Strategies and Actions used by STEM Degree Seeking Adult, Full-time, Undergraduates: A Grounded Theory Study

Adwoa Boateng
St. John Fisher College, aabwml@rit.edu

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Strategies and Actions used by STEM Degree Seeking Adult, Full-time, Undergraduates: A Grounded Theory Study

Abstract
Higher education research focuses on traditional undergraduates under the age of 25 years. The focus of the researcher's study was on the academic experiences of adult, full-time, STEM undergraduates 25 years of age and older. The purpose of the study was to identify strategies and actions adult students use towards their academic success while enrolled in science, technology, engineering, and mathematics (STEM) programs. The Grounded Theory Method was utilized as the qualitative approach to iteratively generate a theory based on the experiences of adult, full-time undergraduates in STEM programs. The significance of the proposed study was an opportunity to provide higher education administrators with an insight into the college academic experiences of adult STEM undergraduates in classrooms and on campus.

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Strategies and Actions used by STEM Degree Seeking Adult, Full-time, Undergraduates:

A Grounded Theory Study

By

Adwoa Boateng

Submitted in partial fulfillment
of the requirements for the degree
Ed.D. in Executive Leadership

Supervised by
Dr. Dianne Cooney Miner

Committee Member
Dr. Bernard Ricca

Ralph C. Wilson, Jr. School of Education
St. John Fisher College

December, 2012
Dedication

Embarking into new territories of higher education was made possible with the guidance, support, and friendships from many special people, who I will forever cherish.

First, I want to thank the adult undergraduate college students who took time out of their very busy schedules to meet with me and to trust me enough to tell their stories about their academic journey.

I am very grateful to Dr. Dianne Cooney Miner, my dissertation chair, and to Dr. Bernard Ricca, my committee, for their patience and guidance as they introduced me to the dissertation research process using the Grounded Theory Method and Atlas.ti software.

Many thanks for the mentoring friendships and advice I gained from Dr. Marie Cianca, my academic advisor; Professor Aumer and Professor Waterstram-Rich, my field experience mentors; Dr. Wischnowski; Dr. Walton; Dr. Ghazle; Dr. Wild; Chandra McKenzie; Dr. Gatley; Dr. Joseph; and many others.

I am also very grateful for the assistance I received during my IRB process from Dr. Maggelakis, Dr. Doolittle, Timothy Rupright, Heather Foti, Karen Hirst, Catherine Mahrt-Washington, Sean Bennett, Sandra Murphy, and from college deans, department chairs, program directors, faculty, academic advisors, staff, and students too numerous to mention.

Finally, a very big thank you to my mother, family and friends, professional peers, Harro East yoga cohort, Saint John Fisher College Executive Leadership Ed.D
Cohort 5, and faculty for cheering me on during my dissertation journey. I am forever blessed.

I will always remember my first day in class when Drs. Walton and Cianca said “Trust the process.” The following quotes from Randy Pausch’s *The Last Lecture* (2012) express my feelings about my dissertation journey and life:

People are more important than things.

Time must be explicitly managed, like money.

You can always change your plan, but only if you have one.

Ask yourself: Are you spending your time on the right things?

Develop a good filing system. Rethink the telephone. Delegate.

Take a time out. Time is all you have. And you may find one day that you have less than you think.” …“ It's not about how to achieve your dreams, it's about how to lead your life, ... If you lead your life the right way, the karma will take care of itself, the dreams will come to you (Pausch, 2012).
Biographical Sketch

Adwoa Boateng is currently the library liaison for the College of Science, Imaging Science, and the College of Health Sciences and Technology at the Rochester Institute of Technology, Rochester, NY.

Adwoa’s professional expertise is information research, knowledge management, project consulting, and user behavior, which was developed during her employment at General Electric, Corning, Inc., Bausch & Lomb, Xerox, EDS, the U.S. Patent & Trademark Office, and the Rochester Institute of Technology. Adwoa’s career began in research and development as a laboratory technician and evolved into the computer industry. The information industry paradigm shift provided opportunities for Adwoa to participate as an information researcher, manager, knowledge management consultant, trainer, and business analyst.

In 1981, Adwoa graduated from Elmira College, Elmira, NY, with a Master of Science in Education and a Bachelor of Science in Biochemistry, Medical Technology. In 1986, Adwoa obtained her second Master of Science degree in Information Studies at State University of New York at Buffalo, NY. In 2002, Adwoa received a Business Systems Analysis certificate, a Website and Intranet Development certificate and a Management of Information Systems Technology certificate from the Saunders College of Business at the Rochester Institute of Technology. In 2010, Adwoa began her doctoral studies at St. John Fisher College in the Ed.D. program in Executive Leadership. She pursued her research in adult students enrolled in science, technology, engineering, and mathematics undergraduate degree programs, under the direction of Dr. Dianne Cooney Miner, and received the Ed.D. degree in 2013.
Abstract

Higher education research focuses on traditional undergraduates under the age of 25 years. The focus of the researcher’s study was on the academic experiences of adult, full-time, STEM undergraduates 25 years of age and older.

The purpose of the study was to identify strategies and actions adult students use towards their academic success while enrolled in science, technology, engineering, and mathematics (STEM) programs.

The Grounded Theory Method was utilized as the qualitative approach to iteratively generate a theory based on the experiences of adult, full-time undergraduates in STEM programs.

The significance of the proposed study was an opportunity to provide higher education administrators with an insight into the college academic experiences of adult STEM undergraduates in classrooms and on campus.
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Chapter 1: Introduction

Introduction

The National Science Foundation (NSF) and the Committee on Equal Opportunities in Science and Engineering reported a shortage of skilled science, technology, engineering, and mathematics (STEM) employees in the United States (Perna et al., 2009). The National Academy of Science, the National Academy of Engineering, and the Institute of Medicine recommended an increase in STEM degree programs, faculty, and students to address this issue (Chen & Boore, 2009).

The National Commission on the Future of Higher Education has encouraged academic institutions to create environments needed for the success of all students (Kuh, Kinzie, Schuh, & Whitt, 2010). Universities have recognized the need to collaborate with community colleges, in identifying potential STEM transfer students for four year degree programs. Currently STEM transfer students are encountering non-transferable college credits, misaligned college courses and difficulties in adjusting to four year college curriculum and campus life (Tilsley, 2012).

Adult college student enrollment in the United States increased from 27% to 43% from 1979 to 2000 with an estimated increase to 50% by 2012 and a 20% increase projection between 2010 and 2020 (National Center for Education Statistics, 2012, 2002; O’Donnell & Tobbell, 2007). The number of adults obtaining bachelor degrees increased from 25% to 30% from 1999 to 2009 (National Center for Education Statistics, 2010).
Academic accrediting bodies and the federal government are not required to report on the enrollment and retention of adult students (Fain, 2012). The increase in the enrollment of adult undergraduate students at four year colleges attracted the attention of the Western Association of Schools and Colleges (WASC) accrediting body. A three-year WASC pilot project will require eight institutions to report on the enrollment and graduation of adult students beginning in 2013 (Fain, 2012).

The influx of adult students into colleges and universities influenced the development of Donaldson and Graham’s (1999) Model of College Outcomes for Adults. The intent of the model was to highlight factors that influence the academic experiences of adult college students. These factors include how adult students adjust to college life, faculty, students, courses, and classrooms. Changes to college-level pedagogy occurred due to the Boyer Commission recommendation for research-based learning. Learning by discovery during research instead of traditional classroom lecturing is now the focus of undergraduate education (Boyer Commission, 1998). Mathematics, physics, chemistry, life sciences and engineering undergraduate departments have transitioned from traditional lecture classes to smaller, interactive class sessions (Tobias, 2000).

**Problem Statement**

Fifty percent of nontraditional students pursuing a bachelor’s degree are no longer enrolled compared to 12% of traditional students. Thirteen percent of nontraditional students compared to 7% of traditional students change their major programs (National Center for Education Statistics, 2002). Higher education research focuses on the enrollment and attrition of undergraduate, traditional college students under the age of 25 years living on college campuses (Stratton, O’Toole, & Wetzel, 2007).
Theoretical Rationale

The rationale for studying adult students 25 years of age and older is based on limited research on the academic experiences of adult STEM undergraduates. College classrooms serve as focal learning points for adult students. The Model of College Outcomes for Adults frames the college adjustment and learning experiences of adult students into six components: personal lives, values, intellectual activities, classroom connection, work environments, and college outcomes (Donaldson & Graham, 1999).

Statement of Purpose

The purpose of this study is to better understand what strategies and actions adult, full-time, undergraduate students, age of 25 years and over use towards their academic success in STEM degree programs.

Research Question

What strategies and actions do STEM degree seeking adult, full-time undergraduate students use towards their academic success?

Study Significance

There has been limited research on the experiences and outcomes of adult undergraduate students enrolled in STEM degree programs. Students’ development is measured by their academic performance as well their interaction with peers and faculty in classrooms and on campuses. Adult students use classrooms as their point of initiation and springboard into college life while balancing their family and work obligations (Donaldson & Graham, 1999). The significance of the study was an opportunity for the researcher to provide higher education administrators and faculty with an insight into the
academic adjustment and learning experiences of adult STEM undergraduates in classrooms.

Definitions of Terms

Adult Students: non-traditional, 25 years and older, often with the demands of career, work, and family obligations (Justice & Dornan, 2001; Kasworm, 1990).

Traditional Students: enter college directly after high school (Choy, 2002; Donaldson & Townsend, 2007).

Summary

This chapter provided the background and framework for the topic of processes and strategies adult, full-time undergraduate students use towards their academic success in STEM degree programs. Chapter two provides a review of literature that supports the Model of College Outcomes for Adults (Donaldson & Graham, 1999) and the researcher’s proposed dissertation research. Chapter three outlines the action plan of the dissertation study using the qualitative Grounded Theory research methodology. Chapter four presents the research findings with the Grounded Theory Method process steps. Limitations of the study are included in Chapter five, which summarizes the research findings with the emergent theory and presents recommendations for higher education leadership.
Chapter 2: Literature Review

Introduction

This literature review chapter begins with a summary of adult undergraduate studies of factors adult students encounter while acclimating to college life and college classes. The Donaldson and Graham’s 1999 *Model of College Outcomes for Adults* frames the factors concerning adult students that are supported by the studies. The literature review chapter includes factors that were researched in the dissertation study.

Purpose

The purpose of the literature review was to identify factors involving college life, classrooms, and degree programs that would influence the academic acclimation and success of adult undergraduates. Adult students are characterized as self-directed learners who pursue learning experiences that are purposeful and relevant to their personal lives and careers (Adult Learning Theory and Models, 2007). Adult student research focuses on students’ academic skills as well as their academic approach, self-efficacy, and persistence while dealing with family and work challenges (Kasworm, 2008).

Review of the Literature

There has been limited research on the experiences and outcomes of adult, full-time undergraduate students enrolled in STEM degree programs. The development of students is measured by their academic performance as well as how they interact with peers and faculty in classrooms and on campuses. Adult students treat classrooms as
their point of initiation and springboard into college life while balancing their personal lives and work schedules. Research has noted adult students’ concerns about transitioning to college life and of their limited studying skills (Donaldson & Graham, 1999). Due to work and family obligations, adult students spend little time on campuses after classes. Therefore, the college classrooms provide a focal learning and social point on college campuses where adult students interact with a diverse student population. The Model of College Outcomes for Adults frames the college life adjustment and learning experiences of adult students into six components involving their personal lives, jobs, values, intellectual activities, classroom connection, and college outcomes (Donaldson & Graham, 1999).

**College life.** The adult students’ initiation to college life begins at the college course registration process and during college class interactions with faculty and a diverse population of students. References to stress, time constraints, and the need to balance school with family and work obligations are examples of outcomes noted by adult students acclimating to college life.

Thomas (2001) studied the college acclimation and learning experiences of 147 working adult female students, average age of 39 years, with family responsibilities, who had not completed college at a younger age. The purpose of the qualitative study was to interview and research the academic experiences of adults in a weekend college degree program. The study’s design was a two-step process involving a survey with follow-up interviews. The study’s tools were the researcher’s survey designed to obtain information about the participants’ education goals as well as their family and work obligations; the Rosenberg Self-Esteem Scale designed to measure the participants’
feelings of self-worth; and the Perlin and Schooler Mastery Scale (1978) designed to measure the participants’ control of their lives. The cultural background of the study’s sample was 40.4% European American, 42.6% African American, 6.6% Native American, 4.4% Hispanic American, 0.7% Asian American, and 5.1% of other ethnic backgrounds. The follow-up interview sample was 19 African American women, average age of 41.7 years. The study’s survey findings revealed career advancement was the main motivation for 85.6% of the adult female students. Sixty three percent of the surveyed participants reported time constraints while balancing college, work, and family were their main obstacles to academic success. Twenty three percent of participants reported receiving encouragement to return to college from their employer, and 17.6% of the participants reported receiving encouragement from their parents. A negative impact on students’ marriages was reported by 40% of the African-American females and by 27.8% of the European-American female students. These negative influences were reiterated by 7 of the 19 interviewed African-American female students whose husband, friend, or work manager did not want them to attend college. Fifteen of the nineteen interviewed participants reported financial constraints and non-supportive college administrators as their academic obstacles. The study’s findings reported that despite encountering obstacles, the participants revealed a high level of self-esteem with a mean score of 38.2 and a moderate level of control on life with a score of 18.94.

Askham (2008) conducted a qualitative case study on factors that influence new adult students’ learning experiences. The case study involved the restructuring of an undergraduate management program and reviewing the program’s impact on enrolled students. The study’s phenomenon of interest was the acclimation experience of adult
students new to a college academic environment and program. The study’s design was a two-year action research process of gathering data before, during, and at the end of courses. The study’s tools were student diaries, logs, individual interviews, and focus group interviews. The study’s sample was 22 undergraduate management adult students, averaging in age of 35 years. The study’s research question focused on identifying the students’ expectations and concerns of the college program. The study’s interview findings revealed two themes highlighting the positive and negative aspects of the students’ learning experiences and self-identity. The researcher’s assumptions that the interviewed adult students could be grouped by age in order to identify similar characteristics were not supported from the study’s findings. The new adult students viewed the college environment as a foreign country where new behaviors and academic writing had to be learned. Interviewed students emphasized the importance of networking and support from faculty, family, and friends.

How new adult students deal with personal and college stresses was the focus of Giancola, Grawitch and Bochert’s (2009) quantitative study. The study’s research questions and design focused on measuring the behaviors of how students adapt to stress. The study sample was 159 students enrolled in a university adult professional studies degree program. The study’s sample ranged from 20 to 56 years (M=36, SD=8.63). Sixty eight percent of the participants were women. The tools used in the study were a multi-survey packet consisting of a Work-Personal-School Stressor Questionnaire used to measure the participants’ level of work, personal, and school stress (Hammer, Grigsby & Woods, 1998); Work-Family-School-Conflict Questionnaire used to measure the level of conflict encountered by participants at work, school, and home (Kirby, Biever, Martinez
& Gomez, 2004); Negative, Positive Appraisal Questionnaire used to measure the participants’ self-evaluations of positive and negative situations (Skinner & Brewer, 2002); COPE, a survey used to measure how participants cope with problems and emotions (Carver, Scheier, & Weintraub, 1989); General Health Questionnaire used to measure participants’ mental health (Goldberg, 1978); and Satisfaction With Life Questionnaire used to measure participants’ satisfaction with life (Diener, Emmons, Larsen, & Griffin, 1985). In addition, the researcher included a self-designed demographic questionnaire to obtain gender, race, ethnicity, student course load, employment, and family information. The study’s findings revealed that adult students’ work stresses were higher than both their personal life stresses, $t(148)=2.86, p<.001$ and school stresses, $t(148)=13.76, p<.001$. The adult students’ personal life stressors were higher than their school stresses, $t(148)=11.57, p<.001$.

The Model of College Outcomes for Adults noted that the role of work had the highest priority in the lives of adult students, which meant sacrificing time for their family and personal lives (Donaldson & Graham, 1999). Under this context, the impact of a weekend college program on adult students’ work and personal life was the purpose of Kirby, Biever, Martinez, and Gomez’s (2004) quantitative case study. The study’s sample was 566 students ranging from 22 to 55 years. Forty five percent of the 566 participants were graduate students. The study’s design and tool was a Work-Family-School Conflict Measure Questionnaire used to assess the participants’ satisfaction with work, college, and family and the impact of the college program on the participants’ lives (Hammer et al., 1998). The participants’ ethnicity, age, family situation, number of dependents, course credit hours, and school experience were used as the predictor
variables in a multiple regression analysis. The study’s findings reported that family stress, when tested as the dependent variable, showed that the predictors were not significant. Family support (B=.518), p<.001 was a significant predictor of lower stress in students. School experience satisfaction (B=.102), p<.05 was a significant predictor of satisfied students with lower work stress levels. Employed students who had work support (B=.454), p<.001 had lower work stress. Full-time working students (B=-.225) had higher stress than part-time working students (F(7,483=43.151, p=.001). Time constraints were reported as the greater source of stress on students than family, work, and the weekend college program. The study recommended institutions evaluate their programs’ impact on students.

The importance of family and friends’ support for adult students during their college experience is an outcome noted in the Model of College Outcomes for Adults (Donaldson & Graham, 1999). Price (2004) studied the role that external support from family and friends played in the academic success of part-time nursing students. The purpose of the qualitative study was to profile the external support nursing students received while enrolled in a part-time Bachelor of Science nursing program. The study’s phenomenon of interest was the nursing program’s withdrawal or extension by part-time nursing students. The study’s sample was 30 nursing students ranging from 30 to 40 years. The study’s five-year design involved 41 interviews and 83 student observations, using the Grounded Theory method (Glaser & Strauss, 1967). Eleven of the 30 nursing students were interviewed with their selected external support person. The location of the interviews was selected by the participants. Participants were provided interview transcript updates for feedback. The interview transcripts were coded and categorized
into themes. The study’s findings reported four categories of issues relating to inconsistent family support, family frustration with unexpected college program schedule changes, students’ studying habits, and students’ personal relationships with their support. The type of family support profiled in the interviews involved parenting and home life responsibilities by relatives and friends of the nursing students. There was no evidence of lack of support by the nursing students’ male relatives and friends. The study’s findings revealed that the significance of the role of students’ external support in the students’ lives had not been recognized by the nursing program administrators.

**College programs.** The classroom factors that adult students encounter are the faculty, students, classroom technology, course content, course delivery, and course teaching method. Specifically, new technologies, online courses, accelerated degree programs, diverse student populations, and new course teaching methods are what adult students have to adjust to. Learning by discovery in a research-oriented classroom instead of a traditional lecture-based classroom is now the focus of undergraduate education (Boyer Commission, 1998). Mathematics, physics, chemistry, biology, and engineering undergraduate departments have transitioned from traditional lecture classes to smaller, interactive class sessions (Tobias, 2000).

Zastavker, Ong and Page (2006) investigated the use of project-based learning (PjBL) methods for research solving activities with female engineering students. The purpose of the mixed method study was to observe how PjBL impacted female students’ interest in engineering introductory courses. The design of the mixed method study involved a survey and interviews using the Grounded Theory method during a two-year period. The study’s quantitative tool was the researcher-developed survey. The study’s
sample was 150 engineering undergraduate students. The study’s findings reported that hands-on activities were related to increased students’ interest in pursuing an engineering degree ($r=0.59, p<0.001$) and an engineering career ($r=0.56, p<0.001$). Female participants reported positive learning experiences with the PjBL method. The study’s limitation was the prior technical knowledge of the male and female students before enrollment had not been gathered to use as a comparison. The researcher reported the study will be repeated at three other universities with larger engineering programs in order to compare results.

Another example of alternative STEM teaching was researched by Koch (2001) investigating alternative teaching of college physics. The purpose of the quantitative study was to test the impact of the application of a meta-cognitive technique on students’ reading comprehension of physics text. The study’s phenomenon of interest was college physics students’ ability to solve physics problems, but inability to comprehend physics texts. The study’s research questions focused on the physics students’ learning process. The study’s design was a three-month evaluation of reading comprehension levels of physics text. The study’s sample was 64 undergraduate physics students ranging from 21 to 28 years. The meta-cognitive tool used in the study was the Koch and Eckstein (KE) physics test, which required continuous self-assessment while reading and comprehending physics text (Koch and Eckstein, 1995). The students were randomly divided into a control group (30 students) and the KE experimental (32 students) group. The control group received assistance from faculty while completing physics reading and comprehension assignments. Faculty only moderated the KE experimental group as the students self-assessed themselves while completing physics reading and comprehension.
assignments. The study’s findings revealed that the experimental group that used the KE technique was more successful than the control group ($t=3.75; p=0.0004$). The reading and comprehension ability of the physics students in the experimental group had improved. The study recommended future experimentation using KE exercises with other STEM subjects.

The delivery of undergraduate degree programs has changed from traditional course lengths in on campus classes to online classes and accelerated degree programs. Boylston, Peters and Lacey (2004) conducted a quantitative study to compare students’ satisfaction with a traditional nursing program and an accelerated nursing program. The study’s phenomena of interest was registered nurses (RNs) returning to college while balancing home life and careers. The purpose of the study was to compare students’ success in an accelerated nursing program with a traditional nursing program. The study’s research questions focused on students’ satisfaction with their student courses. The study’s sample was 53 undergraduate nursing students ranging from 25 to 45 years. Twenty three participants were enrolled in the accelerated nursing program. Thirty participants were enrolled in the traditional 20-month nursing program. Eighty three percent of the traditional program students and 73.91% of the accelerated program students were European American. Thirteen percent of the traditional program students and 26% of the accelerated program students were African American. The study’s design and tool was the Noel-Levitz Adult Student Priorities (ASPS) survey (Noel Levitz, 2000). The ASPS reliability based on Cronbach’s coefficient was 0.90 for importance scores and 0.90 for satisfaction items. The study’s findings ranked in order of satisfaction levels were: academic advising as the most important by the traditional program group with a
rating of 5.73 (SD=1.06) and by the accelerated program group with a rating of 5.92 (SD=1.04). Second in importance was instructional quality: by the traditional program group with a rating of 5.89 (SD=0.89) and by the accelerated program group with a rating of 6.30 (SD=0.85). Third ranked in importance was the program’s registration process: by the traditional program group with a rating of 5.12 (SD=1.00) and by the accelerated program group with a rating of 5.87 (SD=0.83). Fourth ranked in importance was safety and security: by the traditional program group with a rating of 5.39 (SD=0.90) and by the accelerated program group with a rating of 5.96 (SD=0.98). The study’s findings revealed that students enrolled in the accelerated nursing program were more satisfied with their program than the students enrolled in the traditional program.

The impact of online course teaching methods was the focus of Ke and Xi’s (2009) quantitative study. The purpose of the study was to measure the level of the adult students’ interactions in both undergraduate and graduate online courses. The study’s sample was 51 students ranging from 24 to 59 years, with 43 years as the mean age. Twenty eight percent of the participants were Hispanic and Asian. Eighty five percent of the sample was female. The study’s design involved reviewing online course transcripts and surveying students enrolled in ten online courses. The online courses were in nursing, business, and education, which used three types of online teaching models. One type of online teaching was the Content + Support Model (Mason, 1998) that involved 20% of the course time spent in online class discussions and the remaining course time spent on the course textbook. Another online teaching method was the Wrap Around Model (Mason, 1998) that was less textbook structured and involved 50% of the course time spent in online class activities. Another type of online teaching was the Integrated
Model (Mason, 1998) that was structured around online class discussions and student activities instead of a textbook. The 10 online courses were observed in two steps during six weeks. The first step involved gathering, analyzing, and coding students’ online class discussion transcripts. The second step involved the distribution of the survey’s tools: the Learning Experience Survey (Ke & Xie, 2009), used to measure students’ course satisfaction level; the Classroom Community Scale Survey (Rovai, 2002), used to measure students’ social interaction in the online courses; and the Study Process Questionnaire (Biggs, Kember & Leung, 2001), used to measure students’ level of learning in class. The study’s findings revealed the adult students’ preference for the Content + Support model courses, which were structured more around course textbooks than around online class activities. There was a negative correlation between adult students and information sharing class activities ($r = -.39$, $p < .01$), revealing the adult students’ lesser class involvement in online courses. The study’s findings highlighted insufficient evidence to correlate students’ ages with their course learning satisfaction. The study recommended measuring the preparation of adult students for online courses and to include course grades as a measure in future studies.

Ke (2010) further investigated students’ learning experiences in ten online courses. The purpose of the mixed method case study was to observe faculty and student interactions in online courses. The study’s phenomenon of interest was the impact of online faculty teaching practices on adult student learning. The study sample was 8 course instructors and 16 selected adult students ranging from 24 to 59 years. Thirty-six percent of the students were minorities (Hispanic, Asian) and 60% were female students. The study’s design utilized a natural case study method (Stake, 1995) that involved pre
and post course interviews to review online teaching methods with adult students. The study included interviews of faculty to assess their online teaching experience and their perception of how online courses were conducted. The adult students’ interview questions focused on their learning experiences. The study’s sample was 16 selected students and 8 online course faculty. The study’s tools involved three surveys: the Learning Satisfaction Survey (Rovai, 2002), designed to measure students’ satisfaction with learning online; the Classroom Community Scale (Rovai, 2002), designed to measure students’ online involvement with other online students; and the Study Process Questionnaire (Biggs, Kember & Leung, 2001), designed to measure the students’ level of learning. The study’s findings revealed that few of the faculty had designed online courses and the design of online courses was based on traditional campus courses. The study’s findings revealed that 69% of students rated assignments as important to their online course learning experiences. Students reported their time was better spent on individual (Mi) course projects (Mi=5.4 vs Mg=4.7, t=2.4, p<.05), which they rated as more relevant to their learning experience than (Mg) online group projects, Mi=5.2 vs Mg= 4.6, t=2.7, p<.01. The study’s interviews revealed the students’ expectations and the importance of faculty to interact equally online with all of their students in individual courses. A significant correlation was identified between the courses that used online discussions for student social interactions (r=.38, p=.01), when compared to courses that used online discussions for graded assignments (r=.29, p<.05). Meaning, students participated more in online course discussions that were not being graded for their courses. The study recommended including students’ course grades as an additional variable to measure in future research studies.
The experiences of adult undergraduates enrolled in accelerated degree programs was the focus of Njumbwa’s (2008) research. The purpose of the mixed method study was to investigate factors that influenced adult students’ persistence in completing the accelerated degree program. The study’s sample was 30 adult undergraduate students consisting of 19 women and 11 men, ranging from 27 to 50 years. Sixty-seven percent of the participants were full-time employees. Fifty-eight percent of the sample enrolled directly from a two-year college while the rest of the students had been out of school for some time. The study’s tools and design were the researcher’ designed questionnaire and written reflections by the students in their research projects. The questionnaire was delivered at the end of a class session after the students completed their research projects. The analyzed student reflections were coded and categorized into recurring phrases and themes. The study’s quantitative findings revealed 57% of the participants found their new research skills and knowledge relevant to their work environment. Sixty percent of the participants reported being very satisfied with their research experience. The study’s qualitative findings revealed four themes from the student’s responses that focused on students’ stress; researching challenges; persistence and satisfaction from meaningful research experiences; and time constraints while balancing family, work, and the research program. Participants reported never having prior high school or college experience with information research and academic writing. One student reported persevering after observing her classmates’ struggles in the program. Participants reported the support from their families as influencing their persistence with the program. The researcher recommended the study be replicated with accelerated degree programs in other subject areas and compare the results with traditional programs at the same research site.
College classroom. The development of students is measured by their academic performance as well as their interaction with peers and faculty in classrooms and on campuses. Adult students treat classrooms as their point of initiation and springboard into college life while balancing their family and work obligations (Donaldson & Graham, 1999).

The college acclimation of first-generation, adult undergraduate students and college-experienced, adult undergraduate students was the focus of Giancola, Munz, and Trares’s (2008) study. First-generation adult undergraduate students were characterized in the study as adult students with no prior college experience and whose parents did not have college degrees. In contrast, the college-experienced adult undergraduate students have prior college exposure and have college-educated parents. The study’s phenomenon of interest was studying first generation adult students in a four year program instead of two year college program. The purpose of the quantitative study was to compare the expectations of first-generation adult students and the college-experienced adult students. The study’s sample was 317 adult students enrolled in a weekend, evening adult university program. Two hundred and six students out of 317 students were first-generation students, and the remaining 111 were college-experienced adult students.

Ninety percent of the 317 students were over 25 years. The study’s design utilized the Model of College Outcomes for Adult Students (Donaldson & Graham, 1999), which theorizes that not all adult undergraduate students have the same academic expectations. The study’s tool was the Noel-Levitz Adult Student Priorities Survey (ASPS, USA Group Noel-Levitz, 2003) designed to measure students’ expectations of academic support and college services. The survey’s questions focused on students’ ratings on the importance
of academic advising, academic services, campus climate, instructor effectiveness, registration effectiveness, safety, and security. The study’s findings revealed that first-generation and college-experienced adult students differed on the importance of instructor effectiveness, registration effectiveness, campus climate, and services. First-generation adult students rated effective instructors (Mfirst=6.52 versus M=6.38), college registration process (Mfirst=6.44 versus M=6.27), campus climate (Mfirst=6.45 versus M=6.21), and college services (Mfirst=6.32 versus M=6.10) higher in importance than the college-experienced adult students. The study’s results noted there was no significant difference in academic perceptions between first-generation adult and college-experienced adult undergraduate students.

Adult student enrollment increased from 27% to 43% from 1979 to 2000 and is estimated to increase in the United States to 50% by 2012 (National Center for Education Statistics, 2002; O’Donnell & Tobbell, 2007). The number of adults obtaining bachelor degrees increased from 25% to 30% from 1999 to 2009 (National Center for Education Statistics, 2010). The influx of adult students in college classrooms has added to the diversity of student populations in classrooms. Gregoryk and Eighmy (2009) conducted a study comparing the interaction among diverse student populations including adult students in classrooms. The purpose of the mixed method study was to identify class communication and interaction preferences among three age categories of students: baby boomers, generation Xers, and millennials. The study’s phenomena of interest were the learning styles of different student generations. The study’s sample was 1,219 undergraduate students. The demographics of the sample were baby boomers ranging from 46 to 55 years, generation Xers ranging from 26 to 45 years, and millennials
ranging from 17 to 25 years. The study’s design and tools were conducted in two steps. The first step was a focus group study using the Personal Value Assessment Method (Hicks & Hicks, 1999) to interview four groups: group A (17-25 years), group B (26-35 years), group C (36-45 years), and group D (46-55 years). The interviews identified students’ perception of each age groups and themes specific to each age group. The themes were used in the study’s second step, which involved an Intergenerational Interaction Survey (Ross, 1996), used to identify the student groups’ differences and similarities in values and learning preferences. The survey’s findings revealed that Group C (36-45 years) rated the importance of classroom multitasking abilities higher than Group A (17-25 years). Internet usage class projects was less favored by Group B (26-35 years), mean 2.86, (SD=0.95). Team classroom projects received the least favorable response from group D (46-55 years), mean = 2.67 and the most favorable response from group C (36-45) with a mean =3.32. The study’s findings noted that older students (26-55 years) scored the highest on the significance of technology in their lives. The study interpreted the lower technology significance ratings by the younger students (17-25 years) to mean that they take technology for granted. The study recommended that faculty should not design course activities based on students’ ages but instead to identify students’ individual preferences for class activities.

In addition to investigating the interactions among the diverse student population in classrooms, the motivation and learning characteristics among students was the focus of Justice and Dornan’s (2001) research. The purpose of the quantitative study was to compare motivation and learning characteristics of adult students with younger traditional students. The study’s phenomenon of interest was course instruction designed for adult
students’ learning characteristics. The study’s sample was 95 undergraduate students divided into two groups. The first group was 40 female and 18 male traditional students ranging from 18 to 23 years. The second group was 19 female and 18 male adult students ranging from 24 to 64 years. The study’s design and tools were three questionnaires utilized during a three-week period: the Study Activity Survey Form R (SAS-R, Christopoulos et al., 1987), used to self-measure routine study behaviors; the Inventory of Memory Experiences Tool (IME, Herrman & Neisser, 1978), used to self-measure memory abilities; and the Motivated Learning Strategies Tool (MSLQ, Pintrich & DeGroot, 1990), used to self-measure motivation behaviors. The study’s findings revealed a significant age group effect, $F(1,90)=5.23,p<.02$, showing adult students had higher study activities than the younger students. The age group results, $F(1,90=4.03,p<.02$) and the gender results ($F1,90)=5.37,p<.03$) revealed that the adult students and females initiated managing difficult class tasks. The IME tool results revealed no significant differences of self-reporting memory ability and experiences by students’ age or gender. The MSLQ tool results revealed no significant differences on self-efficacy and text anxiety by students’ age or gender. A significant age and gender result, $F(1,90)=4.11,p<.05$, highlighted adult female students having a higher interest in their courses. The study revealed no significant differences between the traditional and adult students in their class performance.

The focus of Strage’s (2008) classroom study was of undergraduate students’ perception of their courses, professors, and learning environment. The design of the quantitative study was to measure the perceptions of adult and younger students, professors, and learning environment. The study’s phenomena of interest were students’
expectations of a college learning environment. The study’s sample was 1,310 undergraduate university students enrolled in 42 academic majors. Two thirds of the participants were female. Fifty eight percent of the participants ranged from 18 to 22 years and the remaining participants ranged from 23 to 39 years. One-third of the participants were first-generation students. The study’s design involved delivering a survey to students in class during a two-week period. The study’s tool was developed by the researcher: a 96-item questionnaire using multiple-choice questions, open-ended questions, and Likert scale questions. The study’s findings revealed higher expectations from the older students for faculty to be organized (F=6.590, p=.001) and flexible (F=5.856, p=.003). Older students expected courses to be well organized (F=4.702, p=.009). The younger students expected faculty to be funny (F=4.112, p=.017) and enthusiastic (F=4.067, p=.017). Younger students expected courses to be engaging (F=5.211, p=.006) and fun (F=11.206, p=.000) with faculty utilizing active instruction activities (F=9.139, p=.000). The study’s limitations were the researcher’s survey tool and the sample was not randomly selected. The study recommended faculty to utilize the study’s findings while developing class activities in other courses.

Higher education research focuses on the enrollment and attrition of undergraduate, traditional-age college students under 25 years, living on college campuses (Stratton, O’Toole, & Wetzel, 2007). The focus of the researcher’s dissertation research study was on the processes and strategies that adult first-generation STEM students, 25 years of age and over, use towards their academic success. Under this context, Sorey and Duggan (2008) investigated predictors of persistence in adult college students. The study’s sample was 350 adult students, 25 years of age and older, and 350
traditional students, 18 to 24 years of age. The study’s tool was a survey questionnaire designed by the researcher and based on the works of retention researchers Cabrera, Castenada, Nora, and Hengstler (1992), Metzner and Bean (1987), Pascarella and Terenzini (1980). The study’s research design involved distributing survey paper copies through the college dean’s office to volunteers over a four-week period. The study’s findings were based on an overall 17.6% response rate from 68 traditional students and 55 adult students. The major constructs measured by the survey were finances, support from others, degree utility, intent to leave, institutional commitment, goal commitment, academic integration, and social integration. The scales used to measure the study’s major constructs had acceptable reliability with the following Cronbach coefficient alpha: degree utility (.78), encouragement and support from others (.84), intent to leave (.80), institutional commitment (.85), goal commitment (.66), academic integration (.64), and social integration (.71). The social integration construct had the strongest relationship to adult student persistence (.614). Adult students satisfied with their relationships with other students and faculty were more likely to persist. The researcher recommended emailing the survey to increase participation and to conduct a longitudinal student persistence study. In addition, a retention committee was recommended to create programs and services to reduce attrition and to provide new faculty training, focusing student learning, and persistence.

Influences on the academic persistence of adult students were the focus of Ivankova and Stick’s (2007) research. The purpose of the mixed method study was to explore factors that influence the persistence of adult students. The study’s phenomena of interest were barriers that prevented adult students from graduating. The study’s
design and tools involved a two-step process. The first step involved distributing the researcher’s quantitative survey (Ivankova & Stick, 2004), designed to gather participants’ academic and demographic information. The second step involved interviewing selected students based on the results of the quantitative survey. The study’s research questions focused on the influence of students, advisors, and faculty on adult students’ persistence in a doctoral program. The study’s sample was 278 students ranging from 36 to 54 years. The study’s findings identified the course program, faculty, the students’ self-motivation, academic support services, and online learning environments as the factors that influenced adult students’ persistence. Seventy six percent of students reported positive academic advising experiences. Fifty percent of the students reported satisfaction with academic support services. The study’s correlation results were program ($r=0.905$) and online learning environment ($r=0.526$) having the highest correlations followed by faculty ($r=-0.486$), self- motivation ($r=0.482$), and student support services ($r=0.202$). The qualitative study involved interviews with 4 out of the 278 students. Online course transcripts, photos, and personal objects were included with the interview data for analysis. The study’s findings revealed four themes that focused on the students’ academic experiences, course learning environment, student support, and the students’ self-motivation. Students’ self-motivation had the greatest effect on students’ persistence while the influence of the students’ academic advisor, online learning environments, family, and their jobs did not greatly affect the persistence of adult students. The study’s results reported that students who had dropped out of the doctoral program had less satisfactory experiences with their faculty, course program,
and student support services. The study recommended future research on faculty perspectives of the persistence of adult students.

Summary

The Model of College Outcomes for Adults frames the college adjustment and learning experiences of adult students into six components involving their personal lives, values, intellectual activities, classroom connection, work environments, and college outcomes (Donaldson & Graham, 1999). The reviewed studies highlighted the influence of different learning and communicating styles of students in classrooms, due to a wide range of student age groups. The classroom student demographics did not have a significant influence on the academic success of adult undergraduate students. No significant differences were noted in the learning experiences of the older nontraditional students and the younger traditional students. Research results suggested the design of courses should focus on individual students’ preferred learning styles and not on student ages. Regardless of age, course time constraint was a common factor highlighted in the reviewed studies.

The focus of the researcher’s dissertation was on adult undergraduate STEM students inclusive of gender, race, and ethnicity for the purpose of comparing college learning experiences. The researcher reviewed factors that influenced an adult student’s acclimation to college life and STEM programs. Managing time and managing stress while balancing work, school, and family life were common themes highlighted by adult students. The reviewed studies involving classroom technology and student demographics in classrooms did not have a significant influence on the academic success of adult students. The importance of adult students’ support received from higher
education administration, faculty, family, and work were noted in the reviewed literature as common influencing factors in the academic success of adult students.
Chapter 3: Methodology

Introduction

This chapter provides the research steps the researcher followed while conducting the study using grounded theory. A summary of the benefits of using Grounded Theory for this study is provided. The following is an overview aligning the research problem statement, research question with the research context, design, and delivery.

Research Context

The research study was conducted at a northeastern university that has 9 colleges, 80 graduate programs, and over 90 bachelor degree programs in business, liberal arts, computer science, engineering, printing, mathematics, physics, chemistry, environment, medical, and biology-related sciences. In 2012, the university’s total enrollment was 17,950 students of which 15,085 were undergraduate students and 2,865 were graduate students. Academic resources available to new undergraduate students are the university’s library, student services, admissions, financial aid departments, college academic advisors, campus tour videos, and campus webpage links to additional resources.

Researcher’s Positionality

The researcher’s positionality in the study involved providing library class instruction and information research assistance to science, technology, engineering, and mathematics (STEM) students and faculty at the participating university. The researcher was an adult student graduate of the participating university, enrolled in undergraduate
information technology certificate programs. The STEM college deans at the participating university were notified about the researcher’s dissertation research study.

**Research Participants**

A purposeful sampling of full-time adult students 25 years of age and over enrolled in STEM undergraduate programs was conducted. Solicitation letters were distributed out of the college deans’ offices for the researcher, to 116 full-time undergraduate students, 25 years of age and over, enrolled in academic year 2011-2012 science courses identified at the participating university.

The study was inclusive of all American ethnic, racial, and cultural groups enrolled in STEM undergraduate programs. The gender, family status, financial support, employment status, and program major of the participants were gathered during the study. Adult full-time undergraduate students receiving international support or support from the Fulbright Scholars program and McNair Scholars program were not included in the study. For the purpose of this study, targeted American students were those who were not receiving special student services, academic mentoring, or financial support from international countries and private organizations.

**Instruments Used in Data Collection**

Before beginning the study, the researcher submitted the St. John Fisher College’s Institutional Review Board (IRB) Application for Expedited Review Form B (St. John Fisher College Institutional Review Board, 12/10) for approval.
After the St. John Fisher College’s Institutional Review Board (IRB) Application for Expedited Review Form B was approved, the researcher submitted the participating university’s Institutional Review Board (IRB) Form for approval.

The data collection instruments used in the study were the research study participation flyer (Appendix A), the research study participation letter (Appendix B), an informed consent form (Appendix C), and Interview Questions (Appendix D).

**Procedures Used**

Prior to any interview, each participant read and signed an informed consent form at the beginning of the interview (Appendix A). One signed copy was given to the participant and the other signed copy was retained by the researcher. The informed consent form highlighted the purpose of the researcher’s study, the interview process, permission to tape the participant’s interview, and the participant’s contact information (Pulos, 2008).

**Protection of human subjects.** The researcher informed the study participants before they were interviewed that their disclosed information would be kept confidential. For the purpose of this study, confidentiality was defined as the researcher not sharing participants’ information with others. In the case of the interviewed participants discussing harming themselves or others, the researcher would have contacted the proper authorities for safety reasons.

Before the interview process began, the researcher thanked the participants for their voluntary participation, and in the case the interview questions created any discomfort, they could choose to end the interview. Any interview information identifying the participants or other individuals including names, detailed work, and
professional and university connections were removed from the transcripts and dissertation to ensure confidentiality.

After receiving the St. John Fisher College’s IRB approval and the participating university’s IRB approval, the researcher emailed the research study’s participation letter to the participating university’s STEM college deans. At the same time, the researcher contacted the participating university’s institutional research and policy studies department to distribute the names and email addresses of currently enrolled full-time adult students including the 116 full-time, undergraduate students, 25 years of age and over, enrolled in academic year 2011-2012 science courses to the STEM college deans.

Copies of the research study’s participant flyer were posted in the common meeting areas of students on the campus of the participating university.

Nine undergraduate, full-time adult students contacted the researcher and volunteered, after reviewing the posted research study flyers or after receiving the study participatory letter.

The volunteers were asked to set aside 45 minutes to one hour for individual interviews, which were conducted by the researcher.

The individual participant interviews were recorded on two voice recorders by the researcher and then transcribed by a professional service. The interview transcripts were coded by the researcher using the Atlas.ti 7 software. The Atlas.ti 7 software is used to manage and analyze collected information provided in audio, visual, and text formats (Atlas.ti, 2011). Identifying information about the participants was removed from the interview transcripts (Dollinger, 2007; Long, 2009; Pulos, 2008).
All interviews were conducted in neutral locations suggested by the researcher or the volunteer participants. Each interviewed adult student received a cafe refreshment token. A copy of individual interview transcripts was made available to the respective study participants, upon request. Transcripts, recordings, and documents will be kept under lock and key at the researcher’s office for the duration of the study and then destroyed after three years (Dollinger, 2007; Long, 2009; Pulos, 2008).

**Research Method**

Grounded Theory was the qualitative research method used to interview the adult full-time student participants about their experiences in STEM undergraduate programs. The interview questions (Appendix D) were designed to understand the participants’ college acclimation and learning experiences and to identify processes and strategies used by the participants.

The benefit of using Grounded Theory was that it required the researcher to begin the research with an open mind while interviewing adult students in their academic environment. With sensitivity, the researcher gathered data in the natural settings of the study participants. The purpose of qualitative research was to investigate people, a problem, or an issue that quantitative research cannot measure or explain when dealing with thoughts and behaviors in a study (Creswell, 2007).

The purpose for utilizing the Grounded Theory method is that a theory would be discovered and generated from the interview data concerning the participants’ academic experiences. A theory was generated from collected data instead of trying to fit or to verify a pre-existing theory as expected in quantitative research. The Grounded Theory method required a process that iteratively generated the theory during the interviewing
process (Creswell, 2007; Glaser & Strauss, 1967). Grounded Theory is defined as the “discovery of theory from systematically obtained and analyzed data” (Glaser & Strauss, 1967, p. 1). This process is used in situations where research questions involve social interactions, social experience, or a situation that needs to be explained but not tested (Kennedy & Lingard, 2006).

Grounded Theory requires systematic, analytical procedures beginning with interviewing and observing participants in order to collect data and documents that are grouped into major categories based on the emerging information. Creswell (2007) describes the systematic process of repeatedly going out to interview participants and coming back to the researcher’s environment to analyze the interview data results as the comparative process. The researcher began this comparative process by conducting the grounded theory’s first step identified as theoretical sampling, which begins when the researcher interviews participants to obtain data.

The first time the researcher categorized the interview data began the open coding process of Grounded Theory methodology, which is the first level of coding. The second level of coding conducted by the researcher was axial coding, which focused on specific coded categories of data in order to discover emerging trends. The emerging trends are identified by factors that caused their discovery, which are known as causal conditions. Responses to the emerging trends are identified as strategies, intervening conditions, and consequences. The researcher continued to interview participants at the open coding level while simultaneously categorizing data at the axial coding level. Selective coding was the last coding step where the researcher further analyzed the categorized data to
discover and develop a theory relating to the experiences of the interviewed participants (Creswell, 2007).

The levels of coding conducted by the researcher occurred during a four-step, constant data comparison process where categorized data were integrated and memo writing began before writing the emerging theory (Glaser & Strauss, 1967). Early in the comparative process, the researcher began memo writing and creating diagrams that visually linked the relationships of the forming data categories. Memo writing required the researcher to write ideas about the codes concerning collected data and their relationships. The purpose of memo writing was to allow the researcher to reflect, to focus, and to uncover missed data or assumptions. Memo writing is similar to writing a diary that involves writing down thoughts before they are forgotten. The memo-writing process can be done visually using diagrams instead of text to highlight links between the codes (Chen & Boore, 2009; Soklaridis, 2009). Memo writing during the constant comparison of data and coding provided the researcher an opportunity to identify emerging trends in the data categories that led to a developing theory. When no new data was noticed by the researcher during the constant interviewing and data categorizing steps, then theoretical saturation was achieved, which helped the researcher develop an emerging theory (Glaser & Strauss, 1967).

What distinguishes Grounded Theory from other qualitative research processes is its inductive process of constant questioning and comparing of data to generate a theory. Grounded Theory required the researcher to conduct continuous and simultaneous data collection and analysis while interviewing participants. Preliminary analysis of data collected at the beginning of the research determined the next data collection cycle.
Sampling continued until retrieved data no longer provided new information about the situation being researched (Kennedy & Lingard, 2006).

**Plan for Monitoring**

During the Grounded Theory steps, the researcher was cognizant of theoretical sensitivity that allowed a researcher to decide what concepts to look for during a study. Theoretical sensitivity required the researcher to be perceptive and to recognize subtle clues that contributed to an emerging theory from the collected data (Chen & Boore, 2009; Glaser & Strauss, 1967).

To help remain focused during the data collection and comparative process, the researcher kept in mind what was being studied in the data and what category the data affected. Collecting and analyzing data was continued until no new information was obtained from the interviews, which was identified as the saturation point (Chen & Boore, 2009; Soklaridis, 2009).

During the Grounded Theory steps, the researcher did not ask participants to write diaries nor to provide documents concerning their academic experiences. The researcher stopped interviewing participants at the saturation point to begin formulating a theory based on the interviews’ themes and categories. The saturation point during Grounded Theory meant that the researcher no longer observed new concepts in the gathered data nor while interviewing the study participants. Grounded Theory researchers are reminded that concepts, not people, are categorized (Chen & Boore, 2009). Six months was the duration of the Grounded Theory method, which included interviewing, transcribing, coding, categorizing, and data analysis.
Summary

Grounded Theory study participants not only tell “what is going on but tell the researcher how to view it correctly” (Kennedy & Lingard, 2006, p. 103). The researcher incorporated Strauss and Corbin’s 1990 sampling and memo writing steps while maintaining Glaser and Strauss’s 1967 Grounded Theory iterative process of asking questions, comparing, and identifying categories in order to present a theory (Chen & Boore, 2009).

The rationale for selecting the Grounded Theory method was to provide a process that identified the strategies and actions of STEM degree-seeking, adult, full-time, undergraduates. The impact of the study’s generated theory provides the higher education administration information about the strategies of adult, full-time, undergraduates as they pursue their STEM degrees.
Chapter 4: Results

Introduction

The purpose of the qualitative research study was to identify the strategies and actions used by adult full-time undergraduate students seeking science, technology, engineering, and mathematics (STEM) degrees. Strategies are defined as actions or events that occur as a result of a phenomenon (Creswell, 2007).

The phenomenon in the research study is adult full-time students pursuing STEM undergraduate degrees at a university.

The design of the research study was to not begin with a pre-defined theory. Instead, the research study’s theory was inductively generated from interviews with adult STEM full-time undergraduate students.

The design of the research process was to repeatedly interview study participants while constantly comparing new interview data in order to develop an emerging theory. The constant comparison of data was continued until saturation occurred, which meant no new information was identified during the interview process (Creswell, 2007).

The qualitative research method used in the study was Grounded Theory, which requires researchers to inductively generate a theory based on grounded data. Recorded interviews with the study participants provided the data that was coded and constantly compared during the research process. According to Glaser and Strauss (1967), an emerging theory entwined with supporting data cannot be completely opposed by more data or by another theory.
The tools used in the research study were the research study participant letter; research study participant flyer; informed consent form; interview questions; a transcription service; and Atlas.ti 7, a document management software. The recorded interviews were transcribed by a professional transcription service. The transcripts were uploaded by the researcher into Atlas.ti 7 to code the interview data. Atlas.ti 7 is a document management software used in qualitative research to code text, audio, visual, and graphic data (Atlas.ti 7, 2012; Creswell, 2007).

The researcher outlined the results of the study with the coding steps for future novice grounded theory researchers. The study results are outlined in sequence concerning the study participants, interview process, data collection, data coding, and data analysis steps, resulting in identifying an emergent grounded theory. The data coding method was not conducted in a linear process, which is reiterated in the research study. The researcher used interview transcript excerpts to illustrate concepts, patterns, and themes leading to the emergent theory about the strategies and actions of adult STEM undergraduates. Randomly selected letter and number codes were used with interview transcript line numbers, in order to provide anonymity for the study participants.

No names of persons or specific STEM degree programs at the participating university were mentioned in the research study. References to the subjects of the degree programs were generically described to provide anonymity to the study participants and degree programs at the participating university. The research study was conducted for six months from May to October 2012.
Participants

A purposeful sampling of registered 116 adult study participants was conducted based on the students’ full-time enrollment status in STEM programs at a Northeastern university and their ages being 25 years and older. The study participants were contacted by email with the researcher’s study participation letter through the STEM deans’ offices at the participating university. The names and email addresses of the study participants were sent directly to the deans’ offices by the participating university’s institutional research and policy studies department to use to distribute the study participation letter. Research study participation flyers were posted in common student meeting areas on the campus of the university.

Process

Nine adult undergraduate STEM students volunteered and contacted the researcher either after viewing the posted study participation flyers or after receiving an email of the researcher’s study participation letter. The researcher conducted nine one-on-one interviews with the study participants, which were recorded in enclosed meeting rooms on the university campus to provide anonymity and at the convenience of the study participants. Follow-up interview questions were conducted and recorded in person or by email during the research study, at the convenience of the study participants.

The participant recruitment focus of the research study was on the age of the adult undergraduate students and their full-time enrollment status in a STEM degree-related program. Based only on their age and STEM degree program enrollment, the study participants were a homogeneous adult student group.
The participant recruitment focus of the research study was not on gender, race, or ethnicity of the study participants. Demographic data about the study participants concerning their education, family, and employment status were collected during the recorded interviews.

**Data Collection**

The research study’s informed consent form was read and signed by each study participant and the researcher before the nine interviews were conducted. Each study participant received a copy of the signed informed consent form. All signed forms and transcripts will be kept in a locked office drawer for three years. The forms and transcripts will be destroyed after three years.

The researcher interviewed the nine study participants in a semi-structured format using the same interview questions and in the same sequence during the interviews to ensure consistency. The individual interviews occurred from 45 minutes to 1 hour based on the availability of the study participants. The interviews began with demographic questions to obtain personal and educational background information of the study participants before conversations focused on the study participants’ academic experiences. Follow-up academic experience questions were conducted after the initial interview questions were answered.

During the interview process, the researcher provided each of the study participants with a copy of the following interview questions to view during the interview sessions (Appendix D):
Demographic questions. The demographic questions included the following:

- What is your age?
- What is your home/family status?
- What is your enrollment status at the participating university?
- When do you plan to complete your degree program requirements and to obtain your college degree?
- Are you currently enrolled as a Fulbright Scholarship student?
- Are you currently enrolled as a McNair Scholars student?
- Are you currently enrolled as an international student?
- Before coming to the participating university, when were you last enrolled in a college course or college degree program at the participating university or at another college/university?
- Have you already earned a college degree from another academic institution before coming to the participating university?

Academic experience questions. The academic experience questions included the following:

1. Tell me what influenced your decision to pursue a college degree in the STEM field.
2. Are your experiences as an undergraduate student as you expected?
3. Please describe your expectations of college before becoming a student.
4. Have your expectations remained the same or have they changed?
5. Please describe your most difficult experience you have encountered as an undergraduate student. How have you overcome any difficulties you have experienced?

6. What is working well for you as you pursue your college degree?

7. What is not working out as well for you as you pursue your college degree?

8. Are you receiving support from family, friends and from your employer if you are working?

9. Are you receiving support from your professors and advisors?

10. Please tell me about a time when you may have considered dropping out of college, changing degrees, or changing careers?

11. Do you have any suggestions for your college or for the university’s administration concerning adult students enrolled in undergraduate STEM degree programs?

The nine interviews and the analysis of the interview transcripts were not conducted in a linear process. The researcher conducted interviews with new study participants and follow-up interviews with earlier study participants while analyzing interview transcript data. This iterative interview process was continued until no new information was identified. The follow-up questions were designed to provide the study participants an opportunity to reflect on their overall academic experiences. Seven of the nine study participants volunteered additional time to answer the following follow-up academic experience questions (Appendix D):
1. Please describe your education plan (strategy) and your processes (actions) used to help you complete your undergraduate degree program at the participating university.

2. What do you wish you would have done differently before enrolling in the undergraduate degree program at the participating university?

3. What strategies (plans) or processes (actions) would you recommend to adult students who are returning to college?

**Coding Process**

Open coding was the first step in identifying concepts revealed during interviews of study participants, with assigned codes (Bryant & Charmaz, 2007). Codes are used to connect relationships between recorded concepts and the study participants. Patterns and themes became readily identifiable as the researcher categorized codes and concepts as a theory began to emerge (2007).

The researcher began the open coding process using the line-by-line coding steps. The purpose of line-by-line coding was to break down each sentence in the interview transcripts by a word or groups of words in order to assign a code. This process is used to generate categories of concepts that reflect the content of the analyzed lines of the interview transcripts. Codes were sorted into categories to better manage the quantity of data generated during the line-by-line coding process (Figure 4.1).

The next step after open coding was axial coding, which was the process of linking the categories of concepts to identify their relationships to the strategies and actions of the study participants (Creswell, 2007). Categories of concepts evolve as one
category serves as the pivot on which further rearrangement of codes and categories are formed (Bryant & Charmaz, 2007).

The final step in the research study after axial coding was selective coding, which focused on the core phenomenon that formed the basis for the emerging theory (Creswell, 2007).

Result Analysis

![Diagram showing Category Codes Breakdown](image)

**Figure 4.1. Category Codes Breakdown.**

During the line-by-line coding process, the researcher separated the codes into two categories labeled demographic and academic experience. The academic experience category was broken down into three more categories to better identify patterns and themes in the interview transcripts. Sixty-one codes describing the personal background of the study participants were grouped in the category labeled demographic (Figure 4.1).

The four academic experience questions categories had 116 codes labeled initial responses and 263 codes labeled in vivo responses. In vivo codes use exact words from
unsolicited responses of study participants to code words and categories (Creswell, 2007). One hundred and thirteen codes were labeled for responses that began with I statements. Forty-three codes were generated for follow-up interview question responses.

**Demographic Category**

![Diagram](image)

*Figure 4.2. Atlas.ti 7 Demographic Code Category Examples.*

Six males and three females volunteered and responded to the research study flyer or to the research study participant letter (Figure 4.2). Eight of the students were hearing and one of the students was identified as hard of hearing. One of the study participants was a first generation college student and eight of the students were not. The STEM degree programs that the study participants were enrolled in ranged from biological sciences, health, medical related fields to mathematics, computer science, and engineering. All of the study participants were enrolled in STEM degree programs as full-time undergraduate students and were 25 years of age and older. The study participants’ anticipated graduation from their respective degree programs ranged from 2012 to 2015.
The family status of the study participants ranged from one married adult with no children to one married adult with seven children, one single adult with one child, and six single adults with no children. The study participants’ ages ranged from the mid twenties to mid fifties. Four of the nine study participants were over 40 years of age. The ages of the remaining five ranged between 25 years to 40 years of age.

The focus of the research study was on adult students returning to college on their own and who were not enrolled in Fulbright or McNair Scholars programs at the participating university. None of the nine study participants were enrolled as international students or enrolled in the Fulbright Scholars program or the McNair Scholars program. The McNair Scholars program, funded by the U.S. Department of Education, prepares undergraduate students who are first-generation or members of under-represented populations for doctoral studies and research (McNair Scholars, NA). The Fulbright U.S. Student program provides grants for one-year study/research projects or English Teaching Assistantships. The program is designed to facilitate cultural exchange in classrooms and homes in foreign countries (Fulbright, 2012).

The demographic category of codes revealed a trend of adult students not working full time while taking courses as full-time students. One participant commented, “no way can I work full-time” (P4:75). The researcher noted that two of the study participants were not employed, six of the study participants were employed part-time, and one student worked full time while enrolled in a STEM degree program.

Before enrolling at the participating university, three out of the nine study participants had not completed a college degree. Four out of the nine study participants had earned two-year undergraduate degrees, and the remaining two study participants had
earned a non-STEM undergraduate degree before enrolling at the participating university. Four of the nine study participants had enrolled in non-STEM, liberal arts, psychology, and sociology-related courses and programs before switching to STEM degree programs. Stopping and starting degree programs was noted in five out of the nine study participants’ prior education background before enrolling at the participating university.

Further analysis of the demographic code category revealed the prior careers of seven of the nine study participants had been in the business, manufacturing, human resources, and social sciences related fields. Two out of the nine study participants stated their careers began in the United States Air Force, Military, and Navy.

**Academic Experience Category**

All of the study participants shared a common goal, which was to obtain a STEM undergraduate degree. Noted commonalities shared by the study participants were their perseverance framed by time as a concern while balancing family and work with college.

Interview questions, inquiring about the difficulties study participants encountered, highlighted how adult students handled time, stress, learning experiences, and faculty relationships with perseverance. The following transcript excerpts identify the study participants with the letter P and transcript line numbers.

“Transitioning in...was probably the most difficult...realized that none of the experience that I’ve had before mattered,...much more fast paced” (PC: 57, 68,73).

“Considered dropping out of college, probably that first few months. … did not do well in the first test...I thought I knew how to prepare, … panicked …” (P3: 91).
“I was lost for weeks, I’m still lost” (PV:129).

“Just trying to get a sense of where I want to be in the field” (P2:33).

The course requirements of the STEM degree programs influenced the learning process of the study participants. Not all of the STEM degree programs required learning outside of classrooms, in laboratories, and through co-ops. Seven of the nine study participants, who had to seek co-ops, emphasized the importance of obtaining real work experience before graduating, mentoring, and the role of their advisors and faculty. Example comments were:

“I’d have to say the most difficult … was getting experience … doors were slamming … I contacted every professor … saying please I need a co-op … ” (PV:74).

“They don’t really help you find co-ops, they just point you in the right direction. I struggled to find a co-op … I had too much experience, would have been better if I was an 18 year old” (P2: 35).

“Internship … co-op whatever, nobody called me” (P4: 127).

“Should have a program designed for adults to get real work experience … everything is focused towards the younger kids, we don’t have time when we graduate to flounder” (PV:107).

The role and level of interactions between the study participants and their faculty advisors was a common topic reiterated by all of the study participants. Comments during the interviews revealed the need for adult students to be guided by their faculty and advisors to determine if they had taken the right career path, for example:
“I talk to my advisor to tell me exactly what classes I’m supposed to take” (P4:61).

“I knew that I needed to find an internship but I expected more support from my professors and advisors … there’s some sort of disconnect” (P2:65).

“Professors I e-mailed … never responded. ... you feel like you’re really bothering people … I need help” (PV:107).

One study participant recommended “a more structured way of pairing up a professor with a student like a mentor” (PV:107).

Interactions with advisors and faculty were not the only people-related activities occurring in classrooms. Study participants highlighted their interactions with other adult and younger students as illustrated in the following comments:

“Had conversations with the other few adult students … about handling… and everybody says the hardest is just finding the time to study, just to focus, cause studying and cooking dinner … doing laundry, stop to pick up my children, … multitasking” (PV: 88).

“Not really, no common area on campus to would meet other adult students…. frustrating working with, I don’t like to say kids but it’s hard not to see them sometimes as kids and … I don’t know if they see me as … authority or parent kind of role” (P3: 48, 51).

“The younger students it’s easy for them, they show up without books and sleep during class” (PD: 89).

“I study with both. … I help them out … they help me out. The younger students are more immature in handling the workload … the older students are more responsible” (P7:113).
Not all of the study participants expressed difficulty finding academic support outside classrooms as two study participants commented: “Advisors they’ve been incredibly supportive ... several of them have come and told me to consider …” (P3: 86); “He’s going to be my mentor. … really invaluable to me” (P5:115).

Time was a frequently repeated word by the study participants as they discussed balancing their family and work responsibilities with their degree program requirements. One out of the nine study participants worked full time while enrolled as a full-time student. Eight study participants worked limited hours or were not employed while enrolled in STEM degree programs.

One study participant commented that “Most challenging difficulty is finding time to balance a family and my studying … everybody says the hardest is just finding the time to study” (PV: 83, 89, 107).

Other comments from other study participants were:

“I would say probably more adults tend to be commuter students ... time spent in commuting almost an hour” (P3: 80,124,134).

“I never used the campus tutoring services because I’m a commuter student and my time here is scheduled … didn’t fall into what was easy for me” (P2: 43).

“Balancing time and life while going to school, for everybody is different” (P4:152-154).

“Started an extra degree … to kill two birds with one stone” (P1:95).

One comment by a study participant framed how the study participants strategized while pursuing their degrees: “We don’t have the time when we graduate to flounder...I want to know am I really going to like working in science, for the rest of my life … I
know that I’m not going to get the opportunity to come back to school again …” (PV: 107).

Memoing

Memoing is a form of writing used in developing ideas about an emerging theory (Cresswell, 2007). The theory provides the opportunity to immediately illustrate an idea (Glaser & Strauss, 1967). As illustrated in Figure 4.3, the researcher used Atlas.ti 7 software to create notes and reminders about codes used to identify patterns and commonalities among the study participants. The following are original text, not cited text, extracted from the Atlas.ti 7 memo transcripts:

**MEMO: ME - 06/25/2012 (0 Quotations) (Super, 2012-06-25 12:32:21)**
Is the student in the right program?

**MEMO: ME - 08/06/2012 (0 Quotations) (Super, 2012-08-06 17:36:22)**
Questions and expects relationships with faculty and advisors. Wants mentoring. Expects structure to guide students. Wants physical space for adult students.

**MEMO: ME - 08/12/2012 [1] (0 Quotations) (Super, 2012-08-12 21:03:09)**
Financial difficulties. Test taking difficulties. Worries about finding a job.

What does the concept of time mean to the adult student?
2 participants have enrolled in dual degrees to save time.

Did not express an urgency to connect with adult students. Was comfortable networking with younger classmates.

**MEMO: ME - 09/30/2012 (0 Quotations) (Super, 2012-09-30 13:08:03)**
Struggled with technology advancements on campus and fast college pace.

*Figure 4.3. Atlas.ti 7 Memoing Examples.*

The constant comparison of data, memoing, data breakdown, and rearrangement of new categories of codes was a continuous, non-linear process while the researcher continued to interview study participants and review interview transcripts.
Patterns and Themes

The qualitative research study illustrates a story about nine adult full-time undergraduates with the common goal of pursuing a STEM degree. The researcher noted a pattern of repeated words or phrases concerning time, student expectations, advisors, and professors in the nine interviews. Continuing the iterative data comparison process, the researcher went back to listen to all of the nine interviews, as well as review their respective transcripts, to get a sense of what concepts the study participants were emphasizing in their comments.

The “opportunity to advance” (P7: 23) and “this is where the jobs are” (PV: 45) were example comments made by two study participants when asked what influenced their decision to pursue a STEM college degree. All of the nine study participants referenced personal interests for choosing STEM college degrees because they “enjoy mathematics” (P3: 28), “always been interested in science” (P6: 21), “did well in math and science” (PD: 29), and “wish that I could have gone to school sooner” (P7: 07).

Example expressions from the study participants as they reflected on their adjustment to campus and classroom life were “Shocked at how much computers have taken place; workload is a lot more intense” (P6: 24) and “expected it to be challenging” (PV: 67).

“Being an older student sort of feel out of place a lot” (P3: 32).

“A lot of work and really hard … older than everyone … problems fitting in” (P2: 31), “It’s a lot harder … scared with keeping up” (P8: 29, 67).
The most difficult academic experiences of the nine study participants ranged from financial, courses, class activities, campus space, to not receiving administrative services support as illustrated in the following comments:

“Still find some of the chemistry, biology, science classes difficult” (P2:39).

“Adjustment with taking tests” (P3:54).

“Frustrating I can’t really finish in time in class” (PD:33).

“Tried to get tutoring assistance …. was ignored” (P6:23).

During the interviews, two of the nine study participants reiterated a need for campus space for adult students, while other study participants expressed angst in adjusting to campus life as illustrated in the following comments:

“I know that there’s a commuter lounge but I don’t even know where it is.” (P2:87).

“I get there early in the morning bring everything with me all day,… there’s no storage area or lounge area to keep that where… it would be incredibly helpful not to have to schlep every single thing with you… My understanding there’s a commuter lounge on campus but I was never able to figure out where it was.” (P3:104)

Being persistent was the answer of four of the nine study participants, when asked what was working well for them as students. Example comments were “persistence, knowing what you want not being afraid to ask for it” (PV:81), “very determined…not going to let things .. stop me” (P2:42), and “don’t give up”…(PD:51)

Three of the nine study participants reported satisfaction with their STEM degree programs with comments such as “very happy with my major” (PC:79) and “Staying
motivated” (P7:53). One of nine study participants further commented on receiving benefits that involved “learning ..growing..meeting new people  making .. new contacts”(P8:41).

When study participants were asked what was not working out as well for them, the responses evolved around financial difficulties, finding time, academic resource access to adjusting to classrooms and classroom technology:

“Resources are phenomenal when you live on the campus… I don’t…”(P6:41).

“Money” (P7:85).

“Finding time to balance a family and balance my studying” (PV:83).

“A bit of a shock, .. being in the classroom” (P3:56).

“Kind of frustrating …in a new field ... hadn’t worked with computers” (PD:55).

One of the nine study participants reported not receiving family, friend, or work support. The remaining eight study participants reported receiving a range of emotional and financial support from family and friends with the following example comments.

“yes parents, grandparents” (P2: 153)., “some family support” (PC:109)., and “support of family and friends” (P8:39).

When the researcher asked about receiving support from professors and advisors, four study participants reported little or no support as illustrated in the following comments, “Yeah somewhat, I haven’t reached out to them as much” (P8:51) and “expected more support and involvement from my professors and advisors which I haven’t seen much of …” (P2:31).

The remaining five out the nine study participants revealed a higher level of interactions and support from their professors and advisors as illustrated in the following comments:
“Can’t say enough about my professors and my advisors” (PV: 91).

“Advisors they’ve been incredibly supportive” (P3:86).

“Professors and advisors were terrific”(P6:45).

“Professor going to be my mentor”(PC:115).

“When I ask for help they’ll definitely offer it” (PD:59).

When asked about the time when they changed degrees or thought of dropping out of their degree programs, two of the nine study participants responded with, “As far as dropping out, not at all, I love it” (PV:95) and “No, it’s all been positive “(PC: 146).

Two other study participants reported struggling in their programs as illustrated in the following comments: “Not yet, something that I’m interested in … can’t find anybody who will talk to me about it”(P2 :75) and “going through it right now struggling with some classes” (PD:61). One study participant reported, “had to change my degree program due to grades” (P4: 113). The remaining four study participants did not volunteer specific answers to the question during their interviews.

When asked to provide suggestions for the participating university’s administration concerning adult STEM undergraduates, the advice provided focused on mentoring, adult friendly campus, programs, and classes. The researcher listed the comments by the study participants to highlight the key concepts and the tone of the conversations during the interviews:

“Mentoring .. they think you’re old enough you don’t need a mentor .. that’s not true ..help adult students get jobs” (P6:61).

“Have a program designed for the adults to.. get …real work experience .. I feel like everything is focused towards the younger kids” (PV:107).
“More emphasis on co-ops for adults who have already worked” (P2:77).

“More independent studies to reduce class time” (P3:24).

“Make it more adult friendly for those coming back to school. Some classes only offered at one time” (P8:79).

“Kind of hard for the adult because the campus is for young people” (PD:73).

“University does not have a lot of adult students so they’re not very good at handling it …people want to come back to school, they want to learn…adult students get more out of their education the second time around.” (P8:107).

Seven of the nine study participants volunteered to answer follow-up academic experience interview questions which were: (Appendix E)

- Please describe your education plan (strategy) and your processes (actions) used to help you complete your undergraduate degree program at the participating university.

- What do you wish you would have done differently before enrolling in the undergraduate degree program at the participating university?

- What strategies (plans) or processes (actions) would you recommend to adult students who are returning to college?

The design of the follow-up questions was to provide the study participants a chance to reflect on their academic journey and to tell their story about their academic experiences and learning strategies as shown in Figure 4.4.
“Plan on graduating” (PV: 140) and “plan is to get through as quickly as possible” (P2: 99) were comments from two study participants when asked what their strategies and actions were.

When asked what would they have done differently before enrolling in the undergraduate degree program, one study participant commented, “I wish I could have saved up more and met with a financial aid advisor” (P8: 92). Another study participant commented, “I wish that I had taken basic science courses at community colleges, so that I could save money and take other classes here” (PV: 144) and “wish that I had gone to college sooner” (P6: 87, P7: 124) were statements made by two other study participants.

“Optimize your time.. don’t waste time” (P6: 89) was the advice from one study participant when asked what strategies or actions would he/she recommend to adult students who are returning back to college.
Advice from the study participants focused on time management, networking, cost management, and perseverance as illustrated and sectioned in the following comments:

Cost Management:
“Take as many general science classes as possible at state schools, community colleges to save money” (PV:144).

Time Management:
“Stay focused … manage your time … don’t drop out” (P7: 93).
“Be proactive. . . ask specific questions of schedule days and times” (P8: 105).
“Speak with the academic advisor about timelines” (P9: 87).

Networking advice:
“Start meeting people, professors, ask more questions” (P7: 87).
“Make as many connections with students, professionals, use co-ops to get a real experience, volunteer” (P2: 199).
“Perseverance, develop reading skills… master math” (P6: 89).

When the study participants were asked for recommendations to college administrators, mentoring was an example suggestion:
“Pairing up a professor with a student like a mentor and making campuses adult friendly” (P1:109), “Be more sensitive, people want to come back to school, they want to learn… “adult students get more out of their education the second time around” (P8: 109).
Axial Coding

Axial coding is the next step after open line-by-line coding, which identifies a key phenomenon to investigate. It requires linking and rearranging categories created during the open coding steps (Creswell, 2007). The new categories evolve around noted events, happenings or an incidence of a phenomenon.

The researcher continued to identify patterns of concepts and themes in the five core categories coded: demographic, academic experience first responses, academic experience I responses, academic in vivo responses, and follow-up question responses. The academic experience response categories were central to the phenomenon of the research study which were the strategies and actions of the study participants.

Subsequently, three new concept categories were created from the demographic category and the three academic experience response categories, which highlighted the study participants’ expectations of themselves, campus life, and their academic experience. The three concept categories focused on the study participants’ strategies and actions involving time as a variable or role, student academic expectations, and the role or influence of advisors and professors. As shown in Figure 4.5, the researcher noted 56 concept codes relating to time as a concern or role, 16 concept codes relating to the role or influence of advisors and faculty, and 15 concept codes relating to the role or expectations concerning degree programs, time, and guidance.
Continuing the iterative data comparison process, the three concept categories were further broken down into eight groups: (a) 24 stress handling concept codes, (b) 24 learning experiences concept codes, (c) 22 time concept codes, (d) 21 self-efficacy concept codes, (e) 21 expectation concept codes, (f) 17 perseverance concept codes, (g) 16 support concept codes, and (h) 10 self-identity concept codes.

The fifth academic experience category, labeled follow-up interview question with 43 codes, was rearranged into four new concepts labeled recommendations with 17 codes, strategy with 13 codes, finance with 6 codes, and time with 3 codes as shown in Figure 4.6.

![Figure 4.5. Concept Codes Rearrangement.](image-url)

**Figure 4.5.** Concept Codes Rearrangement.

**Figure 4.6.** Follow-up Interview Concepts Rearrangement.
Links were identified between the study participants’ self-efficacy, self-identity, self-perception, and how they handled stress and their learning environments as highlighted in the following comments:

“Adult students try to blend in and not disclose their age” (PC:133).

“I'm more mature” (PV:63, P8:109).

“I am a commuter with no place to store and rest while on campus” (P3:111; P2:43).

“Students know more but I'm not afraid” (PV:63).

“Not going to let things stop me” (P2:41).

“I know I'm going to pursue what I have a passion for” (PV:45).

“I know how much time I spend on things …know what my limits are” (P3:62).

The researcher linked the perseverance of the study participants to proactive strategies and actions described during stressful events as reflected in the following comments:

“I hunted down faculty”(PV:75).

“Will figure out a way”(P2:41).

“I ask questions…I get involved” (PV:69, P2:65; PD:35).

“Trying to get a sense of where I want to be …by volunteering” (P2:33).

“Seeked co-ops on my own”(P2:35), (P4:125), (P8:71).

“Talked to other students” (P3:114),(P2:99), (P7:39).

“Just going to keep pushing…just keep asking, keep going after what I want, keep looking” (PV:79).

“Picked up an extra degree” (PV:5; PC:18; P7:83) was commented by
three of the nine study participants who enrolled in double majors, illustrating proactive strategies in pursuing STEM degrees.

Two of the nine study participants described their proactive strategies and actions on campus while acclimating to academic life, “Tried to orient self to the university campus” (P2:89; P3:62); “called to find campus commuter lounge… did not get an answer” (P3:110).

One participant recognized that “not taking a lot of classes worked...” (P3:62).

Five of the nine study participants reported difficulties adjusting during their first months of enrollment in their programs:

“Refocused test taking strategies” (P3:54).

“Had to adapt to a fast paced program” (PC:57).

“First quarter…got my GPA up” (PC:73; P4:39).

“Having difficulty balancing time…family.”(PV:83).

“Transitioning from a state university” (PC:57).

“Advisors unable to help” (P2:65).

“Feel like you're bothering somebody when asking for help” (PV:109).

“Doors were slamming” (PV:83).

“Is the institution going to help me get a job after I graduate?”(P4:46)

The concept of time as a goal was frequently referenced during discussions around the strategies and actions of the nine study participants. “Plan is to get through as quickly as possible”( P2:197) commented one study participant while describing strategic actions.
The mention of time as a variable centered around the study participants’ academic experience, family, and campus life.

“A commuter with tight schedule no time to use campus tutoring service” (P3:102).
“Difficulty balancing time…finding time to balance a family” (PV:83).
“Self-directed courses always work allows more time”(P3:44).
"Working towards two degrees double major” (P1:05; PC:18).
“This time I realize the opportunities that you have to make it whatever you want your experience to be,…expected that there’s always the facilities and the resources and I would just have to seek them out”(P1:69).

Saturation

During the iterative comparison process of codes and concepts, the researcher continued to conduct new interviews and follow-up interviews in order to identify new information that had not been heard before in previous interviews. No new information, words, or concepts were heard or identified during the follow-up interviews with the study participants and after the ninth, last study participant interview.

Selective Coding

The concept categories and follow-up interview question categories were the key sources for linking the study participants’ self-identity, self-efficacy, and perseverance with their strategies during stressful events and their learning experiences.

During selective coding, one category of code evolves as the pivot on which further coding and categories are formed (Bryant & Charmaz, 2007). The pivotal categories in the research study were the themes of time, student expectations, and the
role of advisors and faculty, which highlighted patterns creating an emergent theory. The
emergent theory is based on the story of the strategies and actions of nine adult fulltime
undergraduates pursuing a STEM undergraduate degree.

**Emergent Theory**

A theory is defined as developing concepts and highlighting the reactions between
them (Creswell, 2007). The three common factors shared by the study participants were
their academic expectations, the role of time, and the role and influence of advisors and
professors on the success of adult students. The noted academic barriers encountered by
the study participants were their adjustment to STEM degree programs, limited or no
access to co-ops, and academic support. The emerging theory from this research study
was that time is the frame under which adult students execute their strategies and actions
as they pursue their STEM degrees.

The researcher iteratively compared the responses of the initial academic
experiences interview questions to the follow-up interview questions. The
recommendations provided by the study participants in response to the follow-up
questions referenced time as the framework around which study participants conducted
their actions.

Advice from the study participants for future adult students framed time as a
factor to use as a strategy with comments such as, “You have to really optimize your
time…don’t waste time” (P6: 91) and “stay focus…and get through as quickly as
possible” (P7: 121).

Under the framework of time and self-efficacy, adult students proactively sought
a degree with guidance from faculty and advisors: “Plan on graduating” (PV:140), “you
have to be proactive and take your own steps” (P8: 87). “The professors. . .are fantastic…They guided me throughout school” (PV:150), “They don’t mentor. . .my course curriculum was set up by an academic advisor who was phenomenal (P6:61).

“Mentoring…they think you’re old enough you don’t need a mentor…that’s not true” (P6: 61) was a statement from a study participant reiterating the significance of the role of academic advisors and professors as mentors with adult students. Six out of the nine study participants referenced the word mentor or described a mentoring relationship with an advisor or professor during their interviews.

A study participant commented, “I know of a lot of adult students who have dropped out of the program because no one is helping them to stay…people want to come back to school, they want to learn and I think adult students get more out of their education the second time around” (P8:107). Another study participant commented while describing personal difficulties, “As far as dropping out, not at all, I love it…if I won the lottery I would go to school for the rest of my life” (PV:95).

The emerging theory developed from the grounded data is that time frames the strategies and actions of adult students as they seek the mentoring guidance of their advisors and professors. The adult full-time undergraduate students’ self-efficacy, perseverance, and their learning experiences in classrooms and co-ops influence their success towards achieving STEM degrees.
Chapter 5: Summary

Introduction

The purpose of this study was to identify the strategies and actions of adult, full-time undergraduate students, 25 years of age and older pursuing science, technology, engineering, and mathematics (STEM) degrees. Identifying behaviors of adult STEM undergraduates provides an insight into their academic experiences and needs while in classrooms on a university campus.

The problem statement of this study highlights the focus of higher education research on the enrollment and attrition of traditional undergraduate students under the age of 25 years, living on college campuses (Stratton, O’Toole, & Wetzel, 2007). The rationale for studying adult undergraduates is based on limited research on the academic experiences of adult STEM undergraduates in four-year colleges (Hoyt, Howell, Touchet, Young & Wygant, 2010; Kasworm, 2010; Samuels, Beach & Palmer, 2012).

The strategies and actions of the study participants support and provide additional perspectives to the Model of College Outcomes for Adults (Donaldson & Graham, 1999). The intent of the model was to highlight college campus and external community factors that influence the academic experiences of adult college students. The model highlighted limited studies on adult undergraduates and reviews of 20 years of literature on undergraduate students enrolled in non-STEM programs. The Model of College Outcomes for Adults outlines factors that affect adult students in six categories: (a) personal history; (b) self-efficacy and values; (c) intellectual processing;
(d) classroom experience; (e) work, family, and community influence; and (f) college outcomes (Donaldson & Graham, 1999).

This chapter summarizes the grounded theory research method used to iteratively cull key themes and concepts from interviews with adult STEM undergraduates. The key themes are compared with reviewed literature in this study and with the findings of Donaldson and Graham’s *Model of College Outcomes for Adults* (1999). The study’s key themes were time and the role and influence of faculty, advisors, and co-op experiences on adult undergraduates as they pursued their STEM degrees.

The shortage of STEM employees in the United States has been noticed by universities, colleges, and the U.S. government (Chen & Boore, 2009; Kuh, Kinzie, Schuh, & Whitt, 2010; Perna et al., 2009). In recognition of this shortage, universities are collaborating with community colleges to increase the number of students with undergraduate degrees (Fain, 2012). The enrollment increase of adult undergraduates at four-year colleges attracted the attention of the Western Association of Schools and Colleges (WASC) accrediting body. The WASC initiated a plan to gather and analyze data on the enrollment and graduation of adult undergraduates in 2013 (Fain, 2012). The outcome of the research study is grounded theory data that illustrates the needs of adult students in four-year colleges to higher education administration. The conclusion of the chapter highlights the limitations of the study and suggestions for higher education concerning the academic experiences of adult STEM undergraduates.
Research Process Summary

This study utilized the Grounded Theory Method to provide answers to the study’s research question: *What strategies and actions do STEM degree seeking adult, full-time undergraduate students use towards their academic success?*

The study’s research question was initiated based on the researcher’s interest in learning about the needs of adult undergraduates enrolled in STEM degree programs and the realization that so little is known about the unique needs of this population. Consequently, a grounded theory approach was chosen to develop an early initial theory to help describe the unique academic experiences of adult STEM students and their thoughts on supporting academic success. The emergent theory outlined their needs based on their unique academic experiences. The grounded theory research method was selected to provide readers with a description and a perspective of human behavior, which predicts or explains behavior based on iteratively compared data (Glaser & Strauss, 1967).

The study participants were purposefully selected based on their full-time enrollment status in STEM undergraduate programs and their ages being 25 years and older. Recruitment for the research study was not limited to gender, race, ethnicity, education, family, nor employment status of the study participants. Based on age and STEM degree program enrollment, the study participants were a homogeneous adult student group. All of the participants identified themselves as not being foreign students.

Based on gender, education, family, and employment status, the study participants were a diverse group. Diverse adult college student populations cannot easily be placed in one-size-fits-all categories, which has prompted recommendations that universities
create databases to profile adult students on their campuses (Samuels, Beach, & Palmer, 2012). Profiling adult undergraduates would benefit higher education administrators who may not understand the needs of adult students. Most universities are not required nor do they adequately track the enrollment of adult students (Fain, 2012).

Findings Summary

The intent of the Model of College Outcomes for Adults was to highlight factors that influence the academic experiences of adult college students across subject disciplines (Donaldson & Graham, 1999). The research study and recent literature on non-STEM adult undergraduates support the findings of the Model of College Outcomes for Adults (Samuels, Beach & Palmer, 2012).

The researcher’s study findings focused on a specific adult undergraduate student population by STEM-related subjects. The goal of the nine study participants in the research study was to obtain a STEM undergraduate degree. The strategies and actions of the study participants began at the time of their enrollment in STEM degree programs ranging from biological and health sciences to computer science, mathematics, and engineering.

The emerging theory developed from the study findings, suggests time framed the strategies and actions of the study participants as they sought guidance from faculty advisors. The self-efficacy and perseverance of the study participants influenced their learning actions and outcomes in classrooms, co-ops, and degree programs.

The participants’ self-efficacy and perseverance influenced their personal histories and goals to obtain a STEM degree, which are supported and provide additional perspectives to the Model of College Outcomes for Adults (Donaldson & Graham, 1999).
“I tried to do as much on my own, but that didn’t work for me so now … I ask for help from the professors, teaching assistants, from everywhere, other students in classrooms and in laboratories (PD:35)” is an example comment illustrating strategies and actions of study participants measuring their academic performance with other students and faculty. Classrooms serve as an initiation for adult students into college life while balancing their personal obligations (Donaldson & Graham, 1999).

Time was a redundant theme reiterated by the study participants while discussing balancing family, work, and college responsibilities. The literature reviewed in this study referenced time constraints as a common factor for adult students (Kirby, Biever, Martinez & Gomez, 2004; Njumbwa, 2008; Thomas, 2001). The Model of College Outcomes for Adults noted that job responsibilities had the highest priority in the lives of adult students, which meant limiting their time with family while balancing college (Donaldson & Graham, 1999). The researcher’s study findings reveal an additional perspective that eight of the nine STEM study participants purposely did not work full time in anticipation of their college workload. One study participant commented, “no way can I work full-time” (P4:75). Not having enough time limited the study participants’ access to college campus services as commented by one participant: “I never used the campus tutoring services because I’m a commuter student and my time here is scheduled … didn’t fall into what was easy for me” (P2: 43). Two of the study participants were not employed, six were employed part time, and one worked full time while enrolled in a STEM degree program. The study participants purposely did not work full time, knowing that time was essential for commuting, studying, fulfilling degree requirements, earning extra degrees, and attending to personal obligations. Three
of the nine study participants enrolled in double majors to speed up their pursuit of STEM careers.

The role and level of interactions between the study participants and their advisors and faculty was a redundant theme reiterated by all of the study participants. Three of the nine study participants voluntarily expressed satisfaction in their relationships with their advisors and faculty. Six study participants expressed different levels of interaction needs and expectations of their advisors and faculty.

Seeking co-op experiences, as well as STEM career and course advice were the core examples of guidance sought by the study participants from their faculty and advisors. Co-ops were important to the academic success of the adult undergraduates. “I’m using the co-op concept to get a real world perspective of jobs, qualifications, salary, etc.” (PZ:99), “I definitely think it’s beneficial… every college should make their students do co-ops”(P8: 71), and “don’t have the time when we graduate to flounder around so …have to know … am I really going to like working in a lab… for the rest of my life you know. I know that I’m not going to get the opportunity to come back to school” (PV:107). The significance of these example statements illustrates the importance of co-ops for adult undergraduates in addition to their classroom experiences.

Work-Study experiences in the community provide and reinforce meaning to what the adult students have learned in classrooms (Donaldson & Graham, 1999). For the purpose of this research study, work-study experiences includes co-op experiences referenced by the study participants. The requirements of the study participants’ STEM degree programs influenced their learning process. Not all of the STEM degree programs in the study required learning outside of classrooms and laboratories through co-ops.
Seven of the nine study participants, who had to seek co-ops, emphasized the importance of gaining new and meaningful work experiences before graduating.

The study participants connected prior knowledge and life experiences with new information and learning experiences from their classrooms and co-ops. Despite having a wealth of prior experiences and knowledge, the study participants continually sought reassurance from their advisors, faculty, and co-ops that they had selected the right STEM degree program and the right career for their future lives. As two study participants commented, which was similarly echoed by other study participants, “It would be better if I was an 18 year old…I have too much experience, which is a problem…I struggled to find a co-op” (PZ:35) and “Mentoring ... they think you’re old enough you don’t need a mentor ... that’s not true ...help adult students get jobs” (P6:61).

The study’s findings highlight the role and influence of the advisor and faculty in a professional mentoring capacity as a recurring theme. Gender differences in the interactions between the study participants and their advisors and faculty were not observed in the study’s findings. All of the study participants described their interactions with their advisors and faculty as a professional relationship and not in a social relationship context. This is in contrast to recent literature that noted gender differences between female adult undergraduates and male adult undergraduates in their interactions with faculty. The female adult students demonstrated a need to develop personal relationships with their faculty advisors while discussing academic matters (Samuels, Beach & Palmer, 2012). The focus of the research study and the Model of College Outcomes for Adults were not on gender differences in the learning experiences of adult students (Donaldson and Graham’s, 1999).
The personal background of the study participants supported the personal history, self-efficacy, value systems, and college outcomes outlined in *Model of College Outcomes for Adults* (Donaldson & Graham, 1999). The study participants revealed their strategies of exploring and developing career options through prior employment and prior academic experiences before pursuing STEM undergraduate degrees. Four of the nine study participants had enrolled in liberal arts, business, psychology, and sociology-related courses and programs before switching to STEM degree programs. Stopping and starting in different subject degree programs was noted in five of the nine study participants’ prior education background before enrolling at the participating university. The prior careers of the nine study participants began in business, social sciences, United States Air Force, Navy and other military branches. Before enrolling in the participating university, three out of the nine study participants had not completed a college degree. Four out of the nine study participants had earned a two-year undergraduate degree. Two study participants had earned non-STEM undergraduate degrees before enrolling at the participating university.

New adult students view the college environment as a foreign country, where new behaviors and academic writing have to be learned (Askham, 2008). The researcher’s study findings supported the *Model of College Outcomes for Adults*’ report of adult students returning to college deficient in effective learning habits (Donaldson & Graham, 1999). Five of the nine study participants revealed difficulties acclimating to taking tests, fast paced courses, and subjects like mathematics, chemistry, biology, anatomy, and computer science during their first months after enrollment. Two of the nine study participants revealed struggling initially with classroom technologies. The students
overcame their struggles by persevering on their own or by seeking help from other students, faculty, and academic services. Reviewed literature in the study concerning classroom technology did not indicate classroom technology as a factor preventing the academic success of adult students (Gregoryk & Eighmy, 2009; Ke, 2010).

However, in this study the study participants’ concern for fitting into classrooms and campus was identified. They overcame these struggles with their self-efficacy and values, which influenced their actions as summarized by study participants, “Adult students try to blend in and not disclose their age” (PC:133), “Tried to orient self to the university campus” (P2:89, P3:62), and “very determined…not going to let things … stop me” (P2:42).

The importance of family and friends’ support for adult students is a factor emphasized in the Model of College Outcomes for Adults (Donaldson & Graham, 1999). An additional perspective noted in the research study’s findings was the study participants referenced more concern of support from their faculty and advisors than from their family and friends. The study participants revealed not purposefully seeking friendships with other students, but being more focused on their STEM courses and obtaining support from their advisors and faculty. Due to family and work obligations, the study participants did not have time for college social activities. Developing formal academic relationships are more important to adult students than informal academic relationships (Donaldson & Graham, 1999).

The diverse demographic background of the nine study participants included three female students and six male students with ages ranging from mid twenties to mid fifties. Eight of the students were hearing and one of the students was identified as hard of
hearing. One of the study participants was a first-generation college student and eight of the students were not. The marital and family status of the study participants ranged from two married students with children and one married student with no children to one single student with one child to support and five singles with no children to support.

**Conclusion**

Higher education leadership have begun to recognize the needs of adult students but not sufficiently or systematically. The demographic characteristics of adult students and their academic needs are diverse and multifaceted (Gordon & Habley, 2000). Applying a cookie-cutter approach with one-size-fits-all programs for adult students is not effective in addressing the needs of diverse adult students. Suggestions to higher education have been to create partnerships across four-year and two-year institutions, while analyzing enrollment, attrition, financial, and demographic characteristics of adult students (Fain, 2012; Gordon & Habley, 2000).

Partnerships between higher education and industries would be enhanced by the use of adult undergraduates enrolled in co-ops as potential sources of human capital for employment. Systematic training and development of human capital is not conducted in industries. Successful companies incorporate the management of human capital in their strategic plans (Hall, 2008). The study’s findings highlight the importance of co-op experiences, faculty, and advisors as they help adult students commit to future STEM-related careers. The implication for industry leaders is to utilize co-ops as means of recognizing and identifying adult undergraduates as future human capital. The benefit for companies to hire adult undergraduates is they provide professional maturity and
require less technical and people skills training, which is needed for younger, traditional students.

According to the National Academic Advising Association (NACADA), there has been renewed attention to the role of faculty and advisors with students (Gordon & Habley, 2000). One study participant recommended “a more structured way of pairing up a professor with a student like a mentor” (PV:107), which is an example of adult students preferring formal relationships to informal relationships. Debates have occurred in defining advising as a teaching role or as a service role, and most institutions view advising as a teaching role (Gordon & Habley, 2000).

Participants in this research study identified difficulties acclimating to taking tests, fast-paced courses, and subjects like mathematics, chemistry, biology, and classroom technologies. The NACADA views returning adult students with multifaceted needs and recommends orientation sessions involving time management and test-taking strategies as means to better prepare adult students (Gordon & Habley, 2000).

Limitations of Study

The focus of the candidate’s dissertation was on adult undergraduate STEM students inclusive of gender, race, and ethnicity for the purpose of comparing college learning experiences. The candidate reviewed factors that influenced an adult student’s acclimation to college life and STEM programs. Managing time and managing stress while balancing work, school, and family life were common themes highlighted by adult undergraduate students.

The rationale for selecting the Grounded Theory Method was to provide a process that identified the strategies and actions of STEM degree-seeking adult, full-time,
undergraduates. Using grounded theory allows research study participants to illustrate what is occurring as well as to inform the researcher as to how to correctly understand what is occurring (Glaser & Strauss, 1967).

The researcher’s emerging theory is based on the recurring themes that time framed the strategies and actions of the study participants as they sought guidance from their advisors and professors. The self-efficacy and perseverance of the study participants influenced their learning experiences and outcomes in classrooms, co-ops, and degree programs. The impact of the study’s generated theory will provide higher education and industries with a perspective on the strategies and actions of adult, full-time, undergraduates pursuing STEM degrees.

The researcher’s study was conducted with a low study response of nine adult undergraduate students from multiple STEM colleges. The study participants with prior undergraduate degrees were not excluded from the research due to the low response to the study. The study participants were recruited from across multiple STEM colleges at the participating university with programs involving biology, medicine, health, computer science, mathematics, and engineering. Not all of the STEM degree programs required adult students to learn outside classrooms through co-op experiences.

The study did not research the students’ orientation and college credit transfer experiences, which were provided voluntarily by some of the study participants. The NACADA recommends that four-year institutions recognize prior working experiences of adult students and provide college credits for their acquired work skills and knowledge (Gordon & Habley, 2000).
Future Research Challenges

Four-year colleges with STEM programs, not set up for adult undergraduates, will be challenged in identifying the needs of adult students. Physical access challenges and poor communication of tutoring, career and counseling services account for low campus usage by adult students. Adult students experience limited access to financial aid and advising support services that are influenced by non-existent strategic planning at higher institutions (Kasworm, Rose, Ross-Gordon, & American Association for Adult and Continuing Education, 2010).

Identifying the type and level of advising by faculty and advisors for diverse adult undergraduate populations will be a challenge for colleges and universities. Further research on gender differences between female adult undergraduates and male adult undergraduates with their advisors and faculty needs to be reviewed in STEM degree programs.

Orientation programs for returning adult undergraduate students needs to be developed depending on the STEM programs’ requirements at individual institutions. The NACADA suggests institutions develop and implement flexible programs that incorporate innovative technologies and services that support returning adult students (Gordon & Habley, 2000). The researcher recommends creating a virtual, online portal to college campus services, STEM degree programs, and adult orientation programs. Providing online access to campus resources and services will assist adult students with physical access and time constraints. The researcher recommends the adult orientation programs or events to include pre-assessment tests of adult students’ biology, chemistry, mathematics, and computer skill levels before enrolling in specific STEM degree
programs. The results of the pre-assessment tests would then be used as a guideline for faculty and advisors working with the adult STEM students.

The Model of College Outcomes for Adults was designed to encourage further investigation of returning adult undergraduates but only referenced students enrolled in non-STEM degree programs (Donaldson & Graham, 1999). Career instability and change is the new norm that requires continuous learning and career changes for adults. Career counselors have to be prepared to address the needs of adults as they create or pursue careers in response to industry mandates. Adults are in charge of their careers and success, while balancing family, work, and returning to four-year colleges for future career opportunities (Smith & Densch-DeFrates, 2009).

**Summary**

The qualitative research study illustrates a story of the academic experiences of nine adult undergraduates enrolled in STEM-related degree programs. The intent of the study was to highlight challenges for four-year colleges not prepared for the influx of adult undergraduates with grounded theory supported data.

“I do know of an adult student who had to drop out” (P8:81) is an example of grounded theory supported data highlighting adult dropout challenges for four-year colleges. The Western Association of Schools and Colleges accrediting body has begun to research adult undergraduate enrollment and attrition issues (Fain, 2012).

The message from the research study is the emergent theory based on grounded theory supported data. The emergent theory suggests time frames the strategies and actions of adult students as they seek the mentoring guidance of their advisors and professors.
The adult students’ self-efficacy, perseverance, and learning experiences in classrooms and co-ops influence their success towards achieving STEM degrees. The self-efficacy and perseverance of the adult undergraduates is based on their personal history and goal, which is to successfully obtain a STEM degree.

To reduce the shortage of STEM employees in the United States, adult STEM undergraduates should be viewed by industry as valuable resources. The academic experiences and actions of adult STEM undergraduates reinforce the need for four-year colleges to ensure the academic success of future STEM employees.
References


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RECRUITING ADULT STUDENTS FOR A STUDY

A study is being conducted to research the experiences of adult full-time undergraduates enrolled in science, technology, engineering, mathematics (STEM) degree programs.

Subject Profile:
- Adults 25 years of age and older
- Full-time, Undergraduates
- Have not completed a college degree or Returning back to college after 15 years
- Enrolled in science, technology, engineering or mathematics (STEM) degree programs

Interview Process:
- 1 or 2 interviews ranging 45 to 60 minutes
- A consent form signed first before the interview
- Interviews held in private campus locations at students’ convenience

Subject Exclusions:
- Two year, community college degree transfers
- Enrolled in Fulbright, McNair Scholars, & other supporting scholarship programs.
Appendix B

Study Participation Letter

Hello,

You have been invited to participate as a volunteer in a research study.

The purpose of the research study is to learn about the experiences of adult, undergraduate, full-time students completing their degrees in the science, technology, engineering, mathematics (STEM) field. The intent of the study is to interview adult STEM full-time undergraduates, 25 years of age and older who have returned to college due to career changes, layoffs, or for career advancement reasons.

All interviews, audio transcripts and written documentation will be kept confidential. All study participants will be required to sign an informed consent form before being interviewed. Study participants will be compensated with a café token for a free regular size beverage. Interviews will be held on campus for 45 minutes in meeting rooms with a door to close for privacy. Follow-up interviews with a study participant may be conducted only if needed for further information.

The researcher is a doctoral candidate enrolled in Executive Leadership (Ed.D.) program at Ralph C. Wilson, Jr. School of Education, St. John Fisher College, Rochester, NY. The research study has been approved by the participating university’s Institutional Review Board and the St. John Fisher College Institutional Review Board. Participation in the study will not impact any services offered now or in the future. No identifying information will be shared during any dissemination of any data to the participating university or other venues.
If you are interested in participating in the study or have further questions, please contact the researcher Adwoa (Adjua) Boateng at [redacted email] or [redacted phone number].

Please notify the researcher if you require interpreter services.

I look forward to meeting with you.

Sincerely,
Adwoa Boateng [redacted email] or [redacted phone number].
Appendix C

Informed Consent Form

Title: What strategies and processes do undergraduate, full-time adult students use towards achieving their college degree while enrolled in STEM undergraduate programs?

Researcher: Adwoa Boateng

Faculty Supervisor: Dr. Dianne Cooney Miner

Introduction
You have been asked to participate in a dissertation study about the experiences of undergraduate, full-time, adult students completing their college degrees in the science, technology, engineering and mathematics (STEM) field. Your participation is voluntary. Participation in the study will not impact any services offered now or in the future.

Purpose
The purpose of the research study is to learn about the strategies and processes adult full-time undergraduates use towards achieving their STEM college degrees. The intent of the study is to interview adult undergraduates who have returned to college due to career changes, layoffs, or for career advancement reasons.

The dissertation study has been approved by the St. John Fisher College Institutional Review Board.

The researcher is a doctoral candidate enrolled in Executive Leadership (Ed.D.) program at Ralph C. Wilson, Jr. School of Education at St. John Fisher College. Results of the study will be analyzed and documented for the partial fulfillment of the requirements for the Education Doctorate in Executive Leadership (Ed.D.) at Ralph C.
Wilson, Jr. School of Education St. John Fisher College. No identifying information will be shared during any dissemination of any data to the participating university or other venues.

**Study Procedure**

The study will involve interviews between the researcher and one study participant at a time, that will last 45 to 60 minutes. Interview questions will be asked in a conversation format to allow participants to speak about their experiences. The interview questions (Appendix D) will include demographic questions.

A follow-up interview may be conducted with the individual study participant for 45 to 60 minutes, only if needed for further information.

**Compensation**

At the beginning of each interview, all study participants will be compensated with a token for a free regular size beverage from the participating university café.

**Logistics**

The researcher and the study participant will meet in a quiet meeting room with doors to close for privacy. The selected time and day will be mutually agreed upon by the researcher and the study participant.

Interviews will not be conducted during a student’s scheduled classroom and laboratory sessions.

**Confidentiality**

The audio tape recordings will be transcribed by a professional transcription service. All audio tape recordings and written transcripts will be identified by an anonymous code with no individual names or other identifying information.
Study participants may ask for and receive a copy of their individual interview transcript and be informed of the results of the dissertation study.

All interview audio recordings, written transcripts, and signed informed consent form will be kept in the researcher’s office under lock and key for three years and then destroyed.

**Withdrawal from Study**

At the beginning of each interview, all study participants will be told they can stop participating in the interview process at any time and for any reason.

**Risks**

If at any time during an interview, the study participant reveals reasonable, identifying characteristics of his or herself and of other individuals, the researcher will remove all details of characteristics and identifying information. To protect the anonymity of the student participant, all data will be provided in group format.

If at any time during an interview, the study participant shares information or displays signs of being under stress, due to personal or academic reasons, the researcher will stop the interview. The researcher will proceed to use her knowledge of appropriate services at the participating university and provide appropriate referrals to the student.

**Study Benefits**

The experiences shared by the study participants will provide an insight on how higher education can support adult undergraduates enrolled in STEM degree programs at four-year colleges.

I have read the above, received a copy of this form, and agree to participate in the above-named study.
Study Participant:

Print name ___________________________________ Signature _____________________________

Date/Time _________________________________________

Researcher:

Print name ___________________________________

Signature _______________________________________

Date/Time _______________________________________

If you have any further questions regarding this study, please contact the researcher

Adwoa Boateng, at  ,  .
Appendix D

Interview Questions

Thank you for taking the time to meet with me. This interview is being recorded and will be kept confidential. A copy of this interview will be made available to you upon your request.

I am interested in learning about your experiences as a full-time adult, 25 years of age and older, pursuing a college degree in the science, technology, engineering and mathematics (STEM) field.

Please answer the following demographic questions:

Gender:
— Male
— Female
— Other
— Choose not to report

Age:
— Less than twenty-five years
— Twenty-five years or older

Home/Family status while enrolled:
— Married with family/children to support
— Married with no family/children to support
— Single with family/children to support
— Single with no family/children to support

Enrollment status:
— Part Time (enrolled in between 1 and 11 credits per quarter)
— Full Time (enrolled in more than 11 credits per quarter)

When do you plan to complete your degree program requirements and to obtain your college degree?

Are you currently enrolled as a Fulbright Scholarship student?
— Yes
— No

Are you currently enrolled as a McNair Scholars student?
— Yes
— No
Are you currently enrolled as an international student?

__________ Yes

__________ No

Before coming to RIT, when were you last enrolled in a college course or college degree program at RIT or at another college/university?

__________ Less than one year ago

__________ At least one year but less than five years ago

__________ Five years or more ago

__________ Never enrolled in a college course or college degree program

Have you already earned a college degree from another academic institution before coming to RIT?

__________ Yes

__________ No

Academic Experience Questions:

1. Tell me what influenced your decision to pursue a college degree in the STEM field.

2. Are your experiences as an undergraduate student as you expected?

3. Please describe your expectations of college before becoming a student?

4. Have your expectations remained the same or have they changed? If so in what way have they remained the same or changed?

5. Please describe your most difficult experience you have encountered as an undergraduate student?

6. How have you overcome any difficulties you have experienced?

7. What is working well for you as you pursue your college degree?

8. What is not working out as well for you as you pursue your college degree?

9. Are you receiving support from family, friends and from your employer if you are working? Please describe the type of support you are getting.

10. Are you receiving support from your professors and advisors? Please describe the type of support you are receiving.

11. Please tell me about a time when you may have considered dropping out of college, changing degrees, or changing careers?

12. Do you have any suggestions for your college or for the university’s administration concerning adult students enrolled in undergraduate STEM degree programs?
Follow-up Interview Questions:

**Question 1:** Please describe your education plan (strategy) and your processes (actions) used to help you complete your undergraduate degree program at [Redacted].
*Your Response:*

**Question 2:** What do you wish you would have done differently before enrolling in the undergraduate degree program at [Redacted]?
*Your Response:*

**Question 3:** What strategies (plans) or processes (actions) would you recommend to adult students who are returning to college?
*Your Response:*