2012

Math and science community college faculty: A culture apart

Jane Bradley
Iowa State University

Math and science community college faculty: A culture apart

by

Jane Bradley

A dissertation submitted to the graduate faculty

in partial fulfillment of the requirement for the degree of

DOCTOR OF PHILOSOPHY

Major: Education (Educational Leadership)

Program of Study Committee:

Frankie Santos Laanan, Co-Major Professor
Larry Ebbers, Co-Major Professor
Soko Starobin
Sharon Drake
James Colbert

Iowa State University

Ames, Iowa

2012

TABLE OF CONTENTS

LIST OF TABLES v

ABSTRACT vi

CHAPTER 1: INTRODUCTION 1
Background 2
Statement of the Problem 4
Purpose of the Study 6
Theoretical Perspective 7
Research Questions 9
Hypotheses 10
Significance of the Study 10
Definitions of Terms 12
Summary 13

CHAPTER 2: REVIEW OF THE LITERATURE 14
Federally Funded Community College STEM Programs 15
Programs to Increase the Number of STEM Graduates Among Minority Students... 17
Programs to Increase the Number of STEM Graduates Among Women 20
Undergraduate Student Success 22
Student Involvement 22
Student Sense of Belonging 23
Faculty–Student Interactions 24
Community College Students 26
Community Colleges 28
Community College Faculty 29
Faculty Identity 31
Community College STEM Faculty 32
Iowa Community Colleges 33
Summary 36

CHAPTER 3: METHODOLOGY OF THE STUDY 38
Overview 38
Research Design 39
Population and Sample 40
Survey Instrument 41
Tests of Validity and Reliability 43
Validity 45
Reliability 46
Data Collection 46
Data Analysis 47
Delimitations and Limitations 50
Ethical Issues 52
Summary 53

CHAPTER 4: RESULTS 54
Comparison of Math/Science to Non-Math/Science Faculty 54
Demographic and Professional Characteristics 54
Time Spent Interacting With Students 58
Communicating With Students 59
Social Interactions 60
Recruiting Students 61
Identifying Barriers to Student Success 62
Mentoring and Guiding Students 65
Student Recruitment and Retention 66
Prediction Models for Faculty Engagement in Student Recruitment and Retention 68
Data Reduction by Exploratory Factor Analysis 68
Prediction Models 71
Student Recruitment 73
Student Retention 75

CHAPTER 5: DISCUSSION, CONCLUSIONS, AND IMPLICATIONS 78
Comparison Studies 80
Demographic Characteristics 80
Interactions With Students 81
Barriers to Student Success 83
Mentoring and Guiding Students 85
Student Recruitment and Retention 86
Predicting Faculty Engagement in Student Recruitment and Retention 87
Implications 90
Implications for Practice 91
Implications for Policy 91
Recommendations for Future Research 92
Summary 93

REFERENCES 98

APPENDIX A: EXCERPT FROM IOWA ADMINISTRATIVE CODE 105

APPENDIX B: IOWA COMMUNITY COLLEGE FULL-TIME FACULTY SURVEY 2011 107

APPENDIX C: INSTITUTIONAL REVIEW BOARD APPROVAL 124

APPENDIX D: SURVEY QUESTIONNAIRE FOR PILOT STUDY 125

APPENDIX E: CLIENT INFORMATION 126

APPENDIX F: PILOT PARTICIPATION LETTER 127

APPENDIX G: PARTICIPATION LETTER 128

APPENDIX H: SURVEY QUESTIONS USED TO ANSWER RESEARCH QUESTIONS 129

APPENDIX I: STATISTICAL DATA 133

ACKNOWLEDGEMENTS 143

LIST OF TABLES

Table 1. Comparison of Demographic Characteristics Between Math/Science and Non-Math/Science Full-Time Faculty 55

Table 2. Professional Characteristics of Math/Science and Non-Math/Science Faculty ...57

Table 3. Comparison of Average Number of Hours Spent Doing Activities With Students in a 7-Day Week 59

Table 4. Comparison of Means for Questions on Communicating With Students 60

Table 5. Comparison of Means for Questions Concerning Interactions With Students Outside of the Classroom 61

Table 6. Comparison of Means for Questions Concerning Student Recruitment Efforts ..62

Table 7. Comparison of Means for Identifying Barriers to Student Success 63

Table 8. Comparison of Means for Questions Concerning Mentoring and Guiding Students 65

Table 9. Comparison of Math/Science and Non-Math/Science on Attitudes Concerning Roles in Student Recruitment and Retention 67

Table 10. Constructs of Faculty Culture 69

Table 11. Comparison of Means for Factors Describing Faculty 70

Table 12. Constructs of Professional Development Activities 72

Table 13. Independent Variables for Student Recruitment and Retention Regression Models 74

Table 14. Standardized Beta Coefficients for Engagement in Student Recruitment 75

Table 15. Multiple Regression ANOVA Table for Predicting Engagement in Student Recruitment 75

Table 16. Standardized Beta Coefficients for Engagement in Student Retention 76

Table 17. Multiple Regression ANOVA Table for Predicting Engagement in Student Retention 77

ABSTRACT

This is a quantitative, survey-based study of Iowa community college faculty members. The survey was administered in the spring of 2011 to all faculty members identified by their colleges as being employed full time. This study compares the demographics of math and science faculty members to faculty within the arts and sciences who do not teach math or science. Comparisons of how the two groups interact with students and what they identify as barriers to student success are included, as well as their attitudes about mentoring, encouraging students, and their roles in student recruitment and student retention. Highly correlated variables are grouped as factors and used in the construction of prediction models for faculty engagement in student recruitment and student retention efforts. A contrast in the cultures of the math/science faculty members as compared to the non-math/science faculty is considered for its impact on faculty engagement with students and those variables believed to support undergraduate student success.

CHAPTER 1: INTRODUCTION

Preparing enough science, technology, engineering, and mathematics (STEM) workers to meet the demand for jobs in these areas is critical for maintaining the position of the United States as a leader among industrialized nations. The ability to compete in a global economy depends increasingly on a well-trained STEM workforce. In order to produce this highly skilled and educated group, more students must be attracted to these fields and persist to graduation. Community colleges can play an important role in directing more students into the STEM majors. Not only are the enrollments growing at community colleges, but they also enroll a more diverse group of students who have, to date, been underrepresented in these academic majors (Starobin & Laanan, 2008).

STEM faculty members can play a vital role in the successful recruitment and retention of students into the STEM fields. They can share with prospective students their passion for their chosen field and encourage them by explaining what can be achieved with a STEM degree. They can also create an educational environment that maintains student interest and supports academic success for students once they have chosen a STEM academic pathway. It is important that their efforts in these activities be optimized.

A team of researchers with an interest in STEM issues surveyed all full-time community college faculty in the state of Iowa (Rogotzke, 2011). In this study, the answers provided by full-time community college math and science faculty were compared to the answers of arts and sciences faculty who do not teach math or science. Faculty perceptions of their students and attitudes about their roles and responsibilities as they pertain to students were compared along with faculty behaviors that have been shown to positively impact the undergraduate student experience. The reported perceptions, attitudes, and behaviors were collectively considered as the culture of the faculty and were analyzed using a personality-based theory of careers (Holland, 1973). The answers to the culture-related questions were used to construct predictive models for faculty engagement in student recruitment and student retention. Certain professional development activities were also considered to see if they increased the likelihood of faculty participation in these activities. With the recent emphasis on the need for STEM majors, this study provides insight into whether math and science faculty members have rallied to meet the challenge of increasing majors in these disciplines.

Background

The need for employees with skills and knowledge in areas of STEM is immediate and will grow in the future. A 2005 survey of 779 companies in the United States revealed that 36% reported moderate to serious shortages of scientists and engineers (Deloitte Development LLC, The Manufacturing Institute, & Oracle, 2009). A 2007 study by the U.S. Department of Labor supported this immediate need with projections that 15 of the 20 fastest growing occupations for 2014 will require significant mathematics or science preparation (Bureau of Labor Statistics, 2007). The job sectors with the greatest need for employees in the STEM fields are growing and include education, government, industry, and manufacturing. Overall projections show a growth in STEM occupations from 9.8% in 2008 to 17.0% in 2018 (Langdon, McKittrick, Beede, Khan, & Doms, 2011).

Employment in the STEM areas is often rewarded with better pay and increased job security (Langdon et al., 2011). Over the past 10 years, the growth in STEM jobs was found to be three times greater than non-STEM jobs, and STEM jobs were paid at a 26% higher rate than non-STEM jobs. Average hourly earnings are higher at all levels of education for

STEM jobs than for non-STEM jobs, even when corrections are made for other influencing factors. Surprisingly, this wage differential exists when a worker is employed in a non-STEM job but holds a degree in an area of STEM.

Although there has been a modest increase in the number of STEM degrees awarded in the United States over the past 5 years, the graduation rate is not keeping up with the employment needs (National Science Board, 2010). Only 15.6% of the degrees awarded in the United States from 2003 to 2007 were from STEM fields, compared to almost 46.7% in China, 37.8% in South Korea, and 28.1% in Germany. It is estimated that nearly 70,000 new doctoral graduates are needed from women and minorities to obtain a balance in gender and ethnicity in the STEM disciplines (Conference for the Recruitment and Retention of Women and Minorities into the STEM Disciplines, 2006). This information is a cause for concern since attracting more young people into technological careers and educating more Americans in the STEM fields is critical to maintaining the country's global competitiveness (STEM Education Caucus, n.d.).

Community colleges have the capacity to prepare students, especially women and minorities, for transfer into 4-year programs of study in a STEM field or for STEM jobs that do not require preparation at the baccalaureate degree level (Starobin, Laanan, & Burger, 2010). Community college student populations are typically diverse, consisting of more than 57% women and 38% minority students, so there is potential for attracting those students who have historically been underrepresented in the STEM majors (National Center for Education Statistics, 2003). The National Governors Association Center for Best Practices (NGA Center, 2011) issued a brief outlining how each state can utilize community colleges to improve the STEM pipeline. Community colleges are less expensive than most 4-year colleges and universities and are highly accessible since an estimated 90% of the U.S. population resides within 25 miles of a community college. Evidence supports the notion that community colleges can serve as resources for STEM majors, since 44% of students who earn a bachelor's or master's degree in a STEM field attended a community college at some point.

Recruiting students into STEM majors is a formidable challenge faced by community colleges that is followed by the difficulties of retaining students until they finish a STEM degree. One of the barriers identified by the NGA Center (2011) was the low rate of degree and credential completion at the community colleges. Federal grants are now available specifically to aid in community college efforts to attract and retain STEM students. Projects funded by the National Science Foundation (NSF), such as the STEM Talent Expansion Program (STEP) and Advanced Technological Education (ATE) program, have been designed to improve science and technology education at secondary schools and community colleges, to engage community colleges in outreach efforts to high schools for recruitment into the STEM majors, and to establish improved articulation agreements between 2-year and 4-year degree-granting institutions (Bailey, Matsuzuka, Jacobs, Morest, & Hughes, 2004). By offering incentives and resources to traditional and nontraditional college students, women, minorities, and reverse transfer students, community colleges play an important role in increasing the number of students in these fields of study.

Statement of the Problem

Even though there are many opportunities for employment in the STEM areas, the attraction to these fields of study in higher education has been lacking. It seems that secure, high-paying jobs are not enough to draw adequate numbers of students to fill the employment needs. This warrants a close look at what institutions of higher education are doing to recruit and retain students into STEM majors. Now that community colleges are seen as a potential source for these majors, there is a particular need for more information about their student recruitment and retention practices.

As community colleges strive to produce more STEM-trained workers with 2-year degrees and to provide rigorous coursework for students who want to transfer into 4-year STEM programs at colleges and universities, it is critical that they have effective recruitment and retention practices in place. Faculty can play an important role in these efforts since the influence they have on the undergraduate student experience is considerable. Among the seven principles for good practice in undergraduate education identified by Chickering and Gamson (1987) are five indicators of student engagement where faculty characteristics and behaviors have significant effects: (a) encouraging cooperation among students, (b) encouraging active learning, (c) communicating high expectations, (d) encouraging contact between students and faculty, and (e) using active learning techniques. The work of Umbach and Wawrzynski (2005) suggests that the characteristics, behaviors, attitudes, and perceptions of faculty collectively can create a culture that supports positive undergraduate outcomes with varying degrees of success. There is general agreement that faculty can influence students in their choice of majors and play a key part in student encouragement and support, which are especially important in the efforts associated with the retention of underrepresented students (Allison & Cossette, 2007; Baxter, 2008; Starobin & Laanan, 2008). The influence of cultures within the institution, such as in the "silos" of the math and science departments, is significant as well in students' choices of majors (Porter & Umbach, 2006). In fact, the person-environment fit can be so powerful that Porter and Umbach (2006) suggested that faculty members should be aware that their classes are populated by similar types of students and that they should work hard to attract more diverse students. An examination of the actions, attitudes, and perceptions of math and science faculty within the community college system may reveal positive and negative influences on students' choices of major and quality of their undergraduate experience.

Since faculty have a significant influence on student retention and recruitment, it is important to know what is actually happening within institutions of higher education with respect to faculty efforts in these areas. This is particularly true in the area of STEM education. Studies with useful data that provide this information are difficult to find, especially for community college STEM faculty.

Purpose of the Study

The purpose of this study was to compare the culture of full-time Iowa community college math and science faculty, or math/science faculty, to that of the arts and sciences faculty who do not teach math or science, referred to as non-math/science faculty. This was done to see if the faculty members support efforts in student recruitment and retention similarly. The definition of the term *culture* is a moving target and has evolved over time, assuming many meanings and nuances with different geographies and time periods (Baldwin, Faulkner, & Hecht, 2006). Because of the breadth of variety in definitions, it is important to provide the meaning within the context of a study. For this study, the term *culture* was used provisionally to collectively discuss the perceptions faculty have of their students, and their attitudes and behaviors that can have an impact on students during their undergraduate experience. Personality type was considered as an explanation for observed differences between the two groups. Constructs of highly correlated variables for professional development and characteristics that are known to support student success were used to create predictive models for faculty engagement in student recruitment and student retention efforts.

Theoretical Perspective

In order to compare and contrast the culture, as defined within this study, of community college math/science faculty to that of their non-math/science faculty colleagues, consideration was given to institutional impacts on faculty culture. The Blackburn and Lawrence (1995) model outlines how the resources, mission, and student composition of the institution can impact faculty educational practices, behaviors, and productivity. In turn, this faculty culture then impacts the culture for student learning and engagement. While this model could have been applied to this study, the understanding provided by it would have been limited by the design of the study. There were representatives from each of the institutions participating in the study in both the math/science and non-math/science faculty groups. Using an institutional impact model would not have been adequate to explain observed differences since members of both groups would have experienced the same institutional conditions.

Instead, Holland's (1973) theory of careers provided the theoretical perspective for analyzing the data collected from this Iowa study. This perspective was useful since the two groups of faculty were clearly different in their choices of the disciplines they taught. The cultural differences between the math/science and the non-math/science full-time community college faculty were examined as manifestations of their personalities. Holland's model identified six personality categories that have been linked to particular types of jobs. These categories include realistic, investigative, artistic, social, enterprising, and conventional. The premise of his theory is that individuals will thrive in those occupations that best match their personality and that people seek those careers where they will be associated with people most like themselves. While this model has been used in a predictive way for career and academic counseling, it has also been applied to individuals within occupations to determine the validity of the model (Holland, Gottfredson, & Nafziger, 1975; Holland, Sorensen, Clark, Nafziger, & Blum, 1973).

Two personality categories identified by Holland (1973) are significant to this study. The social category applies to all of the faculty members due to their interest in teaching and choosing careers as full-time instructors. Social people tend not to work with machines and tools and avoid ordered, systematic activities. They prefer activities where they interact with people and value supporting the welfare of others. It is evident why this personality type is associated with teachers since it supports caring and supportive faculty–student interactions. The second category is in opposition to the social category but pertains to the math and science faculty members because of their choice to enter these particular fields. This is the investigative category. Investigative people prefer scholarly work that is systematic, complex, critical, and precise and tend to avoid social interactions. The personality traits associated with the investigative personality type are so distinct that they are recognized by popular culture to the extent that terms such as *nerds* or *geeks* have been coined to describe individuals possessing them. This personality category is not supportive of meaningful faculty–student interactions or relationships and could negatively impact efforts to attract and retain students into these fields of study.

Research Questions

This study compares full-time Iowa community college math/science faculty to non-math/science faculty in critical areas known to support student recruitment and retention. Models for predicting high engagement in recruitment and retention efforts were constructed from variables associated with faculty culture and professional development. The study was guided by the following research questions:

1. How does the sociodemographic composition of the full-time community college math/science faculty compare to that of the non-math/science faculty? Specifically, are there differences in any of the sociodemographic variables that could account for observed differences between the two groups?
2. How do math/science faculty interact with students outside of the classroom, and how do these interactions compare to those of non-math/science faculty? Specifically, how do the two groups communicate with students, and how often do these communications take place? What types of academic and social interactions occur between the faculty and the students, and how do faculty encourage these interactions?
3. Do math/science faculty identify the same barriers to student success as non-math/science faculty members? (Potential barriers to success included academic preparation, availability of student support services, and personal issues.)
4. Do math/science faculty have the same perceptions as non-math/science faculty concerning their role as mentors and providers of encouragement to their students? (Areas of encouragement related to participation in social and academic organizations and job shadowing or internship opportunities.)

5. Do math/science faculty have the same attitudes about the importance of their roles in student recruitment and retention as non-math/science faculty members? Specifically, do the two groups have similar attitudes about recruiting students in general and for recruiting underrepresented students in their disciplines? Do they view their roles similarly with respect to retention within their classes and within their disciplines?
6. Can professional activities and aspects of faculty culture be identified that correlate and predict a high commitment to recruitment and retention of students in their fields by math/science faculty?

Hypotheses

The first five research questions guiding this study were answered by comparing the math/science community college faculty members to the non-math/science faculty members. The null hypothesis was applied to these questions and stated that no difference would be found between the two groups in the variables studied for each question. Statistically significant differences between the two groups that were identified were subject to analysis from the theoretical perspective of the study. In other words, explanations for differences were provided that considered an aversion to social interaction as a plausible cause for the difference. A directional hypothesis was employed for Research Question 6, which stated that variables of faculty culture and professional development could be identified that would predict a high level of engagement by faculty in student recruitment and student retention.

Significance of the Study

With the current emphasis on attracting more students into STEM fields of study and the allocation of significant resources to support these efforts, the expectation would be that STEM faculty would demonstrate a high commitment to recruitment and retention efforts when measured against non-STEM faculty. The results of this study can be used by community college faculty members, administrators, and other policymakers to direct changes that would improve the recruitment and retention of students to STEM disciplines at the community college. The ultimate goal would be an increase in the number of graduates from community college STEM programs of study.

From the results of this study, science and math faculty can identify how their practices vary from those of their colleagues outside of math and science, particularly in ways that may have a negative impact on their students. Together with the community college administrators, these faculty members can develop strategies that provide professional development opportunities and resources that the faculty members need in order to make improvements. Clear communication between the faculty and the administration concerning retention policies can establish expectations to optimize strategies.

Policy changes at the institutional level may be indicated. In order for faculty to participate in training opportunities and to be actively involved in recruitment and retention efforts, changes in faculty teaching loads may be needed along with the inclusion of these efforts in their job descriptions. Additional funding to support faculty professional development may be required, and incentives to motivate and encourage faculty members to be actively involved with students could be another consideration.

This study can inform policymakers of the current state of involvement exhibited by Iowa community college math and science faculty in the recruitment and retention of students into STEM majors. With this information, better decisions can be made on the allocation of resources to support more effective practices. Funding streams for STEM initiatives can be targeted for better professional development in areas that are lacking, and funding for research to identify effective professional development practices can be justified as a result of this research. Also, differential pay may need to be instituted in order to attract and retain effective STEM faculty members.

Definitions of Terms

The acronym STEM is used to identify the disciplines of science, technology, engineering, and mathematics. This is a study of two STEM areas: science and mathematics, with science including both the natural and physical sciences but not the applied health science fields such as nursing. The survey identified the areas of arts and sciences to include the fine arts, communications, humanities, business, social sciences, physical or natural sciences, mathematics, and engineering. Non-math/science faculty were those who reported teaching subjects within the arts and sciences division at the college but not math or science. No self-identified career and technical faculty were included in this study.

The term *recruitment* was used to describe the enlisting of students into specific college majors, either internally or externally. *Retention* was used to describe the perseverance of students within a single course or throughout the length of a program of study. Retention in the students' chosen major through the transfer process to a 4-year program of study was also included in the definition.

Full-time faculty members were those who were employed under a full-time faculty contract at the community college. By definition from the Iowa Department of Education, full-time faculty members must have a minimum teaching load of 15 credit hours in sequential semesters. Each participant was asked to self-identify if he/she was employed as a full-time faculty member.

Summary

In order to address the critical need for a STEM-trained workforce in the United States, it is imperative that institutions of higher education produce more graduates with majors in these fields. The faculty members at these institutions play influential roles in attracting and keeping students engaged in their academic programs. They also have the capacity to encourage and support students academically and socially, actions that have been linked to student satisfaction and success. This study provides a comparison of community college math/science faculty and non-math/science faculty in their perceptions, attitudes, and behaviors, collectively referred to as their culture, in those areas that have been found to support positive outcomes for undergraduate students. With this information, community colleges in Iowa can make more informed decisions about how to support and motivate faculty in various aspects of faculty–student interactions to promote student recruitment and retention in the STEM disciplines.

CHAPTER 2: REVIEW OF THE LITERATURE

Because of the need for growth in the number of graduates from STEM programs of study, the recruitment and retention of students into STEM majors has received much attention in recent years at institutions of higher education. Federal funding is available to community colleges to help increase the number of STEM graduates. This funding is aimed at transfer programs and 2-year programs leading directly to employment into STEM fields. Examples of federal programs and the projects funded by these programs are included in this chapter. Attention is given to projects that were designed to attract and retain underrepresented students into the STEM fields of study.

Also included in this chapter is a review of seminal studies related to undergraduate student success. Results that can positively impact student recruitment and retention and that target the importance of faculty members in these efforts are of particular interest. While most of these studies were founded on research conducted at 4-year institutions, the findings may be applicable to community college students.

The community college level of higher education has been the subject of a growing number of studies. A discussion of recent studies and literature associated with community colleges and community college faculty is provided in this chapter. Faculty characteristics and identity are discussed along with institutional effects that impact the faculty. Recent discussions that have taken place about community college STEM faculty are also included.

Finally, an overview of the Iowa community college system is provided. This is a study based on the data collected from the full-time employed faculty members at Iowa community colleges. This information is important to establish the system as it existed when this study was conducted.

Federally Funded Community College Programs

National Science Foundation (NSF) grants have been awarded for many STEM recruitment programs (NSF, 2009). One of the largest NSF funding opportunities for community colleges is the Advanced Technological Education (ATE) program. The mission of the ATE program is to improve science and technology education at secondary schools and community colleges, to engage community colleges in outreach efforts to high schools for recruitment into the STEM majors, and to establish improved articulation agreements between 2-year and 4-year degree-granting institutions. A report from a study by the Community College Research Center (CCRC) highlighted the accomplishments of the program but also addressed barriers that need to be overcome for its continued success, including the need for more process-oriented strategies to promote the institutionalization and sustainability of the efforts supported by ATE (Bailey et al., 2004).

Another program, the STEM Talent Expansion Program (STEP), has been important to community college efforts. STEP is designed to increase the number of students receiving associate or baccalaureate degrees in established or emerging STEM fields. STEP Centers allow a group of faculty from different institutions of higher education to identify a national challenge or opportunity related to STEM and coordinate activities that will address the challenge or opportunity on a nationwide basis (NSF, 2012a).

Scholarships in STEM (S-STEM) is a program that grants funds to institutions of higher education so they can provide scholarships to academically talented students. The scholarships are based on financial need, which helps to reach the underrepresented populations of students. They are available for all degree awards, including associate degree programs. The ultimate goal of the grant is to enable students to enter the STEM workforce or to start graduate programs of study upon completion of their STEM undergraduate degree programs (NSF, 2012b).

Examples of funded projects can be found on the NSF (2009) website. It is interesting to note how varied the projects are. Many are partnerships among various agencies that support expanded opportunities to students. Examples include the following:

1. A collaboration of Bellevue Community College with the National Workforce Center for Emerging Technologies (NWCET) and the CCRC at Columbia University. This project is designed to provide internship opportunities to STEM students and externship opportunities to STEM faculty in the field of technology. An important part of this project is to communicate to industry the qualities of 2-year-college-educated IT technicians since community college technician programs offer industry-driven instruction. This aspect of the project is needed because industries often prefer graduates from 4-year programs of study to the 2-year-program graduates (NSF, 2007a).
2. A partnership between Central Virginia Community College and the University of Virginia. The goal of this STEP program is to increase the number of students enrolling in and graduating from engineering degree programs. Curriculum sharing between the two schools is an important component of this program, as well as guaranteeing a seamless transfer to the university for those students achieving a 3.4 grade point average. Tuition assistance, mentoring, and a distance degree program are included (NSF, 2007b).
3. Project Pathways, a collaboration consisting of a community college, local public schools, the Big Thicket National Preserve, and the Conservation Fund, with special assistance from the University of Texas Southwest Medical Center, the University of North Texas, Harvard University, and Texas Instruments. The project includes efforts to enhance

interdisciplinary inquiry-based curricula by offering workshops and retreats for teachers and administrators. Early undergraduate research is an emphasis with the availability of state-of-the-art instrumentation.

4. A new learning community model, called a learning village or metacommunity, offered by Des Moines Area Community College to its students seeking a major in engineering. This model is designed to increase the institution's flexibility for students. It includes a service learning option and improved support for student transfer. Curriculum modifications to better engage students are also part of the plan.

Programs to Increase the Number of STEM Graduates Among Minority Students

The recruitment of underrepresented students into STEM majors is a major emphasis of many community college programs. One program designed to attract Hispanic students from the high schools into college programs is SciTech Summer Camp, which is a joint project led by the Society of Hispanic Professional Engineers and the Hispanic Engineer National Achievement Awards Corporation. This program provides high school students with opportunities to participate in a variety of activities in the college environment to familiarize them with and promote STEM fields in higher education. Challenges faced in this effort are substantial. Jean Johnson, the executive vice president in charge of Public Agenda's Education Insights Division, believes that Hispanic families really value education but also doubt that college is a viable possibility for their children (Cech, 2008). She said there is often a choice between going to college or going to work and helping the family, explaining why only 6% of the nation's 53 million college graduates in 2006 were Hispanic, though Hispanics represented 15% of the nation's population.

Hispanics are the largest and fastest growing minority group in the United States. Paul Gasbarra and Jean Johnson (2008) reported that one out of every two of the 1.4 million people added to the nation's population between 2005 and 2006 was Hispanic, and as of July 1, 2006, there were 44.3 million Hispanics living in the United States. In this same report, interviews with Hispanic scientists and inventors, officers at technology corporations, and leaders from nonprofit, corporate, government, and educational institutions were used to generate a list of the many challenges to improving math and science education for Hispanic students. The list included the following: (a) poor socioeconomic conditions; (b) poorer schools in areas with high concentrations of Hispanics; (c) distraction due to illegal immigration issues; (d) mastery of academics in a nonnative language; (e) specific failures in the way math and science are taught; (f) lack of Hispanic role models, particularly in STEM; (g) traditional gender roles that deter Hispanic women from pursuing STEM careers; (h) limited parental education attainment and different expectations of the role schools play in the lives of children; (i) poor preparation and lack of financial resources for college educations; and (j) lack of mentors, faculty support, and study groups to mitigate pressures on first-generation college students. The general consensus was that most issues for these students start in the K-12 education system.

An interesting approach being used for Native American students provides community-based research projects as a means to attract and retain students. This is accomplished by taking the STEM curriculum out to the students rather than the students coming to a traditional campus setting. Fort Peck Community College, in collaboration with Little Big Horn College, Fort Belknap College, Stone Child College, and Rocky Mountain College, offers students the opportunity to learn research skills by taking a course for college credit called Research for Undergraduates, which is delivered via a blend of Internet and television. These skills are reinforced by the students actively conducting research under the guidance of trained STEM instructors and research site coordinators.

Another project targeting Native Americans is offered by Fort Berthold Community College. The college received a grant to develop a learning community of STEM students. These students receive financial incentives, special seminars, and enrichment and cultural activities with an emphasis on research. The program involves a specialized team of STEM instructors and includes tribal studies in the curriculum. STEM students are assigned to a cohort and are required to make a commitment to continue their education past the 2-year degree.

Four community colleges have joined forces to improve recruitment of minority students, particularly African American students, into STEM majors (Baxter, 2008). The consortium includes Arkansas Northeastern College, East Arkansas Community College, Mid-South Community College, and Phillips Community College of the University of Arkansas. The partnering school districts in the project have a 60% minority population and a 79% high-poverty population. Minority enrollment at the four community colleges represents 42% of their total student enrollment. The consortium provides academic pathways leading to careers in advanced manufacturing and information technology skills by offering Associate of Applied Science (AAS) degrees in these areas. A university partner, University of Arkansas (UA) Fort Smith, accepts the credits earned in these 2-year degrees into its Bachelor of Applied Science (BAS) degree program. UA Fort Smith also provides a program coordinator to the community college consortium. This project targets students ranking in the middle of their high school classes. Most of these students are first-generation college students and come from economically disadvantaged backgrounds, so the career pathway has multiple stop-out points to accommodate those students who need to work while completing their studies. The program involves an extensive team at each of the community colleges to work with the secondary schools to recruit and meet the many needs of these students. As a result of these efforts, African American students are now enrolled in the advanced manufacturing program and information technology program leading toward the AAS and BAS degree where none had been enrolled before.

Glendale Community College has developed the Math and Science Transfer, Excellence and Retention (MASTER) program to increase the number of underrepresented students who receive bachelor's degrees in science, engineering, or mathematics. This program provides intense student support in the form of drop-in tutoring, supplemental instruction, and group study and problem-solving sessions facilitated by trained supplemental instruction leaders. A summer bridge program assists the students in developing their educational plans, understanding transfer requirements, developing study skills, and learning to set goals. The participants receive a top-of-the-line graphing calculator and priority registration for the fall semester. Students are assigned to a "caring professor/mentor" to help them overcome problems. Priority registration, small seminar-style classes, and an increased emphasis on scientific thinking and problem solving by dedicated teachers are also provided (Glendate Community College, 2006).

Programs to Increase the Number of STEM Graduates Among Women

In addition to minority populations, women have historically been underrepresented in STEM majors. In 2001, women earned 60% of undergraduate degrees in biology but only 22% of physics degrees, 28% of computer science degrees, and 20% of engineering degrees

(Rypisi, Malcom, & Kim, 2009). A 2007 U.S. Department of Labor report stated that women earned 57% of all bachelor's degrees, but only 39% of those were in STEM fields. While many community college STEM programs are aimed at the recruitment of underrepresented populations, there are special considerations for the recruitment of women. A collaborative effort between Iowa State University and two community colleges, Highline Community College and Seattle Central Community College, supports the recruitment of women into STEM fields through the production of media presentations to educate the public and college students about STEM baccalaureate-degree pathways (Starobin & Laanan, 2008). Products from this study include a STEM transfer guide for prospective community college students and an educational website for educational staff, students, business and industry, researchers, policymakers, and the public.

As part of an NSF-funded ATE project, Edmonds Community College conducted a study of effective recruitment strategies used in program design to increase the recruitment of women and girls into STEM majors (Allison & Cossette, 2007). This work focused on the social cognitive career theory as the theoretical model to guide the development of practices for the recruitment of females into STEM careers. Reported results include eight "elements of interventions" to the recruitment of women into STEM majors: (a) providing a positive environment, (b) promoting self-confidence, (c) providing hands-on workshops, (d) working cooperatively or collaboratively rather than competitively, (e) providing practical applications, (f) providing role models, (g) encouraging family support, and (h) providing mentoring.

Many community college efforts are in progress to increase enrollment into the STEM majors from all student populations. Funding has been made available for many of these efforts, including NSF funds for major projects that include educational institutions, business, and industry. Some of the work has been to study what the needs are among various student populations to enhance the success and efficiency of recruitment and retention efforts. Efforts to date have been diverse, ranging from more traditional activities and actions to some that are creative and entrepreneurial in nature.

Undergraduate Student Success

The recruitment and retention of students into programs of study are important for institutions of higher education. The rewards from these efforts include greater enrollment numbers resulting in more tuition, more funding support, and the maintenance of the viability of academic programs. Several studies have identified key factors that positively impact the college student experience.

Student Involvement

Astin's (1984, 1985, 1999) involvement theory places an emphasis on student engagement in the academic experience. Astin considered the amount of physical and psychological energy students devote to their college experience as student engagement. He regarded involvement as an expansion of the psychology construct of motivation because of the addition of behavioral elements to the concept. According to his theory, students who do such things as read, study, attend class, belong to campus organizations, and interact with faculty members tend to be more successful than those students who do not engage in such activities. He found that almost any form of student involvement during college is beneficial to student learning and development. Astin proposed that students must actively participate in the learning experience in order to achieve the greatest academic success, and he encouraged educators to focus more on student actions than on their own and to create learning environments with a greater emphasis on student participation.

In a recent study conducted by Kuh, Cruce, Shoup, Kinzie, and Gonyea (2008), the researchers came to many of the same conclusions as Astin with respect to student engagement. Their study was based on results from the National Survey of Student Engagement (NSSE) taken by students at 18 baccalaureate-granting colleges and universities from 2000 to 2003. Two conclusions resulted from the analysis of the surveys. The first was that student engagement in academically related activities positively impacted student persistence between the first and second year of college, a finding that is particularly meaningful to 2-year community colleges. The second was that effective educational practices were especially beneficial to at-risk students and students of color, populations that often start their education at a local community college and are underrepresented in the STEM fields of study.

Student Sense of Belonging

A student's sense of belonging is important in retention, according to Tinto's (1993) theory of departure. This theory states that formal and informal academic and social systems are important parts of the undergraduate experience and are necessary to reduce the likelihood of academic departure. Tinto found that institutions with lower retention rates reported low levels of faculty interaction with students, while those reporting high retention rates reported high levels of interaction. Tinto's work supports that academic failure is not always a result of lack of skills but may be due to a feeling of isolation or lack of connection with the college culture. Tinto stated that institutions should make student welfare one of their highest priorities with a total commitment to the education of all students and the provision of supportive academic and social communities to promote the student's sense of belonging as an integral member of a community.

An important aspect of formal and informal academic and social systems is that they provide opportunities for students to observe and model behaviors and attitudes of their academic peers and mentors (Bandura, 1986). The examples set by faculty members in these settings can have a profound impact on student self-efficacy. Academic and social systems provide opportunities for faculty to discover personality traits of their students and establish learning environments that can play substantive roles in students' choices of majors, especially with respect to STEM majors (Porter & Umbach, 2006). Mentoring has long been accepted as a valued system for the academic success of students. A critical review of literature led to three common themes related to mentoring (Crisp & Cruz, 2009; Jacobi, 1991). The first is that mentoring relationships provide assistance to support the growth and accomplishment of an individual. The second is that mentoring often assists the individual with professional and career development. Third, mentoring relationships are personal and reciprocal.

Faculty–Student Interactions

Several studies have linked faculty–student interactions to positive student outcomes (Avalos, 1994; Berger, 1997; Kuh & Hu, 2001; Pascarella & Terenzini, 2005). Frequent interactions of students with faculty have been found to be the most important factor in student satisfaction, particularly satisfaction with faculty (Astin, 1993, 1999). The amount of interaction a student has with faculty has widespread effects on student development. The interactions specifically noted by Astin include being a guest in a faculty member's home, working with a faculty member on a research project, assisting in teaching a class, and talking outside of the classroom. Data from a longitudinal, survey-based study of approximately 25,000 students at more than 200 4-year colleges and universities between 1985 and 1989 support the importance of faculty engagement with students (Astin, 1993). The results indicated faculty–student interactions are second only to peer group effects in undergraduate student development. These interactions have a positive correlation with degree attainment and enrollment in a graduate or professional school. Interestingly, the research involvement of faculty members negatively impacts student satisfaction and student success, while the more student-oriented faculty members have a significant positive impact on the overall college experience. Since interactions with faculty members result in greater student satisfaction with all aspects of their undergraduate experience, Astin suggested that enhancing these interactions would be advantageous to most college campuses.

A typology of faculty–student interaction outside of the classroom was constructed from a qualitative study at a residential college in a large university (Cox & Orehovec, 2007). Five types of interactions were identified and modeled according to frequency. From most frequent to least frequent, the types include disengagement, incidental contact, functional interactions, personal interactions, and mentoring. Even though the importance of faculty–student interactions has been established in many studies, the occurrence of these interactions is limited according to this study. Students reported that they appreciated the visibility of the faculty on campus outside of the classroom, but social interactions where students interacted in a meaningful way on an individual basis with a faculty member were rare. Cox and Orehovec's (2007) work revealed that even those students who were active members of the college community reported limited contact with faculty members outside of the classroom. When interactions did occur, they were found to be meaningful to students and important in enhancing their feelings of connectedness with the faculty member and adding value to the college. Overall, faculty–student interactions have been found to benefit students' affective and cognitive development, increase students' satisfaction with their higher education learning experience, and improve student persistence (Astin, 1977, 1993; Kuh, Douglas, Lund, & Ramin-Gyurnek, 1994; Tinto, 1993).

Community College Students

A review of literature on attrition at community colleges identified student factors that are not always considered in research on 4-year colleges and universities (Summers, 2003). These factors include working full time, registering late, not having clear educational goals, performing poorly in classes, and not engaging in a variety of student support services. More research is needed to verify the impact of each of these factors on retention, but the recognition of their potential as predictors of student attrition is a first step.

Work by Starobin (2004) points out the need for a support system consisting of family and individuals at school for women in STEM programs. Interviews with three female students who were enrolled in engineering programs at community colleges were conducted to learn of their experiences in this male-dominated field (Starobin & Laanan, 2008). These interviews provided insight into practices and policies that enhance the recruitment of women into engineering majors. The findings included the importance of (a) building a supportive environment to include faculty, advisers, peer and study groups; (b) providing clear transfer program guidelines; and (c) sending positive messages early in a student's program of study. The study also pointed out the need for strong partnerships between 2-year and 4-year STEM programs to improve transfer and learning experiences for women in STEM.

Although few, there are studies available on factors impacting retention of students from one institution of higher education to another. A comprehensive study of the factors affecting transfer among urban community college students concluded that a clear transfer path in the students' program of study was the most highly predictive of interinstitutional transfer (Hagedorn, Cypers, & Lester, 2008). The institutional factors that could have a negative impact on transfer rates include poor advising resulting in the loss of credits in the transfer process. This may be particularly true among STEM students since these majors often are dependent on course sequences starting with the freshman year of college, and any lapse in planning can add semesters, and even years, to a student's academic plan.

Individual factors having a negative impact on transfer include financial stresses and lack of academic preparation and familiarity with the higher education systems. Students who leave high school with a high grade point average and the completion of at least one high school math class have been found to have better transfer rates (Lee & Frank, 1990), and among Hispanic students, the completion of math courses and the intention to transfer are important to transfer success (Kraemer, 1995). Faculty recognition of underprepared students and their familiarity with resources available to these students may help those who do not have the academic background typically shown to support success.

The transfer of community college students interested in STEM majors to universities has been described as a "trickle" (Hagedorn & DuBray, 2010). Academic preparation, or lack thereof, can determine whether a student will be successful in science and mathematics at the community college. Persistence of underprepared students to college-level mathematics is particularly challenging and can pose a barrier to those students who start with developmental courses (Hagedorn, Lester, & Cypers, 2010). The study by Hagedorn and DuBray (2010) suggested that community colleges take a more active role in setting goals for students and counsel and advise in a manner that supports successful transfer of the student to achieve these goals. The importance of early alerts and intrusive advising for those students who do not have a history of academic success was stressed.

A special issue of the *Journal of Women and Minorities in Science and Engineering* examined how community colleges can increase the number of women and minorities in community college STEM programs of study (Starobin et al., 2010). This work recognized the need for successful recruitment and retention of these underrepresented populations and underscored the role that community colleges can play in these efforts. The value of 2-year programs of study that lead directly to jobs was delineated along with the importance of clear transfer paths into 4-year STEM programs. This work recognized the contribution that community colleges can make in growing the STEM workforce.

Community Colleges

According to the American Association of Community Colleges (AACC, 2006), community colleges educate 11.6 million students each year. This represents 45% of all the undergraduates in the United States. Community colleges are the main source of technician education in the United States. Nearly 40% of public school teachers (Shkodriani, 2004) and approximately 44% of science and engineering graduates attended community colleges (Tsapogas, 2004). Community colleges provide remedial education, associate's degrees leading to transfer into baccalaureate-degree programs, career and technical programs of study, and adult and continuing education programs supporting lifelong learning and skills training. Community colleges influence many of the fields in the global marketplace and can support the competitiveness of the United States in the global economy. The role of the community college in the United States is expanding and becoming more important in many areas, particularly in STEM with the hope of increasing the number of STEM degrees awarded.

Community colleges are not institutions of research. The primary role of the community college is to support student learning through teaching and skills training. As institutions of higher education with a primary focus on teaching, the community college faculty members are the principal supporters of the community college mission.

Community College Faculty

The role of the community college faculty member is first and foremost to be a teacher. Institutional responsibilities may exist beyond this role but do not carry the same importance in the amount of time and energy faculty members devote to them. Studies of faculty at 4-year institutions are not adequate to gain a full understanding of community college faculty members because of the differences in the characteristics and values of the community college environment as compared to that of a 4-year college or university (Hardy & Laanan, 2006). Studies employing the results from the National Study of Postsecondary Faculty (NSOPF), conducted by the National Center for Education Statistics, have been used to gain a better understanding of community college faculty members (Gahn & Twombly, 2001; Hardy & Laanan, 2006; Palmer, 2002). Highlights of these studies reveal the aging of the community college faculty and the associated challenges of faculty retirements. Also, the lack of ethnic and racial diversity among the younger faculty as compared to the student populations is an area of concern. However, these national studies do support that gender balance among the full-time community college faculty has been achieved.

In addition to demographic characteristics of the faculty, a study by Hardy and Laanan (2006) revealed information about faculty opinions and job satisfaction. The faculty participants reported satisfaction with their authority to decide course content and which courses they taught. They also expressed favorable responses regarding their satisfaction with their instructional duties, job security, and overall job satisfaction. Their greatest dissatisfaction was with their increased workload, available time to keep current in their field, and the effectiveness of faculty leadership within their institutions. A notable percentage of the faculty also reported low satisfaction with the quality of students at their institutions. While these studies reveal that community college faculty members are in general agreement in some aspects of their opinions and job satisfaction, differences were noted, especially when considering faculty age, that expose the complexities of this faculty population.

Other than studies based on results from the NSOPF, little research has been done on community college faculty (Twombly & Townsend, 2008). The number of articles in peer-reviewed journals is small, and the content of these articles generally falls into one of five categories: (a) characteristics of community college faculty, (b) faculty work, (c) dimensions of the faculty career and labor market, (d) the influence of institutional factors on faculty work, and (e) community college teaching as a profession. It can be argued that community college faculty members are the victims of the success of the institutions where they work. Increased enrollments and an entrepreneurial approach to meeting workforce preparation needs through training programs and by modifying traditional curricula to emphasize employability skills has resulted in increased faculty workloads (Levin, Kater, & Wagoner, 2006). Community college faculty members are committed to the mission of their colleges to “serve the underserved” and “strengthen the community.” However, in meeting these needs, they are taking on more students when the institution lacks resources, increasing their use of instructional technologies to meet expectations from students and other constituents, and participating more in institutional governance as part of a political exchange process with administration. Interestingly, the increase in workload is often manifested as a teaching overload where the faculty member gets paid at the part-time faculty rate.

Faculty Identity

In Outcalt’s (2002) exploration of the professionalization of community college faculty members, a lack of interaction among the faculty was noted that hindered the development of a clear community college faculty identity. Faculty concerns with shortage of time and need for stricter prerequisites for the courses they teach were common, as well as their commitment to effective instructional practices. However, Outcalt pointed out that it is almost impossible to consider community college faculty as a monolithic group and that the development of a cohesive identity is impeded by the increasing numbers of part-time faculty, the expanding mission of the community college as an extraeducational social agency, and the pressure on the faculty to be involved in activities related to matters other than their instructional duties. He suggested that the various subgroups of the faculty, and their associated particularities, must be considered when formulating an identity for the community college professoriate and that faculty development with an emphasis on teaching could strengthen the roles of the faculty as teachers and contribute to the formation of a more cohesive community college faculty identity.

In contrast to the notion that it is important for community college faculty to seek a common professional identity, Palmer (2002) acknowledged the differences among community college faculty members of different disciplinary groups. He suggested the need to appreciate and support these differences through professional development designed to strengthen faculty within each discipline rather than seeking to unite the faculty as a homogeneous culture. His study revealed variations among community college faculty by discipline in four areas: (a) academic and employment histories, (b) approaches to instruction, (c) methods used to assess student work, and (d) scholarship outside of teaching. The grouping of the faculty by discipline resulted in 11 groups, with 3 fitting into the STEM areas, accounting for approximately a quarter of the participants (Palmer, 2002). Although this was not a study of STEM disciplines, characteristics associated with these groups were identified, which began to shape an identity of this group of faculty.

Community College STEM Faculty

The aging demographic that is impacting community college faculty in general is also a concern for community college STEM faculty. It is estimated that 43% of full-time STEM faculty are 55 years of age or older (Cetaldi, Fahimi, & Bradburn, 2005). In anticipation of the retirement of this aging group, a summit was organized by the AACC and the American Mathematical Association of Two-Year Colleges (AMATYC) in Washington, DC, in 2005. The purpose of the summit was to identify strategies for successfully recruiting, retaining, and developing exemplary and diverse STEM faculty members (Patton, 2006). The summit participants identified characteristics of exemplary community college faculty in the STEM majors as including a desire and passion to teach diverse students, good written and oral communication skills, proficiency in technologies that assist student learning, and solid backgrounds in their fields. In addition, they should exhibit the ability to model for their students what it means to be a lifelong learner, establish and maintain networks with business and industry contacts, infuse current information and opportunities to solve real-world problems in their curriculum, collaborate with faculty in other disciplines and at other institutions, and be on the front lines of cross-curriculum initiatives and outreach efforts. To recruit these exemplary faculty members, the summit participants recommended recruiting from diverse groups and STEM professionals. They also suggested the importance of making community colleges attractive to STEM faculty by promoting diversity and excellence at the college and offering perks and services to enhance the work environment.

A qualitative study by Starobin and Laanan (2008) confirmed the need for community college STEM faculty to provide guidance, support, and encouragement to female students in STEM majors. These actions support the development of the female students' skills and confidence and promote successful transfer to 4-year programs of study. The study also highlighted the importance of STEM faculty encouraging the female participants to consider a STEM major, especially early in their academic experience. The women reported that this sent them a message that said, "You can do it," that they needed to hear to follow a STEM academic pathway.

Iowa Community Colleges

This study took place in the state of Iowa. The Iowa community college system consists of 15 postsecondary, 2-year institutions located in geographically distinct areas identified as Areas I through XVI. The areas served vary in size from 4 to 12 counties, with all of Iowa's 99 counties included in one of these merged areas. Each college is governed by a locally elected board whose members serve 3-year terms. All of Iowa's community colleges have an "open-door" admission policy, which guarantees Iowans an opportunity for educational assistance and career development regardless of previous educational attainment.

To accomplish this, each community college offers assistance in developing skills necessary for success through preparatory career and college parallel programs, supplementary services to disabled and disadvantaged students, and a variety of other support services designed to help students succeed (Iowa Department of Education, 2011).

The community colleges offer programs in three major areas of instruction: college parallel coursework, preparatory career programs of vocational and technical education, and adult education. College parallel coursework is typically offered through the arts and sciences divisions with courses designed to transfer to 4-year institutions of higher education. The preparatory career programs designed for college students offer college credit courses through career and technical programs of study. Those designed for high school students are offered through technical preparation programs and have articulation agreements with the colleges. Adult education courses and programs do not usually award college credits and include a variety of part-time programs, such as basic education for adults who have less than an eighth-grade education, high school completion programs, technical education for upgrading employment skills, preoccupational training, and courses of recreational interest.

All of Iowa's community colleges must comply with approval standards adopted by the State Board of Education. These standards are published in the Iowa Code of Education. The State Board works with the Iowa Department of Education to provide oversight, supervision, and support for the community colleges. State accreditation processes are in place, and each community college must be accredited by the state of Iowa. The state accreditation process is integrated with the North Central Association of the Higher Learning Commission, which is the national accrediting agency for all of the 15 public community colleges in Iowa. One governance area that is particularly important to this study is the approved minimum faculty standards (Appendix A). The minimum standards of the faculty teaching college parallel coursework include a master's degree in the field of instruction or a master's degree in a related area with 12 graduate credits in the field of instruction. These 12 credits may be within the master's degree requirement or independent of the master's degree.

The Annual Condition of Iowa's Community Colleges 2010 (Schenk et al., 2011) reported a total enrollment for the 2010-2011 academic year of 155,140 students taking 2,314,697 college credits. Sixty-five percent of the students were enrolled in college parallel credit courses, 27% in career and technical courses, and 8% in other types of college credit classes. Forty-four percent of the students were male and 56% were female. The median age for these students was 21 and the average age was 24. Minority or ethnic minorities made up 18.5% of the total. Ninety-two percent of the students who enrolled in the fall of 2011 were Iowa residents.

The same report indicated that during the 2010-2011 academic year there were 7,666 faculty positions (Schenk et al., 2011). Fifty-five percent of the faculty members were female. The average age was 48.5 years for all faculty members and 50.1 years for full-time faculty members. Ninety-three percent of the faculty members were Caucasian, with the largest minority representation being African American. The average base salary for 9-month contracted full-time faculty was $52,350. The data from this report were in aggregate for all faculty members, including part-time, or adjunct, instructors. So, while this report cannot be used to validate the results of this study, it can be used to inform about the overall characteristics of Iowa community college faculty during the appropriate time frame.

Summary

While teaching practices that promote student success include traditional examples of mastery of the subject area and good communication and organizational skills, good practices for faculty members to follow also include the encouragement of student–faculty contact and the encouragement of cooperation among students (Patton, 2006). In other words, the faculty–student relationship is not limited to academic content only. The need has been shown for students to be involved in extracurricular activities of almost any type to reduce academic attrition (Astin, 1999). It is in these situations that a faculty member can get to know a student as a person rather than just a name in the course roster. Students feeling like they belong within the academic and social systems at their colleges has been shown to be important for student persistence (Tinto, 1993). It is important for faculty to be involved in formal and informal academic systems and to support and encourage social activities and organizations for students.

Getting students involved is more challenging at the community college than at the university (Astin, 1999). This is because community college students are more likely to commute, attend classes part time, and have considerable responsibilities outside of school, such as jobs and families, which all work in opposition to the investment of time required for meaningful engagement. Because community colleges are seen as a potential source for increasing the number of students seeking STEM majors, and because they do face some unique challenges not found at 4-year institutions, federal grants have been made available that are designed specifically to meet the needs presented by these 2-year institutions. Funding is particularly important as community colleges search for ways to reach out to underrepresented students in STEM majors.

The full-time faculty employed at Iowa community colleges provided the population for this study. A description of the state's community college system was included in this chapter to provide a better understanding of the work requirements and environments affecting these faculty members. It is important to note the many similarities among the colleges, even though they each serve their own areas within the state.

CHAPTER 3: METHODOLOGY OF THE STUDY

Overview

This study compared the attitudes, perceptions, and behaviors, collectively referred to as the culture, of full-time Iowa community college math/science faculty to those of non-math/science faculty to see if they support efforts in student recruitment and retention similarly. Personality type was considered as a cause for observed differences. Additionally, variables related to culture and to professional development were examined and used to construct models that predict faculty engagement in either student recruitment or student retention. The research design, research questions, survey instrument, pretests, data collection, and data analysis are discussed in this chapter. Limitations, delimitations, and ethical issues are also considered.

The research was guided by six research questions:

1. How does the sociodemographic composition of the full-time community college math/science faculty compare to that of the non-math/science faculty? Specifically, are there differences in any of the sociodemographic variables that could account for observed differences between the two groups?
2. How do math/science faculty interact with students outside of the classroom, and how do these interactions compare to those of non-math/science faculty? Specifically, how do the two groups communicate with students, and how often do these communications take place? What types of academic and social interactions occur between the faculty and the students, and how do faculty encourage these interactions?

3. Do math/science faculty identify the same barriers to student success as non-math/science faculty members? (Potential barriers to success included academic preparation, availability of student support services, and personal issues.)
4. Do math/science faculty have the same perceptions as non-math/science faculty concerning their role as mentors and providers of encouragement to their students? (Areas of encouragement related to participation in social and academic organizations and job shadowing or internship opportunities.)
5. Do math/science faculty have the same attitudes about the importance of their roles in student recruitment and retention as non-math/science faculty members? Specifically, do the two groups have similar attitudes about recruiting students in general and for recruiting underrepresented students in their disciplines? Do they view their roles similarly with respect to retention within their classes and within their disciplines?
6. Can professional activities and aspects of faculty culture be identified that correlate and predict a high commitment to recruitment and retention of students in their fields by math/science faculty?

Research Design

A quantitative methodology that employed the use of a self-administered, electronic survey was used for this study. The target population included all full-time Iowa community college faculty members. The survey provided a numeric description of answers to the research questions and was appropriate due to the geographic challenges posed by the disperse locations of the participants among the 15 community colleges in Iowa (Creswell, 2009). In addition, the time limitations of the faculty members made a survey the preferred means of gathering data since it allowed the participants the choice of when and where to take the survey and the flexibility of going back over questions and exiting and entering the survey when necessary. The survey was cross-sectional and was administered in the spring of 2011.

Population and Sample

The population for this study consisted of all full-time community college faculty members in the state of Iowa. A total of 1,812 full-time faculty members were identified by the 15 community colleges, and each was sent an invitation to participate. The faculty members represented all instructional areas of the colleges, including career and technical programs, arts and sciences, and developmental education. The first question in the survey asked the participants to self-report their status as a full-time faculty member to provide an additional means of establishing their full-time employment. Their roles at the respective colleges were self-reported by answering specific questions in the survey related to their areas of instruction. The sampling design was a combination of single stage and multistage due to the preference of 2 of the 15 institutions to administer the survey internally rather than directly by the researchers. The inclusion of all faculty members allowed the researchers to generate a comprehensive data set for many research projects, including comparisons between different groups.

Seven participants reported that they were not full-time faculty members, so their responses were eliminated from the data set. There were 931 participants who answered in the affirmative as full-time faculty members and 20 who did not answer the question. All of these were kept in the data set for a total of 951. The second question of the survey pertained to their principal activity during the prior academic year. Only those who selected the answer of "teaching" as their principal activity were kept in the population, reducing the total to 900. This excluded 20 missing answers, 5 who identified their main activity as support services, and 26 who reported "other" as their principal activity during the year.

Those faculty members who identified that their primary teaching responsibility was in the arts and sciences as opposed to career and technical or other areas were selected and made up the sample for this study. This reduced the 900 participants to 429. These remaining participants were then divided into two groups by a recoding step in Qualtrics®. Those who answered that the majority of their teaching assignment was within math or science were labeled as math/science faculty, and those who reported any of the other disciplines were labeled as non-math/science faculty. There were 149 valid math/science faculty members and 280 non-math/science faculty identified.

Survey Instrument

Under the direction of Associate Professor Frankie Santos Laanan and Professor Larry Ebbers of the Educational Leadership and Policy Studies program at Iowa State University (ISU), an original survey was designed by a team of researchers interested in several areas of full-time community college STEM faculty experiences (Appendix B). The 2007-2008 Higher Education Research Institute Faculty Survey (HERI), the Community College Faculty Survey of Student Engagement (CCFSSE), and the 2004 National Study of Postsecondary Faculty (NSOPF) were used as resources in the construction of the survey. Kathy Rogotzke (2011), a doctoral student on the team, provided oversight of the survey construction work and the Internal Review Board (IRB) process as her capstone project for her program of study (Appendix C). The survey process, including the instrument, pretesting, and communications to participants, were approved by the ISU IRB.

The final survey instrument included 41 items divided among nine sections requiring approximately 220 responses. Five comment areas were optional. The nine sections included the following:

1. Demographics to verify the full-time status of the participants along with related questions concerning union membership, educational preparation, and prior teaching experience.
2. Responsibilities and workload, which included questions related to teaching load by semester and other work-related activities.
3. Teaching and learning, which asked participants to analyze how often they used different instructional techniques and methods, evaluation methods, and technology and communication systems.
4. Professional development, which included questions related to participation in different professional development and training activities and how the participants rated the usefulness of these activities. This section also asked questions related to the educational aspirations of the participants and their involvement in any original research activities.
5. Student relations, which included questions related to the participants' perceptions concerning student preparedness and resources and their interactions with students.
6. Partnerships, which asked the participants how often they were involved in a variety of collaborative efforts.
7. Job choice and satisfaction, which included questions about why the participants entered their community college teaching professions and their satisfaction with their departments, campus climate, benefits, and training opportunities.
8. Sociodemographics, which asked participants to identify their salary ranges, contract lengths, gender, race, and marital status.

9. An optional comments section that asked the participants to identify what they enjoyed most and what they enjoyed least about their jobs as community college faculty members, and what would make their jobs better. It also gave them the opportunity to provide advice for future community college faculty members and to describe important characteristics or qualities of an effective community college instructor.

Tests of Validity and Reliability

In order to carry out a successful quantitative study using a survey, it was imperative to establish the validity and reliability of the instrument. According to Fowler (2009), there are five guiding principles for self-administered surveys. They should be self-explanatory, restricted to closed answers, there should be only a few different forms of questions, the layout should be clear and uncluttered, and instructions and information should be provided repeatedly to the point of redundancy. To verify that these criteria had been met in the design of the survey, and to help establish its validity and reliability, pretests were conducted before the launch of the statewide project.

Multiple meetings of the team were held where survey questions were suggested, discussed, and analyzed. Because the survey was quite lengthy, the importance of each of the questions to the proposed research projects was considered, and many survey questions were eliminated. Once the survey questions were decided on, the survey was shared with three research experts: Mr. Joseph DeHart, executive director of institutional effectiveness and assistant to the president at Des Moines Area Community College; Dr. Linda Hagedorn, associate dean for undergraduate programs for the College of Human Sciences at ISU; and Dr. Michael Morrison, former president of North Iowa Area Community College. Changes were made to the survey in response to their reported observations.

Before conducting the pilot study of the survey, it was administered to the research team in the electronic form that would be used for the statewide project. Each member was asked to complete the online version of the survey and to note any difficulties or irregularities encountered in the process. The team was also asked to review a series of questions that would be posed to the group involved in the pilot study (Appendix D). The team then met in person to discuss observations, review the survey content once again, and to finalize a draft to be sent to the ISU IRB as a modification to the overall project, which had already been approved. The Office of Community College Research and Policy was identified as the client (Appendix E). Instructions for the pilot participants and the questions that would be asked of these participants concerning the content of the instrument were included. A letter of invitation to participate in the pilot study was also reviewed, revised, and submitted to the ISU IRB (Appendix F).

Upon receipt of the approval notification from the ISU IRB, 18 former full-time community college faculty members were invited to participate in the pilot study. These individuals were either retired faculty members or they had moved to non-faculty positions. Representatives from STEM and non-STEM disciplines were included. Links to the survey were sent out to each participant electronically using Qualtrics® survey software, and the progress of the pilot study was monitored by identifying those who had chosen to participate. Reminders were sent out periodically to encourage more participation. The message that contained the link to the survey also served as a release statement explaining the purpose of the survey and the pilot study, how the results would be used, and the assurance of participants' anonymity. Specific instructions were provided to participants about reflecting back to when they were full-time faculty members and answering the questions related to their last year of instruction.

If they chose to take the survey, the pilot participants were asked to answer questions concerning their experiences and opinions of the survey instrument. They were asked if they had any technical problems and how long it took them to complete the survey. They were given the opportunity to list any questions that they found problematic due to awkward wording, lack of definitions, or inadequate answer options. The participants were asked to provide specific feedback about questions that seemed ambiguous or repetitive and about the overall organization of the instrument. The length of the survey was of particular concern because of the impact it could have on the completion rates for the research project. They were then asked to provide additional information that could improve the survey and what they thought the likelihood was that full-time faculty members would complete the survey.

The data from the pilot study were analyzed using the functions provided by the survey software, and reports were downloaded directly from the raw data. The answers provided in the pilot study were sufficient to conduct a statistical analysis of the distribution of the answers and to identify missing data. The answers to the pilot questions, which provided the participants the opportunity to critique the survey, were also considered in constructing the final survey instrument. The results from the pilot study were used to edit and modify the questions and improve the organization and design of the survey instrument.

Validity

According to Fowler (2009), validity measures how well an answer given on a survey corresponds to some measure of a true score, while Creswell (2009) stated that validity is how accurately one can make inferences from scores on a survey instrument. Face validity, how well the survey measures what the researchers desire to measure (Fink, 1995), and content validity, the extent to which a measurement reflects the specific intended domain of content (Carmines & Zeller, 1991), were established through the feedback provided from the survey experts and the pilot study. Fowler (2009) stated that there are four reasons why respondents may provide an inaccurate answer to a factual question. These include not understanding the question, not knowing the answer, not being able to recall the answer, and not wanting to report socially undesirable answers. Statistical analyses of the answers to the survey questions were used to identify unusual or missing data that could be indicators of poor question design or technical problems.

Reliability

Test-retest was used to establish the reliability, or test stability, of the survey instrument. According to Creswell (1994), reliability measures the consistency of responses provided to survey items. Five participants from the pilot study were asked to take the survey again 39 to 48 days after they had completed it the first time. The answers provided to both surveys were compared and used to establish reliability coefficients for all forced-answer and some open-ended questions included in the survey. If reliability was an issue with a survey question, it was omitted, reworded, or redesigned.

Data Collection

In the spring of 2010, the 15 Iowa community colleges were sent letters requesting the identification of the appropriate individuals at each institution who could provide a letter of institutional approval for participation, faculty lists with email information, and an internal review approval letter for those colleges that had their own review boards and processes. Upon receipt of this information, electronic messages were sent to each of the identified individuals requesting the information. Collection of this information was continued into the spring of 2011 in order to get the most up-to-date information before launching the survey.

In the spring of 2011, a presurvey message was sent to all of the full-time faculty using the email addresses that were provided by the community colleges. This message was designed to provide information and increase awareness regarding the survey, generate excitement about participating, and to check email addresses for accuracy. No emails returned as undeliverable, so the survey was launched the following day by sending another email with the link to the survey. Two community colleges preferred that an administrator at their institution send the link through an internal process. These administrators were sent the same messages and asked to forward them to their faculty members. Each of the administrators provided the researchers with the number of full-time faculty members surveyed in order for an accurate response rate to be calculated.

Faculty members were informed in the email sent for the survey that by clicking on the link to the survey, they were giving their permission for researchers to include their answers in the survey database (Appendix G). The participants were informed that they could skip any questions they preferred not to answer and that they could exit the survey and reenter at the same point at a later time. They were also told that they could move forward and backward throughout the survey and that they could choose to not participate in the survey at any time throughout the process. Reminders were sent periodically throughout the month of the survey that extended from April 14, 2011, to May 13, 2011.

Data Analysis

The survey was administered and the data collected electronically with the use of the Qualtrics® survey program provided by ISU. Once the survey was completed, the data were downloaded directly into the Statistical Package for Social Sciences® (SPSS) software. Answers to open-ended questions were entered manually by the researchers. The data were reviewed for irregularities and coded by the team before being released for data analysis by each individual researcher.

The response rate was determined by dividing the number of surveys that were submitted by participants as completed by the sum of the number of surveys sent out to email addresses provided by the institutions and the number of full-time faculty members supplied by the institutions using internal delivery methods. The total number of surveys sent to full-time faculty members at all 15 community colleges was 1,812. There were 958 surveys started by participants, but the number of surveys that were actually submitted as completed was 826 for a 45.6% rate of return. All responses were considered for the study, even if the survey was not completed or submitted.

Demographic characteristics of the faculty participants were examined using descriptive statistics provided by SPSS. Frequency distributions for gender, age, race, and marital status were analyzed and reported for the two groups. Also considered were completed degrees, attendance at a community college as a student, union membership, and annual base pay. Frequency distributions were also repeated throughout the analysis process to verify the study population.

Comparison analyses for Research Questions 1 through 5 were done using independent samples *t* tests to compare the means of the answers provided to survey questions by the two different groups and to determine if there was a statistically significant difference between them. Levene's test for equality of variances was used to satisfy that equal variances were assumed between the two groups. If the Levene test was not significant, equal variances were assumed. If the test was significant, then equal variances were not assumed and the adjusted data were reported. A 95% confidence interval was used for all tests of significance (Morgan, Leech, Gloeckner, & Barrett, 2007). The upper and lower bounds of the confidence intervals for all significant findings were reviewed to verify that both values had the same sign, thus excluding the possibility of zero difference. One exception to the use of the independent samples *t* test was the comparison of ages between the math/science and non-math/science faculty members, for which the Mann-Whitney U test was done.

To address Research Question 6, two types of data analysis were required: exploratory factor analysis (EFA) and multiple regression analysis. EFA was used as a data reduction step by grouping highly correlated variables together into a single construct. A correlation matrix of variables was calculated. Then the factors were extracted and rotated to aid in interpretation. Included in the EFA were the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. Settings included eigenvalues greater than 1, a maximum of 25 iterations for convergence, a varimax method, and the exclusion of cases listwise. Once each factor was identified from the rotated component matrix, Cronbach's alpha was calculated to measure the reliability of each. Alpha scores above 0.6 were considered for the final results. Factors with scores above 0.95 were examined for issues of redundancy and either eliminated or the variables included in the analysis were adjusted.

Multiple regression analysis was used to predict faculty engagement in either student recruitment or student retention from a combination of independent or predictor variables from the survey questions or from the EFA. The independent variables were placed into three blocks. The first was the same for both models and included age, gender, instructor type, and attendance at a community college as a student. The second block included variables and factors related to faculty culture, and the third included professional development variables and factors. Maximum iterations for convergence were set at 25. Under statistics, settings selected were estimates for regression coefficients, model fit, R^2 change, and descriptives. Two scatter plots were selected that included *ZRESID for Y and ZPRED for X, and two standardized residual plots were selected that included histogram and normal probability. Unstandardized, standardized, and adjusted were all selected under predicted values. Options selected included to use the probability of F for stepping method criteria and replace with mean.

Delimitations and Limitations

This study was delimited to full-time community college faculty members employed at public, not-for-profit 2-year institutions in the spring of 2011. All 15 community colleges were located in Iowa and accredited through the North Central Association of the Higher Learning Commission. They were subject to the same governance by the Iowa Department of Education.

The study was also delimited to a somewhat narrow definition of culture. The term *culture* was used to discuss and describe the perceptions, attitudes, and behaviors of the community college faculty with respect to student recruitment and retention. The theoretical perspective used to interpret the data was focused and described differences between the math/science and non-math/science faculty in terms of personality types, particularly the aversion to social interactions that is characteristic of the investigative type of personality.

A limitation of this study was the accuracy of the survey delivery to the full-time faculty members at each participating community college. The survey instrument was disseminated and administered electronically in two different ways. Thirteen of the 15 community colleges allowed the electronic survey links to be provided directly to each faculty member. This process relied on the accuracy and completeness of the electronic mailing list provided by each institution. No emails were returned, but two addressees responded that they were not full-time faculty members. In anticipation of this problem, questions were included in the survey to identify non-full-time faculty participants. Two community colleges requested that the survey link be administered from an internal source at their campuses. This was problematic in determining the effective delivery of the link and the return rate for those two colleges.

Over 50% of the full-time faculty accessed the survey, but not all progressed to the end for a recorded exit, and some did not answer every question. The length of the survey may have been problematic in getting better completion rates. One community college experienced technical problems that were identified as local issues and were out of the control of the survey process. The problems were addressed by that institution's information technicians and surveys were received from that institution, but several were not completed. While the survey was tested and piloted with survey experts and a sample population, interpretation of some questions may have varied from one individual to another. In addition, the responses to the survey items were self-reported and subject to bias by the participants.

It is important to note that since many community colleges rely heavily on part-time instructors, not all faculty efforts in recruitment and retention were included in this study.

Also, generalizations of the results are limited since the study was confined to only community colleges in the state of Iowa. Even though each college varies according to the needs and culture of its community, the data are all reported in aggregate so that local differences would not be revealed. The time frame of the study posed challenges since the survey was administered in the spring, near the end of an academic year, and participants were reflecting on the entire year, relying only on their memories for many of their responses.

Ethical Issues

All guidelines provided by the ISU IRB were followed to ensure that all ethical issues were considered. The anonymity of all participants was maintained, and no information concerning the community colleges where they were employed as faculty members was revealed. The answers were used in a limited manner to address specific research questions, and the results were reported only in aggregate. The volunteers were informed that they could choose not to answer specific questions and that they could discontinue their participation at any time throughout the project.

An ISU IRB-approved cover letter (Appendix G), which informed the participants about who was administering the survey and its purpose, was sent out along with the survey link. The letter provided instructions for completing the survey and assurances that participation was voluntary and confidential. Contact information was provided for reports of concerns or to ask questions. The participants were told that accessing the survey through the online link served as their permission to use their answers in the study.

Summary

This was a study of Iowa full-time community college faculty members' perceptions, attitudes, and behaviors concerning the recruitment and retention of students into STEM majors. The methodology was quantitative and used results from a statewide survey. It compared variables related to demographics and culture between math/science faculty and non-math/science faculty. The variables chosen were those that have been found to support success in recruitment and retention. These same variables, along with those related to professional development, were used to construct predictive models of faculty engagement in these efforts.

CHAPTER 4: RESULTS

The responses to a statewide survey of full-time community college faculty members provided the data used in this study. After sorting participants according to their self-reported status as full-time faculty members, responses from 429 faculty members were found to be valid and formed the sample population for the following analyses. These faculty members' responses indicated that, at the time of the survey, they were employed as full-time faculty members, with their primary duties being instructional within the arts and sciences area of their colleges. Of these 429 faculty members, 149 classified themselves as full-time math or science instructors (math/science faculty) and 280 were in areas of instruction within the arts and sciences but outside of the areas of math and science (non-math/science faculty).

The data were analyzed to answer six research questions, and the results reported in this chapter are organized accordingly. The first five questions required comparisons between the math/science faculty and the non-math/science faculty. Unless indicated otherwise, results for these five questions are from descriptive and independent samples *t*-test analyses of the survey data. The results for the remaining research question are from exploratory factor analyses and multiple regression analyses using the combined population of all the arts and sciences faculty (N = 429).

Comparison of Math/Science to Non-Math/Science Faculty

Demographic and Professional Characteristics

Gender, age, marital status, and race/ethnic background were compared between the math/science and the non-math/science faculty participants. Among math/science faculty members, males outnumbered females 78 to 71, accounting for 52.3% of the group. Females outnumbered males among the non-math/science faculty 155 to 117, accounting for 57.0% of that group. A comparison of the two groups shows that equal variances could be assumed and that the difference in composition by gender was statistically insignificant (p = 0.067). Table 1 presents the comparison data of the demographic characteristics of the faculty.

Table 1

Comparison of Demographic Characteristics Between Math/Science and Non-Math/Science Full-Time Faculty

	Math/science faculty		Non-math/science faculty	
Variable	*n*	%	*n*	%
Gender				
Female	71	47.7	155	57.0
Male	78	52.3	117	43.0
Total	149		272	
Age[a]				
Younger than 25 years	1	< 1.0	0	< 1.0
25-34	13	9.6	29	11.7
35-44	34	25.0	46	18.6
45-54	48	35.3	82	33.2
55-64	35	25.7	75	30.4
65-74	5	3.7	15	6.1
Total	136		247	
Marital status				
Single and never married	17	12.6	21	8.7
Married	103	76.3	187	77.6
Living with partner or significant other	4	3.0	9	3.7
Separated, divorced, or widowed	11	8.1	24	10.0
Total	135		241	
Race/ethnic background				
American Indian or Alaska Native	0	< 1.0	3	1.2
Asian	6	4.5	0	< 1.0
African American	1	< 1.0	3	1.2
Hispanic	0	< 1.0	2	< 1.0
Hawaiian or Pacific Islander	0	< 1.0	0	< 1.0
Other	1	< 1.0	9	3.7
Caucasian	126	94.0	226	93.0
Total	134		243	

[a] Scale: 1 = younger than 25 years, 2 = 25-34 years, 3 = 35-44 years, 4 = 45-54 years, 5 = 55-74 years, and 6 = 65-74 years.

On average, the math/science faculty were younger (M = 3.87) than the non-math/science faculty, with a mean falling within the age category of 35-44 years. The mean age of the non-math/science faculty (*M* = 4.00) was at the lowest end of the age category of 45-54 years. The difference in the ages of the two groups was not a concern for this study since a Mann-Whitney U test was insignificant, $U = 15{,}529$, $p = 0.20$.

The majority of the faculty, 76.3% of the math/science and 77.6% of the non-math/science, reported being married. Only 8.1% of the math/science and 10.0% of the non-math/science said that they were separated, divorced, or widowed. The remainder of the faculty reported being single and never married (12.6% of math/science and 8.7% of non-math/science) or living with a partner or significant other (3.0% of math/science and 3.7% of non-math/science).

The majority of math/science faculty (94%) and non-math/science faculty (93%) reported being Caucasian. Only eight math/science faculty members reported being non-Caucasian: Asian ($n = 6$), African American ($n = 1$), and other ($n = 1$). Seventeen non-math/science faculty reported being non-Caucasian: American Indian or Alaska Native ($n = 3$), African American ($n = 3$), Hispanic ($n = 2$), and other ($n = 9$). Even though few faculty members reported belonging to a race other than Caucasian, the distribution of those who did report was different between the two groups. Asian faculty made up the highest percentage of minority math/science instructors at 4.5%, and the category of "other" made up the largest minority group reported by non-math/science faculty at 3.7%.

In addition to personal demographic questions, the participants were asked questions pertaining to their professional characteristics, such as union membership, base salary, the identification of all degrees they had earned, and to report if they had ever attended a community college as a student. More non-math/science faculty reported being union members at 65.2% compared to 58.1% of the math/science faculty. Most of the faculty

(70.6% math/science and 68.5% of the non-math/science) fell within the $40,000 to $59,999 base salary range. Only 2.2% of the math/science faculty and 2.5% of the non-math/science faculty reported base salaries greater than $80,000. The comparison of the responses of the two groups on their professional characteristics is shown in Table 2.

Table 2

Professional Characteristics of Math/Science and Non-Math/Science Faculty

	Math/science faculty (*n* = 149)		Non-math/science faculty (*n* = 280)	
Variable	*n*	%	*n*	%
Union				
Yes	79	58.1	176	65.2
No	57	41.9	94	34.8
Total	136		270	
Base salary				
$20,000 - $39,999	10	7.4	20	8.3
$40,000 - $59,999	96	70.6	165	68.5
$60,000 - $79,999	27	19.8	50	20.7
$80,000 - $99,999	3	2.2	6	2.5
Total	136		241	
Degrees completed				
Doctorate	36	24.0	53	19.0
Attended community college				
No	107	42.9	166	33.9
Yes	40	57.1	112	66.1
Total	147		278	

The intent of this study was to compare levels of education between the two groups by asking the participants to check all degrees that they had earned. However, when examining the results, it was found that 348 of the arts and sciences faculty reported earning a master's degree and only 148 reported earning a bachelor's degree. This implied that many participants answered this question with the highest degree earned rather than checking all degrees earned. Since the reliability of the survey question was in doubt, the only data that were considered were responses about an earned doctorate. This was the highest degree listed in the survey and was the only category that would be answered the same no matter how the question was interpreted. Another limitation to this question was the inability to distinguish between those participants who did not mark an answer because they did not earn the degree and those who chose not to answer the question. The percentages reported in Table 2 are based on the total population of math/science and non-math/science faculty participating in the survey. It can be seen that a higher percentage of math/science faculty earned a doctoral degree than the non-math/science faculty. A comparison for statistical significance was not computed due to the limitations of the data, and the data were not used in any other analyses.

A higher percentage of non-math/science faculty (66.1%) reported having attended a community college when compared to math/science faculty (57.1%). An independent samples *t* test indicated the difference to be statistically significant ($p = .000$). Due to its significance, this variable was considered for the models predicting high faculty commitment to student recruitment and retention.

Time Spent Interacting With Students

The results for five questions from the survey that provided information about how much time faculty members estimated that they spent doing specific activities with students in an average 7-day week are shown in Table 3. Of the five activities considered, all the faculty reported that emailing students took the most time, with no significant difference between the two groups ($p = .724$). This amount of time was 1-4 hours per week for both the math/science and non-math/science faculty ($M = 1.25$ and $M = 1.28$, respectively). Math/ science faculty reported that they spent the least amount of time supervising internships and field trips, with an average estimate of well below an hour per week ($M = .09$). Non-math/

science faculty were significantly more likely to spend time on these activities (p = .000), but the average amount of time was still well below an hour per week (M = .32). Also, math/ science faculty reported spending significantly less time working with students on activities other than coursework (committees, clubs, orientation, etc.) than the non-math/science faculty ($p < .01$). There was no significant difference between the two groups on estimated amount of time devoted to advising (p = .160) or working with honors projects (p = .209).

Table 3

Comparison of Average Number of Hours Spent Doing Activities With Students in a 7-Day Week

	Math/science			Non-math/science					
Variable	*n*	*M*	*SD*	*n*	*M*	*SD*	*t*	*df*	*p*
Communicating via email	142	1.25	.678	271	1.28	.609	-.354	411	.724
Supervising internships/field trips	138	.09	.317	258	.32	.789	-3.99[a]	372[a]	.000
Advising	139	.76	.600	267	.85	.703	-1.41	404	.160
Activities other than coursework	139	.51	.706	264	.82	1.074	-3.05	401	.002
Honors projects	139	.12	.363	260	.17	.412	-1.26[a]	314[a]	.209

Note. Scale: 6 = 21 or more hours, 5 = 17-20 hours, 4 = 13-16 hours, 3 = 9-12 hours, 2 = 5-8 hours, 1 = 1-4 hours, and 0 = 0 hours.
[a] Values were adjusted because variances were not equal.

Communicating With Students

When looking at how the two groups typically communicated with students, both indicated that they used face-to-face meetings the most, with the means falling between *most of the time* and *all of the time* (M = 2.25 for math/science and M = 2.26 for non-math/science faculty), as shown in Table 4. Both groups reported rarely using Facebook or other types of communication not listed in the survey, with the means for both groups being very close to *not used*. Significant differences were found in using email, with math/science faculty less likely to use email (p = .004) or phone calls (p = .019). Interestingly, the mean values for all types of communication were less for math/science faculty when compared with non-math/ science participants.

Table 4

Comparison of Means for Questions on Communicating With Students

	Math/science			Non-math/science					
Variable	*n*	*M*	*SD*	*n*	*M*	*SD*	*t*	*df*	*p*
Email	141	1.82	.816	271	2.06	.816	-2.92	410	.004
Face-to-face	142	2.25	.726	270	2.26	.736	-.168	410	.866
Phone calls	140	1.01	.575	269	1.17	.706	-2.36[a]	335[a]	.019
Facebook	139	.14	.427	262	.15	.489	-.023	399	.981
Other	85	.25	.671	175	.34	.820	-.879	258	.380

Note. Four-point Likert scale: 3 = *all of the time*, 2 = *most of the time*, 1 = *some of the time*, and 0 = *not used*.
[a] Values were adjusted because variances were not equal.

Social Interactions

Six survey questions were used to examine how faculty interacted with students in a social context rather than academic. As shown in Table 5, both groups reported that they frequently greeted and waved at students or made brief comments to students. The means for both groups were close to *often* at 3.91 for math/science faculty and 3.90 for non-math/ science faculty. This was the only question in the group for which the mean for math/ science faculty was higher than for non-math/science. The lowest reported social interaction for both groups, with no significant difference between the two, was having social conversations about the faculty member, with the means falling between *rarely* and *sometimes*. There was no significant difference between the two groups in how often they reported answering questions or having short discussions with students about academic issues or counseling students to provide career or professional development advice. However, math/science faculty were significantly less likely to engage students in social conversations about the student (*p* = .016) or provide counseling to students in order to provide emotional support (*p* = .022).

Table 5

Comparison of Means for Questions Concerning Interactions With Students Outside of the Classroom

	Math/science			Non-math/science					
Variable	*n*	*M*	*SD*	*n*	*M*	*SD*	*t*	*df*	*p*
Greetings, waves, or brief comments	141	3.91	.327	255	3.90	.335	.371	394	.711
Answering questions or short discussions concerning academic issues	141	3.62	.502	254	3.69	.489	-1.38[a]	283[a]	.170
Social conversations about the student	141	3.01	.774	253	3.20	.720	-2.41	392	.016
Social conversations about instructor	141	2.61	.782	254	2.73	.781	-1.44	393	.150.
Counseling to provide emotional support	141	2.65	.784	254	2.84	.784	-2.31	393	.022
Counseling to provide career or professional development advice	141	3.13	.689	254	3.19	.750	-.657	393	.512

Note. Four-point Likert scale: 4 = *often*, 3 = *sometimes*, 2 = *rarely*, and 1 = *never*.
[a] Values were adjusted because variances were not equal.

Recruiting Students

Table 6 summarizes the results of four questions that were used to measure and compare how often the faculty participated in recruitment-related activities. There were no statistically significant differences found between the groups for any of the four questions. Both groups reported that they were most likely to encourage students to major in their discipline, with means below but close to *sometimes*. Both groups were least likely to visit K-12 classes to encourage students to consider majors in their discipline, with the means being the same for both groups, falling between *never* and *rarely*. The means for both groups approached *rarely* for making presentations about career opportunities for individuals with degrees in their discipline, with math/science having the lowest mean at 1.83 as compared to 1.91 for non-math/science faculty. The means slightly surpassed *rarely* for participation in recruitment activities organized by their institutions, with math/science faculty again having the lowest mean (M = 2.15).

Table 6

Comparison of Means for Questions Concerning Student Recruitment Efforts

	Math/science			Non-math/science					
Variable	*n*	*M*	*SD*	*n*	*M*	*SD*	*t*	*df*	*p*
Encourage to major in discipline	141	2.87	.668	252	2.85	.787	.154	391	.878
Visit K-12 classes	141	1.52	.771	251	1.52	.792	.084	390	.933
Presentations about career opportunities	141	1.83	.963	251	1.91	.948	-.783	390	.434
Recruitment activities organized by institution	141	2.15	.963	251	2.29	1.062	-1.39[a]	315[a]	.167

Note. Four-point Likert scale: 4 = *often*, 3 = *sometimes*, 2 = *rarely*, and 1 = *never*.
[a] Values were adjusted because variances were not equal.

Identifying Barriers to Student Success

As shown in Table 7, 12 questions from the survey were used to compare perceptions of math/science faculty to those of non-math/science faculty regarding barriers to student success. These questions centered around three categories: academic preparation, institutional resources, and personal issues. Questions about academic preparation required the participants to rate their level of agreement with statements concerning academic preparation, critical thinking skills, reading skills, writing skills, and math skills. Perceptions concerning institutional resources were examined by asking the participants their level of agreement with statements about the use of learning resources by students and the availability of support and tutoring services. Personal issues faced by students were explored by employing similar questions about the adequacy of student effort in their classes and the degree to which students struggle in their classes due to demands placed on them by their employment, family responsibilities, and financial stress. The participants were given the option of answering all of these questions with "don't know" in order not to force responses when they felt they did not have adequate information to formulate an agreement statement. Those who chose this option were not included in the data analyses explaining the variability seen in the sample size for each question.

Table 7

Comparison of Means for Identifying Barriers to Student Success

	Math/science			Non-math/science					
Variable	*n*	*M*	*SD*	*n*	*M*	*SD*	*t*	*df*	*p*
Adequate academic preparation	141	2.18	.647	253	2.17	.608	.173	392	.863
Adequate critical thinking skills	141	2.22	.645	252	2.08	.622	2.06	391	.040
Adequate reading skills	136	2.57	.592	252	2.31	.666	3.93	386	.000
Adequate writing skills	133	2.25	.644	249	2.15	.629	1.40	380	.162
Adequate math skills	137	2.12	.642	95	2.25	.699	-1.50[a]	191[a]	.134
Adequate use of learning resources	138	2.39	.759	247	2.36	.641	.353[a]	246[a]	.725
Sufficient support services	139	3.29	.704	246	3.11	.754	2.33	383	.020
Sufficient tutoring services	139	3.22	.769	246	2.99	.830	2.66	383	.008
Adequate effort by students	138	2.29	.664	249	2.35	.738	-.841	385	.401
Employment demands	132	2.98	.704	233	3.08	.659	-1.36	363	.175
Family responsibilities	131	3.07	.610	232	3.09	.651	-.376	361	.707
Financial stress	118	2.98	.640	226	3.05	.678	-.927	342	.354

Note. Four-point Likert scale: 4 = *strongly agree*, 3 = *agree*, 2 = *disagree*, and 1 = *strongly disagree*.
[a] Values were adjusted because variances were not equal.

When asked about their level of agreement with the positive statements about academic preparedness for their classes, the responses given by the participants fell close to *disagree*, with mean values ranging from 2.08 to 2.31. The one exception to this was the mean of the math/science faculty responses to adequacy of reading skills, which edged closer to *agree* (M = 2.57) and was significantly different from the mean for the non-math/science faculty (p = .000). There was also a statistically significant difference between the two groups in their perceptions of critical thinking skills, with math/science faculty being more favorable of the level of preparation perceived (p = .040). Interestingly, the mean values for the questions concerning the adequacy of the academic preparation of students were higher for the math/science faculty in every case. This indicates that, when compared to their non-math/science colleagues, math/science faculty perceive that students are better prepared for their courses in the identified areas.

Both math/science and non-math/science faculty generally disagreed with the statement that students effectively utilize learning resources for their classes (M = 2.39 and M = 2.36, respectively). However, both groups responded in a more positive manner when asked about the availability of resources for their students, with the means of their answers indicating their agreement that sufficient support services and tutoring services were available (M > 3.00). In fact, the mean values of the math/science faculty responses concerning both support services and tutoring services were significantly higher than those of the non-math/science faculty (p = .020 and p = .008, respectively).

When asked about their perceptions of personal barriers to student success, there were no significant differences found in the responses provided by the participants. Both groups generally disagreed that students put in adequate effort to be successful in their classes (M = 2.29 for math/science faculty and M = 2.35 for non-math/science faculty). However, there was general agreement that the outside demands of work, family, and finances were problems for students (mean values ranging from 2.98 to 3.09).

Mentoring and Guiding Students

Five items from the survey provided data to compare math/science faculty with non-math/science faculty regarding their attitudes about mentoring and guiding students. The survey participants were asked to report their level of agreement with statements about their personal role as a mentor, the benefits of discipline-related student organizations, and the benefits of job shadowing or internship opportunities. Questions concerning the importance of encouraging their students to participate in social organizations and activities as well as academic activities were also included. The results are shown in Table 8.

Table 8

Comparison of Means for Questions Concerning Mentoring and Guiding Students

	Math/science			Non-math/science					
Variable	*n*	*M*	*SD*	*n*	*M*	*SD*	*t*	*df*	*p*
Consider myself a mentor	140	3.24	.521	251	3.41	.641	-2.80[a]	339[a]	.005
Students benefit from discipline-related student organizations	107	2.74	.664	200	3.03	.769	-3.32	305	.001
Students benefit from discipline-related job shadowing or internship opportunities	105	2.90	.733	188	3.02	.859	-1.27	291	.206
Important that I encourage students to participate in social organizations and activities	125	2.82	.614	241	3.08	.714	-3.55	364	.000
Important that I encourage students to participate in academic activities	133	3.20	.547	248	3.39	.620	-2.99[a]	300[a]	.003

Note. Four-point Likert scale: 4 = *strongly agree*, 3 = *agree*, 2 = *disagree*, and 1 = *strongly disagree*.
[a] Values were adjusted because variances were not equal.

While the mean values indicate that the participants generally agreed with all of the statements, in every case the value for the math/science faculty responses was lower than that of the non-math/science faculty. Additionally, only the difference in responses to the statement that students benefit from discipline-related job shadowing or internship opportunities was statistically insignificant (*p* = .206). Math/science faculty were significantly less likely than non-math/science faculty to agree with the importance of their role in encouraging students to participate in social organizations and activities (*p* = .000) or academic activities (*p* = .003). They also attributed less benefit to student participation in discipline-related organizations than the non-math/science faculty (*p* = .001). Math/science faculty were also less likely to consider themselves mentors to the students in their classes than the non-math/science faculty members (*p* = .005).

Student Recruitment and Retention

The attitudes of the faculty related to their roles in student recruitment and retention were explored by asking them to rate their level of agreement with statements concerning the importance of efforts in these areas and their responsibility for these efforts. The results are summarized in Table 9. There were no significant differences found between the two groups on any item. While there was general agreement with each statement as indicated by the means, those items related to recruitment had lower values than those for retention.

The item with the lowest mean for both groups (*M* = 2.36 for math/science and *M* = 2.34 for non-math/science faculty) was the statement that it was important to recruit students in a way that maintained or helped establish gender balance within their disciplines. The means that were next to the lowest for both groups (*M* = 2.42 for math/science and *M* = 2.47 for non-math/science faculty) were for the statement that it was important to recruit students of color into their disciplines. The highest level of agreement concerning recruitment was for the item with a more general statement of responsibility for the recruitment of students into majors in their disciplines.

Table 9

Comparison of Math/Science and Non-Math/Science Faculty on Attitudes Concerning Roles in Student Recruitment and Retention

	Math/science			Non-math/science					
Variable	*n*	*M*	*SD*	*n*	*M*	*SD*	*t*	*df*	*p*
Responsible to recruit students into majors in my discipline	136	2.56	.787	244	2.50	.853	.708	378	.479
Important to recruit in a way that maintains or helps establish gender balance in my discipline	121	2.36	.796	210	2.34	.911	.209	329	.834
Important to recruit students of color into my discipline	121	2.42	.783	210	2.47	.903	-.478	280	.633
Responsible for aiding in the retention of student in my classes	141	3.33	.592	249	3.32	.702	.071	388	.944
Responsible for aiding in the retention of students within my discipline at my institution	138	3.13	.649	244	3.14	.804	-.118[a]	336[a]	.906
Responsible for aiding in the retention of students within my discipline when transferring to another institution	129	2.93	.709	228	2.87	.876	.725[a]	313[a]	.469

Note. Four-point Likert scale: 4 = *strongly agree*, 3 = *agree*, 2 = *disagree*, and 1 = *strongly disagree*.

When comparing the means for the questions related to retention, agreement was strongest for the faculty being responsible for retention within their classes (*M* = 3.33 for math/science and *M* = 3.32 for non-math/science faculty). This was followed by the item related to retention within their disciplines (*M* = 3.13 for math/science and *M* = 3.14 for non-math/science faculty). The lowest mean values were for retention of students within their disciplines when transferring to another institution (*M* = 2.93 for math/science and *M* = 2.87 for non-math/science faculty).

Prediction Models for Faculty Engagement in Student Recruitment and Retention

Data Reduction by Exploratory Factor Analysis

Prediction models for commitment to student recruitment and retention were tested using survey items related to two key areas of interest: faculty culture and professional development. Data reduction was performed by identifying constructs for faculty culture and professional development using exploratory factor analysis (EFA). Thirty-six items from the survey that reflected participants' perceptions, attitudes, and behaviors were included in the faculty culture analysis, and 18 were used in the professional development analysis. The answers provided by both math/science and non-math/science instructors were used.

Seven factors that included 24 of the 36 survey items for faculty culture emerged as identified in Table 10. The seven factors were (a) job satisfaction, (b) student recruitment, (c) student retention, (d) confidence in students, (e) student services, (f) student encouragement, and (g) student interaction outside of the classroom. The value of Cronbach's alpha was higher ($\alpha = .906$) for the student recruitment construct if "it is my responsibility to recruit students into majors in my discipline" was left out. However, because the value was still good ($\alpha = .851$) with this variable included, it was retained because of its general inclusiveness of students. Similarly, the value of Cronbach's alpha would have been slightly higher ($\alpha = .813$) for the student encouragement factor if "students interested in the discipline I teach benefit from discipline-related student organizations" had been left out, but it was included because of its value to the study and because Cronbach's alpha value was good ($\alpha = .809$) with its inclusion. The internal consistency of each factor was found to be reliable, with Cronbach's alpha values ranging from a low of .736 for student interaction outside of the classroom to a high of .852 for job satisfaction.

Table 10

Constructs of Faculty Culture

Variable	Factor loadings
Job satisfaction (α = .852)	
I am recognized as an excellent teacher by the administration at my institution	.881
Female faculty members are treated equitably at my institution	.832
I am a valued employee at this institution	.733
Faculty members of color are treated equitably at my institution	.665
Student recruitment (α = .851)	
It is important for me to recruit in a way that maintains or helps establish gender balance in my discipline	.891
It is important for me to recruit students of color into my discipline	.838
It is my responsibility to recruit students into majors in my discipline	.646
Student retention (α = .847)	
It is my responsibility to aid in the retention of students in my classes.	.889
It is my responsibility to aid in the retention of students within my discipline at my institution.	.886
It is my responsibility to aid in the retention of students in my discipline when transferring to another institution.	.797
Confidence in students (α = .832)	
Students in my classes demonstrate adequate critical thinking skills	.899
Students in my classes demonstrate adequate math skills	.832
Students in my classes demonstrate adequate writing skills	.830
Students in my classes are well prepared academically for my classes	.793
Student services(α = .828)	
Sufficient tutoring services are available for students in my classes	.818
Sufficient support services are available for students in my classes	.814
Student encouragement (α = .809)	
It is important that I encourage students to participate in social organizations and activities	.800
It is important that I encourage students to participate in academic activities	.787
Students interested in the discipline I teach benefit from discipline related job shadowing or internship opportunities	.609
Students interested in the discipline I teach benefit from discipline-related student organizations	.545
Student interaction outside of the classroom (α = .736)	
Social conversations about the student	.803
Social conversations about yourself	.777
Counseling to provide career or professional development advice	.728
Counseling to provide emotional support	.629

Significant differences in the answers provided by the math/science faculty when compared to the non-math/science faculty were found for several of the variables included in the new factors for faculty culture. An independent samples *t* test was performed to compare the factors between the two groups. This was done to further explore the significance of the differences between the two groups and to determine if the differences were somewhat mitigated when multiple variables were considered for a particular characteristic. The results can be seen in Table 11.

Table 11

Comparison of Means for Factors Describing Faculty

	Math/science			Non-math/science					
Variable	*n*	*M*	*SD*	*n*	*M*	*SD*	*t*	*df*	*p*
Job satisfaction	89	14.01	1.93	143	13.42	2.54	2.01[a]	220[a]	.046
Student recruitment	117	7.32	2.08	203	7.33	2.36	-.020	318	.984
Student retention	129	9.36	1.74	222	9.31	2.13	.219[a]	312[a]	.827
Confidence in students	129	8.69	2.09	93	8.88	2.23	-.656	220	.513
Student services	138	6.51	1.38	242	6.11	1.45	2.61	378	.010
Student encouragement	89	11.62	2.00	174	12.59	2.43	-3.45[a]	210[a]	.001
Student interaction outside of the classroom	141	11.41	2.32	251	11.97	2.24	-2.35	390	.019

[a] Values were adjusted because variances were not equal.

Significant differences between the two groups of faculty were seen in four of the seven factors: job satisfaction, student services, student encouragement, and student interaction outside of the classroom. Math/science faculty reported significantly higher satisfaction with their jobs as compared to the non-math/science faculty ($p = .046$). They also indicated significantly higher satisfaction with the services provided for students at their institutions ($p = .010$). However, they were significantly less likely to provide encouragement to students (p = .001) or interact with students outside of the classroom (p = .019).

A second EFA was performed on 18 items from the survey related to professional development activities. Examples of activities included were participation in national conferences that were discipline specific or focused on teaching, discipline-related workshops, teaching workshops, and other professional development and training activities. The questions for these items required a yes or no response for participation. If the answer of yes was chosen, the participants were asked a follow-up question to rank the usefulness of the activity. It was the Likert scale for usefulness that was used in the EFA. Other questions that were included related to participation in partnerships with organizations outside of the participant's college and participation in formal recruitment activities. Of the 18 items included in the EFA, 17 fit into five constructs. The one item that was excluded related to grant partnerships with 4-year institutions. The five factors identified were (a) professional conferences, (b) student outreach and opportunities, (c) training to assist students, (d) workshops, and (e) articulation discussions (see Table 12). Again, Cronbach's alpha values indicated reasonable internal consistency reliability, with values ranging from a low of .680 for articulation discussions to a high of .881 for professional conferences.

Prediction Models

Factors identified in the EFA for faculty culture were used as dependent variables for two models, one to predict faculty engagement in student recruitment and the other in student retention. The two factors were clearly labeled as "student recruitment" and "student retention." Each had good internal consistency as revealed by the Cronbach's alpha values

Table 12

Constructs of Professional Development Activities

Variable	Factor loadings
Professional conferences (α = .881)	
Usefulness of presenting at a conference focused on my discipline	.862
Usefulness of a national conference focused on my discipline	.850
Usefulness of paid travel to conferences/workshops	.836
Usefulness of national conference focused on teaching and instruction	.791
Usefulness of presenting at a conference focused on teaching and instruction	.789
Student outreach and opportunities (α = .853)	
Placement of students into internships	.816
Visit K-12 classes to encourage students to consider majors in my discipline	.809
Placement of students into job shadowing opportunities	.786
Make presentations to potential students about career opportunities for individuals with degrees in my discipline	.781
Recruitment activities that my institution has organized	.663
Finding employment for students	.648
Training to assist students (α = .816)	
Usefulness of professional development on strategies to assist underprepared students	.766
Usefulness of training to teach diverse learners	.697
Workshops (α = .727)	
Usefulness of workshops focused on the discipline in which you teach	.778
Usefulness of workshops focused on teaching/instructional techniques	.738
Articulation discussions (α = .680)	
Discussions concerning course content and articulation with 4-year college/university faculty	.854
Discussions concerning course content and articulation with other community college instructors	.798

of .851 for student recruitment and .847 for student retention, and each reflected a broad commitment to the effort it represented. The factor of student recruitment asked the faculty to rate their level of agreement with statements that recruiting students of color and recruiting to maintain gender balance were important and that it was their responsibility to recruit students into majors in their disciplines. The factor of student retention asked the faculty to rate their level of agreement with statements that it was their responsibility to retain students in their classes, within their disciplines, and when transferring to other institutions.

The same three blocks were used for constructing the prediction models for both student recruitment and student retention. Block 1 included the input for the models and consisted of the demographic variables of gender, age, and attendance at a community college as a student. This block also included the faculty classification as a math/science faculty member or a non-math/science faculty member in a variable called "instructor type." Block 2 added the factors for faculty culture: confidence in students, student services, student encouragement, student interaction outside of the classroom, job satisfaction, and an additional variable of "consider myself a mentor." Block 3 added factors for professional development activities: professional conferences, student outreach and opportunities, training to assist students, workshops, and articulation discussions. The grouping by blocks, means, standard deviations, and alpha values of the independent variables that made up the prediction models are presented in Table 13.

Simultaneous multiple regression was conducted to explore the predictive value of the combination of independent variables for the dependent variables of student recruitment and student retention. The significance of the contribution that individual variables made to each model was considered. The first model included only the input variables (Block 1) of gender, age, community college attendance as a student, and instructor type. The second model added variables describing faculty cultures (Block 2) to the input variables (Block 1). Model 3 consisted of all the variables included in Model 2 and added the professional development variables (Block 3).

Student Recruitment

The standardized beta coefficients for the student recruitment model can be found in Table 14. None of the variables contributed significantly to Model 1, which only included

Table 13

Independent Variables for Student Recruitment and Retention Regression Models

Independent variable	*M*	*SD*	α
Block 1			
1. Gender	.46	.495	N/A
2. Age	3.96	1.021	N/A
3. Attendance at a community college as a student	.36	.478	N/A
4. Instructor type	.653	.477	N/A
Block 2			
5. Confidence in students	8.770	1.543	.832
6. Student services	6.255	1.350	.828
7. Student encouragement	12.259	1.827	.809
8. Student interaction outside of the classroom	11.770	2.179	.736
9. Job satisfaction	13.647	1.716	.852
10. Consider myself a mentor	3.35	.578	N/A
Block 3			
11. Professional conferences	12.14	2.06	.881
12. Student outreach and opportunities	11.92	2.20	.853
13. Training to assist students	8.89	2.24	.816
14. Workshops	4.030	1.170	.727
15. Articulation discussions	5.508	1.479	.680

the input variables. In Model 2, four variables made a significant contribution to the model: gender, student encouragement, student interaction, and consider myself a mentor. Prediction Model 3 also had four significant variables: age, consider myself a mentor, student outreach and opportunities, and training to assist students. All of the significant variables were positively correlated with the exception of age in Model 3.

As can be seen in Table 15, Model 1 was not significantly predictive of high engagement in student recruitment. However, both Model 2 and Model 3 were significantly predictive ($p < .01$ for both). The combination of variables in Model 3 was statistically significant, and this model was the best predictor of the three models considered, $F(15, 413) = 5.804$, $p = .000$. It indicated that 14.4% of the variance in faculty engagement in student recruitment was explained by the combination of variables it contained.

Table 14

Standardized Beta Coefficients for Engagement in Student Recruitment

Independent variable	Student recruitment		
	Model 1	Model 2	Model 3
Block 1			
1. Gender	.051	.098*	.082
2. Age	-.093	-.079	-.106*
3. Attendance at a community college as a student	-.075	-.075	-.063
4. Instructor type	.021	-.039	-.046
Block 2			
5. Confidence in students		.043	.003
6. Student services		-.002	.000
7. Student encouragement		.166**	.068
8. Student interaction outside of the classroom		.151**	.075
9. Job satisfaction		-.040	-.044
10. Consider myself a mentor		.114*	.118*
Block 3			
11. Professional conferences			-.019
12. Student outreach and opportunities			.241**
13. Training to assist students			.149**
14. Workshops			-.031
15. Articulation discussions			.020

Note. $n = 429$.
$*p < .05$. $**p < .01$.

Table 15

Multiple Regression ANOVA Table for Predicting Engagement in Student Recruitment

Model	Adjusted R^2	Sum of squares	*df*	Mean square	*F*	*p*
1	.006	24.627	4	6.157	1.628	.166
2	.087	176.371	10	17.637	5.077	.000
3	.144	283.527	15	18.902	5.804	.000

Student Retention

The prediction model of faculty engagement in student retention was constructed similarly to the one for student recruitment. As can be seen in Table 16, attendance at a community college as a student was the only factor that contributed significantly to Model 1.

Three factors contributed significantly to Model 2: attendance at a community college as a student, student encouragement, and consider myself a mentor. Four factors contributed significantly to Model 3: attendance at a community college as a student, student encouragement, consider myself a mentor, and training to assist students. Attendance at a community college as a student was negatively correlated in all three models. All of the other significant variables were positively correlated with the dependent variable of student retention.

Table 16

Standardized Beta Coefficients for Engagement in Student Retention

	Student retention		
Independent variable	Model 1	Model 2	Model 3
Block 1			
1. Gender	.020	.070	.075
2. Age	-.052	-.034	-.054
3. Attendance at a community college as a student	-.102*	-.109*	-.094*
4. Instructor type	.008	-.049	-.054
Block 2			
5. Confidence in students		-.046	.027
6. Student services		.071	.069
7. Student encouragement		.152**	.103*
8. Student interaction outside of the classroom		.014	-.021
9. Job satisfaction		-.009	-.022
10. Consider myself a mentor		.336**	.328**
Block 3			
11. Professional conferences			.007
12. Student outreach and opportunities			.079
13. Training to assist students			.145**
14. Workshops			.023
15. Articulation discussions			.065

Note. $n = 429$.
*$p < .05$. **$p < .01$.

Model 1 was not statistically significant as a predictor of engagement in student retention. However, both Model 2 and Model 3 were significant predictors ($p < .01$ for both).

Model 3 had the highest predictive value, *F*(15, 413) = 7.982, *p* = .004, and accounted for 19.7% of the variance in faculty engagement in student retention (Table 17).

Table 17

Multiple Regression ANOVA Table for Predicting Engagement in Student Retention

Model	Adjusted R^2	Sum of squares	*df*	Mean square	*F*	*p*
1	.004	17.94	4	4.486	1.389	.237
2	.173	266.78	10	26.678	9.952	.000
3	.197	311.81	15	20.787	7.982	.004

CHAPTER 5: DISCUSSION, CONCLUSIONS, AND IMPLICATIONS

As the need for science, technology, engineering, and mathematics (STEM) professionals has grown, efforts to recruit students into majors in these areas have become a high priority in the United States. Traditional recruitment efforts have not been successful in admitting students in sufficient numbers to keep up with the demands of the labor market. Strategies to improve student recruitment along with retention in STEM majors need to be developed, especially those that will be most effective for women and minorities. Community colleges are now being tapped as a potential source of new STEM majors because they have diverse student populations and because they have large enrollments that are growing.

This study used some of the critical findings from research on student success in college to formulate a survey instrument that would measure faculty engagement in recruitment and retention efforts (Appendix B). The answers that math/science faculty provided to questions on the survey were analyzed to reveal their perceptions, attitudes, and behaviors related to those efforts that have been found to support undergraduate student outcomes. Their reported perceptions, attitudes, and behaviors, collectively considered as the culture of the math/science faculty, were compared to those of the non-math/science faculty to reveal cultural differences between the two groups. Since math/science faculty have careers that often attract investigative personality types (Holland, 1973) who avoid social situations, any differences that were revealed by the study were considered to see if they occurred because of this aversion to social situations. The same data were used to create prediction models for faculty engagement in student recruitment and retention.

The study involved 429 full-time arts and sciences faculty members from 15 Iowa community colleges, who answered a variety of questions about their behaviors, perceptions, and attitudes through an electronic survey. These participants were divided into two groups according to the discipline they identified as the one in which they taught the majority of the time. The 149 participants who reported that their primary teaching activities were in math, physical science, or natural science were placed in the math/science group. Those who identified a different area within the arts and sciences were grouped together as the non-math/science faculty.

The similarities between the math/science faculty members and the non-math/science faculty members made a comparative study of their cultures meaningful by reducing the number of variables influencing their answers. Since there were participants representing every community college in both groups, differences associated with specific aspects of each institution, such as institutional culture, governance, and environment, were minimized. Also, some of the colleges were situated in urban areas while others were in rural settings, but since there were math/science and non-math/science faculty members representing each college, any differences attributed to location and size of the school were somewhat balanced between the two groups.

Similarities among the 15 community colleges also helped to ensure a more homogeneous group of participants. In addition to being accredited by the North Central Association of the Higher Learning Commission, all of the community colleges must conform to the oversight of the Iowa Department of Education and the community college section of the Iowa Code for Education. As a result, all arts and sciences faculty members had the same minimum credentials of a master's degree in their subject area or a master's degree in a related area with 12 graduate credits in the subject area to be taught. Their teaching loads were similar with defined minimum and maximum credit limits, and the minimum contact hours required for each college credit taught were the same. Because of the designation of service areas by the Iowa Department of Education, each college must meet the transfer needs of its students independently by offering a full range of arts and sciences courses. This ensured that there was good representation of both faculty groups from each college. A legislatively mandated requirement for a quality faculty plan for each faculty member that includes professional development meant that all of the faculty were engaging in activities to enhance their professionalism. These conditions established a unique opportunity to measure differences between the math/science and non-math/science faculty with respect to engagement in student recruitment and retention in a way that exposed differences in their cultures.

Comparison Studies

Comparisons were made between the math/science faculty and the non-math/science faculty to answer Research Questions 1-5 of the study. Differences that were revealed from the analyses of the data were considered from the perspective of Holland's (1973) career theory. An explanation of the differences based on an aversion to social interactions was the primary focus.

Demographic Characteristics

Answers provided by the participants to the survey revealed that there were no statistically significant differences between the two groups in gender, age, or ethnicity. While the males outnumbered the females in the math/science group and the females outnumbered the males in the non-math/science group, the difference was statistically insignificant. The same was true for the average ages of the groups. The math/science faculty were slightly younger, but the difference was not statistically significant. Nearly all of the faculty in the study were Caucasian, with only about 6.5% reporting being non-Caucasian. These findings were fortunate for this study since any of these three variables could impact faculty culture, making it more difficult to explain differences in the context of a personality type that is averse to social interactions.

Other demographic variables considered were marital status, completion of a doctoral degree, union membership, and attendance at a community college as a student. The descriptive statistics were quite similar between the two groups for these variables, with the exception of attendance at a community college. More non-math/science faculty members attended a community college as students than the math/science faculty. Since this difference was significant, it was included in the prediction models for the study.

Interactions With Students

When comparing actual time spent interacting with students between the two groups, some interesting differences were revealed. Math/science faculty reported spending very little time on supervising internships and field trips. In fact, the mean of their answers fell just over zero hours. The difference was significant when compared to the non-math/science faculty. This is an unfortunate finding since studies have shown that these experiences appear to have a positive effect on the development of job-related skills and employment after college (Pascarella & Terenzini, 2005). The math/science faculty also reported that they spent significantly less time on activities with students other than coursework as compared to the non-math/science faculty, with a reported average time of about 30 minutes per week. Since interactions with faculty have been found to improve student engagement and learning in college (Avalos, 1994; Berger, 1997; Kuh & Hu, 2001; Pascarella & Terenzini, 2005), the fact that so little time is spent with students outside of the classroom is alarming. Although not always significantly different, math/science faculty reported spending less time with students in a 7-day week in all categories studied when compared to their non-math/science colleagues.

Math/science faculty were similar to non-math/science faculty in how they communicated with students. Both groups relied mostly on face-to-face meetings, with the next preference being email. However, in every type of communication that the participants were asked to rank, math/science faculty reported a lower frequency than the non-math/ science faculty. While these questions did not ask for an estimate of actual clock hours spent in these forms of communication, the fact that they reported using all of them less often may imply that math/science faculty do not communicate as frequently with their students as the non-math/science faculty members.

The frequencies of student–faculty interactions outside of the classroom that were more social than academic were measured using the answers provided to six questions on the survey. Interactions between students and faculty outside of the classroom have been linked to student satisfaction with all college experiences (Astin, 1999), and evidence exists that virtually every type of interaction between a student and a faculty member can have a positive effect on the student (Cox & Orehovec, 2007). While the frequency of greeting students was almost the same, math/science faculty reported a lower frequency of engaging in the other five types of interactions. The differences were not significant for discussions of academic issues, social conversations about the instructor, or career counseling, but they were significant for social conversations about the student and counseling to provide emotional support. The two types of interaction with the greatest differences are more intimate when compared to the others, which supports that math/science faculty may tend to feel more comfortable with less personal interactions.

The two groups were most similar in their student recruitment efforts. Both the frequencies and the patterns were similar, with both groups encouraging students to major in their discipline *sometimes*. Again, a reduced involvement was seen with math/science faculty reporting lower frequencies of making presentations about career opportunities and participating in recruitment activities organized by their institutions.

The data gathered for how the faculty interact with students did not support the null hypothesis that stated no difference would be seen between the math/science faculty and their non-math/science peers. Math/science faculty were significantly less likely to be involved in activities that would require interactions with the students that were not as structured as interactions in the classroom and that would promote more personal contact with their students. Math/science faculty reported spending less time supervising internships and field trips, participating in activities not related to coursework, and communicating with students by email or phone calls. The most personal types of interaction, having social conversations about the student and providing emotional support to students, had the greatest differences between the groups.

Barriers to Student Success

All of the faculty were in general agreement about the barriers to student success of employment, family, and finances. However, a striking difference was found between the math/science and non-math/science faculty concerning student preparation for classes. The participants were asked to rank their level of agreement with a statement that simply asked if their students demonstrated adequate academic preparation. More specific questions followed concerning their students' critical thinking, reading, writing, and math skills. While the answers from both groups of faculty revealed overall disagreement with the statements that students were adequately prepared, the math/science faculty responded with higher levels of agreement to every statement except the one for math skills. For this question, their responses were lower and closer to *disagree* than the responses from non-math/science faculty, but the difference was not significant. For the questions concerning the adequacy of their students' reading and critical thinking skills, math/science faculty indicated a significantly higher level of satisfaction with their students' skills in both areas than the non-math/science faculty. Therefore, these data indicate that the math/science faculty perceived that their students were better prepared for their classes when compared to their colleagues' perceptions of student preparedness.

Another interesting difference was that math/science faculty ranked their satisfaction with student support at a higher level than the non-math/science faculty. There was overall agreement that adequate support services were available to the students, but the adequacy of support services and tutoring services was ranked significantly higher by the math/science group than by the non-math/science group. Their answers indicated that they were satisfied that their colleges provided adequate resources for the students but believed, along with their non-math/science colleagues, that their students did not use the resources effectively or put in enough effort to be successful in their classes.

The answers provided by the math/science faculty concerning barriers to student success were unexpected given the academic rigor of their disciplines. It was difficult to postulate reasonable explanations for the differences between the two groups. If it was assumed that the faculty perceptions were accurate, then the implication would be that somehow students were better prepared for math and science classes than other classes. One explanation could be that the students were completing developmental-level courses designed to prepare them for college-level math and science, but these same types of courses are offered in the other academic areas, so this seems unlikely. It could also mean that the colleges were able to provide better tutoring in math and science to support student success than in other academic areas. This, too, seems unlikely. An explanation that would be supported by an aversion to social interactions would be that math/science faculty are less in tune with the needs of their students because of their reduced engagement with the students. Students may not have opportunities to share difficulties they are facing or report the lack of available services when their primary contact with the faculty member is in the classroom, with few social opportunities being available for private discussions.

Mentoring and Guiding Students

Perhaps the most alarming result from this study was in the area of mentoring and guiding students. Even though research has supported the importance of mentoring for increasing self-efficacy and productivity and improving professional identity and career satisfaction, math/science faculty were significantly less likely to consider themselves mentors to their students (Fagenson, 1989; Hollingsworth & Fassinger, 2002; Russell & Adams, 1997; Sorrentino, 2006-2007). Similarly, Astin's (1984) seminal studies have led to the development of a student involvement theory supporting the importance of student engagement in all aspects of college life. But the math/science faculty were significantly less likely to agree that students benefit from discipline-related activities. Their responses suggested that they place significantly less importance on encouraging students to participate in social organizations and activities and in academic activities than the non-math/science faculty. These findings are corroborated by the math/science faculty's report of spending less time engaging with students in activities outside of the classroom.

The act of mentoring requires the development of a relationship with the mentee that is supportive, encouraging, and informative. If math/science faculty are averse to social interactions, then being an effective mentor would be difficult for them. The survey question asked if the faculty member considers himself/herself a mentor, so the answer to this question may reflect the faculty member's recognition of personal limitations rather than not supporting the importance of mentoring. The aversion to social interactions may have an impact on encouraging students to become involved in academic and social organizations. The math/science faculty members indicated less involvement in these sorts of student organizations than the non-math/science faculty, so it is not surprising that they put a lower value on the experiences for students.

Student Recruitment and Retention

The only research question where the null hypothesis was supported was Research Question 5 concerning faculty attitudes about their roles in student recruitment and retention. Very little difference was found between the two groups for all of the survey questions related to this topic. Both groups reported similar levels of agreement with the importance of recruitment and retention efforts, and both felt similar levels of responsibility for participating in these activities. The faculty responses did indicate that all of the faculty were more likely to agree with the statements related to retention than with those about recruitment.

The questions from the survey that were used to answer this research question asked the faculty members if recruitment and retention efforts were important and if they were responsible for engaging in them. The questions were philosophical in nature, not requiring any specific social involvement or commitment, so it is not surprising that the two groups responded similarly. In fact, the general agreement between the two groups of faculty is encouraging since, at least in theory, the math/science faculty are supportive of student recruitment and retention efforts.

Predicting Faculty Engagement in Student Recruitment and Retention

The intercorrelations of 36 variables describing faculty culture and 18 variables related to professional development were tested using exploratory factor analysis (EFA). This provided a way to group the variables in a meaningful way according to the strength of their relationships to one another and to an unobservable measure called a factor (Darlington, n.d.). The factors that were identified were then used in the development of a model to predict faculty engagement in student recruitment and retention.

Seven factors emerged from the faculty culture analysis that included 24 of the variables tested: (a) job satisfaction, (b) student recruitment, (c) student retention, (d) confidence in students, (e) student services, (f) student encouragement, and (g) student interaction outside of the classroom. The factor of job satisfaction included variables not used in the comparison studies, but it was included here to discover if faculty members' attitudes about their jobs influenced their willingness to be involved in recruitment and retention efforts. The remaining factors were made up of variables that were used in comparisons between the math/science faculty and the non-math/science faculty. The student recruitment factor was significant because it revealed the correlation of variables related to recruitment by gender and race along with the general recruitment of students into majors of study, implying that faculty attitudes about recruitment were similar for all students. The student retention factor was broad and included variables related to retention in classes, within a discipline, and when transferring to another institution. Both the student recruitment and student retention factors were used as the dependent factors in the prediction models for faculty engagement in these efforts.

The factors related to faculty culture were compared between the math/science and non-math/science faculty for their significance. No differences were found in student recruitment, student retention, or confidence in students. Significant differences were measured between the two faculty groups in the factors for job satisfaction, student services, student encouragement, and student interactions outside of the classroom. These results were expected based on the findings of the individual variables included in the factors.

Five factors were identified from the variables related to professional development: (a) professional conferences, (b) student outreach and opportunities, (c) training to assist students, (d) workshops, and (e) articulation discussions. The factor of professional conferences included discipline-focused conferences as well as those supporting teaching and instruction, indicating that the usefulness of both types of professional meetings were considered similarly by the faculty. The usefulness of paid travel to the conferences also fell within this factor. The factor of student outreach and opportunities included actively involved, student-centered variables such as placement of students into internships, job shadowing, and employment positions. Visits with students in Grades K-12, presentations to potential students, and institutional recruitment activities were also included. The two types of training that made up the factor of training to assist students were for underprepared students and diverse learners. The factor of workshops included those focused on disciplines and on teaching/instructional techniques. The factor of articulation discussions included interactions between the community college faculty and faculty at other community colleges and 4-year colleges/universities but did not include high school faculty.

All of the factors that emerged from the EFA, and the variable of "consider myself a mentor" that did not fit into a factor for faculty culture, were tested in two prediction models for faculty engagement in student recruitment and retention. The purpose of the models was to take the fixed input of the faculty, which included age, gender, instructor type (math/ science or non-math/science), and community college attendance as a student (Block 1), and determine the influence that faculty culture (Block 2) and professional development (Block 3) had on the dependent variables of student recruitment and student retention. These models made it possible to identify separately the degree to which faculty culture and professional development influenced the two models and to compare the significance of the variables between the two models.

The model that was most predictive for engagement in student recruitment, explaining 14.4% of the variance, was Model 3, indicating the importance of including variables related to faculty culture and professional development. Significant variables included age, consider myself a mentor, student outreach and opportunities, and training to assist students. Only age had a negative value for the standardized beta coefficient, indicating that a young faculty member was more likely to be engaged in student recruitment. Consider myself a mentor was the only significant factor in the model that was also significantly different between math/science and non-math/science faculty, but its impact was not seen since instructor type was not significant in the model. In fact, this model supports that math/science faculty are as likely to be engaged in recruiting students as non-math/science faculty.

Model 3 was also the most predictive for faculty engagement in student retention, explaining 19.7% of the variance, again indicating the importance of the inclusion of both faculty culture and professional development. Attendance at a community college as a student had a negative standardized beta coefficient, indicating that a faculty member who did not attend a community college as a student would be more highly engaged in student retention. Since math/science faculty members were significantly less likely to attend a community college as students, this result favored their engagement in student retention. Other significant variables included student encouragement, consider myself a mentor, and training to assist students. Of these three factors, two had been found to be significantly different between math/science and non-math/science faculty. Math/science faculty reported that they were significantly less likely to consider themselves mentors and they were significantly less likely to encourage students. Once again, instructor type was not significant in this model, indicating that math/science faculty were just as likely to be engaged in student retention efforts as the non-math/science faculty.

Implications

To successfully attract the most students possible to majors in science and mathematics, all resources must be used to their greatest capacity, including the math and science faculty. This study indicates that the perceptions, attitudes, and behaviors of the faculty in the math and science departments at community colleges may work against efforts to attract more students into these fields and that interventions may be necessary to improve this deficiency in the support of student recruitment and retention efforts.

Implications for Practice

Math and science faculty should be made aware that they are not supporting students to the same extent as their colleagues. If math and science faculty are working independently of other departments, then they may not have opportunities to observe these differences in their interactions with students as compared to their non-math/science colleagues. Cross-discipline associations, discussions, and training could be informative to these faculty members and help turn the trends observed in this study into more positive actions that better support attracting and keeping more students in math and science.

Agencies that provide STEM grants could focus more on the role of faculty in student recruitment and retention. In addition to scholarships and student services, higher expectations of faculty involvement in grant activities could be useful. Training to assist students was found to be highly significant ($p < .01$) for both models. This factor included variables of training to assist underprepared students and diverse learners. Provisions for portions of the funding to be used for these key professional development activities on a more consistent basis would also be beneficial.

Implications for Policy

Administrators can help by becoming more aware of the levels of involvement of faculty in efforts that support students and by providing opportunities for interactions across disciplines. While it is common for administrators to consider gender and ethnicity in the makeup of certain institutional organizations and committees, policy changes requiring a mix of disciplines should be considered. Well-selected training in areas of student support outside of the classroom should be made available to support student retention, and faculty should be required to participate in these types of training opportunities. Adding the expectation of faculty involvement in student organizations and outside activities would be beneficial as well, even to the point of including such involvement in faculty job descriptions. Administrators can help by providing funding, time, and incentives to faculty so that they can engage in these sorts of activities.

Recommendations for Future Research

The differences identified between the community college math/science faculty and non-math/science faculty were significant in this study. However, both groups were similar in that all participants were assigned to teach in an area of arts and sciences. A comparison of the same variables between math/science faculty or arts and sciences faculty and career and technical faculty would be quite informative. Career and technical faculty are expected to recruit students into their programs and are often on the road promoting their programs to outside groups of prospective students. Since career and technical program viability is largely based on student and community demand and the number of students enrolled, these faculty members depend on recruitment and retention of students for job security. A study comparing career and technical faculty to arts and sciences faculty could reveal the impact that job descriptions and job expectations have on the level of faculty engagement in student recruitment and retention efforts.

Research that measures changes in enrollment of new students and continuing students at a college after concentrated faculty training in key areas identified in this study would be quite valuable. While many factors could contribute to changes in enrollment, a careful systematic approach in multiple settings could provide better insight into the importance of the faculty and their involvement in these activities.

An expansion of this study to include full-time faculty at 4-year institutions would be useful to those institutions in a practical sense and could lend validity, or lack of validity, to the idea that differences in faculty culture may be ascribed to personality differences among the disciplines. Community college faculty members were used for this study. These are individuals who have made a choice to engage in a career with a focus on teaching. Since there were significant differences found in the culture of the math/science instructors when compared to other instructors, the same differences may also be apparent in other institutions of higher education. In fact, the cultural disparity at research institutions may be greater than what was found in this study since the commonality of an interest in teaching might not be as strong.

A compelling research project would be a qualitative study involving math and science faculty members. The research presented here offered a hypothesis that math/science faculty are less likely to be engaged in activities that promote student success requiring more social interaction due to their personality type. It would be interesting to hear faculty discuss what they believe their roles are as math and science instructors and how they are involved, or not involved, in student recruitment and retention. The same variables included in this study could be formulated into questions that could be quite revealing. For example, it would be interesting to hear how a faculty member would respond to the prompt, “I consider myself a mentor to the students in my classes.”

Summary

With the need to feed the STEM pipeline with qualified employees, it is imperative that students be attracted to and retained in STEM fields of study. This research looked at the perceptions, attitudes, and behaviors, collectively called the culture, of full-time Iowa community college math and science faculty in comparison to arts and sciences faculty who did not teach in these areas. The results showed a striking difference between the two groups. Additionally, two models are presented that predict faculty engagement in student recruitment and retention efforts.

The math/science and non-math/science faculty were quite similar in gender balance, ethnicity, and age distribution. There were also many commonalities in their jobs as full-time faculty members at Iowa community colleges. Because of the similarities among the faculty members included in this study, differences in faculty culture were explained based on personality types as described by Holland (1973). Holland proposed that, throughout their lives, people have experiences and live in environments that reinforce certain behaviors and provide different models of suitable behavior. Reinforcement occurs when certain activities, interests, self-estimates, and competencies are encouraged. Modeling occurs because important people in an individual's life, such as parents, engage in certain behaviors more than others. These experiences lead to the development of a characteristic cluster of personal traits that Holland organized into a typology of six theoretical personality types: realistic, investigative, artistic, social, enterprising, and conventional. The math/science faculty have chosen careers that are associated with two of the six types: social and investigative. A career as a teacher is congruent with the social typology, whereas their choice of discipline is congruent with the investigative typology. According to Holland, investigative people tend to avoid social interactions, yet social interactions between students and faculty members have been shown to support positive student outcomes (Avalos, 1994; Berger, 1997; Kuh & Hu, 2001; Pascarella & Terenzini, 2005).

This study revealed differences between math/science and non-math/science faculty in key areas that support student outcomes. The math/science faculty were often significantly less likely to have meaningful interactions with students outside of the classroom, to communicate with students, and to spend time in non-course-related activities. Social conversations between math/science faculty and their students were less common, as was counseling to provide students with emotional support. Math/science faculty were significantly less likely to consider themselves mentors to their students or to encourage students to participate in student organizations.

Bright spots for math/science faculty included almost equal involvement in student recruitment efforts, and they reported similar attitudes concerning these efforts. Math/science faculty attributed less significance to barriers to student success than the non-math/science faculty. Both groups reported that students were underprepared for their classes, but the math/science faculty reported higher satisfaction with students' critical thinking and reading skills than their peers. They also reported higher satisfaction with the adequacy of the tutoring and support services provided to students. One concern with these findings is that the math/science faculty may not be aware of barriers students experience because of their lack of involvement with them outside of the classroom.

Data reduction by EFA produced seven factors describing faculty culture and five factors for professional development. Four factors for faculty culture were found to be significantly different between the two groups of faculty members. One was student services, which revealed the math/science faculty satisfaction with the student services available to their students. Also significant was the math/science faculty's lack of involvement in student encouragement and student interactions outside of the classroom.

Both involve social interactions, which explains the differences according to the model set forth by Holland (1973). The fourth factor, job satisfaction, is particularly interesting. Math/science faculty expressed higher job satisfaction than their non-math/science colleagues, which might indicate that they are not incongruous in their employment as teachers who are "social." However, Holland pointed out that when a person is employed in a field where there is a lack of match with his/her competencies, the result may be that the person does not work when nonwork is more rewarding. This means that faculty may choose not to engage in those social activities that are incongruous with their typology, and the academic freedom provided to them at their colleges allows them to do this.

Models for predicting involvement in student recruitment and student retention were constructed using variables and factors from this study. Two factors that were significant and common to both models included consider myself a mentor and training to assist students. The student recruitment model explained 14.4% of the variance in faculty engagement, and the student retention model explained 19.7% of the variance. These effect sizes were small according to Cohen's (1988) guidelines; however, as Cohen pointed out, the effect is relative and subject to the conditions of the study. Even these small effect sizes were considered important given the complexities involved in predicting faculty behaviors.

Overall, this research revealed that the culture of community college math and science faculty does not support student recruitment and retention in areas requiring the most social interaction. The results presented here indicate that perceptions, attitudes, and behaviors among math and science faculty often run counter to what is believed to be supportive of student success in college and for positive student outcomes. However, the predictive models supported that other factors could reduce the effects of the aversion to social interactions and that the math and science faculty were engaged in these efforts at their institutions.

REFERENCES

Allison, C. J., & Cossette, I. (2007). Theory and practice in recruiting women for STEM careers. *Proceedings of the Women in Engineering Programs and Advocates Network 2007 Conference*. Retrieved from http://www.stemrecruiting.org/docs/pub/WEPAN07.pdf

American Association of Community Colleges. (2006). *Facts 2006*. Washington, DC: Author.

Astin, A. W. (1977). *Four critical years: Effects of college on beliefs, attitudes and knowledge*. San Francisco, CA: Jossey-Bass.

Astin, A. W. (1984). Student involvement: A developmental theory for higher education. *Journal of College Student Personnel, 25*(2), 297-308.

Astin, A. W. (1985). Involvement: The cornerstone of excellence. *Change*, *17*, 35-39.

Astin, A. W. (1993). What matters in college? *Liberal Education, 79*, 4-12.

Astin, A. W. (1999). Student involvement: A developmental theory for higher education. *Journal of College Student Development, 40*(5), 518-529.

Avalos, J. (1994, November). *Going beyond the decision: An analysis of the reasons for leaving college.* Paper presented at the annual meeting of the Association for the Study of Higher Education, Tucson, AZ.

Bailey, T. R., Matsuzuka, Y., Jacobs, J., Morest, V. S., & Hughes, K. L. (2004). *Institutionalization and sustainability of the National Science Foundation's Advanced Technological Education program*. New York, NY: Community College Research Center.

Baldwin, J. R., Faulkner, S. L., & Hecht, M. L. (2006). A moving target: The illusive definition of culture. In J. R. Baldwin, S. L. Faulkner, M. L. Hecht, & S. L. Lindsley (Eds.), *Redefining culture: Perspectives across the disciplines* (pp. 27-52). Mahwah, NJ: Lawrence Erlbaum Associates.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.

Baxter, B. (2008, October/November). The power of partnership: Building STEM talent for tomorrow's workforce. *Community College Journal*, 10-13.

Berger, J. (1997). Students' sense of community in residence halls, social integration, and first-year persistence. *Journal of College Student Development, 38*(5), 441-452.

Blackburn, R., & Lawrence, J. (1995). *Faculty at work: Motivation, expectation, satisfaction*. Baltimore, MD: The Johns Hopkins University Press.

Bureau of Labor Statistics. (2007). *Fastest growing occupations, 2004-2014*. Retrieved February 8, 2009, from http://www.bls.gov/emp/emptab21.htm

Carmines, E. G., & Zeller, R. A. (1991). *Reliability and validity assessment*. Newbury Park, CA: Sage.

Cech, S. J. (2008). Building bridges to the future. *Education Week, 27*, 22-24.

Cetaldi, E. F., Fahimi, M., & Bradburn, E. M. (2005). *2004 national study of postsecondary faculty (NSOPF:04) report on faculty and instructional staff in Fall 2003* (NCES 2005-172). Washington, DC: U.S. Department of Education, National Center for Education Statistics.

Chickering, A. W., & Gamson, A. F. (1987). Seven principles for good practice in undergraduate education. *AAHE Bulleting, 39*(7), 3-7.

Cohen, J. (1988). *Statistical power and analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Conference for the Recruitment and Retention of Women and Minorities into the STEM Disciplines. (2006). CRRWMSD overview. Retrieved from http://crrwmsd.unlv.edu

Cox, B. E., & Orehovec, E. (2007). Faculty–student interaction outside the classroom: A typology from a residential college. *The Review of Higher Education, 30*, 343-362. doi:10.1353/4h3.2007.0033

Creswell, J. W. (1994). *Research design: Qualitative and quantitative approaches.* Thousand Oaks, CA: Sage.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches.* Thousand Oaks, CA: Sage.

Crisp, G., & Cruz, I. (2009). Mentoring college students: A critical review of the literature between 1990 and 2007. *Research in Higher Education, 50*, 525-545.

Darlington, R. B. (n.d.). *Factor analysis*. Retrieved from http://www.psych.cornell.edu/ Darlington/factor.htm

Deloitte Development LLC, The Manufacturing Institute, & Oracle. (2009). *People and profitability: A time for change: A 2009 people management practices survey of the manufacturing industry*. Retrieved from http://www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/us_pip_peoplemanagementreport_100509.pdf

Fagenson, E. A. (1989). The mentor advantage: Perceived career/job experiences of protégés versus non-protégés. *Journal of Organizational Behavior, 10,* 309-320.

Fink, A. (Ed.). (1995). *How to measure survey reliability and validity v. 7*. Thousand Oaks, CA: Sage.

Fowler, F. J. (2009). *Survey research methods.* Thousand Oaks, CA: Sage.

Gahn, S., & Twombly, S. B. (2001). Dimensions of the community college labor market. *Review of Higher Education, 24,* 259-282.

Gasbarra, P., & Johnson, J. (2008, May). *Out before the game begins: Hispanic leaders talk about what's needed to bring more Hispanic youngsters into science, technology and math professions*. Paper presented at America's Competitiveness: Hispanic Participation in Technology Careers Summit, Palisades, NY.

Glendale Community College. (2006). Math and science transfer, excellence & retention (MASTER) scholarship program. Retrieved April 2, 2010, from http://www.glendale .edu/master/

Hagedorn, L. S., Cypers, S., & Lester, J. (2008). Looking in the review mirror: Factors affecting transfer for urban community college students. *Community College Journal of Research and Practices, 32*, 643-664.

Hagedorn, L. S., & DuBray, D. (2010). Math and science success and nonsuccess: Journeys within the community college. *Journal of Women and Minorities in Science and Engineering, 16*(1), 31-50.

Hagedorn, L. S., Lester, J., & Cypers, S. J. (2010). C problem: Climb or catastrophe. *Community College Journal of Research and Practice, 34*, 240-255.

Hardy, D. E., & Laanan, F. S. (2006). Characteristics and perspectives of faculty at public 2-year colleges. *Community College Journal of Research and Practice, 30,* 787-811.

Holland, J. L. (1973). *Making vocational choices: A theory of careers*. Englewood Cliffs, NJ: Prentice-Hall.

Holland, J. L., Gottfredson, G. D., & Nafziger, D. H. (1975). Testing the validity of some theoretical signs of vocational decision-making ability. *Journal of Counseling Psychology, 22,* 411-436.

Holland, J. L., Sorensen, A. B., Clark, J. P., Nafziger, D. H., & Blum, Z. D. (1973). Applying an occupational classification to a representative sample of work histories. *Journal of Applied Psychology, 58,* 34-41.

Hollingsworth, M., & Fassinger, R. (2002). The role of faculty mentors in the research training of counseling psychology doctoral students. *Journal of Counseling Psychology, 49*(3), 324-330.

Iowa Department of Education. (2011). About community colleges. Retrieved March 1, 2012, from http://educateiowa.gov/index.php?option=com_content&view=article&id=241&Itemid=4338

Jacobi, M. (1991). Mentoring and undergraduate academic success: A literature review. *Review of Educational Research, 61*(4), 505-532.

Kraemer, B. A. (1995). Factors affecting Hispanic student transfer behavior. *Research in Higher Education, 36*(3), 303-322.

Kuh, G. D., Cruce, T. M., Shoup, R., Kinzie, J., & Gonyea, R. M. (2008). Unmasking the effects of student engagement on first-year college grades and persistence. *The Journal of Higher Education, 79*(5), 540-563.

Kuh, G. D., Douglas, K. B., Lund, J. P., & Ramin-Gyurnek, J. (1994). *Student learning outside the classroom: Transcending artificial boundaries* (ASHE-ERIC Higher Education Report No. 8). Washington, DC: The George Washington University, School of Education and Human Development.

Kuh, G. D., & Hu, S. (2001). The effects of student–faculty interactions in the 1990s. *Review of Higher Education, 24*(3), 309-332.

Langdon, D., McKittrick, G., Beede, D., Khan, B., & Doms, M. (2011). STEM*: Good jobs now and for the future* (Issue Brief No. 03-11). Washington, DC: U.S. Department of Commerce, Economics and Statistics Administration.

Lee, V. E., & Frank, K. A. (1990). Students' characteristics that facilitate the transfer from two-year to four-year colleges. *Sociology of Education, 63*(3), 178-193.

Levin, J. S., Kater, S., & Wagoner, R. L. (2006). *Community college faculty: At work in the new economy*. New York, NY: Palgrave Macmillan.

Morgan, G. A., Leech, N. L., Gloeckner, G. W., & Barrett, K. C. (2007). *SPSS for introductory statistics: Use and interpretation* (3rd ed.). Mahwah, NJ: Lawrence Erlbaum Associates.

Moriarty, M. A. (2007). Inclusive pedagogy: Teaching methodologies to reach diverse learners in science instruction. *Equity & Excellence in Education, 40*, 252-265.

National Center for Education Statistics. (2003). *Digest of education statistics: 2002*. Washington, DC: U.S. Department of Education.

National Governors Association Center for Best Practices. (2011). *Using community colleges to build a STEM-skilled workforce* [Issue brief]. Washington, DC: Author.

National Science Board. (2010). *Science and engineering indicators 2010*. Arlington, VA: Author.

National Science Foundation. (2007a). From STEM to stern: An education to industry research, action, change project to develop long-term employer-education partnerships. Retrieved March 1, 2009, from http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0703026

National Science Foundation. (2007b). Providing undergraduate connections to engineering education in Virginia. Retrieved March 1, 2009, from http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0756846

National Science Foundation. (2007c). Project Pathways: Broadening access and success for STEM students. Retrieved March 1, 2009, from http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0525536

National Science Foundation. (2007d). Collaborative research: SEEC: STEM student enrollment and engagement through connections. Retrieved March 1, 2009, from http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0653058

National Science Foundation. (2009). Active funding opportunities—Recently announced. Retrieved March 1, 2009, from http://www.nsf.gov/funding/pgm_list.jsp?org=NSF&ord=rcnt

National Science Foundation. (2012a). Science, technology, engineering, and mathematics talent expansion program (STEP). Retrieved March 6, 2012, from http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5488&org=NSF

National Science Foundation. (2012b). NSF scholarships in science, technology, engineering, and mathematics (S-STEM). Retrieved March 6, 2012, from http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5257&org=NSF

Outcalt, C. L. (2002). Toward a professionalized community college professoriate. *New Directions for Community Colleges, 118,* 109-115.

Palmer, J. C. (2002). Disciplinary variations in the work of full-time faculty members. *New Directions for Community Colleges, 118,* 9-19.

Pascarella, E. T., & Terenzini, P. T. (2005). *How college affects students: A third decade of research* (Vol. 2). San Francisco, CA: Jossey-Bass.

Patton, M. (2006). *Teaching by choice: Cultivating exemplary community college STEM faculty*. L. Barnett & F. S. Felics (Eds.). Washington, DC: American Association of Community Colleges.

Porter, S. R., & Umbach, P. D. (2006). College major choice: An analysis of person-environment fit. *Research in Higher Education, 47*, 429-449. doi:10.1007/s11162-005-9002-3

Rogotzke, K. (2011). *Iowa community college science, engineering and mathematics (SEM) faculty: Demographics and job satisfaction* (Unpublished doctoral dissertation). Iowa State University, Ames.

Russell, J., & Adams, D. (1997). The changing nature of mentoring in organizations: An introduction to the special issue on mentoring organizations. *Journal of Vocational Behavior, 51*(1), 1-14.

Rypisi, C., Malcom, L. E., & Kim, H. S. (2009). Environmental and developmental approaches to supporting women's success in STEM fields. In S. R. Harper & S. J. Quaye (Eds.), *Student engagement in higher education: Theoretical perspectives and practical approaches for diverse populations* (pp. 117-135). New York, NY: Routledge.

Schenk, T., Bassis, V., Farver, K., Jones, G., Varner, J., & Vybiral, A. (2011). *The annual condition of Iowa's community colleges 2010*. Des Moines, IA: Iowa Department of Education.

Shkodriani, G. (2004). *Seamless pipeline from two-year to four-year institutions for teacher training* (PT3 Policy Brief). Denver, CO: Education Commission of the States.

Smart, J. C., Feldman, K. A., & Ethington, C. A. (2006). *Holland's theory and patterns of college student success: Commissioned report for the National Symposium on Postsecondary Student Success: Spearheading a dialog on student success*. Retrieved from http://nces.ed.gov/npec/pdf/smart_team_report.pdf

Sorrentino, D. M. (2006-2007). The SEEK mentoring program: An application of the goal-setting theory. *Journal of College Student Retention, 8*, 241-250.

Starobin, S. S. (2004). *Gender differences in college choice, aspirations, and self-concept among community college students in science, mathematics, and engineering* (Unpublished doctoral dissertation). University of North Texas, Denton.

Starobin, S. S., & Laanan, F. S. (2008). Broadening female participation in science, technology, engineering and mathematics: Experiences at community colleges. *New Directions for Community Colleges, 152*, 37-46.

Starobin, S. S., Laanan, F. S., & Burger, C. J. (2010). Role of community colleges: Broadening participation among women and minorities in STEM. *Journal of Women and Minorities in Science and Engineering, 16*, 1-5.

STEM Education Caucus. (n.d.). Why was the STEM Education Caucus created? Retrieved February 8, 2009, from http://www.stemedcaucus2.org

Summers, M. D. (2003). ERIC review: Attrition research at community colleges. *Community College Review, 30*, 64-84.

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd ed.). Chicago, IL: The University of Chicago Press.

Tsapogas, J. (2004). *The role of community colleges in the education of recent science and engineering graduates* (Info Brief No. 04-315). Arlington, VA: National Science Foundation, Division of Science Resources Statistics.

Twombly, S., & Townsend, B. K. (2008). Community college faculty: What we know and need to know. *Community College Review*, *36*(1), 5-24.

Umbach, P. D., & Wawrzynski, M. R. (2005). Faculty do matter: The role of college faculty in student learning and engagement. *Research in Higher Education, 46*, 153-184.

U.S. Department of Labor. (2007). *The STEM workforce challenge: The role of the public workforce system in a national solution for a competitive science, technology, engineering, and mathematics (STEM) workforce*. Retrieved from http://www.doleta.gov/youth_services/pdf/STEM_Report_4%2007.pdf

APPENDIX A: EXCERPT FROM IOWA ADMINISTRATIVE CODE

Minimum Faculty Standards

Excerpt from Iowa Administrative Code
Chapter 24 – Community College Accreditation
281—24.3 (260C)
Definitions.

For purposes of interpreting rule 281—24.5(260C), the following definitions shall apply:

"Field of instruction." The determination of what constitutes each field of instruction should be based on accepted practices of regionally accredited two- and four-year institutions of higher education.

"Full-time instructor." An instructor is considered to be full-time if the community college board of directors designates the instructor as full-time. Consideration of determining full-time status shall be based on local board-approved contracts.

"Higher Learning Commission." The Higher Learning Commission is the accrediting authority within the North Central Association of Colleges and Schools. Iowa Code sections 260C.47 and 260C.48 require that the state accreditation process be integrated with that of the North Central Association of Colleges and Schools.

"Instructors meeting minimum requirements." A community college instructor meeting the minimum requirements of Iowa Code Supplement section 260C.48(1) as amended by 2008 Iowa Acts, House File 2679, is an instructor under contract for at least half-time or more teaching college credit courses. Beginning July 1, 2011, a community college instructor meeting the minimum requirements is an instructor teaching college credit courses. Credit courses shall meet requirements as specified in rule 281—21.2(260C), and meet program requirements for college parallel, career and technical education, and career-option programs as specified in rule 281—21.4(260C) and Iowa Code chapter 260C.

"Minimum of 12 graduate hours." The 12 graduate hours may be within the master's degree requirements or independent of the master's degree, but all hours must be in the instructor's field of instruction.

"Relevant work experience." An hour of recent and relevant work experience is equal to 60 minutes. The community college will determine what constitutes recent and relevant work experience that relates to the instructor's occupational and teaching area. The college shall maintain documentation of the instructor's educational and work experience.

281—24.5 (260C)
Accreditation components and criteria—additional state standards.

To be granted accreditation by the state board of education, an Iowa community college must also meet five additional standards pertaining to minimum standards for faculty; faculty load; special needs; vocational education evaluation; and quality faculty plan.

July 1, 2009 281—IAC 24.5 July 1, 2009 281—IAC 24.5 s.

24.5(1) *Faculty.*
Community college-employed instructors who are under contract for at least half-time or more, and by July 1, 2011, all instructors who teach in career and technical education or arts and sciences shall meet minimum standards. In accordance with Iowa Code Supplement section 260C.48(1) as amended by 2008 Iowa Acts, House File 2679, standards shall at a minimum require that community college instructors who are under contract for at least half-time or more, and by July 1, 2011, all instructors meet the following requirements:

a. Instructors in the subject area of career and technical education shall be registered, certified, or licensed in the occupational area in which the state requires registration, certification, or licensure, and shall hold the appropriate registration, certificate, or license for the occupational area in which the instructor is teaching, and shall meet either of the following qualifications:

(1) A baccalaureate or graduate degree in the area or a related area of study or occupational area in which the instructor is teaching classes.

(2) Special training and at least 6,000 hours of recent and relevant work experience in the occupational area or related occupational area in which the instructor teaches classes if the instructor possesses less than a baccalaureate degree.

b. Instructors in the subject area of arts and sciences shall meet either of the following qualifications:

(1) Possess a master's degree from a regionally accredited graduate school, and have successfully completed a minimum of 12 credit hours of graduate level courses in each field of instruction in which the instructor is teaching classes.

(2) Have two or more years of successful experience in a professional field or area in which the instructor is teaching classes and in which post-baccalaureate recognition or professional licensure is necessary for practice, including but not limited to the fields or areas of accounting, engineering, law, law enforcement, and medicine.

c. Developmental education and adult education instructors employed half-time or more may or may not meet minimum requirements depending on their teaching assignments and the relevancy of standards to the courses they are teaching and the transferability of such courses. If instructors are teaching credit courses reported in arts and sciences or career and technical education, it is recommended that these instructors meet minimum standards set forth in 281—subrule 21.3(1), paragraph *"a"* or *"b."*By July 1, 2011, all instructors teaching credit courses shall meet minimum standards.

APPENDIX B: IOWA COMMUNITY COLLEGE FULL-TIME FACULTY SURVEY 2011

Default Question Block

Iowa Community College Faculty Survey 2010-2011

Thank you for your willingness to help with this survey. The purpose of this survey is to collect information that will help us better understand the demographics, background, perceptions, practices and needs of Iowa's full-time community college faculty members.

INSTRUCTIONS: This survey is for all full-time faculty who are teaching at a community college. Your responses to the questions are voluntary and strictly confidential. They will be used only in statistical summaries. You may skip any question you are not comfortable answering. There are nine sections which we estimate will take about 20 minutes to complete.

If you have any questions or problems feel free to contact: Jane Bradley (bradley@swcciowa.edu, 641-782-1338); Michael Miller (memiller@indianhills.edu, 641-683-5226); or Kathy Rogotkze (rogotkat@niacc.edu, 641-422-4154).

We greatly appreciate your time in completing the survey.

I. EMPLOYMENT/EDUCATION INFORMATION

1. Do you have full-time faculty status as defined by your institution for the 2010 - 2011 academic year?

- ◯ Yes
- ◯ No

2. What was your principal activity at your current institution during the 2010-2011 Academic Year? (If you have equal responsibilities, please select one.)

- ◯ Teaching
- ◯ On sabbatical
- ◯ Support services (e.g. technical activity such as programmer or technician; other institutional activities such as library services; subsidized performer, artist-in-residence, etc.)
- ◯ Other, please list activity ______

3. What area is your primary teaching responsibility in this academic year (Fall 2010 - Spring 2011)?

- ◯ Arts and Science

○ Career and Technical

○ Other, please list area

During this academic year (Fall 2010 - Spring 2011), in which discipline is the MAJORITY of your teaching assignment in?

○ Fine Arts (indicate the discipline in the space below such as Art, Music, etc.)

○ Communications (indicate the discipline in the space below such as English, Speech, etc.)

○ Humanities (indicate the discipline in the space below such as History, Philosophy, etc.)

○ Business (indicate the discipline in the space below such as Accounting, Computer Science, etc.)

○ Social Sciences (indicate the discipline in the space below such as Economics, Psychology, etc.)

○ Physical or Natural Sciences (indicate the discipline in the space below such as Biology, Chemistry, etc.)

○ Mathematics

○ Engineering

○ Other, please list discipline

During this academic year (Fall 2010 - Spring 2011), in which discipline is the MAJORITY of your teaching assignment in?

○ Agricultural

○ Business and Information Technology

○ Family and Consumer Science

○ Health Occupations

○ Industrial Technology

○ Marketing

○ Other, please list discipline

4. Are you a member of a union or other bargaining association that is legally recognized to represent faculty at your institution?

○ Yes

○ No

○ Skip this question

If no, what was your reason for not belonging to a union or other bargaining association to represent the faculty at your institution?

- ◯ A union is not available.
- ◯ A union is available but I am not eligible to join.
- ◯ A union is available but I decided not to join.
- ◯ Other, please list reason

5. What degrees have you completed? Do not include honorary degrees. (Check all that apply. If you have none of the degrees or awards, select "Not applicable.")

- ☐ Doctoral degree (Ph.D., Ed.D. etc.)
- ☐ First-professional degree (M.D., D.O., D.D.S, etc.)
- ☐ Master's degree
- ☐ Bachelor's degree
- ☐ Associate's degree or equivalent (A.A., A.S., etc.)
- ☐ Certificate or diploma for completion of undergraduate program (other than associate's or bachelor's degree)
- ☐ Not applicable (Do not hold a degree)

In which field of study is your Doctoral degree?

In which field of study is your Master's degree?

In which field of study is your Bachelor's degree?

6. How many years teaching experience do you have in each of the following educational settings? Do not include teaching assistant, substitute teaching or student teaching experience. Also indicate whether you have (or had) certification to teach at each level.

	Number of years of experience. Enter 0 for none	Have (or had) certification to teach at this level. Yes
Elementary School (grades K - 6)		☐

Middle School (grades 6 - 8)	☐	☐
High School (grades 9 - 12)	☐	☐
Community College	☐	☐
Four-year college or university	☐	☐

7. How many years have you taught at your current institution (including the current 2010-2011 academic year)?

8. Did you attend a community college before becoming a faculty member at a community college?

○ Yes

○ No

II. RESPONSIBILITIES AND WORKLOAD

9. Enter the total number of credit hours you are teaching or will teach at your current institution:

	Total credit hours
During the Fall 2010 term	☐
During the Spring 2011 term	☐

10. Enter the total number of credit hours you are teaching or will teach at <u>other institutions</u>:

	Total credit hours
During the Fall 2010 term	☐
During the Spring 2011 term	☐

11. During a typical 7-day week, about how many hours on average do you spend doing each of the following? (Please respond to each item.)

	0	1 - 4	5 - 8	9 - 12	13 - 16	17 - 20	21 or more
a. Preparing for classes	○	○	○	○	○	○	○

b. Lab preparation							
c. Grading							
d. In regularly scheduled office hours (in person or on-line)							
e. Communicating with students via email							
f. Supervising internships or other field experiences							
g. Advising students							
h. Working with students on activities other than course work (committees, clubs, orientation, etc.)							
i. Working with honors' projects							
j. Administrative activities							
k. College committees							
l. Mentoring other faculty							
m. Talking/visiting area industries							

III. TEACHING AND LEARNING

12. What instructional techniques/methods did you use for the classes you taught for credit during the Fall 2010 term?

	Not used	Used some of the time	Used most of the time	Used all the time
a. Lecturing				
b. Class discussions				
c. Cooperative learning (group work)				
d. Reflective writing/journaling				
e. Inquiry based learning				
f. Experiential learning/Field studies				
g. Automatic response systems (e.g. clickers) with immediate feedback in class				

13. What methods did you use to evaluate students in the classes you taught for credit during the Fall 2010 term?

	Not used	Used some of the time	Used most of the time	Used all the time
a. Multiple-choice questions				
b. Essay questions				
c. Short-answer questions				
d. Quizzes				
e. Homework assignments				
f. Student presentations				

g. Research papers	○	○	○	○
h. Projects	○	○	○	○
i. Lab assignments	○	○	○	○

14. What technology did you use for the classes you taught for credit during the Fall 2010 term? (Web sites used for instructional duties might include the syllabus, readings, assignments, and practice exams for classes.)

	Not used	Used some of the time	Used most of the time	Used all of the time
a. Websites for course information	○	○	○	○
b. On-line course management system (e.g. WebCt, Blackboard, Angel)	○	○	○	○
c. Publisher developed site (e.g. My Math Lab)	○	○	○	○
d. Pod casting	○	○	○	○
e. Other, please list	○	○	○	○
f. Other, please list	○	○	○	○

15. What means did you use to communicate with your students during the Fall 2010 term?

	Not used	Used some of the time	Used most of the time	Used all of the time
a. Email	○	○	○	○
b. Face-to-face	○	○	○	○
c. Phone calls	○	○	○	○
d. Facebook	○	○	○	○
e. Other, please list	○	○	○	○
f. Other, please list	○	○	○	○

16. Enter the total number of courses in which you used the following delivery methods during the Fall 2010 term.

	Number of courses					
	Did not use	1	2	3	4	5 or more
a. On-line or web delivery	○	○	○	○	○	○
b. Hybrid delivery (combination of face to face and on-line delivery)	○	○	○	○	○	○
c. Iowa Communications Network (ICN) delivery	○	○	○	○	○	○

IV. PROFESSIONAL DEVELOPMENT

17. Which of the following have you participated in while employed by your current institution? For those that you have participated in, evaluate the usefulness of the experience.

	Participation in		Usefulness				
	Yes	No	Not useful	Somewhat useful	Useful	Very Useful	N/A
a. Workshops focused on teaching/instructional techniques	○	○	○	○	○	○	○
b. Workshops focused on the discipline in which you teach	○	○	○	○	○	○	○
c. On-line course or tutorial focused on teaching/instructional techniques	○	○	○	○	○	○	○
d. On-line course or tutorial focused on the discipline in which you teach	○	○	○	○	○	○	○
e. National conference focused on teaching and instruction	○	○	○	○	○	○	○
f. National conference focused on my discipline	○	○	○	○	○	○	○
g. Presented at a conference focused on teaching and instruction	○	○	○	○	○	○	○
h. Presented at a conference focused on my discipline	○	○	○	○	○	○	○

18. Are you currently pursuing a more advanced degree or interested in pursuing a more advanced degree?

- ○ Yes, I am currently pursuing a more advanced degree.
- ○ No, I am not currently pursuing a more advanced degree but I am interested in pursuing one in the future.
- ○ No, I am not currently pursuing a more advanced degree and I do not plan to do so in the future.

In which field are you pursuing a more advanced degree?

19. Which of the following have you participated in while employed by your current institution? (Check all that apply, checking N/A indicates that, to your knowledge, your institution does not make this opportunity available.) For those that you have participated in evaluate the usefulness of the experience.

	Participated in			Usefulness				
	Yes	No	N/A	Not useful	Somewhat Useful	Useful	Very Useful	N/A
a. New faculty orientation	○	○	○	○	○	○	○	○
b. Mentoring by a senior faculty member in a formal program	○	○	○	○	○	○	○	○

c. Serving as a mentor to a new faculty member in a formal program	○	○	○	○	○	○	○	○
d. Lunch-n-Learn/Brown bag seminar	○	○	○	○	○	○	○	○
e. Professional development on strategies to assist under-prepared students	○	○	○	○	○	○	○	○
f. Paid travel to conferences/workshops	○	○	○	○	○	○	○	○
g. Association membership dues paid by the institution	○	○	○	○	○	○	○	○
h. Tuition remission for courses taken at your institution	○	○	○	○	○	○	○	○
i. Tuition reimbursement for courses taken at another institution	○	○	○	○	○	○	○	○
j. Paid sabbatical leave	○	○	○	○	○	○	○	○
k. Externship	○	○	○	○	○	○	○	○

20. Have you participated in original research in the following while employed by your current institution? Check all that apply.

	Yes	No
Research in your disciplinary field	○	○
Research in teaching and instruction	○	○

Was your research in your disciplinary field published or do you plan to publish it?

- ○ Yes, it has been published.
- ○ No, it has not been published, but I plan to publish it.
- ○ No, it has not been published, nor do I plan to publish it.

Was your research in teaching and instruction published or do you plan to publish it?

- ○ Yes, it has been published.
- ○ No, it has not been published, but I plan to publish it.
- ○ No, it has not been published, nor do I plan to publish it.

V. STUDENT RELATIONS

21. Considering all the students you teach, indicate on average your level of agreement with the following statements about student preparedness, and resources available:

	Level of agreement				
	Strongly	Disagree	Agree	Strongly	Don't

	disagree			agree	know
a. Students are well prepared academically for my classes.	○	○	○	○	○
b. Students in my classes demonstrate adequate critical thinking skills.	○	○	○	○	○
c. Students in my classes demonstrate adequate reading skills.	○	○	○	○	○
d. Students in my classes demonstrate adequate writing skills.	○	○	○	○	○
e. Students in my classes demonstrate adequate math skills.	○	○	○	○	○
f. Students effectively utilize learning resources for my classes.	○	○	○	○	○
g. Sufficient support services are available for students in my classes.	○	○	○	○	○
h. Sufficient tutoring services are available for students in my classes.	○	○	○	○	○
i. Students put in adequate effort to be successful in my classes.	○	○	○	○	○
j. Students struggle in my classes because of the demands placed on them by their employment.	○	○	○	○	○
k. Students struggle in my classes because of the demands placed on them by their family responsibilities.	○	○	○	○	○
l. Students struggle in my classes because of financial stress.	○	○	○	○	○

22. Indicate your level of agreement with the following statements about your interactions with students:

	Level of agreement				
	Strongly disagree	Disagree	Agree	Strongly agree	Don't know
a. I consider myself a mentor to the students in my classes.	○	○	○	○	○
b. It is my responsibility to recruit students into majors in my discipline.	○	○	○	○	○
c. It is important for me to recruit in a way that maintains or helps establish gender balance in my discipline.	○	○	○	○	○
d. It is important for me to recruit students of color into my discipline.	○	○	○	○	○
e. It is my responsibility to aid in the retention of students in my classes.	○	○	○	○	○
f. It is my responsibility to aid in the retention of students within my discipline at my institution.	○	○	○	○	○
g. It is my responsibility to aid in the retention of students within my discipline when transferring to another institution.	○	○	○	○	○

23. Indicate your level of agreement about academic and social groups:

	Levels of agreement				
	Strongly disagree	Disagree	Agree	Strongly agree	Don't know
a. Students interested in the discipline I teach benefit from discipline related student organizations.	○	○	○	○	○
b. Students interested in the discipline I teach benefit from discipline related job shadowing or internship opportunities.	○	○	○	○	○
c. It is important that I encourage students to participate in social organizations and activities.	○	○	○	○	○
d. It is important that I encourage students to participate in academic activities.	○	○	○	○	○

24. Indicate how often you interact with students outside of the classroom in the following ways:

	Frequency			
	Never	Rarely	Sometimes	Often
a. Greetings, waves or brief comments	○	○	○	○
b. Answering questions or short discussions concerning academic issues	○	○	○	○
c. Social conversations about the student	○	○	○	○
d. Social conversations about yourself	○	○	○	○
e. Counseling to provide emotional support	○	○	○	○
f. Counseling to provide career or professional development advice	○	○	○	○

25. Indicate how often you engage in the following:

	Frequency			
	Never	Rarely	Sometimes	Often
a. Encourage students in my classes to major in my discipline	○	○	○	○
b. Visit K-12 classes to encourage students to consider majors in my discipline	○	○	○	○
c. Make presentations to potential students about career opportunities for individuals with degrees in my discipline	○	○	○	○

VI. PARTNERSHIPS

26. How often throughout your community college teaching career have you engaged in the following?

	Never	Rarely	Sometimes	Often
a. Discussions concerning course content and articulation with four year college/university faculty.	○	○	○	○

b. Discussions concerning course content and articulation with other community college instructors.	○	○	○	○
c. Discussions concerning course content and articulation with high school faculty.	○	○	○	○
d. Placement of students into job shadowing opportunities.	○	○	○	○
e. Placement of students into internships.	○	○	○	○
f. Finding employment for students.	○	○	○	○
g. A grant partnership with a four year institution(s).	○	○	○	○

VII. JOB CHOICE AND SATISFACTION

27. In the left column rate how important the following were in your decision to accept a position at your current institution, and in the right column rate how important the following are in your decision to continue working at your current institution.

	Taking the job				Continuing with the job			
	Not important	Important	Very important	Essential	Not important	Important	Very important	Essential
a. Pay	○	○	○	○	○	○	○	○
b. Job benefits	○	○	○	○	○	○	○	○
c. Geographical location of the college	○	○	○	○	○	○	○	○
d. Support for family	○	○	○	○	○	○	○	○
e. Colleagues	○	○	○	○	○	○	○	○
f. Emphasis on teaching	○	○	○	○	○	○	○	○
g. Support for research	○	○	○	○	○	○	○	○
h. Teaching load	○	○	○	○	○	○	○	○
i. Office space	○	○	○	○	○	○	○	○
j. Support for technology	○	○	○	○	○	○	○	○
k. Other, please list	○	○	○	○	○	○	○	○

28. Indicate your level of agreement with the following statements about your department:

	Levels of agreement				
	Strongly disagree	Disagree	Agree	Strongly agree	Don't know
a. I feel that I fit in as a member of my department.	○	○	○	○	○
b. I am recognized as an excellent teacher by my colleagues.	○	○	○	○	○
c. I am valued by my colleagues for my service to the college (outside of my teaching duties).	○	○	○	○	○
d. Faculty in my department work hard to					

improve their teaching. ○ ○ ○ ○ ○

29. Indicate your level of agreement with the following statement about course transfer:

	Levels of agreement				
	Strongly disagree	Disagree	Agree	Strongly agree	Don't know
Courses in my discipline transfer to four year colleges and universities in a manner that is beneficial to students.	○	○	○	○	○

Please share any comments you would like to about how courses transfer.

30. Indicate your level of agreement with the following statements about your institution:

	Levels of agreement				
	Strongly disagree	Disagree	Agree	Strongly agree	Don't know
a. I am satisfied with the level of academic freedom allowed me at my institution.	○	○	○	○	○
b. In general, my immediate supervisor is quite accommodating of family-related needs.	○	○	○	○	○
c. To be viewed favorably from administration at this institution, faculty members must put their jobs ahead of their families or personal lives.	○	○	○	○	○
d. At this institution it is very hard to leave during the workday to take care of personal or family matters.	○	○	○	○	○
e. Faculty members often take work home at night and/or on weekends.	○	○	○	○	○
f. I enjoy my role as a community college instructor.	○	○	○	○	○
g. I am a valued employee at this institution.	○	○	○	○	○
h. I am recognized as an excellent teacher by the administration at this institution.	○	○	○	○	○
i. Faculty members of color are treated equitably at my institution.	○	○	○	○	○
j. Female faculty members are treated equitably at my institution.	○	○	○	○	○

k. This institution has a great deal of personal meaning for me.	○	○	○	○	○
l. I would be very happy to spend the rest of my career at this institution.	○	○	○	○	○
m. If starting my career again, I would still become a community college instructor in my discipline.	○	○	○	○	○
n. If starting my career again, I would still return to this institution.	○	○	○	○	○

31. Rate your level of satisfaction with the following at your institution:

	Very dissatisfied	Dissatisfied	Satisfied	Very Satisfied
a. Your salary	○	○	○	○
b. Your benefits package	○	○	○	○
c. Your office space	○	○	○	○
d. Your teaching space(s)	○	○	○	○
e. Technology support	○	○	○	○
f. Professional development offerings	○	○	○	○
g. Opportunities for advancement	○	○	○	○
h. Your job	○	○	○	○

32. To what extent do you agree or disagree with the following statements?

	Strongly disagree	Disagree	Agree	Strongly agree
a. I have thought about leaving this job.	○	○	○	○
b. I plan to look for a job within 3 years outside of this institution.	○	○	○	○
c. I plan to look for a job within 3 years outside of academia.	○	○	○	○
d. I plan to retire from this job within 3 years.	○	○	○	○
e. I plan to seek an administrative position within 3 years.	○	○	○	○

33. From your perspective as a current instructor, how important are the following types of training for teaching at a community college?

	Not important	Important	Very important	Essential
a. Graduate coursework in your subject area	○	○	○	○
b. Student teaching or guided practice teaching	○	○	○	○
c. Teaching methods course	○	○	○	○
d. Education courses	○	○	○	○

e. Community college history and culture courses	○	○	○	○
f. Training and information about teaching diverse learners	○	○	○	○
g. Training and information about teaching adult learners	○	○	○	○
h. Training and information about teaching under prepared students	○	○	○	○

34. How helpful do you personally feel the following would be to help you balance your work life?

	Not helpful	Somewhat helpful	Very helpful
a. Personal days	○	○	○
b. Availability of substitute instructors	○	○	○
c. Career break/sabbaticals	○	○	○
d. Time-off for family engagements/events	○	○	○
e. Working from home	○	○	○
f. Counseling services for employees	○	○	○
g. Health programs	○	○	○
h. Parenting or family support programs	○	○	○
i. Exercise facilities	○	○	○
j. Sick leave sharing	○	○	○

VIII. DEMOGRAPHICS

We are almost finished. The next questions will be about your compensation and your background. Your responses to these items—as with all the items on this survey—are voluntary and strictly confidential. They will be used only in statistical summaries.

35. What was your base salary during the last calendar year (Fall 2010 – Spring 2011) from your current institution? (Do not include summer pay and overload).

- ○ Less than $20,000
- ○ $20,000 - $39,999
- ○ $40,000 - $59,999
- ○ $60,000 - $79,999
- ○ $80,000 - $99,999
- ○ $100,000 or more

36. What length of time was your base salary for the last year based on? Enter the number of months. (Please answer based on length of your contract and how long you work rather than on the number of months you are paid.)

37. How much compensation did you receive from other income from your current institution not included in your basic salary (e.g. for summer session, overload courses, administration, research, coaching sports, etc.)?

- ◯ Less than $2,000
- ◯ $2,000 - $3,999
- ◯ $3,000 - $5,999
- ◯ $6,000 - $7,999
- ◯ $8,000 - $9,999
- ◯ $10,000 or more

38. Are you?

- ◯ Male
- ◯ Female

39. How old were you on January 1, 2011?

- ◯ Younger than 25 years
- ◯ 25 - 34 years
- ◯ 35 - 44 years
- ◯ 45 - 54 years
- ◯ 55 - 64 years
- ◯ 65 - 74 years
- ◯ 75 years or older

40. Please select one or more of the following choices to best describe your race. Select all that apply.

- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Hispanic or Latino
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ White
- ☐ Other

41. What was your marital status on January 1, 2011? (select one)

- ◯ Single and never married
- ◯ Married
- ◯ Living with partner or significant other
- ◯ Separated or divorced or widowed

IX. OPEN ENDED QUESTIONS

This is the final section. These five open ended questions give you the opportunity to tell us more about your experience as a community college faculty member. We value your comments.

42. What do you enjoy the most about your job as a community college faculty member?

43. What do you enjoy the least about your job as a community college faculty member?

44. What would improve your job as a community college faculty member?

45. What advice do you have for future community college faculty members?

46. Please describe important characteristics or qualities of an effective community college instructor.

Once you go to the next page this survey will be submitted and you will not be able to go back. If there are questions you want to check or review before you submit the survey please go back and do so now. We appreciate your thoughtful participation in this survey. Thank you!

If you have any questions or concerns feel free to contact any one of us: Jane Bradley (bradley@swcciowa.edu , 641-782-1338); Michael Miller (memiller@indianhills.edu , 641-683-5226); or Kathy Rogotkze (rogotkat@niacc.edu, 641-422-4154).

APPENDIX C: INSTITUTIONAL REVIEW BOARD APPROVAL

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

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

Date: 3/23/2011

To: Kathy Rogotzke
2631 155th St
Charles City, IA 50616

CC: Dr. Frankie Santos Laanan
N225A Lagomarcino
Dr. Larry Ebbers
N256 Lagomarcino Hall

From: Office for Responsible Research

Title: Iowa Community College Faculty Survey

IRB Num: 10-145

Approval Date:	3/21/2011	**Continuing Review Date:**	7/7/2011
Submission Type:	Modification	**Review Type:**	Expedited

The project referenced above has received approval from the Institutional Review Board (IRB) at Iowa State University. Please refer to the IRB ID number shown above in all correspondence regarding this study.

Your study has been approved according to the dates shown above. To ensure compliance with federal regulations (45 CFR 46 & 21 CFR 56), please be sure to:

- **Use only the approved study materials** in your research, **including the recruitment materials and informed consent documents that have the IRB approval stamp**.
- **Obtain IRB approval prior to implementing any changes** to the study by submitting the "Continuing Review and/or Modification" form.
- **Immediately inform the IRB** of (1) **all serious and/or unexpected adverse experiences** involving risks to subjects or others; and (2) **any other unanticipated problems** involving risks to subjects or others.
- **Stop all research activity if IRB approval lapses**, unless continuation is necessary to prevent harm to research participants. Research activity can resume once IRB approval is reestablished.
- **Complete a new continuing review form** at least three to four weeks prior to the **date for continuing review** as noted above to provide sufficient time for the IRB to review and approve continuation of the study. We will send a courtesy reminder as this date approaches.

Research investigators are expected to comply with the principles of the Belmont Report, and state and federal regulations regarding the involvement of humans in research. These documents are located on the Office for Responsible Research website http://www.compliance.iastate.edu/irb/forms/ or available by calling (515) 294-4566.

Upon completion of the project, please submit a Project Closure Form to the Office for Responsible Research, 1138 Pearson Hall, to officially close the project.

APPENDIX D: SURVEY QUESTIONNAIRE FOR PILOT STUDY

Survey Questionnaire for Pilot Study

Thank you for taking the survey and participating in this pilot study. Please answer the following questions concerning the survey. Your answers will be used to improve the survey before the start of our research project.

How long did it take you to complete the survey? (________ minutes)

Indicate if you "agree" or "disagree" with the following statements. For each "disagree" you select, a dialogue box will appear so that you can explain in detail why you chose that answer. Please include the identification of the question(s) that are problematic where appropriate.

The survey length was appropriate
The instructions provided were clear and concise.
All of the survey questions were grammatically correct.
I understood what was being asked in each question.
The answer choices provided were appropriate for all of the questions.
The definitions were provided or I knew the definitions of all terms used in the survey.
The organization of the survey was logical.
The electronic form of the survey was user friendly.
Most faculty members will complete the entire survey.

Please provide any other information you believe would be useful to us before we administer this survey to faculty members this fall.

APPENDIX E: CLIENT INFORMATION

Office of Community College Research and Policy (OCCRP).
Educational Leadership and Policy Studies
N225A Lagomarcino Hall
Ames , Iowa 50011-3195
Fax: 515.294.4942

Larry Ebbers

University Professor
Phone: 515.294.8067 515.294.8067
E-mail: lebbers@iastate.edu

Frankie Santos Laanan – Working partner

Associate Professor
Phone: 515.294.7292 515.294.7292
E-mail: laanan@iastate.edu

APPENDIX F: PILOT PARTICIPATION LETTER

Thank you for your consideration concerning the following request.
Jane Bradley, SWCC
Kathy Rogotzke, NIACC
Michael Miller, IHCC
Dr. Larry Ebbers, ISU
Dr. Frankie Laanan, ISU

Dear Former Full-Time Community College Instructor:
You are being asked to participate in a pilot study of a survey that is scheduled to be administered to all Iowa full-time faculty in the fall of 2010. The purpose of the survey is to provide data for several research initiatives designed to gain a better understanding of the demographics, perceptions, practices and needs of Iowa's community college faculty members. Your responses to the survey and to the questionnaire that follows the survey will be used to assure its validity and reliability. This study is being conducted by a team of faculty and graduate students in support of the Office of Community College Research and Policy at Iowa State University.

Please answer the questions in the survey by **substituting the dates of your last year of experience as a full-time community college faculty member** in place of the dates identified in the questions. Answer the questions to the best of your recollection and then provide feedback about the survey by answering the questionnaire at the end. You may move forward and backward through the survey to assist you in answering any questions.

Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time. Your responses will remain confidential and all data reporting will be done anonymously. If you decide to not participate in the study or leave the study early, it will not result in any penalty or loss of benefits to which you are otherwise entitled. You can skip any questions that you do not wish to answer.

If you are willing to participate in this pilot study, please click on the link below to enter the survey. Accessing the survey will be regarded as your permission to use the data you provide in the study.

Again, thank you for your participation in this pilot study.

APPENDIX G: PARTICIPANT LETTER

April 14, 2011

We are conducting a study that focuses on the experiences of full-time faculty members working in Iowa Community Colleges. The purpose of this study is to gain a better understanding of the demographics, background, perceptions, practices, and needs of Iowa's full-time community college faculty members. This research includes a web survey that asks about the academic and social experiences of full-time faculty members at the institution where you were working during the 2010-2011 academic year. The main objective is to learn more about the demographics, experiences and needs of full-time faculty.

As a full-time faculty member, you have been selected to participate in this study. I know this is a busy time of year, but please take approximately 20 minutes to answer the questions on this web survey. This is your opportunity to help us develop a better understanding of the experiences and needs of full-time faculty members working in Iowa's Community College system.

Your participation in this study is voluntary, and your willingness to participate will have no effect on your current status as a faculty member at your respective community college. Summary data will be provided to the college at the conclusion of this study. Results containing less than 10 cases/respondents will be suppressed to protect any indirect identification of participants. Your email address will be retained for follow-up communication only and will then be removed from the data set.

Your responses to this survey will remain completely confidential and secured and your name will never be associated with the answers you provide. In addition, you may skip any question(s) you do not wish to answer.

If you would like more information about this research project, or experience difficulty accessing the web survey, please to contact me at rogotkat@niacc.edu or via telephone at (641) 422-4154. To contact the Iowa State University supervising faculty member for this research project, please call Dr. Larry Ebbers, at (515) 294-7292 or by email at lebbers@iastate.edu.

If you have any questions about the rights of research subjects or related injury, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, Office of Research Assurances, (515) 294-3115, 1138 Pearson Hall, Ames, IA 50011.

Thank you for your time and attention and for supporting our efforts to gain a better understanding of the demographics, beliefs, needs and behaviors of Iowa's full-time community college faculty members.

Sincerely,

Kathy Rogotzke
Graduate Student, Educational Leadership and Policy Studies

APPENDIX H: SURVEY QUESTIONS USED TO ANSWER RESEARCH QUESTIONS

Research Question 1. How does the socio-demographic composition of the full-time community college science and mathematics faculty in Iowa compare to the non-math/science faculty?

Q. 38 Are you male or female?
Q. 39 How old were you on January 1, 2011?
Q. 40 Please select one or more of the following choices to best describe your race.
Q. 41 What was your marital status on January 1, 2011?
Q. 5 What degrees have you completed?
Q. 8 Did you attend a community college before becoming a faculty member at a community college?

Research Question 2. How do math and science faculty interact with students outside of the classroom and how do these interactions compare to non-math/science faculty? (Faculty behaviors)

Q. 11 During a typical 7-day week, about how many hours on average do you spend doing each of the following?
e. Communicating with students via email
f. Supervising internships or other field experiences
g. Advising students
h. Working with students on activities other than course work (committees, clubs, orientation, etc.)
i. Working with honor's projects.

Q. 15. What means did you use to communicate with your students during the Fall 2010 term?
a. email
b. face-to-face
c. phone calls
d. Facebook
e. Other

Q. 24 Indicate how often you interact with students outside of the classroom in the following ways:
a. Greetings, waves or brief comments.
b. Answering questions or short discussions concerning academic issues.
c. Social conversations about the student.
d. Social conversations about yourself.
e. Counseling to provide emotional support.
f. Counseling to provide career or professional development advice.

Q. 25. Indicate how often you engage in the following:
a. Encourage students in my classes to major in my discipline

b. Visit K-12 classes to encourage students to consider majors in my discipline.
c. Make presentations to potential students about career opportunities for individuals with degrees in my discipline.
d. Recruitment activities that my institution has organized.

Research Question 3. Do science and mathematics faculty identify similar barriers to student success as non-math/science faculty members? (Faculty Perceptions)

Q. 21 Considering all the students you teach, indicate on average your level of agreement with the following statements about student preparedness and resources available:
a. Students are well prepared academically for my classes.
b. Students in my classes demonstrate adequate critical thinking skills.
c. Students in my classes demonstrate adequate reading skills.
d. Students in my classes demonstrate adequate writing skills.
e. Students in my classes demonstrate adequate math skills.
f. Students effectively utilize learning resources for my classes.
g. Sufficient support services are available for students in my classes.
h. Sufficient tutoring services are available for students in my classes.
i. Students put in adequate effort to be successful in my classes.
j. Students struggle in my classes because of the demands placed on the;m by their employment.
k. Students struggle in my classes because of the demands placed on them by their family responsibilities.
l. Students struggle in my classes because of financial stress.

Research Question 4. Do science and math faculty have the same perceptions as non-math/science faculty concerning their role as mentors and providers of encouragement to their students? (Faculty Perceptions)

Q. 22 Indicate your level of agreement with the following statements about your interactions with students:
a. I consider myself a mentor to the students in my classes.

Q. 23 Indicate your level of agreement about academic and social groups:
a. Students interested in the discipline I teach benefit from discipline related student organizations.
b. Students interested in the discipline I teach benefit from discipline related job shadowing or internship opportunities.
c. It is important that I encourage students to participate in social organizations and activities.
d. It is important that I encourage students to participate in academic activities.

Research Question 5. Do science and math faculty have similar attitudes about the importance of their roles in student recruitment and retention as non-math/science faculty members? (Faculty Attitudes)

Q. 22 Indicate your level of agreement with the following statements about your interactions with students:

b. It is my responsibility to recruit students in to majors in my discipline.
c. It is important for me to recruit in a way that maintains or helps establish gender balance in my discipline.
d. It is important for me to recruit students of color into my discipline.
e. It is my responsibility to aid in the retention of students in my classes.
f. It is my responsibility to aid in the retention of students within my discipline at my institution.
g. It is my responsibility to aid in the retention of students within my discipline when transferring to another institution.

Research Questions 6. Can professional activities, including professional development activities, be identified that correlate and predict a high commitment to recruitment and retention of students in their fields by science and mathematics faculty? (Professional involvement)

Q. 17 Which of the following have you participated in while employed by your current institution?

a. Workshops focused on teaching/instructional techniques.
b. Workshops focused on the discipline in which you teach.
e. National conference focused on teaching and instruction.
f. National conference focused on my discipline.
g. Presented at a conference focused on teaching and instruction.
h. Presented at a conference focused on my discipline.

Q. 19 Which of the following have you participated in while employed by your current institution?

e. Professional development on strategies to assist uner-prepared students.
g. Training to teach diverse learners.
h. Paid travel to conferences/workshops.
l. Paid sabbatical leave.

Q. 25 Indicate how often you engage in the following:

b. Visit K-12 classes to encourage students to consider majors in my discipline.
c. Make presentations to potential students about career opportunities for individuals with degrees in my discipline.
d. Recruitment activities that my institution has organized.

Q 26 How often throughout your community college teaching career have you engaged in the following?

a. Discussions concerning course content and articulation with four year college/university faculty.
b. Discussions concerning course content and articulation with other community college instructors.
c. Discussions concerning course content and articulation with high school faculty.
d. Placement of students into job shadowing opportunities.
e. Placement of students into internship positions.
f. Finding employment for students.
g. A grant partnership with a four year institution(s).

Student Recruitment

		Stud. recr.	Split MS/AS	Gender	Age	Attd. CC	Confid. stud.	Stud. svcs	Stud. enc.	Stud. interact.	Cons. mentor	Job satis.	Prof. conf.	Stud. outr.	Stud. asst.	Wkshps	Artic. disc.
Stud. recr.	Pearson corr.	1.000	.001	.036	-.083	-.073	.021	.015	.234	.199	.194	-.023	.019	.317	.173	.031	.098
	Sig. (1-tailed)	.	.492	.230	.042	.065	.330	.382	.000	.000	.000	.318	.350	.000	.000	.263	.021
Split MS/AS	Pearson corr.		1.000	-.089	.057	.129	.033	-.126	.153	.114	.128	-.093	.033	.107	.049	.071	-.015
	Sig. (1-tailed)		.	.033	.118	.004	.248	.004	.001	.009	.004	.028	.251	.013	.158	.072	.381
Gender	Pearson corr.			1.000	.162	-.017	-.006	-.031	-.121	-.141	-.103	.009	-.074	.039	-.114	-.087	.031
	Sig. (1-tailed)			.	.000	.365	.452	.261	.006	.002	.016	.426	.063	.209	.009	.035	.259
Age	Pearson corr.				1.000	-.001	-.159	-.076	-.137	.050	.030	-.012	.011	.014	.046	-.082	.082
	Sig. (1-tailed)				.	.491	.000	.058	.002	.151	.269	.399	.412	.390	.172	.045	.044
Attd. CC	Pearson corr.					1.000	-.010	-.013	-.007	.022	.054	-.006	-.063	-.002	-.073	-.011	-.038
	Sig. (1-tailed)					.	.415	.397	.440	.328	.134	.451	.096	.482	.066	.409	.215
Confid. stud.	Pearson corr.						1.000	.111	-.062	-.112	-.017	.100	.056	.081	.056	.097	-.098
	Sig. (1-tailed)						.	.011	.099	.010	.366	.019	.126	.047	.123	.022	.022
Stud. svcs	Pearson corr.							1.000	.100	-.110	.068	.126	.058	.024	-.006	.109	.022
	Sig. (1-tailed)							.	.019	.012	.079	.005	.115	.311	.450	.012	.324
Stud. enc.	Pearson corr.								1.000	.261	.339	.012	-.005	.366	.153	.109	.078
	Sig. (1-tailed)								.	.000	.000	.406	.457	.000	.001	.012	.054
Stud. interact.	Pearson corr.									1.000	.306	.026	.077	.336	.088	.026	.155
	Sig. (1-tailed)									.	.000	.299	.056	.000	.035	.295	.001
Cons. mentor	Pearson corr.										1.000	.013	.042	.134	.131	.062	.075
	Sig. (1-tailed)										.	.395	.194	.003	.003	.099	.060
Job satis.	Pearson corr.											1.000	.044	.042	.033	.184	.049
	Sig. (1-tailed)											.	.182	.192	.245	.000	.157
Prof. conf.	Pearson corr.												1.000	.016	.245	.254	.066
	Sig. (1-tailed)												.	.370	.000	.000	.085

		Stud. recr.	Split MS/AS	Gender	Age	Attd. CC	Confid. stud.	Stud. svcs	Stud. enc.	Stud. interact.	Cons. mentor	Job satis.	Prof. conf.	Stud. outr.	Stud. asst.	Wkshps	Artic. disc.
Stud. outr.	Pearson corr.													1.000	.077	.071	.275
	Sig. (1-tailed)													.	.055	.071	.000
Stud. asst	Pearson corr.														1.000	.277	-.050
	Sig. (1-tailed)														.	.000	.148
Wkshps	Pearson corr.															1.000	.004
	Sig. (1-tailed)															.	.466
Artic. disc.	Pearson corr.																1.000
	Sig. (1-tailed)																.

Note. *N* = 429.

Model Summary[a]

Model	R	R^2	Adjusted R^2	Std. error of the estimate	Change statistics				
					R^2 change	F change	$df1$	$df2$	Sig. F change
1	.123[b]	.015	.006	1.94495	.015	1.628	4	424	.166
2	.329[c]	.108	.087	1.86389	.093	7.280	6	418	.000
3	.417[d]	.174	.144	1.80463	.066	6.581	5	413	.000

[a]Dependent variable: student recruitment. [b]Predictors: (constant), attended CC, age, split MS from AS, gender. [c]Predictors: (constant), attended CC, age, split MS from AS, gender, job satisfaction, I consider myself a mentor to students, confidence in students, student services, student interaction, student encouragement. [d]Predictors: (constant), attended CC, age, split MS from AS, gender, job satisfaction, I consider myself a mentor to students, confidence in students, student services, student interaction, student encouragement, professional conferences, articulation discussions, assist students, workshops, student outreach.

ANOVA[a]

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	24.627	4	6.157	1.628	.166[b]
	Residual	1603.920	424	3.783		
	Total	1628.547	428			
2	Regression	176.371	10	17.637	5.077	.000[c]
	Residual	1452.176	418	3.474		
	Total	1628.547	428			
3	Regression	283.527	15	18.902	5.804	.000[d]
	Residual	1345.020	413	3.257		
	Total	1628.547	428			

[a]Dependent variable: student recruitment. [b]Predictors: (constant), attended CC, age, split MS from AS, gender. [c]Predictors: (constant), attended CC, age, split MS from AS, gender, job satisfaction, I consider myself a mentor to students, confidence in students, student services, student interaction, student encouragement. [d]Predictors: (constant), attended CC, age, split MS from AS, gender, job satisfaction, I consider myself a mentor to students, confidence in students, student services, student interaction, student encouragement, professional conferences, articulation discussions, assist students, workshops, student outreach.

Coefficients[a]

Model		Unstandardized coefficients		Standardized coefficients		
		Beta	Std. error	Beta	*t*	Sig.
1	(Constant)	7.991	.398		20.101	.000
	Split MS from AS	.084	.200	.021	.421	.674
	Gender	.203	.194	.051	1.049	.295
	Age	-.178	.094	-.093	-1.898	.058
	Attended CC	-.307	.199	-.075	-1.547	.123
2	(Constant)	3.072	1.286		2.389	.017
	Split MS from AS	-.158	.198	-.039	-.798	.426
	Gender	.385	.188	.098	2.045	.041
	Age	-.151	.092	-.079	-1.633	.103
	Attended CC	-.305	.191	-.075	-1.601	.110
	Confidence in students	.055	.060	.043	.903	.367
	Student services	-.003	.070	-.002	-.039	.969
	Student encouragement	.177	.055	.166	3.222	.001
	Student Interaction	.135	.045	.151	2.977	.003
	I consider myself a mentor to students	.384	.172	.114	2.229	.026
	Job satisfaction	-.046	.053	-.040	-.853	.394
3	(Constant)	3.772	1.423		2.651	.008
	Split MS from AS	-.187	.193	-.046	-.969	.333
	Gender	.324	.185	.082	1.756	.080
	Age	-.203	.090	-.106	-2.247	.025
	Attended CC	-.258	.186	-.063	-1.392	.165
	Confidence in students	.004	.060	.003	.062	.951
	Student services	.000	.068	.000	.005	.996
	Student encouragement	.072	.057	.068	1.275	.203
	Student interaction	.068	.046	.075	1.466	.144
	I consider myself a mentor to students	.400	.168	.118	2.381	.018
	Job satisfaction	-.050	.053	-.044	-.943	.346
	Professional conferences	-.026	.064	-.019	-.398	.691
	Student outreach	.124	.027	.241	4.563	.000
	Assist students	.323	.106	.149	3.058	.002
	Workshops	-.052	.082	-.031	-.635	.526
	Articulation discussions	.026	.063	.020	.421	.674

[a]Dependent variable: student recruitment.

Excluded Variables[a]

Model		Beta in	*t*	Sig.	Partial correlation	Collinearity statistics Tolerance
1	Confidence in students	.006[b]	.114	.910	.006	.972
	Student services	.011[b]	.225	.822	.011	.978
	Student encouragement	.237[b]	4.905	.000	.232	.947
	Student interaction	.218[b]	4.550	.000	.216	.965
	I consider myself a mentor to students	.209[b]	4.363	.000	.208	.972
	Job satisfaction	-.023[b]	-.479	.632	-.023	.991
	Professional conferences	.018[b]	.377	.706	.018	.989
	Student outreach	.318[b]	6.911	.000	.319	.986
	Assist students	.181[b]	3.762	.000	.180	.975
	Workshops	.026[b]	.528	.597	.026	.983
	Articulation discussions	.102[b]	2.121	.035	.103	.991
2	Professional conferences	.008[c]	.161	.872	.008	.974
	Student outreach	.248[c]	4.816	.000	.230	.767
	Assist students	.137[c]	2.911	.004	.141	.941
	Workshops	.009[c]	.197	.844	.010	.929
	Articulation discussions	.062[c]	1.317	.189	.064	.955

[a]Dependent variable: student recruitment. [b]Predictors in the model: (constant), attended CC, age, split MS from AS, gender. [c]Predictors in the model: (constant), attended CC, age, split MS from AS, gender, job satisfaction, I consider myself a mentor to students, confidence in students, student services, student interaction, student encouragement.

Student Retention

		Stud. ret.	Split MS/AS	Gender	Age	Attd. CC	Confid. stud.	Stud. svcs	Stud. enc.	Stud. interact.	Cons. mentor	Job satis.	Prof. conf.	Stud. outr.	Stud. asst.	Wkshps	Artic. disc.
Stud. ret.	Pearson corr.	1.000	-.010	.013	-.048	-.101	.041	.120	.263	.124	.375	.018	.068	.184	.206	.103	.110
	Sig. (1-tailed)	.	.417	.395	.159	.018	.197	.006	.000	.005	.000	.359	.081	.000	.000	.016	.011
Split MS/AS	Pearson corr.		1.000	-.089	.057	.129	.033	-.126	.153	.114	.128	-.093	.033	.107	.049	.071	-.015
	Sig. (1-tailed)		.	.033	.118	.004	.248	.004	.001	.009	.004	.028	.251	.013	.158	.072	.381
Gender	Pearson corr.			1.000	.162	-.017	-.006	-.031	-.121	-.141	-.103	.009	-.074	.039	-.114	-.087	.031
	Sig. (1-tailed)			.	.000	.365	.452	.261	.006	.002	.016	.426	.063	.209	.009	.035	.259
Age	Pearson corr.				1.000	-.001	-.159	-.076	-.137	.050	.030	-.012	.011	.014	.046	-.082	.082
	Sig. (1-tailed)				.	.491	.000	.058	.002	.151	.269	.399	.412	.390	.172	.045	.044
Attd. CC	Pearson corr.					1.000	-.010	-.013	-.007	.022	.054	-.006	-.063	-.002	-.073	-.011	-.038
	Sig. (1-tailed)					.	.415	.397	.440	.328	.134	.451	.096	.482	.066	.409	.215
Confid. stud.	Pearson corr.						1.000	.111	-.062	-.112	-.017	.100	.056	.081	.056	.097	-.098
	Sig. (1-tailed)						.	.011	.099	.010	.366	.019	.126	.047	.123	.022	.022
Stud. svcs	Pearson corr.							1.000	.100	-.110	.068	.126	.058	.024	-.006	.109	.022
	Sig. (1-tailed)							.	.019	.012	.079	.005	.115	.311	.450	.012	.324
Stud. enc.	Pearson corr.								1.000	.261	.339	.012	-.005	.366	.153	.109	.078
	Sig. (1-tailed)								.	.000	.000	.406	.457	.000	.001	.012	.054
Stud. interact.	Pearson corr.									1.000	.306	.026	.077	.336	.088	.026	.155
	Sig. (1-tailed)									.	.000	.299	.056	.000	.035	.295	.001
Cons. mentor	Pearson corr.										1.000	.013	.042	.134	.131	.062	.075
	Sig. (1-tailed)										.	.395	.194	.003	.003	.099	.060
Job satis.	Pearson corr.											1.000	.044	.042	.033	.184	.049
	Sig. (1-tailed)											.	.182	.192	.245	.000	.157
Prof. conf.	Pearson corr.												1.000	.016	.245	.254	.066
	Sig. (1-tailed)												.	.370	.000	.000	.085

		Stud. ret.	Split MS/AS	Gender	Age	Attd. CC	Confid. stud.	Stud. svcs	Stud. enc.	Stud. interact.	Cons. mentor	Job satis.	Prof. conf.	Stud. outr.	Stud. asst.	Wkshps	Artic. disc.
Stud. outr.	Pearson corr.													1.000	.077	.071	.275
	Sig. (1-tailed)													.	.055	.071	.000
Stud. asst	Pearson corr.														1.000	.277	-.050
	Sig. (1-tailed)														.	.000	.148
Wkshps	Pearson corr.															1.000	.004
	Sig. (1-tailed)															.	.466
Artic. disc.	Pearson corr.																1.000
	Sig. (1-tailed)																.

Note. *N* = 429.

Model Summary[a]

Model	R	R^2	Adjusted R^2	Std. error of the estimate	Change statistics				
					R^2 change	F change	$df1$	$df2$	Sig. F change
1	.114[a]	.013	.004	1.79713	.013	1.389	4	424	.237
2	.439[b]	.192	.173	1.63729	.179	15.471	6	418	.000
3	.474[c]	.225	.197	1.61374	.032	3.458	5	413	.004

[a]Dependent variable: student retention. [b]Predictors: (constant), attended CC, age, split MS from AS, gender. [c]Predictors: (constant), attended CC, age, split MS from AS, gender, job satisfaction, I consider myself a mentor to students, confidence in students, student services, student interaction, student encouragement. [d]Predictors: (constant), attended CC, age, split MS from AS, gender, job satisfaction, I consider myself a mentor to students, confidence in students, student services, student interaction, student encouragement, professional conferences, articulation discussions, assist students, workshops, student outreach.

ANOVA[a]

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	17.944	4	4.486	1.389	.237[a]
	Residual	1369.378	424	3.230		
	Total	1387.322	428			
2	Regression	266.784	10	26.678	9.952	.000[b]
	Residual	1120.538	418	2.681		
	Total	1387.322	428			
3	Regression	311.812	15	20.787	7.982	.000[c]
	Residual	1075.510	413	2.604		
	Total	1387.322	428			

[a]Dependent variable: student retention. [b]Predictors: (constant), attended CC, age, split MS from AS, gender. [c]Predictors: (constant), attended CC, age, split MS from AS, gender, job satisfaction, I consider myself a mentor to students, confidence in students, student services, student interaction, student encouragement. [d]Predictors: (constant), attended CC, age, split MS from AS, gender, job satisfaction, I consider myself a mentor to students, confidence in students, student services, student interaction, student encouragement, professional conferences, articulation discussions, assist students, workshops, student outreach.

Coefficients[a]

Model		Unstandardized coefficients		Standardized coefficients		
		Beta	Std. error	Beta	*t*	Sig.
1	(Constant)	9.775	.367		26.611	.000
	Split MS from AS	.029	.185	.008	.158	.875
	Gender	.074	.179	.020	.413	.680
	Age	-.092	.086	-.052	-1.064	.288
	Attended CC	-.383	.183	-.102	-2.086	.038
2	(Constant)	3.292	1.130		2.915	.004
	Split MS from AS	-.185	.174	-.049	-1.064	.288
	Gender	.254	.165	.070	1.539	.125
	Age	-.060	.081	-.034	-.744	.458
	Attended CC	-.412	.167	-.109	-2.458	.014
	Confidence in students	.054	.053	.046	1.019	.309
	Student services	.095	.061	.071	1.555	.121
	Student encouragement	.150	.048	.152	3.102	.002
	Student Interaction	.012	.040	.014	.299	.765
	I consider myself a mentor to students	1.046	.151	.336	6.907	.000
	Job satisfaction	-.009	.047	-.009	-.196	.844
3	(Constant)	2.746	1.272		2.158	.031
	Split MS from AS	-.204	.172	-.054	-1.185	.237
	Gender	.273	.165	.075	1.653	.099
	Age	-.095	.081	-.054	-1.179	.239
	Attended CC	-.355	.166	-.094	-2.137	.033
	Confidence in students	.032	.053	.027	.592	.554
	Student services	.092	.061	.069	1.527	.128
	Student encouragement	.102	.051	.103	2.006	.045
	Student interaction	-.017	.041	-.021	-.423	.673
	I consider myself a mentor to students	1.022	.150	.328	6.808	.000
	Job satisfaction	-.023	.047	-.022	-.482	.630
	Professional conferences	.008	.058	.007	.145	.885
	Student outreach	.038	.024	.079	1.548	.122
	Assist students	.289	.094	.145	3.059	.002
	Workshops	.036	.073	.023	.486	.627
	Articulation discussions	.079	.056	.065	1.413	.158

[a]Dependent variable: student retention.

Excluded Variables[a]

Model		Beta in	*t*	Sig.	Partial correlation	Collinearity statistics
						Tolerance
1	Confidence in students	.033[b]	.668	.505	.032	.972
	Student services	.119[b]	2.450	.015	.118	.978
	Student encouragement	.271[b]	5.666	.000	.266	.947
	Student interaction	.136[b]	2.786	.006	.134	.965
	I consider myself a mentor to students	.394[b]	8.751	.000	.392	.972
	Job satisfaction	.017[b]	.350	.727	.017	.991
	Professional conferences	.064[b]	1.316	.189	.064	.989
	Student outreach	.186[b]	3.886	.000	.186	.986
	Assist students	.208[b]	4.344	.000	.207	.975
	Workshops	.101[b]	2.080	.038	.101	.983
	Articulation discussions	.111[b]	2.295	.022	.111	.991
2	Professional conferences	.049[c]	1.090	.276	.053	.974
	Student outreach	.100[c]	1.993	.047	.097	.767
	Assist students	.148[c]	3.309	.001	.160	.941
	Workshops	.065[c]	1.424	.155	.070	.929
	Articulation discussions	.073[c]	1.623	.105	.079	.955

[a]Dependent variable: student retention. [b]Predictors in the model: (constant), attended CC, age, split MS from AS, gender. [c]Predictors in the model: (constant), attended CC, age, split MS from AS, gender, job satisfaction, I consider myself a mentor to students, confidence in students, student services, student interaction, student encouragement.

ACKNOWLEDGEMENTS

I want to thank Dr. Larry Ebbers for the support he has shown me from the time we met. His support, encouragement, and words of wisdom have been extremely valuable to me in my graduate school life and my professional life. I would not have entered the program if it had not been for Dr. Ebbers's guidance and persistence. He made me feel like I was important and that I was capable of earning a PhD.

I also want to thank Dr. Frankie Laanan for his support, encouragement, and for leading me to this wonderful project. Dr. Laanan was patient with me as I negotiated being a graduated student in the human sciences instead of the life sciences. He provided a safe learning environment for me to move out of my comfort zone and enter into this entirely different experience.

A special thank you goes to Dr. Kathy Rogotzke, my partner through the entire research experience. Thanks for all the opportunities to discuss the research, share experiences, and vent the frustrations. We made it!

I also want to thank the other members of my committee for spending their time supporting me in my quest. It has been such a joy getting to know Dr. Sharon Drake and Dr. Soko Starobin in class and outside of class. Thanks for all of your kind support and encouragement. My gratitude also goes to Dr. James Colbert for committing the time to serve on my committee and for providing valuable feedback along the way. It has been nice to have another science person along on this journey.

I appreciate the time away from work that Southwestern Community College allowed me to take to complete this degree. It would have been so difficult without that support.

Finally, thank you, Matt—for everything. I love you.