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An analysis of academic performance by discipline of community college transfer students

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DEDICATION

I dedicate this dissertation to:

My parents, Ross M. Emley and W. Jane Emley

whose love, care and support provided the foundation for my college education.

My loving partner and wife, Luann R. Johnson

whose unending encouragement and belief in my abilities

inspired me to pursue this life goal.

My exhilarating and wonderful sons, Eric J. Emley and Alex J. Emley

whose understanding, patience and virtue enabled me to pursue my dream.

The caring and thoughtful teachers in my life who understood that

teaching is a personal human experience and inspired my life-long education.

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ABSTRACT

This study analyzed the academic performance of successful community college transfer students by academic discipline courses. Grade distributions were compared between Des Moines Area Community College (DMACC) and Iowa State University (ISU) by matched disciplines. A T-test for equality of means and Chi-square analysis was used to determine significant differences in the grade distributions.

The participants included 837 transfer students that graduated with a bachelor's degree from ISU between 1998 and 2002. Descriptive analysis of student demographics identified overall patterns and unique features of successful transfer students. Analysis of grade distributions of specific disciplines and community college general education courses identified significant differences.

The results of the study indicated a majority of transfer students were female, white, traditional age, with lower than State of Iowa average ACT scores. Almost half (48.2%) of the students transferred 60-65 credits and 66% complete the bachelor's degree in 5 years. Overall GPA was significantly different between DMACC (2.96) and ISU (2.84). Significant differences were found in 20 of 31 matched discipline groups. DMACC general education grade distributions and ISU grade distributions were also significantly different.

The results suggest that further research is necessary to analyze specific student characteristics and the related transfer success. Student support services and academic performance of community college courses will need further research. The significant differences in grade distributions suggest that faculty and administration of both institutions need to review course competencies, grading criterion and assessment techniques. Further research is warranted to better understanding specific community college academic

performance and related university major fields of study. Community college courses specifically designed for transfer students may need to be developed in the general education curriculum to better prepare transfer students for university course expectations. In addition, a comprehensive assessment program of general education skills and abilities may need to be implemented to more fully understand the academic expectations of transfer students.

CHAPTER 1. INTRODUCTION

Background of the Study

Community colleges are the fastest growing higher education institutions with over fifty percent of the new freshman college students in the United States (NCES, 2001). The community college is a door of opportunity to higher education for many students who otherwise may not attend college. Historically, community colleges functioned to provide an opportunity for students to explore a variety of educational goals. One goal, the collegiate/transfer function, provided access to 4-year colleges and universities through community college courses that reflect the first two years of a university curriculum (Cohen & Brower, 2003). Today, the collegiate/transfer function constitutes the majority of students taking credit classes in American community colleges (Coley, 2000).

With such a major impact on higher education, educational leaders and the community repeatedly ask, "Do community colleges adequately prepare students to successfully transfer and complete a bachelor's degree at a 4-year institution? In the past two decades, this question has resulted in an expansion of community college research and literature directed to understanding how the community college experience impacts students (Cohen & Brower, 1996, 2003; Pascarella, 1999, 2003).

Transfer research has examined student characteristics, psychosocial adjustment, institutional barriers and academic achievement. Research on academic achievement focused on degree completion and grade point average (GPA). The research often compared transfer students with native students – students who enrolled only in the four-year college or university (Algin, Davis & Mooradian, 1995; Carlan & Byxbe, 2000; Doughtery, 1992; Hamilton, 1997; Nunley & Breneman, 1988). The research indicated that transfer students

experienced transfer shock; a phrase used to describe the drop in GPA during the first semester at the 4-year college or university (Hills, 1965; Keeley & House, 1993; Preston, 1993) and was less likely to persist to complete the bachelor's degree (persistence rate). Cohen and Brawer, (2003) related that earlier transfer research reflected a reduction of collegiate curriculum in community colleges and an overall decline in the academic knowledge and abilities of high school students. More recent research indicates increased transfer success with degree attainment and overall GPA (Arnold, 2001; Christian, 2000, Glass, Conrad, & Harrington, 2002).

In the past decade, transfer success have been described when specific honors or transfer programs were implemented (Brawer, 1995; Friedlander, 1983; Kane, 2001; Laanan, 1995). The transfer programs required high admission standards, and provided an enriched core curriculum, individualized support and increased academic rigor in writing, reading and research (Banks & Byock, 1991). These honors or transfer programs were reported to be successful, but concerns were expressed about elitism. The programs separated the student population by essentially creating a special learning environment for transfer students (Bulakowski & Townsend, 1995).

Besides implementing specific transfer programs, community colleges refocused efforts to improve the collegiate function in response to increased enrollments (Eaton, 1994). To improve transfer success more research focused on identifying psychosocial adjustment and specific academic performance factors (Christian, 2000). This research moved beyond student demographics and overall GPA for understanding transfer success. Psychosocial adjustment specifically examined the levels of involvement, quality of effort, general perceptions and satisfaction. Other psychosocial variables included friend/family support,

attitudes, perceptions, self-concept, beliefs and extra-curricular involvement (Laanan, 1995, 2000).

Research on academic achievement focused more specifically on transfer courses (Quanty & Dixon, 1996). The focus on courses coincided with increased communication and discussion about the collegiate/transfer function in community colleges and sparked increased efforts to develop state or system-wide accountability of transfer success (Cohen & Brawer, 2003;Seybert, 2002). This renewed effort to support the collegiate/transfer function in community colleges prompted this researcher to study the academic performance of transfer courses at Des Moines Area Community College (DMACC).

Statement of the Problem

Transfer research focused on student demographics has reported findings about characteristics such as race, gender, part-time or full-time status or number of work hours. These results create a sociological understanding about the transfer population. However, these characteristics are not amenable to change by faculty or educational processes. The current open door policies at DMACC, like those of many community colleges, allow students to take any number of general education courses, at any time with few prerequisites. Community college policies cannot alter gender, race or family structures of the student, or the number of hours a student decides to work. Institutional barriers such as confusing articulation agreements can be changed to ease the burden of the transfer process. However, articulation agreements have an indirect impact and do not directly affect academic performance. Research is most useful for faculty when the results have a direct connection to the courses or disciplines they teach. Then, faculty can take responsibility for the teaching and learning process and create meaningful change within the classroom.

Relatively few studies examine transfer according to course achievement or academic disciplines. Two studies found transfer shock across discipline majors (Keely & House, 1993; Richardson & Doucette, 1980). Other research found GPA differences across disciplines (Tippin, 1982; Webb, 1985) and differences in specific course levels and transfer rates (Armstrong & Mellissinos, 1994). Brinkman (1994) purported that a course-by-course analysis is necessary to understand transfer success fully. Quanty (1999) concluded that traditional research results are "too general to suggest specific actions that faculty may take to prepare students better" (p. 459). Quanty and Dixon (1995) developed a Course-Based Model of Transfer Success (CBMTS) to study students' academic success between transfer institutions. This new approach of transfer research was applied statewide to the Virginia community colleges and university system (23 community colleges and six universities). The research outcomes "clearly demonstrates what we feel is a major strength of the CBMTS approach, its ability to transform the transfer problem into a very manageable set of opportunities or critical comparisons"(Quanty, 2001, p 7). Transfer research based on courses or academic disciplines can provide useable and meaningful information for faculty to understand academic performance.

Purpose of the Study

The purpose of this study was to analyze the academic performance of transfer students between DMACC and ISU. The study compared grade distributions of courses completed by 837 transfer students. The community college courses were grouped by discipline and matched with the same or related discipline at the university (see Appendix A). The grade distributions were compared to understand any significant differences of the matched disciplines.

This study used the Course-based Model of Transfer Success by Quanty and Dixon. (1995) as a guiding framework. Quanty et.al. (1996) described the significant differences as critical comparisons. The critical comparisons will provide objective information to understand academic performance of transfer students better.

Significance of the Study

This study is designed primarily to benefit faculty by providing objective information by which they can review critically the academic performance of transfer students. The critical review can support decision-making about course competencies along with grading criterion and curriculum development. Faculty can review significant differences in academic performance to understand better the course expectations between DMACC and ISU. This study also can provide a framework for discussion between DMACC and ISU faculty.

Students can benefit by understanding how community college courses provide a successful path to transfer and degree completion. This study can provide information for advising about coursework and performance based on actual outcomes rather than perceptions or anecdotal feedback. In addition, increased communication between community colleges and universities can occur to support or improve articulation agreements. Community stakeholders and policy makers can benefit by identifying effective or value added (Astin, 1993) coursework at the community college with transfer and degree completion at a university. This study can provide a clear picture of transfer success to support the community college collegiate/transfer function. This study can contribute to the course/discipline research of community college transfer, thus enabling a new understanding of the academic performance on transfer students at a four-year university.

Theoretical Perspective

This study used the Course-based Model of Transfer Success (CBMTS) by Quanty and Dixon (1995) as a guiding framework. The model examines specific courses rather than overall GPA to understand transfer success. This study identified the significant differences in academic performance, what Quanty et.al. (1996) described as critical comparisons. The effect of critical comparisons is not just to objectify the transfer process. The purpose was also to provide an objective starting point for faculty to examine their respective course expectations, grading policies and curriculum development. The critical comparisons provide a form of critical inquiry. That is, this study asked faculty not to maintain a status quo, but to use the critical comparisons as points of reference for change. Crotty (1998) purported that critical inquiry requires a search for knowledge in the context of action. This study supports the assumption that critical comparisons will produce actions that ultimately will change the level of success for community college transfer students.

This study utilized a quantitative methodology to analyze academic performance. The quantitative approach identified and analyzed the pattern of academic performance (grades) in each matched discipline to reveal an objective pattern of similarity or difference. This approach can be seen as a post-positivist perspective asserting that certain patterns of academic performance can be studied to discover some probability of objective truth about transfer success (Crotty, 1998). The approach, however, does not determine a single pattern of success nor implies only one pattern of academic achievement.

Differences in students' cognitive/learning styles, and psychosocial experiences construct and help determine academic performance. This study did not define the absolute pattern of transfer success, but instead, identified significant differences in patterns of grades

that provide for critical reflection. The assumption is that whatever pattern of academic performance is examined between the community college and four-year university, a similarity (lack of difference) should occur. Therefore, a variety of patterns of academic performance may be examined together.

A purpose of this study was to create an objective view of academic performance beyond GPA. This objectivity is in contrast to a subjective perspective of faculty within a discipline. A faculty member may maintain a subjective perspective that the criterion for academic performance (course content, expectations, and grading levels) established for the course is effective for successful transfer. The faculty can perceive subjectively that student's transfer grades are indicative of later academic success at the four-year university. The subjective perspective may be supported by each faculty member's own educational experience and interactions with colleagues. However, the perspective may or may not be supported by research evidence. This study should provide an objective picture of the academic performance at DMACC and ISU. From this picture, faculty can become more aware of the similarities or differences in academic performance at the two learning institutions. Thus, a piece of the transfer puzzle is constructed to understand transfer success.

A complex array of variables forms a picture about transfer and contributes to transfer success (Laanan, 2001). However, understanding of transfer success requires a broad understanding of many variables, such as student characteristics, psychosocial adjustment, institutional barriers or programs as well as academic achievement. All the variables have some meaning and contribute, although not equally, to transfer success. The assumption of this study reflects the idea that accumulating information about transfer success will provide an increasing understanding about this phenomenon. The understanding of transfer success

will not be a static formula of success, but will be an ongoing construction of relatively objective data that reflects the activities of students transferring from community college to the university. An ongoing review of student characteristics, educational activities and institutional factors will be necessary to provide a more complete understanding of transfer success.

A developmental framework was used to help relate community college learning experiences to the academic performance at the four-year university. Academic success at the community college is perceived as supported by the students' K-12 foundation of academic knowledge, skills and abilities and helps determine success in transferring and completing a Bachelor's degree. Correlation research of transfer students supports this contention. Cohen (1999) described increased transfer success when students were required to complete two years of full-time study prior to transfer. McQuay (2000) reported increased transfer success in community college systems nation-wide when students completed 60 or more credits before transferring. The research seems to indicate that more coursework at the community college provides increased development of important factors (e.g., knowledge, skills, attitudes, social/emotional competencies, etc.) that increases success. Astin's (1984) I-E-O model of higher education identified that student "input" characteristics are an essential component to understanding the needs of the learning "environment" to produce the defined "output." Thus, the current study directed attention at the academic performance of the community college as an input compared to the later output of graduation.

Research Questions and Hypotheses

Three research questions and two null hypotheses guided the main study:

1. What are the demographic characteristics of DMACC students who transfer and successfully complete a bachelor's degree at ISU?
2. How different are the aggregated discipline grade distributions between DMACC and ISU?

   H_0: There is no significant difference between DMACC and ISU grade distributions.
3. How different are the grade distributions of DMACC general education courses and ISU courses?

   H_0: There is no significant difference between DMACC and ISU grade distributions.

The first research question examined the demographic characteristics of the DMACC-ISU transfer student. Data were gathered regarding race, gender and age at time of transfer along with ACT or Compass scores in English, Reading and Math. In addition, information on the first term enrolled at DMACC, first term enrolled at ISU and term graduated at ISU were gathered to determine the length of time to completion of the bachelor's degree. Data on credit hours earned at DMACC, and credit hours accepted by ISU were gathered to determine the percentage of credits accepted. The number of ISU credits hours attempted was also gathered. The cumulative DMACC GPA and GPA for the accepted credits, and ISU cumulative GPA were gathered to identify differences. The demographic data were gathered to provide a picture of the DMACC transfer student. In addition, data on number of courses, by discipline, were gathered to identify frequency distributions. Community college students have the most diverse backgrounds of any student population in higher education (Cohen, 2003). This study described the frequency distributions of demographic variables of

DMACC-ISU transfer students. The transfer student demographic information provided a description about this specific DMACC-ISU transfer population.

The second research question examined the differences between academic performance (grades) at DMACC and ISU, by discipline. In other words, were the grades that students earned in community college courses different from the grades earned at the university? The inference was that academic performance at one higher education institution should have some degree of similarity with performance the other institution. For example, consider a student who takes three courses (9 credits) in psychology (discipline) along with many other core courses (more than 24 credits of general education) at a community college. Upon transferring to the university the student takes additional courses in psychology, perhaps as a major/minor or as an elective for the social sciences requirement. This study analyzed the degree of difference in the grades in the discipline (psychology) between the two institutions. If the grades were significantly different then the difference could be described as a "critical comparison" (Quanty, 1995). The research question sought to identify significant differences in the grade frequencies aggregated by academic discipline. The null hypothesis, therefore, stated that there is no significant difference between the academic performance of discipline groups at the community college and the four-year university.

Research Question 3 asked: How different are the grade distributions of DMACC general education courses and ISU courses? Some DMACC discipline courses are defined as core curriculum for the Associates degree requirements according to college policies. These courses provide the basis for what is described as the general education and constitute most of the community college transfer curriculum. The study sought to examine the differences

in the grades distributions of DMACC general education courses and the ISU courses. The null hypothesis, therefore, stated that there are no significant differences between the academic performances of DMACC general education courses and ISU courses.

Limitations of the Study

This study was limited to the specific sample of DMACC students who transferred to ISU and graduated with a bachelor's degree between 1998 and 2003. This study provided as much demographic information as was available to describe this sample. This study did not provide support for external validity to generalize the results to other community college populations. Instead, the focus of the study was primarily to benefit the specific learning institutions involved in the study. The selected years (1998-2003) were determined by the most recent data set available to include a sample large enough to be representative of the DMACC-ISU transfer student. A sample of 837 students can provide a representative sample of current transfer students. No significant changes in academic population, course curriculum, and articulation agreements were noted during this time period.

This study selected successful transfer students and defined the DMACC-ISU transfer students by completion of a bachelor's degree. Focusing only on successful students completing a degree narrows the scope of the study. However, this study was designed to compare the academic performance (grades) of successful students between DMACC and ISU to identify significant differences among those with successful academic performance. The significant differences will be critical comparisons for further critical inquiry.

This study was limited by the mechanisms available for identifying the critical comparisons. The study did not identify the cause or identify the reason for the significant differences in academic performance. The use of Chi-square statistical analysis determined

the likelihood that the frequencies of the grades are the same or different. Many intervening variables may account for the differences in the grades. However, identifying the differences provides a point of reference for further critical inquiry.

Another limitation of the study concerns the unit of measurement. The assumption was made that academic performance level and the corresponding grade assigned to the college transcript are valid. Many studies have indicated the lack of relationship between grades and various standardized test of academic achievement (Pascarella & Terenzini, 1991, 2003). Many different levels of expectations, competence and personal perception do occur on the part of the course and instructor. However, grades are used in higher education to determine successful completion of the course expectations and requirements for graduation. Therefore, content validity is established by the policies of the learning institutions accepting grades and the grade point average (2.0 or greater) as a criterion to meet successfully the degree requirements and graduate.

Definitions of Terms

The following terms were defined for the purpose of the study:

Academic disciplines: The grades were aggregated according to the DMACC core curriculum and related program disciplines. The DMACC disciplines were matched with the similar ISU discipline. The DMACC disciplines were considered the anchor disciplines and the ISU disciplines were matched according to descriptions of the discipline provided by the ISU Courses and Programs 2003-2005 Catalogue. Appendix A listed the matched DMACC and ISU disciplines for the study.

Academic performance: The letter grade (A, B, C, D, F) indicated on the official student record collected from DMACC or ISU

DMACC GPA: The overall grade point average of courses accepted for transfer credits. Development education, adaptor or continuing education course are not included.

ISU GPA: The overall grade point average of ISU courses upon completion of Bachelor's degree requirements.

Successful transfer student: A person enrolled at DMACC for 24 or more credit hours that transfers to ISU and completes a Bachelor's degree (between the academic years of 1998 to 2003). Twenty-four credits are equal to 50% of the DMACC's core requirements of general education curriculum. The 24-credit level is also the ISU admission criteria to consider the community college GPA in lieu of the ACT score and high school rank for admission requirements. Also, DMACC transfer credits must constitute at least 66% of the accepted ISU credits. No more than 33% of transfer credits can come from another learning institution.

Transfer hours: The number of DMACC course credit hours transferred to ISU. The credits transferred may not all be used for the completion of the degree. Each discipline department may not accept some credits based on individual courses.

Summary

This chapter described an overview of community college transfer research that has examined student characteristics, psychosocial adjustment, institutional barriers and academic achievement. The problem statement focused on academic achievement and the need for research beyond student characteristics and overall GPA analysis. The statement described the need for course-based research of transfer students to understand specifically academic performance in each discipline area. The purpose of this study was to examine the academic performance of successful transfer students to determine significant differences in

grades based on discipline areas between DMACC and ISU. The differences are identified as critical comparisons to provide a starting point for further critical inquiry.

CHAPTER 2. REVIEW OF LITERATURE

Introduction

This chapter provides an overview of: (1) a brief history of community colleges in the United States; (2) an overview of Iowa State University (ISU); (3) an overview of Des Moines Area Community College (DMACC); and (4) the research related to community college transfer success to four-year colleges or universities. Described in the transfer research are four main themes: student characteristics, psychosocial adjustment, institutional barriers, and academic achievement. Academic achievement research is emphasized to integrate significant findings with the defined research questions.

History of Community Colleges in the United States

The community college dominates as the entrance to higher education today. More new and/or freshman students enter community colleges than any other institution of higher education (NCES, 2001). The history of this remarkable educational development goes back to the early 1900s. Publicly support universities were evident in every state, due in part to the Morrill Acts of 1862 and 1890 (Cohen & Brawer, 2003). Then four-year colleges and universities started separating higher education into a "junior college" for preparatory collegiate education and the "senior college" for university scholarly terminal education. Bogue (as cited in Cohen & Brawer, 2003) reported that, by 1922, the American Association of Junior Colleges defined a junior college an offering two years of collegiate instruction that strictly corresponded with the first two years of a four-year. In 1931, Ells (as cited in Fields, 2001) identified the Depression and resulting public programs as providing an opportunity for junior colleges to expand into vocational education.

The name junior college gradually faded in the 1950s and 60s, and the community college emerged to reflect the expanded mission and role in education. This expanded mission included noncredit community or continuing education and specific vocational/technical degree programs. The population of community colleges expanded with the mission to reflect an open-access to many underserved or less prepared members of the community. The community college system remains a comprehensive and multi-faceted higher education system. Today, several states—California, Florida, Illinois and Texas, have very structured community college systems to provide a direct flow of students to their respective state university system.

Iowa State University

Iowa State University (ISU), a Carnegie Doctoral/Research-Extensive University, was established in 1858 as the Iowa Agricultural College, the first land-grant college enacted by the Morrill Act in 1862. The college opened in 1868, with a class of 26 graduating in 1872. The college was renamed in 1898 as the Iowa State College of Agriculture and Mechanic Arts, and then in 1959 it became Iowa State University of Science and Technology. Notable university distinctions include: first state institution to found a veterinary school; George Washington Carver received bachelor's (1894) and master's (1896) degrees at ISU; and Carrie Chapman Catt graduated valedictorian in 1880 at ISU. The electronic digital computer was invented by John Atanasoff in the 1930s. The College of Agriculture and the College of Engineering developed into nationally recognized programs (ISU, 2003).

Currently, the Fall 2002-03 enrollment included 27,898 students representing all Iowa counties, all of the United States and 113 foreign countries. The undergraduate student

population comprised 83.9% of total student enrollment. ISU had the largest number of Iowa high school graduates enrolled of any Iowa higher education institution. Iowa community college transfer students comprised 903 (largest in the state) of the 1,537 total of ISU transfer students. More than 100 undergraduate majors and nearly 200 graduate fields of study were offered by nine colleges: Agriculture, Business, Design, Education, Engineering, Family & Consumer Sciences, Liberal Arts & Sciences, Veterinary Medicine, and the Graduate College. In the 2001-02 academic year, 4,163 bachelor's degrees, 98 professional degrees, 802 Master's degrees, and 239 Doctorate degrees were awarded.

Des Moines Area Community College

The Iowa community college system was enacted in 1965 by the 61st General Assembly after a 1962 report entitled, "Education Beyond High School Age: The Community College", authored by the Iowa Department of Education. The community college was created officially on March 18, 1966 as Merged Area XI, with a defined district encompassing major portions of 11 Iowa counties and minor parts of 11 adjacent counties. Approximately 11% of Iowa land area is represented with 20% of the state's population. This population area comprises the state's capitol, Des Moines, along with the greater metropolitan area, which constitutes the largest population area in the state. The elected Board adopted Des Moines Area Community College (DMACC) in 1968 when the first classes were held on newly built main campus in Ankeny. DMACC is a multi-campus system with campuses in Boone (established -1969), Urban –Des Moines (1972), Carroll (1979), Newton (1993) and West Des Moines (2001). DMACC offers Associate of Arts, Associate of Sciences, Associate of Applied Sciences, and Associate of General Studies degrees along with 75 career (vocational/technical) programs certificates and degrees.

DMACC is an open-access college with a Fall 2002 enrollment of 20,736 credit taking students and 34,695 non-credit students for a total of unduplicated enrollment of 55,431. Students enrolled in college transfer track included 15,188 students, or 27.4% of the student body. The total credits enrolled by transfer track students were 195,926 or 58,6% of all credits generated. The Fall 2002 enrollment of DMACC students transferring to ISU was 301. When the 301 DMACC transfer students were figured into the 903 total ISU transfer students from Iowa community colleges it was understood that 1/3 of all Iowa community college transfers to ISU were former DMACC students. The total number of former DMACC students enrolled at ISU during the Fall 2002, semester was 1,196, which represents 4.3% of the total ISU student population. The data show the important impact of DMACC students on ISU transfer enrollment.

Research on Community College Transfer

Research on community college transfer follows four main themes: student characteristics, psychosocial adjustment, institutional barriers/programs and academic achievement. Each theme describes the success or lack of success from each unique perspective with a variety of contributing factors. The research generally focuses on identifying the important variables that contribute to the success or lack of success.

Student characteristic research describes the various demographic information of transfer students, such as age, gender, race, part-time/full-time status, high school grades, employment and family background, along with the number of credits taken and transferred. These studies track how persistent students accomplish the goal of a bachelor's degree (Alba & Lavin, 1981; Dougherty, 1992, 1994; Graham & Hughes, 1994; Hamilton, 1997; Hill, 1965; Hughes & Graham, 1992; Nunley & Breneman, 1988; Palmer, et al., 1994; Pascarella

& Terenzini, 1991). The results generally identified lower persistence rates of community college students compared to native students at 4-year institutions. Minority racial/ethnic and lower socioeconomic variables correlated with disproportionately low transfer rates (Cohen, 1988; Illinois Community College Board, 1996; Kraemer, 1995, 1996;Richardson & Skinner, 1992; Stewart, 1988). The research prompted further investigation into other contributing factors (psychological and social) that related to diminished academic performance (Graham & Hughes, 1994; Laanan, 1996).

Research on psychosocial adjustment focuses on the "social and psychological relearning in the face of new encounters, new teacher, new opportunities and new academic, personal and social demands" (Laanan, 2000, p. 4). The adjustment research includes levels of involvement, quality of effort, general perceptions and satisfaction. Other psychosocial variables include friend/family support, attitudes, perceptions, self-concept and beliefs as well as extra-curricular involvement (Laanan, 1995, 2000). Cejda (1994) studied faculty collaboration and support to understand the effect on transfer adjustment. A variety of transfer and honors programs were developed and studied for the impact on transfer adjustment (Banks & Byock, 1991; Bulakowski & Townsend, 1995; Friedlander, 1983; Kane, 2001; Laanan, 1996, 2000; Zamani, 2001). These programs generally produced better academic performance, social adjustment and involvement and increased satisfaction with the transfer process. As institutions developed new programs to improve student transfer outcomes, system barriers to transfer also were identified.

Institutional barriers to the transfer process were focused initially on agreements to accept community college credits at a 4-year institution. Articulation agreements or the lack of agreement created many problems for transfer students. Students could be advised to take

courses for credits at the community college only to find that the credits were not accepted at the 4-year institution. Learning institution collaborations and intra-state education alliances were formed to improve articulation agreements and dispel institutional myths and attitudes (Brawer, 1995;Burnett, 2001;Rifkin, 1998; Tobolowsky, n.d.; Welsh, 2002). The outcome of the coordination of services and agreement resulted in a general increase in transfer rates and credits accepted to and by the 4-year institution. Kane (2001) described the Transfer Alliance Program as "perhaps the best model to date of a comprehensive intersegmental mechanism for community college-to-university transfer... [and] regenerated confidence in the excellence of community colleges as transfer institutions" (pp. 28, 37).

One of the founding missions of community colleges was transfer education (Cohen & Brawer, 2003; Eaton, 1994). The mission of offering students the opportunity of access and acquisition to the educational process is the hallmark of the community college mandate. Students overwhelmingly use the community college through general education courses to access the otherwise restricted door of four-year learning institutions. Yet, with all the transfer activities, many questions remain concerning the transfer rates and success for transfer students.

Many studies focus on the transfer rates and demographic factors (Hamilton, 1997; Kinnick, et.al., 1998; Kraemer, 1996, McMillan & Park, 1994; Palmer, 1994). Demographic studies of transfer students were part of the some of the earliest research interest about community college success. This focused interest resulted in the establishment of research centers, such as the Center for the Study of Community Colleges (CSCC) at the University of California at Los Angeles and the National Effectiveness Transfer Consortium (NETC), to calculate rates and track transfer students (McMillan & Parke, 1994). In the late 1980s,

CSCC and NETC developed standard definitions to describe the transfer student. Many studies before this time defined transfer students differently and, thus, a broad range of transfer rates (5-82%) were reported (Hirose, 1994, Piland, 1995). Twenty years of consistent data collection by the CSCC of some 416 community colleges across the United States indicated a transfer rate of over 25% (Szelenyi, 2001). Research findings prompted discussion and inquiry into factors related to the changing rates of transfer among the community college population.

Student demographics provide a descriptive analysis of the transfer process. These studies describe the students' age, gender, race, and transfer credits along with grade-point averages. Coley (2000) reported transfer trends and indicated some criticism about community colleges ability to provide successful transfer processes. However, other reviews of research indicated retention rates, grade point averages and baccalaureate degree attainment similar to native four-year institutional students (Terenzini, Springer, Yaeger, Pascarella, & Nora, 1996). Another research analysis indicated, "the likelihood of transfer was nearly twice as high for students enrolled full time in the first year than for part-time students" (Coley, 2000, p. 23). One overriding concern is that 40-50% of community college students are enrolled part-time. Another confounding factor is that 68% of transfer students did not complete a degree before transferring. Transfer students spend about 20 months at the community college and often took a similar amount of time off between institutions. Even with the part-time schedule, lack of degree and time lag the overall persistence rate was 70% for bachelor's degree attainment. This rate is similar to that of native four-year students. Similarities between community college transfer students and four-year native

students elaborated by Graham and Hughes (1994) and Hamilton (1997) supported this position. These studies concluded that academic outcomes were not significantly different.

A variety of community college factors as well as definitional and methodological problems were reported in the transfer literature. Primary to these problems are determining how to differentiate students who intend to transfer from those who do not. Further longitudinal approaches and identifying community college beginners perpetuate these problems (Coley, 2000).

One difficult factor in the transfer research is articulation agreements and policies. These agreements between community colleges and four-year institutions connect the lower-division courses (first two years) and upper-division courses. They explain what courses and credits may be transferred to the four-year institution. Acceptance by the four-year institutions has required a multi-level approach from state educational codes, college presidents and institutional curriculum committees (Cohen, 1993). Articulation policies required lengthy discussion and agreement by the learning institutions. These transfer negotiations have produced increasing acceptance especially by public four-year universities. Rifkin (1996) described the barriers and recommended actions to promote articulation policy for the ever-changing roles that community college must meet to respond effectively to changes in community needs and workforce developments.

Burnett (2001) reported on Oregon's efforts to reduce the barriers of articulation with an "Intersector group" made up of representative of the state's community college, four-year schools, independent colleges and Department of Education. This instersector group identified the emerging issue of nonlinear transfer. Students are not following the traditional path of high school to community college to four-year institution (a linear process).

Increasingly, they found students starting and stopping at different times, co-enrolling, and reverse transferring (Burnett, 2001). The students were taking advantage of the variety of learning opportunities offered to them and fitting them to their own personal needs and life situations. These divergent paths and patterns to academic achievement prompted further initiatives to support transfer effectiveness and devise better ways to report the transfer process.

Cejda (1999) analyzed the functional roles that community colleges play in students achieving their baccalaureate degree. Four functional pathways were described. The first included the traditional two-plus-two path in which the student acquires two years of academic credit in each institution. The actual calendar timeframe of achieving the two years of credits varied across students and institutions. The second pathway involved concurrent enrollment in both the community college and four-year institution. The course obtained did not always follow prescriptive program plans, but the coursework met overall degree requirements. The third path involved using community college during summer sessions. Studies indicated that some students attended single sessions repeatedly, namely the summer, to obtain necessary requirements of the university general education. Reverse and lateral transfer was the last pathway utilizing the community college. Especially in urban areas, Cejda (1999) indicated that studies showed an increasing number of students shifting back and forth from four-year institutions and community colleges to meet their own specific educational needs. This coursework seemed to fit their individual and situational needs. For the bachelor's degree a required number of credits and the final coursework were completed in the four-year institution. Follow-up studies indicated that students do not follow a single pathway, but utilize any number of the described pathways to achieve their academic goals.

With these pathways in mind, Cejda (1999) indicated that almost 50% of community college students "transfer" which is nearly twice the typical statistic reported by previous traditional transfer definitions. The study concluded that multiple indicators of transfer are necessary to account fully for the student movement and to examine the transfer effectiveness and student success.

Specific college-to-university studies used a variety of definitions and cohort groups to research their own learning institution's transfer effectiveness. Hamilton (1997) used a variety of cohorts over a five-year time span to track their success in baccalaureate institutions. Descriptive analysis was used to report demographics of the students and their degree attainment, amounts of credits transferred, and types of degrees. Best and Gehring (1993) reported comparing three groups: sixty or more credits, less than sixty credits and nontransfer students. They compared grade point averages, graduation rates and dismissal rates. The overall success rates were highest for students transferring at junior-level. Another descriptive approach to understanding transfer was conducted by James Madison University (1998) where community colleges that provided the majority of students were examined and demographic characteristic were analyzed. The primary dependent variable was student performance of prerequisites for degree programs, grade point average, and degree attainment.

Thomas Nelson Community College and Christopher Newport University, in Virginia, examined over 1800 students to identify patterns in the transfer process (Quanty & Dixon, 1995). Typical demographic information was reported (credit hours transferred, age, ethnicity, and gender). However, a new tracking system, a course-based model was utilized (Quanty, 1996). The prerequisites for each upper-division course were examined. A grade

distribution indicated that transfer students did as well or better than native university students. Quanty (1996) described this approach as having a strong empirical foundation to describe community college effectiveness.

The variety of descriptive demographic approaches provided an understanding of patterns of the student transfer process, but did not examine academic success characteristics. The addition of the course-based model (Quanty, 1996) added considerable focus to the specific course variables and academic performance of the community college transfer student. Student demographics (age, gender, ethnicity, etc.) lend to an understanding of who is transferring, but does little to understand how success is obtained. Quanty (1996) purported that characteristics of coursework, such as prerequisites, general education requirements and resulting academic performance, are a better indicator of transfer success.

Academic performance was explored further by Cejda, Kaylor, and Rewey (1998) in relation to transfer shock. Higher dismissal rates and academic probation were indicative of transfer students. They showed that, although transfer shock was investigated, few studies examined the phenomenon from a discipline-based approach. This study used a restricted sample of AA degree students who were traditional age, enrolled full-time and pursued the same declared major throughout the study. These limitations where supported by the recent trends of transfer degree legislation enacted in the Florida community college system and Illinois Articulation Initiative of required lower-division courses linking with 17 bachelor's majors. The discussion indicated a need to examine the academic performance of community college transfer students specific to programs and disciplines. The results support measuring the variety of transfer success across respective majors. Additional research by Armstrong and Mellissinos (1994) also called for discipline specific coursework

and transfer process research and examining other population groups (part-time, nontraditional age, etc.).

The community college student population taking liberal arts or general education coursework indicates the need for more understanding of the transfer process. Striplin (2000) reported that 54% of course work in community colleges is in liberal arts disciplines. Of the liberal arts courses, 74% are transferable to in-state four-year public institutions. General education requirements, which are dominated by liberal arts courses, were the largest proportion of academic degree programs (69%) and a significant proportion of occupational degree programs (29%).

Summary

The review of literature provided an overview of: (1) the history of community colleges in the United States; (2) an overview of Iowa State University (ISU); (3) an overview of Des Moines Area Community College (DMACC); and (4) the research related to community college transfer to four-year colleges or universities. Described in the transfer research are four main themes: student characteristics, psychosocial adjustment, institutional barriers/programs, and academic achievement. Academic achievement research was emphasized to integrate significant findings with the defined research questions.

The review of transfer research supported the need for further research designed to focus on the success characteristics of baccalaureate attainment and community college coursework. Studies designed to compare specific coursework through discipline categories and transfer success can provide information important to meet the needs of the community college transfer function. Finding the academic patterns of coursework, prerequisites and disciplines that can provide comparable or predictive factors for successful transfer would be

a valuable tool for student support services, academic counseling, curriculum committees and overall institutional effectiveness.

CHAPTER 3. METHODOLOGY

Introduction

The purpose of this study was to analyze academic performance of transfer students at DMACC and ISU. This chapter describes the study design, population, data collection, and analysis. A quantitative approach was selected to analyze the academic performance of transfer students (DMACC-ISU). The study compared grades of 837 DMACC-ISU transfer students who graduated with a bachelor's degree from ISU between 1998 and 2003. The sample resulted in 51,314 courses which were aggregated by discipline. Chi-square analysis was used to compare the grade frequencies between DMACC and ISU.

Research Design

This quantitative study described the demographic characteristics and analyzed the academic performance of DMACC-ISU transfer students. The study sought to answer the following research questions:

1. What are the demographic characteristics of DMACC students who transfer and successfully complete a bachelor's degree at ISU?
2. How different are the grade distributions, aggregated by discipline, between DMACC and ISU?
3. How different are the grade distributions of DMACC general education courses and ISU courses?

Research Question 1 provided a descriptive analysis of the demographic characteristics. Research Questions 2 and 3 used the procedure of falsification by the null

hypothesis as the basis for the study. The course grades of the study sample were collected and compared to determine if significant differences exist between DMACC and ISU.

Population of the Study

This study collected data on 837 DMACC-ISU students who graduated with a bachelor's degree from ISU from 1998 to 2003. The data were collected from the DMACC Institutional Research Office and ISU Office of the Registrar. The data requested were secondary information without student-identifying information (e.g., name, social security, school ID), and the grades were aggregated by discipline in the form of Microsoft Excel spreadsheets. Human subjects approval was obtained through the Institutional Review Board at ISU with support given by DMACC's Office of Institutional Research and the Vice President for Academic Affairs.

The sample was identified from student records generated by the Registrar's Office at ISU. The most current sample of ISU graduates who transferred from DMACC back successive years to obtain a large enough samples to be representative. The sample resulted in ISU graduates from fall semester 1999 to summer semester, 2003, inclusively (5 years). Research Question 1 describes the sample by the following demographic characteristics:

- Gender: described as male or female
- Race of the students: defined in the categories: White/non-Hispanic, Black/non-Hispanic, Asian/Pacific islander, Hispanic, American Indian/Alaskan, and mixed/other.
- Age: defined as the chronological year from birth at the time of transfer.
- First year enrolled at DMACC: defined as the year the student first enrolled at DMACC.

- Graduated from ISU: defined as the year the student completed the Bachelor's degree from ISU.
- Years in college: defined as the first year enrolled at DMACC subtracted from the year graduated from ISU.
- Number of transfer hours: defined as the number of college credits hours accepted for transfer to ISU.
- ACT scores: defined as the math, English, reading and composite scores of students upon entering DMACC. The test may have been completed prior to enrollment (during high school) or at the time of enrollment. Not all students enrolling at DMACC completed the ACT test.
- DMACC GPA: defined as the grade point average of DMACC courses accepted by ISU for transfer on a 0.00 to 4.00 point scale.
- ISU GPA: defined as the grade point average on a 0.00 to 4.00 scale at time of graduation.

A pilot study was completed in December 2002. A random sample of 50 of the target population was selected (based on data from 1998 to 2002) and an analysis of demographic variables was completed. Additionally, grade distributions were analyzed for courses in academic disciplines competed at DMACC. A full review of this pilot study is included in the Chapter 4: Results – Pilot Study section.

Data Collection

The data were received from the ISU Registrar's Office and the DMACC Office of Institutional Research. The data were in the form of Excel spreadsheets listing all courses taken by the target population and the corresponding grade. The courses were aggregated according to academic discipline. The DMACC courses were aggregated according to disciplines of the general education requirements. These disciplines were determined by the DMACC requirements for associate of arts and associate of science degrees approved by DMACC's Board of Directors and accredited by North Central Accreditation (NCA) review. Related discipline courses outside of the general education curriculum were also included in the study of Research Question 2 (matched disciplines). The courses were: accounting, business administration, management, marketing, and physical education. These courses were included in the study because of high student enrollment both at DMACC and ISU. For Research Question 3 (general education), only the disciplines identified as general education (core disciplines) were used for the comparison. Appendix A indexes the DMACC disciplines and the matched ISU disciplines.

The DMACC general education (core curriculum) provided the basic structure for the comparison. ISU discipline categories had different department/college designation due to different organizational structures. When different discipline or department/college designation occurred, the discipline was first identified within the ISU curriculum groups of biological and physical sciences, math, communications, humanities, and social sciences. From this grouping the discipline was matched by content within the same groupings as DMACC disciplines (see Appendix A for the discipline-matching list).

Data Analysis

The data were analyzed using Windows version 11.0 of the Statistical Package for the Social Sciences (SPSS). The study used descriptive statistical analysis to analyze the frequency distributions of the defined demographic variables. A crosstabulation with the Chi-square test of independence was used to determine whether DMACC and ISU grades aggregated by academic discipline are significantly different. The probability value for significance was set at <.05. The test of independence was used to calculate the difference between the DMACC and ISU grades. The study used the null hypothesis (DMACC grades are equal to ISU grades) as the basis for the study of Research Question 2 and 3. Each research question is stated with the supporting statistical analysis description below:

Research question 1: What are the demographic characteristics of DMACC students who transfer and successfully compete a bachelor degree at ISU?

This research question analyzed the demographic characteristics and required a descriptive analysis of the frequency distributions of the demographic variables. The descriptive computation included the frequency, percent, mean, standard deviation, kurtosis, and skewness. Minimum and maximum values were also described for ACT scores. The overall grade distributions of DMACC and ISU were also compared using a t-test for equality of means, crosstabulation and Chi-square analysis. A Sommer's d measure of effect size was used to determine the magnitude of the relationship between DMACC and ISU grades.

Research question 2: How different are the aggregated discipline grade distributions between DMACC and ISU?

This research question analyzed the aggregated discipline grade distributions and utilized a crosstabulation and Chi-square analysis to help determine if the DMACC and ISU

grades are significantly different. Chi-square was used to test each grade of the two groups (DMACC, ISU). Chi-square, a test of independence, was used to calculate the differences between the observed and expected frequencies between the groups, and compute the percentage of grades in each group distribution. A standard residual was computed by subtracting the observed frequency from the expected values divided by an estimate of the standard error of measure. The mean value was set at 0 with a standard deviation of 1.

Twenty-four DMACC disciplines were compared with the matched ISU discipline. The grades were categorized according to letter grades: A, B, C, D and F. Due to the large frequency of grades (~64%) reported in whole letters, grades reported as plus (+) or minus (-) were changed to whole letter grades. This assumes that the frequency of plus and minus were equally distributed.

Research question 3: How different are the grade distributions of DMACC general education courses and ISU courses?

This research question analyzed the grade distributions by using a crosstabulation and Chi-square analysis to determine if the DMACC general education (Gen. Ed.) courses and ISU grades are significantly different. Chi-square was used to test each grade within the two groups (DMACC-Gen. Ed. and ISU). Chi-square, a test of independence, was used to calculate the differences between the observed and expected frequencies between the groups and compute the percentage of grades in each group distribution. A standard residual was computed by subtracting the observed frequency from the expected values divided by an estimate of the standard error of measure. The mean value was set at 0 with a standard deviation of 1.

The discipline courses were combined into one Gen. Ed. Group according to the core curriculum for the Associates degree requirements. The 19 disciplines that represented the

core curriculum included: anthropology, arts, biology, Chemistry, Drama, Economics, English, French, geography, history, math, music, philosophy, physics, political science, psychology, sociology, Spanish, and speech.

Ethical Issues

The research was conducted at DMACC and ISU. DMACC's Vice-President for Academic Affairs, Dean of Sciences and Humanities, and the Executive Director for Planning and Research supported the study. Confidentiality was maintained by students' records access through secured locations and systems. Student data entered for research purposes contained no specific identifying information (name, Social Security number, college ID, etc.) and were coded with another case number for this study. The results of the data analysis were aggregated data, thus no individual student information can be determined from the published results. The ISU Institutional Review Board approved the use of human subjects for this research.

Summary

This chapter described the study design, population, data collection and analysis, and ethical concerns. A quantitative approach was used to analyze the academic performance of transfer students and SPSS software was used for the data analysis. First, a descriptive analysis was used to examine the demographic characteristics of DMACC-ISU transfer students. Second, the study compared grades of 1,142 DMACC-ISU transfer students who graduated with a bachelor's degree from ISU between 1998 and 2003. The courses were aggregated by discipline and Chi-square analysis was used to compare the grade frequencies between DMACC and ISU. Third, the study used regression analysis by backward

elimination to determine which combination of disciplines was most predictive of overall ISU GPA. Ethical standards were met by approval from the ISU Institutional Review Board to conduct the study along with support from DMACC administration. All student data were secondary information without specific identifying data, thus ensuring confidentiality.

CHAPTER 4. RESULTS

Introduction

This study examined the academic performance of successful DMACC-ISU transfer students. This chapter describes the results of a pilot study and the three research questions of the main study. The research questions of the main study are:

1. What are the demographic characteristics of DMACC students who transfer and successfully complete a bachelor's degree at ISU?
2. How different are the grade distributions, aggregated by discipline, between DMACC and ISU?
3. How different are the grade distributions of DMACC general education courses and ISU courses?

The first section describes the pilot study that examines grade distributions of targeted DMACC courses. The second section describes the demographics characteristics of the successful DMACC-ISU transfer student. The third section describes the analysis of grade distributions aggregated by discipline. Finally, the fourth section reports the analysis of grade distribution by DMACC general education courses.

Pilot Project

Design and methodology

The pilot project was completed between September and December of 2002. The purpose of the pilot project was to explore a sample of transfer student grades in targeted DMACC courses. The pilot project provided an initial context to understand the characteristics of transfer students and support the logical framework of the subsequent

study. It focused on a course-based model of transfer research by identifying the transfer students, the community college coursework and grades. Fifty students were randomly selected from a pool of 1,018 DMACC transfer students currently attending ISU. For the purpose of this research, transfer students were defined as students who transferred with 24 or more credits from DMACC and completed a bachelor's degree at ISU. Demographic information included gender, race, and age at time of transfer, and number of transfer hours.

Academic performance was obtained in two ways. First, ACT scores at time of first enrollment at DMACC were examined to understand academic preparation for college. Second, academic performance was examined at DMACC by course grades of specific courses in the core disciplines. Descriptions of the core disciplines are based on the requirements of the Associates in Arts degree (AA) and follow the course of study equivalent to those offered to freshman- and sophomore-level students attending any four-year college/university. The four core groups and related disciplines are depicted in Table 4.1. The targeted courses were identified from each of the related disciplines of the four core groups. Introductory courses with the highest enrollment in each core discipline were identified and the grade distributions were analyzed.

The pilot study proposed two hypothesizes: (1) the ACT scores significantly correlate with the grade achievement of the community college courses; and (2) academic performance of the community college core curriculum courses will correlate significantly with DMACC GPA and ISU GPA. The Pearson product moment correlation was used for both hypotheses.

Table 4.1. Core curriculum groups and related course disciplines

Core groups	Related disciplines
Communications	English, Speech
Social & Behavioral Sciences	Anthropology, Economics, Geography, History, Political Science, Psychology, and Sociology
Math and Sciences	Biology, Chemistry, Math, and Physics
Humanities	Arts, French, Humanities, Literature, Music Philosophy, and Spanish

Results

Analysis of the demographic characteristics indicated the gender distribution to be comprised of more females (58%) than males (42%). Age distribution was very positively skewed to 22-27 year-olds (56%), followed by 27-32 year-olds (28%), and 33-37 year-olds (10%). This distribution was similar to the DMACC population after 2-3 years of academic experience. The race distribution was significantly skewed with 86% White, followed by 12% Asian, 2% Black, and no Hispanic race indicated. Although DMACC does have a significant percentage of White students, the Hispanic and Black categories were under-represented in this pilot study based on the general DMACC population and the Asian category was over-represented.

Academic preparation at time of enrollment at DMACC was examined using ACT scores with the results (Table 4.2). Transfer hours showed significant bias, although this was not indicated by the mean (55.38) and standard deviation (14.4) shown in Figure 4.1. The frequency of students transferring about 65 credits created a significantly platykurtic distribution (kurtosis = -.378) and some negative skewing (skewness = -.528). The overwhelming number of students transferring 63 to 67 credits may be due to the maximum of 65 transfer credits allowed for a Bachelor's degree. Additional credits can be reported, but

Table 4.2. Distribution of ACT scores of DMACC transfer students at ISU

ACT score	N	Mean	Std. Deviation
Mathematics	32	19.53	4.250
English	32	19.38	3.808
Reading	32	20.44	4.435

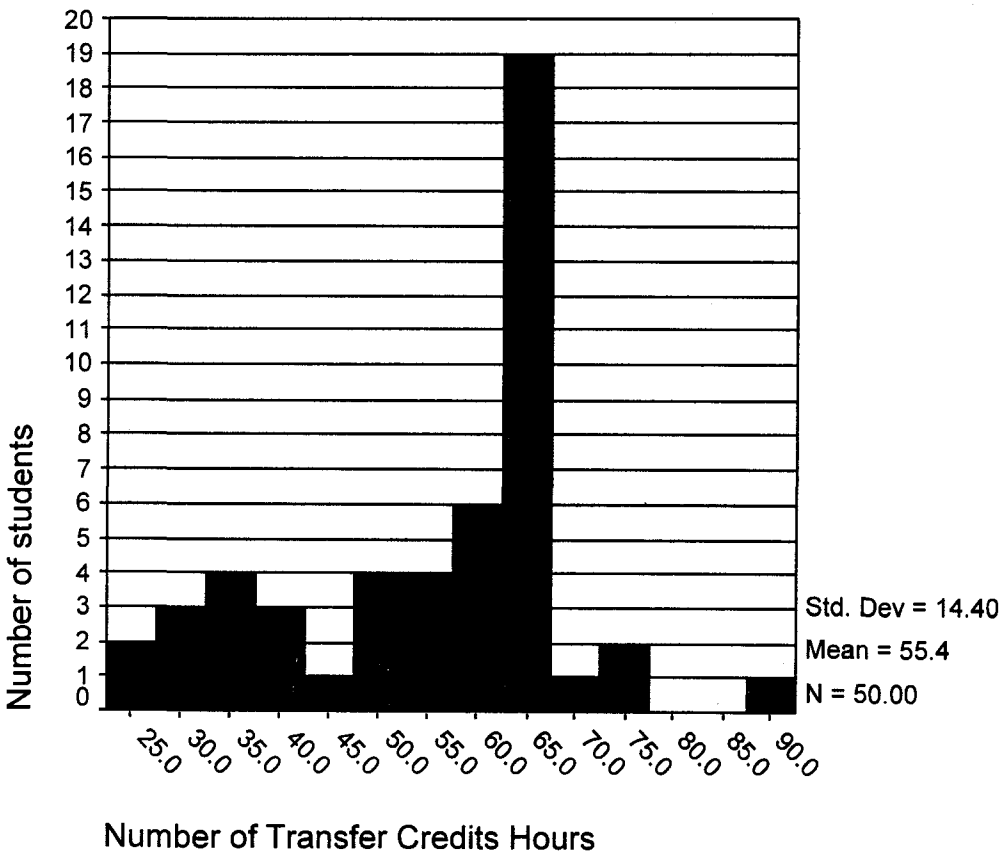

Figure 4.1. Histogram of transfer hours

understanding that more students are taking the maximum number of credits before transferring.

The DMACC GPA in the sample indicated had mean of 2.855 and standard deviation of .4963. The distribution is positively skewed (skewness = .236) and is somewhat

platykurtic (kurtosis = -.670). The range of GPA is restricted from 2.0 to 4.0, because only students with a grade point average of 2.0 or higher can transfer credits. This may account for the higher frequency of 2.0-2.88 GPA that is indicated by the negative skewing. ISU GPA had mean of 2.81 and standard deviation of .43. A positive skewing (skewness = .299) and leptokurtosis (kurtosis = .517) were also noted. According to these statistics, it would appear that the DMACC and ISU grade point averages are very similar. Computing the Pearson product moment correlation resulted in a positive correlation (.490) between DMACC GPA and ISU GPA.

Next the pilot project examined ACT scores and the relationship with DMACC academic achievement. The research hypothesis was that ACT scores correlate significantly with the grade achievement of the community college courses. The course-specific descriptive data analysis was grouped according to core curriculum areas. The communications group courses included: English 117 Composition I, English 118 Composition II and Speech 110. The courses had similar enrollments and grade means, along with negative skewing and platykurtic distributions. The statistical analysis indicated a high frequency of grades around 3.0 and 4.0. The mean for Speech 110, Fundamentals of Speech was slightly lower (2.88), but also showed a negative skewing and leptokurtic distribution. Similar to the English composition courses, the Speech course had a higher frequency of 3.0 and 4.0 grades.

Based on the Pearson product moment correlation, the communication core courses had very limited correlation with ACT English scores (r = .278, -.118, and .086, respectively) with ACT reading scores (r = .234, -046, and -.129, respectively). This poses an interesting issue for ACT predictive value and success in college. However, it also may indicate that the

relatively low ACT scores do not mean that transfer students cannot succeed in college. The overall communications core courses have a slight to moderate correlation with DMACC GPA and ISU GPA. English 117 had the highest correlation value with a DMACC correlation of r = .470 (p =.05) and ISU GPA of r = .427. (p = .05).

The social and behavioral sciences core curriculum included two courses, Psychology 101 and Sociology 101, with 33 and 30 transfer students in the sample completing the courses. However, courses had similar grade distributions, with grade means of 2.95 and 2.96, and similar standard deviations (.821 and .783, respectively). The two courses had the smallest standard deviation of all DMACC courses analyzed, indicating less variability about their means. Psychology 101 had more negative skewing (skewness = -.455) and Sociology had a large platykurtic value (kurtosis = -1.214). The two courses covaried considerably with the ACT reading score. Psychology 101 had a minimally negative correlation (r = -0.53) and Sociology 101 had a moderately positive correlation of r = .313, but did not attain the usual .05 criterion for level of significance (p = .206). This means that chance factors could account for the correlation effect. The correlation with DMACC GPA was the highest of all courses analyzed. Psychology 101 had a moderately positive correlation of r = .548 (p=.001) and Sociology 101 had a higher, moderately positive correlation of r = .661 (p = .01). This means that the grade distribution of the courses and the overall GPA distribution were more similar than for any other course. Other social and behavioral sciences disciplines did not meet the course enrollment guideline of at least 15 students.

The math and science core was represented by only one course, Math 115. Math 115 had a mean grade point of 2.64 and standard deviation of .948. This was the lowest grade mean and largest standard deviation of all courses analyzed. Very little skewing was

identified but the kurtosis was leptokurtic due to the high frequency of grades around 2.0, 3.0, and 4.0. This may reflect the whole-letter grading because of the limited frequency of plus and minus letter values in the distribution. The fact that this course had the largest standard deviation of all analyzed courses indicates that more greatly from the mean. The ACT math score and Math 115 grade distributions had only a very limited positive correlation (r = .187) and did not meet the criterion for level of significance (a = .05) with p = .380. The analysis indicated a high probability of chance in the correlation. The correlation of Math 115 and DMACC GPA also was moderately positive (r = .251) but was not significant with p = 160. This level of significance also indicates a probability of chance in the relationship. However, Math 115 and ISU GPA had a moderately positive correlation (r = .389) with a significance level of p = .025. This indicates only a minimal probability that this moderate correlation was produced by chance.

The overall demographic description seemed to indicate that the sample was a representative group of transfer students with similar GPA distributions between DMACC and ISU, but only a moderately positive correlation (r = .490). The communications and social/behavioral science cores courses had higher mean values than for the DMACC GPA. The courses are all introductory and may indicate a lower level of course academic expectation. Math 115 was the only mean grade value lower than the DMACC GPA mean.

In summary, the ACT scores did not significantly predict either DMACC GPA or ISU GPA. This raises concerns about the value of ACT scores in placement and remediation of students in required courses. The ACT score distribution does seem to indicate that students with lower ACT scores can succeed in community college courses and then transfer and succeed in 4-year university courses.

Summary

The pilot project described the demographic characteristics of the sample of DMACC-ISU transfer students. The most interesting description was the high frequency of students transferring 62 to 65 credits. The other demographic characteristics mirrored reported DMACC population results. Based on the pilot study, Research Hypothesis 1: ACT scores correlate significantly with DMACC GPA, was not supported. Therefore, this result failed to reject the null hypothesis that there is no significant difference in ACT scores and DMACC GPA. Similarly, Research Hypothesis 2: Academic performance of DMACC core curriculum courses will significantly correlate with DMACC GPA and ISU GPA, was not supported by the pilot study. The null hypothesis that there is no significant difference in academic performance of students in core discipline courses as measured by DMACC GPA and ISU GPA was not rejected.

Based on the pilot study, it was determined that larger sample sizes are important to include more discipline groups and courses. The next study used the full DMACC-ISU population rather than a sample. Removed from the original population were transfer students with fewer than 24 credits from DMACC and students that transfer more than 33% of the transfer credits from another institution, than DMACC. This resulted in a sample size of 837 students. The next study also included the analysis of academic performance between DMACC and ISU. The analysis was more specific, using courses aggregated by discipline groups, rather than overall ISU GPA.

Main Study

The results of the study are organized around three research questions. Research Question 1 describes the demographic characteristics of the full population of DMACC-ISU transfer student. Research Question 2 analyzes the differences in grade distributions between DMACC and ISU core courses using a Chi-square analysis. Research Question 3 analyzes the combination of discipline group courses that is most predictive of overall ISU GPA using a regression analysis.

Student demographics

Research Question 1: What are the demographic characteristics of DMACC students who transfer and successfully complete a bachelor's degree at ISU?

Research Question 1 describes the demographic characteristics of 837 DMACC-ISU transfer students according to the following characteristics: gender, race, age, first year enrolled at DMACC, year graduated from ISU, years in college, number of transfer credit hours, ACT scores (English, Math, Reading), DMACC GPA and ISU GPA. Table 4.3 depicts the demographic characteristics for categorical data reported in frequency and percent of sample. Graphs and tables of descriptive statistics appear in Appendix C.

The demographic analysis indicated a little over half of the sample was females (52.6%), with males representing 47.4% of the sample. The gender data are similar to the overall DMACC population (females 57%, males 42%), but with 5% more males. The race distribution identified Whites as the largest group (87%) and Asian at 10.4%. Black and Hispanic students represented 1.6% and 1.0%, respectively. The significant White population is also reflected in the overall DMACC population (White 84.5%). The Asian population was larger in the sample from the overall population (4.6%). The Black

Table 4.3. Demographic characteristics of DMACC-ISU transfer student sample

Demographic Characteristic	Frequency	Percent
Gender (n=833)		
Female	438	52.6
Male	395	47.4
Race (n=836)		
Asian	87	10.4
Black	13	1.6
Hispanic	8	1.0
White	728	87.0
Age at Time of Transfer (n=836)		
< 18 years old	19	2.2
19-22 years old	575	68.8
23-26 years old	119	14.2
27-30 years old	52	6.2
31-35 years old	25	2.9
36-40 years old	21	2.6
> 40 years old	25	2.9
First Year Enrolled at DMACC (n=837)		
1970-1974	7	.7
1975-1979	9	1.0
1980-1984	11	1.2
1985-1989	35	4.2
1990-1994	160	19.1
1995-1999	598	71.5
2000	17	2.0
Year Graduated from ISU (n=837)		
1999	168	20.1
2000	138	16.5
2001	172	20.5
2002	163	19.5
2003	196	23.4
Years in college (n=837)		
2 years	2	.4
3 years	100	11.9
4 years	282	33.7
5 years	174	20.8
6 years	96	11.5
7 years	52	6.2
8 years	24	2.9
9 years	24	2.9
10-15 years	54	6.5
>15 years	28	3.3
Number of transfer credits hours (n=837)		
<30 credits	82	9.8
31-40 credits	84	10.0
41-50 credits	90	10.8
51-60 credits	129	15.5
61-70 credits	403	48.2
>71 credits	48	5.7

population was under-represented in the transfer sample (1.6%) compared to the overall DMACC population (4.6%). The Hispanic students were also under-represented (1.0%) compared to the overall DMACC population (2.0%). The minority under-representation mirrors the national trends in minority transfer students (Cohen & Brawer, 2003).

The age at time of transfer reflected the general DMACC population after attending DMACC for two years after high school. The largest age group, 19-22 years old, represented 68% of the sample. However, students who were 23 to 30 years old represented 20.4% of the sample. The number of years attending college also revealed an extended time in the higher educational process. Almost one-third of the sample (32.3%) attended DMACC and ISU for five to six years, and one-third (33.7%) attended college for four years. Other students in the sample (21.8%) attended college seven years or more. This wider range of years attending college reflects national data (NCES, 2003) and the increasing non-linear nature of transfer students (Cohen & Brawer, 2003).

The analysis of the number of credits hours transferred revealed a significant portion (48.2%) of students transfer with 61-70 credits. More specifically, the largest portion of students (28.7%) transferred 65 credits. Students with 64 credits constituted 8.9% of the sample. Therefore, over one-third of the sample transferred with 64 or 65 credits. The large portion of students can be explained because 65 credits are the maximum number of transfer credits allowed by ISU policy.

Table 4.4 identifies the ACT scores taken in high school prior to enrollment or at time of enrollment to DMACC. The scores offer a standardized assessment of pre-college preparation and knowledge/skills attainment.

Table 4.4. ACT scores of transfer students

Academic performance	Minimum	Maximum	Mean	SD
ACT scores				
English (n=507)	8	31	19.5	3.99
Math (n=510)	3	38	19.9	4.04
Reading (n=506)	9	36	20.8	4.82

Table 4.4 also presents other demographic characteristics concerning academic preparation (ACT scores). The data were analyzed using descriptive statistics for minimum and maximum values, mean, and standard deviation. The ACT means scores fell below state high school averages of: English 22.3, Math 22.6, and Reading 22.2 (State of Iowa, 2003). Due to the open access policy of DMACC that allows students to enroll with only a high school degree, it is typical for community college ACT scores to be below state averages. The 25th percentile of fall 2002, ISU first-time, first-year (freshman students) scored at 20.19 on English and 20.93 on Math. Fields (2001) found significant differences in Iowa community college transfer students and native ISU students.

Analysis by paired-sample t-test of ACT scores and DMACC transfer GPA indicated minimal positive correlation (English .34, Math .36, and Reading .31). The paired samples test found significant differences (<.001) in ACT scores and DMACC GPA (t values of: English -.86, Math -.98 and Reading -.86). The lower ACT scores, if indicative of high school academic preparation, identified the sample as less prepared than the average high school student and the ISU new freshman full-time student.

In summary, DMACC students had a wide range of ACT scores and mean lower than most ISU students and the State of Iowa high school average. Therefore, it appears that

students with lower than average ACT scores can succeed at DMACC and transfer and succeed in earning a bachelor's degree from ISU.

All DMACC and ISU grades

To better understand the overall academic performance of the DMACC-ISU transfer student, Table 4.5 examined all DMACC course grades and all ISU grades. The analysis

Table 4.5. Analysis of all matched discipline grades by DMACC and ISU

Statistical analysis	DMACC	ISU
N = 34,973	n = 11,823	n = 23,150
Mean	2.96 (SD 1.006)	2.84 (SD .973)
T-test for equality of means: 11.239; Significance <.001 (SE .011)		
Grade: A (n = 10,483)		
Actual count	4,204	6,279
Expected count	3,544	6,939
Percent of discipline grades	35.6%	27.1%
Standard Residual	11.1	-7.9
Grade: B (n = 13,604)		
Actual count	4,234	9,370
Expected count	4,599	9,005
Percent of discipline grades	35.8%	40.5%
Standard residual	-5.4	3.8
Grade: C (n = 8098)		
Actual count	2,477	5,621
Expected count	2,737	5,360
Percent of discipline grades	21.0%	24.3%
Standard residual	-5.0	3.6
Grade: D (n = 1,832)		
Actual count	574	1,258
Expected count	619	1,213
Percent of discipline grades	4.9%	5.4%
Standard residual	-1.8	1.3
Grade: F (n = 956)		
Actual count	334	622
Expected count	323	633
Percent of discipline grades	2.8%	2.7%
Standard residual	0.6	-0.4
Pearson Chi-square: 272.549; df = 4; Significance <.001		
Sommer's d effect size: -0.083; Significance <.001		

is a combination of the DMACC GPA and ISU GPA along with the distribution of all grades. According to the t-test for equality of means, the DMACC transfer GPA (2.96) and ISU graduation GPA (2.84) were significantly different (<001). An analysis of specific grades indicated higher percentage of A's for DMACC and higher percentage of B's for ISU. Standardized residual values indicated that DMACC had significantly less than expected C's and B's, but considerably more A's. ISU had more than expected B's and C's, but considerably less A's. The Chi-square analysis indicated the difference in specific grades between DMACC and ISU was significant (<. 001). The Sommers'd measure of effect size indicated a significant effect size (<. 001). Therefore, the t-test for equality of means and the Chi-square analysis of specific grades found significant differences between DMACC and ISU grades of all matched disciplines to reject the null hypothesis.

To further understand the implications of the grade distributions, it is necessary to review the transfer policies and graduation criterion. This study purposely selected "successful" transfer students that can result in a skewing effect on the grade distribution. The transfer policies indicate that grades of "D" or "F" cannot be accepted for transfer to ISU. Therefore, DMACC grades will be negatively skewed by the elimination of these grades. However, as indicated in Table 4.5, grades of "D" and "F" were reported in the DMACC grade distribution. The reporting of D's and F's occurred because of the Associates of Arts (A.A.) Articulation Agreement with Iowa public community colleges. The Agreement states that student can: "enter the College of Liberal Arts and Sciences at ISU with an associate of arts degree from an Iowa public community college, with at least 60 prescribed semester credits acceptable for transfer and at least a 2.00 cumulative GPA to meet the general education requirements of the college" (p. 9, ISU, 2003). The prescribed

semester credits are determined by the associates of arts degree requirements of the community college as accredited by the Higher Learning Commission of the North Central Association (NCA) of Colleges and Schools. Therefore, a GPA of 2.0 becomes the criterion for transfer acceptance and grades of "D" or "F" may be included in the transfer grades.

The ISU grade distribution can be understood within the context of the "successful" student graduating with a B.A. degree. The criterion for graduation requires a 2.0 cumulative GPA. Therefore, the number of D's and F's may be limited because the students successfully completed the degree requirements. Another possible inference is the students' academic performance was successful at DMACC and therefore provided the necessary academic foundation to be successful at ISU.

ISU major disciplines

Table 4.6 depicts the frequencies of the major field of study for the transfer students. The table is organized in descending order, from the highest to lowest frequency. It identifies the frequency of major field of study for the sample of DMACC-ISU transfer students. Management Information System had the highest percentage (8.0%)with Elementary Education, Finance, Liberal Studies, and Marketing the next highest (5.1%). . Seventy-seven different disciplines were identified as the major field of study for the 837 students in this study. Therefore, it appears from the table that transfer students major in a wide range of disciplines.

Table 4.6. Rank order and frequency of ISU major field of study

Rank order	ISU Major Field of Study	Frequency	Percent	Cumulative percent
1	Management Information Systems	67	8.0	8.0
2	Elementary Education	43	5.1	13.1
	Finance	43	5.1	18.2
3	Liberal Studies	42	5.0	23.2
	Marketing	42	5.0	28.2
4	Child and Family Studies	41	4.9	33.1
5	Accounting	31	3.7	36.7
6	Transportation and Logistics	28	3.3	40.1
7	Sociology	27	3.2	43.3
8	Exercise and Sport Science	23	2.7	46.0
9	Management	22	2.6	48.6
	Psychology	22	2.6	51.2
10	Early Childhood Education *	20	2.4	53.7
11	English	19	2.3	56.0
	History	19	2.3	58.3
12	Journalism and Mass Communication	18	2.1	60.4
13	Hotel, Restaurant and Institution Management	17	2.0	62.4
14	Industrial Technology	16	1.9	64.3
15	Art and Design – Bachelor's in Fine Arts	14	1.7	66.0
	Mechanical Engineering	14	1.7	67.7
16	Electrical Engineering	13	1.3	69.0
17	Agricultural Studies	12	1.4	70.4
	Apparel Merchandising, Design & Production	12	1.4	71.8
	Horticulture	12	1.4	73.2
	Political Science	12	1.4	74.6
18	Animal science (Pre-Vet)	10	1.2	75.8
	Chemistry	10	1.2	77.0
	Speech Communication	10	1.2	78.2
19	Animal Ecology	9	1.1	79.3
	Communication Studies	9	1.1	80.4
	Computer Engineering	9	1.1	81.5
20	Advertising	8	1.0	82.5
	Agricultural Business	8	1.0	83.5
	Civil Engineering	8	1.0	84.5
	Microbiology	8	1.0	85.5
21	Agronomy	7	.8	86.3
	Computer Science	7	.8	87.1
22	Community & Regional Planning	6	.7	87.8
23	Art and Design – Bachelor of Arts	5	.6	88.4
	Graphic Design	5	.6	89.0
	Agricultural Systems Technology	5	.6	89.6
	Biology	5	.6	90.2
	Construction Engineering	5	.6	90.8
	Dietetics	5	.6	91.4
	Forestry	5	.6	92.0
	Math	5	.6	92.6
	Production/Operations Management	5	.6	93.2
24	Anthropology	4	.5	93.7
	Family Resource Mngt. & Consumer Science	4	.5	94.1
	Housing and the Near Environment	4	.5	94.5
	Philosophy	4	.5	95.0
25	Architecture – Professional Degree	3	.4	95.4
	Chemical Engineering	3	.4	95.7
	Environmental Sciences (Agriculture)	3	.4	96.1
	Industrial Engineering	3	.4	96.4
	Landscape Architecture	3	.4	96.8
	Other Disciplines (22 different disciplines)	27	3.2	100

* Early Childhood Education includes both College of Education and College of Family & Consumer Sciences

Research Question 2: How different are the aggregated discipline grade distributions between DMACC and ISU?

To answer this question, the mean, standard deviation, and t-test for equality of means were computed to determine significant differences in overall grade mean values. The crosstabulation and Chi-square analysis compared the actual frequencies of grades (A, B, C, D, & F) with the expected frequencies, and the percentage of each grade reported between DMACC and ISU. The Chi-square analysis examined the differences in the grades and computed a standardized residual value. The standardized residual was considered significant when the value exceeded 3.0. The Chi-square analysis computed the degree of differences to determine the degree of independence between DMACC and ISU. The criterion for threshold of significance was set at .05.

Each discipline group was examined by matching the DMACC course acronym with the related course at ISU. The results were organized from the DMACC discipline courses. A complete indexing of matched disciplines and courses between DMACC and ISU can be found in Appendix B. The discipline grades analysis results were arranged in alphabetical order, with a table of statistical analysis including a brief narrative description.

As shown in Table 4.7, an analysis of the Acounting grades indicated the means were significantly different (<.001) with about equal standard deviations. DMACC had a higher percentage of A's whereas ISU had a higher percentage of C's. The standard residual indicated that DMACC had significantly (3.4) more A's. In summary, the Chi-square analysis indicated significant differences (<.001)) between DMACC and ISU grades and the t-test of equality of means was also significant (<.001). Therefore, the grades between DMACC and ISU were significantly different and the null hypothesis was rejected.

Table 4.7. Chi-square analysis of Accounting grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 1,198		n = 458	n = 740
Mean		2.88 (SD .924)	2.621 (SD .912)
T-test for equality of means: 4.885; Significance <.001 (SE .054)			
Grade: A	(n = 251)		
	Actual count	129	122
	Expected count	96	155
	Percent of discipline grades	2.82%	16.5%
	Standard residual	3.4	-2.7
Grade: B	(n = 462)		
	Actual count	176	286
	Expected count	177	285
	Percent of discipline grades	38.4%	38.6%
	Standard residual	-0.0	0.0
Grade: C	(n = 399)		
	Actual count	128	271
	Expected count	153	247
	Percent of discipline grades	27.9%	36.6%
	Standard residual	-2.0	1.6
Grade: D	(n = 60)		
	Actual count	17	43
	Expected count	23	37
	Percent of discipline grades	3.7%	5.8%
	Standard residual	-1.2	1.0
Grade: F	(n = 8)		
	Actual count	8	18
	Expected count	10	16
	Percent of discipline grades	1.7%	2.4%
	Standard residual	-0.6	0.5
Pearson Chi-square: 27.914 (df = 4); Significance <.001			
Sommers'd effect size: -.163; Significance <.001			

The Agricultural Business grades analysis indicated the means were significantly different (.002). DMACC had a larger percentage of A's and ISU had a larger percentage of C's (Table 4.8). According to the standard residual value, DMACC had more than expected A's (2.0). The Chi-square analysis indicated significant differences (.032) in the specific grades and the Sommers'd measure of effect size was also significant (.001). In addition, the t-test of equality of means was significant (.002). Therefore, the grades analysis indicated

Table 4.8. Chi-square analysis of Agricultural Business grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 840		n = 180	n = 660
Mean		3.25 (SD .825)	3.02 (SD .911)
T-test for equality of means: 3.107; Significance .002 (SE .075)			
Grade: A	(n = 314)		
	Actual count	84	230
	Expected count	67	247
	Percent of discipline grades	46.7%	34.8%
	Standard residual	2.0	-1.1
Grade: B	(n = 315)		
	Actual count	62	253
	Expected count	68	248
	Percent of discipline grades	34.4%	38.3%
	Standard residual	-0.7	0.3
Grade: C	(n = 171)		
	Actual count	29	142
	Expected count	37	134
	Percent of discipline grades	16.1%	21.5%
	Standard residual	-1.3	0.7
Grade: D	(n = 33)		
	Actual count	5	28
	Expected count	7	26
	Percent of discipline grades	2.8%	4.2%
	Standard residual	-0.8	0.4
Grade: F	(n = 7)		
	Actual count	0	7
	Expected count	2	6
	Percent of discipline grades	.0%	1.1%
	Standard residual	-1.2	0.6
Pearson Chi-square: 10.565; (df = 4); Significance .032			
Sommers'd effect size: -.141; Significance .002			

significant differences between DMACC and ISU grades and the null hypothesis was rejected.

The Anthropology grades analysis indicated the means were not significantly different (.099), and there was a larger standard deviation of DMACC grades. DMACC had a higher percentage of A's whereas ISU a higher percentage of C's (Table 4.9). The standard residual values indicated that A grades by DMACC were more than expected but were not significant (> 3.0). The Chi-square analysis indicated the difference in specific grades was

Table 4.9. Chi-square analysis of Anthropology grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 301		n = 74	n = 227
Mean		2.93 (SD 1.051)	2.71 (SD .993)
T-test for equality of means: 0.680; Significance .099 (SE .135)			
Grade: A	(n = 76)		
	Actual count	25	51
	Expected count	19	57
	Percent of discipline grades	33.8%	22.5%
	Standard residual	1.5	-0.8
Grade: B	(n = 118)		
	Actual count	29	89
	Expected count	29	89
	Percent of discipline grades	39.2%	39.2%
	Standard residual	0.0	0.0
Grade: C	(n = 77)		
	Actual count	13	64
	Expected count	19	58
	Percent of discipline grades	17.6%	28.2%
	Standard residual	-1.4	0.8
Grade: D	(n = 20)		
	Actual count	4	16
	Expected count	5	15
	Percent of discipline grades	5.4%	7.0%
	Standard residual	-0.4	0.2
Grade: F	(n = 10)		
	Actual count	3	7
	Expected count	3	8
	Percent of discipline grades	4.1%	3.1%
	Standard residual	0.3	-0.2
Pearson Chi-square: 5.679 (df = 4); Significance .224			

not significant (.224), and the t-test for equality of means was also not significant (.090). Therefore, the grades analysis did not determine a significant difference in anthropology grades failed to reject the null hypothesis.

The Architecture grades analysis indicated the grade means were different and the standard deviation was higher for ISU (Table 4.10). DMACC had a larger percentage of A's and ISU a higher percentage of B's. The standard residual values indicated DMACC had more than expected A's (2.6). The Chi-square analysis of specific grades indicated

Table 4.10. Chi-square analysis of Architecture grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 274		n = 80	n = 194
Mean		3.23 (SD .811)	2.75 (SD 1.009)
T-test for equality of means: 3.760; Significance <.001 (SE .127)			
Grade: A	(n = 77)		
	Actual count	35	42
	Expected count	23	55
	Percent of discipline grades	43.8%	21.6%
	Standard residual	2.6	-1.7
Grade: B	(n = 120)		
	Actual count	30	90
	Expected count	35	85
	Percent of discipline grades	37.5%	46.4%
	Standard residual	-0.9	0.5
Grade: C	(n = 55)		
	Actual count	13	42
	Expected count	16	39
	Percent of discipline grades	16.3%	21.6%
	Standard residual	-0.8	0.5
Grade: D	(n = 13)		
	Actual count	2	11
	Expected count	4	9
	Percent of discipline grades	2.5%	5.7%
	Standard residual	-0.9	0.6
Grade: F	(n = 9)		
	Actual count	0	9
	Expected count	3	6
	Percent of discipline grades	0.0%	4.6%
	Standard residual	1.6	1.0
Pearson Chi-square: 16.601 (df = 4); Significance .002			
Sommers'd effect size: -.266; Significance <.001			

significant differences (.002), and the Sommers'd measure of the magnitude of the difference was also significant (<.001). The t-test of equality of means also determined a significant difference (<.001). Therefore, based on the grades analysis the null hypothesis was rejected.

The Arts grade analysis indicated DMACC had a larger mean value (Table 4.11). DMACC had a higher percentage of A's and ISU had slightly higher percentage of B's. The standard residual values indicated DMACC had more than expected A's (1.5), but not significantly. The Chi-square analysis indicated the differences in specific grades were not

Table 4.11. Chi-square analysis of Arts grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 605		n = 162	n = 443
Mean		3.06 (SD .896)	2.87 (SD .967)
T-test for equality of means: 2.161; Significance .031; (SE .087)			
Grade: A	(n = 178)		
	Actual count	58	120
	Expected count	47	130
	Percent of discipline grades	35.8%	27.1%
	Standard residual	1.5	-0.9
Grade: B	(n = 261)		
	Actual count	66	195
	Expected count	70	191
	Percent of discipline grades	40.7%	44.0%
	Standard residual	-0.5	0.3
Grade: C	(n = 124)		
	Actual count	30	94
	Expected count	33	91
	Percent of discipline grades	18.5%	21.2%
	Standard residual	-0.6	0.3
Grade: D	(n = 26)		
	Actual count	6	20
	Expected count	7	19
	Percent of discipline grades	3.7%	4.5%
	Standard residual	0.4	-0.2
Grade: F	(n = 16)		
	Actual count	2	14
	Expected count	4	12
	Percent of discipline grades	1.2%	3.2%
	Standard residual	-1.1	0.7
Pearson Chi-square: 5.624 (df = 4); Significance .229			

significant (.229), but the t-test for equality of means was significant (.031). Therefore, the grade analysis did not consistently find a difference between DMACC and ISU grades, and failed to reject the null hypothesis.

The Biology grades analysis indicated the DMACC grade mean was higher than ISU (Table 4.12). DMACC had a higher percentage of A's, whereas ISU a slightly higher percentage of C's and D's. DMACC had more than expected A's, whereas ISU had less than expected A's. DMACC had less than expected D's, whereas ISU had more than expected. The Chi-square analysis indicated significant differences in specific grades (<.001), and

Table 4.12. Chi-square analysis of Biology grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 1,872		n = 751	n = 1,121
Mean		2.89 (SD 1.040)	2.69 (SD 1.042)
T-test for equality of means: 4.081; Significance <.001 (SE .049)			
Grade: A	(n = 535)		
	Actual count	253	282
	Expected count	215	320
	Percent of discipline grades	33.7%	25.2%
	Standard residual	2.6	-2.1
Grade: B	(n = 650)		
	Actual count	258	392
	Expected count	260	389
	Percent of discipline grades	34.4%	35.0%
	Standard residual	-0.2	0.1
Grade: C	(n = 467)		
	Actual count	171	296
	Expected count	187	280
	Percent of discipline grades	22.8%	26.4%
	Standard residual	-1.2	1.0
Grade: D	(n = 168)		
	Actual count	45	123
	Expected count	67	101
	Percent of discipline grades	6.0%	11.0%
	Standard residual	-2.7	2.2
Grade: F	(n = 52)		
	Actual count	24	28
	Expected count	21	31
	Percent of discipline grades	3.2%	2.5%
	Standard residual	0.7	-0.6
Pearson Chi-square: 27.105; (df = 4); Significance <.001			
Sommers'd effect size: -.115; Significance <.001			

the Sommers' d measure of effect size was significant (<.001). The t-test for equality of means was also significant (<.001). Therefore, the null hypothesis was rejected.

The Business Administration grades analysis indicated the DMACC mean was larger (Table 4.13). The percentages of grades for DMACC were higher for A's and B's, whereas ISU had a higher percentage of C's. DMACC had significantly more whereas ISU had significantly less than expected A's. The Chi-square analysis indicated the differences

Table 4.13. Chi-square analysis of Business Administration grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 1,030		n = 464	n = 566
Mean		3.06 (SD .934)	2.66 (SD .925)
T-test for equality of means: 6.955; Significance <.001 (SE .058)			
Grade: A	(n = 278)		
	Actual count	177	101
	Expected count	125	153
	Percent of discipline grades	38.1%	17.8%
	Standard residual	4.6	-4.2
Grade: B	(n = 399)		
	Actual count	170	229
	Expected count	180	219
	Percent of discipline grades	36.6%	22.2%
	Standard residual	-0.7	0.7
Grade: C	(n = 286)		
	Actual count	93	193
	Expected count	129	157
	Percent of discipline grades	20.0%	34.1%
	Standard residual	-3.2	2.9
Grade: D	(n = 42)		
	Actual count	16	26
	Expected count	19	23
	Percent of discipline grades	3.4%	4.6%
	Standard residual	-0.7	0.6
Grade: F	(n = 25)		
	Actual count	8	17
	Expected count	11	14
	Percent of discipline grades	1.7%	3.0%
	Standard residual	-1.0	0.9
Pearson Chi-square: 60.580 (df = 4); Significance <.001			
Sommers'd effect size: -.252; Significance <.001			

among specific grades were significant (<.001), and the Sommers'd measure of effect size was also significant (<.001). The t-test for equality of means was significant (<.001). Therefore, the grades analysis determined the differences in grades were significant to reject the null hypothesis.

The Chemistry grades analysis indicated DMACC had a larger mean (Table 4.14). DMACC had a larger percentage of A's, whereas ISU a larger percentage of B's. The expected frequencies of A grades were slightly higher for DMACC yet slightly lower for

Table 4.14. Chi-square analysis of Chemistry grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 828		n = 289	n = 539
Mean		2.66 (SD 1.125)	2.58 (SD .983)
T-test for equality of means: 1.136; Significance .257; (SE .079)			
Grade: A	(n = 179)		
	Actual count	80	99
	Expected count	63	117
	Percent of discipline grades	27.7%	18.4%
	Standard residual	2.2	-1.6
Grade: B	(n = 275)		
	Actual count	85	190
	Expected count	96	179
	Percent of discipline grades	29.4%	35.3 %
	Standard residual	-1.1	0.8
Grade: C	(n = 277)		
	Actual count	88	189
	Expected count	97	180
	Percent of discipline grades	30.4%	31.2%
	Standard residual	-0.9	0.6
Grade: D	(n = 63)		
	Actual count	19	44
	Expected count	22	41
	Percent of discipline grades	6.6%	8.2%
	Standard residual	-0.6	0.5
Grade: F	(n = 34)		
	Actual count	17	17
	Expected count	12	22
	Percent of discipline grades	5.9%	3.2%
	Standard residual	1.5	-1.1
Pearson Chi-square: 14.713 (df = 4); Significance .005			
Sommers'd Effect Size: -.066; Significance .109			

ISU. The Chi-square analysis indicated the differences in specific grades were significant (.005); however, the Sommers'd measure of effect size was not significant (.109). The t-test for equality of means was not significant (.257). Therefore, the grades analysis did not consistently identify significant differences and failed to reject the null hypothesis.

The Commercial Horticulture grades analysis indicated similar grade means (Table 4.15). DMACC had a higher percentage of A's, whereas ISU had slightly higher percentages of B's and C's. The standard residual values indicated only small differences in expected

Table 4.15. Chi-square analysis of Commercial Horticulture grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 209		n = 46	n = 163
Mean		2.85 (SD 1.135)	2.81 (SD .997)
T-test for equality of means: .221; Significance .825 (SE .172)			
Grade: A	(n = 67)		
	Actual count	17	50
	Expected count	15	52
	Percent of discipline grades	37.0%	30.7%
	Standard residual	0.6	-0.3
Grade: B	(n = 60)		
	Actual count	12	48
	Expected count	13	47
	Percent of discipline grades	26.1%	29.4%
	Standard residual	-0.3	0.2
Grade: C	(n = 63)		
	Actual count	12	51
	Expected count	14	49
	Percent of discipline grades	26.1%	31.3%
	Standard residual	-0.5	0.3
Grade: D	(n = 15)		
	Actual count	3	12
	Expected count	3	12
	Percent of discipline grades	6.5%	7.4%
	Standard residual	-0.2	0.1
Grade: F	(n = 4)		
	Actual count	2	2
	Expected count	1	3
	Percent of discipline grades	4.3%	1.2%
	Standard residual	1.2	-0.6
Pearson Chi-square: 2.766 (df = 4); Significance .598			

frequencies of grades. The Chi-square analysis indicated the differences in specific grades were not significant (.598); also, the t-test for equality of means was not significant (.825). Therefore, the grades analysis determined the differences were not significant and failed to reject the null hypothesis.

The Computer Science grades analysis indicated the DMACC mean was much larger (Table 4.16). DMACC had a much higher percentage of A's, whereas ISU had a larger percentage of B's. The frequency of A's was significantly higher than expected for DMACC

Table 4.16. Chi-square analysis of Computer Science grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 893		n = 429	n = 464
Mean		3.40 (SD .850)	2.49 (SD 1.002)
T-test for equality of means: 14.498; Significance <.001 (SE .063)			
Grade: A	(n = 319)		
	Actual count	248	71
	Expected count	153	166
	Percent of discipline grades	57.8%	15.3%
	Standard residual	7.7	-7.4
Grade: B	(n = 303)		
	Actual count	125	178
	Expected count	146	157
	Percent of discipline grades	29.1%	38.4 %
	Standard residual	-1.7	1.6
Grade: C	(n = 187)		
	Actual count	43	144
	Expected count	90	97
	Percent of discipline grades	10.0%	31.0%
	Standard residual	-4.9	4.8
Grade: D	(n = 56)		
	Actual count	6	50
	Expected count	27	29
	Percent of discipline grades	1.4%	10.8%
	Standard residual	-4.0	3.9
Grade: F	(n = 28)		
	Actual count	7	21
	Expected count	14	15
	Percent of discipline grades	1.6%	4.5%
	Standard residual	-1.8	1.7
Pearson Chi-square: 202.542 (df = 4); Significance <.001			
Sommers'd effect size: -.515; Significance <.001			

whereas ISU was significantly less. The Chi-square analysis indicated the overall differences in specific grades were significant (<.001), and the Sommers'd measure of effect size was also significant (<.001). The t-test for equality of means was also significant (<.001). Therefore, the grades analysis determined significant differences in grades and rejected the null hypothesis.

The grades analysis for Computer Programming (DATA) indicated the DMACC mean and standard deviation was larger (Table 4.17). The percentage of A's was higher for

Table 4.17. Chi-square analysis of Computer Programming (DATA) grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 694		n = 148	n = 546
Mean		3.10 (SD 1.042)	2.78 (SD .893)
T-test for equality of means: 3.386; Significance .001 (SE .094)			
Grade: A	(n = 188)		
	Actual count	70	118
	Expected count	40	148
	Percent of discipline grades	47.3%	21.6%
	Standard residual	4.7	-2.5
Grade: B	(n = 278)		
	Actual count	39	239
	Expected count	59	219
	Percent of discipline grades	26.4%	43.8 %
	Standard residual	-2.6	1.4
Grade: C	(n = 173)		
	Actual count	25	148
	Expected count	37	136
	Percent of discipline grades	3.6%	27.1%
	Standard residual	-2.0	1.0
Grade: D	(n = 47)		
	Actual count	12	35
	Expected count	10	37
	Percent of discipline grades	8.1%	6.4%
	Standard residual	0.6	-0.3
Grade: F	(n = 6)		
	Actual count	2	6
	Expected count	2	6
	Percent of discipline grades	1.4%	1.1%
	Standard residual	0.2	-0.1
Pearson Chi-square: 42.614 (df = 4); Significance <.001			
Sommers'd effect size: -.220; Significance <.001			

DMACC, whereas the percentage C's and D's were larger for ISU. DMACC had significantly more A's than expected. The Chi-square analysis indicated the differences in specific grades were significant (<.001) and the Sommers'd measure of effect size was also significant (<.001). The t-test for equality of means was also significant (.001). Therefore, the analysis determined significant differences in grades between DMACC and ISU and rejected the null hypothesis.

The Drama grades analysis indicated DMACC mean was larger (Table 4.18). DMACC had a larger percentage of A's, whereas ISU a larger percentage of B's and C's. The Chi-square analysis indicated the differences in specific grades were significant (.003), and the Sommers'd measure of effect size was significant (.001). However, 3 cells (30%) had lower than expected frequencies; therefore, the analysis may not be as valid. The t-test for equality of means was also significant (<.001). Therefore, the null hypothesis was rejected.

Table 4.18. Chi-square analysis of Drama grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 160		n = 52	n = 108
Mean		3.29 (SD .893)	2.65 (SD 1.105)
T-test for equality of means: 3.643; Significance <.001 (SE .176)			
Grade: A	(n = 51)		
	Actual count	27	24
	Expected count	17	34
	Percent of discipline grades	51.9%	22.2%
	Standard residual	2.6	-1.8
Grade: B	(n = 61)		
	Actual count	16	45
	Expected count	20	42
	Percent of discipline grades	30.8%	41.7%
	Standard residual	-0.9	0.6
Grade: C	(n = 28)		
	Actual count	6	22
	Expected count	9	19
	Percent of discipline grades	11.5%	20.4%
	Standard residual	-1.0	0.7
Grade: D	(n = 14)		
	Actual count	3	11
	Expected count	5	10
	Percent of discipline grades	5.8%	10.2%
	Standard residual	-0.7	0.5
Grade: F	(n = 6)		
	Actual count	0	6
	Expected count	2	4
	Percent of discipline grades	0.0%	5.6%
	Standard residual	-1.4	1.0
Pearson Chi-square: 16.043 (df = 4); Significance .003; Note: 3 cells (30%) low count			
Sommers'd effect size: -.346; Significance <.001			

The Economics grades analysis indicated the means and standard deviation were similar (Table 4.19). The percentages of grades were very similar, with ISU having slightly more A's. The standard residual values for expected frequencies were small, and not significantly different between DMACC and ISU. The Chi-square analysis indicated the overall differences in specific grades were not significant (.416) and the t-test for equality of means was not significant (.134). Therefore, the analysis determined there were no significant differences between DMACC and ISU grades, and failed to reject the null hypothesis.

Table 4.19. Chi-square analysis of Economics grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 1,121		n = 595	n = 526
Mean		2.51 (SD .963)	2.59 (SD .983)
T-test for equality of means: -1.500; Significance .134 (SE .058)			
Grade: A	(n = 191)		
	Actual count	93	98
	Expected count	101	90
	Percent of discipline grades	15.6%	19%
	Standard residual	-0.8	0.9
Grade: B	(n = 393)		
	Actual count	204	189
	Expected count	209	184
	Percent of discipline grades	34.3%	35.9%
	Standard residual	-0.3	0.3
Grade: C	(n = 413)		
	Actual count	228	185
	Expected count	220	194
	Percent of discipline grades	38.3%	35.2%
	Standard residual	0.6	-0.6
Grade: D	(n = 86)		
	Actual count	51	35
	Expected count	46	40
	Percent of discipline grades	8.6%	6.7%
	Standard residual	0.8	-0.8
Grade: F	(n = 19)		
	Actual count	19	19
	Expected count	20	18
	Percent of discipline grades	3.2%	3.6%
	Standard residual	-0.3	0.3
Pearson Chi-square: 3.925 (df = 4); Significance .416			

The Education grades analysis indicated the means were similar, with the standard deviation larger for DMACC (Table 4.20). DMACC had a higher percentage of A's, whereas ISU had a higher percentage of B's. The standard residual values of frequencies indicated no significant differences than expected. The Chi-square analysis indicated the differences in specific grades was significant (.045); however, the Sommers'd measure of effect size was not significant (.154). The t-test for equality of means was also not significant (.709). Therefore the grades analysis failed to reject the null hypothesis.

Table 4.20. Chi-square analysis of Education grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 919		n = 53	n = 866
Mean		3.38 (SD .965)	3.33 (SD .725)
T-test for equality of means: .375; Significance .709 (SE .135)			
Grade: A	(n = 415)		
	Actual count	31	384
	Expected count	24	391
	Percent of discipline grades	58.5%	44.3%
	Standard residual	1.4	-0.4
Grade: B	(n = 420)		
	Actual count	16	404
	Expected count	24	396
	Percent of discipline grades	30.2%	46.7%
	Standard residual	-1.7	0.4
Grade: C	(n = 66)		
	Actual count	3	63
	Expected count	4	62
	Percent of discipline grades	5.7%	7.3%
	Standard residual	-0.4	0.1
Grade: D	(n = 8)		
	Actual count	1	7
	Expected count	1	8
	Percent of discipline grades	1.9%	0.8%
	Standard residual	0.8	-0.2
Grade: F	(n = 10)		
	Actual count	2	8
	Expected count	1	9
	Percent of discipline grades	3.8%	0.9%
	Standard residual	1.9	-0.5
Pearson Chi-square: 9.752 (df = 4); Significance .045			
Sommers'd effect size: -.113; Significance .154			

The English grades analysis indicated the DMACC mean and standard deviation were slightly larger (Table 4.21). DMACC had a larger percentage of A's, whereas ISU had a larger percentage of B's. DMACC had significantly more than expected A's, whereas ISU had less than expected. DMACC had less than expected B's, whereas ISU had more than expected. The Chi-square analysis indicated the differences in the specific grades were significant (<.001), and the Sommers'd measure of effect size was significant (.003). The

Table 4.21. Chi-square analysis of English grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 2,964		n = 1,580	n = 1,384
Mean		3.01 (SD .948)	2.95 (SD .870)
T-test for equality of means: 1.975; Significance .048 (SE .033)			
Grade: A	(n = 904)		
	Actual count	545	359
	Expected count	482	422
	Percent of discipline grades	34.5%	25.9%
	Standard residual	2.9	-3.1
Grade: B	(n = 1,335)		
	Actual count	648	687
	Expected count	712	623
	Percent of discipline grades	41.0%	49.6%
	Standard residual	-2.4	2.5
Grade: C	(n = 572)		
	Actual count	290	282
	Expected count	305	267
	Percent of discipline grades	18.40%	20.4%
	Standard residual	-0.9	0.9
Grade: D	(n = 77)		
	Actual count	58	19
	Expected count	41	36
	Percent of discipline grades	3.7%	1.4%
	Standard residual	2.6	-2.8
Grade: F	(n = 76)		
	Actual count	39	37
	Expected count	41	36
	Percent of discipline grades	2.5%	2.7%
	Standard residual	-0.2	0.3
Pearson Chi-square: 46.570 (df = 4); Significance <.001			
Sommers'd effect size: -.060; Significance .003			

t-test for equality of means was not significant (.048). Therefore, the grade analysis rejected the null hypothesis.

The Engineering grades analysis indicted similar mean and deviation values (Table 4.22). The percentage of grades was similar, and the standard residual values indicated minimal differences between actual and expected frequencies. The Chi-square analysis indicated the differences between specific grades were not significant (.591), and the t-test for equality of means was also not significant (.836). Therefore, the grades analysis

Table 4.22. Chi-square analysis of Engineering grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 291		n = 43	n = 248
Mean		2.91 (SD 1.019)	2.87 (SD 1.057)
T-test for equality of means: .207; Significance .836 (SE .174)			
Grade: A	(n = 89)		
	Actual count	14	75
	Expected count	13	76
	Percent of discipline grades	32.6%	30.2%
	Standard residual	0.2	-0.1
Grade: B	(n = 117)		
	Actual count	16	101
	Expected count	17	100
	Percent of discipline grades	37.2%	40.7%
	Standard residual	-0.3	0.1
Grade: C	(n = 60)		
	Actual count	9	51
	Expected count	9	51
	Percent of discipline grades	20.9%	20.6%
	Standard residual	0.0	0.0
Grade: D	(n = 3)		
	Actual count	3	7
	Expected count	1.5	8.5
	Percent of discipline grades	7.0%	2.8%
	Standard residual	1.3	-0.5
Grade: F	(n = 15)		
	Actual count	1	14
	Expected count	2.2	13
	Percent of discipline grades	2.3%	5.6%
	Standard residual	-0.8	0.3
Pearson Chi-square: 2.803 (df = 4); Significance .591			

determined that the differences between DMACC and ISU Engineering grades were not significant and failed to reject the null hypothesis.

The French grades analysis indicated significantly different means, yet the standard deviations were similar. DMACC had a higher percentage of A's and B's (Table 4.23). The frequency of D's and F's were minimal. The Chi-square analysis indicated that overall differences in French grades between DMACC and ISU were significant (.007), and the Sommers'd measure of effect size was also significant (<.001). However, 4 cells (40%) had

Table 4.23. Chi-square analysis of French grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 78		n = 42	n = 36
Mean		3.12 (SD .739)	2.33 (SD 1.069)
T-test for equality of means: 3.714; Significance <.001 (SE .212)			
Grade: A	(n = 18)		
	Actual count	14	4
	Expected count	10	8.3
	Percent of discipline grades	33.3%	11.1%
	Standard residual	1.4	-1.5
Grade: B	(n = 33)		
	Actual count	19	14
	Expected count	18	15
	Percent of discipline grades	45.20%	38.9%
	Standard residual	0.3	-0.3
Grade: C	(n = 19)		
	Actual count	9	10
	Expected count	10	9
	Percent of discipline grades	21.4%	27.8%
	Standard residual	-0.4	0.4
Grade: D	(n = 6)		
	Actual count	0	6
	Expected count	3.2	2.8
	Percent of discipline grades	0%	16.7%
	Standard residual	-1.8	1.9
Grade: F	(n = 2)		
	Actual count	0	2
	Expected count	1.1	0.9
	Percent of discipline grades	0%	5.6%
	Standard residual	-1.0	1.1
Pearson Chi-square: 2.803 (df = 4); Significance .007; Note: 4 cells (40%) low count			
Sommers'd effect size: -.413; Significance <.001			

less than expected frequencies that may make the analysis less valid. The t-test for equality of means was significant (<.001). Therefore, the analysis rejected the null hypothesis.

The Geography grades analysis indicated DMACC mean and standard deviation was slightly larger (Table 4.24). DMACC had a higher percentage of A's, whereas ISU had a larger percentage of C's and D's. Only slight differences between actual and expected frequencies were indicated. The Chi-square analysis indicated the differences in specific grades were slightly significant (.045), and the Sommers'd measure of effect size was not

Table 4.24. Chi-square analysis of Geography grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 165		n = 120	n = 45
Mean		2.75(SD 1.079)	2.51 (SD .815)
T-test for equality of means: 1.347; Significance .180 (SE .177)			
Grade: A	(n = 40)		
	Actual count	35	5
	Expected count	29	11
	Percent of discipline grades	29.2%	11.1%
	Standard residual	1.1	-1.8
Grade: B	(n = 54)		
	Actual count	37	17
	Expected count	39	15
	Percent of discipline grades	30.8%	37.8%
	Standard residual	-0.4	0.6
Grade: C	(n = 56)		
	Actual count	37	19
	Expected count	41	15
	Percent of discipline grades	30.8%	42.2%
	Standard residual	-0.6	1.0
Grade: D	(n = 9)		
	Actual count	5	4
	Expected count	6.5	2.5
	Percent of discipline grades	4.2%	8.9%
	Standard residual	-0.6	1.0
Grade: F	(n = 6)		
	Actual count	6	0
	Expected count	4.4	1.6
	Percent of discipline grades	5.0%	0.0%
	Standard residual	0.8	-1.3
Pearson Chi-square: 9.722 (df = 4); Significance .045			
Sommers'd effect size: -.171; Significance .055			

significant (.055). The t-test for equality of means was also not significant (.180). Therefore, the analysis determined the differences in grades was not significant and failed to reject the null hypothesis.

The History grades analysis indicated the means and standard deviations were similar (Table 4.25). ISU had a slightly higher percentage of B's, whereas DMACC slightly higher C's. Standard residual values of differences between actual and expected frequencies were minimal. The Chi-square analysis indicated the difference in specific grades was not significant (.287), and the t-test for equality of means was also not significant (.924).

Table 4.25. Chi-square analysis of History grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 1,101		n = 499	n = 602
Mean		2.73 (SD .991)	2.74 (SD 1.001)
T-test for equality of means: .599; Significance .924 (SE .060)			
Grade: A	(n = 252)		
	Actual count	118	134
	Expected count	114	137
	Percent of discipline grades	23.6%	22.3%
	Standard residual	0.4	-0.3
Grade: B	(n = 457)		
	Actual count	195	262
	Expected count	207	250
	Percent of discipline grades	39.1%	43.5%
	Standard residual	-0.8	0.8
Grade: C	(n = 279)		
	Actual count	134	145
	Expected count	126	153
	Percent of discipline grades	26.9%	24.1%
	Standard residual	0.7	-0.6
Grade: D	(n = 76)		
	Actual count	39	37
	Expected count	34	42
	Percent of discipline grades	7.8%	6.1%
	Standard residual	0.8	-0.7
Grade: F	(n = 37)		
	Actual count	13	24
	Expected count	17	20
	Percent of discipline grades	2.6%	4.0%
	Standard residual	-0.9	0.8
Pearson Chi-square: 5.003 (df = 4); Significance .287			

Therefore, the analysis determined the differences in grades between DMACC and ISU was not significant and failed to reject the null hypothesis.

The Hotel and Restaurant Management grades analysis indicated DMACC mean was higher (Table 4.26). DMACC had a much higher percentage of A's, whereas ISU had a much higher percentage of C's. DMACC had significantly more A's than expected and less C's. The Chi-square analysis indicated the differences between specific grades was significant (<.001), and the Sommers'd measure of effect size was also significant (<.001).

Table 4.26. Chi-square analysis of Hotel and Restaurant Management grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 588		n = 45	n = 543
Mean		3.36 (SD .883)	2.76 (SD .943)
T-test for equality of means: 4.072; Significance <.001 (SE .146)			
Grade: A	(n = 149)		
	Actual count	24	125
	Expected count	11	138
	Percent of discipline grades	53.3%	23.0%
	Standard residual	3.7	-1.1
Grade: B	(n = 237)		
	Actual count	16	221
	Expected count	18	219
	Percent of discipline grades	35.6%	40.7%
	Standard residual	-0.5	0.1
Grade: C	(n = 153)		
	Actual count	3	150
	Expected count	12	141
	Percent of discipline grades	6.7%	27.6%
	Standard residual	-2.5	0.7
Grade: D	(n = 38)		
	Actual count	1	37
	Expected count	2.9	35
	Percent of discipline grades	2.2%	6.8%
	Standard residual	-1.1	0.3
Grade: F	(n = 11)		
	Actual count	1	10
	Expected count	0.8	10
	Percent of discipline grades	2.2%	1.8%
	Standard residual	0.2	0.0
Pearson Chi-square: 23.745 (df = 4); Significance <.001			
Sommers'd effect size: -.379; Significance <.001			

The t-test for equality of means was also significant (<.001). Therefore, the grades analysis determined the differences in grades between DMACC and ISU was significant, and rejected the null hypothesis.

The Journalism grades analysis indicated DMACC's mean value was higher (Table 4.27). DMACC had a higher percentage of A's. The standard residual values of the differences between actual and expected frequencies were small. The Chi-square analysis indicated the differences between specific grades were not significant (.237), but the t-test for equality of means was significant (.023). The discrepancy of significant findings between

Table 4.27. Chi-square analysis of Journalism grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 455		n = 40	n = 415
Mean		3.28 (SD .716)	2.94 (SD .896)
T-test for equality of means: 2.279; Significance .023 (SE .146)			
Grade: A	(n = 133)		
	Actual count	17	116
	Expected count	12	121
	Percent of discipline grades	42.5%	28.0%
	Standard residual	1.6	-0.5
Grade: B	(n = 207)		
	Actual count	17	190
	Expected count	18	189
	Percent of discipline grades	42.5%	45.8%
	Standard residual	-0.3	0.1
Grade: C	(n = 92)		
	Actual count	6	86
	Expected count	8.1	84
	Percent of discipline grades	15.0%	20.7%
	Standard residual	-0.7	0.2
Grade: D	(n = 15)		
	Actual count	0	15
	Expected count	1.3	14
	Percent of discipline grades	0.0%	3.6%
	Standard residual	-1.1	0.4
Grade: F	(n = 8)		
	Actual count	0	8
	Expected count	0.7	7
	Percent of discipline grades	0.0%	1.9%
	Standard residual	-0.8	0.3
Pearson Chi-square: 5.536 (df = 4; Significance .237			

the two tests may be related to the higher sample size of ISU (n = 415) than DMACC (n = 40); therefore, the analysis failed to reject the null hypothesis.

The Math grades analysis indicated the DMACC mean was higher. DMACC had a higher percentage of A's (Table 4.28). The standard residual values indicated significantly more A grades than expected. ISU had significantly less A's than expected. The Chi-square analysis indicated the differences in specific grades were significant (p= <.001), and the Sommers'd measure of effect size was significant (<.001). The t-test for equality of means

Table 4.28. Chi-square analysis of Math grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 2,498		n = 1,116	n = 1,382
Mean		2.67 (SD 1.112)	2.51 (SD 1.076)
T-test for equality of means: 3.757; Significance <.001 (SE .044)			
Grade: A	(n = 575)		
	Actual count	309	266
	Expected count	257	318
	Percent of discipline grades	27.7%	19.2%
	Standard residual	3.3	-2.9
Grade: B	(n = 806)		
	Actual count	342	464
	Expected count	360	446
	Percent of discipline grades	30.6%	33.6%
	Standard residual	-1.0	0.9
Grade: C	(n = 734)		
	Actual count	307	427
	Expected count	328	406
	Percent of discipline grades	27.5%	30.9%
	Standard residual	-1.2	1.0
Grade: D	(n = 265)		
	Actual count	108	157
	Expected count	118	147
	Percent of discipline grades	9.7%	11.4%
	Standard residual	-1.0	0.9
Grade: F	(n = 118)		
	Actual count	50	68
	Expected count	53	65
	Percent of discipline grades	4.5%	4.9%
	Standard residual	-0.4	0.3
Pearson Chi-square: 25.066 (df = 4); Significance <.001			
Sommers'd effect size: -0.090; Significance <.001			

was significant (<.001); therefore, the differences were significant to reject the null hypothesis.

The Management grades analysis indicated the DMACC was higher (Table 4.29). DMACC had a higher percentage of A's, whereas ISU had higher percentages of B's and C's. The standard residual values indicated DMACC had significantly more A's than expected and less B's. ISU had less than expected frequencies of A's. The Chi-square analysis indicated the difference in specific grades was significant (<.001), and the

Table 4.29. Chi-square analysis of Management grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 1,276		n = 236	n = 1,040
Mean		3.19 (SD.876)	2.71 (SD .940)
T-test for equality of means: 7.571; Significance <.001 (SE .064)			
Grade: A	(n = 313)		
	Actual count	101	212
	Expected count	57	255
	Percent of discipline grades	42.8%	20.4%
	Standard residual	5.7	-2.7
Grade: B	(n = 517)		
	Actual count	36	427
	Expected count	64	421
	Percent of discipline grades	15.3%	41.0%
	Standard residual	-2.8	0.2
Grade: C	(n = 74)		
	Actual count	4	309
	Expected count	14	281
	Percent of discipline grades	1.7%	29.7%
	Standard residual	-2.6	1.7
Grade: D	(n = 27)		
	Actual count	4	70
	Expected count	5	60
	Percent of discipline grades	1.7%	6.7%
	Standard residual	-0.4	1.2
Grade: F	(n = 4)		
	Actual count	4	23
	Expected count	2.2	22
	Percent of discipline grades	1.7%	2.2%
	Standard residual	1.2	0.2
Pearson Chi-square: 63.185 (df = 4); Significance <.001			
Sommers'd effect size: -.300; Significance <.001			

Sommers'd measure of effect size was significant (<.001). In addition, the t-test for equality of means was significant (<.001). Therefore, the analysis determined significant differences and rejected the null hypothesis.

The Marketing grades analysis indicated the DMACC mean was higher (Table 4.30). DMACC had a higher percentage of A's, whereas ISU had higher percentages of B's. DMACC had significantly more than expected frequencies of A's and less than expected B's. The Chi-square analysis indicated the differences in specific grades were significant (<.001),

Table 4.30. Chi-square analysis of Marketing grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 1,089		n = 218	n = 871
Mean		3.10 (SD .893)	2.89 (SD .842)
T-test for equality of means: 3.072; Significance .002 (SE .067)			
Grade: A	(n = 287)		
	Actual count	85	202
	Expected count	58	230
	Percent of discipline grades	39.0%	23.2%
	Standard residual	3.6	-1.8
Grade: B	(n = 504)		
	Actual count	80	424
	Expected count	101	403
	Percent of discipline grades	36.7%	48.7%
	Standard residual	-2.1	1.0
Grade: C	(n = 249)		
	Actual count	44	205
	Expected count	50	199
	Percent of discipline grades	20.2%	23.5%
	Standard residual	-0.8	0.4
Grade: D	(n = 7)		
	Actual count	7	28
	Expected count	7	28
	Percent of discipline grades	3.2%	3.2%
	Standard residual	0.0	0.0
Grade: F	(n = 14)		
	Actual count	2	12
	Expected count	2.8	11
	Percent of discipline grades	0.9%	1.4%
	Standard residual	-0.5	0.2
Pearson Chi-square: 23.068 (df = 4); Significance <.001			
Sommers'd effect size: -.143; Significance <.001			

and the Sommers'd measure of effect size was also significant (<.001). The t-test of equality of means was significant (<.001); therefore, the grade analysis determined significant differences in grades and rejected the null hypothesis.

The Music grades analysis indicated the DMACC mean was less than ISU (Table 4.31). ISU had a higher percentage of B's, whereas DMACC had a higher percentage of C's, D's, and F's. DMACC had less B's, and more D's and F's than expected. ISU had less F's than expected. The Chi-square analysis indicated differences in specific grades were

Table 4.31. Chi-square analysis of Music grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 405		n = 166	n = 239
Mean		3.22 (SD 1.101)	3.45 (SD .652)
T-test for equality of means: -2.465; Significance .014 (SE .095)			
Grade: A	(n = 221)		
	Actual count	93	128
	Expected count	91	130
	Percent of discipline grades	56.0%	53.6%
	Standard residual	0.3	-0.2
Grade: B	(n = 130)		
	Actual count	38	92
	Expected count	53	77
	Percent of discipline grades	22.9%	38.5%
	Standard residual	-2.1	1.7
Grade: C	(n = 38)		
	Actual count	20	18
	Expected count	16	22
	Percent of discipline grades	12.0%	7.5%
	Standard residual	1.1	-0.9
Grade: D	(n = 9)		
	Actual count	8	1
	Expected count	3.7	5.5
	Percent of discipline grades	4.8%	0.4%
	Standard residual	2.2	-1.9
Grade: F	(n = 7)		
	Actual count	7	0
	Expected count	2.9	4.1
	Percent of discipline grades	4.2%	0.0%
	Standard residual	2.4	-2.0
Pearson Chi-square: 28.284 (df = 4); Significance <.001; Note: 3 cells (30%) low count			
Sommers'd effect size: .045; Significance .409			

significant (<.001), however, the Sommers'd measure was not significant (.409). A low frequency in three cells (30%) may decrease validity of the analysis. The t-test for equality means was significant (.014). With caution, the analysis found significant differences and rejected the null hypothesis.

The Philosophy grades analysis indicated the DMACC mean higher (Table 4.32). DMACC had a higher percentage of A's, whereas ISU had a higher percentage of B's and C's. DMACC had significantly more A's and significantly less C's. ISU had significantly

Table 4.32. Chi-square analysis of Philosophy grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 1,084		n = 465	n = 619
Mean		3.26 (SD .960)	2.85 (SD .970)
T-test for equality of means: 6.928; Significance <.001 (SE .059)			
Grade: A	(n = 407)		
	Actual count	240	167
	Expected count	175	232
	Percent of discipline grades	51.6%	27.0%
	Standard residual	5.0	-4.3
Grade: B	(n = 403)		
	Actual count	144	259
	Expected count	173	230
	Percent of discipline grades	31.0%	41.8%
	Standard residual	-2.2	1.9
Grade: C	(n = 198)		
	Actual count	55	143
	Expected count	85	113
	Percent of discipline grades	11.8%	23.1%
	Standard residual	-3.2	2.8
Grade: D	(n = 47)		
	Actual count	14	33
	Expected count	20	27
	Percent of discipline grades	3.0%	5.3%
	Standard residual	-1.4	1.2
Grade: F	(n = 29)		
	Actual count	12	17
	Expected count	12.4	16.6
	Percent of discipline grades	2.6%	2.7%
	Standard residual	-0.1	0.1
Pearson Chi-square: 73.162 (df = 4); Significance <.001			
Sommers'd effect size: -.266; Significance <.001			

less A's and more C's than expected. The Chi-square analysis indicated the differences in specific grades were significant (<.001), and the Sommers'd measure of effect size was also significant (<.001). The t-test for equality of means was significant (<.001); therefore, the analysis determined significant differences and rejected the null hypothesis.

The Physical Education grades analysis indicated that DMACC had a higher mean than ISU (Table 4.33). DMACC had a much higher percentage of A's, whereas ISU had much higher percentage of B's. DMACC had a significantly higher frequency of A's and

Table 4.33. Chi-square analysis of Physical Education grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 850		n = 94	n = 756
Mean		3.65 (SD .826)	2.92 (SD .945)
T-test for equality of means: 7.163; Significance <.001 (SE .102)			
Grade: A	(n = 299)		
	Actual count	77	222
	Expected count	33	266
	Percent of discipline grades	81.9%	29.4%
	Standard residual	7.6	-2.7
Grade: B	(n = 322)		
	Actual count	5	317
	Expected count	36	287
	Percent of discipline grades	5.3%	41.9%
	Standard residual	-5.1	1.8
Grade: C	(n = 179)		
	Actual count	9	170
	Expected count	20	159
	Percent of discipline grades	9.6%	22.5%
	Standard residual	-2.4	0.9
Grade: D	(n = 29)		
	Actual count	2	27
	Expected count	3.2	26
	Percent of discipline grades	2.1%	3.6%
	Standard residual	-0.7	0.2
Grade: F	(n = 21)		
	Actual count	1	20
	Expected count	2.3	19
	Percent of discipline grades	1.1%	2.6%
	Standard residual	-0.9	0.3
Pearson Chi-square: 103.192 (df = 4); Significance <.001			
Sommers'd effect size: -.4860; Significance <.001			

significantly lower frequency of B's. The Chi-square analysis indicated significant differences in specific grades (<.001), and the Sommers'd measure of effect size was also significant (<.001). The t-test for equality of means was significant (<.001); therefore, the grades analysis determined significant differences in grades and rejected the null hypothesis.

The Physics grades analysis indicated the DMACC mean was higher (Table 4.34). DMACC had higher percentage of A's and B's, whereas ISU had a higher percentage of C's. However, the standard residual values indicated only small differences in expected frequencies of all grades. The Chi-square analysis indicated the difference in specific grades

Table 4.34. Chi-square analysis of Physics grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 413		n = 174	n = 239
Mean		2.62 (SD 1.072)	2.46 (SD 1.040)
T-test for equality of means: 1.488; Significance .138 (SE .105)			
Grade: A	(n = 79)		
	Actual count	38	41
	Expected count	33	46
	Percent of discipline grades	21.8%	17.2%
	Standard residual	0.8	-0.7
Grade: B	(n = 141)		
	Actual count	65	76
	Expected count	59	82
	Percent of discipline grades	37.4%	31.8%
	Standard residual	-07	-0.6
Grade: C	(n = 132)		
	Actual count	46	86
	Expected count	56	76
	Percent of discipline grades	26.4%	36.0%
	Standard residual	-1.3	1.1
Grade: D	(n = 42)		
	Actual count	17	25
	Expected count	19	24
	Percent of discipline grades	9.8%	11.0%
	Standard residual	-0.2	0.1
Grade: F	(n = 19)		
	Actual count	8	11
	Expected count	8	11
	Percent of discipline grades	4.6%	4.6%
	Standard residual	0.0	0.0
Pearson Chi-square: 4.984 (df = 4); Significance .289			

between DMACC and ISU was not significant (.289), and the t-test for equality of means was also not significant (.138). Therefore, the analysis determined significant differences in grades and failed to reject the null hypothesis.

The Political Science grades analysis indicated slight differences in means and standard deviation (Table 4.35). ISU had a higher percentage of B's, whereas DMACC had higher percentage of F's. The standardized residual value of the difference between actual and expected frequencies indicated minimal differences. The Chi-square analysis indicated the difference in specific grades between DMACC and ISU was not significant (403), and the

Table 4.35. Chi-square analysis of Political Science grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 526		n = 153	n = 373
Mean		2.54 (SD 1.100)	2.64 (SD .978)
T-test for equality of means: -.934; Significance .351 (SE .102)			
Grade: A	(n = 103)		
	Actual count	32	71
	Expected count	30	73
	Percent of discipline grades	20.9%	19.0%
	Standard residual	0.4	-0.2
Grade: B	(n = 200)		
	Actual count	51	149
	Expected count	58	142
	Percent of discipline grades	33.3%	39.9%
	Standard residual	-0.9	0.6
Grade: C	(n = 158)		
	Actual count	47	111
	Expected count	46	112
	Percent of discipline grades	30.7%	29.8%
	Standard residual	0.2	-0.1
Grade: D	(n = 45)		
	Actual count	14	31
	Expected count	13	32
	Percent of discipline grades	9.2%	8.3%
	Standard residual	0.3	-0.2
Grade: F	(n = 20)		
	Actual count	9	11
	Expected count	6	14
	Percent of discipline grades	5.9%	2.9%
	Standard residual	1.7	-0.8
Pearson Chi-square: 4.022 (df = 4); Significance .403			

t-test for equality of means was not significant (.351). Therefore, the analysis determined the differences in grades were not significant and failed to reject the null hypothesis.

The Psychology grades analysis indicted the DMACC mean was higher (Table 4.36). DMACC had higher percentages of A's and B's. The standard residuals indicated that DMACC had more A's, and less C's and D's than expected. ISU had significantly less A's than expected. The Chi-square analysis indicated the differences in specific grades were

Table 4.36. Chi-square analysis of Psychology grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 1,691		n = 902	n = 790
Mean		2.87 (SD 1.064)	2.63 (SD 1.025)
T-test for equality of means: 4.709; Significance <.001 (SE .051)			
Grade: A	(n = 482)		
	Actual count	302	180
	Expected count	257	225
	Percent of discipline grades	33.5%	22.8%
	Standard residual	2.8	-3.0
Grade: B	(n = 557)		
	Actual count	300	257
	Expected count	297	260
	Percent of discipline grades	33.3%	15.2%
	Standard residual	0.2	-0.62
Grade: C	(n = 464)		
	Actual count	211	253
	Expected count	247	217
	Percent of discipline grades	23.4%	32.0%
	Standard residual	-2.3	2.5
Grade: D	(n = 133)		
	Actual count	54	79
	Expected count	71	62
	Percent of discipline grades	6.0%	10.0%
	Standard residual	-2.0	2.1
Grade: F	(n = 55)		
	Actual count	34	21
	Expected count	29	26
	Percent of discipline grades	3.8%	2.7%
	Standard residual	0.9	-0.9
Pearson Chi-square: 38.653 (df = 4); Significance <.001			
Sommers'd effect size: -.144; Significance <.001			

significant (<.001), and the Sommers'd measure of effect size was significant (<.001). The t-test for equality of means was also significant (<.001). Therefore, the analysis determined the differences in grades were significant and rejected the null hypothesis.

The Sociology grades analysis indicated the DMACC mean was higher (Table 4.37). DMACC had a higher percentage of A's, whereas ISU had a higher percentage of C's. The standard residual values indicated that DMACC had higher than expected A's and lower than expected C's, whereas ISU had higher than expected C's. The Chi-square analysis of

Table 4.37. Chi-square analysis of Sociology grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 1,450		n = 623	n = 827
Mean		3.11 (SD .891)	2.94 (SD .896)
T-test for equality of means: 3.636; Significance <.001 (SE .047)			
Grade: A	(n = 466)		
	Actual count	228	238
	Expected count	200	266
	Percent of discipline grades	36.6%	28.8%
	Standard residual	2.0	-1.7
Grade: B	(n = 634)		
	Actual count	278	356
	Expected count	272	362
	Percent of discipline grades	44.6%	43.0%
	Standard residual	0.3	-0.3
Grade: C	(n = 281)		
	Actual count	90	191
	Expected count	121	160
	Percent of discipline grades	14.4%	23.1%
	Standard residual	-2.8	2.4
Grade: D	(n = 40)		
	Actual count	12	28
	Expected count	17	23
	Percent of discipline grades	1.9%	3.4%
	Standard residual	-1.3	1.1
Grade: F	(n = 29)		
	Actual count	15	14
	Expected count	13	17
	Percent of discipline grades	2.4%	1.7%
	Standard residual	0.7	-0.6
Pearson Chi-square: 24.329 (df = 4), Significance <.001			
Sommers'd effect size: -.120; Significance <.001			

specific grades indicated significant differences (<.001), and the Sommers' d measure of effect size was significant (<.001). The t-test for equality of means was also significant (<.001); therefore, the analysis determined significant differences in grades and rejected the null hypothesis.

The Spanish grades analysis indicated the means and standard deviations were similar (Table 4.38). The analysis of specific grades indicated that the percentages were similar. The standard residual values of expected frequencies indicated minimal differences. The

Table 4.38. Chi-square analysis of Spanish grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 329		n = 191	n = 138
Mean		3.03 (SD .989)	3.06 (SD .980)
T-test for equality of means: -.241; Significance .809 (SE .110)			
Grade: A	(n = 126)		
	Actual count	72	54
	Expected count	73	53
	Percent of discipline grades	37.7%	39.1%
	Standard residual	-0.1	0.2
Grade: B	(n = 120)		
	Actual count	70	50
	Expected count	70	50
	Percent of discipline grades	36.6%	36.2%
	Standard residual	0.0	0.0
Grade: C	(n = 65)		
	Actual count	39	26
	Expected count	38	27
	Percent of discipline grades	20.4%	18.8%
	Standard residual	0.2	-0.2
Grade: D	(n = 7)		
	Actual count	3	4
	Expected count	4.1	2.9
	Percent of discipline grades	1.6%	2.9%
	Standard residual	-0.5	0.6
Grade: F	(n = 11)		
	Actual count	7	4
	Expected count	6.4	4.6
	Percent of discipline grades	3.7%	2.9%
	Standard residual	0.2	-0.3
Pearson Chi-square: .953 (df = 4); Significance .917; Note: 3 cells (30%) low count			

Chi-square analysis indicated the differences in specific grades were not too significant (.917). The t-test for equality of means was also not significant (.809). Therefore, the analysis determined that differences in grades were not significant and failed to reject the null hypothesis.

The Speech grades analysis indicated that the means and standard deviations were similar (Table 4.39). The analysis of specific grades indicated that ISU had a slightly higher percentage of A's, whereas DMACC a slightly higher percentage of B's. Standard residual

Table 4.39. Chi-square analysis of Speech grades at DMACC and ISU

Statistical Analysis (p = .05)		DMACC	ISU
N = 1,063		n = 595	n = 468
Mean		2.98 (SD .843)	3.03 (SD .795)
T-test for equality of means: -1.136; Significance .256 (SE .051)			
Grade: A	(n = 304)		
	Actual count	162	142
	Expected count	170	134
	Percent of discipline grades	27.2%	30.3%
	Standard residual	-0.6	0.7
Grade: B	(n = 503)		
	Actual count	290	213
	Expected count	282	222
	Percent of discipline grades	48.7%	45.5%
	Standard residual	0.5	-0.6
Grade: C	(n = 220)		
	Actual count	119	101
	Expected count	123	97
	Percent of discipline grades	20.0%	21.6%
	Standard residual	-0.4	0.4
Grade: D	(n = 7)		
	Actual count	15	11
	Expected count	15	11.4
	Percent of discipline grades	2.5%	2.4%
	Standard residual	0.1	-0.1
Grade: F	(n = 10)		
	Actual count	9	1
	Expected count	5.6	4.4
	Percent of discipline grades	1.5%	0.2%
	Standard residual	1.4	-1.6
Pearson Chi-square: 6.511 (df = 4); Significance .164			

values of expected frequencies indicated only minimal differences. The Chi-square analysis indicated the difference in specific grades was not significant (.164), and the t-test for equality of means was not significant (.256). Therefore, the analysis determined the differences in grades were not significant and failed to reject the null hypothesis.

DMACC General Education and ISU

Research Question 3: How different are the grade distributions of DMACC general education courses and ISU courses?

The focus of this research question was on the general education courses at DMACC. DMACC describes general education as follows:

> General Education focuses on the knowledge and skills necessary for the understanding and effective application of many fields which include written/oral communications, pure/applied science, mathematics, social/behavioral sciences and humanities. The essential importance of general education remains a central principle in curriculum development at DMACC.

To understand the impact of the general education at DMACC, this study identified all the disciplines defined as core curriculum (see Appendix B). The course grades in the disciplines were combined into one data set (General Education) to be compared with all ISU courses grades. The General Education grades and ISU grades were analyzed to determine the mean, standard deviation, and the t-test for equality of means of the overall grade distribution (Table 4.40). A crosstabulation of the specific grades (A, B, C, D, & F) examined the actual frequency, computed the expected frequency, and the percentage of grade distribution. A standard residual was also calculated to compare differences in actual frequencies from expected frequencies. The Chi-square analysis computed the relationship of the grades between the two groups (DMACC General Education and ISU). If the

Table 4.40. Analysis of grades for DMACC General Education and ISU

Statistical Analysis (p = .05)		DMACC (Gen. Ed.)	ISU (All)
N = 32,155		n = 9,005	n = 23,190
Mean		2.90 (SD 1.017)	2.84 (SD .973)
T-test for equality of means: 4.687; Significance <.001 (SE .012)			
Grade: A	(n = 9,190)		
	Actual count	2,911	6,279
	Expected count	2,754	6,616
	Percent of discipline grades	32.3%	27.1%
	Standard residual	6.6	-4.1
Grade: B	(n = 12,678)		
	Actual count	3,308	9,370
	Expected count	3,551	9,128
	Percent of discipline grades	36.7%	40.5%
	Standard residual	-4.1	2.5
Grade: C	(n = 7,640)		
	Actual count	2,019	5,621
	Expected count	2,140	5,500
	Percent of discipline grades	22.4%	24.3%
	Standard residual	-2.6	1.6
Grade: D	(n = 1,745)		
	Actual count	487	1,258
	Expected count	489	1,256
	Percent of discipline grades	5.4%	5.4%
	Standard residual	-0.1	0.0
Grade: F	(n = 902)		
	Actual count	280	622
	Expected count	253	649
	Percent of discipline grades	3.1%	2.7%
	Standard residual	1.7	-1.1
Pearson Chi-square: 97.991 (df = 4); Significance <.001			
Sommers'd effect size: -0.043; Significance <.001			

difference was significant, then a Sommers'd measure of effect size was computed to show the magnitude of the difference.

General Education and Non-General Education

The General Education grades analysis indicated the DMACC mean was higher, with a larger standard deviation. DMACC had a higher percentage of A's, whereas ISU had a higher percentage of B's. The standard residual values indicated that DMACC had significantly more A's than expected but significantly less B's. ISU had significantly less

A's than expected but more B's. The Chi-square analysis indicated the differences between specific grades was significant (<.001), and the Sommers'd measure of effect size was also significant (<.001). The t-test for equality of means was significant (<.001). Therefore, the analysis determined significant differences in the grades and rejected the null hypothesis.

The General Education (Gen. Ed.) courses combine 21 discipline grades from the 33 DMACC matched disciplines and reflected similar grade distributions. Both "all DMACC" grades and "Gen. Ed. DMACC" grades were significantly different from "All ISU" grades. However, the differences in grade distribution could be described only by grade mean of All DMACC (2.96) and Gen. Ed. DMACC (2.90). Thus, further analysis of the differences was completed. Table 4.41 depicts the differences between Gen. Ed. DMACC and Non-Gen. Ed. DMACC grades.

The Gen. Ed. and Non-Gen. Ed. DMACC grades analysis indicated the Non-Gen. Ed. mean was higher. Non-Gen. Ed also had a much higher percentage of A's, whereas Gen. Ed. had a higher percentage of B's and C's. The standard residual value to compare actual and expected frequencies indicated that Non-Gen. Ed. had significantly higher A's than expected, whereas Gen. Ed. had significantly lower. Non-Gen. Ed. also had significantly lower C's, D's, and F's than expected. Gen. Ed. had significantly higher C's than expected and higher D's than expected. The Chi-square analysis indicated the differences between specific grades was significant (<.001), and the Sommers'd measure of effect size was significant (.012). The t-test for equality of means was also significant (<.001). Therefore, the analysis determined significant differences in Non-Gen. Ed. and Gen. Ed. grades and rejected the null hypothesis.

Table 4.41. Analysis of grades for Gen. Ed. DMACC and Non-Gen. Ed. DMACC

Statistical Analysis (p = .05)		DMACC (Gen. Ed.)	DMACC (Non-Gen. Ed.)
N = 11,823		n = 9,005	n = 8,817
Mean		2.90 (SD 1.017	3.18 (SD .941)
T-test for equality of means: 13.472; Significance <.001 (SE .021)			
Grade: A	(n = 4,204)		
	Actual count	2,911	1,292
	Expected count	3,202	1,002
	Percent of discipline grades	32.3%	45.9%
	Standard residual	-5.1	9.2
Grade: B	(n = 4,234)		
	Actual count	3,308	926
	Expected count	3,225	1,009
	Percent of discipline grades	36.7%	32.9%
	Standard residual	1.5	-2.6
Grade: C	(n = 2,477)		
	Actual count	2,019	458
	Expected count	1,887	590
	Percent of discipline grades	22.4%	16.3%
	Standard residual	3.0	-5.4
Grade: D	(n = 574)		
	Actual count	487	87
	Expected count	437	137
	Percent of discipline grades	5.4%	3.1%
	Standard residual	2.4	-4.3
Grade: F	(n = 334)		
	Actual count	280	54
	Expected count	254	80
	Percent of discipline grades	3.1%	1.9%
	Standard residual	1.6	-2.9
Pearson Chi-square: 194.831 (df = 4); Significance <.001			
Sommers'd effect size: -0.162; Significance <.001			

Research Question 3 compared DMACC Gen. Ed. grades to ISU, which resulted in significant differences. Upon closer examination, the DMACC Gen. Ed. grades and Non-Gen. Ed. grades were also significantly different. Based on the two analyses, each DMACC (Gen. Ed. and Non-Gen. Ed.) group was significantly different from ISU grades.

However, the degree of difference between Non-Gen. Ed. and all ISU must be examined to full understand the differences. Table 4.42 applied the same statistical analysis and combined the all three groups (Non-Gen Ed., Gen. Ed., and ISU) to analyze the

Table 4.42. Analysis of grades by Non-Gen. Ed. for DMACC and All ISU

Statistical Analysis (p = .05)		DMACC (Non-Gen. Ed.)	DMACC (Gen. Ed.)	All ISU
N = 11,823		n = 2,818	n = 9,005	n = 23,150
Grade: A	(n = 10,483)			
	Actual count	1,293	2,911	6,279
	Expected count	845	2,699	6,939
	Percent of discipline grades	45.9%	32.3%	27.1%
	Standard residual	15.4	4.1	-7.9
Grade: B	(n = 13,604)			
	Actual count	926	3,308	9,370
	Expected count	1,096	3,503	9,005
	Percent of discipline grades	32.9%	36.7%	40.5%
	Standard residual	-5.1	-3.3	3.8
Grade: C	(n = 8,098)			
	Actual count	458	2,019	5,621
	Expected count	652	2,085	5,360
	Percent of discipline grades	16.3%	22.4%	24.3%
	Standard residual	-7.6	-1.4	3.6
Grade: D	(n = 1,832)			
	Actual count	87	487	1,258
	Expected count	148	471	1,213
	Percent of discipline grades	3.1%	5.4%	5.4%
	Standard residual	-5.0	0.7	1.3
Grade: F	(n = 956)			
	Actual count	54	280	622
	Expected count	77	246	633
	Percent of discipline grades	1.9%	3.1%	2.7%
	Standard residual	-2.6	2.2	-0.4
Pearson Chi-square: 480.955 (df = 4); Significance <.001				
Sommers'd effect size: -.089; Significance <.001				

combined effect of the three grade distributions. Each group was compared with the other two groups for the combined analysis.

The analysis of Non-Gen. Ed, Gen. Ed. and ISU grade distributions indicated Non-Gen. Ed. had the highest percentage of A's. ISU had the highest percentage of B's. Gen. Ed. and ISU had similar percentages of C's followed by Non. Gen. Ed. with the lower percentage of C's. The standard residual values comparing the actual frequency with the expected frequency indicated Non-Gen. Ed. had a very significantly more A's than expected, Gen. Ed. had significantly more and ISU had significantly less than expected. Conversely, ISU had

significantly more B's and Non-Gen. Ed and Gen. Ed. had significantly less than expected. ISU also had significantly more C's and Non-Gen. Ed. had significantly less than expected. Non-Gen. Ed. had significantly less D's than expected. Gen. Ed. had more F's than expected and Non-Gen. Ed. had less than expected. The Chi-square showed significance difference between the groups and the Sommers'd was also significant.

SUMMARY, CONCLUSION, AND IMPLICATIONS

This chapter provides a summary of the study, identifies the overall conclusions and explains the implications. The summary will briefly describe the background, purpose and design of the study. The conclusions will synthesize the statistical analysis and results of the three research questions. The implications will present recommendations to utilize the results and make proposals for further research.

Summary of the Study Design and Methodology

Community colleges are the fastest growing higher education institution, comprised of over 50% of the new freshman college students in the United States (NCES, 2001). The collegiate/transfer function is one of the founding missions of community colleges and, currently, constitutes the majority of students taking credit classes in American community colleges (Coley, 2000). Because of the significant impact that community colleges have on higher education, research on community colleges and their transfer success has intensified. Transfer research examines student characteristics, psychosocial adjustment, institutional barriers, academic achievement, and other factors.

Transfer research of academic achievement often reports student demographic characteristics and related environmental variables, with the overall grade point average (GPA) to understand successful transfer. Relatively few studies examine academic achievement related to transfer success according to specific courses or disciplines. Quanty (1999) concluded that traditional transfer research results are: "...too general to suggest specific actions that faculty may take to prepare students better" (p. 459). Transfer research based on courses or academic disciplines can provide useable and meaning information for

faulty and administration to understand academic performance. The purpose of this study was to analyze the academic performance of transfer students between DMACC and ISU.

DMACC is situated in the highest concentrated population area of Iowa, comprising 20% of the state's population. Within close proximity to ISU, DMACC provides approximately 1/3 of the yearly transfer enrollment of Iowa community college students. As such, the DMACC transfer function constitutes approximately 25% of the credit-student enrollment and generates over 60% of general education credits. This study examined the academic performance of 837 transfer students who graduated with a bachelor's degree from ISU from 1998 to 2002.

The data were gathered from student grade reports from DMACC and ISU. Confidentiality of information was maintained by removing personal identifying information (i.e., college ID, Social Security No., etc.) from the records. The Institutional Review Board at ISU approved a Human Subjects application, and support for the study was received by DMACC's Executive Director for Research and the Vice President for Academic Affairs.

The research questions and hypotheses were:

1. What are the demographic characteristics of DMACC students who transfer and successfully complete a bachelor's degree at ISU?
2. How different are the grade distributions, aggregated by discipline, between DMACC and ISU?

   Ho: There is no significant difference between DMACC and ISU grade distributions.
3. How different are the grade distributions of DMACC general education courses and ISU courses?

   Ho: There is no significant difference between DMACC and ISU grade distributions.

Research Question 1 examined the student demographic characteristics to understand who are the DMACC transfer students to ISU. The students' gender, race, age, first year enrolled at DMACC, year graduated from ISU, years in college, number of transfer credit hours, ACT scores (English, Math, Reading), DMACC GPA and ISU GPA, as well as the major field of study were examined to identify common patterns as well and unique features.

Research Question 2 analyzed the grade distributions (A, B, C, D, & F) between DMACC and ISU. The grades were aggregated by discipline groups. The groups were defined by DMACC disciplines and matched with the same or similar discipline at ISU (see Appendix A). The grades were analyzed using the t-test for equality of means to determine the overall grade mean differences. The study also used crosstabulation and the Chi-square test of independence to identify significant differences in the each grade distribution. Based on the two analyses the study determined whether the differences were significant and rejected or failed to reject the null hypotheses. The null hypothesis was stated as: There is no significant difference between DMACC and ISU grade distributions.

Research Question 3 also analyzed the grade distribution between DMACC general education (Gen. Ed.) courses and ISU courses. All DMACC disciplines identified by the core curriculum of the Associate Degree program were combined into one Gen. Ed. group. The Gen. Ed. grade distributions were compared with the ISU course using the same statistical analysis, namely the t-test for equality of means, crosstabulation and the Chi-square test of independence. Based on the two analyses the study determined whether the differences were significant and rejected or failed to reject the null hypothesis. The null hypothesis was stated as: There is no significant difference between DMACC and ISU grade distributions.

Conclusions

Student demographics

The descriptive analysis of DMACC-ISU student demographics indicated the majority of the students in the study were female (52%), White (87%), 19-22 years old (68%), and completed the bachelors degree in 5years or less (67%). Almost half of the students (46%) transferred 60-65 credits to ISU. The mean ACT scores were: English 19.5, Math 19.9, and Reading 20.8. The ACT scores were below the State of Iowa 2003 average and below the 25th percentile of ISU students. It appears that transfer students are under-prepared according to their ACT scores, but they are successful at DMACC and ISU.

The analysis of overall academic performance of the transfer students indicated a DMACC GPA of 2.96 and an ISU GPA of 2.84. The differences in the GPA were statistically significant. The analysis of specific grade distributions indicated DMACC reported significantly more A's than expected, whereas ISU had significantly less than expected. DMACC reported significantly less B's than expected, whereas ISU had significantly more than expected. DMACC reported significantly less C's than expected, whereas ISU had significantly more than expected. Grades of D and F were not significantly different between DMACC and ISU. It appears the most significant difference is that DMACC grades have more A's, whereas ISU has more B's

An analysis of the ISU major field of study indicated a wide range of bachelor's degrees. The field of study with the highest percentage of students was Management Information Systems (8.0%) followed by Elementary Education (5.1%), Finance (5.1%), Liberal Studies (5.1%), and Marketing (5.0%). Overall, students completed their degree programs in 77 different fields of study. It appears from this data that DMACC transfer

students have the opportunity, after their community college education, to be successful in earning their bachelor's degree in a wide variety of fields of study.

Discipline grade differences

The second research question examined the differences in the grade distributions by academic disciplines. Each DMACC discipline was matched with the same or similar ISU discipline. The specific grades were compared to identify significant differences. Table 5.1 summarizes the grade analyses by discipline (in alphabetical order).

The analysis of grade distributions indicates that DMACC had more than expected A grades in 18 out of the 20 disciplines identified as significantly different. ISU had 10 disciplines with less than expected A's. DMACC had 7 disciplines with less than expected B's, whereas ISU had 2 disciplines with more than expected B's. DMACC had 9 disciplines with less than expected C's, whereas ISU had 3 disciplines with more than expected C's. Grades of D had mixed results (more & less) for both institutions. Neither institution had significant differences in F grades.

To summarize, it appears that students earned significantly more A's and less B's at DMACC. Conversely, at ISU, the students earn significantly less A's, and more B's and C's. The magnitude of differences in more than expected grades and less than expected grades varied from a +7.7 to a –7.2. The disciplines represented were: the communication core (English & Literature); social and behavioral sciences (Psychology & Sociology); math and sciences (Biology, Chemistry, & Math,); and humanities (Drama, Music, & Philosophy). A variety of technical program areas were also represented (Accounting, Agri-business, Architecture, Business Administration, Computer Science, Computer Programming, Education, Hotel/Restaurant Management, Management, Marketing, & Physical Education).

Table 5.1. Summary by discipline of grade analyses having significant differences

	Significant level		Standard residual***	
		Sommers'd **	Significant grade(s)	
Discipline	Chi-square*	effect	DMACC	ISU
Accounting	<.001	<.001	A (+3.4)	
Agricultural-Business	.032	.002	A (+2.0)	
Architecture	.002	<.001	A (+2.6)	
Biology	<.001	<.001	A (+2.6)	A (-2.1)
			D (-2.7)	D (+2.2)
Business Administration	<.001	<.001	A (+4.6)	A (-4.2)
			C (-3.2)	C (+2.9)
Chemistry	.005	.109 (not sig.)	A (+2.2)	
Computer Science	<.001	<.001	A (+7.7)	A (-7.2)
			C (-4.9)	C (+4.8)
			D (-4.0)	D (+3.9)
Computer Programming	<.001	<.001	A (+4.7)	A (-2.5)
			B (-2.6)	
			C (-2.0)	
Drama	.003	<.001	A (+2.6)	
Education	.045	154 (not sig.)	not sig.	not sig.
English	<.001	.003	A (+2.9)	A (-3.1)
			B (-2.4)	B (+2.5)
			D (+2.6)	D (-2.8)
Hotel/Restaurant Management	<.001	<.001	A (3.7)	
			C (-2.5)	
Math	<.001	<.001	A (+3.3)	A (-2.9)
Management	<.001	<.001	A (+5.7)	A (-2.7)
			B (-2.8)	
			C (-2.6)	
Marketing	<.001	<.001	A (+3.6)	
			B (-2.1)	
Music	<.001	.409	B (-2.1)	
			D (+2.2)	
			F (+2.4)	F (-2.0)
Philosophy	<.001	<.001	A (+5.0)	A (-4.3)
			B (-2.2)	
			C (-3.2)	C (+2.8)
Physical Education	<.001	<.001	A (+7.6)	A (-2.7)
			B (-5.1)	
			C (-2.4)	
Psychology	<.001	<.001	A (+2.8)	A (-3.0)
				B (+2.5)
			C (-2.3)	
			D (-2.0)	D (+2.1)
Sociology	<.001	<.001	A (+2.0)	
			C (-2.8)	C (+2.4)

* Chi-square significance level: .05 = minimum; <.001 = maximum
** Sommers'd significance level: .05 = minimum; <.001 = maximum
*** Standard Residual Significance: + = more than expected; - = less than expected
number value = magnitude of difference

Therefore, it appears that significant differences in grades were evident in a variety of core curriculum and program areas.

General Education and ISU grade differences

Research Question 3 examined the combined DMACC core curriculum described as General Education. The General Education disciplines are defined by the associate's degree requirements of the core curriculum. These disciplines are identified in the core curriculum of communications, social and behavioral sciences, math and sciences, and humanities. The disciplines were combined into a General Education grade distribution and compared with the ISU grade distribution. In addition, the DMACC grade distribution of disciplines not identified as core curriculum (Non-Gen. Ed.) were also analyzed with the ISU grade distribution. Table 5.2 summarizes the General Education, Non-Gen. Ed. and ISU grade distributions.

The grade analysis appears to indicate that Non-Gen. Ed disciplines had significantly more A's than expected and significantly less B's, C's, D's and F's. The Gen. Ed. disciplines had significantly more A's than expected, significantly less B's and more F's. ISU had significantly less A's than expected. The Chi-square analysis of the three distributions (Non-Gen. Ed., Gen. Ed., and ISU) found significant difference (<.001)between the distributions and the Sommers'd measure of effect size was also significant (<.001). The t-test for equality of means found significant differences (<.001) between Non-Gen. Ed. and ISU, and Gen. Ed. and ISU.

In summary, the grade analysis found significant differences in all three grade distributions. The DMACC Non-Gen. Ed distribution had more significant differences in

Table 5.2. Summary of grade analysis, with significant differences by discipline

Grade distribution	GPA	Standard residual / Significant grade(s)
Non-Gen. Ed.	3.18	A (+15.4)
		B (–5.1)
		C (–7.6)
		D (–5.0)
		F (–2.6)
Gen. Ed.	2.90	A (+4.0)
		B (–3.3)
		F (+2.2)
ISU	2.84	A (–7.9)

specific grades than the DMACC Gen. Ed. distribution when compared with the ISU grade distribution.

Implications

This study used the Course-Based Model for Transfer Success (CBMTS) by Quanty and Dixon (1995) to measure grade distributions of transfer students to determine if there are significant differences between DMACC and ISU regarding grades based on discipline as well as General Education courses. The CBMTS model was designed to compare grade distributions between learning institutions to identify critical comparisons, such as grade distributions, by denoting significant differences. The critical comparisons would then become the basis for further critical inquiry. Based on the CBMTS, this study identified significant differences for which the implications can be regarded as the beginning of the critical inquiry. For this reason, CBMTS was a valuable research tool to understand the academic performance of transfer students by specific discipline. The CBMTS did not provide the reasons or answers to why the grade distributions were significantly different. Therefore, the findings using the CBMTS model need to be followed by the critical inquiry

process to be effectively implemented. Thus, it was the intent of this study to provide a beginning framework to implement the critical inquiry process.

The results of the study indicate that significance differences were found in the grade distributions between DMACC and ISU. What could account for the differences? Is it transfer shock or psychosocial adjustment? Is it poor preparation or better performance at DMACC? Is it higher expectations or poor learning environment at ISU? These possible explanations provide the basis for understanding the implications of this study.

The drop in academic performance after transfer from the community college to the four-year college/university has been studied frequently and described as "transfer shock" (Cejda, 1994; Hills, 1965; Keeley & House, 1993; Laanan, 2001). The change in performance has been described by some as a psychosocial adjustment process (Laanan,1995). The change in environment from the community college to a larger university could provide a reason for the change in academic performance. In this study, DMACC typically has class sizes between 10 to 30 students and the instructor has regular contact with the students. For full-time faculty (approximately 40% of classes), the instructor provides regular office hours for students to receive individualized instruction. The student also has many opportunities for additional support through the Academic Achievement Center. This type of supported learning environment may not be the typical learning environment at ISU. Class sizes are larger, the amount of individualized instruction is less, and academic support opportunities may be limited. The larger population of students may also create a less personal learning experience. Further research into the psychosocial variables between DMACC and ISU will provide better understanding on the impact of the transfer process. The psychosocial variables and the student demographics can provide the

necessary information for a multivariate analysis to identify important influence on academic performance.

This study indicated that more women than men successfully transferred to ISU and graduated. The growing trend for women to achieve higher education degrees is well documented, and this study confirms the national trends. Further research of the specific disciplines based on gender will yield information for making decisions about support services. Women are under-represented in certain technical and academic fields of study (e.g., engineering, math, & sciences). Further research based on gender will help focus student support services. Racial minorities also were an under-represented group in this study. Further research of the discipline courses analyzed by race can provide important information to focus student support services and program policies

The primary age group in this study was 19-22 years-old. The community college has a wide range of ages and support services need to be designed to respond to a variety of needs. However, traditional-age students dominate the transfer population. Academic resources and support services should focus on this large segment of the community college population. In addition, under-represented transfer groups will need attention and support services to increase the success of this population.

This study described the most frequent number of credits transferred (60-65). This information is very important for student advising. Overwhelmingly, the successful transfer student took a large portion of the general education requirements at DMACC. Other students transferred with fewer credits and successfully earned their degree. However, more students completed the maximum number of credits before transferring. Further research of students stratified by credits transferred (0-30, 30-45, 45-60, & 60+) is important to help

understand the impact of transfer credits on degree attainment. The results of this and other studies on transfer credits will help focus advising on the essential courses that are most indicative of transfer success. By defining the essential courses and number of credits to produce the most success, students can achieve the most success for their community college experience.

One of the most surprising outcomes of the demographic analysis was the "years in college." Based on this study, 67% of transfer students started DMACC and completed their bachelor's degree in 5 years or less. This may indicate a more time-effective and cost-effective way to complete a bachelor's degree. Students with limited financial resources have regularly sought out community colleges. Now, more than ever, working students who are interested in a cost and time-efficient process to earn a degree may choose to attend community colleges. Educational resources and support services will need to plan for further expansion of enrollment in community colleges.

The analysis of ACT scores in this study indicated that transfer students have a wide range of scores and, certainly, lower than the average Iowa high school scores, yet they still succeed. One perspective may be that ACT scores are not a reliable method for understanding student academic performance. On the other hand, from another perspective, the impact of community college education provides the necessary foundation of general education to enable successful transfer and degree completion. Further research into specific student samples by ACT scores will yield a better understanding of how community college education promotes successful transfer. The ACT scores can be analyzed by the courses completed and number of credits in a hierarchical level of analysis to provide a focused picture of transfer success by different student characteristics and course/credit completion.

This approach will provide more specific advising for students entering community colleges with different levels of high school achievement.

However, additional methods of assessment and developmental educational placement policies may be necessary to provide effective student advising and course selection. Currently, DMACC does not have mandatory placement and advising occurs based on student willingness to participate. When better research information is obtained then specific recommendations along with prescribed policies may increase student transfer success.

The descriptive report on the frequency of ISU majors (see Table 4.6) indicated that student have many different educational goals at community colleges. This study also indicated that students could succeed after a community college education in a wide variety of academic majors. In the past community colleges were accused of "cooling out" students by not supporting the wide range of student needs and educational goals (Dougherty, 1992). This study seems to indicate that the community college responds to a wide range of student goals and provides the necessary educational foundation to transfer and major in a wide variety of fields of study. Further research in analyzing specific educational goals, academic performance, and the related fields of study is warranted to help understand transfer success and advise students. Each college at ISU can collaborate with related DMACC disciplines to research the success of students within their major field of study. The research results will provide more specific information for student advising and effective academic preparation.

The results of the student demographic analysis have implications for student advising. Providing students with information about patterns of success is very important. Students often need support services and advising to understand how to be more successful in

achieving their educational goals. Information about the demographic characteristics provides educational advisors and counselors with valuable information to share with students as well as valuable information to improve student support services. However, this study only focused on the successful transfer student and did not describe "other" transfer students. Other transfer students include students who transferred from DMACC to ISU yet did not complete a degree. These students did not complete the degree requirements for a number of reasons. Further research focused on the "other" transfer population is necessary in order to fully understand the impact of the transfer process. Collaboration between DMACC and ISU is necessary to more clearly define the various student outcomes of the transfer process.

The second research question examined the academic performance of transfer students by discipline. Can this be because of poor preparation at DMACC or is it due to better performance at DMACC? If the contention is poor academic preparation then faculty, chairs and deans may need to develop discipline review groups. The discipline groups can further discuss the results of this study. Further explanations of the grade differences are important to identify possible changes in course competencies to meet the expectations of the upper division courses at ISU. Collaborative discussions of courses and related competencies are important to better understand the academic skills expectations between DMACC and ISU.

The grade level criteria may also need to be reviewed in order to create more consistent and effective criteria between DMACC and ISU. Different grading philosophies may be reflected in the different institutions and university colleges. The grading philosophy, or perspective of community college instructors, may be competency-based

attainment. The competency-based attainment perspective is grading based on achieving a certain level of competency. When a student meets the threshold of competency then an A is reported for meeting the competency. Essentially, the degree of meeting and exceeding the competency may not be reflected. A grade distribution perspective may be indicative of the university setting. Grading may be viewed as reflecting a normal distribution across the student population. Therefore, competent students can receive a certain grade level, for example a B, and more competent students can receive an A. By using a grade distribution concept, the frequency of B's would be more than the frequency of A's. The difference in grade philosophy and practice is an ongoing debate that provides a basis for further review, discussion, and collaboration between DMACC and ISU.

More effective assessment strategies may also be an important consideration. DMACC faculty may use limited types of assessment that do not effectively identify what the student has learned, which could lead to invalid grading. The assessment techniques may not evaluate important skills and abilities and, thus, fail to indicate weak and limited skill areas that create barriers to learn upper-division coursework at ISU. For example, students may need critical thinking skills to be successful in upper-division courses at ISU. If various community college courses do not provide effective assessment of critical thinking skills and limit assessment to narrow content areas, then the course grade will not effectively address the necessary skills and abilities to be successful in upper-division university courses. A community college assessment program involving faculty development, student learning outcomes projects, and coordinated dissemination of assessment information is necessary to effectively implement and use assessment for improving teaching and learning processes, and ultimately improve student success.

The third research question addressed the general education courses at DMACC. The results indicated that grades were significantly different between DMACC Gen. Ed. and ISU. This information can help departmental and division administrators at DMACC and ISU communicate about the general educational needs of students to meet expectations of upper-division courses. The faculty of each discipline within the general education curriculum needs to further explore the course competencies, grading criteria, and effective assessment strategies. Further research would be important to understand the relationship of core curriculum groups (communications, social and behavior sciences, math, sciences, and humanities). The research can focus on specific general educational goals as it relates to teaching and learning processes, and assessment strategies. This study indicated that disciplines within the general education curriculum need to clarify their respective educational goals and work toward improving student-learning outcomes.

The study may also indicate the need to enhance course or curriculum development. Courses specifically designed for transfer students (i.e., Transfer Program courses) may be needed to increase certain general educational skills to maximize student success. Several community colleges systems across the national have utilized transfer programs. The transfer programs identify students with a bachelor's degree as their educational goal, and provide specialized support and course-work to increase critical skill levels. The various community college disciplines within the core curriculum areas can identify general educational skills and provide specific coursework to meet the general education goals. The specific coursework can be directly aligned with knowledge/skill expectations of ISU upper-division courses. In this way, transfer students and DMACC will take a proactive approach to increasing academic performance to meet expectations at ISU. One area of focus that is

important for transfer success may be scientific inquiry and research methods. ISU, as a research-extensive university, exposes students to the process of scientific inquiry and effective research methodology. This exposure may not be evident or significant to the community college faculty and curriculum. Therefore, transfer students may not have the foundation in understanding scientific inquiry and research. Community college courses designed for transfer student need to be developed to address a more scientific, research-based educational process. DMACC faculty, in collaboration with ISU faculty, need to identify important areas of study in the community college curriculum, such as scientific inquiry and research methods, to meet the needs of transfer students.

In conclusion, this study provides a beginning for support services, faculty and administration to focus resources and efforts for "transfer" students. The transfer function constitutes the largest single educational goal at DMACC. Understanding the demographic information of transfer students helps focus advising and support services on successful progress to the four-year institution. Understanding the grade distributions of disciplines as compared to the university provides a beginning for faculty discussions regarding course competencies, grading criteria, and assessment strategies. The discussions can lead to improvements in teaching and learning processes, and effective assessment of student learning outcomes. The results of the analysis of DMACC general education and ISU grades can provide information for curriculum development and a focused transfer program.

This study can be used by DMACC to begin a process of communication and collaboration with ISU, and as a starting point for further research. Institutional research at DMACC can build upon this study and develop a comprehensive approach to understanding student characteristics, needs, and educational goals to provide the most effective educational

experience for a wide variety of students. Research at DMACC needs to focus on the skills and abilities of entering students to understand high-school preparation, the development of educational goals, and the necessary student support services to effectively engage and retain new students. Further, DMACC can study course selection, completion, and academic performance of students as they prepare to transfer. This research will help administrators and faculty develop an understanding of the barriers to transfer success to make necessary changes in the educational experience to maximize academic preparation for transfer.

Finally, a collaborative study focusing on high-school students' preparation, community college course completion, and academic performance in relation with university course completion and academic performance would be valuable to DMACC and ISU to increase transfer success. This coordinated effort could provide the necessary information to respond to the growing need to demonstrate accountability to legislative and governmental bodies in support of budgetary allocations. Most importantly, this study, including the future research recommendations, could lead to the development of broad-based faculty, staff, and administrative involvement to focus on serving the needs of transfer students.

APPENDIX A. MATCHED DISCIPLINES

DMACC DISCIPLINES	ISU DISCIPLINES
Communications Core	
English, Humanities & Literature	English
Speech	Speech Communications, Communications Studies
English & Speech	.Pre-journalism & Mass Communications
Social & Behavior Sciences	
Anthropology	Anthropology
Economics	Economics
Geography	Geography
History	History
Political Science	Political Science
Psychology	Psychology
Sociology	Sociology
Math & Sciences	
Biology	Biology, Animal Ecology; Biochemistry, Biophysics, and Molecular Biology; Botany, Environmental Science, Entomology, Genetics, Microbiology, Zoology
Chemistry	Chemistry, Chemical Engineering
Math	Math, Statistics
Physics and Math	Physics, Astronomy & Astrophysics
Humanities	
Art	Art, Art Design, Art Education, Art Visual
Drama	Performing Arts, Theatre
French	French
Music	Music
Philosophy	Philosophy, Religion
Spanish	Spanish
Related Disciplines	
Accounting	Accounting
Agricultural Business	Ag. Education, Ag. Studies, Ag. Sys. Tech., Agronomy, Animal Science,
Architecture	Architecture
Building Trades	Construction Engineering
Business Administration	Pre-business, business-special, business Undeclared, Finance,

Commercial Horticulture	Horticulture
Computer Programming	Computer Engineering, Management Information Systems,
Computer Science	
Criminal Justice	Criminal Justice Studies
Education	Curriculum & Instruction, Elementary Ed.
Engineering	Engineering, Mechanical Eng., Chemical Eng., Electrical Eng
Hotel/Restaurant Management	Food Science & Human Nutrition, Hotel/Restaurant & Institution Management
Journalism	Journalism and Mass Communications
Physical Education	Exercise & Sports Science, Health Studies, Physical Education
Management	Management
Marketing	Marketing, Advertising, Textiles & Clothing

APPENDIX B. DMACC DISCIPLINES

GENERAL EDUCATION DISCIPLINES

COMMUNICATIONS
English
(Composition, Literature & Humanities)
Speech

HUMANITIES
Arts
Drama
French
Music
Philosophy
Spanish

MATH & SCIENCES
Biology
Chemistry
Math
Physics

SOCIAL & BEHAVIORAL SCIENCES

Anthropology
Economics
Geography
History
Political Science
Psychology
Sociology

OTHER DMACC DISCIPLINES

Included in Disciplines Analysis

Accounting
Business Administration
Commercial Horticulture
Computer Science
Criminal Justice
Education
Management
Marketing
Physical Education

Included in Grade Analysis

Agriculture
CADD
Child Development
DATA
Engineering
Hotel/Rest. Mngmt.
Journalism
Office

Other Courses NOT used in Study
Library
Orientation

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