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A study of the impact of minority undergraduate student interventions on academic success as measured by cumulative GPA

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A study of the impact of minority undergraduate student interventions on academic success as measured by cumulative GPA

by

Alton L. Kornegay

A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Industrial Education and Technology

Program of Study Committee:

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2003
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For the Major Program
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Iowa State University (ISU) has invested extensively in campus resource intervention programs in an attempt to ensure students’ academic success during their sojourn at this university. For the purpose of this study, academic success has been defined as the level of achievement based on grade point average (GPA).

Having recognized a need to facilitate the development and continuance of a supportive environment for its ethnic minority student population, Iowa State University has made academic intervention programs available. The university has made several special efforts on behalf of its ethnic minority undergraduate student population in an attempt to ensure academic success to this segment of the student population. This study considered seven specific minority undergraduate student interventions: (1) Carver Academy; (2) Early Success Program (ESP); (3) Student Support Services Program (SSSP); (4) Multicultural Vision Program (MVP); (5) Leadership through Engineering Academic Diversity (LEAD); (6) Agricultural Minorities Empowered for Success (AMES), and (7) other Learning Communities (LCs).

The results of the study indicated that there was no significant difference in academic achievement between undergraduate minority students who used interventions and those who did not use interventions.
CHAPTER 1. INTRODUCTION

Background of the Study

Achievement gap

The phenomenon of the achievement gap between White and Asian undergraduate students and their African American, American Indian, and Hispanic peers as measured by cumulative GPA was considered in this study. The achievement gap is illuminated and its persistence in American education institutions is described. Historical and possible causal relations are given, as well as attempts to alleviate the problem. The attempted alleviations are analyzed and summarized; then suggestions are made for improvement based upon the findings of the study.

Defining achievement gap in U.S. public school systems, Gina Burkhardt (2003), North Central Regional Educational Laboratory (NCREL) Executive Director, noted: “One of the most disheartening situations in the U.S. educational system is the achievement gap in standardized test scores between African-American, Latino/a, Native American, and low-income students and their white, Asian, and economically advantaged peers. This gap is called the achievement gap.”

According to Burkhardt (2001), achievement gap is ingrained in American schools:

Unfortunately, too many students begin their education with fewer advantages and foundational skills than others—facts that quickly translate into learning gaps at school. Teachers and administrators face the growing challenge of how to address this divide. From the most economically challenged school district to the most affluent, significant gaps continue to separate students by their ethnicity, language, socioeconomic status, and gender. (p. 2)
College and university education professionals have struggled for years to improve undergraduate learning and to prove the efficacy of intervention programs designed to boost academic achievement for ethnic minority students. In the National Association for the Advancement of Colored People's (NAACP's) *New Crisis* magazine, Fletcher (2003) noted, "The yawning achievement gap separating Black and Latino students and their White and Asian counterparts has been one of the most vexing problems facing American educators for decades" (p. 13).

"It is crucial to understand several components of the family structure when determining the likelihood of academic success of students" (Gooding, 2001, p. 3). Social factors that involve race, ethnicity, English proficiency, family income, parental education, and family are significant when it comes to educational opportunity and access to it. Other contributors to college student success include preschool and primary-level education (Gooding, 2001).

A study of the evolution of multiculturalism may shed some light on why some diverse groups, based on race, ethnicity, language, social class, and family involvement, are achieving differently at American colleges and universities. Evolution in this context means a gradual process in which something changes, especially into a more complex form (Davis, 1973).

Multiculturalism evolved to become part of higher education's learning communities, but along the way, went through several transformations. Paul Gorski (1999) stated in his Multicultural Philosophy Series: "as conceptualizations of multicultural education evolve and diversify, it is important to revisit its historical foundation—the roots from which it sprang" (p. 1).
As the field of multicultural education has evolved since its beginnings in the 1960s, it has moved beyond acknowledgement, affirmation, and celebration of diversity to become a reform movement that is concerned with social justice and transformation, both in schools and in the larger society (McCormick & Allen-Sommerville, 2000, p. 1). According to McCormick and Allen-Sommerville, to understand the concept of multicultural education, one must understand the implications of diversity and pluralism in American society. They also noted that a cornerstone concept of multicultural education is cultural pluralism that celebrates the diversity in our U.S. population. Multicultural education acknowledges and affirms the value of diverse racial, ethnic, cultural, religious, language, gender, socioeconomic status, and ability groups to the rich-textured tapestry that makes up our pluralistic society (p. 1).

One of the pioneers of multicultural education, James Banks (1981), was among the first multicultural education scholars to examine schools as social systems from a multicultural context.

Banks founded his conceptualization of multicultural education on the idea of “educational equality.” According to Banks (1981;1989), in order to maintain a “multicultural school environment,” all aspects of the school must be examined and transformed, including policies, teachers’ attitudes, instructional materials, assessment methods, counseling, and teaching styles.

Banks (1989) and Davidman and Davidman (1997) noted that the historical roots of multicultural education lie in the civil rights movements of various historically oppressed groups. Many trace the history of multicultural education back to the social action of African
Americans and other people of color who challenged discriminatory practices in public institutions during the civil rights struggles of the 1960s.

Among those institutions specifically targeted were educational institutions, which were among the most oppressive and hostile to the ideals of racial equality. Activists, community leaders, and parents called for curricular reform and insisted on a reexamination of hiring practices. Both, they demanded, should be more consistent with the racial diversity in the country. (Gorski, 1999)

Multiculturalism became a part of the American education system. Gorski (1999) wrote in his Multicultural Philosophy Series:

As conceptualizations of multicultural education evolve and diversify, it is important to revisit its historical foundation – the roots from which it sprang. What did the earliest forms of multicultural education look like and what social conditions gave rise to them? What educational traditions and philosophies provided the framework for the development of multicultural education? How has multicultural education changed since its earliest conceptualization? The answers to these questions provide an important contextual grounding for understanding the various models of multicultural education evolving today. (p. 1)

In the late 1960s and early 1970s, the women's rights movement joined this push for education reform. Women's rights groups challenged inequities in employment and educational opportunities as well as income, identifying education as a primary contributing factor in institutionalized and systemic sexism. Feminist scholars and other women activists, like groups of color before them, insisted on curricula more inclusive of their histories and experiences. They challenged the discrepant low number of female administrators relative to the percentage of female teachers (Banks, 1989):

Sensing progress—if only slight—by groups of color and women in their struggles for human rights and social and educational change into the early 1970s, other traditionally oppressed groups found growing support and energy for their movements. Through the 1970s, gay and lesbian groups, the elderly, and people with disabilities organized visible and powerful pushes for sociopolitical and human rights.
As K-12 schools, universities, and other educational institutions and organizations scrambled to address the concerns of these and other historically marginalized groups, a host of programs, practices, and policies emerged, mostly focused on slight changes or additions to traditional curriculum. Together, the separate actions of these various groups who were dissatisfied with the inequities of the education system, along with the resulting reaction of educational institutions during the late 1960s and 1970s, defined the earliest conceptualization of multicultural education. (p. 12)

Integration and learning communities

Gorski (1999) noted that several researchers have attempted to study various aspects contributing to achievement gap:

By the middle and late 1980s, other K-12 teachers-turned-scholars including Carl Grant, Christine Sleeter, Geneva Gay, and Sonia Nieto provided more scholarship in multicultural education, developing new, deeper frameworks that were grounded in the ideal of equal educational opportunity and a connection between school transformation and social change. In order to move beyond slight curricular changes, which many argued only further differentiated between the curricular “norm” and the marginalized “other,” they built on Bank’s work, examining other structural foundations of schools and how these contributed to educational inequities. Tracking, culturally oppressive teaching approaches, standardized tests, school funding discrepancies, classroom climate, discriminatory hiring practices, and other symptoms of an ailing and oppressive education system were exposed, discussed, and criticized. (p. 2)

Transformation

Gradually, higher education began to change its practices. The 1980s, saw the emergence of a body of scholarship on multicultural education by progressive education activists and researchers who refused to allow schools to address their concerns by simply adding token programs and special units on famous women or famous people of color (Gorski 1999).
Social action

In an interview on standards and multiculturalism, Bohn (2002), a professor with the Department of Curriculum and Instruction at Illinois State University, asked Professor Christine Sleeter, a professor at California State University - Monterey Bay and co-editor with Banks (2001) on *Culture, difference, and power*: “How do we keep the critical issues in multicultural education from becoming obfuscated or even abandoned as the standards movement intensifies?” (p. 2).

Sleeter’s (2001) reply was:

By organizing to pressure state school boards and state legislatures. People must understand that multicultural education is not just one more program to add to a school, and a passé program at that! Multicultural education is a field and arena for reforming schools in ways that support pluralism and justice. (p. 2)

Due to the need to make colleges and universities more responsive to the needs of the undergraduate student, learning communities were re-instituted in academia. The ultimate goal of learning communities is to promote more positive academic and social outcomes for students. Hopefully, this learning concept will enable students to better acclimate to the major shift from high school to college and enhance student retention and grade point averages (GPA).

Regarding using learning communities as academic learning interventions, Mitchell (1999) stated:

People in higher education have recently begun to talk seriously of student success. Simply stated, student success involves designing, implementing, managing, and assessing learning opportunities that help students complete seamless transitions into, through, and out of college. Students who successfully complete these transitions will reach desired levels of academic achievement and career, personal, and leadership development. (p. 1)
Student interventions have long been considered useful tools to learning organizations. However, a comprehensive study to prove the efficacy of such intervention programs to the general populations that they serve, as measured by improved grade point average (GPA), has not been rewarding.

In developing and implementing effective undergraduate intervention programs, much consideration must be given to a number of variables that may influence the outcomes of such applications. In addition to the intervention, or interventions, one must consider the impact of other causes, such as: high school rank, high school GPA, ACT score, SAT score, etc.

Consider, for example, the Department of Residence statistics for Iowa State University residence hall students for spring 2001. Although the undergraduate students represented in Table 1.1 were ISU students, they were also students housed in the Department of Residence. However, because they were not of the fall 1998 cohort, they were not included in the sample of this study.

Non-Hispanic White students had the highest average spring 2001 GPA (2.82) of all known self-reported ethnic types, while non-Hispanic Black students had the lowest GPA (2.28). A significant difference was found between non-Hispanic Black students and each of the following student groups: Non Hispanic White (p< .001), Asian or Pacific Islander (p< .001), and Hispanic (p< .001). In addition, there was a significant difference between Non-Hispanic White and Hispanic students (p< .05).
Table 1.1. Average grades by ethnicity

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>All Students</th>
<th>Freshmen</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spring 00</td>
<td>Spring 01</td>
</tr>
<tr>
<td></td>
<td>GPA  N</td>
<td>GPA  N</td>
</tr>
<tr>
<td>American Indian or Alaskan Native</td>
<td>2.26 20</td>
<td>2.40 16</td>
</tr>
<tr>
<td>Non-Hispanic Black</td>
<td>2.02 280</td>
<td>2.28 261</td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>2.74 5598</td>
<td>2.82 5964</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>2.67 141</td>
<td>2.75 210</td>
</tr>
<tr>
<td>Hispanic (Spanish American)</td>
<td>2.42 111</td>
<td>2.61 147</td>
</tr>
<tr>
<td>Prefer not to indicate</td>
<td>2.82 27</td>
<td>2.91 29</td>
</tr>
<tr>
<td>Total</td>
<td>2.70 6177</td>
<td>2.79 6627</td>
</tr>
</tbody>
</table>

Source: Iowa State University, 2001.

The Pew Charitable Trusts decided to assess certain colleges and universities to determine how well colleges and universities are addressing the problem of helping students achieve academic success, by interviewing the students that these same schools serve. The study sought to ascertain how well certain schools of higher learning were achieving their goals of supplying students the learning and knowledge for which they're striving. In the spring of 2000, the National Survey of Student Engagement (NSSE) gauged the extent to which colleges encouraged actual learning, by scoring students’ responses to 40 questions (Reisberg, 2000, p. A67).

The questions in the NSEE 2000 survey were clustered into five national benchmarks of effective educational practices (Reisberg, 2000): (1) level of academic challenge; (2) the amount of “active and collaborative learning,” which would include how often students made class presentations, worked on group and community projects, and tutored others; (3) student interaction with faculty members; (4) access to enriching educational experiences such as
internships and study-abroad programs; and (5) level of campus support, gauged by factors like how much the college helps students cope with non-academic responsibilities and supports social life.

Some Iowa State University freshmen and seniors participated in the National Survey of Student Engagement 2000. Huba (2000) noted in a summary of the ISU NSEE 2000 university practices, "...in spring 2000, 345 Iowa State University freshmen and seniors completed NSEE's questionnaire, The College Student Report. As part of the survey, students indicated how frequently they engage in behaviors that are highly correlated with many important learning and personal development outcomes of college. They also provided opinions about Iowa State."

In the segment of her report of the NSEE 2000 report labeled "Results Related to Diversity" Huba (2000) noted:

Another set of findings is worthy of note, given ISU's diversity and internationalization requirement. One question on the survey elicits students' perception about the degree to which ISU emphasizes contact among students from different economic, social, and racial/ethnic backgrounds. [...] Results show that fewer than half of freshmen (47.5%) and seniors (44.5) reported that their college education contributed "quite a bit" or "very much" to enhancing their understanding of people from different racial/ethnic backgrounds.

Pertaining to salient points of the outcomes of the national survey, Reisberg (2000) remarked that, across the board, the survey found that the benchmark most colleges struggled with was student interaction with faculty members. It was most common at liberal-arts colleges and least common at doctorate-granting institutions, where 53% of freshmen and 35% of seniors "never" discussed ideas from their readings or courses with a faculty member outside the classroom, and 79% of freshmen and 63 percent of seniors never worked with a faculty member in a non-academic venue (Figure 1.1).
In the NSEE 2000 survey, Iowa State University also exceeded the national average at comparative institutions of higher learning in faculty contact by students outside the classroom. According to Huba (2000), the same study indicated that: “Compared to students at other Research I/II institutions on the study, ISU students also had more opportunities for out-of-class contact with faculty.”
The survey also found that students at large universities are the least involved in activities that promote collaborative learning. "Arguably, these are the very institutions where active and collaborative learning approaches are most needed to compensate for the anonymity and passivity that can characterize large, impersonal learning environments." (Reisberg, 2000, p. 1). Sixty-three percent of seniors who were surveyed participated in community service, and 41% were involved in a community-based project as part of a regular course. However, 19% of first-year students never made a class presentation (Reisberg, 2000).

A concept known as "service-learning" is one that can involve students in community-based projects as part of a regular course. In addressing service-learning as a way to involve students in community service, Shapiro and Levine (1999) remarked, "The concept of service-learning has emerged as a powerful, valuable vehicle for experiential (by experience) learning in college. Service learning intentionally connects a socially valuable, public service activity with a particular academic course content toward the goal of intellectual growth" (p. 87). Cross (1998) noted that: "Service learning is the ultimate learning community" (p. 10).

Concerning learning communities, Lenning and Ebbers (1999) posited that, "Learning communities that emphasize collaborative learning and that serve both academic and social purposes for students will become a primary avenue for improving the education of undergraduate students, with effective collaborative learning crucial" (p. 61).

The NSEE 2000 study indicated that ISU did better than the national average of the survey in several areas when compared to similar institutions of learning, one area being collaborative learning. Huba (2000) commented, "Another area in which ISU students
exceeded comparison group means is collaborative learning. The data show that ISU students work together both in and outside of class more frequently than students in the national and Research I/II comparison groups.”

In defining effective learning communities, Schroeder (1994) provided the following six principles:

1. Learning communities are generally small, unique, and cohesive units characterized by a common sense of purpose and powerful peer influences.

2. Student interaction within learning communities should be characterized by the four “I”s: involvement, investment, influence, and identify.

3. Learning communities involve bounded territory that provides easy access to and control of group space that supports ongoing interaction and social stability.

4. Learning communities should be primarily student centered, not staff centered, if they are to promote student learning. Staff must assume that students are capable and responsible young adults who are primarily responsible for the quality and extent of their learning.

5. Effective learning communities should be the result of collaborative partnerships between faculty, students, and residence hall staff. Learning communities should not be created in a vacuum; they are designed to intentionally achieve specific educational outcomes.

6. Finally, learning communities should exhibit a clear set of values and normative expectations for active participation. The normative peer cultures of learning communities enhance student learning and development in specific ways.
Need and Problem of the Study

It should not be assumed that the total responsibility of improving undergraduate student achievement performance lies only with institutions of higher learning. Students themselves, have a hand in this. This researcher acknowledges that the students’ success is in the hands of the very students whom the interventions seek to help.

The students’ work ethics, and consequently their study habits, play a significant part in how successful their matriculation will be. The students who need the academic interventions must realize that starting their college careers academically hindered, places a great burden upon their own shoulders to do the things necessary to assure that their academic progress is accelerated in order to close the achievement gap (Reisberg, 2000):

The NSSE results indicate that less than 15 percent of full-time freshmen and seniors surveyed spend 26 or more hours a week studying (the traditional standard, the report says, is about 30 hours a week for full-time students). About half of the students said they spend between six and 15 hours a week, and one in 10 full-time students spends five or fewer hours a week preparing for class. (p. A67)

Students in higher education institutions are awarded honors on the basis of academic achievement, achievement which is usually based, at least in part, on the student’s GPA (Mundfrom, 1991, p. 4). Students achieving at a predetermined level have academic honors conferred on them with little or no regard given to the difficulty level of attainment. Every student achieving at this certain level, i.e., has a GPA surpassing the minimum cut-off point, is considered to have performed at the same level of attainment. These students are more likely to persist in higher education than those perceived as failing based on these same academic measurement criterions.
Statistics show that when these lower achieving groups achieve at levels comparable to the higher achieving groups, they tend to later become more productive and less problematic citizens. In 1992, for example, workers with bachelor’s degrees earned an average of $32,629, compared to $18,737 for those with only a high school diploma and $12,809 for those who did not complete high school (Bureau of the Census, 1995).

Comparisons across ethnic lines were made in this study, and are likely to continue to be made as college graduates enter job markets after graduation. What is important is that lower achieving students of color need to raise their achievement performances in order to level the playing field when it comes to gainful employment and more productive lives.

The problem addressed in the study was one of determining if any of the following academic interventions: (1) Carver Academy; (2) Early Success Program (ESP); (3) Student Support Services Program (SSSP); (4) Multicultural Vision Program (MVP); (5) Leadership through Engineering Academic Diversity (LEAD); (6) Agricultural Minorities Empowered for Success (AMES), and (7) other Learning Communities (LCs), has a significant impact on improving cumulative GPA for minority students.

Currently, a need exists to provide a comprehensive listing of the number of undergraduate student academic interventions at Iowa State University. There is also a need to provide some sort of comparative measure of the efficacy of the intervention programs that are in place. At Iowa State University, African Americans, Hispanics, and American Indian or Alaskan Native students generally have lower GPA than Caucasians, Asians, and Pacific Islanders (Table 1.1).
Purpose and Significance of the Study

The purpose of this study was to ascertain whether an academic intervention or combination of interventions can impact GPA of consistently underachieving, underrepresented groups at Iowa State University. If certain academic interventions demonstrate efficacy and potency when it comes to helping these underachieving groups achieve, then the potential should exist to raise the overall achievement of all ethnic groups at Iowa State University. If it can be shown that these interventions are effective in helping to solve the problem of underachievement at Iowa State University, then the potential exists for other organizations, i.e., high schools, middle schools, community colleges, etc. to focus their attention and resources on programs similar to those included in this study. This etiology fills a critical gap in educational research.

Objectives of the Study

The study sought to determine whether:

1. interventions cause a change in minority student achievement;
2. the change in academic performance is measurable; and
3. the effect of the change is measurable.

Research Question

The study was guided by one specific research question that addresses minority undergraduate academic learning interventions:

1. Is there a relationship between student achievement as measured by probability of increased cumulative GPA and the inclusion of interventions?
The target population for the research included all ISU undergraduate students, but especially the minorities who were achieving the least, as measured by cumulative GPA at ISU.

**Hypothesis**

One hypothesis was addressed in this research: Is there a relationship between interventions and GPA?

**H₀**: There is no relationship between interventions and GPA.

**H₁**: There is a relationship between interventions and GPA.

**Assumptions and Delimitations**

Several assumptions were made throughout this study pertaining to the validity and reliability of the data and the research design. Much of the data used in the study was obtained from records maintained either by the university Office of the Registrar or one of the seven undergraduate intervention programs at Iowa State University. The criteria that were used to assess increased achievement attainment for underachieving ethnicities were seven intervention programs which ISU minority students could participate in during their early college careers. Data from four of the seven interventions were used in the analysis. The remaining three interventions were considered to be without benefit if included in the statistical analysis for the study because they were not in existence when the study cohort entered ISU and, thus, at the time were not available to the studied population.

As with any study that is conducted in a similar manner, inferences are desired to be made from the sample of data collected, to the populations from which the data came. While attempts were made to make the scope of the data collection, and consequently, of the study
itself as broad as possible, it should be noted that all of the data were collected at one institution, Iowa State University. Therefore, any inferences which are made from these data need to consider this delimitation. While it is certainly possible that interventions at other institutions may be similar to those at Iowa State University, generalizations of this type should be made at the discretion of the reader.

**Definition of Terms**

The following terms were defined for use in this study:

*At-risk Undergraduate Students*: Undergraduate students who are likely to require academic interventions to achieve successfully.

*Learning community*: According to Gabelnick, MacGregor, Matthew, & Smith, 1990:

> Learning community - A learning community is any one of a variety of curricular structures that link together several existing courses – or actually restructure the material entirely – so that students have opportunities for deeper understanding and integration of the material they are learning, and more interaction with one another and their teachers as fellow participants in the learning enterprise. (p. 19)

*Minority Students*: Minority students at Iowa State (Iowa State University, 2003a) are self-declared; that is, they are identified because they have declared at admission and/or registration that they belong to one of the four ethnic minority groups the university recognizes for special services (African American, Asian American, Hispanic American, or Native American). A student may remove this designation by contacting the Registrar's Office.

*Multiculturalism*: According to James Banks (1994), multiculturalism is education that addresses the teaching pedagogy and learning methods of students throughout the globe.
Specifically, it addresses the similarities and differences amongst students and incorporates these within the classroom on a daily basis, rather than in a “tokenistic” manner.

*Multicultural Education:* Multicultural education in the United States (Bennett, 1999) is an approach to teaching and learning that is based upon democratic values and beliefs, and affirms cultural pluralism within culturally diverse societies and an interdependent world. It is based on the assumption that the primary goal of public education is to foster the intellectual, social, and personal development of virtually all students to their highest potential.

*Underrepresented Groups:* According to the Association of American Medical Colleges definition, underrepresented minorities are Black/African-Americans, American Indians, Mexican Americans, and mainland Puerto Ricans.
CHAPTER 2. LITERATURE REVIEW

Themes in Academic Intervention Research

At-risk students may leave institutions of higher education for reasons other than a deficient GPA. While some students leave school because of academic dismissal, “only 15 to 25 percent of all institutional departures arise because of academic failure” (Tinto, 1993, pp. 81-82).

Castellanos and Jones (2003) examined a study on environmental pull factors by Nora and Wedham. Nora and Wedham (1991) examined the influence of environmental pull factors on the persistence of college students and identified three constructs that exerted a pulling-away effect both on a student’s decision to remain in college and on his or her social and academic integration on campus. The three factors included: (a) family responsibility such as taking care of a sibling, grandparent, or an entire family; (b) working off campus while enrolled in college courses; and (c) commuting to college every day. Nora and Wedham concluded that students who had family responsibilities or who had to work off campus failed to fully integrate socially and academically. Ultimately these students left higher education altogether.

In substantiating reasons other than academic as to why minorities left institutions of higher education without graduating, Nora, Cabrera, Hagedorn, and Pascarella (1996) found that the minorities who had to leave campus to work were 36% more likely to drop out of college. In addition minority women who had to handle taking care of a family member were 83% more likely to drop out of college.
Many students complete their college experience stating that the majority of their learning occurred outside the classroom (Chickering, 1969). Student development theorists, such as Astin (1996), Pascarella and Terenzini (1991), and Tinto (1987), suggest that student learning is most effective when inclusive of more areas of life that students deem important.

To provide a background for the current study, five themes were reviewed regarding academic intervention research: (1) student characteristics; (2) setting goals; (3) economic benefits; (4) training design; and (5) student environment. Then an overview of academic intervention programs provided by Iowa State University is presented, followed by the conclusion.

**Student characteristics**

Minority undergraduate students have diverse socioeconomic backgrounds. Demographic characteristics of groups that have been targeted as high-risk by higher education institutions and scholars have included racial and ethnic minorities, economically disadvantaged, persons with disabilities, first generation to attend college, international students, women (in traditional male fields), non-traditional age students, athletes, and transfer students (Martin, 1999).

Because African Americans are at the bottom of the academic achievement scale, this study briefly considered the history of this issue. For a majority of African Americans, education is the key out of the abyss of poverty. There are a number of socioeconomic reasons to explain why the achievement gap exists between certain minorities and non-minorities.
In his book entitled *Closing the achievement gap*, Comer (2001), a noted medical authority on children, schools and society who teaches at the Yale Child Studies Center, remarked:

*It is important to acknowledge the problem and identify its causes. We may then be able to create the political and social will and resource—in the black community and the larger society—needed to use approaches that can make it possible for African American children to achieve at the level of their full potential. The gap exists for a number of reasons: because blacks were denied educational opportunities during slavery, because the society drastically underinvested in the education of blacks after slavery, because blacks have been excluded from participation in the mainstream political, economic and social system. The gap’s consequences include the wide perpetuation of the myth of black inferiority, and its internalization by too many African American young people at a very early age. To close the gap nationwide and permanently, it will be necessary to understand the origin of the myth of black inferiority, the purposes it serves that makes it so difficult to destroy, and the negative consequences for all Americans, black young people in particular.*

Prior to the late 17th century the status of African Americans was unclear and the myth was not entrenched. Free blacks, mostly in the north, owned businesses that served blacks and whites and were poised to move into the mainstream of the society. About the same time more white indentured servants and blacks were becoming free. They wanted greater access to opportunity, namely land...

The notion of the superiority of whites over blacks was written into law through a series of legal decisions. White indentured servitude was discouraged and then ended. Slavery for blacks began to be defended in the language of pseudo-science that attempted to “prove” black inferiority. Because these conditions provided economic, political, social and psychological benefits to everybody except blacks, a wedge was driven between blacks and white “have nots”—the two groups that had banded together in the Bacon Rebellion. The inferiority argument, and related privilege granted even to the “have nots” among white society, is the linchpin, and defies evidence and logic. At this early time, and in this power-motivated way, the notion of black inferiority was established and permeated all aspects of American society; it has been transmitted through all of our institutions from generation to generation.

It is the inferiority rationale that permitted the exclusion of blacks from the political, economic and social mainstream of the society. It promoted abuse and terror, and for blacks, a sense of belonging in the society in a tenuous and
limited way. These conditions promote insecurity and troublesome behaviors among too many. Black families lived under the kind of economic and social stress that makes it difficult to provide children the experiences they need to develop to their fullest potential… Locked out of mainstream participation that could have improved life conditions, the ill effects of life under difficult societal conditions was passed along in many black families. (p. 3)

Undergraduate students who are likely to require academic interventions to achieve successfully are termed “at risk or high risk” students. The terms “at-risk” or “high-risk” students (Jones & Watson, 1990) are used to define those students whose probability of withdrawal from college is above average. These students, mostly found among the underrepresented in higher education, have an attrition rate that is disproportionately higher than the general student population. Therefore, colleges and universities make special efforts to identify and monitor the admission and progress of these students (Martin, 1999).

Once admitted, many institutions provide special student support services and programs in an attempt to retain these students and increase their graduation rates. Financially, institutions monitor the enrollment of “at-risk” students because the high rates of noncompletion and declines in student population have a direct effect on increasing the average cost per student (Jones & Watson, 1990) (Table 2.1).

Setting goals

Early intervention programs have played a very important and significant role in providing services for minority youth. As the participation rates of African-American and Latino students continue to increase, the services that will guide them towards successful entrance and transition to college life will be key determinants on student retention (Wilds & Wilson, 1998).
Table 2.1. Estimated increase in tuition revenue to Iowa State University due to the inclusion of learning communities

<table>
<thead>
<tr>
<th>Entry year cohort</th>
<th>Resident students</th>
<th>Tuition</th>
<th>Non-resident students</th>
<th>Tuition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 1998</td>
<td>47</td>
<td>$130,942</td>
<td>18</td>
<td>$168,228</td>
</tr>
<tr>
<td>Fall 1999</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Totals</td>
<td>47</td>
<td>$130,042</td>
<td>18</td>
<td>$168,228</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Estimated 1999-2000 Increase in Enrollment &amp; Tuition</th>
<th>Estimated 2000-2001 Increase in Enrollment &amp; Tuition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resident students</td>
<td>Tuition</td>
</tr>
<tr>
<td>Fall 1998</td>
<td>67</td>
</tr>
<tr>
<td>Fall 1999</td>
<td>58</td>
</tr>
<tr>
<td>Totals</td>
<td>125</td>
</tr>
</tbody>
</table>

Note: The estimated grand total of increased tuition over the two years is $1,130,324; NA=not available.

Although there is a significant increase in the higher education of minorities, this group is predominately concentrated at community colleges with few transferring into four-year institutions (Brewer, 1990). In addition, most minority students (83.7%) are still enrolled in lower-cost and public institutions (Wilds & Wilson, 1998). Early intervention programs can provide college preparation for more African American, Latino, and Native American students to meet the criteria of the more selective public flagship and private institutions. These initiatives can also decrease the gaps between the participation of Whites and minorities and address the lack of representation of minorities in certain career fields, including mathematics and science.

Economic benefits

As in the case of learning communities at ISU, records indicate that it is economically advantageous to the university whenever undergraduates are academically successful and persistent (Epperson, 2001). As shown in Table 2.1, the economic gains are significant in
terms of increased revenue when comparing 1999-2000 and 2000-2001 Resident and Non-resident student increases attributed to learning communities’ ability to retain students.

The growth and competitiveness of the U.S. economy demand a skilled, technologically competent workforce. The National Science Foundation (Advancement Via Individual Determination [AVID], date unknown), for example, noted that greater participation by minorities will be required to fill the demand for professionals in math, science, engineering, and technology. Students with little education will be unable to compete for well-paying jobs in growing industries. The Department of Commerce predicts that, through 2005, employment in occupations requiring at least a bachelor's degree will grow twice as fast as in occupations requiring less education.

The ability to compete for jobs will be especially critical in the years ahead, when employment is forecast to grow much more slowly than in recent years. Failure to continue education beyond high school has a dampening effect on earnings: for example, in 1992, workers with bachelors degrees earned an average of $32,629, compared to $18,737 for those with only a high school diploma and $12,809 for those who did not complete high school” (Bureau of Census, 1995).

In a United States Department of Commerce news article, Bergman (2002) remarked that over an adult’s working life, high school graduates can expect, on average, to earn $1.2 million; those with a bachelor's degree, $2.1 million; and people with a master's degree, $2.5 million. People with doctoral ($3.4 million) and professional degrees ($4.4 million) do even better (Bergman, 2002). Day and Burger (2000) noted previously that, at most ages, more education equates with higher earnings, and the payoff is most notable at the highest educational levels.
Figure 2.1 depicts earnings by educational attainment from 1997-1999. Clearly, a person with a professional degree will earn the most. Figure 2.2 combines educational attainment and average annual earnings of workers 24 – 64 years of age. Full-time workers will earn more than part-time workers in all categories. Workers with either a PhD or a professional degree will earn $20,000 - $30,000 more than someone with a Master’s degree, and three to four times, respectively, as much as a worker with a high-school diploma.

(In millions of 1999 dollars)

<table>
<thead>
<tr>
<th>Educational Attainment</th>
<th>Earnings (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctoral degree</td>
<td>$3.4</td>
</tr>
<tr>
<td>Professional degree</td>
<td>$4.4</td>
</tr>
<tr>
<td>Master's degree</td>
<td>$2.5</td>
</tr>
<tr>
<td>Bachelor's degree</td>
<td>$2.1</td>
</tr>
<tr>
<td>Associate's degree</td>
<td>$1.6</td>
</tr>
<tr>
<td>Some college</td>
<td>$1.5</td>
</tr>
<tr>
<td>High school graduate</td>
<td>$1.2</td>
</tr>
<tr>
<td>Not high school graduate</td>
<td>$1.0</td>
</tr>
</tbody>
</table>

“Synthetic” estimates of work-life earnings are created by using the working population’s 1-year earnings and summing their age-specific earnings for people ages 24 to 65 years. The resulting total represents what individuals with the same educational level could expect to earn, on average, in today’s dollars, during a hypothetical 40-year working life. A typical work-life is defined as the period from age 25 to age 64. While many people stop working at an age other than 65, or start working before age 25, this range of 40 years provides a practical benchmark for many people. (Day & Newburger, 2002, p. 1)

Due to a lack of higher education, many minorities will not reap the benefits that higher education provides. Guthrie and David (1994) considered it intolerable that large numbers of young people should be, in effect, shut out of the jobs that promise growth and earnings simply because of the circumstances of their birth into a minority group or a disadvantaged family. The issues of equity, opportunity, and justice that helped shape the American character and history are at stake. Providing opportunities for all students to succeed is not only economically advantageous, it is the right thing to do.

Dr. Martin Luther King Jr. spoke of the dignity, rewards, and advantages of work for America’s minorities. In his last presidential address to the Southern Christian Leadership Conference entitled, “Where do we go from here?” Dr. King (1967) addressed the issue of kind of work: “...the work which improves the condition of mankind, the work which extends knowledge and increases power and enriches literature and elevates thought.”

Dr. King went on to say:

Work of this sort could be enormously increased, and we are likely to find that the problems of housing and education, instead of preceding the elimination of poverty, will themselves be affected if poverty is first abolished. The poor transformed into purchasers will do a great deal on their own to alter housing decay. Negroes who have a double disability will have a greater effect on discrimination when they have the additional weapon of cash to use in their struggle... The dignity of the individual will flourish when the decisions concerning his life are in his own hands, when he has the means to seek self-improvement. Personal conflicts among husbands, wives and children will
diminish when the unjust measurement of human worth on the scale of dollars is eliminated.

Education design

There is an urgent need to design undergraduate programs to benefit the segment of the American population that fails to succeed in traditional higher education. Undergraduate student interventions are designed to help traditionally underrepresented, under achieving ethnic minorities in American colleges and universities who are at risk of leaving institutions of higher education without completing degree requirements. Early intervention programs are a key element of providing a solid framework to increase the retention of first-generation, low income minority students (Brewer, 1990; Wilds & Wilson, 1998). African American and Latino students (Brewer, 1990; Wilds, & Wilson, 1998) are less likely to graduate from college and complete a four year degree in comparison to White students, especially at predominately White institutions. Therefore, the concern for students of color in higher education does not stop with access into the institution but continues with providing the resources to retain these students. By implementing on-going educational programs and student support services at postsecondary institutions, minority student concerns and issues in higher education are addressed at an early stage of college student development.

Student environment

When one considers the social atmosphere that permeates typical large American university campuses, one realizes that the institution’s social climate must be one that welcomes minority undergraduates if these students hope to have a chance to matriculate. The student environment is vitally important for students, especially undergraduates, to
successfully achieve. Hurtado, Milem, Clayton-Pederson, and Allen, (2000) investigated environments of diverse student populations to determine how the climate for racial and ethnic diversity is tied to teaching and learning. They found that an institution's ability to provide a comfortable environment for learning and socializing is a key factor in facilitating the intellectual and social development of students from all racial/ethnic groups. The key to enacting diverse learning environments lies in understanding and developing programs and policies to improve the climate for racial/ethnic diversity (Hurtado et. al., 2000).

To support the reality of the achievement gap between White students and their minority underrepresented peers in the U.S., De Cardenas (1998) noted that recent data from the U.S. Department of Education show that, nationally, 25% of Whites/Caucasians obtain at least a bachelor's degree, compared with only 12% of African Americans and 10% of Latinos. The gap between Whites and minorities tripled for advanced degrees. De Cardenas (1998) found that early preparation played a vital role in the academic success and college-degree completion of a student.

To counteract this achievement gap, many colleges and universities have turned to academic interventions such as learning communities. A learning community is:

...any one of a variety of curricular structures that link together several existing courses – or actually restructures the material entirely – so that students have opportunities for deeper understanding and integration of the material they are learning, and more interaction with one another and their teachers as fellow participants in the learning enterprise. (Gabelnick, MacGregor, Matthew, & Smith, 1990, p. 19)

Learning communities

The learning community can basically trace its roots to a short-lived program at the University of Wisconsin, in the Meiklejohn Experimental College during the 1920s (Smith,
Meiklejohn’s experiment eventually failed at the University of Wisconsin, but was resurrected again in the 1960s:

...when the higher education system nearly doubled in size and the community college system was broadly established. This was a time of innovation with various experiments with structure. Cluster colleges were one attempt to humanize the scale of higher education and promote community. ...The momentum for learning communities dramatically increased in 1985 with the establishment of the Washington Center for Undergraduate Education at the Evergreen State College. (Smith, p. 1)

There are basically four types of learning communities (Lenning & Ebbers, 1999, pp. 15-47):

1. Curricular Learning Communities;
2. Classroom Learning Communities;
3. Residential Learning Communities; and
4. Student-Type Learning Communities. Lenning and Ebbers basically define the different type learning communities as follows:

**Curricular**

Initially, the primary focus of such learning communities (excluding federated learning communities, where a faculty member is appointed to the learning community as a dedicated learner) was to facilitate collaborative learning among entering undergraduate students (transfer students as well as first-year students) (Lenning & Ebbers, L., 1999. p.17). Originally, this category was called “entering student communities,” as the need to overcome inhibitions and anxieties, and to develop meaningful community that can facilitate adjustment to college and academic success is especially great for entering students.

The Technology Learning Community (TLC), a program in the Industrial Education and Technology department at Iowa State University (2003c), can be classified as a curricular learning community. Approximately 90% of students enrolled in the TLC at Iowa State University transferred from another discipline or from a two-year college.
**Classroom**

This type of learning community is usually found in elementary schools where students and the teacher interact and work together continually and daily (Lenning & Ebbers, 1999). A college class can become a true learning community although, according to Pascarella and Terenzini (1991), and Pollio (1984), it tends not to happen because a college class meets only an hour several times a week, and lecturing remains the dominant mode of instruction (as cited in Lenning & Ebbers, 1999, p. 29).

Lenning and Ebbers (1999) noted one comprehensive K–12 model for developing classroom community, or a “total-classroom learning community”. This model is also relevant for postsecondary education focuses on developing effective problem-solving and human relations skills in students, and on the instructor’s becoming primarily a facilitator rather than the traditional teacher (Andersen 1995).

**Residential**

Residence-based learning communities are designed to integrate diverse curricular and co-curricular experiences (Shapiro & Levine, 1999). For this reason, they may be the most radical of the four learning communities, “...because they challenge and require change within multiple university systems: curriculum, teaching, and housing” (p. 37).

However, so as not to confuse the classic residential college model learning community with a living learning center, Smith (1993) offered the following differentiation between the two (as cited in Shapiro & Levine, 1999), “A classical residential college is characterized by one factor: faculty reside among their students” (p. 5). On the other hand, a living learning center is typically defined as student living space with intentional academic
programming and services, such as in-hall tutoring, ongoing lecture series, and academic advising. It is also common for living learning programs to feature academic courses taught in the residential facility (p. 36).

**Student-type**

These types of learning communities are designed for specific student populations (Lenning & Ebbers, 1999). Five types of student-type learning communities (Love & Tokuno, in press) include:

- The academically under prepared;
- Underrepresented groups;
- Students with disabilities;
- Honors students; and
- Students with specific academic interests.

These types of learning communities can also include educational communities for minority students (Harris & Kayes, 1996) or African American students (Treisman, 1985).

**Academic Interventions at Iowa State University**

Regarding the intervention value of directing activities outside the classroom, Light (2001) noted, “Perhaps the idea of making connections between in-class and out-of-class activities sounds obvious. Yet without concrete illustrations of how to do it, and why it can be so helpful, the suggestion risks becoming an abstraction” (p. 16).

College and university efforts to help academically under prepared minority undergraduate students successfully achieve academically may or may not be reflected in students’ GPA. Muraskin (1997) noted that colleges and universities sponsor early
intervention programs with many students to overcome class and social barriers for successful entrance and graduation from college.

Seven academic interventions in which minority students at Iowa State University may participate are described briefly. Each is unique to the undergraduate student population that it is designed to serve. Students may participate in more than one intervention.

**Carver Academy**

Established in 1999, the Carver Academy program is a four-year academic program for George Washington Carver Scholarship recipients. The most successful college students are those who take advantage of the university’s resources at an early stage in their academic careers. By targeting and mentoring its members, the Academy provides opportunities that promote students' short and long term professional goals.

Scholars will be contacted in May and receive an activity schedule in July. In August, the Sunday before classes start, students, faculty and staff will meet to discuss the program and share a meal (Iowa State University, 2003d).

**Early Success Program (ESP)**

Established in 1994, the Early Success Program (ESP) is designed to facilitate a supportive environment and give personal attention to motivated first-year freshman minority students (Iowa State University, 1998a; 2003e). The overall mission of ESP is to increase the retention and graduation rate among minority students at Iowa State University.

Participants are enrolled in one-credit pass-fail seminars (UST 131 in the fall semester and UST 132 in the spring) which meet for 50 minutes twice a week. Each class consists of ten to twelve freshman students. The classes are taught by two upperclassmen
who are minority students with significant campus involvement and experience. The student leaders operate within a fairly firm structure with respect to the objectives and requirements; however, they have flexibility as to how they carry out those requirements (Iowa State University, 1998b; 2003e).

During the second part of each semester, students are matched with a mentor, a member of the university’s faculty or staff whose academic or career field is closely related to the student’s chosen major. Some of the topics covered in the seminars include career investigation, SSSP (Student Support Services Program), Ronald E. McNair Scholarship Program, time management skills, race and campus climate issues, obtaining an internship, the 4-year Plan, scholarship opportunities, and more. Through valuable seminars, presentations, and tours, ESP helps introduce students to Iowa State and its resources. In addition to the classroom setting, monthly social activities allow students to interact with each other (Iowa State University, Early Success Program 1998a, b; 2003e).

**Student Support Services Program (SSSP)**

Established at ISU in 1980, the Student Support Services Program (SSSP) program, funded by the U.S. Department of Education, is designed to meet the academic and personal support needs of 250 ISU students who qualify on any of four general guidelines: first generation, low income, physical disability, or learning disability (Iowa State University, 2002a).

Once students meet the eligibility criteria, participants receive support in the form of free individual and group tutoring, peer mentoring, academic advising, financial/debt management assistance, study skills training, personal counseling and special workshops,
awards celebrations, and support for cultural events and leadership conferences (Iowa State University, 2002a).

**Multicultural Vision Program (MVP)**

Established in 1999, the Multicultural Vision Program (MVP) was created for Iowa high school minority students with academic potential and demonstrated financial need (Iowa State University, 2002b). The MVP Award is a four-year full tuition grant (renewable for eight semesters) for 100 minority high school seniors. To be eligible, a student must: be an Iowa resident; be admissible to Iowa State University; be Native American or Alaskan Native, African American, Asian American/Pacific Islander, or Latino/a; have demonstrated financial need; and have faced challenges of personal and/or financial hardship.

MVP Award recipients are provided a broad range of support services to help them succeed in a new academic environment. During the first year, students participate in a University Studies “MVP Seminar,” a first-year experience course designed to provide links to the contacts, support systems, and resources at Iowa State. In addition, a variety of activities are organized to keep parents and families involved in the progress of each student. In return for the financial award and special opportunities, MVP recipients assist with community service activities (Iowa State University, 2002b).

This program states that academic success at Iowa State is ultimately the responsibility of the individual student. As a land-grant university, Iowa State has a long tradition of providing access to higher education for all students. Iowa State graduate George Washington Carver personified the potential of all students who enroll at Iowa State. He believed in the power of higher education to help him and others live better lives. His
innovations in agriculture and science, as well as his passion for the arts and community
service, forever changed the lives of people around the world (Iowa State University, 2002b).

Leadership through Engineering Academic Diversity (LEAD)

The Leadership through Engineering Academic Diversity (LEAD) program, established in 1994, is committed to improving the educational experience and academic success, retention, and graduation of minority engineering students at Iowa State University (Iowa State University, 2002c, d; 2003e, f). As a resource and advocate for those students, the LEAD Program provides academic, professional, and social programs to ease their transition and enhance their success. LEAD works with the Society of Women Engineers (SWE), the National Society of Black Engineers (NSBE), and the Society of Hispanic Engineers (SHPE).

The Society of Women Engineers (SWE) was founded in 1949-50 when small groups of women engineers started meeting in the east coast cities of New York, Boston, Philadelphia, and Washington, D.C. The society was incorporated in 1952. SWE’s major concern has always been to provide a support group for women in engineering and to encourage high school women to pursue engineering degrees. SWE sponsors programs to these ends in the areas of personal development, social activities, informational meetings, and community service events. (Iowa State University, 2003g).

The Society of Women Engineers (SWE) stimulates women to achieve full potential in careers as engineers and leaders, expands the image of the engineering profession as a positive force in improving the quality of life, and demonstrates the value of diversity. (Iowa State University, 2003g).

The National Society of Black Engineers (NSBE) NSBE is comprised of more than 250 chapters on college and university campuses and more than 50 Alumni Extension chapters nation wide. These chapters are geographically divided into six regions. NSBE had its genesis at a national conference planned and hosted by the Society of Black Engineers at Purdue University in April 1975. Black Engineering students from the United States and Canada attended the event. From this meeting of concerned students and educators, NSBE was born. In 1976, NSBE was incorporated as a nonprofit organization.
in the State of Texas. NSBE also became recognized as a tax-exempt organization under Section 501 (c) (3) of the Internal Revenue Code. (Iowa State University, 1999)

NSBE stimulates and develops student interest in the various engineering disciplines. It strives to increase the number of minority students studying engineering at both the undergraduate and graduate levels. It encourages members to seek advanced degrees in engineering or related fields and to obtain professional engineering registrations. It encourages and advises minority youth in their pursuit of an engineering career. It promotes public awareness of engineering and the opportunities for Blacks and other minorities in the engineering profession. It also functions as a representative body on issues and developments that affect the careers of Black Engineers. (Iowa State University, 2003f)

The Society of Hispanic Professional Engineers (SHPE) was founded in Los Angeles, California, in 1974 by a group of engineers employed by the city of Los Angeles. Their objective was to form a national organization of professional engineers to serve as role models in the Hispanic community. The concept of Networking was the key basis for the organization. SHPE quickly established two student chapters to begin the network that would grow to encompass the nation as well as reach countries outside the United States. Today, SHPE enjoys a strong but independent network of professional and student chapters throughout the nation. (Iowa State University, LEAD: Organizations, 2003f)

Agricultural Minorities Empowered for Success (AMES)

Established in 2000, the purpose of AMES is to form a foundation for the integration of new minority students in the College of Agriculture and Iowa State University’s undergraduate academic community (Iowa State University, Learning communities in the College of Agriculture, 2003h).

The AMES learning community opportunity is open to all incoming first year and transfer minority students to enroll in this learning community each fall. The students can be involved in this learning community and others at the same time. It is designed for first year minority students in the College of Agriculture. Students in this learning community will benefit from peer mentoring, peer tutoring, career exploration, faculty mentoring, social activities, and seminars/workshops. A course has been developed specifically for this learning community. The course is AgEdS 113X: Access to Success
Seminar (1 Cr); A course that orients AMES Program participants. The course provides an introduction to campus resources, encouragement of self-exploration and development of academic skills, and agriculture professional development. It meets once a week for an hour during the fall semester. The meeting time will be established during the first week of classes so as to accommodate anyone’s schedule (Iowa State University, 2003i).

All other Learning Communities (LCs)

This category consists of all other Iowa State University learning communities that minority students participate in that are not listed above. Leadership through Engineering Academic Diversity (LEAD) and Agricultural Minorities Empowered for Success (AMES) are learning communities listed separately in this study because they primarily serve minority students. LC students gain an immediate supportive group of students, faculty, and staff. LCs also provide encouragement to study together. Students often learn best together when they share ideas. In the “old days” students were often encouraged to work alone, but LCs are different. The LC is about “collaborating”...not cheating...but working together and assisting each other... and going deeper into a subject than one could if one studied alone all the time. Hopefully, the LC offers balance – both a supportive group of people and yet all the freedom to make friends outside the LC (Iowa State University, 2003d).

LC students generally take one, two, or three classes together, meaning they will also take classes without other LC people in them. [What’s the phrase? Oh, yeah... “THE BEST OF BOTH WORLDS”...a small group within the larger community] (Iowa State University, 2003j).

There is a word of caution: LCs are not magic. Each individual needs to work hard to be successful. Hopefully the LC provides the environment, or structure, or framework, or support system for people to be successful. However, ultimately, it’s students who need to do
the work... to get involved, work hard, ask questions, and take advantage of the many faculty
and staff who want them to succeed (Iowa State University, 2003j).

The underlying philosophy for learning communities is that students of higher
education who take a collaborative, participatory role in their own learning (via learning
communities) are more likely to achieve statistically higher retention than their peers who do
not participate in learning communities (Cove & Love, 1996). Collaborative learning
strategies enhance learning by actively incorporating social and affective dynamics between
students, and between students and faculty. Such strategies are based on the idea that
acquiring and creating knowledge is an active social process which students need to practice;
it is not a process in which students are spectators, sitting passively in a lecture hall (Bruffee

According to Bruffee (1984, 1993), implications for institutions moving toward
developing an ethos of holistic learning include: providing visionary, persistent, and
pervasive leadership, promoting student involvement in learning, developing learning
communities, enhancing the educational climate of residence halls, and intentionally
influencing the socialization of faculty and student affairs professionals.

Although the Technology Learning Community (TLC) in the Industrial Technology
Department at ISU is not a residential learning community, it is a learning community for
first semester students (freshmen or transfers) in the Industrial Technology curriculum. The
TLC helps entering students maximize their educational experience and begin their
professional acculturation within the discipline of industrial technology (Freeman, Field, and
Dyrenfurth, 2001). The TLC participants are grouped into small clusters of students. Each
cluster works with a peer mentor, an industrial mentor, the academic advisor, and industrial
technology faculty members throughout the program. The TLC experience includes structured educational activities, professional exploration and development, and social activities (Iowa State University, 2003c; Freeman, Field, and Dyrenfurth, 2001).

Conclusion

In order to understand more comprehensively how and why academic learning achievement interventions are successful, or not successful, in achieving the desired outcomes and in moving the purposes of institutions of higher learning ahead, consideration must be given to factors beyond the students, the campus environment, and indeed past the application of the academic learning interventions.

As indicated in Chapter 1, differences exist in the rates that minority students achieve academically at Iowa State University. As shown in Table 1.1, according to the spring 2001 grade report, the average GPA for African Americans was 2.2, whereas it was 2.74 for Whites, followed by 2.67 for Asians.

Do certain academic interventions make some ethnic minority students achieve at higher rates than their peers? This question is central to any study of different levels of undergraduate minority achievement, for, if one can satisfactorily answer it, one should be able to devise plans, strategies, or methodologies to make learning easier, and possibly enhance minority student achievement. If not, one could possibly devise a new focus for the purpose of the interventions, i.e., to enable minority students to persist at four-year colleges and universities.

Today, several early intervention programs are coordinated and funded by colleges and universities, community groups, businesses, and other organizations that are committed
to providing opportunity and access of underrepresented and disadvantaged citizens into higher education. The assistance of the government (federal, state and local) in providing funding, mentor opportunities, employment for students, and other resources has also been very instrumental in efforts to provide outreach to “at-risk” students (Fenske et. al., 1997).
CHAPTER 3. METHODOLOGY

College and university educators continue to struggle with the problem of an academic achievement gap measured by GPA between lower achieving African American, American Indian or Alaskan Native, Hispanic and higher achieving White and Asian undergraduate students. Institutions of higher education are offering various learning interventions in an attempt to raise GPA for the lower achieving ethnic groups mentioned above. Iowa State University records (see Table 2.1.) indicate that it is economically advantageous to the university whenever all undergraduates are academically successful and persistent (Epperson, 2001).

Population of the Study

The population of interest for this study was comprised of the entire 1998 fall semester cohort of entering minority students at Iowa State University. Iowa State University is a Big 12, Carnegie Doctoral/Research University—Extensive, located in Ames, Iowa, in the Midwestern region of the United States. Ames is a predominantly white, middle-class, college town with a population of over 50,000, including Iowa State University with a student population of over 27,000.

Of the seven minority intervention programs at ISU considered in this study, the analysis included students in four programs: (1) Early Success Program (ESP); (2) Student Support Service Program (SSSP); (3) Leadership through Engineering Academic Diversity (LEAD); and (4) All other Learning Communities (LCs). Three programs were not included in the analysis (Carver Academy; Multicultural Vision Program [MVP]; and Agricultural Minorities Empowered for Success [AMES]) because these minority intervention programs
were started at ISU after fall 1998. These programs were included in the original research because the founding dates of the minority intervention programs were revealed during the research process, not prior to it.

The Iowa State University registrar’s office classified participants in the study by five distinct categories based on ethnicity, only the least achieving three ethnicities were used in the study analysis (Table 3.1):

1. American Indian or Alaskan Native
2. Black (not Spanish)
3. Hispanic (Spanish American)

The study analysis was comprised of 187 minority students of three ethnicities: American Indian or Alaskan Native (n=16); Black (not Spanish) (n=96); and Hispanic (Spanish American) (n=75). Four interventions were analyzed: (1) ESP, (2) LEAD, (3) SSSP, and (4) All other LCs.

Table 3.1. Demographic data based on ethnicity, admission type, and whether an intervention was used

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>N</th>
<th>Transfer</th>
<th>ISU Transfer</th>
<th>New Freshman</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>American Indian/Alaskan Native</td>
<td>16</td>
<td>7</td>
<td>1</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Black (not Spanish)</td>
<td>96</td>
<td>38</td>
<td>3</td>
<td>55</td>
<td>37</td>
</tr>
<tr>
<td>Hispanic (Spanish American)</td>
<td>75</td>
<td>22</td>
<td>2</td>
<td>41</td>
<td>29</td>
</tr>
<tr>
<td>Total</td>
<td>187</td>
<td>67</td>
<td>6</td>
<td>104</td>
<td>68</td>
</tr>
</tbody>
</table>

Note: Total row represents combined group data used for analysis.
* Not considered in the data analysis.
This cohort consisted of three (3) groups of minority students as categorized by the following definitions of admission types:

1. Transfer – transferred from another university/college
2. ISU Transfer – admitted as special, but changed to degree seeking at ISU
3. Special – non degree seeking
4. Exam – high school diploma received as GED
5. New Freshmen

The number of minority undergraduate students by ethnicity was:

(16) – American Indian or Alaskan Native
(96) – Black (not Spanish)
(75) – Hispanic (Spanish American)

The number of minority undergraduate students by admission type was:

(67) – Transfer – transferred from another university/college
(6) – ISU Transfer – admitted as special, but changed to degree seeking while attending ISU
(10) – Special – non degree
(104) – New Freshmen

Of the total of 187 minority students:

(68) – Students used interventions, whereas
(119) – Students did not use interventions.
Data Collection and Analysis

Independent and dependent variables

For the research analysis, the independent variables were four undergraduate student interventions: ESP, LEAD, SSSP, and All other LCs. The single dependent variable was undergraduate student academic achievement as measured by probability of increased cumulative GPA.

Data collection

Independent variable data pertaining to the student interventions were collected from coordinators of the seven interventions and reviewed by this researcher. The dependent data of semester-by-semester cumulative GPA for the entire fall 1998 Iowa State University entering cohort were collected from the Iowa State University registrar’s office. Data from the Registrar’s Office were reviewed for accuracy several times. Inaccuracies were rejected when they were found. This researcher eventually accepted all remaining data as sound and accurate.

Data analysis

The data used for this analysis consisted of the cumulative GPA by semester for the entering fall 1998 cohort. The study tracked the students by which intervention or interventions they used during each semester. The number of semesters of interventions ran the gamut, from only one semester to the entire eight semesters. Therefore, there were some entries in the data analysis where data were missing due to students who did not take an intervention. There were instances where students used interventions, skipped semesters for
interventions, and then resumed taking interventions after skipping semesters. This pattern of intervention use created pockets in the data where nothing was entered in the data cells.

The beta-binomial model was the statistical tool in the analysis. "When faced with proportion data that exhibit extra binomial data variation, i.e., missing data values, data analysts often consider the beta-binomial distribution as an alternative model to the more common binomial distribution" (Garren, Smith, & Piegorsch, 2003, p. 1). This researcher in conjunction with statisticians at Iowa State University determined that the beta-binomial model was the best fit for data analysis of this study. By definition,

A random variable \( x \) has a beta distribution, and it is referred to as a beta random variable, if and only if its probability density is given by

\[
f(x) = \begin{cases} 
\frac{\Gamma(\alpha + \beta)}{\Gamma(\alpha) \cdot \Gamma(\beta)} x^{\alpha-1} (1-x)^{\beta-1} & \text{for } 0 < x < 1 \\
0 & \text{elsewhere}
\end{cases}
\]

where \( \alpha > 0 \) and \( \beta > 0 \).

(Freund & Walpole, 1987, p. 215)

The research analysis was performed using the software program S-Plus 6.1 for UNIX (Insightful, 2003). This researcher and statisticians at Iowa State University selected this software data analysis program because of its ability to perform an analysis when data values were missing.

The alpha level was set at .05. In fitting the beta-binomial model, one may assume that the probability of increasing cumulative GPA in any given semester for one particular student is distributed from a beta distribution, with parameters \( \alpha \) and \( \beta \). One then assumes that the number of semesters that a student increased his/her cumulative GPA is binomially
distributed, with probability, $\alpha/(\alpha+\beta)$. This model, taken to be the null model, is then compared to the alternative model, where $\alpha$ and $\beta$ are allowed to be different for different models.

To test the alternative model against the null model, one uses the likelihood ratio test. This researcher in conjunction with statisticians at Iowa State University determined that the likelihood-ratio-test was the best fit for composite testing for the null and alternate hypotheses of this study. Murison (2000) stated the following about the likelihood-ratio-test procedure:

The notion of using the magnitude of the ratio of two probability density functions as the basis of a best test or of a uniformly most powerful test can be modified, and made intuitively appealing, to provide a method of constructing a test where either or both of the hypothesis and alternative are composite. The method leads to tests called likelihood ratio tests, and although not necessarily uniformly most powerful, they often have desirable properties.

(p. 1)

The actual results and simulated results (represented by possible scenarios of Maximum Likelihood Estimation (MLE) are described for each research question, as follows.

The Maximum Likelihood Estimation (MLE) as described by Purcell (2000) states that the concept of likelihood, introduced by Sir R. A. Fisher, is closely related to the more common concept of probability. MLE addresses the probability of observing events. For example, for an unbiased coin, the probability of observing heads is 0.5 for every toss. This is taken to mean that if a coin were tossed a large number of times then one would expect, on average, to find half of the time the coin landed heads, half of the time tails.

Upon further examination of MLE, Purcell (2000) posited that there are certain laws of probability that allow us to make inferences and predictions based on probabilistic
information. There are certain laws of probability that allow one to make inferences and predictions based on probabilistic information. For example, the probabilities of different outcomes for a certain event must always add up to 1: if there is a 20% chance of rain today, there must be an 80% chance of no rain. Another very common law is that if two events are independent of one another (that is, they in no way influence each other), then the probability of certain pairs of outcomes will be the product of the two outcomes by themselves: if one tosses a coin twice, the probability of getting 2 heads is 0.5 times 0.5 = 0.25.

In establishing parameters for a distribution Purcell (2000) noted that, when one speaks about the probability of observing events such as the outcome of a coin toss, one is implicitly assuming some kind of model, even in this simple case. In the case of a coin, the model would state that there is some certain, fixed probability for the particular outcomes. This model would have one parameter, \( p \) the probability of the coin landing on heads. If the coin is fair, then \( p = 0.5 \). One can then speak about the probability of observing an event, given specific parameter values for the model. In this simple case, if \( p = 0.5 \), then the probability of the coin landing heads on any one toss is also 0.5.

In order to apply this analysis to this research, one must consider conditions where the probabilities are not as fixed and absolute as in the example above. Purcell (2000) stated that in the real world, very few things have absolute, fixed probabilities. Many of the aspects of the world that one is familiar with are not truly random. Take for instance, the probability of developing schizophrenia. What if the prevalence of schizophrenia in a population is 1%. If one knows nothing else about an individual, one would say that the probability of this individual developing schizophrenia is 0.01. In mathematical notation,

\[ P(Sz) = 0.01. \]
One knows from empirical research, however, that certain people are more likely to develop schizophrenia than others. For example, having a schizophrenic first-degree relative greatly increases the risk of becoming schizophrenic. The probability above is essentially an average probability, taken across all individuals both with and without schizophrenic first-degree relatives.

Based upon the explanation of non-absolute non-fixed probabilities, the notion of conditional probability (Purcell 2000) enables researchers to incorporate other potentially important variables, such as the presence of familial schizophrenia, into statements about the probability of an individual developing schizophrenia. This researcher applied the concepts and principals in the example above to the question of this study: whether academic interventions affected minority student GPA at Iowa State University.

**Methodological Assumptions and Limitations**

Three assumptions were made pertaining to the methodology:

1. The probability for raising GPA is the same for any semester for any student.
2. Independence of GPA observations.
3. Students are all independent of each other.

Data from the Iowa State Registrar's office and the coordinators of specific interventions informed this researcher of which students took which interventions and in which semester.

The methodology had the following limitation: The magnitude of the cumulative GPA increase (or decrease) is not taken into account (i.e., the probability of increasing cumulative GPA, if the intervention is used early in the student's undergraduate program, and there are few credits on record already versus an intervention later when there are
significant amounts of credits already in cumulative calculations. The same one-semester GPA may lead to a different percentage of increase, however, if one is only counting plus (+) or minus (-) to cumulative GPA, the magnitude does not matter).
CHAPTER 4. RESULTS AND DISCUSSION

Overview

The chapter begins with an examination of the population demographics. Information that would enable identification of specific students was purposely withheld for reasons of confidentiality. The study ultimately examined four of seven undergraduate student interventions at Iowa State University designed to help students improve academic performance as measured by GPA. The purpose of the research was to ascertain whether one academic intervention or a combination of interventions could impact GPA of consistently underachieving underrepresented student groups causing them to achieve at higher levels, thereby raising their GPA.

Characteristics of the variables were investigated following a description of the sample. The investigation included examination of the beta-binomial distributions and likelihood-ratio tests of four different interventions in three different scenarios.

The study examined the effect of four distinct academic interventions: (a) Early Success Program (ESP); (b) Leadership through Engineering Academic Diversity (LEAD); (c) Student Support Services Programs (SSSP); and (d) All other Learning Communities (LCs).

The study sought to determine whether:

1. interventions cause a change in minority student achievement.
Research Question

This research addressed one research question concerning academic learning interventions:

1. Is there a relationship between student achievement as measured by GPA and the inclusion of interventions?

The study addressed the research question using three research analysis actual situations and three research analysis scenarios.

Results and Discussion

Results

Table 4.1 displays the statistical results of the research analysis using the beta-binomial model. The study considered the cohort of minority students with interventions, minority students without interventions, and a combination of minority students with and without interventions.

Figure 4.1 depicts a plot of the probability density for the no-intervention group, intervention groups and both groups combined. The curve with the highest peak is the intervention group, the curve with the lowest peak is the no-intervention group, and the curve with the middle peak is both groups combined.

The likelihood ratio test statistic is distributed as \( \chi^2 \) with 2 degrees of freedom under the null model (as one needs to estimate two more parameters in the alternative model). The test statistic was \( \chi^2 = 0.278 \) (2 df), and had a corresponding p-value of 0.870, so one may conclude that there is not enough evidence to reject the null model, which specifies one \( \alpha \) and one \( \beta \) for the entire sample.
Table 4.1. Beta-binomial distribution of the population

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>Variance of estimate</th>
<th>Lower 2.5% limit</th>
<th>Upper 97.5% limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students with intervention</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>α</td>
<td>5.99</td>
<td>7.31</td>
<td>0.69</td>
<td>11.29</td>
</tr>
<tr>
<td>β</td>
<td>4.84</td>
<td>4.60</td>
<td>0.64</td>
<td>9.04</td>
</tr>
<tr>
<td>Students with no intervention</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>α</td>
<td>4.04</td>
<td>1.93</td>
<td>1.32</td>
<td>6.77</td>
</tr>
<tr>
<td>β</td>
<td>3.19</td>
<td>1.12</td>
<td>1.12</td>
<td>5.27</td>
</tr>
<tr>
<td>All students</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>α</td>
<td>4.80</td>
<td>1.68</td>
<td>2.26</td>
<td>7.34</td>
</tr>
<tr>
<td>β</td>
<td>3.83</td>
<td>1.02</td>
<td>1.86</td>
<td>5.81</td>
</tr>
</tbody>
</table>

Confidence intervals of mean, \((\alpha/ (\alpha+\beta))\), probability of increasing cumulative GPA for students in intervention programs, students not in intervention programs, and all students combined

<table>
<thead>
<tr>
<th>Intervention program</th>
<th>Number of students</th>
<th>Lower 2.5% limit</th>
<th>Upper 97.5% limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>117</td>
<td>0.508</td>
<td>0.598</td>
</tr>
<tr>
<td>No</td>
<td>150</td>
<td>0.512</td>
<td>0.606</td>
</tr>
<tr>
<td>Combined</td>
<td>267</td>
<td>0.523</td>
<td>0.589</td>
</tr>
</tbody>
</table>
Figure 3.1. Probability density for the intervention groups, non-intervention groups and both groups
Research Analysis 1 GPA with interventions

Research Analysis 1: Is there a relationship between student achievement as measured by the probability of increasing cumulative GPA and the inclusion of interventions?

Analysis 1 was conducted using S-Plus software version 6.1 (Insightful, 2003) using a beta binomial model to determine if there is a relationship between interventions and student achievement. The study used the \( \chi^2 \) likelihood ratio test to determine if there was a difference in the probability to increase cumulative GPA between students who used an intervention and the more complex model of the combined sample of students who used interventions and students who did not use interventions. The \( \chi^2 \) likelihood ratio test statistic was 0.278, with a corresponding p-value of 0.870. Thus, there was no significant difference in student achievement with interventions.

The histogram of the model representing the probability of students who used an intervention increasing their cumulative GPA is shown in Figure 4.2. The \( \alpha \) parameter for the upper limit of 97.5% was 11.29 whereas the lower limit of 2.5% was 0.69. The \( \beta \) parameter for the upper limit of 97.5% was 9.04 whereas the lower limit of 2.5% was 0.64. The maximum likelihood estimate for the \( \alpha \) parameter is 5.99 and the maximum likelihood estimate for the \( \beta \) parameter is 4.84 (Table 4.1). Using these maximum likelihood estimates for \( \alpha \) and \( \beta \), a simulated model results in the probability histogram as shown in Figure 4.3. There is nothing visible in the simulated histogram that would indicate that the model used is inappropriate.
Figure 4.2. Actual histogram of probabilities for intervention students and GPA

Figure 4.3. Simulated histogram of probabilities for intervention students and GPA
The histogram of the model representing the probability of students increasing their cumulative GPA without the benefit of an intervention is shown in Figure 4.4. The $\alpha$ parameter for the upper limit of 97.5% was 6.77 whereas the lower limit of 2.5% was 1.32. The $\beta$ parameter for the upper limit of 97.5% was 5.27 whereas the lower limit of 2.5% was 1.12. The maximum likelihood estimate for the $\alpha$ parameter is 4.04 and the maximum likelihood estimate for the $\beta$ parameter is 3.19 (Table 4.1). Using these maximum likelihood estimates for $\alpha$ and $\beta$, a simulated model results in the probability histogram shown in Figure 4.5. Again, there is nothing visible in the simulated histogram that would indicate that the model used is inappropriate.

Figure 4.4. Actual histogram of probabilities for non-intervention students and GPA
The histogram of the model representing the probability of increased GPA for the combination of five groups of students who used an intervention and students who did not use an intervention is shown in Figure 4.6. The $\alpha$ parameter for the upper limit of 97.5% was 7.34 whereas the lower limit of 2.5% was 2.26. The $\beta$ parameter for the upper limit of 97.5% was 5.81 whereas the lower limit of 2.5% was 1.86. The maximum likelihood estimate for the $\alpha$ parameter is 4.80 and the maximum likelihood estimate for the $\beta$ parameter is 3.83 (Table 4.1). Using these maximum likelihood estimates for $\alpha$ and $\beta$, a simulated model results in the probability histogram shown in Figure 4.7. There is nothing visible in the simulated histogram that would indicate that the model used is inappropriate.
Figure 4.6. Actual histogram of probabilities for all students combined based on the relationship between students and GPA

Figure 4.7. Simulated histogram of probabilities for all students combined
Discussion

In the third analysis, a group of five minorities was used in the “All students” category of Table 4.1 versus groups of three minorities in the “students with intervention” and “Students with no intervention” categories of Table 4.1. This was due to the fact that the analysis indicated no significant difference when three ethnic groups used interventions or used no interventions. ISU statisticians and this researcher concluded that a combined-group analysis consisting of the three groups in the first and second scenarios would derive no further benefit to the study. Therefore, it was decided to investigate whether interventions made a significant impact when all five ISU minorities were combined, including those students who used interventions and those students who used no interventions. The aforementioned study result indicated there was no significant impact when combined groups of five minorities were compared.

Analysis

No significant difference was found in either the actual or simulated models for three different models of research question 1. In each case, there was no significant impact. In each case, the test statistic ($\chi^2=0.278$) had a corresponding p-value of .870. A p-value of .05 or less would indicate significance. As shown in the probability density graph in Figure 4.1, the interventions failed to make an impact, i.e., the density was more peaked for the intervention students, but the impact was not statistically significant. Therefore, there is no significant impact on GPA resulting from minority student interventions.
Results

The beta-binomial statistical model and likelihood ratio test were used to describe the efficacy of the intervention programs currently in place at ISU. The simulated histogram is simulated from the beta distribution, with the parameters derived from Maximum Likelihood Estimation (MLE), while the histograms are histograms of the actual data. Figures 4.1 – 4.6 depict the lack of efficacy of intervention programs that are currently in place for minority students: (a) those who used interventions; (b) those who did not use intervention; and (3) the combined results. Figures 4.1 and 4.2 depict actual and simulated histograms for students with interventions and their GPA (n=68). Figures 4.3 and 4.4 depict actual and simulated histograms for students who did not use interventions and their GPA (n=119). Figures 4.5 and 4.6 depict actual and simulated histograms for intervention and non-intervention students, and their GPA. The vertical axis depicts the distribution of GPA, based on the relationship between interventions and GPAs, whereas, the horizontal axis depicts the probability (p-value) (or likelihood) of the occurrence of the distributions of GPA.

Hypothesis

One hypothesis was addressed in this research: Is there a relationship between interventions and GPA?

H₀: There is no relationship between interventions and GPA.

Hₐ: There is a relationship between interventions and GPA.

Likelihood ratio was used to test the hypothesis. The beta-binomial test resulted in a p-value of 0.870, which is less than the .05 α level set for the study. Thus, the null hypothesis was retained. There was no relationship between interventions and GPA.
Findings

The research question addressed student achievement as measured by GPA. No significance was found in student GPA for students without interventions, students with interventions, or the groups combined.

After an analysis of the data collected from the four minority academic interventions, the following results were revealed:

1. No significant difference in probability of increased GPA was found between minority students who took interventions and those who took no interventions.
2. The plot displaying the results of the analysis showed a slight increase in GPA for students who took interventions, but the increase was not significant.
3. The plot displaying the results of the analysis also showed a slight increase in the size of the overall cohort of students when compared to the group of students who used interventions and those who used no intervention at all. This was due to the fact that a group of five minorities was used in the “All students” category of Table 3.2 versus groups of three minorities in the “students with intervention” and “Students with no intervention” categories of Table 3.2.

The results seem to indicate that minority student interventions have no significant impact on minority students’ GPA. However, a similar study of minority student interventions and minority student persistence by Uden (2002) at Iowa State University indicated a significant impact on minority student retention. While the current study failed to show a significant difference in minority student GPA improvement, other worthwhile benefits may be derived from such interventions.
It is crucial to understand several components of the family structure when determining the likelihood of academic success of students. Social factors that involve race, ethnicity, English proficiency, family income, parental education, and family are significant when it comes to educational opportunity and access to it. Other contributors to college student success include preschool and primary-level education. In addition, incidents of early childhood academic and behavioral problems, or the level of student achievement, dropping out of school, or completing high school and going on to college are each associated with social background factors. Because these factors are interrelated they cannot be overlooked when attempting to determine the relationship between any of the factors and education. Research indicates that when elements such as family structure, size, and parents' educational level are controlled, the variation in student academic performance disappears (Young & Smith, 1997).
CHAPTER 5. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

In the previous four chapters of this study, the study presented the introduction, the review of the literature, the methodology, and the statistical analysis. The study also presented findings in chapter 4. This chapter presents a summary of this study, provides discussion, and makes conclusions based on the findings and results. Finally, recommendations for future research are presented.

The purpose of the research was to ascertain whether one academic intervention or a combination of interventions could impact GPA of consistently underachieving underrepresented student groups causing them to achieve at higher levels, thereby raising their GPA. This study did not attempt to determine how diligently students applied themselves while involved in the intervention or interventions.

While students' GPAs were not significantly affected in this study, it should be noted that, due to the small sample of students (68) taking interventions in the Fall 1998 cohort, there were not enough data points in the data analysis to consider between-intervention group comparisons. In addition, there were not enough data points in the data analysis to consider intra-intervention comparisons.

Of the seven minority intervention programs at ISU considered by this study, the analysis included students in four programs: (1) Early Success Program (ESP); (2) Student Support Service Program (SSSP); (3) Leadership through Engineering Academic Diversity (LEAD); and (4) All other Learning Communities (LCs Three programs were not included in the analysis (Carver Academy; Multicultural Vision Program [MVP]; and Agricultural
Minorities Empowered for Success [AMES]) because no students in the sample participated in these minority intervention programs since they were started at ISU after Fall 1998. These programs were included in the original research because the founding dates of the minority intervention programs were revealed during the research process, not prior to it.

Conclusions

The purpose of this research was to ascertain whether one academic intervention or a combination of interventions could possibly impact GPA of consistently underachieving underrepresented student groups causing them to achieve at higher levels, thereby raising their GPA. This research has provided, through a study of academic interventions used by undergraduate minority students at Iowa State University, a broad view of whether interventions impact academic success as measured by cumulative GPA.

In the preceding chapters the impact of four interventions used by the fall 1998 cohort of African-American, Hispanic, and American Indian undergraduates at Iowa State University were investigated. The analysis developed in these chapters handled the three aforementioned groups of minority students who used academic interventions, the three aforementioned groups of minority students who did not use academic interventions, and a combination of five groups of minority students including Asians and Pacific Islanders who did and did not use interventions. From the results of the analysis of each of these groups, this researcher concluded that academic interventions did not statistically impact academic success of minority undergraduate students at Iowa State University as measured by the probability of increased GPA.
Limitations

As with any study that is conducted in a similar manner, inferences are desired to be made from the sample of data collected to the populations from which the data came. While attempts were made to make the scope of the data collection, and consequently, of the study itself as broad as possible, it should be noted that all of the data were collected at one institution, Iowa State University. Therefore, any inferences which are made from these data need to consider this limitation. While it is certainly possible that interventions at other institutions may be similar to those at Iowa State University, generalizations of this type should be made at the discretion of the reader.

Recommendations

This study examined the use of academic learning interventions for the purpose of improving minority undergraduate GPA. It was an attempt to show which intervention or combination of interventions, if any, was significantly effective in achieving the goal of higher student achievement as measured by probability of increased cumulative GPA. However, this study does not suggest that all avenues to successful learning interventions have been exhausted. Therefore, the following recommendations for future research are offered.

1. As this study considered the probability of increased cumulative GPA for an eight-semester period, another study could consider whether interventions impact students’ GPA during the semester immediately following the intervention.

2. One could study relevance as to how students performed during the semesters whenever the interventions were applied.
3. One could study the impact on GPA of students who use Iowa State University high school intervention programs.

4. One could consider whether students would have stayed in the various disciplines without the interventions.

5. One could consider the difficulty of raising GPA as the student progresses through the undergraduate program.

6. One could consider the impact of the magnitude of change in GPA.

**Practice policies and procedures:**

1. The Minority Student Affairs office could form minority student focus groups for suggestions as to how to raise minority student GPA.

2. The Minority Student Affairs office could develop a control database of minority student intervention results.
BIBLIOGRAPHY


http://www.michigan.gov/census/0,1607,7-162-15687-44548-M_2002_7,00.html


http://www.iastate.edu/~dor/ant/acadsucc/spring2001/tables.html


http://www.mhhe.com/socscience/education/multi/philosophy/1history.html

http://www.avidonline.org/info/?ID=82 - what_is_avid


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To the grandchildren whom I must mention or risk rebuke from them. Olivia, Khalil, Savannah, Averi, Isaiah, and Amaya.

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