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A comparison of accelerated and non-accelerated students and the effect on graduation at a Midwestern rural community college

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**A comparison of accelerated and non-accelerated students and the effect on graduation
at a Midwestern rural community college**

by

Michelle Sams Schmit

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

DOCTOR OF PHILOSOPHY

Major: Education (Education Leadership)

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Ames, Iowa

2011

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DEDICATION

To Ellie and George

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LIST OF ACRONYMS

AP: Advanced Placement

DMACC: Des Moines Area Community College

FAFSA: Free Application for Federal Financial Aid

ICN: Iowa Communications Network

K-12: Kindergarten through 12th grade

NACEP: National Alliance of Concurrent Enrollment Partnerships

NEICC: Northeast Iowa Community College

NIACC: North Iowa Area Community College

NCES: National Center for Educational Statistics

PSEO: Post Secondary Enrollment Options

ABSTRACT

Accelerated programs, also referred to as dual enrollment and concurrent enrollment, provide an opportunity for high school students to earn both high school and college credit by enrolling in specified college courses. These programs provide high school students with the opportunity to experience the college atmosphere, get an early start on college classes, pay less towards their total college expenses, and supplement their high school coursework with more rigorous curriculum.

Far fewer students complete college than intended. Many plan to go, but do not have a realistic idea of what that means or where to begin. Since 1985, dual enrollment programs have been helping many students to realize this goal.

Accelerated enrollment programs challenge high school students while helping them to experience college success. When students experience success early at the college level, they are more likely to persist to graduation.

This study evaluated the likelihood of community college attendance and odds of graduation based on participation in a dual enrollment accelerated program, gender, financial need, number of first term credits, high school grade point average (GPA) and ACT composite score of students who were enrolled at North Iowa Area Community College (NIACC). Among the findings were participation in an accelerated program, gender, high school GPA, and the number of first term credits completed after articulating were determining factors in graduation from NIACC.

This study should be replicated statewide to determine the impact of accelerated program participation on college graduation. As this study revealed other predictors of

significance associated with college graduation, it should be expanded to include additional predictor variables, specifically race, student motivation, and level of college engagement.

CHAPTER 1. INTRODUCTION

This country faces several important issues dealing with workforce preparation and shortages, access to education, and college debt. The available pool of an educated and trained workforce is dwindling while the number of students who desire to earn a college education upon graduation are not. Many of those who earn a college degree are leaving with an educational debt they will not be able to repay at the necessary high salary and level of employment needed. This issue is of particular importance to Iowa which now ranks 4th in the United States for high student loan debt (Cheng & Reed, 2010). These are issues of concern to employers, higher education administrators, legislators, and students.

Research demonstrates a clear economic benefit to continuing education beyond high school (NCES, 2001). The higher the level of degree completion is directly correlated with an increase in income potential. The number of those aspiring to a college education has increased dramatically during the last two decades (NCES, 2001). However, fewer young people graduate from postsecondary school despite their initial intentions (Bailey, Hughes, & Karp, 2002). For example, in 2000, 66% of high school graduates aged 25 to 29 had completed some college, but only 33% held a bachelor's degree (NCES, 2001). The community college, working in partnership with the high school to provide dual enrollment programs, is one solution to ease the transition to college and help students complete their degrees.

Established in 1901, the first two-year "junior" colleges were dedicated to providing access and education to the mass population, often serving as a bridge between the high school and the university (Phelan, 2000.) Community colleges have long been viewed as the

bridge to opportunity for advanced educational pursuits. They are often considered as the educational institution which under-prepared students attend to learn a trade or complete their first two years of college. Community colleges are viewed by some as the last resort for students who could not gain acceptance to a “real” college. Their open enrollment policies allow entry for anyone, including the under-prepared, access to higher education. Expanding the role of the community college from its traditional position has challenged community colleges to evolve, adapt, and respond to the needs of the community and the global economy (Jordan, Cavalluzzo, & Corallo, 2006).

Educational tradition in the United States holds a clear separation between completing one level of education before moving to the next. As a result, there has been a strong separation between high school and college. Dual enrollment programs challenge that notion, breaking down the separation. Community colleges and high schools across the country are working in partnership to provide opportunities for high school students. These opportunities come in a variety of packages and formats, depending on the arrangements between the cooperating high school and community college.

Successful dual enrollment programs share several key characteristics: an emphasis on collaboration and a strong sense of connectedness between both institutions and individuals; an unwavering focus on the needs and interests of students; and adequate and equitable funding (Robertson, 2005). The advancement of the educational system in the United States calls for stronger and increased frequency of connections between high schools and higher education institutions. A system must be developed which truly leaves no student left behind. The key to a successful transition from high school to college begins with making connections between the two.

Over the last decade, and particularly in the last three years, opportunities have expanded for high school student to earn college credit. Added together, the cluster of current possibilities for high school students is both robust and diverse. Students in dual enrollment programs remain formally enrolled in high school, but take college courses taught by either high school or college faculty, in classrooms located either at their high school or on a college campus. At the same time, more and more community colleges are developing ways to accelerate high school students (as well as high school dropouts) by enrolling them in college courses. Meanwhile, a variety of postsecondary incentive programs reward students with free or reduced college tuition for finishing some college work while in high school (Bailey et al., 2002; Hoffman, 2003).

Accelerated enrollment programs create a continuum between high school and college. “These partnerships aid high school students which may (a) ease the transition to college, (b) reduce college costs by accelerating time to degree completion, and (c) provide a highly-trained workforce that can compete in a global marketplace” (Boswell, 2001a). All of these benefits, when factored together, may lead to higher college completion rates.

Accelerated programs also provide a means of challenging students who are ready for something different by providing opportunities to learn and perform at post-secondary standards (Windham, 2006). For many, accelerated programs are actually viewed as a means of high school reform (Robertson, 2005). High school students are able to access courses not available to them at their local high school. Many students in Iowa complete minimum high school requirements by the beginning or mid-semester of their senior year. This follows the national trend as reported by the National Commission on the High School Senior Year (2001) which has emphasized the frequency in which high school seniors opt out of

challenging coursework in their final year. With the high school and community college working in concert, more rigor can be added to the senior year. In Iowa, the high school and community college partnership is guided by Senior Year Plus legislation passed in 2008. This legislation provides consistent and standardized expectations of accelerated programs and partnerships between high schools and community colleges. By combining resources, the two entities can provide increased opportunities for high school students as well as exposing the student to the academic demands and challenges of college work.

The state of Minnesota takes credit for being the first state to institute concurrent enrollment policies for high school students. Many years of practice were finally codified in 1985 with the enactment of the Postsecondary Enrollment Options Program (Boswell, 2001b). Finding their start in Minnesota with formal legislative action, dual enrollment programs grew rapidly in Iowa and around the country. In a 2001 report, the Association of American Colleges and Universities referred to the rapid growth and diversification of dual enrollment programs as “a new arena of educational practice” which could profoundly affect the academic experiences and opportunities of virtually all high school students (Robertson, 2005). By the 2002-2003 school year, there were approximately 1.2 million “enrollments” in dual credit courses in the country (Klein, 2007). By 2005, an estimated 2 million students participated in dual enrollment programs (Robertson, 2005). The Education Commission of the States 2001 report stated that all but three states have some type of dual enrollment program. In Iowa, the number of students participating in dual enrollment programs has grown from 2,219 in the 1991-1993 academic year to a record high of 38,283 in 2010 (Jeffrey, 2007; Iowa Department of Education, 2009, 2010).

Definition of Dual Credit Enrollment

The term dual credit enrollment is used interchangeably with concurrent enrollment and acceleration. The primary purpose is the same regardless of the label; these programs provide the opportunity for high school students, typically juniors and seniors, to simultaneously earn high school and college credit for a course. The classes are designed to be college level and, therefore, increase the intensity and rigor of the high school curriculum. These classes may be held in the high school or on the college campus. According to a 2002-2003 National Center for Education Statistics (NCES) report, 80% of all two- and four-year colleges offered dual enrollment courses at their own campuses, 55% offered them at high schools, and 12% conducted them at other locations. Of these, 73% of two-year institutions arranged for teaching at high schools (Pekow, 2005). These classes are taught by qualified high school instructors or college faculty. According to Pekow, 72% of colleges used high school teachers and others to instruct the courses.

While dual/accelerated enrollment programs allow both high school and college credit to be earned for the same course, other programs fit this model as well. Examples include, tech-prep, which serves students in career and technical education, and early-college high schools, usually located on the college campus, which allow students to work towards an associate's degree or two years of college credit (Klein, 2007).

Dual enrollment programs are often equated with advanced placement courses. The Advanced Placement Program has a long history, dating back to approximately 1950. Dual enrollment, while dating back to the 1970s, did not begin to gain popularity until the mid-1980s. At this point, states became increasingly involved in dual enrollment programs in an attempt to ensure that gifted or other qualified students would have access to college courses

while still enrolled in high school. Often, the intention was to provide gifted high school student with more challenging coursework than may have been available to them in their high school (American Association of State Colleges and Universities, 2002).

Dual Credit Enrollment in Iowa

In Iowa, high schools students enroll in community colleges by a variety of means, primarily through PSEO, college courses offered through a contract between the high school and college, and students who enroll independently as a tuition-paying student.

Iowa legislative and administrative bodies refer to dual enrollment programs as joint enrollment and hold codified language as concurrent enrollment. All labels refer to the same program opportunities of allowing high school students to enroll in approved college courses and receive credit with both institutions simultaneously.

In 1993, North Iowa Area Community College won a statewide grant to develop Iowa's Tech Prep Model, develop a cadre of statewide Tech Prep consultants and expand Tech Prep across the state of Iowa. From Tech Prep was the natural progression to move to offering general education courses for high school students.

Most joint enrollment opportunities fall under the rubric of Senior Year Plus. This legislation, Iowa Code 261E.1, passed in 2008 consolidating and standardizing several existing programs involving college credit opportunities for high school students including PSEO, concurrent enrollment, career and regional academies, and advanced placement (Iowa Department of Education, 2009).

To participate in postsecondary coursework in Iowa, a student must meet readiness standards. As outlined in the Code of Iowa, the eligibility requirements are:

1. The student shall meet the enrollment requirements established by the eligible postsecondary institution providing the course credit.
2. The student shall meet or exceed the minimum performance measures on any academic assessments that may be required by the eligible postsecondary institution.
3. The student shall have taken the appropriate course prerequisites, if any, prior to enrollment in the eligible postsecondary institution delivering the course.
4. The student shall have attained the approval of the school board or its designee and the eligible postsecondary institution to register for the postsecondary course.
5. The student shall have demonstrated proficiently in reading, mathematics, and science as evidence by achievement score on the latest administration of the state assessment for which score are available and as defined by the department. If a student is not proficient in one or more of the content areas listed, the school board may establish alternative but equivalent additional administration of the state assessment, portfolios of student work, student performance rubric, or end-of-course assessments.

Compliance with these standards is addressed at the local community college. Students must complete an enrollment application. The application for NIACC is included in Appendix B.

Specifically addressed in the Iowa Code 261E is the purpose of the PSEO program intended to promote rigorous academic or career and technical pursuits and to provide a wider variety of options to high school students by enabling ninth and tenth grade students who have been identified by the school district as talented and gifted and eleventh and twelfth grade students to enroll in eligible courses at an eligible postsecondary institution of higher learning. These opportunities are required to be included in each school's registration handbook.

In fiscal year 2010 for all community colleges in Iowa, over 38,000 high school students from 407 different high schools took the opportunity to participate through the different types of concurrent enrollment arrangements. The number of students participating under PSEO totaled 5,654 from 325 different high schools (Iowa Department of Education, 2010).

By 2010, the state of Iowa saw record enrollment in dual enrollment growing to 38,283 students accounting for 25.7% of total community college enrollment (Iowa Department of Education, 2010). Since inception, dual enrollment in Iowa has experienced steady growth. Since fiscal year 2003, dual enrollment has increased 114.5%. Fiscal year 2010 had faster growth at 14.2% than the eight-year average. This is representative of a sharp increase over the previous two years (Iowa Department of Education, 2010). The dual enrollment head count by community college over the last five year reporting period is shown in Table 1.1. This table reveals an increase in dual enrollment numbers for all community colleges except Western Iowa Technical College.

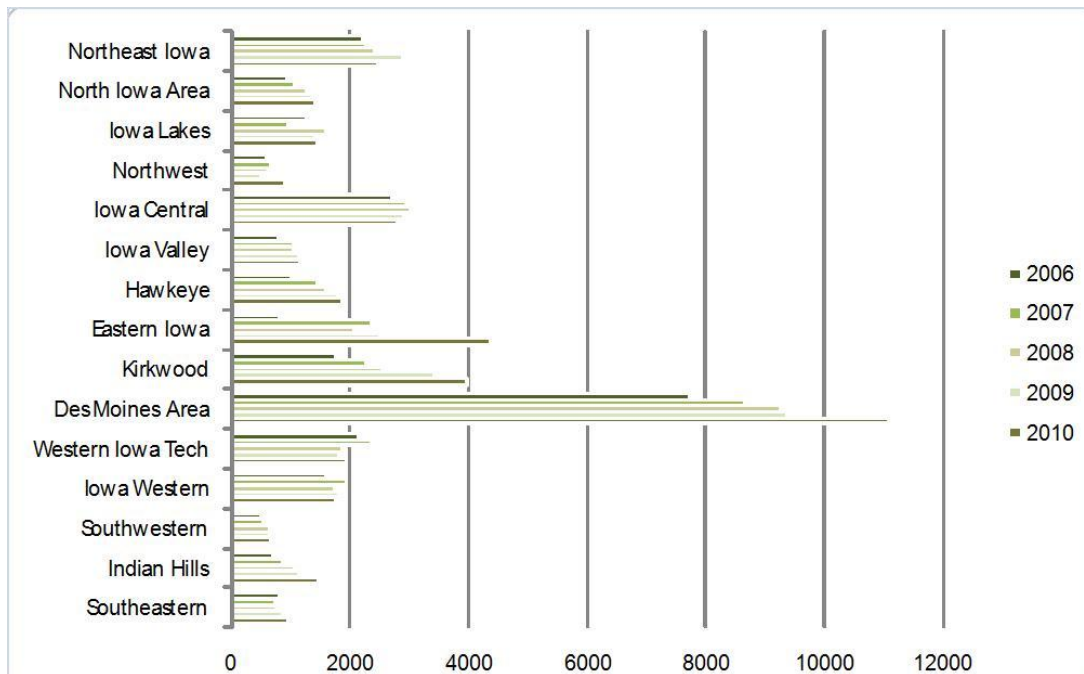
Across the 15 community colleges there exist differences to the degree and extent of increase in the percentage of dual enrolled students in comparison to the total student body. Figure 1.1 provides a visual picture of the steady growth of dual enrolled students over the 5 year period 2006-2010. Clearly, DMACC leads in the number of enrollments over this period, followed by Iowa Central and NEICC. Schools with smaller programs include NWCC, SWCC, and Southeastern.

Table 1.1. Dual enrollment (headcount) by college, 2006-2010

College	2006	2007	2008	2009	2010	Average Change 2006-2010
Northeast Iowa	2,230	2,277	2,409	2,869	2,478	2.1%
North Iowa Area	944	1,059	1,262	1,363	1,423	8.6%
Iowa Lakes	1,279	970	1,582	1,427	1,453	2.6%
Northwest	574	671	608	489	894	9.3%
Iowa Central	2,707	2,928	3,026	2,921	2,781	0.5%
Iowa Valley	782	1,035	1,033	1,124	1,147	8.0%
Hawkeye	1,019	1,436	1,598	1,782	1,884	13.1%
Eastern Iowa	810	2,372	2,081	2,507	4,362	40.0%
Kirkwood	1,766	2,275	2,527	3,412	3,970	17.6%
Des Moines Area Western Iowa	7,736	8,646	9,249	9,376	11,074	7.4%
Tech	2,135	2,350	1,882	1,808	1,941	-1.9%
Iowa Western	1,598	1,925	1,733	1,805	1,756	1.9%
Southwestern	493	528	632	646	682	6.7%
Indian Hills	691	884	1,061	1,130	1,467	16.2%
Southeastern	814	743	767	878	971	3.6%
Total	25,578	30,099	31,450	33,537	38,283	8.4%

SOURCE: Iowa Department of Education, Division of Community Colleges and Workforce Preparation, Community College MIS.

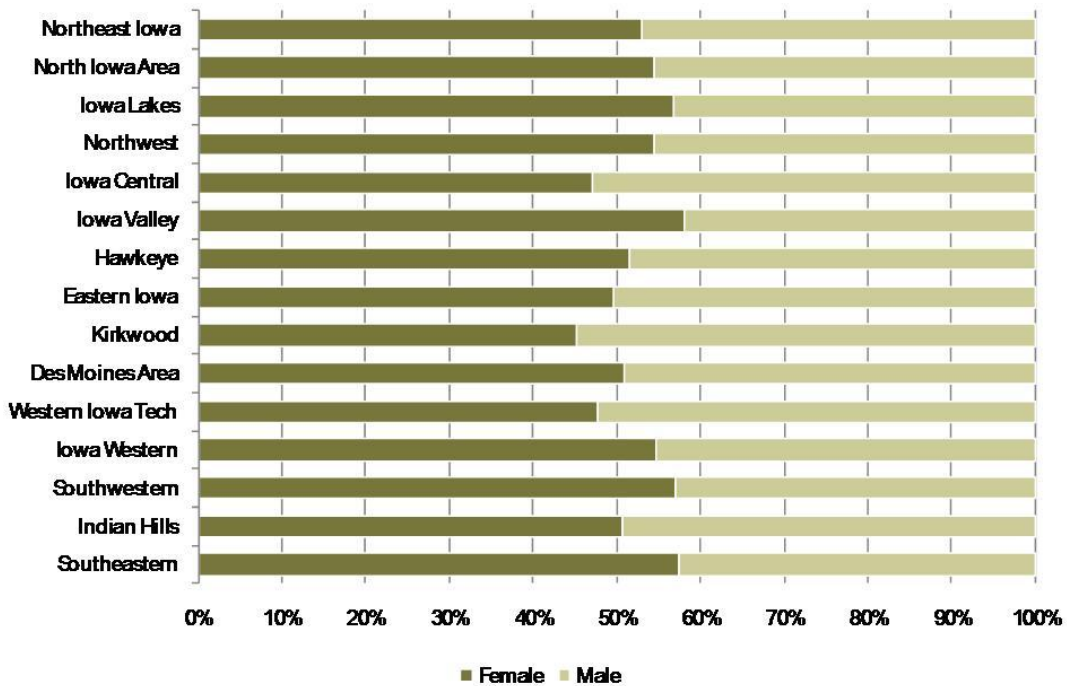
NOTE: Each bar “|” denotes 500 enrollees.



Source: Iowa Department of Education, 2010.

Figure 1.1. Dual enrollment (headcount) by community college, 2006-2010

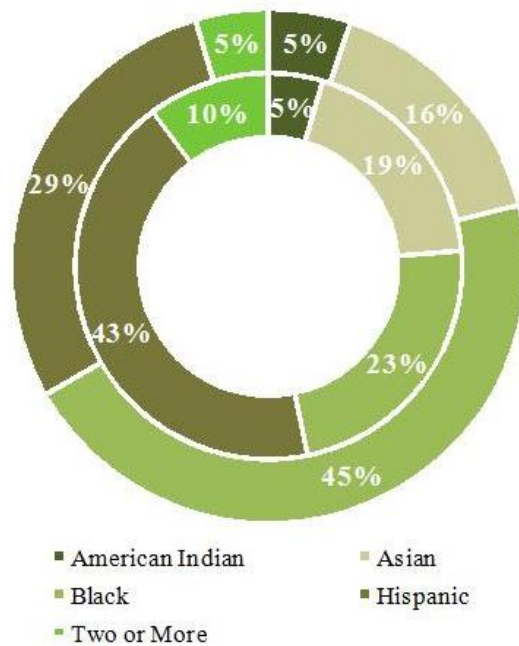
The demographics of the dual enrolled student do not reflect that of the overall student body and are compounded when looking at PSEO programs in particular. When participating in a dual enrollment program, the student earns high school and community college credit simultaneously. A student enrolled as PSEO participates as a college student and, therefore, earns only college credit. In fiscal year 2010, approximately 51% of dual enrolled students were female compared to 55.6% of the overall student body (Figure 1.2). When looking specifically at PSEO, females represent 63.5% of dual enrolled population (Iowa Department of Education, 2010).



Source: Iowa Department of Education, 2010.

Figure 1.2. Dual enrollment by college based on student gender, 2010

The racial/ethnic background of dual enrolled students is less diverse than either the total community college or public K-12 enrollments. In fiscal year 2010, approximately 10% of dual enrolled students were reported as having a minority racial/ethnic background. The lowest program with representation was the PSEO with only 4.1%. In contrast, 13.7% of overall community college student body enrollment was reported to have minority racial/ethnic background (Iowa Department of Education, 2010). These imbalances are depicted in Figure 1.3. In comparison to the demographics of the State of Iowa, both dual enrolled population and community college student body are more diverse, where only 8.7% of the population are non-white, not Hispanic persons (U.S. Census Bureau, 2010).



Source: Iowa Department of Education, 2010.

Figure 1.3. Dual enrollment based on student racial and ethnic background, 2010

The most recent developments on joint enrollment have focused on statewide initiatives to address the quality and rigor criticisms. In 2008, specific legislation was passed which directed the Iowa Department of Education to form a Postsecondary Course Audit Committee (Iowa Code 256.17). This committee reviewed the requirements of accreditation through the National Alliance of Concurrent Enrollment Partnerships (NACEP). It was this committee's recommendation that all community colleges in Iowa apply for accreditation through NACEP and meet the requirements of Iowa Code 256.17 (Utman, e-mail correspondence, 2011). On May 6, 2010 more than 50 college administrators and concurrent enrollment managers, representing all 15 Iowa Community Colleges, met with NACEP representatives a day-long training covering NACEP standards and the accreditation process (NACEP Winter Newsletter, 2010). NACEP is a professional organization for high schools and colleges that fosters and supports rigorous concurrent enrollment. Established in 1999 in response to the dramatic increase in concurrent enrollment courses throughout the country, NACEP serves as a national accrediting body and supports all members by providing standards of excellence, research, communication, and advocacy (NACEP website, 2011).

Dual Credit Enrollment at North Iowa Area Community College

The dual enrollment movement in Iowa began in 1995 at North Iowa Area Community College (NIACC). Dr. Michael Morrison, retired President, then Vice President of Academic Affairs, had been following the development of dual enrollment programs and reported outcomes in other states and believed they could provide enhanced educational opportunities for Iowa high school students.

The dual enrollment program started in 1995, with a simple arrangement with Mason City High School to offer NIACC courses in the high school. One full-time position, dedicated to establishing dual enrollment programs in the community college district, was added to the college staff. With the expansion of the program offerings to nine different programs, the staff has increased to four full-time and one part-time employee. One of several different arrangements of dual enrollment is now offered in every high school in the nine county region which encompasses NIACC.

The Fall 2011 program offerings included:

- Postsecondary Enrollment Options (PSEO)
- On-Site Classes
- Articulated Classes
- Career Link Programs
- Career Link Academies
- Teacher Academies

PSEO classes are offered on the NIACC campus, area community centers, online, and over the Iowa Communications Network (ICN). These are NIACC classes which are student selected when a comparable course is not available through the high school. Both college and secondary credit are issued for PSEO classes. The present cost to the high school for participating is a \$250 maximum fee per student, per class that includes the required textbooks. The high schools do not receive weighted funding to participate in this particular program.

On-site classes are NIACC classes taught at local high schools by high school teachers who meet NIACC's teaching qualifications. The student earns both college and high school credit. The high school pays regular tuition and fees less 30%, book costs, and

provides the instructor. The high school receives weighted funding to offset the cost of this program.

Articulated classes are also held at the local high schools. These are high school classes that closely match the requirements of NIACC courses in vocational and technical programs. Students who earn a grade level of “B” or higher and meet the competency requirements earn articulated NIACC credits. Although these credits generally do not transfer to other institutions, because these are articulated classes, the student will also earn high school credit. As most of these classes are conceived, organized and implemented by the high school, there are no additional costs to the high school or student. The purpose of articulation is curriculum alignment and reduction of duplication of effort.

Career Link programs are offered on the NIACC campus as well as in the high school. These career programs combine two years of secondary education and two years of postsecondary education. Students earn up to one year of college credit while still in high school. The high school pays regular tuition and fees plus the book costs for NIACC classes. There is no charge to the high school for articulated courses. NIACC provides the instructors and all equipment for NIACC classes. The high schools receive weighted funding for participation in this program.

In summary, Career Link Academies are career programs that combine two years of secondary education with two years of postsecondary education. Participating students earn up to one year of college credit while still in high school as well as high school credit. The schools partner with NIACC and often other school districts to offer this program. The high school pays one years’ seating fee plus the cost of books, and NIACC provides the equipment and the instructor. The high school receives weighted funding for this program.

Teacher Academies are the most recent addition to the dual enrollment program's offerings. This program began in 2005 to address the teacher shortage in Iowa and is fully articulated with the University of Northern Iowa. Classes are offered on the NIACC campus, over the ICN and at the local high school. Teacher Academies are a teacher education program that offers 20 semester hours of coursework specifically designed for high school seniors considering a teaching career. The program includes classroom observation to provide students with the experience of being in a classroom. The student earns both college and high school credit. One of the required courses is offered over the ICN and the \$250 PSEO rate is charged to the high school. The high school pays regular tuition and books less 30% when they provide the instructor, and full tuition and fees when NIACC provides the instructor. The high school receives weighted funding for this program.

In fiscal year 2010, dual enrollment at NIACC totaled 1,423 or 27.4 percent of total enrollment. Of the dual enrolled students, approximately 16.9% were enrolled through PSEO, 70.3% were in contracted courses and 12.8% were taking courses independently. The demographics of the group were 45.5% male and 54.5% female, with 95.1% white, 2.5% Hispanic, 1.4% Asian, and .5% black (Iowa Department of Education, 2010).

NIACC offers a well-developed array of dual enrollment programs. These programs were developed on the premise that community colleges must partner with the local high schools in their district for the betterment of the college, high schools, and (most importantly) students. The original premise, as developed in the state of Minnesota to promote rigorous academic pursuits and provide a variety of options for juniors and seniors in high school by giving them the opportunity to take college courses at state expense, is relevant for NIACC as well (Boswell, 2001a).

Need for the Study

While a fair amount of qualitative research with positive results has been conducted in other states, no formal evaluation has occurred in Iowa, although a statewide study is currently under way. Still, there is a clear need for reliable and comprehensive research on these programs and their outcomes for students (Robertson, 2005; Swanson 2008). A very limited amount of quantitative research has been conducted nationally. The research on the academic and postsecondary transition outcomes is sparse. Less research has been conducted on longer-term outcomes (Bailey et al., 2002). Prior research on dual enrollment revealed very few studies employing regression analysis of any kind (Eimers & Mullen, 2003). Further research is necessary to study the impacts of dual enrollment on Iowa students. Since its inception in 1995 at NIACC, the dual enrollment program has not undergone analysis utilizing logistic regression with the inclusion of the variables identified in the present study. Previous studies conducted by Morrison (2007) analyzed the benefits of acceleration using a two-sample *t*-test. The college has made a significant investment in this program and continues to devote resources because of increased enrollment to the college and increased high school partnerships, it remains a good idea. According to Dr. Debra Derr, current president of North Iowa Area Community College:

The benefits to engaging high school students ready for college-level course work are many. These qualitative benefits include: an understanding of the expectations of college-level work, a challenge and engagement during their senior year, the opportunity to get a jump-start on college, the evidence that high school students engaged in dual enrollment courses are more likely to enroll in college directly out of high school and persist into their subsequent year of college. However, there are also questions presented regarding the true 'value' of these programs that must be answered through thorough quantitative investigation and analysis that address success in transition to the next level of education. The questions are being asked not only at the local levels but also at the government policy levels within Iowa.

Those aforementioned assumptions should be studied to provide solid outcome measures. The results of the current research can be used to drive decisions regarding dual enrollment program expansion or reduction.

Purpose of the Study

The purpose of this study was to determine the outcomes of accelerated students at NIACC. The population included in this study was comprised of students enrolled in general education courses through the PSEO dual enrollment program at NIACC. This specific high school population was comprised of students enrolled in courses that were not related to a particular program. The probability of variance due to program and curricular differences was reduced by narrowing the study's focus.

Since the dual enrollment program had been established more than 15 years ago, it has grown to 1,363 students, or 27.5% of the total student population. The program has continued to gain momentum and support from local schools as evidenced by the increased number of partnership agreements. Since the growth of the program may come without educational merit, it should be reviewed to determine if the allocation of human and financial resources is warranted or expansion justified. Therefore, the purpose of this research was to determine if the dual enrollment program at NIACC does what it is intended to do, which is help students navigate the path to higher education and increase the odds of community college graduation.

Contribution

This study provided a much needed rigorous quantitative research. Solid data are necessary for NIACC to make programmatic and resource allocation decisions about their dual enrollment programs.

Objectives

The primary objective of this research was to ascertain if students who participate in the PSEO dual enrollment program attend community college and persist to graduation at a greater rate compared to students who do not. More specifically, answers were sought based on the following objectives:

1. Does participation in PSEO have an effect on persistence to graduation from NIACC?
2. Does gender play a factor in persistence to graduation?
3. Does the need for aid play a factor in enrollment and persistence to graduation?
4. Does the number of first term credits have an effect?
5. Does high school GPA make a difference?
6. Does the ACT composite score play a factor in persistence to graduation?

Research Questions

The following research questions were addressed in this study:

1. Are there any differences in NIACC graduation outcomes among accelerated and non-accelerated students?
2. Is there a difference in graduation outcomes among accelerated and non-accelerated students based on gender?

3. Does the need for financial aid have an impact on graduation outcomes among accelerated and non-accelerated students?
4. Does the number of first term credits completed effect graduation outcomes among accelerated and non-accelerated students?
5. Does high school GPA effect graduation outcomes among accelerated and non-accelerated students?
6. Does ACT composite score effect graduation outcomes among accelerated and non-accelerated students?

Hypotheses

Data were analyzed to determine if the following hypotheses are supported:

1. Compared to non-accelerated students, do accelerated students experience increased odds of graduation from NIACC?
 - a. H_1 : Accelerated students are more likely to graduate than non-accelerated students, controlling for all other covariates.
 - b. $H_0: \beta_{\text{accel}} = 0$; Graduation is not dependent on acceleration.
2. Is there a difference in graduation odds based on gender
 - a. H_1 : Females have greater odds of graduation than males, controlling for all other covariates.
 - b. $H_0: \beta_{\text{female}} = 0$; Graduation is not dependent on gender.
3. Does the need for financial aid have an impact on the odds of graduation?
 - a. H_1 : Higher financial need is associated with lower odds of graduation, controlling for all other covariates.

- b. $H_0: \beta_{\text{need}} = 0$; Graduation is not dependent on financial need.
4. Does the number of first term credits completed effect the odds of persisting to graduation from NIACC?
 - a. H_1 : Higher first term credits completed are associated with higher odds of graduation, controlling for all other covariates.
 - b. $H_0: \beta_{\text{fcredits}} = 0$; Graduation is not dependent on first term credits completed.
 5. Does high school GPA effect the odds of graduation?
 - a. H_1 : Higher student grade point averages are associated with greater odds of graduation, controlling for all other covariates.
 - b. $H_0: \beta_{\text{hsgpa}} = 0$; Graduation is not dependent on high school GPA.
 6. Does ACT composite score effect the odds of graduation?
 - a. H_1 : Higher ACT composite scores are associated with higher odds of graduation, controlling for all other covariates.
 - b. $H_0: \beta_{\text{act_composite}} = 0$; Graduation is not dependent on ACT composite scores

Significance

For the academic year 2009-2010, NIACC had 1,444 students enrolled in dual enrollment programs which constituted 27.5% of the total enrollment. As the popularity of these programs continues to grow as an option for high school administrators and students, their effectiveness should be determined through a quantitative analysis of outcomes to ascertain whether students are being served appropriately.

Dual enrollment programs have recently been scrutinized, questioning the their effectiveness towards college preparation and rigor (Dooley, 2011). This is not a problem

unique to Iowa. Although community college and high school administrators are optimistic, some state officials and legislators are skeptical (Bailey et al., 2002). The current study was not designed to justify dual enrollment programs, but to determine their viability. This research may prove useful to administrators who wish to begin dual enrollment programs or expand existing programs and justify financial support.

Of further significance in and of itself is the data source. This is the first time research has been conducted using a secondary source.

Assumptions

The following assumptions were made regarding this study:

1. The data entered and collected from the MIS at NIACC are accurate.
2. The data collected from the NIACC Financial Aid Department are accurate.
3. NIACC faculty members are unbiased in their treatment of students.

Delimitation

This study was delimited to a single rural small Midwestern community college. Nevertheless, the information may be of use to all community colleges in this state or other states with similar systems.

Limitations

This research and analysis were conducted using data compiled from NIACC students enrolled in the years of 1996-2007. While powerful and important to NIACC, these results are not transferable to other community colleges. This study did not account for or elicit the students' motivation to obtain an advanced degree or account for the level of engagement and

student experience while enrolled as a community college student. Both of these factors may have been an influence on community college graduation outcomes.

Definition of Terms

The following terms were defined for use in this study:

Articulated Classes: High school classes that cover material similar to introductory-level college classes. If the student earns a grade of “B” or higher, high school credit can be substituted for college credit.

Associates Degree: An academic degree awarded by community colleges, junior colleges, business colleges and some bachelors degree-granting colleges and universities upon completion of a course of study usually lasting two years.

Community College: A publicly supported school which may offer programs of adult and continuing education, lifelong learning, community education, and up to two years of liberal arts, preprofessional, or occupational instruction partially fulfilling the requirements for a baccalaureate degree but confers no more than an associate degree; or which offers as the whole or as part of the curriculum up to two years of vocational or technical education, training, or retraining to persons who are preparing to enter the labor market. (Iowa Code 260C.2)

Concurrent Enrollment: Any course offered to students in grades 9 through 12 during the regular school year approved by the board of directors of a school district through a contractual agreement between a community college and the school district (Iowa Code 261E.2).

Dual Enrollment: Also referred to as concurrent enrollment; allows high school students to take college courses, earning both high school and college credits.

Global Economy: The expansion of the economy beyond national borders including the globalization of production, markets, finance, communications, and the labor force.

Iowa Communications Network (ICN): Fiber-optic network which provides full-motion video to Iowans allowing them to access to education and government regardless of location.

On-Site Classes: Community college courses offered at local high schools.

Persistence Rates: Percent of students who continue their education to the completion of a NIACC degree.

Post Secondary Enrollment Options (PSEO): A state-allowed program where high school students can earn college credit by taking courses at community colleges, either on site or over the ICN.

Senior year Plus Program: Established to be administered by the department of education to provide Iowa high school students increased access to college credit or advanced placement coursework (Iowa Code 261E.1).

Student: Any individual enrolled in grades nine through twelve in a school district who meets the criteria to participate (Iowa Code 261E.2(8)).

Teacher Academies: Provide opportunities for students interested in the field of education to observe and participate in K-12 classrooms as well as take college level courses.

Tech Prep: A program available to high school students which provides the opportunity for the students to take college technical and specialty career courses.

Weighted Funding: Monies allocated by the State of Iowa for actual enrollment plus additional weightings for students participating in shared classes, special education, classes with shared teachers and classes for English proficiency (Iowa Code 257.6).

CHAPTER 2. LITERATURE REVIEW

Introduction

Clearly the 26 year history of dual enrollment has not transpired without question. The debate and controversy over benefit, quality, rigor and outcomes continues. This chapter summarizes significant and relevant literature on dual enrollment programs at community colleges in the nation. The purpose of this review of literature is to identify the most important issues relating to dual enrollment and make note of the most current research. The chapter begins by identifying seven primary themes that emerged in the literature. Each of these seven areas is addressed in detail. The literature review provides the contextual framework for the quantitative research carried out in this study.

As primary researcher and author of this document, I am compelled to reveal I hold biases on the importance of accelerated programs. In my current employment I hold leadership responsibilities for the secondary school partnership programs. I believe strongly in the benefit of accelerated learning as an avenue for students to advance to higher education who would not otherwise perceived themselves capable of post-secondary success. I believe wholeheartedly in the opportunities accelerated learning provides. To combat biases, research and publications criticizing accelerated learning were intentionally sought and included in this review.

Key Concepts

Seven primary themes became evident in the literature review. These key concepts prevalent in literature were: (1) high school reform/advancing opportunities for students; collaborations between high schools and colleges; (2) the benefits of accelerated programs;

(3) global economy/workforce readiness; (4) impact on student performance; (5) challenges and criticisms; (6) policy recommendations for program success; and (7) limitations. The latter is discussed in detail in a summary of previous research.

High school reform/advancing opportunities

In a growing number of states, improving the rigor and relevance of high school coursework has risen to the top of the education reform agenda (Robertson, 2005). This stands particularly true of the high school senior year. By the time many students begin or reach the middle of their senior year, they have completed the minimum high school requirements for graduation, leaving ample time for seeking additional educational opportunities. The variety and level of additional opportunities may be limited in the high school because of funding constraints (Bailey & Karp, 2005). Therefore, increased opportunities provided through dual enrollment programs may be viewed as a method of reforming the high school curriculum. High school students having access to courses at the community college will have opportunities to take part in more challenging courses in a broader range of subject areas. At the very least, these courses provide an avenue for bridging the gap our current system design creates between high school and college.

In the report, *The Last Opportunity of Senior Year: Finding a Better Way* (2001), the National Commission on the High School Senior year noted that the national life and the economy are changing faster than our schools. The nation faces a deeply troubling future unless we transform the lost opportunity for the senior year into an integral part of our students' perception for life, citizenship, work, and education.

Volumes of written works, research outcomes, opinion letters, federal mandates, creation of instruments to measure student performance, etc., have been created to address the high school experience. Some hold the opinion the K-12 system of education in the United States needs to be evaluated. Under evaluation is the preparedness of our high school graduates to enter the workforce or enter college (Folly, 2007; Callan, Finney, Kirst, Usdan, & Venezia, 2006; Krueger, 2006).

Some students simply will not have success in the traditional education system of our country. They are destined to fail in life unless they are given an opportunity to learn job skills and ways to have success in the American workforce. Traditional high schools often fail in preparing these students. Dual-enrollment programs gives them a chance at success (Galloway, 1994).

Each year, educators, administrators, and concerned parents grapple with the question of how to keep high school seniors engaged in learning and prevent an apathetic attitude popularly labeled “seniorities”. Two questions arise from this goal: (1) How can educators make the senior year of high school meaningful and significant for students? and (2) How can educators make this year a solid transition into either the workforce or higher education? (Peterson, Anjewierden, & Corser, 2001).

Schools have pushed much of the mathematics, languages and science courses into the middle school system that, by the time a student gets to high school, all of the challenging courses have already been taken. Nationally, the dual-credit phenomenon is emerging as an attractive option for students. At the Education Commission of the States’ (2001) annual meeting, the Commission President spoke out for restructuring the high school curriculum, and pushing for more links between the high school and college.

Andrews (2001) noted that the high school years are a waste for many teenagers' time. The large, comprehensive American high school is a disaster. It does not work for most students. The emphasis is on passing enough courses to graduate, rather than on taking the right courses to succeed, enrollment in challenging math and science classes drops. Only one in five seniors takes trigonometry; one in four takes physics.

Dual enrollment provides an opportunity to smooth the transition to postsecondary education; thus, increasing the likelihood that students will complete a postsecondary program and be better prepared for the demands of an information-based economy and society (Bailey & Karp, 2005; Hoffman, Vargas & Santos, 2009). Some dual enrollment programs are designed to decrease dropout rates. Advocates of these programs believe that many student drop out because they do not feel challenged by the work they are doing. High schools may retain such at-risk students by offering them more challenging coursework. The strongest predictor of bachelor degree completion is the intensity and quality of a student's high school curriculum (Adelman, 1999).

Many students who take the required high school courses and earn good grades are not ready for college and careers. Many courses are not rigorous enough and do not expect enough from students (Southern Regional Education Board, 2007). Some programs have also been expanded to include all seniors as a means to combat "senioritis"—the feeling that the senior year in high school does not matter because colleges and universities only consider work done through the junior year in making admission decisions (American Association of State Colleges and Universities, 2002).

Two thirds of jobs will not require an advanced education and, yet, too many applicants are not qualified even for those jobs. Among 16- to 24-year olds, 9% do not get a

high school diploma or GED. Three out of 10 high school students drop out. Complicating the loss of talent pool, is that too few of those who get a diploma possess even basic skills. Too often, many high school graduates cannot read well enough to fill out job applications, much less to understand instructions or training materials need to do the job. In addition, they frequently lack the communication skills to undergo a job interview (Kiplinger, 2009).

Dual enrollment programs increase the intensity and rigor of the high school curriculum by introducing college-level work that has traditionally been seen as vehicles only for gifted students (Jordan et al., 2006). In addition, financial constraints on the high school budget often limit opportunities for gifted students. Many high schools cannot afford to maintain well equipped labs for advanced science courses or employ teachers with the credentials to teach advanced courses. Dual enrollment programs can aid in high school reform by giving high school students access to the more rigorous curricula of advanced courses.

The Education Commission of the States (ECS) and the Bridge Project at Stanford University have advocated dual enrollment programs as a viable strategy for improving the quality of the high school experience and bridging the transition from high school to college (Jordan et al., 2006). Students, particularly those who do not have parents with college experience, may have a difficult time navigating the application process. Some may find it simply to daunting to even explore.

Motives for schools districts to participate in dual enrollment programs include increasing the rigor and flexibility of the high school curriculum, expanding postsecondary opportunities for students, and adding alternatives to the regular comprehensive high school. Benefits for the community college include meeting its broader mission to the community,

increasing current enrollment, and recruiting matriculating students (Jordan et al., 2006).

While I understand the need for enrollment in community colleges, I hope the motivation of community colleges to enter into partnerships with high schools is more than self serving. With education comes increased opportunity for the individual, families, communities, and the country.

In a study using the High School and Beyond National Longitudinal Data Set, Adelman (1999) revealed that the strongest predictor of bachelor's degree completion was the intensity and quality of students' high school curriculum. High schools that may not be able to offer advanced placement courses may find success by partnering with community colleges in dual enrollment programs to provide opportunities for their students. In this model the high school and community college partner together to allow high school students to take advanced classes on the community college campus.

The point where the system of transition from high school to college has failed the overall population is most evident in underrepresented groups. Born in the wake of the struggle for civil rights and bolstered by the implementation of affirmative action, the movement to diversify the population of young people entering college has, indeed, made progress. In general, college campuses are more diverse today than they were four decades ago. Nonetheless, access, retention, and graduation rates still correlate strikingly with race, income, and family educational background (Hoffman, 2003).

In the 18- to 24-year-old group, approximately 90% of white students complete high school, whereas only 81% of African Americans and 63% of Hispanics complete. Whereas 90% of current high school seniors expect to attend college, only 75% of high school graduates will actually attend. A top-quartile, low-income student is less likely to enter

college than a bottom-quartile, high-income student. One-third of college entrants drop out before their second year, and over half fail to complete a degree at the institution where they began. African Americans, who represent 16% of the current 15- to 18-year-old population, earn only 10% of all associate degrees; and Hispanics, who constitute 14% of the population, earn only 7% of associate degree (Adelman, 1999; Barton, 2002).

Models of dual enrollment have exploded in popularity in recent years, as policymakers and educators try to address worries about a lack of rigor and innovation at many high schools (Klein, 2001). While not reforming high school education, these programs do aid in address the shortfalls while providing opportunities to populations of students who may have remained underserved.

Dual enrollment is one strategy for building closer links between high schools and colleges. The program was designed not to substitute, but to enhance high school curriculum (Jordan, 2001).

Summary

Education evaluation and reform in the secondary school continues to be a subject of interest and debate. Of question is the viability of the current traditional education system in graduating students prepared for post-secondary work or the job market. It is the opinion of many as referenced in this section that accelerated education opportunities, specifically dual enrollment, could provide a practical solution. Dual enrollment adds rigor and opportunity to high school curriculum and has the potential to ease the transition to secondary studies.

Collaborations between high schools and colleges

There is a growing perception of a mismatch between what America needs and what it is getting from its educational systems. Policymakers, the media, and parents are calling for high schools, colleges, and universities to work together to provide access to a reasonably priced and relevant education in order to help students develop the critical thinking, technical, and content skills they will need in a changing economy. America's centuries-old model of higher education is being challenged as never before to work with the public schools to help transform practices to meet the educational needs of the children of the baby boom generation (Amey, Eddy, & Campbell, 2010; Boswell, 2001b).

Boswell (2001b) noted that parents are alarmed by reports of the rising cost of college, and policymakers worry about the need for a highly educated and trained workforce to compete in an increasingly global marketplace. These concerns result in an increasing interest among parents and politicians to provide a range of postsecondary enrollment options to high school students that accelerate student progress toward completing the baccalaureate degree. Across the country, an increasing number of community colleges are being called upon to cooperate with K-12 school districts in order to provide a variety of postsecondary options to high school juniors and seniors.

The problem is not limited to methods of access; academic transitions are lacking as well. Few high school and higher education administrators and educators work together to align curriculum. Calls for a seamless K-16 curriculum that would blur distinctions between traditional K-12 schooling and undergraduate education have entered the discussion (Azinger, 2000). Ten states currently align their high school graduation and college

admissions requirements, and it is only in the areas of English and math (National Commission of the High School Senior Year, 2001).

The transition from high school to college is an unsuccessful one for many stemming from a variety of causes. Some students are unsure how to apply for college or pay for it, some are academically unprepared for higher education, and some face a frustrating task of balancing school and work. As postsecondary education becomes increasingly necessary to gain access to most reasonably well-paid jobs, the sharp division between high schools and colleges becomes more problematic (Bailey et al., 2003).

Azinger (2000) suggested partnerships between schools and local community colleges have the potential to constitute an important point of connection between the secondary and postsecondary systems in sharing of resources. From the school district's perspective, these partnerships hold some promise of increasing available resources. For example, tech prep programs connect high school students to technical training facilities and faculty expertise that only the largest districts can otherwise afford. Similarly, concurrent enrollments are needed to justify the allocation of school funds at an individual school level.

Dual enrollment has emerged as one promising form of collaboration to foster the transition from high school to college (Jordan et al., 2006). Where collaborations and strong connections between the two levels of education occur, as in the dual enrollment programs, the barriers to access education are reduced. This increases the likelihood that high school students will continue their education after graduation.

There is some question regarding the benefit of the courses being offered on the high school as compared to on the community college campus. (Jordan et al., 2006) noted that locating the program on the college campus seems to open significant opportunities for

students to take advantage of a broader selection of courses, more advanced educational technology, and better facilities than are available at the high school. Additionally, the community college setting promotes positive interactions between high school and college students, increasing the age diversity. Students and counselors perceive that the community college setting gives students more freedom, but also requires students to take personal responsibility for their own learning (Jordan et al.). When making collaborative agreements between high school and colleges, location of the dual-enrollment course must be a consideration. However, logistical complications may hinder high schools from collaborating with colleges far from their district boundaries.

Dual enrollment has the potential to alter the relationship between high school and college. At one extreme, it could fundamentally change the content of the high school junior and senior years and promote a more focused and, perhaps, coherent role for postsecondary institutions, particularly community colleges. At the other extreme, it could reduce the amount of effective education received by students if they complete high school-with college credits while having learned exactly what they would have in a regular high school program (Bailey et al., 2003). Thoughtful consideration must be made when engaging in cooperative arrangements. Institutions on both ends must be wary of unintended consequences as well as how these arrangements could permanently alter the fundamental purpose of high school education.

After establishing a concurrent enrollment program, administrators are challenged to better strategize for future concurrent enrollment programs or other collaborative partnerships, and to enhance current, concurrent enrollment programs for effectiveness (Gomez, 2001). For years, only a handful of the highest achievers graduated from high

school with college courses on their transcripts. However, as states strive to blur the line between high school graduation requirements and college expectations, such dual-enrollment courses are quickly becoming part of a broader strategy to help more students become college-ready (Klein, 2007). In building collaborative arrangements, and blurring lines between high school and college, educators and administrators must continue to study and develop new strategies to promote student success as a part of an educational system.

Summary

Collaborative partnerships are called for to provide quality education at a reasonable price to meet the demands of critical thinking, technical and skill based knowledge required for today workforce. Dual enrollment programs alter the traditional way of thinking of the relationship between high school and college. Advantages exist for at both levels for investigating new strategies focus on student academic success.

Benefits

Concurrent enrollment partnerships are a model for efficient high school reform. By providing measurable benefits to students, teachers, and schools quality concurrent enrollment partnerships are a unique and efficient way to address numerous reforms being called for across the country (Bailey & Karp, 2003; Education Commission of the States, 2001; Jordan et al., 2006; Krueger, 2006).

Concurrent enrollment partnerships...

- Provide rigorous postsecondary academic challenges to high school students in their own supportive high school environments.
- Provide college access to a broad range of students by placing actual college courses within high schools.

- Afford students and families saving in the overall cost of a higher education.
- Focus student learning on critical thinking and writing skills.
- Evaluate students with multiple and varied assessments, rather than on one high-stakes test.
- Provide high school instructors with ongoing, relevant professional development led by college and university faculty.
- Create spillover effects that “raise the bar” throughout partner schools, even in non concurrent enrollment courses.
- Foster strong local networks among secondary and postsecondary educators that result in a seamless transition for students as they move from high school to college (National Alliance of Concurrent Enrollment Partnerships, 2007)

Additional benefits policymakers have given for their increasing interest in creating postsecondary enrollment options include:

- Accelerating student progress toward a degree in order to free up additional space on campus to meet the projected demands for college access by the “baby boom echo”-children of baby boomers, who are approaching college age
- Providing greater academic challenges to high school students who have “senioritis”
- Increasing student aspiration to go to college
- Providing greater academic opportunities for student at small rural schools
- Building closer ties between college and their communities

Dual enrollment programs provide obvious benefits for students, high schools, and colleges. They also fulfill a broader societal need, helping to fill the gap for skilled and educated workers (Boswell, 2001b).

Students. Dual enrollment programs offer many benefits to students and their families. Conducting college level work while still in high school can better prepare a student for the demands of post-secondary education. In recent years, some students have entered colleges and universities lacking the basic study skills they need to attain a degree.

Dual enrollment programs can help alleviate this problem by transitioning the student to

college-level work. Regardless of the name or delivery model, today's concurrent enrollment programs are used increasingly to enrich a high school student's curriculum, accelerate his or her academic program, and provide that student with a smooth transition for entry into college (Bailey et al., 2003; Hanson, 2001; Puyear, Thor, & Mills, 2001).

Dual enrollment not only aids in college preparation, but also enables participants to accumulate college-level credits while still in high school. Because participants earn college credit for their work, they have the opportunity to complete their baccalaureate or associate's degree in less time than traditional students. Most students cite their ability to earn college credits while still in high school as a primary advantage. Dual enrollment allows students to accumulate credits and, ultimately, shorten the time required to complete college degree (Catron, 2001; Swanson, 2008). Less time to earn a degree means lower costs for students. Regardless of who covers costs, dual-enrolled students ultimately enjoy the benefit of completing a post-secondary degree at a substantially lower cost than their peers.

In a study conducted by the Minnesota Legislative Auditor (Boswell, 2001a), it was estimated that students and their parents saved an estimated \$10.9 million in costs for tuition, fees and books had students enrolled in the same postsecondary courses without the program. The cost savings may be of particular importance to the community college student. Students who attend community colleges typically work more and borrow less. According to a 2003 analysis of federal statistics, full-time, low-income students at community colleges were borrowing an average of \$500 and earning an average of \$5,000 through work to pay for their school expenses (Burdman, 2005).

Dual enrollment programs that include at-risk students can reduce the senior dropout rate. By offering a student the challenge of college level studies, schools increase the chances that students will remain enrolled.

An enhanced curriculum does more for students than any other factor in the admission process (Adelman, 1999). What students are required to take in high school turns out to have decisive, long-term implications for their future. Indeed, recent research conducted by Adelman at the U.S. Department of Education have made the extent of those implications painfully clear: “Among all of the factors in college success, the single most important by far is the quality and intensity of the high school curriculum” (p. 84).

Students from a wide range of backgrounds and with diverse prior accomplishments are also demonstrating that the academic challenge provided by college-level courses can be an inspiration rather than a barrier. The question for the future is whether the degree to which opportunities like these will be able to increase the number of young people who gain a postsecondary credential, especially among those who remain badly underrepresented in higher education (Hoffman, 2005).

Dual-enrollment programs have traditionally been seen as a way to offer gifted students an academically challenging alternative to remaining in their regular age-graded high school programs (Rogers & Kimpston, 1992). Dual enrollment also provides a long-term strategy to improve the preparation of minority students to be competitive for college admission. Adelman (1999) revealed that the impact of a high school curriculum of high academic intensity and quality on degree completion is far more pronounced for African American and Latino students than any other precollege indicator of academic success.

Dual enrollment has the potential to facilitate the high school-to-college transition for a broad range of students: it may motivate students to take a more rigorous high school curriculum; it shifts the focus of occupational education to postsecondary institutions, while keeping such coursework available for high school students; it can provide an early warning mechanism to signal whether students are prepared for college; and it can acclimate high school students to a college environment (Bailey et al., 2003). Students enjoy their participation in dual enrollment programs, and find them useful and motivating (Orr, 2002; Robertson, Chapman, & Gaskin, 2001). It can be assumed that students who find their work challenging and enjoyable are more likely to continue in higher education after high school completion.

High schools. There are two primary benefits for high schools that participate in dual-enrollment. First, improved communication results from the collaboration with the college or university. Through collaboration, high schools can learn more specifically what is expected from students at the college level and alter their current academic and curricular practices as needed to prepare students effectively. Second, high schools also benefit from these programs because they allow for an expanded curriculum. For schools with limited funds for new programs, dual enrollment programs can provide additional curricular options. In turn, an expanded curriculum has the potential to develop students who are better prepared to meet the demands of post-secondary educations (Barnett & Stamm, 2010).

Colleges and universities. Postsecondary institutions also benefit from dual-enrollment programs. They may enjoy added revenue and increased access to potential enrollees. Dual-enrollment programs also open new pathways to recruitment and retention at

the college and university level. In addition, by granting credit for work completed at the college level, an institution may retain a student to degree completion simply because the student has already completed some of the work at that institution (Barnett & Stamm, 2010; Catron, 2001).

Colleges and universities that offer dual enrollment increase their visibility within their service areas. Dual-enrollment programs can attract top high school students who otherwise might not have considered a community college or local university or an advanced education. This creates a recruitment strategy for the college when successful dual-enrollment students, who might not otherwise consider pursuing a college degree, find that they are capable of doing college-level work (Catron, 2001). Once enrolled, these students may be more likely to complete a degree at the institution.

A program of this type is an excellent recruitment tool for the college by attracting better-prepared students who will experience fewer transition difficulties than do incoming freshmen who did not go through the program. In addition, concurrent enrollment programs generate a positive image in the community, faculty members gain from the experience of teaching a college course in a high school setting, the administrators and instructors of the community college gain in-depth knowledge of new student populations, and the college builds a solid base for future collaborations with K-12 institutions (Chapman, 2001).

Helfgot (2001) stated that community colleges suffer from certain myths that exist, such as: community colleges are just like high school with the exception of the restrictions; they are just for dummies; and classes are not “real” college classes. The list continues. These myths are often passed on from generation to generation of high school students. Offering college credit courses in high schools basically provides community colleges a

chance to address these myths head on by having some its very best faculty members teach college courses at the high school. Thus, high school students experience great teaching from great professors. They know it, have a good experience and, in turn, tell others. Word of mouth is powerful, and positive words from academically talented students do much to enhance the college's image and reputation.

Society. Dual enrollment serves a number of societal functions, including preparation of students for the world of work (American Association of State Colleges and Universities, 2002). The state receives a significant return on money it spends to allow high school student to take courses at higher education institutions. The Strategic Economics Group (Siegelman & Otto, 2008) prepared a report exclaiming that \$9.8 million in state spending during the 2005 school year resulted in more than a \$52 million payoff. In that year, 27,331 students took advantage of the program and earned more than 142,000 college-level credits. The 52 million in saving came from approximately \$22 million that the state would have spent on future educational assistance which resulted in approximately \$30 million in savings for families. "It gives you an over five-fold return on investment to both the state and the families of these students, which is nothing short of phenomenal", said Harry Siegelman (p. 1), of the Strategic Economic Group. Siegelman estimated that the savings increased consumer spending in Iowa by approximately \$60 million, boosting Iowa's gross domestic product by approximately \$24 million and increasing employment by approximately 470 jobs. Thus, dual enrollment helps address Iowa's workforce shortage and contributes to economic development (Community College Week, 2008).

Dual enrollment can also fit with other federal goals such as improved career guidance in high school and the assessments sought by the No child Left Behind strategy (Bailey et al., 2003). The enhanced level of educational success all students can achieve benefits the greater good of society.

Summary

Little debate exists challenging that dual enrollment benefits students, high schools, colleges, universities, and society at large. High school students gain access to post-secondary coursework at little or no cost. Dual enrollment enables high schools to add courses of greater rigor to their curricular options. It also increases marketing and recruiting options for colleges and universities. Society benefits from gaining a prepared workforce, and the calculated return on investment is well demonstrated. Although dual-enrollment programs are beneficial, the question remains as to what degree.

Global economy/workforce readiness

Morrison (2008a) cited four issues are coming together which will require the United States to align strategic assets to avoid unfavorable effects:

- Workforce shortages: difficult workforce shortages already exist;
- Educational attainment: lower levels of educational attainment are forecasted for those who will replace the baby boomers in the workplace;
- Global competition: higher levels of education are required in a global economy; and
- Our economy is losing ground in the world's economy.

According to Robertson (2005), our nation is competing in a dynamic global economy in which two assets—a skilled, versatile, and highly adapted workforce, and the capacity to nurture creativity, research, and innovation—provide the decisive edge. Technology is

transforming the workplace and, in many ways, the nature of work itself. The transition to a knowledge-based economy is fueling demand for well-educated, technically proficient workers in all sectors, across a wide range of occupations, and even for entry-level positions.

According to Kiplinger (2009), newly created jobs are more likely to require higher education than in the past. Approximately 31% of all jobs now require a postsecondary degree. Over the next decade the percentage will creep upward, representing millions of additional jobs that can be filled only by workers who have taken their education beyond the high school diploma.

Kiplinger (2009) continued that some businesses are finding it tough to hire. Even in the throes of recession, a range of companies have not been able to fill critical job openings because many applicants lack the appropriate skills. This is not due a labor shortage per say, but a dearth of talent. Over 60% of businesses have remarked it is difficult to find qualified workers. Despite a loss of about 8 million jobs since the recession began, manufacturers as a whole have continued to seek qualified machinists and mechanic operators, welders, laser die cutters and other highly skilled laborers. Engineers—chemical, nuclear, environmental and others with special training—remain in short supply, and scientists are experiencing a shortage as well. Demand for nurses and nursing teachers, physician assistants, physical therapists, pharmacists and other health care workers outstrips supply. The same holds true for information technology workers from systems analysts to programmers. This shortage will grow progressively worse as the most educated and skilled workers begin to retire. The baby boomer generation represents approximately 40% of the current labor force. As a group they not only have considerably more education than proceeding generations, but also more than the generation that follows.

Demographic shifts already on the horizon are expected to further increase the demand for skilled workers. As the baby boomers with postsecondary education retire over the next 20 years, it will be difficult to produce a sufficient number of Americans with postsecondary education or training to meet the economy's need. Shortages of workers with some college-level skills could increase to more than 14 million by 2020 (Carnevale & Desrochers, 2004).

The United States is currently number one in the global economic race but mediocre performance on international assessment of educational quality suggests that its pre-eminent status is living on borrowed time (Carnevale & Desrochers, 2004). A skilled labor force is key to remaining competitive in a global economy and there is reason to worry that the U.S. is not at the head of the pack. American students are underperforming in several international assessments. For example, in one comparative study, American youngsters scored above average in math and science, but were not in the top tier. Eighth graders in Taiwan, Singapore, South Korea, Japan and Hong Kong bested their U.S. counterparts in math while the U.S. ranked 10th in science. In another study, 15-year-old Americans scored below average, falling behind teens in the Czech Republic, Estonia, Slovenia, New Zealand, Canada, Japan and others. In math alone, the U.S. ranked 32nd (Kiplinger, 2009).

It is a reality that is well known that, in the 21st century, America's ability to educate its people will increasingly determine its economic competitiveness as the country shifts from an industrial to an informational economy. The fastest growing and best-paying jobs in the American economy are those that require at least some college experience. America can no longer afford to be a nation divided into education haves and have-nots. Methods must be developed to find a way to provide all its citizens with the opportunity to attain higher levels

of education and training than most have attained in the past (Carnevale & Desrochers, 2004; Robertson, 2005).

Economic pressure for increasing access to education has been building over the past half century. The economic value of human capital has accelerated, and skill requirements on the job have increased markedly since the end of World War II, continually upping the ante on education and training for good jobs. As the 21st century has begun, America's ability to produce and disseminate education will increasingly determine its economic competitiveness as the country shifts from an industrial to an information economy.

Increasing skill requirements are beneficial for the most educated and skilled workers, but they are ever more problematic for the least educated and skilled. As the U.S. has increasingly turned to workers with at least some college or postsecondary training to fill a wide variety of labor-market slots, the least educated workers have been left with few opportunities to access good-paying jobs. Since the 1980s, the real inflation-adjusted earnings of male high school graduates and dropouts have declined precipitously, while the earnings of college-educated workers have increased (Carnevale & Desrochers, 2004). Giving people the knowledge and the skills they need to get and keep good jobs in our work-based society can have positive personal and societal outcomes. Those with the most education are much less likely to experience violence, addiction, illness, incarceration, and other forms of abuse (Grossman & Kaestner, 1997; Witte, 1997).

Carnevale and Desrochers (2004) noted that the least educated are more likely to live in poverty. In households headed by high school dropouts, the poverty rate is 10 times higher than in households headed by college graduates. People who cannot get and keep jobs often drop out of the political system, withdraw from community life and, in some cases,

create alternative economies, cultures, or political structures that are even more damaging to the mainstream. In addition, increases in a country's overall level of educational attainment cause corresponding increases in their overall rate of economic growth. Increasing a country's average level of schooling by one year can increase economic growth by about 5 to 15%. Research has demonstrated clear economic benefits for students who continue education beyond high school (National Center for Education Statistics, 2001).

Summary

In order for the United States to remain competitive in the global economy, it will require a trained and skilled workforce. A highly adaptive workforce is derived from a population with advanced education and training. Although a pool of available labor exists, employers report difficulty in finding qualified workers. American high school students' test scores in math and science are falling behind other countries. Economic pressures call for an increased access to education. A country's overall level of educational attainment is directly associated with economic growth. Past research clearly demonstrates education beyond high school is needed in the workforce.

Student performance

The United States has been experiencing worker shortages in areas that require advanced degrees. To meet the demand for workers our country needs high school students who demonstrate an interest in college and follow through to graduation. A limited number of small-scale studies have suggested that students who participate in dual-enrollment programs earn higher grades in college, require less remediation, and have higher rates of

persistence and retention (Robertson, 2005). In order to fill the need for workers in the U.S., high school students need to complete advanced degrees.

In the past few decades the completion of advanced degrees has reversed from favoring males to females. Women currently outnumber men among new college graduates (Buchmann & DiPrete, 2006; Peltier, Laden, & Matranga 1999). The female advantage in college completion exists across all racial and ethnic groups (Buchmann & DiPrete, 2006). Despite the importance of research on gender inequalities in education, the literature often treats all aspects of education disadvantaging women (Buchmann & DiPrete).

In an independent study, Morrison (2008c) analyzed graduation outcomes of males and females from 1996 to 2006. Using independent variables of high school GPA, cumulative NIACC GPA and ethnicity, Morrison revealed that females were 29% more likely to graduate than males, and whites 61% greater than minorities.

To increase the number of college completers students must first be retained. In their ACT Policy Report, Lotkoedski, Robbins, and Noeth (2004) addressed academic and non-academic factors that lead to college completion. The strongest factors were non-academic which ranked in the following order, beginning with the strongest: academic-related skills, academic self-confidence, and academic goals. Academic related factors showed a moderate strength in relationship to retention, with high school GPA first, socioeconomic status second, and ACT composite score last.

Dual-enrollment programs have a benefit for most students regardless of academic level. Studies have revealed that a wide diversity of students with varying levels of achievement and motivation may benefit from the dual-enrollment experience (Jordan et al., 2006). The benefits of this program are not limited to the gifted student, although much of

the literature focuses on that population. Most likely this can be attributed to dual-enrollment participation requirements. The majority of articles revealed the partnership requires that students meet academic requirements above average. High schools and community colleges that limit participation in these programs to the academically advantaged student may be missing the chance to provide a life altering impact on a population of students who many already dismiss.

It is vital to identify and address the barriers that shut many underrepresented students out of participating in dual-enrollment programs: the lack of rigorous curricula at the high schools they attend a lack of information about opportunities for earning college credit, and substantial tuition and degree requirements (Robertson, 2005). By limiting dual-enrollment programs only to the academically gifted, the intention of a public education is minimized. Academic ability and financial viability of access to higher education promote an elitist view of higher education privilege that is not viewed as a right for all (Robertson). Financial barriers do impact college completion. Alon (2005) studied the effects of need as predicting the probability of graduation. As predicted, students who need financial support are more likely to drop out, and the rate of dropout is capable of partially offsetting the financial disadvantage.

A limited number of studies have concluded that students who participate in dual-enrollment programs experience favorable outcomes compared to students who do not (Swanson, 2008). Nationally, four-year college students who participated in a high school dual-enrollment program have, on average, a higher college GPA and a higher four-year graduation rate than students who did not participate in such a program (Clark, 2001).

Early data has suggested that dual-enrollment students earn higher grades in college than those who have not experienced a dual enrollment program and these students are retained at higher rates. Nevertheless, additional data are needed to sustain these conclusions. The mere existence of these options does not necessarily spell success (Hoffman, 2005).

Holding ability indicators constant, students entering college with AP tend to achieve higher first-year GPAs than those students entering college with dual credit only, or students entering college with no college credit. However, students who entered with AP or dual credit both returned for their second year at a higher rate than students who entered with no college credit (Eimers & Mullen, 2003).

Retention and graduation data have also revealed favorable findings. Students who enroll in dual credit courses attend college and earn some type of degree at a higher rate than those who do not participate in dual credit while in high school. Swanson (2008) found that students who earned at least 20 credits by the end of their freshman year improved their likelihood of completing a degree by 38%. Among Hispanics who enrolled in postsecondary institutions in Fall 2000, 77% who took dual credit courses were still enrolled in Fall 2001 as compared with 62% who did not. Furthermore, 32% of Hispanics who took dual credit graduated with a baccalaureate degree versus 11% who did not take dual credit in high school (Report to the 80th Legislature, 2006).

The data were nearly identical for African-Americans. Among those who enrolled in postsecondary institutions in Fall 2000, 78% who took dual credit courses were still enrolled in Fall 2001 as compared to 59% who did not. Furthermore, 34% of African-Americans who took dual credit graduated with a baccalaureate degree as compared to 11% who did not take dual credit in high school (Report to the 80th Legislature, 2006).

Findings of a case study by Hoffman (2005) reported in *Jobs of the Future* revealed that Florida students who took one or more dual credit courses enrolled in postsecondary institutions at higher rates than students who did not. The data were particularly striking for minority students. Among African-American students, 70% of those who took dual credit courses attended higher education institutions as compared to 45% who did not. Among Hispanic students, 69% of dual credit students went to college or university as compared to 54% who did not.

There was a distinctive difference in terms of the return rate between those with some and those without Advanced Placement (AP) or dual credit. Of those with only AP credit, 87% returned for their second academic year as compared to the return rates of those students who entered with both AP and dual credit (90%) or dual credit only (89%). Students who entered with no previous college credit returned at a rate of 76%. Holding academic ability constant, students entering college with only dual credit, AP credit, or AP and dual credit, had an increased likelihood of returning to college as compared to those students who entered with no college credit. First, when holding academic ability constant, students earning dual credit while in high school did not appear to do significantly better than other students who entered college with no dual credit. At the same time, students who took dual credit did not appear to do worse than students who entered with no previous college credit. Additionally, students entering with dual credit and/or AP were more likely to return to college the second year than other student having earned no dual credit (Eimers & Mullen, 2003).

Contrary to popular belief, dual enrollment is not exclusively for the academically gifted learner. There are many dual-enrollment programs that target non-gifted students. South Dakota public schools used dual enrollment as a tool to decrease the dropout rate of

their high-risk students. Often, at risk students do not see a purpose for attending school. Many non-gifted students are capable of achieving success in college; however, they often experience difficulty in the transition from high school to college (Burns & Lewis, 2000).

Summary

The heart of educational outcomes is student success and performance. Studies addressing gender, high school performance and ACT scores as well as financial factors can play an important role in predicting completion. The benefits of the dual-enrollment system on student completion and success are potentially endless. The review of the literature revealed that cohort student performance research was sparse. Many studies focused on retention rather than performance. What has been written has been cautiously favorable with regard to dual-enrolled student academic performance. It may be expected or assumed these students would perform well because, with limited exception, only those academically gifted were allowed to participate.

Challenges/criticisms

Recent studies of dual-enrollment programs have painted a picture of a rapidly growing movement with enormous appeal and potential, but which lacks a solid basis for decision-making in areas ranging from program design to funding, or to regulation (Robertson, 2005). While many agreed conceptually that dual-enrollment programs are a worthy endeavor, a comprehensive longitudinal study has not been undertaken. In each state and in Iowa, each community college has been left to its own design in establishing dual-enrollment partnerships and programs. Recognizing a need for some consistency, the Iowa community colleges did agree on a common set of best practices (Morrison, 2005).

Some believe the rigor of the curriculum is compromised due to the participation of high school students. Rather than offering coursework that calls high school students to rise to the level of college students, the instructor adjusts the curriculum to meet the abilities of the high school student. Others are concerned with the classes being offered in the high school by high school instructors differ little from traditional high school coursework (Bailey et al., 2002; Boswell, 2001b). The high school student does not experience anything different and loses the benefit of ease of transition to college.

Many courses do not meet the specific needs of the students they are supposed to serve. For example, a course may not be rigorous enough for a gifted student yet too rigorous for a non-gifted student (American Association of State Colleges and Universities, 2002; Clark, 2001; Reiss & Follo, 1993). There exists a perception that the college curriculum needs to be “dumbed down” in order to be accessible to high school students (Boswell, 2001b).

Community college faculty members pride themselves on structuring intensive and creative learning experienced for students at many levels of accomplishment. It is a requirement of their jobs that they teach diverse groups of students. When one adds the additional burden of teaching increased numbers of younger, less mature, and underprepared students, the result is often a diminished learning experience for the entire class (Dougan, 2005).

Cost is a potential drawback to the dual-enrollment system. The method of funding dual enrollments varies greatly from state to state. For some, the cost falls directly to the student and his or her family. For others, it is subsidized in part or whole by the state, some

colleges offer scholarships and other forms of aid to entice students to enter a dual-enrollment program (Fincher-Ford, 1996).

The finance of dual-enrollment programs has been called to question in some states, the primary question being, Who should fund these programs? In some states where funding is distributed to the community college and high school based on enrollments, these programs are viewed as double dipping (Bailey et al., 2002, 2003). In Iowa, as noted previously, the funding of the dual-enrollment program is dependent of the type of offering. Regardless of the funding distribution and weighted funding provided to the K-12 schools, it is up to the partnership arrangement to determine which entity will cover specific costs. This specific criticism may also carry over into the purpose of dual-enrollment programs: Should the program offer opportunities to high school students or seen as a funding stream for the community college? Policymakers in some states have become concerned about the “double-dipping” impact on taxpayers when both K-12 districts and community colleges receive state support for secondary students concurrently enrolled in postsecondary classes (Boswell, 2001b; Orr, 2002).

Azinger (2000) posited that the culture of each high school in the district and the community college will each possess a unique organizational culture. While the first community colleges were originally viewed as extension of the K-12 system, the direction they have taken in the past several decades has resulted in their operational values being shaped by four-year colleges and universities. The result has been a culture that fosters a more open climate to explore controversial optics of study at a level unacceptable in the K-12 system. In addition, the age of the typical community college student allows greater academic and social freedom for both staff and students. Consequently, the nurturing

component of schooling that is vital to the K-12 mission is very different at the community college level. K-12 schools are basically more custodial in nature.

Logistical challenges do exist and restrict the open access and opportunity community colleges strive to offer. Schools in closer proximity to the local community college will have increased likelihood of high school students concurrently enrolled. Community colleges should make concerted efforts to reach out to high schools in all areas of their district. This might mean increased cooperative agreements to offer community colleges courses in the high school (Azinger, 2000; Reiss & Follo, 1993).

Although the articulation and transfer of dual enrollment credits is generally not an issue at public college and universities; some students who seek to transfer to elite private institutions find that concurrent enrollment credits earned while they were in high school will not transfer (Boswell, 2001b; Burns & Lewis, 2000). Student eligibility requirements for dual-enrollment programs may have loosened in conjunction with the expanding purposes of these programs; stringent eligibility standards simply would not mesh with some of the varied purposes these programs seek to fulfill (American Association of State Colleges and Universities, 2002).

The assumption underlying dual enrollment is that high-school juniors and seniors have a minimal course load which allows time for such courses. High school students completed graduation requirements by the end of their junior year. The requirements are too light if a student can complete requirements in two years. Instead of offering courses for college credit, high schools should be ensuring that their own curricula result in every graduate's ability to read and comprehend at the 12th grade level (Dogan, 2005). This explosion of options for student to earn college credit in high school underscores our

progress in creating a seamless education system from kindergarten through college K-16 (Hoffman, 2003).

Legislators create dual-enrollment programs for well-intentioned reasons. Burns and Lewis (2000), and Orr (2002) concluded that dual-enrollment programs are designed to expand educational options for high-school students and save taxpayers millions of dollars as students take high school and college courses simultaneously. They believe the programs reduce college costs for students and their families by reducing the amount of time students spend in school. In addition, theoretically, financial incentives and scholarship extended to high-school students encourage broader participation in postsecondary programs and enhance overall access to higher education.

Summary

The concerns and criticisms of dual enrollment appear frequently and are of significant concern. Concerns ranging from rigor, to philosophical and financial have not been researched and have been left relatively unsubstantiated. Thoughtful research must occur to validate these programs. Too much is at stake to ride on assumptions and support benefits for the few who may have already realized higher education success without the dual enrollment opportunity.

Policy recommendations for program success

Morrison (2008b) identified five key policy recommendations that have been identified through national research and recommendations from major organizations:

1. Expand accelerated opportunities. While accelerated programs have grown in numbers they remain prototypes and are not sufficiently scaled up to reach later numbers of high school students who could benefit from the expansion.

Policymakers should provide high schools and their college partners' incentives for developing and implementing systemic accelerated programs as well as assure that each high school offers a minimum number of accelerated credits prior to high school graduation.

2. **Connect Acceleration to Workforce Development.** Career-technical education programs, requiring expensive advanced technology, often require the development and deployment of regional academies, leveraging the assets of community colleges and regional high schools. These career-technical education regional academies can serve as the backbone for workforce preparation and adult education re-training center. Policymakers should provide incentive and funding for the creation and deployment of accelerated regional academies.
3. **Connect Acceleration to Competitiveness Agenda.** Accelerated programs should be connected to the nation's competitiveness agenda, including economic development initiatives. Human capital development is the engine for success in a competitive global economy.
4. **Assure Seamless Transition.** To increase successful student transition from one level of education to the next, policymakers should assure that high school, community and four-year college curricula are aligned and integrated. Professional development opportunities for faculty and staff at all levels of the educational pipeline need to be integrated. Accelerated credits should readily be accepted for meeting two and four-year college graduation requirements.
5. **Improve Readiness.** Appropriate counseling and planning for successful experiences in accelerated programs must begin in eighth grade. All eighth grade students should complete a career and college plan outlining prerequisite courses for a successful outcome. Progress needs to be appropriately monitored and intervention strategies need to be developed and implemented.

The goals of most policies have stated that early option programs should continue to focus on providing challenging educational opportunities for high school students, improving the college preparation of all students, increasing the number of citizens who participate in some form of postsecondary education in order to ensure a trained, competitive workforce, accelerating the educational progress of student through postsecondary education, and fostering collaboration between high schools and college, resulting in reduced redundancy and ensuring a more seamless K-16 public educational system.

(Boswell, 2001b).

Hoffman (2003) suggested a focused area of research to address equity of access to such programs. Even though underrepresented students are taking greater advantage of postsecondary options while enroll in high school, these benefits remain unevenly distributed. Many underrepresented students are denied the opportunity to participate in such programs by the lack of rigorous curricula at the high schools they attend, lack of information about the many options for earning college credit that are currently available, and by substantial fees for participation in some states. Hoffman (2003) claimed that, “we need to know far more systematically than we now do what the barriers are for these students and how they can be overcome” (p. 48).

The diverse functions and purposes of dual enrollment programs in this country offers evidence to the flexibility of dual enrollment program on the whole; however, this makes accountability somewhat difficult. Each program must have unique performance objectives and a data driven method to measure progress towards those objectives (Burns & Lewis, 2000).

Summary

Policy makers are called to step back and reevaluate the intention of these programs. Evaluation needs to address if these programs be considered a band aid on high school deficiencies or as a means of easing the transition into college. The focus must be broad enough in scope to consider short- and long-term workforce needs.

Summary of Previous Research

A number of small scale studies over the past several years have suggested that students who take advantage of postsecondary options earn higher grades in college, require

less remediation, and have higher rates of persistence and retention. Nevertheless, the need for more reliable and comprehensive information on these programs and the students who participate in them is clear and increasingly urgent (Robertson, 2005). As dual-enrollment programs increase in popularity and demands for a limited pool of resources becomes great it becomes imperative to conduct more comprehensive studies.

Swanson (2008) used logistic regression to determine if participation in dual-enrollment programs experienced higher persistence and bachelor's degree attainment rates. Swanson's study revealed that participants in accelerated learning were more likely to enroll in college after high school graduation and complete a degree than non-accelerated students.

Jordan, Cavalluzzo, and Corallo (2006) found that a wide diversity of students with varying levels of achievement and motivation may benefit from dual enrollment from the dual enrollment experience, leaving these programs as a viable option for all students, not just the academically gifted. Some educators have argued that middle and low achieving high school students can benefit from dual enrollment programs (Bailey et al. 2002). In the view of the current researcher, this is the greatest benefit to dual enrollment programs. These programs can help reduce barriers to those students who may be underserved by the K-12 district.

According to Boswell (2001a), positive outcomes may include lower college costs for students and their families, accelerated progress toward a college degree, expanded postsecondary opportunities for nontraditional populations, and closer ties between community colleges and local high schools (Jordan et al., 2006). It seems a fairly obvious conclusion that the sooner a student begins a college education, the sooner he or she will complete. Additionally, with the high school paying the tuition expenses for the college

course there is a lower cost to students and their families. A recent study revealed that more than one fourth of the students who entered 4-year colleges and almost half who entered 2-year colleges never returned for their second year. Programs such as dual enrollment may help to reduce these numbers (Bailey et al., Jordan et al., 2006). Habitually, high school seniors will say their plans after high school include attending college. Dual-enrollment programs may help to improve retention of students to graduation. It may be a simple matter of discovery that the college experience is not suited for a particular student. It may also provide the opportunity for some students to experience success while still in their comfortable environment in high school. Dual-enrollment programs help to reduce the unrealistic goals of new college students which may increase the number who return for their second year. Students who do not persist in college cite non-academic factors as reasons, such as being overwhelmed by the new institution, they are not focused, or they had unrealistic expectations of the college experience as to why they dropped out (Bailey et al., 2002). By participating in dual-enrollment programs students may also learn that college is not fit for them, thus saving them the expense of the side stepping to education.

A serious methodological problem appears to exist in the population sample of some research that has been conducted. Many dual-enrollment programs maintain highly selective participation requirements, allowing only the academically gifted to participate (Bailey et al., 2002). This limitation does not provide for a clean comparison of success as those who perform well academically would be expected to have greater success than the typical group of students.

There is evidence that supports students' general satisfaction with dual-enrollment programs (Bailey et al., 2002). A follow-up study with dual enrollment completers at Salt

Lake Community College revealed that the majority of students responding to the survey believed their participation in dual enrollment encouraged them to further attend college (Peterson, Anjewierden, & Corser, 2001).

Analysis of the research conducted thus far has suggested positive outcomes for students by improving preparation for college, motivating students to take a more rigorous high school curriculum, increasing coursework options for students, and acclimating students to a college environment while still in high school (Bailey et al., 2002). If any or all the aforementioned positive outcomes hold true for high school seniors, dual-enrollment programs may lead to increased success among students who proceed to college and increased persistence rates among those who do.

Limitation of Previous Research

A significant amount of research has been conducted on high schools and community colleges as separate entities. Some has been published based on collaborative efforts between the two. Much of work published on dual-enrollment partnerships between community colleges and high schools has been more philosophical rather than rooted in solid research. Solid research which has been done has been conducted primarily in the Southern states, Florida in particular (Hunt & Carroll, 2006; Karp, Calcagno, Hughes, Jeong & Bailey, 2007).

The organization, curriculum standards, and academic performance of students differ among states. While some general assumptions may be drawn from the research conducted in other regions of the county, research should be conducted in the middle states as well.

Summary

Much literature has been published describing and articulating the challenges of dual enrollment programs. Little research has actually been conducted on the effectiveness of programs of this nature. Components of the program have appeared to be judged without looking at the total picture or providing qualitative results. High schools and community colleges were often studied as separate entities, but rarely the bridge between the two.

The current research study offers little to contribute to the larger, broadly scoped issues surrounding dual-enrollment programs. It will, however, provide NIACC with additional research on the effectiveness of its programs. In such, effectiveness correlates with enrollment at NIACC after high school graduation. Chapter 3 will address the methodology used in this study.

CHAPTER 3. METHODOLOGY

The purpose of this study was to analyze college graduation outcomes of students enrolled as postsecondary enrollment options (PSEO) students as part of the dual enrollment partnerships at NIACC. Accelerated student graduation outcomes were compared with students who did not participate in the program, controlling for variables identified in the literature review as affecting college graduation. Specifically, effects were controlled for gender, financial need, number of first-term credits completed, high school GPA, and ACT composite score. The accelerated students included in this study were enrolled in general education courses. This chapter outlines the methodology used to evaluate college graduation outcomes for accelerated and non-accelerated students while controlling for covariate variables.

Findings in the literature suggested that students who participate in accelerated programs experience increased enrollment and graduation rates to higher education institutions after high school graduation. Nevertheless, these were broad findings based on a relatively small body of research. With accelerated students encompassing 27.5% of NIACC's total enrollment it has become necessary to determine if acceleration improves college graduation outcomes, controlling for important covariates. The chapter is divided into five sections: Study Population, Research Design, Variables, Data Collection, Data Analysis (Logistic Regression).

Study Population

The population for this study was comprised of high school students from the nine county area that encompasses the boundaries of NIACC. Prior to conducting the research,

the design for this study was submitted to the Institutional Review Board at Iowa State University, which determined that this study did not involve human subjects and provided authorization to proceed with the study (see Appendix B).

This study specifically focused on PSEO students enrolled in general education courses. Excluded from the study were students enrolled in dual-enrollment courses associated with a specific career program. The study population included enrolled students during the academic years 1996-2007. The sample size was comprised of 6728 students.

Research Design

This study evaluated the graduation outcomes from NIACC for dual enrolled students, controlling for important covariates. The variables of the study are listed and described in Table 3.1. The dependent variable in the study was graduation from NIACC, a binary categorical variable. The independent variables were a mix of categorical and

Table 3.1. Dependent and independent variables

Variable Type	Label	Description
Dependent	deg 10	Graduated from NIACC Dummy coded: 1= Graduated with an associate degree 0= Did not graduate with an associate degree
Independent	hsgpa	High school grade point average. Reported from high school, 0 to 4.0 scale
	ftcredits	First term completed credits. College credits earned once fully matriculated at NIACC. Reported in semester hour units.
	need	Financial need (as determined by FAFSA)
	female	Student gender Female = 1; male = 0
	accel	Acceleration. Participated in acceleration, 1 = yes; 0 = no
	act_composite	ACT composite score

continuous variables. Categorical variables included in the study were participation in PSEO and gender. Continuous variables included were: the students' high school GPA, ACT composite score, number of first term credits completed after full enrollment at NIACC, and financial need based on federal financial aid guidelines.

With the ultimate goals of understanding and predicting NIACC gradation, from a number of predictor variables, both linear and logistic regression were considered as methods of analysis for this study. As the criterion variable was a dichotomous, dummy coded variable, linear regression was not the preferred statistical tool because, with the linear probability model, the predicted odds or probabilities of graduation are not constrained within the boundaries of 0 and 1 and standard errors are biased.

Logistic regression is most appropriate when the criterion variable is dichotomous as in this research. Logistic regression permits the calculation of odds and probabilities associated with the predictor variables of college graduation. It enables the researcher to hold for the dependent variable, graduation, as jointly independent of the predictors simultaneously in the logistic regression (Agresti, 2002).

Unless one may want to risk undertaking a linear probability model, the binary dependent variable, graduation, requires using a logistic regression for analysis. This is necessary to linearize the nonlinear relationship that exists between independent variables and the dichotomous dependent variable. The resulting model provides a prediction of the logged odds for the graduation event. The relationship between the predictor variables and the binary dependent variable is determined by noting the magnitude and direction of statistically significant logistic coefficients. However, logits (the natural log of the odds of the dependent variable occurring or not) and logistic coefficients are not intuitive and do not

provide an interpretation as straight forward as that of linear regression. In this way, logistic regression estimates the odds and probability of graduation occurring while controlling for predictor variables.

A clearer relationship of the effect of each variable can be illustrated by calculating the predicted probability. This is done by first exponentiating the logged odds and then deriving the probability from the odds. The operation of exponentiation raises a given constant (base) to the power of another (exponent) number, written as n^a . Probability is the result of determining the possibility that an event will occur and is expressed by the ratio of the number of actual occurrences to the total number of possible occurrences. For the purposes of this study using logistical regression provided the most practical and useful results.

Research Questions and Hypotheses

The following six research questions and hypotheses guided the direction of this research:

1. Compared to non-accelerated students, do accelerated students experience increased odds of graduation from NIACC?
 - a. H_1 : Accelerated students are more likely to graduate than non-accelerated students, controlling for all other covariates.
 - b. H_0 : $\beta_{\text{accel}} = 0$; Graduation is not dependent on acceleration.
2. Is there a difference in graduation odds based on gender
 - a. H_1 : Females have greater odds of graduation than males, controlling for all other covariates.

- b. $H_0: \beta_{\text{female}} = 0$; Graduation is not dependent on gender.
3. Does the need for financial aid have an impact on the odds of graduation?
- a. H_1 : Higher financial need is associated with lower odds of graduation, controlling for all other covariates.
 - b. $H_0: \beta_{\text{need}} = 0$; Graduation is not dependent on financial need.
4. Does the number of first term credits completed effect the odds of persisting to graduation from NIACC?
- a. H_1 : Higher first term credits completed are associated with higher odds of graduation, controlling for all other covariates.
 - b. $H_0: \beta_{\text{fcredits}} = 0$; Graduation is not dependent on first term credits completed.
5. Does high school GPA effect the odds of graduation?
- a. H_1 : Higher student grade point averages are associated with greater odds of graduation, controlling for all other covariates.
 - b. $H_0: \beta_{\text{hsgpa}} = 0$; Graduation is not dependent on high school GPA.
6. Does ACT composite score effect the odds of graduation?
- a. H_1 : Higher ACT composite scores are associated with higher odds of graduation, controlling for all other covariates.
 - b. $H_0: \beta_{\text{act_composite}} = 0$; Graduation is not dependent on ACT composite scores.

Variables

The dependent variable in this research was graduation from NIACC, a binary categorical variable. The independent variables were a mix of categorical and interval variables. Categorical variables included in the study were participation in dual enrollment and gender. Interval variables were: financial need based on federal financial aid guidelines, number of first term credits completed after matriculation at NIACC, high school GPA, and ACT composite score.

It was important to include gender as a variable to analyze results and determine if the accelerated program benefits one gender over the other. The research results could be beneficial in the design of support services if it is discovered that participation in acceleration programs favors one gender over the other.

The intention to include financial need was to address effects of socioeconomic position as best as possible. The inclusion of first term credits completed was done simply to determine the impact of student load on success. High school GPA and ACT composite scores were important variables to include to control for academic advantage. The obvious assumption holds that higher academic scores lead to increases in academic success, which is defined in this study as degree completion.

Data Collection

The data to answer the six primary objectives were collected from two sources. Data relating to dual enrollment participation, gender, the number of first term credits completed, high school GPA, and ACT composite were obtained from the NIACC management information system. The data pertaining to financial need were collected from NIACC

financial aid records. The data was collected by NIACC employees for Dr. Michael Morrison during his presidency at NIACC. He is in possession of the data set which served as the foundation of this research.

Data Analysis

As the dependent variable, graduation, is a binary categorical variable, logistic regression is “...the most important model for categorical response data” (Agresti, 2002, p. 165). Logistical regression applies maximum likelihood estimation after transforming the dependent into a logit variable (the natural log of the odds of the dependent variable occurring or not). In this way, logistic regression estimates the probability of graduation occurring while controlling for predictor variables.

Logistic regression

This section specifies the logistic regression model and provides equations for the calculation of odds or probabilities. The logistic regression model for the relationship between the dependent variable, graduation (Y), and the six independent variables is identified in equation 1.

$$\text{logit}(Y) = \alpha + \beta_1 \text{hsgpa} + \beta_2 \text{ftcredits} + \beta_3 \text{need} + \beta_4 \text{female} + \beta_5 \text{accel} + \beta_6 \text{act_composite} \quad [1]$$

where $\text{logit}(Y)$ is the natural logarithm of the graduation odds; α is the estimated intercept and β_i represent estimated logistic regression coefficients associated with each independent variable (Menard, 2002b). The main interest of this analysis lies in β_5 *accel*, the parameter linked to dual enrollment participation and its impact on degree attainment.

The logit(Y) can be converted to the odds by exponentiation, calculating the odds:

$Y = 1 = e^{\text{logit}(Y)}$ or, more specifically, in the longer form:

$$= e^{(\alpha + \beta_1 \text{hsgpa} + \beta_2 \text{ftcredits} + \beta_3 \text{need} + \beta_4 \text{female} + \beta_5 \text{accel} + \beta_6 \text{act_composite})} \quad [2]$$

An important implication of equation 2 is a change in one unit in a continuous independent variable multiplies the odds by e^β . If one is interested in the effect of c unit changes in the independent variable on Y then the formula is $e^{c\beta}$ (Menard, 2002).

The odds can be converted to the probability (P) that Y=1 by the following formula:

$$P(Y=1) = \frac{e^{(\alpha + \beta_1 \text{hsgpa} + \beta_2 \text{ftcredits} + \beta_3 \text{need} + \beta_4 \text{female} + \beta_5 \text{accel} + \beta_6 \text{act_composite})}}{1 + e^{(\alpha + \beta_1 \text{hsgpa} + \beta_2 \text{ftcredits} + \beta_3 \text{need} + \beta_4 \text{female} + \beta_5 \text{accel} + \beta_6 \text{act_composite})}}$$

Or, more simply stated:

$$P(Y=1) = \frac{\text{odds}}{(1 + \text{odds})} \quad [3]$$

If one knows the probability that Y=1 then an easy conversion to identify the odds is:

$$\text{Odds}(Y=1) = \frac{P}{(1-P)} \quad [4]$$

The logit (Y) has less intuitive appeal for interpretation so more attention is focused on interpreting odds or probabilities. The e^β coefficients (odds ratio) signal effect sizes of each of the variables in the model. The e^β coefficient for each independent dichotomous variable describes “the ratio of odds for the dummy variable group to the odds for the reference group” (Pampel, 2000, p. 23). For a quantitative/continuous variable, the e^β

coefficients equal a multiplicative factor by which the predicted odds change given a 1 unit increase in the predictor variable, holding constant all other covariates (Jaccard, 2001; Menard, 2002a). However, it is important to realize that probability, odds, and the logit are three different ways to express exactly the same thing, albeit in a different format (Menard, 2002a). Ordinary least squares is not an appropriate method to estimate the parameters in equation [1]. Instead, maximum likelihood techniques are applied to the logistic regression (Menard, 2002a).

Wald tests of significance and likelihood ratio tests are provided and interpreted. Measures of fit are addressed to determine how well the model fits the data. Odds or probabilities are utilized to interpret the effect of key predictor variables on graduation outcomes. To determine if the specified logistic model and the data violate key assumptions, regression diagnostic techniques are used to determine if there are any major problems with the model or the data.

Assumptions

Six assumptions were met to make valid the interpretations with logistical regression. The first is that logistic regression does not assume a linear relationship between the dependents and the independents. The conditional probabilities are a logistic function of the independent variables. In this particular study the probabilities are, indeed, a function of the independent variables as the dependent variable is dichotomous.

Second, the dependent variable need not be normally distributed (but does assume its distribution is within the range of the exponential family of distributions, such as normal,

Poisson, binomial, gamma). Solutions may be more stable if predictors have a multivariate normal distribution. The variables included in this research adhere to normal distribution.

Third, the dependent variable need not be homoscedastic for each level of the independents; that is, there is no homogeneity of variance assumption: variances need not be the same within categories. For this study population the standard residuals are evenly dispersed across observations, reducing concerns for heteroscedasticity

Fourth, the independent variables are measured without error. The Wald test conducted for this study concluded the independent variables were significant. An additional likelihood ratio test was performed with results also supporting significance.

Fifth, logistic regression does not require that the independents be interval, causing the observations to be independent. In this research project the observations are independent.

The final assumption is that logistic regression does not require that the independents be unbounded. (<http://faculty.chass.ncsu.edu/garson/PA765/logistic.htm>). This calls for the independent variables to not hold linear combinations of each other. This assumption is met through tests for multicollinearity.

All assumptions of logistic regression have been satisfied. From this, it was surmised all analysis are valid.

Summary

This chapter described the different phases of the study and the procedures that were used to analyze the data. The next chapter will provide an explanation of the findings that resulted from these various analyses.

CHAPTER 4. FINDINGS

The purpose of this study was to analyze the graduation outcomes of accelerated compared to non-accelerated students at NIACC. Accelerated programs, also referred to as dual enrollment and concurrent enrollment, provide an opportunity for high school students to earn both high school and college credit by enrolling in specified college courses. These programs provide high school students with the opportunity to experience the college atmosphere, get an early start on college classes, pay less towards their total college expenses, and supplement their high school coursework with a more rigorous curriculum. The primary objective of this research was to ascertain if graduation odds for accelerated students are greater than graduation odds for non-accelerated students, controlling for important covariates known to influence graduation.

This chapter presents the results of the data analysis using logistic regression. The processes used to validate data analysis are included. The chapter ends with succinct responses to the six research questions.

Characteristics of the Sample

Tables 4.1 provides descriptive statistics for the sample, providing general information about the size and characteristics of the study population. These data provide the broadest evaluation of the sample.

As noted in Table 4.1, the study group was comprised of 6728 subjects, with approximate equal representation of males and females. The need for financial assistance, as measured by federal FAFSA regulations, ranged from \$6,250 to \$48,196. Inclusion of the need variable helps to isolate socioeconomic factors which may preclude a student from

Table 4.1. Descriptive statistics of the sample

Variable	obs	Mean	Std. Dev.	Min	Max
deg10	6728	0.4722	0.4992	0	1
Need	6728	2322.94	3622.21	-6250	48196
Female	6728	0.5099	0.4999	0	1
Accel	6728	0.2002	0.4001	0	1
Ftcredits	6728	11.472	4.6066	2	24
Hsgpa	6728	2.9192	0.5734	0.991	4
act_compos~e	6728	19.892	3.772	6	33

attending college and subsequent graduation. To control for academic ability high school GPA and ACT composite scores were included in this study. The range of high school GPA was .991 to 4.00 with a mean of 2.91. The ACT composite scores ranged from 6 to 33 with a mean score of 19.89.

Tables 4.2 examines the sample by participation in accelerated programs = 1 or not = 0. A simple mean comparison depicts the mean for graduation is higher for students who participated in the accelerated program compared with non-accelerated students. Another

Table 4.2. Descriptive statistics for accelerated (1) and non-accelerated (0)

accel	variable	mean	p50	sd	min	max
0	need	2290.77	530	3617.41	-6250	48196
	female	0.48	0	0.5	0	1
	ftcredits	12.07	13	4.28	2	24
	hsgpa	2.87	2.89	0.58	0.99	4
	act_composite	19.67	19	3.77	6	32
	deg10	0.45	0	0.5	0	1
	1	need	2451.48	318	3639.84	-3640
female		0.62	1	0.49	0	1
ftcredits		9.07	10	5.07	2	19
hsgpa		3.13	3.18	0.51	1.28	4
act_composite		20.79	21	3.66	11	33
deg10		0.57	1	0.49	0	1

mean comparison demonstrates that more females than males participate in the accelerated program. The ranges for need, fulltime credits, high school GPA and ACT composite scores are smaller for those students who participated in dual enrollment.

Table 4.3 specifically addresses the sample based on gender; males = 0 and females = 1. Mean differences exist for all variables based on gender. Along with the higher participation rate, females over males, show higher mean need for financial assistance, have higher HSGPA and ACT composite scores. The mean fulltime credits for females is lower than males.

Table 4.3. Descriptive statistics based on gender

female	variable	mean	p50	sd	min	max
0	need	2051.74	166	3510.09	-5302	48196
	female	0.16	0	0.36	0	1
	ftcredits	11.99	13	4.36	2	24
	hsgpa	2.76	2.76	0.58	1.02	4
	act_composite	19.7	19	3.9	8	32
	deg10	0.41	0	0.49	0	1
1	need	2583.56	904	3708.65	-6250	32226
	female	0.24	0	0.43	0	1
	ftcredits	10.97	13	4.78	2	22
	hsgpa	3.07	3.1	0.52	0.99	4
	act_composite	20.08	20	3.64	6	33
	deg10	0.54	1	0.5	0	1

Results

Stata software was used for the logistic regression analysis. Six independent variables were predicted to have an effect on the dependent variable, graduation. Those variables and descriptions were presented in Table 3.4.

Utilizing maximum likelihood the process begins by estimating the parameters in the equation:

$$\text{logit}(Y) = \alpha + \beta_1 \text{hsgpa} + \beta_2 \text{ftcredits} + \beta_3 \text{need} + \beta_4 \text{female} + \beta_5 \text{accel} + \beta_6 \text{act_composite}.$$

The logistical regression analysis produced the parameter estimates represented in Table 4.4.

Table 4.4. Logistic regression coefficients

Deg10	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
hsgpa	1.087879	0.0621931	17.49	0.000	0.965983	1.209776
ftcredits	0.1099751	0.006201	17.74	0.000	0.097821	0.122129
need	-0.0000725	7.97E-06	-9.09	0.000	-8.8E-05	-5.7E-05
female	0.3753177	0.0558135	6.72	0.000	0.265925	0.48471
accel	0.6293403	0.070416	8.94	0.000	0.491328	0.767353
act_compos~e	-0.0267401	0.0086506	-3.09	0.002	-0.0437	-0.00979
_cons	-4.195352	0.1879954	-22.32	0.000	-4.56382	-3.82689
LR chi2(6)	=	1067.60; Prob > chi2	=	0.0000		
Pseudo R ²	=	0.1147; Log likelihood	=	-4119.2927		

The logit model is statistically significant. The reported likelihood-ratio (LR) tests that graduation (deg10), is jointly independent of the predictors simultaneously: $H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$. The LR test statistic of 1067.60 is chi-squared (χ^2) with 6 degrees of freedom and a p-value of 0.00. This demonstrates that at least one of the coefficients has an effect on deg10, graduation. Additionally, all predictor variables are statistically significant according to the Wald test, which equals the ratio of the coefficient (column 2) divided by its standard error (column 3) and in large samples follows a standard normal distribution.

However, Hosmer and Lemeshow (2000) reported Hauck and Donner (1977) found the Wald test aberrant, often failing to reject the null hypothesis when the coefficient was significant, resulting in a Type II error. They recommended the likelihood ratio test in lieu of

the Wald test. Jennings' (1986) analysis of the Wald test supported Hauck and Donner's (1977) findings. Menard (2002) reported a key disadvantage of the Wald test is that for large regression coefficients the estimated standard error is inflated, resulting in failure to reject the null hypothesis when the null hypothesis is false, a Type II error.

As an extra precaution to test the significance of each predictor variable a likelihood ratio (LR) test was performed to assure that each variable is a statistically significant predictor of graduation. The LR test requires the fitting of two models, whereas the Wald test requires fitting only one, unrestricted model. In order to conduct the LR test in this study the first step is to fit a full model (equation [1]) with all six predictor variables entered into the logistic regression. This produces a full model log likelihood (L_1). Then a variable of interest in the full model is dropped and the regression is run again, producing a restricted model likelihood (L_0). The difference between the two likelihoods is chi-square distributed with $df = k_1 - k_0$, where k equals the number of variables in the regression ($k_1 =$ full model; $k_0 =$ nested, restricted model). A significant LR test indicates the unrestricted model (the larger model) is an improvement over the restricted (smaller) model. Or, simply stated, the "dropped" variable is significantly different from zero and therefore the variable should be maintained in the regression, providing theory supports the variable's inclusion in the model (Agresti, 2002).

Table 4.5 provides a summary of the LR test applied to each predictor in the model; that is, the logistic regression model is calculated with and without the variable being tested. Each test reveals the predictor is statistically significant. As such, one finds additional support for inclusion of all variables in the model.

Table 4.5. Likelihood ratio test

Variable Tested:	Full Model Log Likelihood (L_1) Minus Nested Model Log Likelihood (L_0)	df	p
hsgpa	329.35	1	0.000
ftcredits	334.82	1	0.000
need	87.12	1	0.000
female	45.29	1	0.000
accel	81.49	1	0.000
act_composite	9.59	1	0.000

To determine goodness of fit of logistic models pseudo R^2 is calculated by Stata. Menard (2002) observed several people have tried to come up with the OLS equivalent of an R^2 measure for logistic regression. Not one of these measures seems to have yet achieved widespread acceptance (Hosmer & Lemeshow, 2000). McFaden's R^2 , known as the 'likelihood-ratio index', compares a model with all the parameters to a model with just the intercept (null model). The resulting ratio varies between 0 but can never exactly equal 1 (Long & Freese, 2006). Contrary to the interpretation of R^2 in OLS regression McFaden's R^2 does not explain the amount of variance accounted for by the independent variables (Colin & Trivedi, 2010). Pseudo R^2 is equal to .114. Low R^2 are the norm in logistic regression, presenting a problem to audiences accustomed to higher R^2 in linear regression models according to Hosmer and Lemeshow (2000). They do not recommend routine reporting of R^2 except as a tool in the model building stage. Given the ambiguity associated with pseudo R^2 measures, one may conservatively conclude that McFaden's R^2 in this study indicates an improvement in the model when compared to the null model.

Classification table

One intuitive method to summarize the goodness of fit of a logistic regression model is via a classification table. The basic concept of the classification table methodology is that if the model predicts group membership accurately according to some criterion then this presumably provides evidence that the model fits. Table 4.6 provides a classification table demonstrating the application of this methodology to the graduation logistic model.

Table 4.6 cites the number of correctly specified observations as 66.60%. In this case, 1077 observations are misclassified as 1 when the correct classification is 0 and 1170

Table 4.6. Classification

Classified	-----True-----		Total
	D	~D	
+	2007	1077	3084
-	1170	2474	3644
Total	3177	3551	6728

Classified + if predicted $\Pr(D) \geq .5$		
True D defined as $\text{deg}_{10} \neq 0$		
Sensitivity	$\Pr(+ D)$	63.17%
Specificity	$\Pr(- \sim D)$	69.67%
Positive predictive value	$\Pr(D +)$	65.08%
Negative predictive value	$\Pr(\sim D -)$	67.89%
False + rate for true ~D	$\Pr(+ \sim D)$	30.33%
False - rate for true D	$\Pr(- D)$	36.83%
False + rate for classified +	$\Pr(\sim D +)$	34.92%
False - rate for classified -	$\Pr(D -)$	32.11%
Correctly classified		66.60%

values are misclassified as 0 when the correct value is 1. The remaining 2007 + 2474 observations are correctly classified.

The ratio of 2007/3177, called the sensitivity measure, gives the fraction of observation with $y=1$ that are correctly specified. The ratio of 2474/3551, called the specificity measure, gives the fraction of observations with $y = 0$ that are correctly specified. This leaves the remaining ratio of 1170/3177 reported as false positives and 1077/3551 as false negative error rates.

The disadvantage of the classification table is that it collapses continuous predictive values into binary ones, the choice of cutoff is arbitrary, and it is highly sensitive to the relative number of times $\text{deg}10 = 1$ and $\text{deg}10 = 0$. The cutoff specifies the value for determining whether an observation has a predicted positive outcome. An observation is classified as positive if its predicted probability is greater than the cutoff. The default is 0.5 which was used in the above classification table.

Hosmer and Lemeshow (2000) were critical of the classification table as they demonstrated it is possible to have a scenario where the logistic regression model is in fact the correct model and thus fits, but classification is poor. They maintained a more complete description of classification accuracy is provided by the area under the ROC (Receiver Operating Characteristic) curve, which follows.

ROC curve

Another tool to summarize the predictive power of the logistic model is the ROC curve. It is more informative than the classification table as it summarizes predictive power for all possible cutoff values (Agresti, 2002). The ROC curve plots the probability of

detecting true signal and false signal for an entire range of cutoff points (Hosmer & Lemeshow, 2000). Utilizing Stata's postestimation `lroc` command produces the following ROC curve.

As shown in Figure 4.1, the greater the bulge in the ROC curve the greater the predictive power of the model. The area under the ROC curve, 0.72, is identical to another measure of predictive power, the concordance index, c (Agresti, 2002). If c equals 0.5, then there is no predictive ability associated with the model (predictions are no better than random guesses) and the ROC curve would be represented by a straight diagonal line connecting points (0,0) and (1,1). If c equals 1, then the model perfectly predicts graduation outcomes.

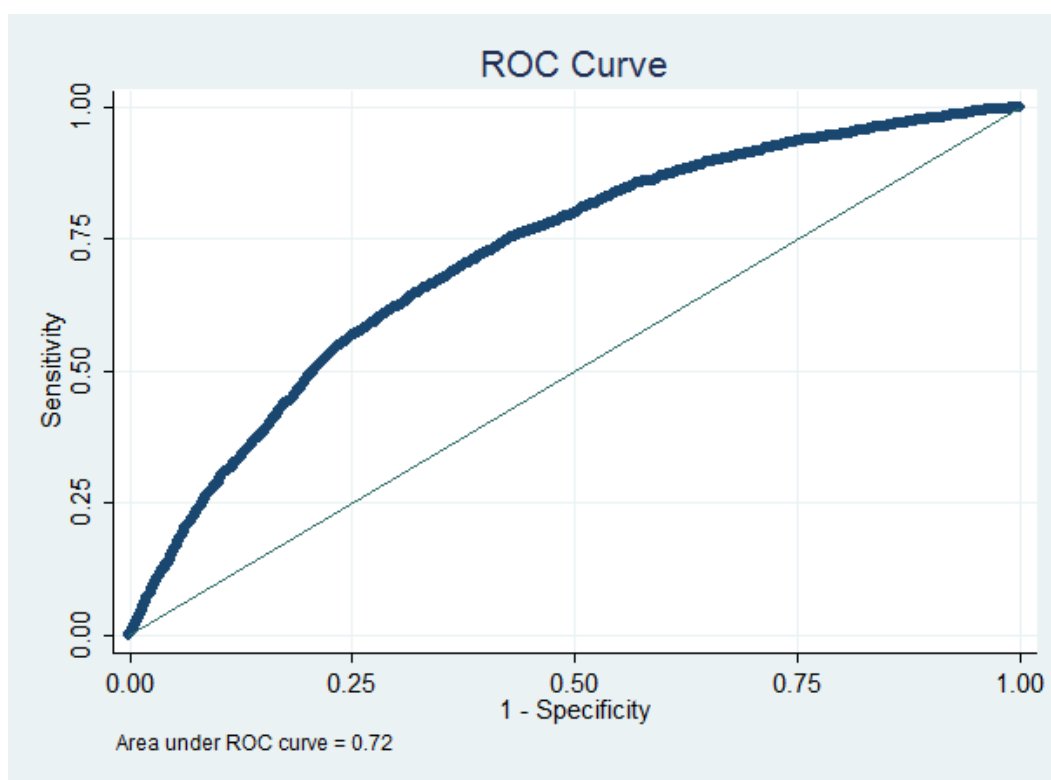


Figure 4.1. Receiver Operating Curve (ROC)

Hosmer and Lemeshow (2000) provided general rules for interpreting the discriminating ability of the ROC curve. Applying their general rules to $ROC = .72$ yields an acceptable discrimination ability of the model to correctly classify observations for all possible cutoff values. The model fits the data.

As a matter of due diligence, the Hosmer-Lemeshow (HL) statistic is provided as a final measure of “goodness of fit”. However, the ability of the Hosmer-Lemeshow test to detect true lack of fit has been called into question. Hosmer-Lemeshow goodness of fit reveals how closely the observed and predicted probabilities match. The null hypothesis is “the model fits” and a p value >0.05 is expected. However, as Chan (2004) observed:

Caution has to be exercised when using this test as it is dependent on the sample size of the data. For a small sample size, this test will likely indicate that the model fits and for a large dataset, even if the model fits, this test may “fail”.

The dataset utilized in this analysis is a large dataset and according to the HL statistic the model fails to fit the data ($p=.011$).

In this situation, Long and Freese (2006) suggested exploring the fit of the data with a lowess graph. The lowess graph in Figure 4.2 compares predicted the odds or probabilities to the moving average of the proportion of cases that are one. The dashed line depicts the fraction of observed cases that equal 1 at each level of the model’s predicted probability of observing a 1. The closer the dashed line is to the diagonal solid line, the better the fit of the model. The

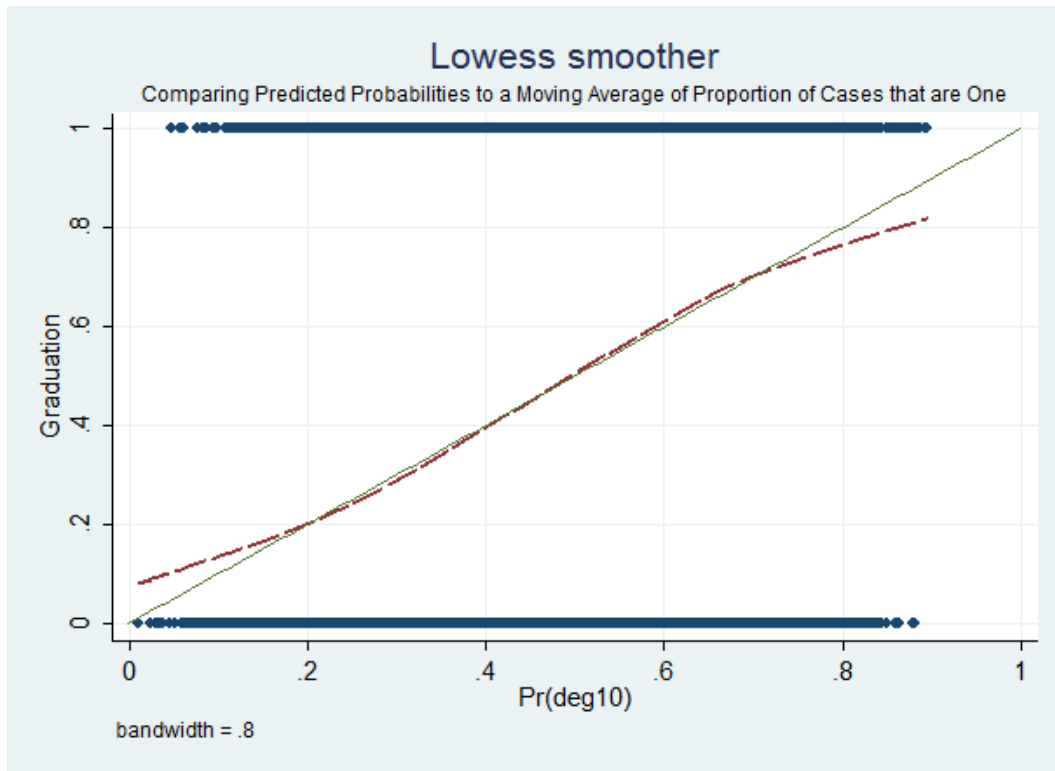


Figure 4.2. Lowess smoother

graph suggests the model fails at accurate predictions at the tails of the probability distribution.

The logistic model appears to fit quite well from .20 to just below .80 probability levels. Table 4.7 provides the odds ratios, p-values and confidence interval for each of the coefficients and will be analyzed by hypothesis.

The results show unpredicted results for ACT composite scores. Table 4.7 reflects an odds ratio of .973 for ACT. For each unit change in ACT score is associated with a decrease in the odds of graduation by a factor of .973, setting all other independent variables to their means. This odds ratio is close to 1.0 suggesting that there is very little change in graduation odds due to composite ACT score. At the 95% confidence level, the odds ratio for the

Table 4.7. Odds ratios

Deg10	Odds Ratio	Std. Err.	Z	P>z	[95% Conf. Interval]
hsgpa	2.967974	0.1845875	17.49	0.000	2.62737 3.352733
ftcredits	1.11625	0.0069219	17.74	0.000	1.102766 1.1299
need	0.9999275	7.97E-06	-9.09	0.000	0.999912 0.999943
female	1.455454	0.081234	6.72	0.000	1.304637 1.623704
accel	1.876372	0.1321266	8.94	0.000	1.634485 2.154057
act_compos~e	0.9736143	0.0084224	-3.09	0.002	0.957246 0.990263
LR chi2(6) = 986.57; Prob > chi2 = 0.0000					
Pseudo R2 = 0.1054					

composite ACT score falls between .957 and .990. The standard error of .0084 is low in relation to the odds ratio, increasing the confidence that the estimate prediction is accurate. The p-value of 0.002 technically supports rejection of the null hypothesis, albeit the hypothesis specified a direct relationship. However, the research hypothesis, “Higher ACT composite scores (act_composite) are associated with a higher likelihood of graduation, controlling for all other covariates,” is not supported. For all remaining variables the odds ratio supports the research hypothesis.

Interpretation using probabilities of graduation

The calculation of probabilities of graduation is another useful tool to evaluate the effects of the predictor variables on graduation. The predicted probability for graduation is calculated by applying the model for student with the following characteristics:

hsgpa: 2.75
ftcredits: 14
need: 500
female: 1
accel: 1
act_composite: 22

Using equation [1] one can insert the input characteristics into the equation:

$$\begin{aligned} \text{logit}(Y) &= \alpha + \beta_1 hsgpa + \beta_2 fcredits + \beta_3 need + \beta_4 female + \beta_5 accel + \beta_6 act_composite \\ &= -4.19 + 1.09(2.75) + 0.11(14) + (-.000073(500) + 0.37(1) + 0.63(1) + (-.0267(22)) = 0.716 \end{aligned}$$

The odds of graduation are given by

$$\text{Graduation} = 1 = e^{\text{logit}(\text{graduation})} = e^{0.716} = 2.06$$

Finally the probability of graduation for students with the given inputs is:

$$P(\text{Graduation}=1) = \frac{\text{odds}}{(1+\text{odds})} = \frac{2.06}{(1+2.06)} = .67$$

Thus, the expected graduation probability for students with the above profile is .67.

As the primary interest is in the effects of acceleration on graduation one can repeat the above exercise with accel set to 0 to assess the expected probability of graduation for non-accelerated students. The logit, odds and probability are 0.086, 1.09 and .52, respectively. Thus the probability of graduation = 1 for non-accelerated students with similar characteristics of accelerated students is .52. In this profile of students a decrease of .15 probability points on a probability scale (or a 22 percent decrease) is observed when accel is set to 1 and then to 0.

What if one wanted to know the effects of all the covariates on graduation probabilities for different “profile types” of students; for example, males and females by acceleration and non-acceleration at the 10th, 50th and 90th percentile for each continuous covariate? Fortunately, one does not have to do the manual calculations. Long and Freese (2006) provided a user written `Spout` command to do all the calculations in Stata. Graphing the outcome in Excel produced the following figure.

Figure 4.3 illustrates the probability of graduation for each identified profile type by gender and participation in an accelerated program. At each of the percentile levels regardless of gender, accelerated students have an increased probability of graduation. At each of the covariate percentile levels, comparing accelerated to non-accelerated, females have an increased probability of graduation. There is a marked impact of improved probabilities with acceleration for both genders at the 50th and 90th percentiles. Non-accelerated males at the 10th percentile experience the lowest probability of graduation. Females at the 90th percentile enjoy the highest graduation probabilities.

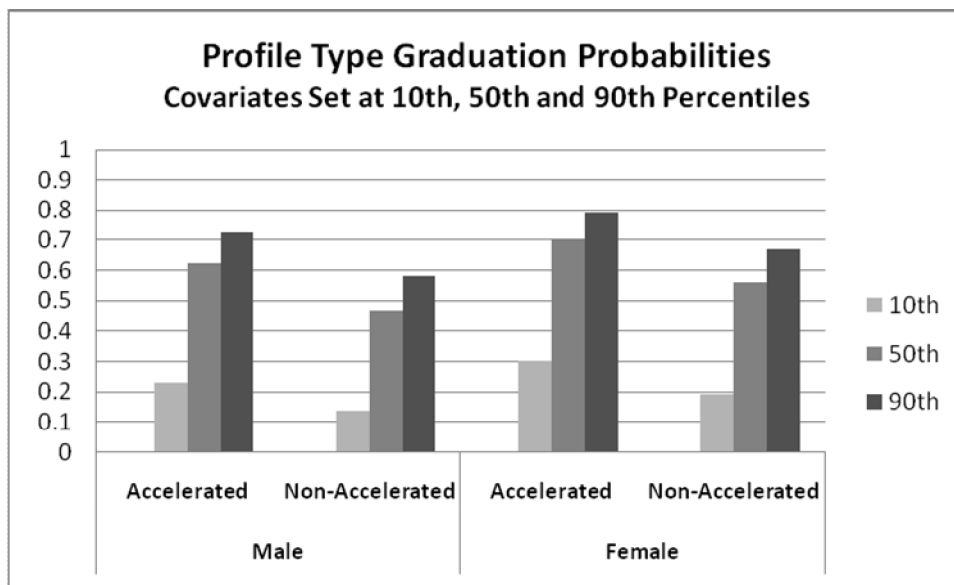


Figure 4.3. Graduation probabilities for gender and acceleration

With covariates set at their means, Figure 4.4 depicts the probability of graduation for accelerated students and non-accelerated students coupled with high school GPA. For both groups the probability of graduation increases as high school GPA increases. However, that effect is increased for accelerated students.

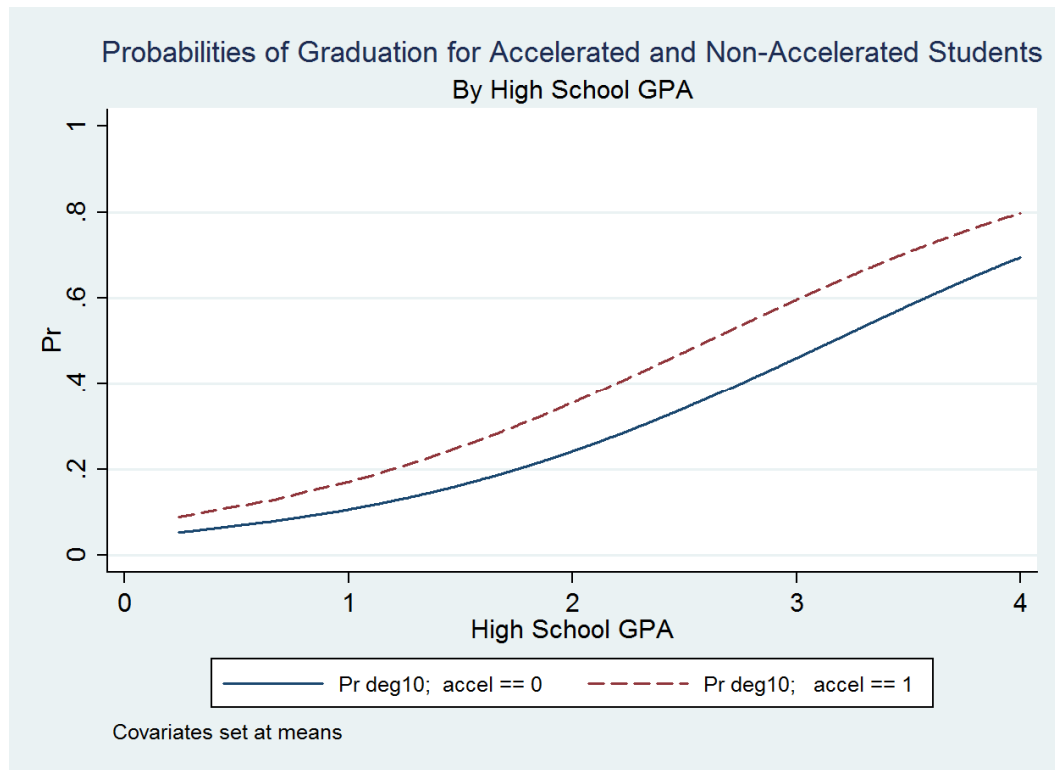


Figure 4.4. Graduation probabilities with high school GPA

The probabilities of graduation by gender with high school GPA in Figure 4.5 again demonstrates that for both genders there is an increased probability of graduation with improved GPA. At every level of high school grade point average females enjoy a distinct graduation advantage, all other covariates set at their means.

Figure 4.6 depicts the impact of high school GPA with the number of completed first term credits on the probability of graduation. With the covariates set at their means the

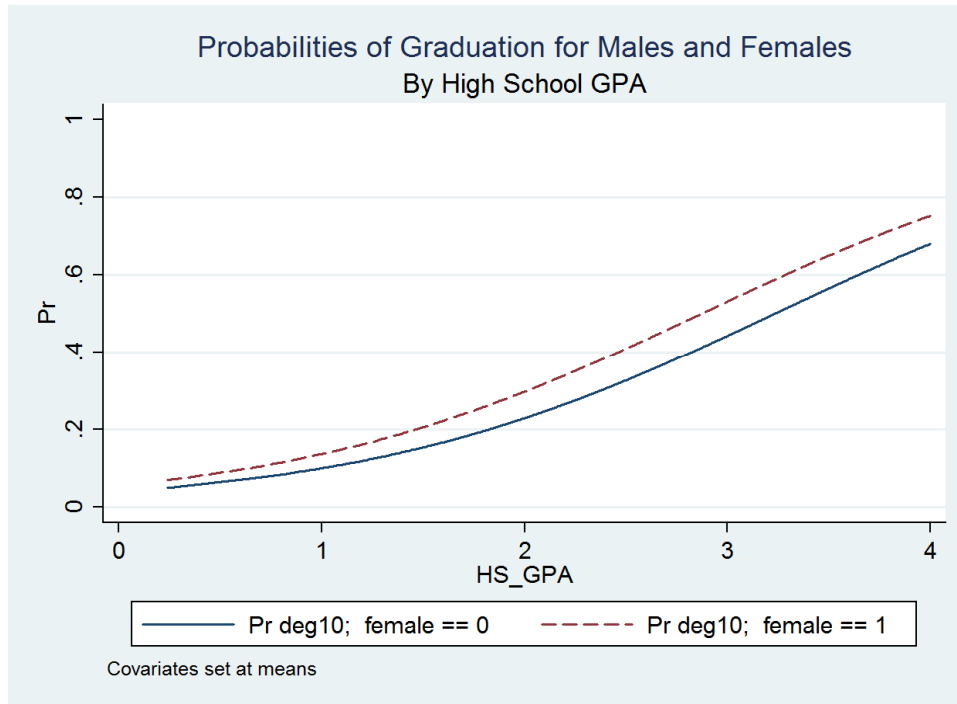


Figure 4.5. Graduation probabilities by gender and high school GPA

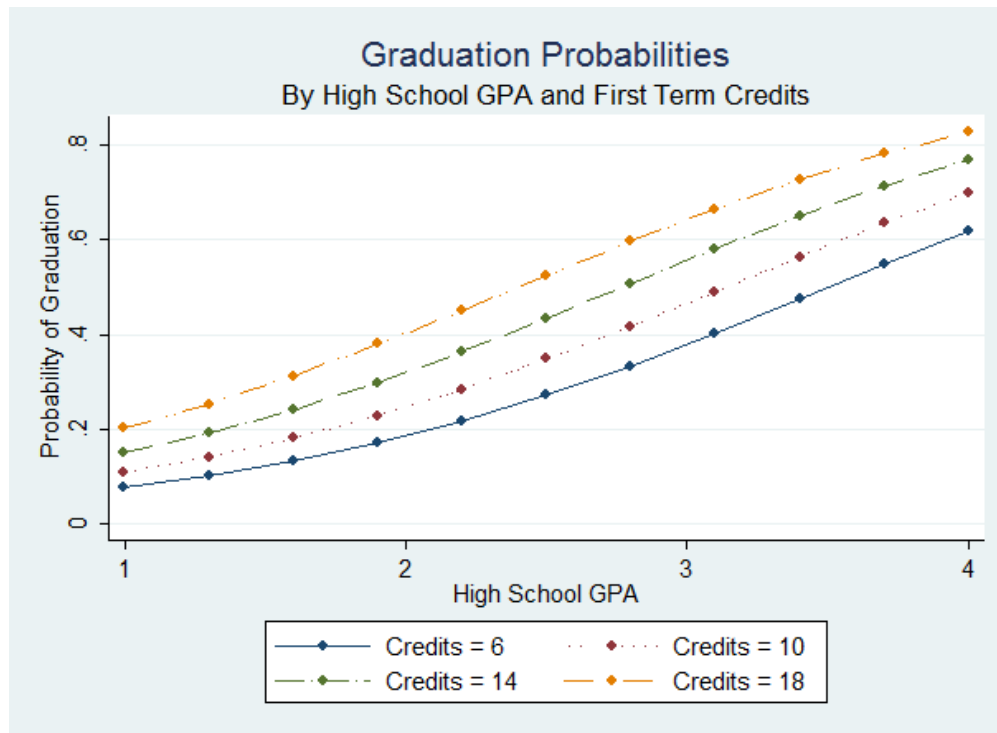


Figure 4.6. Graduation probabilities by high school GPA and completed first term credits

probability of graduation increases as high school GPA and number of completed first term credits increases. This finding supports previous findings in the literature that full-time status is among the best predictors of graduation.

Multicollinearity

Collinearity occurs when the predictor variables are correlated. When multicollinearity is severe the standard errors for the logistic regression coefficients tend to be inflated and sometimes the estimated coefficients can be highly unreliable (Chen et al., 2010). To detect multicollinearity a Stata program called collin is utilized, producing collinearity diagnostics among the predictor variables in Table 4.8.

Table 4.8. Collinearity diagnostics

Variable	VIF	SQRT VIF	Tolerance	R-squared
Hsgpa	1.65	1.28	0.6071	0.3929
Ftcredits	1.09	1.04	0.9165	0.0835
Need	1.02	1.01	0.9828	0.0172
Female	1.12	1.06	0.89	0.11
Accel	1.12	1.06	0.896	0.104
act_composite	1.5	1.22	0.6685	0.3315

Mean VIF = 1.25

Each measure in Table 4.8 measures the strength of the interrelationship among the predictor variables. Tolerance is calculated by $1 - R^2$ where R^2 is the amount of variance in an independent variable accounted for by the other independent variables in the model.

Tolerance varies from zero to one. Low tolerance values near zero indicate that most of the variance in an independent variable is explained by the other independent variables in the equation. High tolerance values near one mean that the variable is not highly associated with the other independent variables in the equation. A related measure, variance inflated

factor (VIF), defined as $1 - \text{tolerance}$ is an indicator of how much of the inflation of the standard error could be related to collinearity. Chen et al. (2010) stated a tolerance rule of thumb of 0.1 or less (equivalently VIF of 10 or greater) is a cause of concern. These tolerance statistics below this level indicate that any correlation between independent variables is not such that regression coefficients need to be questioned (Menard 2002, p. 76).

Table 4.8 shows that both measures of tolerance and VIF support the desired outcome that the independent variables in the logistic model are not highly associated with each other. The VIF statistic with the mean of 1.25 falls well below the point of concern of correlation between independent variables.

Regression Diagnostics

Pearson standardized residuals

Once a model is fitted it is customary to predict outcomes on the basis of the fitted equation. The difference between the prediction and the observed value is referred to as a residual. Violations of some assumptions (normal distribution for a large sample and zero mean) may have minor consequences (Menard 2002). This is not a concern for this study as the Pearson standardized residuals have a mean of $-.004$ and a standard deviation of $.998$.

Hosmer and Lemeshow (2000) indicated there are no fast rules to indicate which residuals are “large”. To identify possibly large residuals the following figure plots Pearson standardized residuals by the observation number. Long and Freese (2006:150) appeared to suggest that special attention should be applied to residuals greater than 2.5 and less than -2.5. Figure 4.7 indicates some residuals approach these values but all residuals are within the $+2.5$ and -2.5 . In addition, it is observed the standard residuals are evenly dispersed across

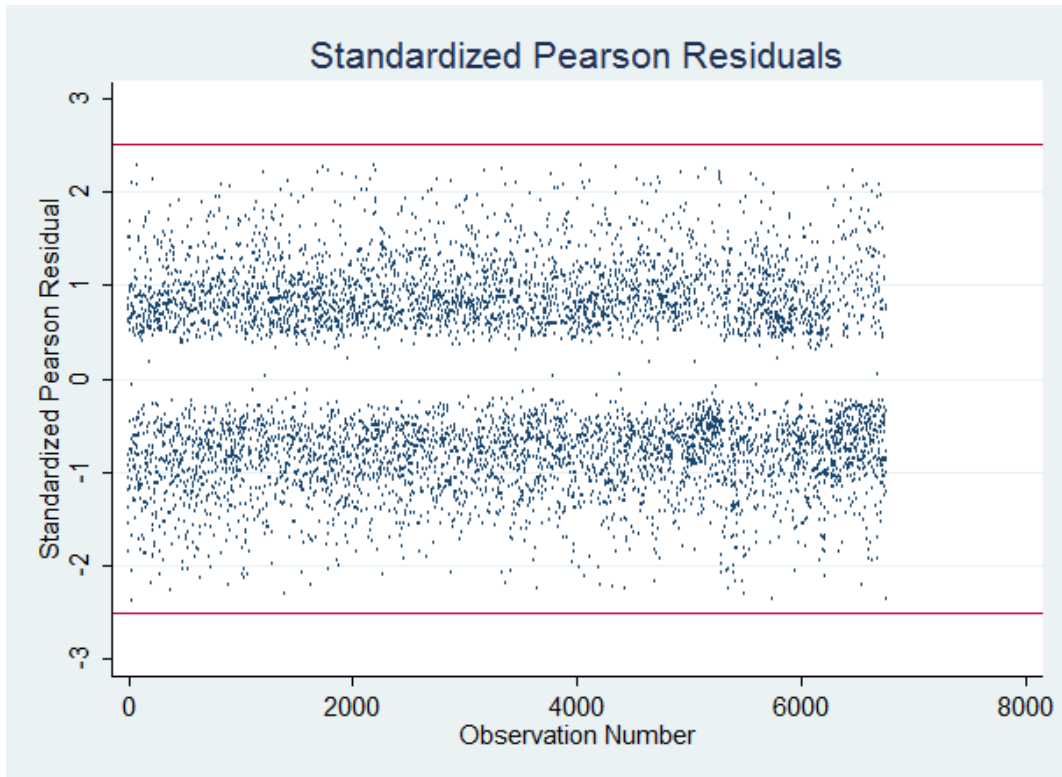


Figure 4.7 Residuals

observations, reducing concerns for heteroscedasticity, which if present, inflate standard errors and calls into question tests of significance.

Influential cases

To analyze cases that may have a strong influence on the estimated parameters Pregibon's (1981) dbeta values were generated and plotted. Pregibon's dbeta, a counterpart to Cook's distance in linear regression, is a measure of the influence of an observation. Influential points are often referred to as high leverage points. Pregibon's dbeta is a measure of how much all the other residuals would change if the i^{th} observation were deleted from the analysis. A lengthy process could be implemented by examining the change in the logistic coefficients that occur when the i^{th} observation is deleted. Fortunately, Pregibon

implemented an approximation that requires fitting the model only one time. Pregibon's dbeta is implemented in Stata through the predict postestimation command, producing the data utilized in Figure 4.8.

Hosmer and Lemeshow (2000) indicate that values larger than 1.0 require special attention. Calculated dbeta values are all below 1, indicating an absence of overly influential cases (Menard 2002: 85).

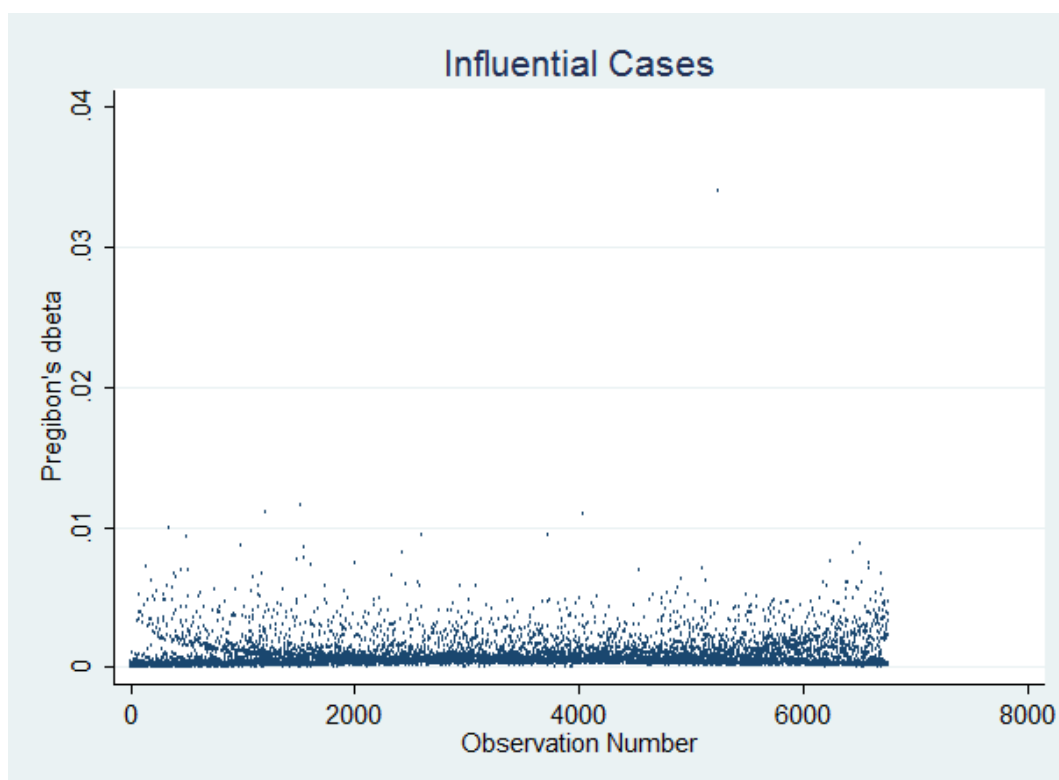


Figure 4.8. Influential cases

Hypotheses analysis

Null hypothesis 1: Graduation is not dependent on acceleration ($\beta_{5accel} = 0$)

Table 4.8 reflects an odds ratio of 1.88. Accelerated students have increased odds of graduating by a factor of 1.88 over non-accelerated students. At the 95% confidence level, the odds of dual enrollment participation impacting graduation fall between 1.63 and 2.15. The standard error of .132 is low in relation to the odds ratio, increasing the confidence that the estimate is accurate. The p -value of 0.00 supports rejection of the null hypothesis. Support for the research hypothesis, “Accelerated students (accel) are more likely to graduate than non-accelerated students, controlling for all other covariates.”

Null hypothesis 2: Graduation is not dependent on gender ($\beta_{4female} = 0$).

After controlling for all other independent variables, the effect of gender and college graduation is evident. Table 4.8 reflects an odds ratio of 1.46. Females have increased odds of graduating by a factor of 1.46 over male students with all other independent variables set at their means. Male graduation odds are the reciprocal of female graduation odds, .704 ($=1/1.46$), all other variables held constant. Male odds of graduation are .70 times smaller than female odds for graduation, all other variables held constant. At the 95% confidence level, the odds of gender impacting graduation fall between 1.30 and 1.62. The standard error of .081 is low in relation to the odds ratio, increasing the confidence that the prediction is accurate. The p -value of 0.00 supports rejection of the null hypothesis and in support of the research hypothesis that females have greater odds of graduation than males, controlling for all other covariates.

Null hypothesis 3: Graduation is not dependent on financial need. ($\beta_{3need} = 0$).

The financial need logistic coefficient, a proxy for socioeconomic status, in Table 4.5 is negative. Table 4.8 reflects an odds ratio of .999 associated with financial need. As the ratio is less than 1, the odds of graduation decrease by a factor of .999 as each unit of need increases, all other variables held constant. Each unit of financial aid was measured in dollars. What would be the impact on graduation odds if student financial needs increased by \$5,000, holding all covariates constant? The solution, ($=e^{(-0.0000725 \times 5000)} = .70$), indicates that the odds for graduation are .70 times smaller when financial aid need increases by \$5,000. This exercise demonstrates the inverse relationship between a positive graduation outcome and financial need. At the 95% confidence level, the odds ratio based on financial needs falls between .9999245 and .9999547. The standard error of 7.97e-06 is low, in relation to the odds ratio, increasing the confidence that the prediction is accurate. The p -value of 0.00 supports rejection of the null hypothesis. Support for the research hypothesis, “Higher financial need (need) is associated with lower odds of graduation, controlling for all other covariates” has been identified.

Null hypothesis 4: Graduation is not dependent on the number of first term credits completed ($\beta_{2ftercredits} = 0$).

After controlling for the influence of all other independent variables the effect of the number of first term credits completed is directly related to graduation. Table 4.8 reflects an odds ratio of 1.12. Setting all other independent variables to their means each unit of change in the number of first term credits completed increases the odds of graduation by a factor of 1.12. Holding all other variables constant an additional 3 first term credit hours completed increases the odds of graduation by a factor of 1.39 ($=e^{(.1099 \times 3)}$). At the 95% confidence level,

the odds ratio for first term credits falls between 1.10 and 1.13. The standard error of .0007 is extremely low in relation to the odds ratio, increasing the confidence that the prediction is accurate. The p -value of 0.00 supports rejection of the null hypothesis. Support for the research hypothesis, “Higher first term credits (fcredits) completed are associated with a higher odds of graduation, controlling for all other covariates” has been found.

Null hypothesis 5: Graduation is not dependent on high school GPA ($\beta_{1hsgpa} = 0$)

After controlling for the influence of all other independent variables the effect of high school GPA on college graduation is substantial. Table 4.8 reflects an odds ratio of 2.97. For each unit of change in high school GPA the odds of graduation are expected to change by a factor of 2.97, controlling for the influence of all other independent variables. At the 95% confidence level, the odds ratio for high school GPA falls between 2.63 and 3.35. The standard error of .184 is low in relation to the odds ratio, increasing the confidence that the prediction is accurate. The p -value of 0.00 supports rejection of the null hypothesis. Support for the research hypothesis, “Higher student grade point averages (hsgpa) are associated with a greater odds of graduation, controlling for all other covariates” has been found.

Null hypothesis 6: Graduation is not dependent on ACT composite score ($\beta_{6act_composite} = 0$).

The effect of composite ACT score and college graduation is weak and negative. The inverse relationship between ACT composite scores and graduation is an unexpected outcome, albeit the effect is weak and close to no relationship. Collinearity diagnostics were examined to determine if ACT composite scores were linearly related to the other covariates, accounting for the unexpected directional relationship. Collinearity was not a factor.

However, inspection of the correlation between graduation and ACT composite is very instructive. The point biserial correlation between graduation and act-composite is 0.1272 with $p = 0.0001$. Squaring the point biserial correlation is interpreted in the same manner as interpreting a squared Pearson correlation coefficient, revealing in this case only 1.44 percent of the amount of variance is shared between graduation and act_composite. This provides additional confidence that the weak relationship in the logit model is not an aberration of collinearity or suppression.

CHAPTER 5. SUMMARY, DISCUSSION, AND RECOMMENDATIONS

Summary

This study was carried out to ascertain if participation in accelerated programs helped students navigate the path to higher education and result in graduation. This was a quantitative study using logistic regression as the method of analysis. The analysis yielded results that not only support acceleration, but also identify important graduation predictor variables as well. Chapter 1 provided an introduction to dual enrollment/acceleration programs and identified why the need for further study is warranted.

Chapter 2 provided a summary of significant and relevant literature on the dual enrollment among community colleges in the nation. The purpose was to identify the most important issues relating to dual enrollment and make note of the most current research. Chapter 3 outlined the methodology used to evaluate college graduation outcomes for accelerated and non-accelerated students while holding for impacting variables. Chapter 4 provided detailed results of the logistic regression analysis and the supporting steps to determine model fit and the strength of the predictor variables. This chapter begins with a summary of the findings, conclusions, limitations of this research followed by recommendations for further study and practice.

Findings

The primary purpose of this study was to research the outcomes of accelerated students at NIACC in comparison with non-accelerated students. These findings ultimately concluded that participation in dual enrollment/accelerated programs did increase the odds of graduation from NIACC. In determining impact of acceleration other predictor variables

were held constant. While not the most significant predictor of graduation the results in this study show the finding remain relatively strong. Participation results in an increased odds of graduation of 1.88. These odds coupled with odds of 1.63 to 2.15 at the 95 % confidence interval make accelerated programs a powerful tool for increasing community college graduation rates. Again, the logistic regression model allows the researcher to hold and account for the effects of other predictors variables. However, it is interesting to note that the accelerated group had more females than males, higher mean high school GPA and less first term credits than the non-accelerated group. All of these previously listed predictor variables have an estimated positive effect on graduation.

For this study, gender was regarded as an independent predictor variable. Primarily, not only out of curiosity and information about this study population, but also to determine if gender, in relation to all predictors variables had an impact on graduation. The results showed that gender indeed had an impact of the odds of graduation.

Conclusions

It was contended that, while there remains issues of complexity in most dual-enrollment systems (transferability and rigor primarily), there is still potential for great benefits to come from this strategy (Windham, 2006). Higher education is different from other economic commodities. Postsecondary education is about more than dollars and cents. It does more than provide foot soldiers for the American economy. College educators also have cultural and political missions to ensure that there is an educated citizenry that can continue to defend and promote our democratic ideals (Carnevale & Desrochers, 2004).

Many programs require students to be academically successful prior to admission. In such cases, it is hardly surprising that dual enrollment students enroll in postsecondary education and have greater success there than a more typical group of students (Bailey, Hughes & Karp, 2002).

Limitations

The results of this study are not transferable to the other colleges. While these research results might be used as a comparison study with other colleges the results are best applicable to NIACC alone.

This study does not take into consideration the students' motivation and plans to attend college after graduation regardless of participation in an accelerated program. To isolate for effects of motivation a long term project should be developed to include a control group. This long range study might begin with survey of students' intentions to attend college beginning in the eighth grade and tracking these students through their academic careers. Since 2010, students in the eighth grade in Iowa have been required to prepare academic plans. This data could be used as the foundation of such a long range study.

Most certainly a students college experience and level of engagement has an effect on persistence and graduation rates. NIACC participates in the Community College Survey of Student Engagement. Survey results prove the assumption that increased engagement correlates with increased persistence and graduation. The level of student engagement is not accounted for in this research.

This research study did not account for race as a predictor variable. The minority population in the nine county service area of NIACC is small. Minority student participation

in accelerated learning opportunities is even smaller. The small sample size of minority students would have resulted in skewed results for the effect of race as a predictor variable to graduation.

The data set does not account for details of two predictor variables controlled for. The data for the ACT scores are reported with admissions materials. What is not known is when the score was earned or if the assessment was taken multiple times. The composition of the first term credits is not known. A great amount of variance may be present in the level of rigor of the first term credits. Community colleges offer a wide range of courses from developmental to advanced.

Finally, this research does not account for the location of participation in accelerated learning. Students in this study participated in community college courses offered in the high school and on the college campus. They are not differentiated from each other in the dataset.

Recommendations

The results of this research should serve as justification and rationale to continue to provide commitment to accelerated learning opportunities. More importantly to NIACC the results should be used to support the college completion agenda initiated by President Obama and endorsed the American Association of Community Colleges. These research results should be used to identify students at risk of not completing. An alert system should be developed to identify at risk students upon community college entry and services provided to them to increase their odds of successful completion.

States should continue to provide adequate and equitable funding for dual-enrollment programs. High schools and colleges should work together in sharing funding burden for

dually enrolled students to ensure that economically disadvantaged students will not be excluded from programs because of their inability to pay (Robertson, 2005).

Admissions requirements which currently exclude educationally disadvantaged students should be examined for inclusion. This population of students may stand the most to gain from dual enrollment programs (Robertson, 2005). The rapid growth and popularity of these programs have left them with little solid base in decision making in areas such as program design, arrangements for adequate funding, and regulation (Robertson, 2005).

Practice

The following recommendations for practice are based on the results of this study, limitations discovered in the literature review and conversations with professionals working in dual enrollment programs:

1. The study results showed participation in accelerated programs is a predictor of community college completion. Accelerated programs should be expanded to increase opportunities in the number and variety of coursework beyond general education. Options should include a connection to workforce needs, possibly through regional academies for technical education.
2. Lobbying efforts should begin calling for changes to the legislation regulating participation in accelerated programs. A good body of research exists in the progress taking place in other states on improvements in educational outcomes using dual enrollment to enhance developmental education. This research demonstrated a link of high school GPA to college graduation. Helping students to earn a higher high school GPA could lead to increased graduation and college completion rates.

3. Engaging students through early advising beginning in middle school could prove a promising method for increasing motivation to participate in accelerated opportunities.
4. The ultimate goal is student success. Support systems should be enhanced to ease the transition from high school to college. Intervention with at risk students should occur early in their academic careers.

Further study

The primary variable of this research was participation or not in accelerated learning. What is not known is the location of where the participation occurred. Further study is necessary to ascertain if difference in outcomes are evident when classes are taken in the high school or on the community college campus. While the coursework is consistent the student taking community college courses in the high school is missing the on campus college experience. The impact of the campus experience should be accounted for in future research.

This quantitative research would be enhanced by accounting for factors identified in the literature and practice which effect persistence and graduation. Most specifically those factors surrounding student engagement in the college experience. Ideally the students in this data set would be linked to their Community College Survey of Student Engagement responses. Due to the restricted confidentiality of student participation in the survey that is not possible. A smaller scale study should be conducted to include a survey results on student level of engagement.

An important aspect not accounted for in this research is a students motivation to attend college. A valuable addition to this research would be to gain an understanding of the impact of participation in accelerated learning in altering a students perception of themselves as college students. By participating in accelerated learning does this help students perceive themselves as college ready and motivated to complete? Additional qualitative research gathered through personal interviews would prove a valuable complement to this research.

The purpose of any research is to gain a better understanding of an issue and put into practice results to effect change. The results of this quantitative research would be improved if married with qualitative focus group work to better represent the voice of the accelerated student participant. To gain an understanding of what it means to the student and the effect on their decision to attend college or not would be a valuable compliment to these results. It is too easy to dismiss race for inclusion as a predictor variable due to small sample size. The focus group concept would provide an avenue to include the voice of the minority student participants.

Research on the outcomes of accelerated learning needs to take place on a statewide level. The study needs to be quantitative, apply logistic regression, and control for the variables of ACT composite score, community college budget, economic condition, gender, high school GPA, high school budget, motivation, and race. Some research has been conducted by separate entities and each controlling for different variables. A larger and more diverse pool needs to be analyzed. The results of which should be used to drive program development and allocation of state resources.

Final Thoughts

I began this research project with an existing underlying belief in accelerated learning and the community college system. The statistical analysis of this research supports the viability of accelerated learning to increase the odds of community college graduation. My belief is now grounded in founded knowledge. It is a frustration in this current political environment that proven educational opportunities continue to be heavily scrutinized. Validation of any programming should occur, but accelerated learning in Iowa has been scrutinized and unsupported to the point of its downfall.

I have found the readings on the use of accelerated learning as an avenue for developmental education most intriguing. Whether they prove to help a student graduate from high school, complete college or something in between it really does not matter if it increases student success. Community Colleges are suited and equipped to assist high schools in developmental education offerings.

In conducting this research I have found a renewed passion for accelerated learning and the breadth of opportunities that can be arranged through the community college. The basic premise of accelerated learning is a living testament to the mission of the community college.

APPENDIX A. HUMAN SUBJECTS APPROVAL

PART K: REGISTRY PROJECTS

26. To be considered a registry: (1) the individuals must have a common condition or demonstrate common responses to questions; (2) the individuals in the registry might be contacted in the future; and (3) the names/data of the individuals in the registry might be used by investigators other than the one maintaining the registry.

Yes No Does this project establish a registry?

If "yes," please provide the registry name below.

Checklist for Attachments

Listed below are the types of documents that should be submitted for IRB review. Please check **and attach** the documents that are applicable for your study:

- A copy of the informed consent document **OR** Letter of introduction containing the elements of consent
- A copy of the assent form if minors will be enrolled
- Letter of approval from cooperating organizations or institutions allowing you to conduct research at their facility
- Data-gathering instruments (including surveys)
- Recruitment fliers, phone scripts, or any other documents or materials participants will see or hear

The original signed copy of the application form and one set of accompanying materials should be submitted for review. **Federal regulations require that one copy of the grant application or proposal be submitted for comparison with the application for approval.**

FOR IRB USE ONLY:

Action by the Institutional Review Board (IRB):

- Project approved. Date: _____
- Project is exempt. Date: _____
- Project not approved. Date: _____
- IRB approval is not required. Date: 10/5/09
- Project is not research according to the federal definition.
- Project does not include human subjects as defined by the federal regulations.

IRB Approval Signature Kerry A Agnito

Date October 5, 2009



APPENDIX B. PSEO STUDENT APPLICATION FORM

High School Student Application / Registration Form



Fax or mail completed form to:
North Iowa Area Community College
School Partnerships Office
500 College Drive
Mason City, IA 50401
Fax: 641-422-4244

Please use black or blue ink. This registration form does not guarantee course enrollment. College level Math and English courses require ACT or COMPASS scores. Required scores must be on file in the Admission's Office to process this registration. A new form must be completed for each term.

PERSONAL INFORMATION Today's date _____

Name _____
Last First (legal) Middle

Address _____
Number/Street City State Zip Code

Home Phone () _____ Cell Phone () _____

E-mail Address (required) _____

Social Security Number _____ - _____ - _____ Birth Date _____ Gender Male Female

Are you an Iowa resident? Yes No

ETHNIC INFORMATION (optional)

Do you consider yourself to be Hispanic/Latino? Yes No

In addition, select one or more of the following racial categories to describe yourself:

- American Indian/Alaskan Native Asian Black or African American Native Hawaiian/Pacific Islander White

ACADEMIC INFORMATION

High School _____ Current Grade Level _____

Possible College Major _____ Anticipated HS Graduation _____
(month/year)

ENROLLMENT INFORMATION

Term beginning: Year _____ August (Fall) January (Spring) May Program Code _____ (NIACC Completes)

	Type of Class*	Course Name	Course Number	Section	Credits
*See Reverse for Description of "Type of Class"	<input type="checkbox"/> Concurrent <input type="checkbox"/> Self-pay <input type="checkbox"/> PSEO				
	<input type="checkbox"/> Concurrent <input type="checkbox"/> Self-pay <input type="checkbox"/> PSEO				
	<input type="checkbox"/> Concurrent <input type="checkbox"/> Self-pay <input type="checkbox"/> PSEO				
	<input type="checkbox"/> Concurrent <input type="checkbox"/> Self-pay <input type="checkbox"/> PSEO				

Family Educational Rights and Privacy Act (FERPA)

I hereby authorize NIACC to release information pertaining to test results, school performance, grades (may include unofficial transcripts), attendance records, evaluation, and personal information to my high school and parent/guardian.

Student Signature _____ Date _____

Authorized H.S. Official Signature _____ Date _____

PSEO Course(s) Only

Please read: **281—IAC 22.3** requires that a student who anticipates enrollment under the Postsecondary Enrollment Act must inform the school district of the intent to participate and that the school district shall inform their students of the availability of the opportunity provided by the Act. **281—IAC 22.6** requires the pupil, if over eighteen years of age, or pupil's parent, guardian, or custodian to reimburse the school district for all costs directly related to all incomplete and non-credit course work. In addition, materials that become the property of the students will be charged. An eligible postsecondary institution should make pro-rata adjustments to tuition reimbursement based upon federal guidelines established pursuant to **20 U.S.C. § 1091b**. The textbook cost is included in the \$250 PSEO tuition. Textbooks are property of NIACC and must be returned to NIACC at the completion of the course. Student assumes the cost of damaged textbook(s) and/or failure to return textbook(s).
I/We are aware that the above named student is enrolling in postsecondary courses.

Student Signature _____ Date _____

Parent Signature _____ Date _____
Parent/guardian signature if student is not 18 years of age



TYPE OF CLASS DEFINITIONS**Concurrent Enrollment**

This box should be checked for contracted or career academy classes in which the local school district has an approved contract with the community college for specific courses in which the student wishes to enroll. The student's high school counselor and/or principal should know which courses have been requested under contract agreements with the college.

PSEO (Post Secondary Enrollment Option)

This box should be checked for NIACC on campus or online courses. The high school has given approval for the student to enroll in the course and the school district agrees to pay up to \$250 of the associated costs. Any costs exceeding \$250 are paid by the community college. If the student withdraws or fails the course, the student or the student's parent/guardian pays all associated course costs.

Self-Pay

This box should be checked if the high school has given approval for the student to enroll in the course, as long as the student pays the tuition, fees and other associated costs such as books, etc. A student may choose to "self-pay" for additional credits beyond the 23 credits that a school district may receive supplemental weighting. All expenses are the responsibility of the student and his/her parent/guardian. Students choosing to "Self Pay" must also sign a NIACC payment agreement before the registration will be processed.

REFERENCES

- Adelman, C. (1999). Answers in the tool box: Academic intensity, attendance patterns, and bachelor's degree attainment. Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.
- Agresti A. (2002) *Categorical data analysis* (2nd edition). New York: Wiley.
- Alon, S. (2005). Model mis-specification in assessing the impact of financial aid on academic outcomes. *Research in Higher Education*, 46(1), 109-125.
- American Association of State College and Universities. (2002) The open door: Assessing the promise and problems of dual enrollment. Washington, DC: *State Policy Briefing*, 1(1).
- Amey, M., Eddy, P., & Campbell, T. (2010). Crossing boundaries creating community college partnerships to promote educational transitions. *Community College Review*, 37(4), 333-347.
- Andrews, H. (2000, December/2001, January). The dual-credit explosion at Illinois community colleges. *Community College Journal*, 12-16.
- Azinger, A. (2000). A K-12 perspective on partnerships with community colleges. San Francisco: Jossey-Bass. *New Directions for Community Colleges*, 111:17-21.
- Bailey, T., & Karp, M. (2003). Promoting college access and success: A review of credit-based transition programs. Washington, DC: U.S. Department of Education, Office of Vocational and Adult Education.
- Bailey, T., & Karp, M. (2004, December/2005, January). Expanding the reach of dual-enrollment. *Community College Journal*, 8-11.
- Bailey, T., Hughes, K., & Karp, M. (2002). What role can dual enrollment programs play in easing the transition between high school and postsecondary education? New York: Columbia University. Community College Research Center Teacher College.
- Bailey, T., Hughes, K., & Karp, M. (2003). Dual enrollment programs: Easing transitions from high school to college. New York: Columbia University, *Community College Research Center Teacher College*, 17.
- Barnett, E., & Stamm, L. (2010). Dual enrollment: A strategy for educational advancement of all students. Blackboard Institute: www.blackboardinstitute.com
- Barton, P. (2002). The closing of the educational frontier. Princeton, NJ: Educational Testing Service.

- Boswell, K. (2001a). Dual enrollment programs: Accessing the American dream. *Update on Research and Leadership*, 13(1).
- Boswell, K. (2001b). State policy and postsecondary enrollment options: Creating seamless systems. In P. F. Robertson, B. G. Chapman, & F. Gaskin (Eds.), *Systems for offering concurrent enrollment at high schools and community colleges. New Directions for Community Colleges*, 113, 7-14. San Francisco: Jossey-Bass.
- Buchmann, C., & DiPrete, T. (2006). The growing female advantage in college completion: The role of family background and academic achievement. *American Sociological Review*, 71(4), 515-541.
- Burdman, P. (2005). *The student debt dilemma: Debt aversion as a barrier to college access*. University of California at Berkeley, Center for Studies in Higher Education.
- Burns, H., & Lewis, B. (2000). Dual-enrolled students' perception of the effect of classroom environment on educational experience. *Qualitative Report*, 4(1 & 2).
- Callan, P., Finney, J., Kirst, M., Usdan, M., & Venezia, A. (2006, March). Claiming common ground: State policymaking for improving college readiness and success. San Jose, CA: The National Center for Public Policy and Higher Education.
- Carnevale, A & Desrochers, D. (2004). Why learning? The value of higher education to society and the individual. Keeping America's Promise. A joint publication of Education Commission of the States and League of Innovation in the Community College. Education Commission of the States, 39-45.
- Catron, R. (2001). Dual enrollment in Virginia. In P.F. Robertson, B.G. Chapman, & F. Gaskin (Eds.). *Systems for offering concurrent enrollment at high schools and community colleges. New Directions for Community Colleges*, 113; 51-58. San Francisco: Jossey-Bass.
- Chan, Y. H. (2004). Biostatistics 201: Linear regression analysis. *Singapore Medical Journal*, 45:55-61.
- Chapman, B. (2001). A model for implementing a concurrent enrollment program. In P. F. Robertson, B. G. Chapman, & F. Gaskin (Eds.). *Systems for offering concurrent enrollment at high schools and community colleges. New Directions for Community Colleges*, 113, 15-22. San Francisco: Jossey-Bass.
- Cheng, D., & Reed, M. (2010). The project on student dept. The Institute for College Access and Success. Retrieved September 19, 2011, from <http://projectionstudentdept.org>
- Clark, R.W. (2001). Dual credit: A report of program and policies that offer high school students college credit. Philadelphia, PA: Pew Charitable Trusts.
- Code of Iowa (2010). Des Moines: Iowa Department of Education.

- Colin, C. A. & Trivedi, P. K. (2010). *Microeconometrics using Stata*. College Station, TX: Stata Press.
- Community College Week*. (2008). Iowa dual enrollment advocates touts return on investment, *20*(13), 15.
- Dooley, S. (2011). Does earning college credit during high school prepare students? *Des Moines Register*, June 8, A1.
- Dougan, C. (2005). The pitfalls of college course for high school students. *Chronicle of Higher Education*, *52*(10) B20.
- Education Commission of the States Center for Community College Policy. (2001). Postsecondary options: Dual/concurrent enrollment. Retrieved October, 2007, from <http://www.wcs.org>
- Eimers, M., & Mullen, R. (2003). *Dual credit and advanced placement: Do they help prepare students for success in college?* Paper presented at the 43rd Annual AIR Fall Conference on May, 20, Tampa, FL.
- Fincher-Ford, M. (1996). *High school students earning college credit: A guide to creating dual-credit programs*. Thousand Oaks, CA: Jossey Bass.
- Folly, L. (2007, October). Making high school reform work. *American School Board Journal*, 32-34.
- Galloway, J. (1994). Dual enrollment gets students where they want to go-only faster. *Vocational Educational Journal*, *68*, 13.
- Gomez, G. (2001). Sources and information: Creating effective collaboration between high schools and community colleges. In P. F. Robertson, B. G. Chapman, & F. Gaskin (Eds.), *Systems for offering concurrent enrollment at high schools and community colleges*. *New Directions for Community Colleges*, *113*, 81-86.22. San Francisco: Jossey-Bass.
- Grossman, M., & Kaestner, R. (1997). Effects of education on health. In J.R. Behrman & N. Stacey (Eds.), *The social benefits of education*. Ann Arbor: University of Michigan Press.
- Hanson, S. (2001). *Annual progress report: Running start*. Olympia, WA: Washington State Board for Community and Technical Colleges.
- Helfgot, S. (2001). Concurrent enrollment and more: Elements of a successful partnership. In P. F. Robertson, B. G. Chapman, & F. Gaskin (Eds.), *Systems for offering concurrent enrollment at high schools and community colleges*. *New Directions for Community Colleges*, *113*, 43-49. San Francisco: Jossey-Bass.

- Hoffman, N. (2005). Add and subtract: dual enrollment as a state strategy to increase postsecondary success for underrepresented students. *Jobs for the Future*, p. 9.
- Hoffman, N. (2003, July/August). College credit in high school: Increasing college attainment rates for underrepresented students. *Change*, 43-48.
- Hoffman, N., Vargas, J., & Santos, J. (2009). New directions for dual enrollment: Creating stronger pathways from high school through college. *New Directions for Community College*, 145, 43-58. San Francisco: Jossey-Bass.
- Hosmer, D. W., & Lemeshow, S. (2000). *Applied logistic regression*. New York: John Wiley & Sons, Inc.
- Hunt, E., & Carroll, C. (2006). Florida's dual enrollment initiative: How state policy influences community colleges' service to underrepresented youth. *New Directions for Community Colleges*, 135, 39-47.
- Iowa Department of Education (2008). House file 2527 report to the legislature.
- Iowa Department of Education (2009). Joint enrollment report.
- Iowa Department of Education (2010). Joint enrollment report.
- Jaccard, J. (2001). *Interactive effects in logistic regression*. Thousand Oaks, CA: Sage University Papers Series on Quantitative Applications in the Social Science, 07-135.
- Jeffrey, J. (2007). Presentation at the Iowa Educational Research and Assessment State Conference, Des Moines.
- Jennings, D. E. (1986). Judging inference adequacy in logistic regression. *Journal of the American Statistical Association*, 81, 471-476.
- Jordan, T. (2001). Dual enrollment options: Columbus state community college model for successful implementation. In P. F. Robertson, B. G. Chapman, & F. Gaskin (Eds.), *Systems for offering concurrent enrollment at high schools and community colleges*. *New Directions for Community Colleges*, 113, 73-80. San Francisco: Jossey-Bass.
- Jordan, W., Cavalluzzo, L., & Corallo, C. (2006). Community college and high school reform: Lessons from five case studies. *Community College Journal of Research and Practice*, 30, 729-749.
- Karp, M., Calcagno, J., Hughes, K., Jeong, D., & Bailey, T. (2007). The postsecondary achievement of participants in dual enrollment: An analysis of student outcomes in two states. Olympia, WA: The Community College Research Center.
- Kiplinger Letter. (2009). *Kiplinger Washington Editors*, 86(51).

- Klein, A. (2007). Acceleration under review. *Education Week* 26(44): 22. In J. R. Behrman & N. Stacey (Eds.), *The social benefits of education*. Ann Arbor: University of Michigan Press.
- Krueger, C. (2006, March). Dual enrollment: Policy issues confronting state policymakers. Policy Brief, Denver, CO: Education Commission of the States.
- Long, J. S., & Freese, J. (2006). *Regression models for categorical dependent variables using stata*. College Station, TX: Strata Press.
- Lotkowski, V., Robbins, S., & Noeth, R. (2004). The role of academic and non-academic factors in improving college retention. Iowa City: ACT policy report.
- Menard, S. (2002). *Applied logistic regression analysis*. Thousand Oaks, CA: Sage University Papers Series on Quantitative Applications in the Social Science, 07-106.
- Menard, S. (2002). *Applied logistic regression analysis* (2nd ed.). Thousand Oaks, CA: Sage Publication.
- Morrison, M. (2005). *College placement educational opportunities for high school students*. Mason City, IA: NIACC President's Report.
- Morrison, M. (2007). *The benefits of acceleration: An outcomes analysis of dual enrollment*. Mason City, IA: NIACC.
- Morrison, M. (2008a). North Iowa Area Community College press release. January 31.
- Morrison, M. (2008b). The strategic value of dual enrollment programs. *Techniques*, October.
- Morrison, M. (2008c). *The educational attainment crisis of males*. Mason City, IA: NIACC.
- National Alliance of Concurrent Enrollment Partnerships (2007). Benefits to concurrent enrollment. Retrieved September, 2007, from http://www.nacp.org/about_benefits.html
- National Alliance of Concurrent Enrollment Partnerships (2010). Winter Newsletter.
- National Alliance of Concurrent Enrollment Partnerships (2011). Website. Retrieved July 13, 2011.
- National Center for Educational Statistics (2001). *The condition of education 2001*. Washington, DC: U.S. Department of Education.
- National Commission on the High School Senior Year (2001). *Raising our sights: No high school senior left behind*. Princeton, NJ: Woodrow Wilson National Fellowship Foundation.

- Nora, A., & Cabrera, A. F. (1996, March/April). The role of perceptions of prejudice and discrimination on the adjustment of minority student to college. *Journal of Higher Education*, 67(2), 119-148.
- Orr, M. (2002, January 25). Dual enrollment: Developments, trends and impacts. Presentation to the Community College Research Center, Teachers college, Columbia University, New York, NY.
- Peltier, G., Laden, R., Matranga, M. (1999). Student persistence in college: A review of research. *Journal College Student Retention*, 1(4): 357-375. Amityville, NY: Baywood Publishing Co., Inc.
- Pekow, C. (2005). High-schoolers well represented on community College campuses. *Black Issues in Higher Education*, 22(9), 7.
- Peterson, M., Anjewierden, J., & Corser, C. (2001). Designing an effective concurrent enrollment program. In P. F. Robertson, B. G. Chapman, & F. Gaskin (Eds.), *Systems for offering concurrent enrollment at high schools and community colleges*. *New Directions for Community Colleges*, 113, 23-31. San Francisco: Jossey-Bass.
- Phelan, D. (2000, February). Enrollment policies and student access at community colleges. Denver, CO. Education Commission of the States, 1-13.
- Puyear, D., Thor, L. & Mills, K. (2001). Concurrent enrollment in Arizona: Encouraging success in high school. In P. F. Robertson, B. G. Chapman, & F. Gaskin (Eds.), *Systems for offering concurrent enrollment at high schools and community colleges*. *New Directions for Community Colleges*, 113, 33-41.31. San Francisco: Jossey-Bass.
- Reiss, P., & Follo, E. (1993). *Accelerated education methods for intellectually gifted secondary students*. Paper presented at eh Annual Midwest Educational Research Association Conference. Kansas City, MO.
- Robertson, P. (2005). Dual enrollment: Spanning the border between high school and college-and reshaping the landscape of public education. *Education Week*, July 13.
- Robertson, P. F., Chapman, B. G., & Gaskin, F. (2001). Systems for offering concurrent enrollment at high schools and community colleges. *New Directions for Community College*, 11. San Francisco: Jossey-Bass.
- Rogers, K. B., & Kimpston, R. D. (1992). Acceleration: What we do vs. what we know. *Educational Leadership*, 50, 58-61.
- Siegelman, H., & Otto, D. (2008). The economic impact of early college opportunity programs at Iowa's community colleges. Des Moines: Strategic Economics Group.
- Southern Regional Education Board. (2007). High school to college and careers: Aligning state policies, p. 3. Atlanta, GA; Author.

Study on Dual Credit Programs in Texas: A report to the 80th legislature from the Texas P-16 council. Retrieved February 1, 2007, from <http://tea.state.tx.us/comm/06dcpreport.pdf>

Swanson, J. (2008). An analysis of the impact of high school dual enrollment course participation on post-secondary academic success, persistence and degree completion. Iowa City: University of Iowa.

US Census Bureau. (2010). Retrieved September 20, 2011 from <http://quickfacts.census.gov/qfd/states/19000.html>

Witte, A. (1997). Crime. In J. R. Behrman & N. Stacey (Eds.), *The social benefits of education*. Ann Arbor: University of Michigan Press.

Windham, P. (2006). Letters to the editor. *Chronicle of Higher Education*. 52, B17.

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