14_1	Individual Coursework Engagement	Please indicate the things you did to address the challenges in this class, and how usefully they were? Spent more time studying	1=Did not use/not applicable; 2=Used, not helpful; 3=Used, somewhat helpful; 4=Used, very helpful
Q_14_2	Individual Coursework Engagement	Please indicate the things you did to address the challenges in this class, and how usefully they were? Taught myself to study more effectively	1=Did not receive/na; 2=Received, not helpful; 3=Received, somewhat helpful; 4=Received, very helpful
Q_14_3	Individual Coursework Engagement	Please indicate the things you did to address the challenges in this class, and how usefully they were? Did all of the assigned readings	1=Did not receive/na; 2=Received, not helpful; 3=Received, somewhat helpful; 4=Received, very helpful
Q_14_4	Individual Coursework Engagement	For this most challenging class, how helpful was the encouragement or advice you received from the following? Increased lecture attendance	1=Did not receive/na; 2=Received, not helpful; 3=Received, somewhat helpful; 4=Received, very helpful
Q14_5	Individual Coursework Engagement	For this most challenging class, how helpful was the encouragement or advice you received from the following? Received a sample test from a friend or club/organization to study	1=Did not receive/na; 2=Received, not helpful; 3=Received, somewhat helpful; 4=Received, very helpful
Q14_6	Individual Coursework Engagement	For this most challenging class, how helpful was the encouragement or advice you received from the following? Studied by myself	1=Did not receive/na; 2=Received, not helpful; 3=Received, somewhat helpful; 4=Received, very helpful
Q14_7	Individual Coursework Engagement	For this most challenging class, how helpful was the encouragement or advice you received from the following? Cheated on assignments or exams	1=Did not receive/na; 2=Received, not helpful; 3=Received, somewhat helpful; 4=Received, very helpful
Q14_8	Individual Coursework Engagement	For this most challenging class, how helpful was the encouragement or advice you received from the following? Withdrew from the course	1=Did not receive/na; 2=Received, not helpful; 3=Received, somewhat helpful; 4=Received, very helpful
Q14_9	Individual Coursework Engagement	For this most challenging class, how helpful was the encouragement or advice you received from the following? Studied with other students in the class	1=Did not receive/na; 2=Received, not helpful; 3=Received, somewhat helpful; 4=Received, very helpful

Q14_10	Individual Coursework Engagement	For this most challenging class, how helpful was the encouragement or advice you received from the following? Received informal tutoring	1=Did not receive/na; 2=Received, not helpful; 3=Received, somewhat helpful; 4=Received, very helpful
Q14_11	Individual Coursework Engagement	For this most challenging class, how helpful was the encouragement or advice you received from the following? Received academic support outside the classroom	1=Did not receive/na; 2=Received, not helpful; 3=Received, somewhat helpful; 4=Received, very helpful
Q14_12	Individual Coursework Engagement	For this most challenging class, how helpful was the encouragement or advice you received from the following? Used feedback from Teacher Assistant or professor on a regular basis	1=Did not receive/na; 2=Received, not helpful; 3=Received, somewhat helpful; 4=Received, very helpful
Q_17_1	Mother's Highest Level of Completed Education	What is the highest level of education completed by your parents? Mother	1=Elementary school or less; 2=Some high school; 3=High school graduate; 4=Some college; 5=Associate's degree; 6=Bachelor's degree; 7=Some graduate school; 8=Graduate degree
Q_17_2	Father's Highest Level of Completed Education	What is the highest level of education completed by your parents? Father	1=Elementary school or less; 2=Some high school; 3=High school graduate; 4=Some college; 5=Associate's degree; 6=Bachelor's degree; 7=Some graduate school; 8=Graduate degree
Q_23	Employment Status	Are you currently working?	1=Yes, I am currently working on campus; 2=Yes, I am currently working off campus; 3=No, I am currently not looking for working opportunities; 4=No, I am currently unemployed but am looking for working opportunities
Q_24	Hours Spent Working for Pay (Weekly)	During your time at the community college, about how many hours a week did you usually spend working...	1=1 to 10 hours, 2=11 to 15 hours, 3=16 to 20 hours; 4=21 to 30 hours; 5=more than 30 hours
Q_38_1	Staff Transfer Engagement	The following items address your use of academic advising/ counseling services at your community coll...-I consulted with academic advisors/ counselor regarding transfer.	1=Neither agree nor disagree; 2=Strongly disagree; 3=Disagree; 4=Slightly disagree; 5=Slightly agree; 6=Agree; 7=Strongly agree

Q_38_2	Staff Transfer Engagement	The following items address your use of academic advising/ counseling services at your community coll...-Information received from academic advisors/counselors was helpful in the transfer process.	1=Neither agree nor disagree; 2=Strongly disagree; 3=Disagree; 4=Slightly disagree; 5=Slightly agree; 6=Agree; 7=Strongly agree
Q_38_3	Staff Transfer Engagement	The following items address your use of academic advising/ counseling services at your community coll...-I met with academic advisors /counselors on a regular basis.	1=Neither agree nor disagree; 2=Strongly disagree; 3=Disagree; 4=Slightly disagree; 5=Slightly agree; 6=Agree; 7=Strongly agree
Q_38_4	Staff Transfer Engagement	The following items address your use of academic advising/ counseling services at your community coll...-I talked with an advisor/ counselor about courses to take, requirements, and education plans.	1=Neither agree nor disagree; 2=Strongly disagree; 3=Disagree; 4=Slightly disagree; 5=Slightly agree; 6=Agree; 7=Strongly agree
Q_38_5	Staff Transfer Engagement	The following items address your use of academic advising/ counseling services at your community coll...-I discussed my plans for transferring to a 4-year college or university with an academic advisor /counselor.	1=Neither agree nor disagree; 2=Strongly disagree; 3=Disagree; 4=Slightly disagree; 5=Slightly agree; 6=Agree; 7=Strongly agree
Q_38_6	Staff Transfer Engagement	The following items address your use of academic advising /counseling services at your community coll...-Advisors/ counselors identified courses needed to meet the general education/major requirements of a 4-year college or university I was interested in attending.	1=Neither agree nor disagree; 2=Strongly disagree; 3=Disagree; 4=Slightly disagree; 5=Slightly agree; 6=Agree; 7=Strongly agree
Q_40_1	Faculty Coursework Engagement	How often did you do each of the following at your community college?-Visited faculty and sought their advice on class projects such as writing assignments and research papers.	1=Never or very rarely; 2=A few times per semester; 3=About once a month; 4=Several times a month; 5=Several times a week
Q_40_2	Faculty Coursework Engagement	How often did you do each of the following at your community college?-Felt comfortable approaching faculty outside class.	1=Never or very rarely; 2=A few times per semester; 3=About once a month; 4=Several times a month; 5=Several times a week
Q_40_5	Faculty Coursework Engagement	How often did you do each of the following at your community college?-Discussed career plans and ambitions with a faculty member.	1=Never or very rarely; 2=A few times per semester; 3=About once a month; 4=Several times a month; 5=Several times a week

Q_40_6	Faculty Coursework Engagement	How often did you do each of the following at your community college?-Asked my instructor for comments and criticisms about my work.	1=Never or very rarely; 2=A few times per semester; 3=About once a month; 4=Several times a month; 5=Several times a week
Q_49	Enrollment Status	Thinking about this current academic term, how would you characterize your enrollment at this college	0=Part-time (less than 12 credits; 1=Full-time (12 or more credit hours)
Q50_1_1	Level of Math Completed	Including this semester, what mathematics courses have you taken? High School - Basic Math, Business Math or Pre-Algebra	0=No; 1=Yes
Q50_1_2	Level of Math Completed	Including this semester, what mathematics courses have you taken? College - Basic Math, Business Math or Pre-Algebra	0=No; 1=Yes
Q50_2_1	Level of Math Completed	Including this semester, what mathematics courses have you taken? High School - Algebra I	0=No; 1=Yes
Q50_2_2	Level of Math Completed	Including this semester, what mathematics courses have you taken? College - Algebra II	0=No; 1=Yes
Q50_3_1	Level of Math Completed	Including this semester, what mathematics courses have you taken? High School - Geometry	0=No; 1=Yes
Q50_3_2	Level of Math Completed	Including this semester, what mathematics courses have you taken? College – Geometry	0=No; 1=Yes
Q50_4_1	Level of Math Completed	Including this semester, what mathematics courses have you taken? High School - Algebra II	0=No; 1=Yes
Q50_4_2	Level of Math Completed	Including this semester, what mathematics courses have you taken? College - Algebra II	0=No; 1=Yes
Q50_5_1	Level of Math Completed	Including this semester, what mathematics courses have you taken? High School - Trigonometry	0=No; 1=Yes
Q50_5_2	Level of Math Completed	Including this semester, what mathematics courses have you taken? College – Trigonometry	0=No; 1=Yes
Q50_6_1	Level of Math Completed	Including this semester, what mathematics courses have you taken? High School - Pre-Calculus	0=No; 1=Yes
Q50_6_2	Level of Math Completed	Including this semester, what mathematics courses have you taken? College - Pre-Calculus	0=No; 1=Yes
Q50_7_1	Level of Math Completed	Including this semester, what mathematics courses have you taken? High School - Calculus	0=No; 1=Yes
Q50_7_2	Level of Math Completed	Including this semester, what mathematics courses have you taken? College – Calculus	0=No; 1=Yes

Q50_8_1	Level of Math Completed	Including this semester, what mathematics courses have you taken? High School - Integrated/Applied Mathematics	0=No; 1=Yes
Q50_8_2	Level of Math Completed	Including this semester, what mathematics courses have you taken? College - Integrated/ Applied Mathematics	0=No; 1=Yes
Q50_9_1	Level of Math Completed	Including this semester, what mathematics courses have you taken? High School - Probability/Statistics	0=No; 1=Yes
Q50_9_2	Level of Math Completed	Including this semester, what mathematics courses have you taken? College – Probability /Statistics	0=No; 1=Yes
Q51_1_1	Level of Science Completed	Including this semester, what science courses have you taken? High School - General Biology	0=No; 1=Yes
Q51_1_2	Level of Science Completed	Including this semester, what science courses have you taken? College - General Biology	0=No; 1=Yes
Q51_2_1	Level of Science Completed	Including this semester, what science courses have you taken? High School – Chemistry	0=No; 1=Yes
Q51_2_2	Level of Science Completed	Including this semester, what science courses have you taken? College – Chemistry	0=No; 1=Yes
Q51_3_1	Level of Science Completed	Including this semester, what science courses have you taken? High School – Physics	0=No; 1=Yes
Q51_3_2	Level of Science Completed	Including this semester, what science courses have you taken? College – Physics	0=No; 1=Yes
Q51_4_1	Level of Science Completed	Including this semester, what science courses have you taken? High School - Biology specialty (i.e., Microbiology, Genetics, Botany, Cell Biology, Marine Biology, etc.)	0=No; 1=Yes
Q51_4_2	Level of Science Completed	Including this semester, what science courses have you taken? College - Biology specialty (i.e., Microbiology, Genetics, Botany, Cell Biology, Marine Biology, etc.)	0=No; 1=Yes
Q51_5_1	Level of Science Completed	Including this semester, what science courses have you taken? High School - Other Earth Sciences (i.e., Geology, Meteorology, etc.)	0=No; 1=Yes
Q51_5_2	Level of Science Completed	Including this semester, what science courses have you taken? College - Other Earth Sciences (i.e., Geology, Meteorology, etc.)	0=No; 1=Yes

Q51_6_1	Level of Science Completed	Including this semester, what science courses have you taken? High School - Physical Science	0=No; 1=Yes
Q51_6_2	Level of Science Completed	Including this semester, what science courses have you taken? College - Physical Science	0=No; 1=Yes
Q_55	Gender	What is your gender?	0=Male; 1=Female
Q_56	Ethnicity/URM	How would you identify your race/ethnic background?	1=American Indian or Alaska Native; 2=Asian; 3=Black or African American; 4=Native Hawaiian or other Pacific Islander; 5=White; 6=Two or more races; 7=Race/Ethnicity Unknown; 8 = "Hispanic"
Q_58	Marital Status	What is your marital status?	1=Married; 2=Living together (not married); 3=Single, never married; 4=Divorced/separated/widowed
Q61	Distance of College from Permanent Home	How many miles is this college from your permanent home?	1=0-50 miles; 2=51-100 miles; 3=101-500 miles; 4=More than 500 miles

APPENDIX F. LOGISTIC REGRESSION COEFFICIENTS: INTENTION TO TRANSFER

Table F.1

Classification Table for Regression Model 1

	Predicted		
	Intention to Transfer		Percentage
Observed	No	Yes	Correct
Step 1: Intention to Transfer			
No	914	383	70.5
Yes	421	870	67.4
Overall percentage			68.9

Note. Cut value = .500.

Table F.2

Logistic Regression Predicting Intention to Transfer for Model 1

Variables	*B*	Wald	*df*	Sig.	Exp(*B*)
I consulted with academic advisors/counselor regarding transfer	0.163	17.252	1	.000	1.177
Information received from academic advisors/counselors was helpful in the transfer process	–0.013	0.104	1	.747	0.987
I met with academic advisors/counselors on a regular basis	–0.239	49.602	1	.000	0.788
I talked with an advisor/counselor about courses to take, requirements, and education plans	0.185	36.473	1	.000	0.831
I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor	0.556	197.439	1	.000	1.744
Advisors/counselors identified courses needed to meet the general education/major requirements of a four–year college or university I was interested in attending	0.023	0.397	1	.528	1.023
Constant	–0.928	52.957	1	.000	0.395

Table F.3

Classification Table for Regression Model 2

Observed	Predicted		
	Intention to Transfer		Percentage Correct
	No	Yes	
Step 1: Intention to Transfer			
No	907	390	69.9
Yes	415	876	67.9
Overall percentage			68.9

Note. Cut value = .500.

Table F.4

Logistic Regression Predicting Intention to Transfer for Model 2

Variables	*B*	Wald	*df*	Sig.	Exp(*B*)
I consulted with academic advisors/counselor regarding transfer	0.165	17.563	1	.000	1.179
Information received from academic advisors/counselors was helpful in the transfer process	–0.02	0.124	1	.725	0.985
I met with academic advisors/counselors on a regular basis	–0.23	45.753	1	.000	0.792
I talked with an advisor/counselor about courses to take, requirements, and education plans	–0.18	35.12	1	.000	0.833
I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor	0.559	198.562	1	.000	1.749
Advisors/counselors identified courses needed to meet the general education/major requirements of a four–year college or university I was interested in attending	0.021	0.35	1	.554	1.022
Visited faculty and sought their advice on class projects such as writing assignments and research papers	–0.03	0.481	1	.488	0.968
Felt comfortable approaching faculty outside class	0.033	0.54	1	.462	1.034
Discussed career plans and ambitions with a faculty member	–0.01	0.02	1	.888	0.993
Asked my instructor for comments and criticisms about my work	–0.04	0.751	1	.386	0.962
Constant	–0.87	34.824	1	.000	0.421

Table F.5

Classification Table for Regression Model 3

Observed	Predicted: Intention to Transfer — No	Predicted: Intention to Transfer — Yes	Percentage Correct
Step 1: Intention to Transfer			
No	909	388	70.1
Yes	411	880	68.2
Overall percentage			69.1

Note. Cut value = .500.

Table F.6

Logistic Regression Predicting Intention to Transfer for Model 3

Variables	*B*	Wald	*df*	Sig.	Exp(*B*)
I consulted with academic advisors/counselor regarding transfer	0.166	17.778	1	.000	1.181
Information received from academic advisors/counselors was helpful in the transfer process	–0.016	0.14	1	.708	0.985
I met with academic advisors/counselors on a regular basis	–0.229	43.917	1	.000	0.795
I talked with an advisor/counselor about courses to take, requirements, and education plans	–0.19	37.547	1	.000	0.827
I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor	0.561	198.975	1	.000	1.752
Advisors/counselors identified courses needed to meet the general education/major requirements of a four–year college or university I was interested in attending	0.022	0.366	1	.545	1.022
Visited faculty and sought their advice on class projects such as writing assignments and research papers	–0.026	0.3	1	.584	0.974
Felt comfortable approaching faculty outside class	0.029	0.406	1	.524	1.029
Discussed career plans and ambitions with a faculty member	–0.004	0.006	1	.937	0.996
Asked my instructor for comments and criticisms about my work	–0.043	0.915	1	.339	0.958
Spent more time studying	0.132	3.57	1	.059	1.142
Taught myself to study more effectively	–0.007	0.015	1	.901	0.993
Received a sample test from a friend or club/organization to study	–0.011	0.088	1	.767	0.989
Studied by myself	–0.069	1.85	1	.174	0.933
Constant	–1.143	24.321	1	.000	0.319

Table F.7

Classification Table for Regression Model 4

Observed	Predicted: Intention to Transfer — No	Predicted: Intention to Transfer — Yes	Percentage Correct
Step 1: Intention to Transfer			
No	927	370	71.5
Yes	410	881	68.2
Overall percentage			69.9

Note. Cut value = .500.

Table F.8

Logistic Regression Predicting Intention to Transfer for Model 4

Variables	*B*	Wald	*df*	Sig.	Exp(*B*)
I consulted with academic advisors/counselor regarding transfer	0.158	15.662	1	.000	1.171
Information received from academic advisors/counselors was helpful in the transfer process	–0.014	0.112	1	.738	0.986
I met with academic advisors/counselors on a regular basis	–0.224	40.751	1	.000	0.800
I talked with an advisor/counselor about courses to take, requirements, and education plans	–0.179	32.392	1	.000	0.837
I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor	0.558	193.383	1	.000	1.746
Advisors/counselors identified courses needed to meet the general education/major requirements of a 4–year college or university I was interested in attending	0.024	0.430	1	.512	1.024
Visited faculty and sought their advice on class projects such as writing assignments and research papers	–0.014	0.084	1	.773	0.986
Felt comfortable approaching faculty outside class	0.025	0.295	1	.587	1.025
Discussed career plans and ambitions with a faculty member	–0.026	0.255	1	.613	0.974
Asked my instructor for comments and criticisms about my work	–0.053	1.354	1	.245	0.949
Spent more time studying	0.111	2.441	1	.118	1.117
Taught myself to study more effectively	0.009	0.028	1	.867	1.009
Received a sample test from a friend or club/organization to study	0.002	0.002	1	.964	1.002
Studied by myself	–0.089	2.976	1	.085	0.915
Ethnicity/URM	–0.140	8.822	1	.003	0.869

Table F.8 (continued)

Variables	*B*	Wald	*df*	Sig.	Exp(*B*)
Mother's highest level of education	0.078	5.646	1	.017	1.081
Father's highest level of education	0.066	4.298	1	.038	1.068
Hours worked (per week)	0.020	0.341	1	.559	1.020
Employment status	–0.106	4.307	1	.038	0.899
Marital status	0.031	0.653	1	.419	1.031
Gender	–0.314	8.555	1	.003	0.731
Distance of campus from home	–0.070	2.470	1	.116	0.932
Level of math completed	–0.050	0.175	1	.676	0.952
Level of science completed	0.169	2.865	1	.091	1.184
Constant	–0.161	0.096	1	.757	0.851

APPENDIX G. LOGISTIC REGRESSION COEFFICIENTS: STEM ASPIRATIONS

Table G.1

Classification Table for Regression Model 1

Observed	Predicted		Percentage correct
	STEM aspirations		
	No STEM major	STEM major	
Step 1: STEM Aspirations			
No STEM major	1,645	610	72.9
STEM major	338	303	47.3
Overall percentage			67.3

Note. Cut value = .500.

Table G.2

Logistic Regression Predicting STEM Aspirations for Model 1

Variables	*B*	Wald	*df*	Sig.	Exp(*B*)
I consulted with academic advisors/counselor regarding transfer	0.074	4.104	1	.043	1.077
Information received from academic advisors/counselors was helpful in the transfer process	–0.016	0.191	1	.662	0.984
I met with academic advisors/counselors on a regular basis	–0.036	1.467	1	.226	0.965
I talked with an advisor/counselor about courses to take, requirements, and education plans	–0.110	13.258	1	.000	0.895
I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor	0.205	33.214	1	.000	1.228
Advisors/counselors identified courses needed to meet the general education/major requirements of a four–year college or university I was interested in attending	–0.031	0.809	1	.368	0.970
Constant	–1.481	115.525	1	.000	0.227

Table G.3

Classification Table for Regression Model 2

Observed	Predicted		
	STEM aspirations		Percentage correct
	No STEM major	STEM major	
Step 1: STEM Aspirations			
No STEM major	1,619	636	71.8
STEM major	335	306	47.7
Overall percentage			66.5

Note. Cut value = .250.

Table G.4

Logistic Regression Predicting STEM Aspirations for Model 2

Variables	*B*	Wald	*df*	Sig.	Exp(*B*)
I consulted with academic advisors/counselor regarding transfer	0.074	4.087	1	.043	1.077
Information received from academic advisors/counselors was helpful in the transfer process	–0.017	0.204	1	.651	0.983
I met with academic advisors/counselors on a regular basis	–0.042	1.918	1	.166	0.959
I talked with an advisor/counselor about courses to take, requirements, and education plans	–0.114	13.946	1	.000	0.892
I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor	0.204	32.705	1	.000	1.226
Advisors/counselors identified courses needed to meet the general education/major requirements of a four–year college or university I was interested in attending	–0.031	0.818	1	.366	0.970
Visited faculty and sought their advice on class projects such as writing assignments and research papers	0.031	0.469	1	.494	1.032
Felt comfortable approaching faculty outside class	0.03	0.480	1	.489	1.031
Discussed career plans and ambitions with a faculty member	–0.001	0.000	1	.989	0.999
Asked my instructor for comments and criticisms about my work	–0.006	0.020	1	.887	0.994
Constant	–1.574	99.262	1	.000	0.207

Table G.5

Classification Table for Regression Model 3

Observed	Predicted		
	STEM aspirations		Percentage correct
	No STEM major	STEM major	
Step 1: STEM Aspirations			
No STEM major	1,594	661	70.7
STEM major	332	309	48.2
Overall percentage			65.7

Note. Cut value = .250.

Table G.6

Logistic Regression Predicting STEM Aspirations for Model 3

Variables	*B*	Wald	*df*	Sig.	Exp(*B*)
I consulted with academic advisors/counselor regarding transfer	0.073	3.916	1	.048	1.076
Information received from academic advisors/counselors was helpful in the transfer process	–0.019	.252	1	.616	0.981
I met with academic advisors/counselors on a regular basis	–0.042	1.926	1	.165	0.958
I talked with an advisor/counselor about courses to take, requirements, and education plans	–0.119	15.094	1	.000	0.888
I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor	0.205	32.841	1	.000	1.227
Advisors/counselors identified courses needed to meet the general education/major requirements of a four–year college or university I was interested in attending	–0.032	.850	1	.357	0.969
Visited faculty and sought their advice on class projects such as writing assignments and research papers	0.029	.390	1	.532	1.029
Felt comfortable approaching faculty outside class	0.020	.215	1	.643	1.020
Discussed career plans and ambitions with a faculty member	–0.005	.012	1	.913	0.995
Asked my instructor for comments and criticisms about my work	–0.010	.056	1	.813	0.990
Spent more time studying	0.230	9.727	1	.002	1.258
Taught myself to study more effectively	–0.001	.000	1	.986	0.999
Received a sample test from a friend or club/organization to study	0.024	.391	1	.532	1.025
Studied by myself	0.024	.238	1	.625	1.024
Constant	–2.342	86.629	1	.000	0.096

Table G.7

Classification Table for Regression Model 4

Observed	Predicted		
	STEM aspirations		Percentage correct
	No STEM major	STEM major	
Step 1: STEM Aspirations			
No STEM major	1,644	611	72.9
STEM major	312	329	51.3
Overall percentage			68.1

Note. Cut value = .250.

Table G.8

Logistic Regression Predicting STEM Aspirations for Model 4

Variables	*B*	Wald	*df*	Sig.	Exp(*B*)
I consulted with academic advisors/counselor regarding transfer	0.066	3.048	1	.081	1.068
Information received from academic advisors/counselors was helpful in the transfer process	–0.024	0.416	1	.519	0.976
I met with academic advisors/counselors on a regular basis	–0.033	1.141	1	.285	0.967
I talked with an advisor/counselor about courses to take, requirements, and education plans	–0.094	9.032	1	.003	0.910
I discussed my plans for transferring to a 4-year college or university with an academic advisor/counselor	0.198	29.282	1	.000	1.218
Advisors/counselors identified courses needed to meet the general education/major requirements of a 4-year college or university I was interested in attending	–0.031	0.768	1	.381	0.970
Visited faculty and sought their advice on class projects such as writing assignments and research papers	0.023	0.230	1	.631	1.023
Felt comfortable approaching faculty outside class	0.010	0.047	1	.829	1.010
Discussed career plans and ambitions with a faculty member	–0.035	0.474	1	.491	0.966
Asked my instructor for comments and criticisms about my work	–0.012	0.068	1	.795	0.988
Spent more time studying	0.180	5.824	1	.016	1.197
Taught myself to study more effectively	0.023	0.165	1	.685	1.023
Received a sample test from a friend or club/organization to study	0.035	0.772	1	.379	1.036

Table G.8 (continued)

Variables	*B*	Wald	*df*	Sig.	Exp(*B*)
Studied by myself	0.009	0.030	1	.862	1.009
Ethnicity/URM	–0.065	1.898	1	.168	.937
Mother's highest level of education	–0.006	0.029	1	.864	.994
Father's highest level of education	0.050	2.535	1	.111	1.051
Hours worked (per week)	–0.075	4.840	1	.028	.928
Employment status	0.003	0.002	1	.961	1.003
Marital status	0.038	0.927	1	.336	1.039
Gender	–0.458	19.907	1	.000	.633
Distance of campus from home	0.086	3.551	1	.060	1.089
Level of math completed	0.279	5.624	1	.018	1.322
Level of science completed	0.428	18.395	1	.000	1.535
Constant	–2.163	16.630	1	.000	.115

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