THE BENEFITS OF ACCELERATION:
AN OUTCOMES ANALYSIS OF DUAL ENROLLMENT

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EXECUTIVE SUMMARY

Early college opportunities for high school students, hereinafter referred to as "acceleration", are growing in both the number of opportunities provided and the number of students enrolled in these courses. This analysis studied the educational benefits of student participation in accelerated programs at North Iowa Area Community College.

The major findings of this analysis are:

- Accelerated students experienced higher levels of academic achievement in both high school and in college courses than non-accelerated students.
- Accelerated students graduated earlier with a NIACC Associate Degree than non-accelerated students.

Specific results from this study are summarized below:

CHARACTERISTICS OF ACCELERATED STUDENTS VERSUS NON-ACCELERATED STUDENTS:

1. HIGH SCHOOL GPA ADVANTAGE: A two sample t-test reveals accelerated students have higher high school GPAs than non-accelerated students ($p < .000$).

2. ACT COMPOSITE ADVANTAGE: Accelerated students enjoy a .66 ACT Composite advantage over their counterparts who have not participated in NIACC's accelerated program ($p < .000$).

EDUCATIONAL ATTAINMENT IN COLLEGE

1. CUMULATIVE GPA ADVANTAGE: Accelerated students who eventually matriculate at NIACC have a .48 cumulative grade point advantage at the completion of their program over non-accelerated students ($p < .000$).

2. DAYS TO DEGREE COMPLETION ADVANTAGE: Accelerated students are more likely to become full-time students rather than part-time students. As such accelerated students enjoy an 836 day degree completion advantage over all other students who have not participated in NIACC's acceleration program ($p < .000$).

Utilizing general linear modeling statistical methods it's observed that four major variables significantly account for 77% of the variance in *"Days to Degree Completion."*

Structural equation modeling revealed *"Dual Enrollment Credits (acceleration)"* as the most significant variable impacting *"Days to Degree Completion*."

Separate analyses provided consistent reasons to believe that acceleration has an important effect on *"Days to Degree Completion."* We began with a simple two-sample t-test and moved forward with increasingly more sophisticated statistical techniques. This involved utilization of general linear modeling and finally structural equation modeling, utilizing path analytic techniques to isolate the unique direct, indirect and total effects of acceleration on "Days to Degree Completion."

Each method gives a different result because each method asks different questions with different constraints (sub-populations and variables.) A straight-forward two sample t-test, comparing all NIACC students with and without accelerated credits found an 836 "Days to Degree Completion" advantage for accelerated students. When constraints are entered into the analysis through the addition of covariates the general linear model predicts that acceleration, holding all other variables constant, yields a 95 day degree completion advantage. The most sophisticated model utilizing structural equation modeling predicts a 78 "Day to Degree Completion" advantage effect for each earned accelerated credit hour.

DISCUSSION

It's clear that acceleration has important and significant effects on educational attainment. It also appears that acceleration can not in itself explain the observed benefits. My personal observations, albeit untested, suggest that successful acceleration raises student/family expectations for both high school and college performance. Early success in college courses for high school students is a powerful motivator and it provides an enhanced self-concept. Family support systems and expectations are mobilized in reinforcing cycles of success. It is probably these increased expectations, enhanced self-concepts and reinforcing success support systems that yield the incredible outcomes observed in this study. These hypotheses point the way to future research.

POLICY IMPLICATIONS

Several supporting pieces of the literature associated with acceleration, taken together as a whole, now come together to inform policymakers for future action. These supporting pieces of the literature include:

- Positive recommendations from national organizations, national commissions, think tanks, state organizations and national experts (see Appendix A)
- Positive academic research findings associated with accelerated student outcomes (see Appendix B)
- Siegelman and Otto's study (2008) demonstrating that acceleration 1) saved the State of Iowa the equivalent of $21.7 million in future assistance at more costly educational institutions; and 2) saved families the equivalent of $30.7 million in future college-related expenses, and
- This study's finding that accelerated students experienced higher levels of academic achievement in both high school and in college courses and graduated earlier with a NIACC Associate Degree than non-accelerated students.

Collectively, the above review supports the following policy recommendations:

1) EXPAND ACCELERATED OPPORTUNITIES. While accelerated programs have grown in numbers they remain prototypes and are not sufficiently scaled up to reach larger 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. Policymakers should 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 (CTE) 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 CTE regional academies can serve as the backbone for workforce preparation and adult education re-training centers. Policymakers should provide incentives 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. Accelerated entrepreneurship academies, integrating best practices learned from Iowa's John Pappajohn Entrepreneurial Centers, promise increased business creation, long-term business success and more attractive jobs.

   Over the decades, we have faced major changes in our economy; we have moved from an agricultural to an industrial economy, then to a post-industrial service economy, and now one based on information age technology. Education has been the key to our competitive advantage and long-term survival as the leader in the world economy. Education has enabled us to invent, to innovate and/or to increase productivity through major shifts in the structure of our economy. It's the old social-Darwinists adage – adapt or die. To thrive we have had to be smarter and more productive. Education has always stood and still stands as the necessary pre-requisite for 1) invention, 2) innovation and 3) an adaptable and flexible workforce. Acceleration signals an adaptive and innovative response to the changing world 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.

Someone once asked Winston Churchill, *"Mr. Churchill, why are we fighting this terrible war?"* Churchill responded, *"If we don't, you'll understand why later."* The same analogy holds true now for the decisions policymakers must make. Policymakers must now act to improve educational outcomes and efficiency. Acceleration promises to deliver on both improved educational outcomes and efficiency.

THE BENEFITS OF ACCELERATION:
AN OUTCOMES ANALYSIS OF DUAL ENROLLMENT

Introduction

Early college opportunities for high school students, hereinafter referred to as "acceleration", are growing in both the number of opportunities provided and the number of students enrolled in these courses. These trend lines coincide with numerous recommendations from national organizations. For an extensive summary of these recommendations see Morrison (2007). For convenience this summary of acceleration recommendations is attached as Appendix A.

Simultaneously, research dealing with academic outcomes of accelerated programs is growing. For an extensive summary of these research findings see Morrison (2007B). For convenience this summary of acceleration research is attached as Appendix B.

State policymakers are also interested in the economic impact of accelerated programs. Siegelman and Otto (2008), studying students enrolled in community college accelerated programs in Iowa, found that these students:

- saved the State the equivalent of $21.7 million in future assistance at more costly educational institutions
- saved their families the equivalent of $30.7 million in future college-related expenses
- generated a 535% return on the program's investment ($21.7 million + $30.7 million = $52.4 million ÷ $9.8 million = 5.3469)

This study adds to the growing body of research with a focus on 1) the characteristics of accelerated students versus their counterparts who did not participate in accelerated programs; 2) differences in academic outcomes of accelerated and non-accelerated students; and 3) differences in days to complete the associate degree for accelerated and non-accelerated students.

RESEARCH HYPOTHESES

The following sets of null and research hypotheses were tested:

TABLE 1 RESEARCH HYPOTHESES

I. CHARACTERISTICS OF ACCELERATED STUDENTS VERSUS NON-ACCELERATED STUDENTS

A. HIGH SCHOOL GPA

H_0 - Accelerated and non-accelerated students have equal high school GPAs

H_1 - Accelerated and non-accelerated students are not equal in high school GPAs

B. ACT COMPOSITE

H_0 - Accelerated and non-accelerated students have equal ACT composite scores

H_1 - Accelerated and non-accelerated students are not equal in ACT composite scores

II. EDUCATIONAL ATTAINMENT IN COLLEGE

A. CUMULATIVE GPA

H_0 - Accelerated and non-accelerated students have equal NIACC cumulative GPAs at the time of degree completion

H_1 - Accelerated and non-accelerated students are not equal in NIACC cumulative GPAs at the time of degree completion

B. DAYS TO DEGREE COMPLETION

H_0 - Accelerated and non-accelerated students take the same amount of days for degree completion at NIACC

H_1 - Accelerated and non-accelerated students are not equal in the days for degree completion at NIACC

1. GENERAL LINEAR MODEL

H_0 - Four independent variables utilized to predict and understand "Days to Degree Completion" are statistically insignificant

H_1 - Four independent variables utilized to predict and understand "Days to Degree Completion" are statistically significant

2. STRUCTURAL EQUATION PATH MODEL

H_0 - A specified causal model utilized to predict and understand "Days to Degree Completion" is statistically significant

H_1 - A specified causal model utilized to predict and understand "Days to Degree Completion" is statistically insignificant

DATA

The data for this study was obtained from 23,023 student records at North Iowa Area Community College. The variables in this analysis are summarized in Table 2:

TABLE 2 VARIABLE NAMES, DESCRIPTION AND CODING

VARIABLE NAME	*DESCRIPTION*	*CODING*
Acceleration	Identifies accelerated vs. non-accelerated students	Dummy coded: 1=Yes for accelerated students 0 = No
Dual Enrollment Credits	Accelerated college credits earned in high school	Semester hour credits
High School GPA	Students high school grade point	Reported from high school
Cumulative GPA	NIACC cumulative GPA	Cumulative GPA
Days to Degree Completion	Days from high school graduation date to NIACC graduation date	Number of days from high school graduation to NIACC degree
ACT Composite	ACT composite score	ACT score
High School Graduation Year	Student's high school graduation year	Year of high school graduation
Semesters for 30 Credits	Number of semesters for students to achieve 30 semester hours of credit	Number of semesters
Degree	Student's earned degree	Dummy coded
Financial Need	Financial need estimated from FAFSA	Expected Family Contribution (EFC) from FAFSA
Academic Ability	Academic ability proxy (from Compass Writing score)	Compass writing score

Not all student records include data for each variable in the analysis. The N for each sub-analysis is reported in appropriate tables.

FINDINGS

I. CHARACTERISTICS OF ACCELERTATED STUDENTS VERSUS NON-ACCELERATED STUDENTS

HIGH SCHOOL GPA:

A two-sample t-test was utilized to test the following null and research hypotheses related to high school GPAs for accelerated and non-accelerated students:

H_0 - Accelerated and non-accelerated students have equal high school GPAs

H_1 - Accelerated and non-accelerated students are not equal in high school GPAs

Graph 1 depicts accelerated versus non-accelerated high school grade point averages.

Graph 1 - High School GPA:
Accelerated vs. Non-Accelerated Students

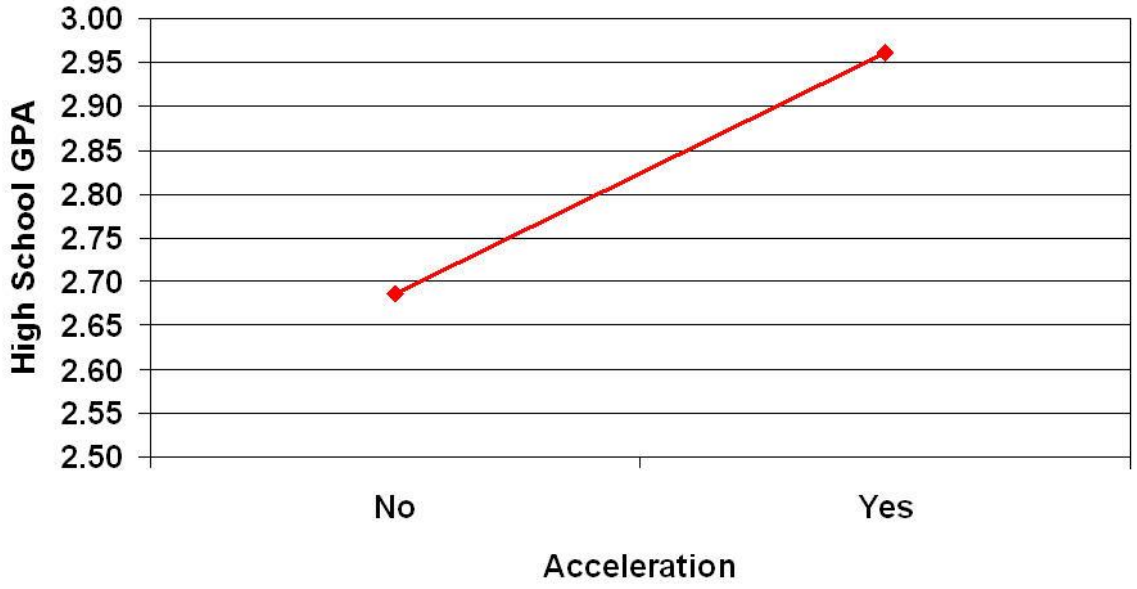


Table 3 reveals a .275 High School GPA mean advantage favoring accelerated students over non-accelerated students.

TABLE 3 HIGH SCHOOL GPA: ACCELERATED AND NON-ACCELERATED STUDENTS			
Group	N	Mean	Standard Deviation
Non-Accelerated	8,702	2.686	0.629
Accelerated	2,036	2.961	0.578

Table 4 depicts a significant difference between the means.

TABLE 4 TWO-SAMPLE T-TEST – HIGH SCHOOL GPA	
Difference in Means	-0.275
95% Confidence Interval	-0.304 to -0.247
t	-18.050
df	10,736
p-value	0.000

It is concluded that the High School GPA mean advantage for accelerated students is significant.

ACT COMPOSITE

A two-sample t-test was utilized to test the following null and research hypotheses related to ACT Composite scores for accelerated and non-accelerated students:

H_0 - Accelerated and non-accelerated students have equal average ACT Composite scores

H_1 - Accelerated and non-accelerated students are not equal in average ACT Composite scores

Graph 2 depicts accelerated versus non-accelerated average ACT Composite scores.

Graph 2 – ACT Composite Averages:
Accelerated vs. Non-Accelerated Students

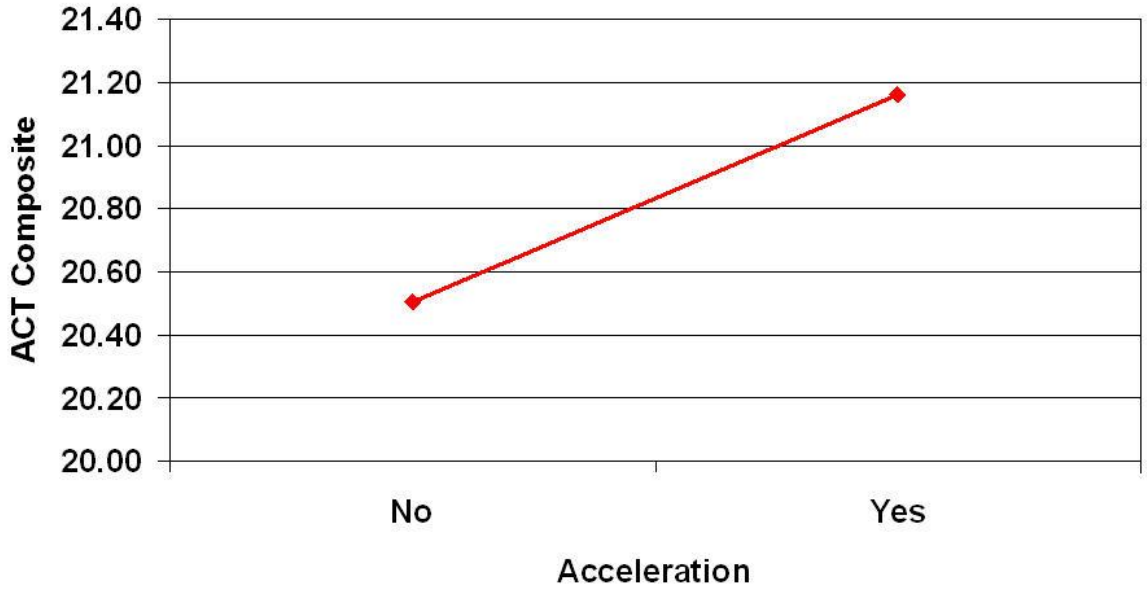


Table 5 reveals a 0.657 ACT Composite mean difference favoring accelerated students over non-accelerated students.

TABLE 5 ACT COMPOSITE AVERAGES: ACCELERATED AND NON-ACCELERATED STUDENTS

Group	N	Mean	Standard Deviation
Non-Accelerated	1749	20.504	3.544
Accelerated	459	21.161	3.618

Table 6 depicts a statistically significant difference between the means.

TABLE 6 TWO-SAMPLE T-TEST – ACT COMPOSITE AVERAGES

Difference in Means	-0.657
95% Confidence Interval	-1.023 to -0.291
t	-3.519
df	2,206
p-value	0.000

It is concluded that the ACT Composite mean advantage of accelerated students is significant.

II. EDUCATIONAL ATTAINMENT IN COLLEGE

CUMULATIVE GPA:

A two-sample t-test was utilized to test the following null and research hypotheses related to Cumulative GPA averages for accelerated and non-accelerated students:

H_0 - Accelerated and non-accelerated students have equal average Cumulative GPA scores

H_1 - Accelerated and non-accelerated students are not equal in average Cumulative GPA scores

Graph 3 depicts the average Cumulative GPA advantage of accelerated students over non-accelerated students.

Graph 3 – Cumulative GPA Averages: Accelerated vs. Non-Accelerated Students

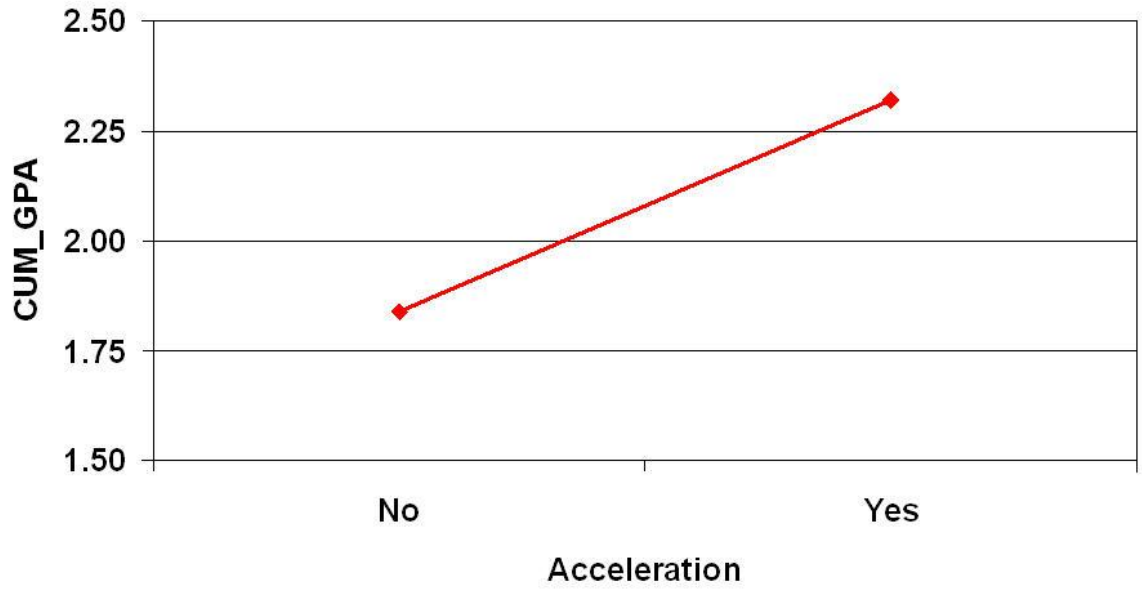


Table 7 reveals a 0.481 Cumulative GPA mean difference favoring accelerated students over non-accelerated students.

TABLE 7 CUMULATIVE GPA AVERAGES: ACCELERATED AND NON-ACCELERATED STUDENTS			
Group	N	Mean	Standard Deviation
Non-Accelerated	13,158	1.839	1.362
Accelerated	2,674	2.319	1.148

Table 8 depicts a significant difference between the means.

TABLE 8 TWO-SAMPLE T-TEST – CUMULATIVE GPA AVERAGES	
Difference in Means	-0.481
95% Confidence Interval	-0.536 to -0.426
t	-17.064
df	15,830
p-value	0.000

It is concluded that the Cumulative GPA mean advantage of accelerated students is significant.

DAYS TO DEGREE COMPLETION:

A two-sample t-test was utilized to test the following null and research hypotheses related to "Days to Degree Completion" for accelerated and non-accelerated students:

H_0 - Accelerated and non-accelerated students have equal average Days to Degree Completion

H_1 - Accelerated and non-accelerated students are not equal in Days to Degree Completion

The unit of analysis for this section is students who have earned a degree from NIACC. Graph 4 depicts the "Days to Degree Completion" advantage that accelerated students enjoy over their non-accelerated counterparts.

Graph 4 – Days to Degree Completion:
Accelerated vs. Non-Accelerated Students

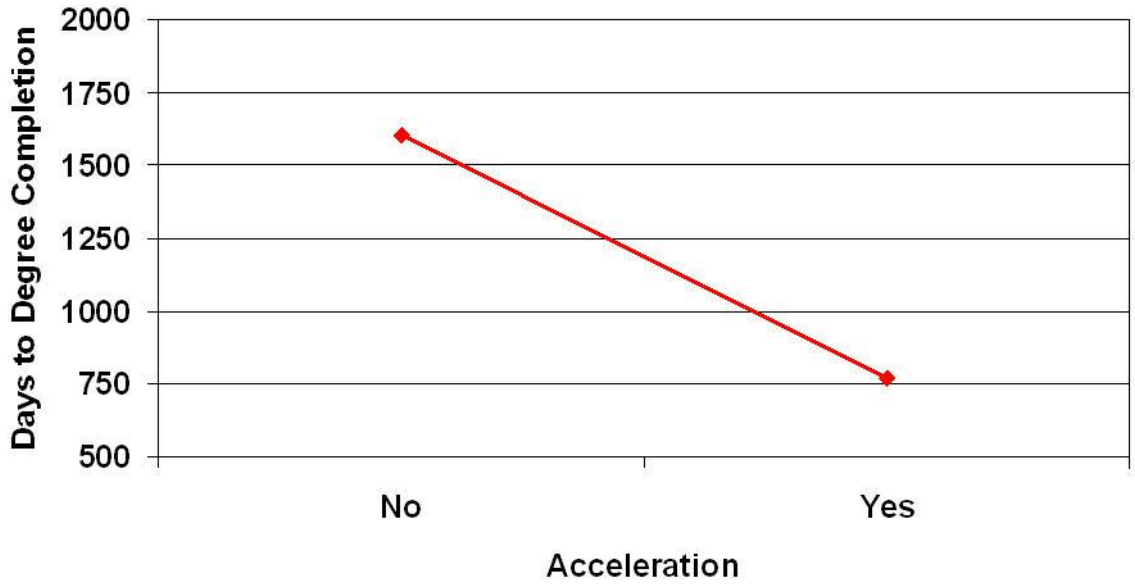


Table 9 reveals a mean "Days to Degree Completion" difference favoring accelerated students over non-accelerated students.

TABLE 9 DAYS TO DEGREE COMPLETION: ACCELERATED AND NON-ACCELERATED STUDENTS			
Group	N	Mean	Standard Deviation
Non-Accelerated	2,873	1,605.309	2,070.939
Accelerated	823	769.209	544.074

Table 10 depicts a significant 836 "Days to Degree Completion" difference between accelerated and non-accelerated students.

TABLE 10 TWO-SAMPLE T-TEST – DAYS TO DEGREE COMPLETION	
Difference in Means	836.100
95% Confidence Interval	693.162 to 979.038
t	11.468
df	3,694
p-value	0.000

It is concluded that the "Days to Degree Completion" mean advantage of accelerated students is significant.

General Linear Modeling of "Days to Degree Completion"

Given the importance of the above finding I decided to analyze accelerated students "Days to Degree Completion" advantage more thoroughly utilizing general linear modeling statistical tools.

In this section of the analysis it is hypothesized that the following independent variables:

- High School Graduation Year
- Acceleration
- Semester for 30 Credits
- Degree

significantly account for the variance in "Days to Degree Completion". Using SYSTAT's "General Liner Modeling" module the following results were observed:

Table 11 Accounting for the Variance in "Days to Degree Completion"

N	3,696
Multiple R	0.881
Multiple R Squared	0.776

Over 77 percent of the variance in "Days to Degree Completion" is accounted for by the four independent variables: high school graduation year, acceleration, number of semesters to earn 30 credits and degree earned ($p < .001$).

The unique effect of each variable on "Days to Degree Completion" is provided in Tables 12 and 13:

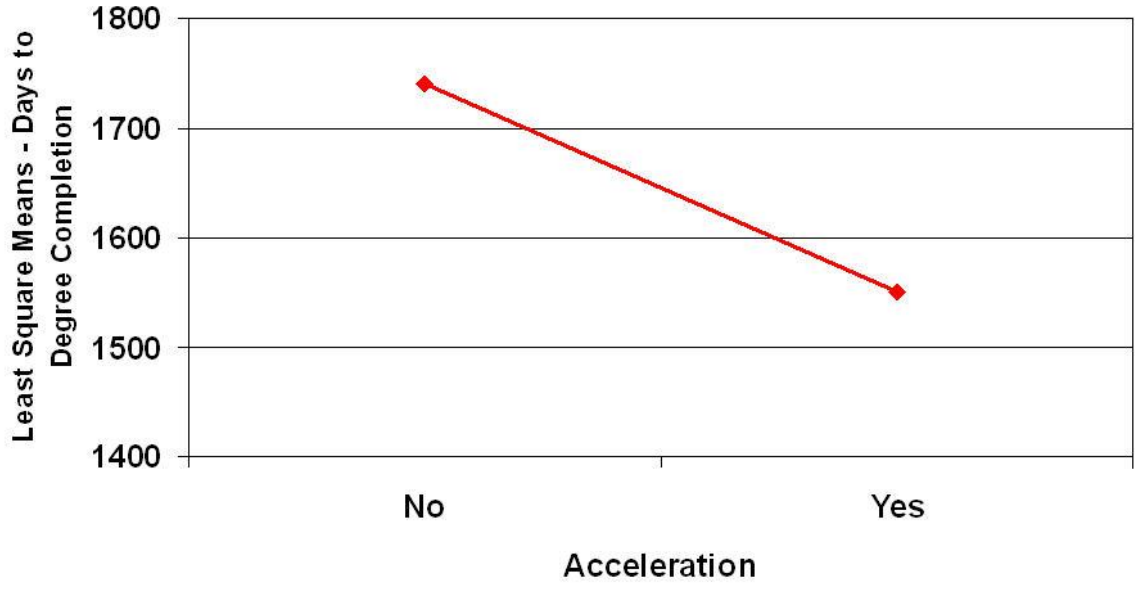
Table 12 Unstandardized Regression Coefficients

Factor	Level	Days to Degree Completion
Constant		548744.330
High School Grad Year		-274.193
Acceleration	No	95.480
Semesters for 30 Credits		296.526
Degree	AA	-357.671
Degree	AAS	-260.763
Degree	AS	482.430

TABLE 13 ANALYSIS OF VARIANCE: DAYS TO DEGREE COMPLETION					
Source	Type III SS	df	Mean Squares	F-Ratio	p-value
High School Graduation Year	7.23E+009	1	7.23E+009	9.17E+003	1.1E-011
Acceleration	1.82E+007	1	1.82E+007	23.1	1.58E-006
Semesters for 30 Credits	3.5E+008	1	3.5E+008	443	1.64E-011
Degree	1.06E+008	3	3.53E+007	44.7	1.52E-011
Error	2.91E+009	3689	7.89E+005		

Non-accelerated students experience an additional 95 days for degree completion, holding all other variables constant ($p < .001$). The least square means for each group's days to degree completion is shown in Graph 5 below.

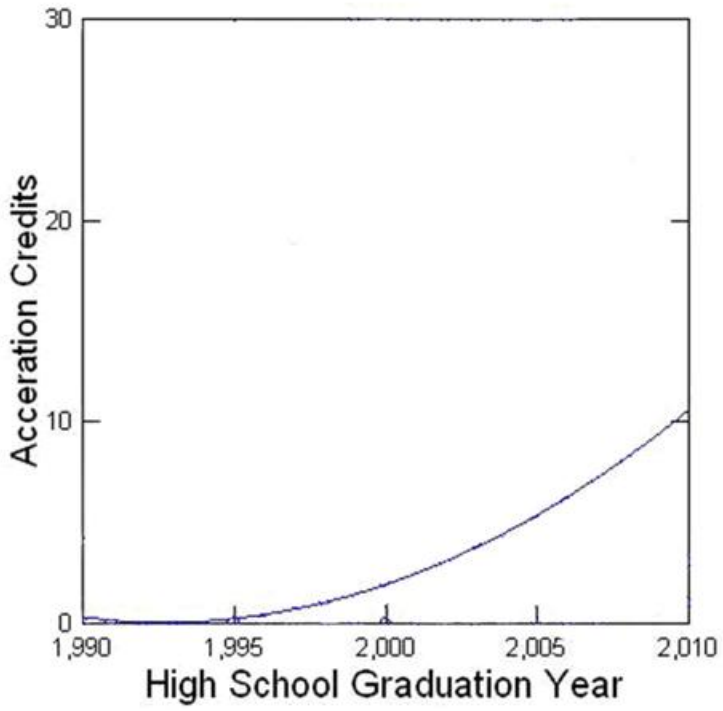
Graph 5 – Days to Degree Completion:
Accelerated vs. Non-Accelerated Students
(Note: Least Square Means Adjusted for Covariate Effects)



Not surprisingly it's also observed that the greater the amount of time students take to reach 30 semester hours of credit the longer the number of days to degree completion. In addition, as Graph 7 depicts more students

are participating in accelerated programs over the past ten years. The year of high school graduation impacts degree time to graduation, with more students benefiting as each year passes. With the Associate of Science in Business (ASB) degree as the reference, students that pursue the Associate of Arts (AA) and Associate of Applied Science (AAS) degrees take significantly less time to complete their degrees, all other variables held constant. The Associate of Science (AS) degree is the exception.

Graph 7 – Relationship between High School Graduation Year and Earned Acceleration Credits



We conclude this section with the observation that the specified model accounts for a very significant amount (77%) of variance in "Days to Degree Completion" and acceleration is a significant predictor of time to complete an associate degree.

Analysis of "Days to Degree Completion" through Structural Equation Modeling

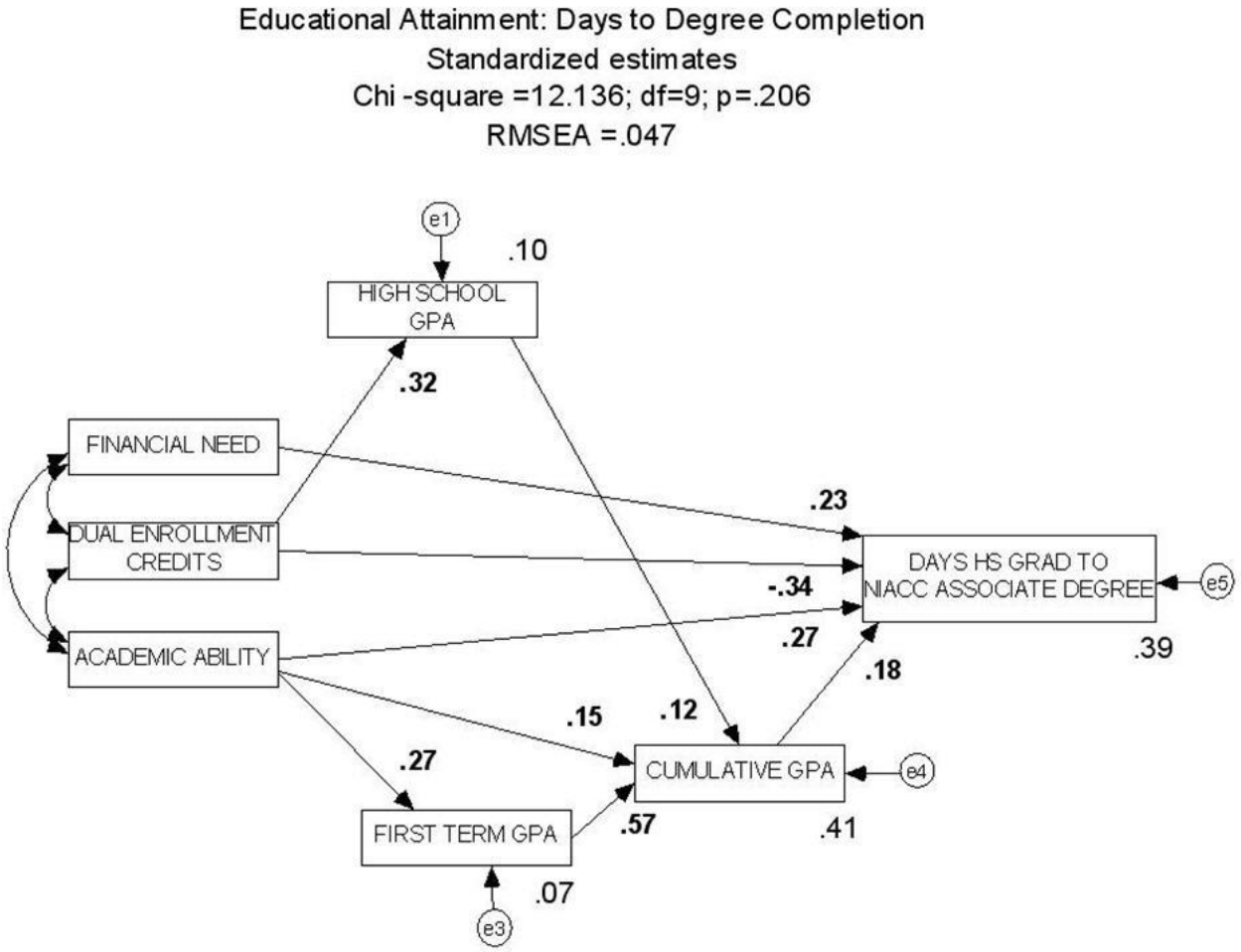
Structural equation modeling can provide more information about the effects of acceleration on "Days to Degree Completion" by identifying the unique direct, indirect and total effects of acceleration on "Days to Degree Completion". A causal path model to understand "Days to Degree

Completion" was specified. The associated null and research hypotheses to test the specified causal model follow:

H_0 - A specified causal model utilized to predict and understand "Days to Degree Completion" is statistically significant

H_1 - A specified causal model utilized to predict and understand "Days to Degree Completion" is statistically insignificant[1]

In order to perform this analysis the following causal path model was specified and maximum likelihood estimates of the effects were calculated.



This model first began as a fully saturated model and therefore as a just-identified model it was impossible to test the model with chi-square (χ^2) probabilities and "goodness of fit" indices. To overcome this issue and to provide a means to test the model against the data the model was

[1] In structural equation modeling (SEM) the null hypothesis being tested is that the postulated model holds in the population. In contrast to traditional statistical procedures the researcher hopes *not* to reject H_0 (Kline, 2005).

constrained through an iterative process of eliminating insignificant paths and re-running the model. The final model is depicted in the above path model.

The first important finding associated with the model is that the data fits the model very well. This is revealed in the χ^2 value and its probability but, more importantly, RMSEA (Root Mean Square Error of Approximation) is less than .05, suggesting a very strong fit of the model to the data. In addition, the exogenous and endogenous variables in the model explain nearly 40% of the variance in "Days to Degree Completion."

The third major finding is observed in an analysis of the standardized total effects of the exogenous and endogenous variables on "Days to Degree Completion" found in Table 14. The variable *Dual Enrollment Credits (acceleration)* is the most significant variable impacting, directly and indirectly, days to complete NIACC's Associate Degree. The total standardized effect of "NIACC Dual Enrollment Credits" on "Days to Degree Completion" is -.333, revealing the expected inverse relationship between earned accelerated credits and days to degree completion.

TABLE 14 STANDARDIZED TOTAL EFFECTS

	Academic Ability	NIACC Dual Enrollment Credits (Acceleration)	High School GPA	First Term GPA	Cum GPA	Financial Need
High School GPA	.000	.320	.000	.000	.000	.000
First Term GPA	.266	.000	.000	.000	.000	.000
Cumulative GPA	.302	.040	.124	.572	.000	.000
Days to Degree Completion	.328	**-.333**	.022	.103	.179	.232

The technical way for articulating the acceleration effect, albeit wordy, follows: The standardized total (direct and indirect) effect of *"Dual Enrollment Credits"* on *"Days to Degree Completion"* is -.333. That is, due to both direct (unmediated) and indirect (mediated) effects of *"Dual Enrollment Credits"* on *"Days to Degree Completion"*, when *"Dual Enrollment Credits"* go

up by 1 standard deviation, *"Days to Degree Completion"* go down by 0.333 standard deviations.

The corresponding unstandardized total effect metric is -77.72, meaning that, holding all other variables constant, each unit increase in earned accelerated credits yields a 78 "Day to Degree Completion" total effect advantage. For further discussion of direct, indirect and total effects, see Kline (1998, p. 52).

CONCLUSION

The major findings of this analysis are:

- Accelerated students enjoy higher levels of academic achievement than non-accelerated students. Accelerated students experience higher academic outcomes in both high school and in college courses.
- Accelerated students graduate earlier with a NIACC Associate Degree than non-accelerated students.

Specific results from this study are summarized below:

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1. CUMULATIVE GPA ADVANTAGE: Accelerated students who eventually matriculate at NIACC have a .48 cumulative grade point advantage at the completion of their program over non-accelerated students ($p < .000$).

2. DAYS TO DEGREE COMPLETION ADVANTAGE: Accelerated students are more likely to become full-time students rather than part-time

students. As such dual enrolled students enjoy an 836 day degree completion advantage over all other students who have not participated in NIACC's accelerated program ($p < .000$).

Utilizing general linear modeling statistical methods it's observed that four major variables significantly account for 77% of the variance in *"Days to Degree Completion"* and acceleration is a significant predictor of time to complete an associate degree.

Structural equation modeling revealed *Dual Enrollment Credits (acceleration)* as the most significant variable impacting *"Days to Degree Completion*."

Separate analyses provided consistent reasons to believe that acceleration has an important effect on *"Days to Degree Completion".* We began with a simple two-sample t-test and moved forward with increasingly more sophisticated statistical techniques. This involved utilization of general linear modeling and finally structural equation modeling, utilizing path analytic techniques to isolate the unique direct, indirect and total effects of acceleration on "Days to Degree Completion."

Each method gives a different result because each method asks different questions with different constraints (sub-populations and variables.) A straight-forward two sample t-test, comparing all NIACC students with and without accelerated credits found an 836 "Days to Degree Completion" advantage for accelerated students. When constraints are entered into the analysis through the addition of covariates the general linear model predicts that acceleration, holding all other variables constant, yields a 95 day advantage. The most sophisticated model utilizing structural equation modeling predicts a 78 "Day to Degree Completion" advantage effect for each earned accelerated credit hour.

LIMITATIONS

As this analysis included only NIACC accelerated students the study's findings are not generalizable to other populations. In addition, the study did not examine other suggested benefits of acceleration. Some people suggest that accelerated students may decide to take a reduced course load to focus their academic attention and improve performance. Other people have observed that accelerated students enroll in more rigorous courses and/or attain more than one associate

or baccalaureate degree. These observations are certainly ripe fruit for future research.

DISCUSSION

It's clear that acceleration has important and significant effects on educational attainment. It also appears that acceleration can not in itself explain the observed benefits. My personal observations, albeit untested, suggest that successful acceleration raises student/family expectations for both high school and college performance. Early success in college courses for high school students is a powerful motivator and it provides an enhanced self-concept. Family support systems and expectations are mobilized in reinforcing cycles of success. It is probably these increased expectations, enhanced self-concepts and reinforcing success support systems that yield the incredible outcomes observed in this study. These hypotheses point the way to future research.

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Several supporting pieces of the literature associated with acceleration, taken together as a whole, now come together to inform policymakers for future action. These supporting pieces of the literature include:

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- This study's finding that accelerated students experienced higher levels of academic achievement in both high school and in college courses and graduated earlier with a NIACC Associate Degree than non-accelerated students.

Collectively, the above review supports the following policy recommendations:

1) EXPAND ACCELERATED OPPORTUNITIES. While accelerated programs have grown in numbers they remain prototypes and are not sufficiently scaled up to reach larger 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. Policymakers should 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 (CTE) 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 CTE regional academies can serve as the backbone for workforce preparation and adult education re-training centers. Policymakers should provide incentives 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. Accelerated entrepreneurship academies, integrating best practices learned from Iowa's John Pappajohn Entrepreneurial Centers, promise increased business creation, long-term business success and more attractive jobs to retain desired talent.

   Over the decades, we have faced major changes in our economy; we have moved from an agricultural to an industrial economy, then to a post-industrial service economy, and now one based on information age technology. Education has been the key to our competitive advantage and long-term survival as the leader in the world economy. Education has enabled us to invent, to innovate and/or to increase productivity through major shifts in the structure of our economy. It's the old social-Darwinists adage – adapt or die. To thrive we have had to be smarter and more productive. Education has always stood and still stands as the necessary pre-requisite for 1) invention, 2) innovation and 3) an adaptable and flexible workforce. Acceleration signals an adaptive and innovative response to the changing world 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.

Someone once asked Winston Churchill, *"Mr. Churchill, why are we fighting this terrible war?"* Churchill responded, *"If we don't, you'll*

understand why later." The same analogy holds true now for the decisions policymakers must make. Policymakers must now act to improve educational outcomes and efficiency. Acceleration promises to deliver on both improved educational outcomes and efficiency.

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APPENDIX A

DUAL ENROLLMENT RECOMMENDATIONS

An Examination of Recommendations on Dual Enrollment from National Commissions, Think Tanks, State Organizations and National Experts

COMPILED BY:

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DECEMBER 2007

Dual Enrollment Recommendations

From National Commissions, Think Tanks, State Organizations, and National Experts

National Commission on the High School Senior Year

- We believe that middle college and dual enrollment options with local colleges and technical institutes should be encouraged.

- Greatly expand the opportunity for high school students to experience the challenges of college-level work and increase the number of "middle college" options for older students in the last two years of high school. Increasing opportunities for dual enrollment (and early high school exit for college enrollment) will permit students to meet admission requirements in the junior or the senior year.

Source: *Raising Our Sights: No High School Senior Left Behind.* Final Report National Commission on the High School Senior Year. October 2001.

National Governors Association

- [Promote] dual-enrollment programs that enable high school students to take college courses for credit.

Source: *Ready for Tomorrow: A Guide for Governors.* The National Governors Association. 2003.

The Toolbox Revisited

- It is all the more reason to begin the transition process in high school with expanded dual enrollment programs offering true postsecondary course work so that students enter higher education with a *minimum* of 6 additive credits to help them cross that 20-credit line. Six is good, 9 is better, and 12 is a guarantee of momentum.

Source: *The Toolbox Revisited: Paths to Degree Completion from High School through College.* U.S. Department of Education. Clifford Adelman, Senior Research Analyst. Policy, Research, and Evaluation Staff Office of Vocational and Adult Education. U.S. Department of Education. February 2006.

The National Center for Public Policy and Higher Education

- *Improve College Access.* Create college tuition policies based on median income and support need-based financial aid; build high-

capacity, open-entry, two-year college systems that encourage transfer; encourage dual enrollment and advanced placement policies that speed the transition from high school to college.

Source: *The National Center for Public Policy and Higher Education Policy Alert*. April 2004.

Reinventing the American High School for the 21st Century

- A renewed focus also must be placed on the transition of students from high school into further educational and career opportunities. Students should be given the opportunity while in high school to take postsecondary entrance and skill certification exams, and school districts and states should work to provide dual enrollment opportunities such as the Tech Prep program.

- Require or strongly encourage all students to enroll in career and college readiness courses, including dual enrollment and Tech Prep programs.

- Design the master schedule in a way that students can take advanced academic and CTE courses, including through dual enrollment and Tech Prep options.

- Create model hybrid academic/CTE courses that allow students to fulfill graduation requirements in core academic skills such as English/language arts, mathematics and science; and ensure that the state's higher education system will accept these courses as meeting admission requirements, and for credit when they are offered as dual enrollment courses.

Source: *Reinventing the American High School for the 21st Century.* ACTE. 2006.

A National Task Force on Public Education - A Joint Initiative of the Center for American Progress and the Institute for America's Future

- In many ways, the blurring of the boundary between high school and college is an emerging sign of what a 21st century education system should look like. The challenge is to build on promising trends to create the education system of the future, one in which most students graduate from high school ready for college and go on to earn a postsecondary credential, while attainment gaps by race and income are eliminated. The scope of the challenge is daunting: the United States must increase the number of its college graduates more rapidly

than at any time in the past 50 years, and in ways that make college success likely for a rapidly changing population. It must achieve this transformation at a time of record federal deficits and ongoing structural deficits in many states.

- We cannot achieve the quantum leap in educational attainment that the nation needs without reconfiguring the use of time and money across the K-16 system. The relationship between secondary and postsecondary education in America again needs breakthrough thinking.

Source: Hilary Pennington. *Fast Track to College: Increasing Postsecondary Success for All Students.* Jobs for the Future Report. Prepared for: *Renewing Our Schools, Securing Our Future A National Task Force on Public Education.* A joint initiative of the Center for American Progress and the Institute for America's Future. December 2004.

A Report to Office of Vocational and Adult Education, U.S. Department of Education and National Commission on the High School Senior Year

- Traditionally, dual enrollment has been targeted at academically advanced students. However, policymakers and educators now believe that dual enrollment is not only for high-achieving students. Instead, they argue that dual enrollment programs may meet the needs of a range of young people, technical students included.

Source: Thomas Bailey and Melinda Mechur Karp, *Promoting College Access and Success: A Review of Dual Credit and Other High School/College Transition Programs*. Report prepared for the Office of Vocational and Adult Education, U.S. Department of Education (New York: Community College Research Center, Teachers College, Columbia University, 2003); National Commission on the High School Senior Year, *Raising Our Sights: No High School Senior Left Behind* (Princeton, N.J.: The Woodrow Wilson National Fellowship Foundation, 2001); Katherine L. Hughes, Melinda Mechur Karp, Baranda J. Fermin, and Thomas R. Bailey, *Pathways to College Access and Success* (Washington, D.C.: U.S. Department of Education, Office of Vocational and Adult Education. 2005.

Minding the Gap: Why Integrating High School with College Makes Sense and How to Do It.

$ In this book the authors strongly argue for integrating high school with college. At present they suggest that dual enrollment is at best a proxy for the desired goal of integration.

Source: Hoffman, N., Vargas, J., Venezia, A., and Miller, M. (2007). Minding the Gap: Why Integrating High School with College Makes Sense and How to Do It. Cambridge, MA: Harvard Education Press.

U.S. Department of Education, Office of Vocational and Adult Education

- The federal government has called for the expansion of dual enrollment to new student populations on a number of occasions.

Source: U.S. Department of Education, Office of Vocational and Adult Education, *The Secondary and Technical Education Excellence Act of 2003: Summary of Major Provisions* (Washington, D.C.: Author, 2003); U.S. Department of Education, Office of Vocational and Adult Education. *OVAE Review*, April 2005.

Dominic J. Brewer and Stefanie Stern Center on Educational Governance

- One new approach to high school redesign, "early college", offers promise towards a rigorous academic course of study that engages students in college level work in grades nine through 14.

Source: *The Promise of "Early College" as a High School Redesign Model.* Working Paper. Dominic J. Brewer and Stefanie Stern Center on Educational Governance. Rossier School of Education University of Southern California. November 2005.

Crisis at the Core: Preparing All Students for College and Work

- Ensure that every student has the opportunity to learn these college readiness skills and that the *Courses for Success* (Biology, Chemistry, Physics, and advanced mathematics courses beyond Algebra II) are offered at every high school, through increased course offerings in high schools, dual enrollment opportunities, summer bridge programs, distance learning, or other enrichment offerings.

Source: *Crisis at the Core: Preparing All Students for College and Work.* ACT. 2004.

High Schools in the Knowledge Economy

- Strategies for Improving Postsecondary Success:
  1. Pursue dual enrollment or co-enrollment.
  2. Encourage partnerships between high schools and postsecondary institutions.
  3. Create middle colleges and early college high schools

Source: *Bridge to Postsecondary Success: High Schools in the Knowledge Economy.* Prepared for The Ohio State Board of Education Task Force on Quality High Schools for a Lifetime of Opportunities. By Hilary Pennington and Joel Vargas. March 2004.

Education and Skills for the 21st Century: *An* Agenda *for A*ction. Jobs for the Future.

- Through dual enrollment and early college high school programs, they can take college-level courses in some subjects while completing high

school graduation requirements in others. Ultimately, these programs can decrease the time it takes to earn a postsecondary credential, keep students engaged in learning, and reduce the financial burden of a college education—at the same time helping move highly educated young people into the workforce more quickly.

Source: Education and Skills for the 21st Century: An Agenda for Action. Jobs for the Future.

The Education Resources Institute

- *Actions for* College and University Presidents, Vice-Presidents, and Deans:
  - Offer dual enrollment and other bridge programs to help underserved students make successful transitions to college.

Source*: A Shared Agenda: A Leadership Challenge to Improve College Access and Success.* Pathways to College Network. The Education Resources Institute (TERI). 31 St. James Avenue. Boston, MA.

Center for Occupational Research

$ Dual enrollment provides several incentives for Career Pathway students to do well in high school and transition to college after high school graduation:

1. By enrolling in college courses while still in high school, students who have already completed their graduation requirements do not waste time in their senior year.

2. High school juniors and seniors have an opportunity to "experience college." They experience a different environment in which they are treated more as adults. And they discover that they can compete at the college level.

3. They discover early whether they have deficiencies that might prevent college entrance, and have an opportunity to correct those deficiencies so that they will not be required to take developmental (remedial) courses in college.

4. They have an opportunity to earn up to one year of college credits by the time they graduate from high school. This "jump start" is not just a morale booster; it can result in significant savings in college expenses.

Source*: Dual Enrollment/Dual Credit: Its Role In Career Pathways.* Katherine L. Hughes, Melinda Mechur Karp, David Bunting, and Janice Friedel. In Career Pathways: Education with a Purpose. Compiled and Coauthored by Dan M. Hull. CORD. 2005.

A National Task Force on Public Education

Benefits to Fast Trac to College:

- Fast Track to College partnerships will help alleviate shortages of qualified teachers at the secondary level.

- Fast Track to College options will increase the rigor of the high- school curriculum.

- Fast Track to College Options will increase students' motivation to do well.

- Stronger connections between high school and postsecondary education will create a clearer signal about the standard of performance required for success at the postsecondary level.

- Fewer transitions and greater supports during transitions would reduce the numbers of students who fall out of the pipeline.

- Getting a head start on college will increase the affordability and availability of college.

- Ensuring that each Fast Track to College option gives students a head start on college will reduce the danger of tracking.

- It will be possible to overcome resistance to Fast Track to College options by providing appropriate incentives to institutions and individuals.

Source*:* Pennington, Hilary. (2004). *Fast Track to College: Increasing Postsecondary Success for All Students.* Jobs for the Future Report Prepared for: *Renewing Our Schools, Securing Our Future. A National Task Force on Public Education.* A Joint Initiative of the Center for American Progress and the Institute for America's Future

APPENDIX B

DUAL ENROLLMENT – WHAT DOES THE RESEARCH SAY?

A SUMMARY OF A NUMBER OF OUTCOMES-ORIENTED STUDIES DEALING WITH DUAL ENROLLMENT

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MARCH 2007
UPDATED: OCTOBER 2007

Dual Credit – What Does the Research Say?

The Postsecondary Achievement of Participants in Dual Enrollment: An Analysis of Student Outcomes in Two States

Florida Findings:

"We found a positive relationship between dual enrollment participation and short- and long-term outcomes for both the full sample and the CTE (Career Technical Education) sub-sample**. Dual enrollment was positively related to students' likelihood of earning a high school diploma.**

Participation in dual enrollment was positively related to enrollment in college for both the full sample and the CTE students. Dual enrollment participation also increased the likelihood of initially enrolling in a four-year institution (by 7.7 percent for all students and 8.6 percent for CTE students). For students who enrolled in postsecondary education, dual enrollment participation was also positively related to their likelihood of enrolling full-time.

Dual enrollment students, whether in the full sample or the CTE sub-sample, were statistically significantly more likely to persist in college to a second semester. They also had statistically significantly higher postsecondary grade point averages one year after high school graduation.

Of those students ever enrolled in postsecondary education, dual enrollment participation was positively associated with their likelihood of remaining enrolled two years after graduating from high school. Dual enrollment students' grade point averages after two years of college were also statistically significantly higher than their non-participating peers. Both of these relationships held true for the full sample and the CTE sub-sample.

The relationship between dual enrollment participation and grade point average continued throughout students' postsecondary careers. **Dual enrollment students' cumulative college grade point averages three years after high school graduation were statistically significantly higher than those of their non-participating peers.** Finally, **dual enrollment students had earned more postsecondary credits three years after high school graduation (indicating that they had made more progress toward a degree).** For the full sample, dual enrollment students had earned 15.1 more credits than their non-dual enrollment peers. CTE dual enrollment students had earned 15.2 more credits than their non-

dual enrollment CTE peers. Although some of these credits were likely earned through dual enrollment, it is also likely that some were earned after matriculation into postsecondary education.

Findings: New York City

Though not as consistently as in Florida, we also found positive short- and long-term outcomes of dual enrollment participation in New York City. **College Now participants were more likely than their peers to pursue a bachelor's degree. College Now participation was also positively related to students' first-semester grade point averages.** College Now participants had first-term grade point averages 0.133 points higher than those of non-participants. Finally, **College Now participation was positively related to students' overall progress toward a degree.** Three-and-a-half years after their initial enrollment in postsecondary education, College Now participants had earned significantly more college credits than their non-participating peers.

Unlike in Florida, we did find some influence of participation intensity in New York. Specifically, the positive relationship between College Now participation and first-semester GPA seems to be due to the impact of taking two or more courses, rather than on participation more generally.

The implications of the findings presented in this report can be seen as pertaining to two separate arenas: dual enrollment generally, and CTE reform. These are as follows:

Dual Enrollment

1. Because dual enrollment participation can benefit a range of students, expand currently restrictive eligibility requirements for dual enrollment.

2. Consider creating dual enrollment sequences since our findings suggest that students benefit from taking more than one dual enrollment course.

3. Expand outreach to underserved populations and provide dual enrollment courses tuition-free for low-income students (if not for all students) in order to ensure that such students are able to take advantage of dual enrollment opportunities.

CTE Programs

1. Expand dual enrollment options for CTE students, particularly in places where these students are not currently offered dual enrollment opportunities.

2. Continue to integrate dual enrollment into CTE pathways and programs.

In conclusion, we present very encouraging, though not definitive, findings that dual enrollment participation is related to positive postsecondary outcomes. This positive association is particularly strong for groups of students who are struggling in postsecondary education, especially males and low-income students."

Karp, Melinda Mechur; Calcagno, Juan Carlos; Hughes, Katherine L.; Jeong, Dong Wook; and Bailey; Thomas R. "*The Postsecondary Achievement of Participants in Dual Enrollment: An Analysis of Student Outcomes in Two States"* National Research Center for Career and Technical Education. Community College Research Center Teachers College, Columbia University. October 2007.

Pew Charitable Trust

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.

Martinez, M. and Klopott, S. *"How is School Reform Tied to Increasing College Access and Success for Low-Income and Minority?"* Institute for Educational Leadership, 2004, p. 34, quoting Clark, R.W., *"Dual Credit: A Report of Programs and Policies that Offer High School Students College Credits,"* Philadelphia, PA: Pew Charitable Trusts, 2001.

Texas Longitudinal Study:

A recent examination of Texas longitudinal data concluded that high school students in that state who concurrently enroll in postsecondary courses experience greater success in college. Indeed, they are twice as likely to graduate from college in four years as those who did not enroll in such a program

O'Brien, D.M. and Nelson, T.D.*"Strengthening College Preparation and Access Through Concurrent Enrollment in High School and Community College,"* University of Texas, Dallas, 2004.

Retention and graduation data indicate similar 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. Among Hispanics who enrolled in postsecondary institutions in Fall 2000, 77 percent who took dual credit courses were still enrolled in Fall 2001, compared with 62 percent who did not. Further, 32 percent of Hispanics who took dual credit graduated with Baccalaureate degrees versus 11 percent who did not take dual credit in high school.

The data are almost identical for African-Americans. Among those who enrolled in postsecondary institutions in Fall 2000, 78 percent who took dual credit courses were still enrolled in Fall 2001, as opposed to 59 percent who

did not. Further, 34 percent of African-Americans who took dual credit graduated with Baccalaureate degrees compared with 11 percent who did not take dual credit in high school.

Study on Dual Credit Programs in Texas: *A Report to the 80th Legislature from the Texas P-16 Council. Retrieved February 1, 2007 at* http://www.tea.state.tx.us/comm/06dcp_report.pdf

Florida Study

A 2005 case study reported in *Jobs for the Future* showed 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 was particularly striking for minority students. Among African-American students, 70 percent of those who took dual credit courses attended higher education institutions, compared with 45 percent who did not. Among Hispanic students, 69 percent of dual credit students went to college or university as opposed to 54 percent who did not.

Nancy Hoffman, *Add and Subtract: Dual Enrollment as a State Strategy to Increase Postsecondary Success for Underrepresented Students*, Jobs for the Future, 2005, p. 9.

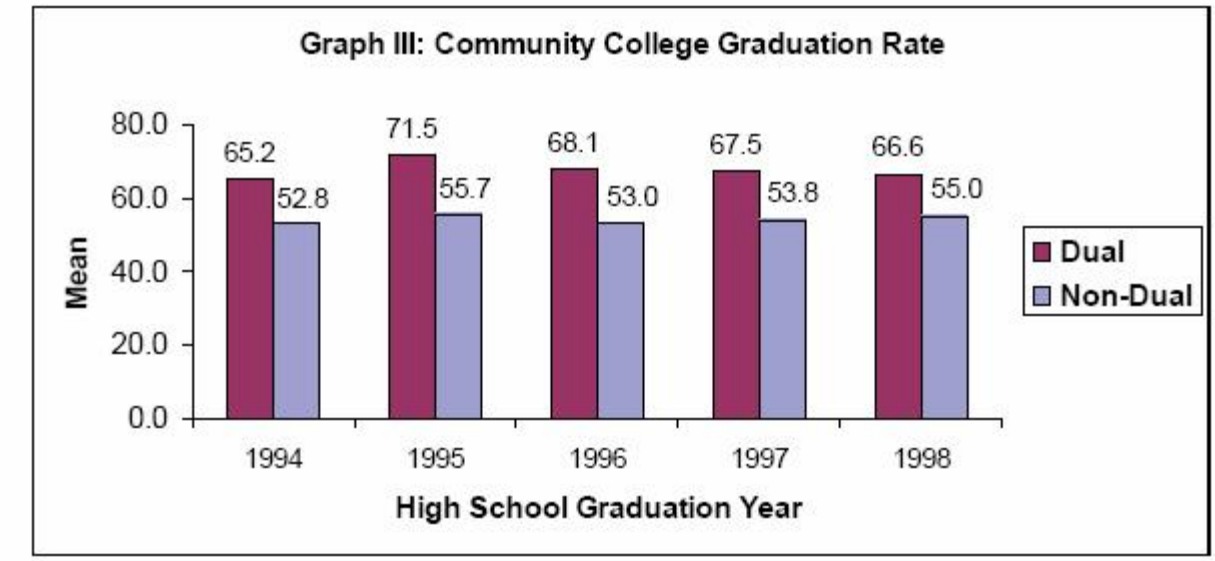
The Florida Department of Education reported the positive findings: "The early results are promising. A recent study by the Florida Department of Education found that "high-school students who enroll in community college dual enrollment programs are enrolling in college and universities at rates significantly higher than students who do not enroll in these accelerated articulation programs. Moreover, Hispanic and African-American students who took dual enrollment courses are enrolling in higher education at higher rates than whites or any other ethnic group".

Florida Department of Education. 2004. *Fast Fact Report.* March.

"High performing Dual Enrollment students graduated from community colleges at higher rates than similar students who did not participate in Dual Enrollment. High performing students, defined as high school students with a 3.0 GPA or above, were tracked for four years following their high school graduation. For each of the 1994 to 1998 cohorts, the college graduation rate for Dual Enrollment students was consistently higher than for non-Dual Enrollment students. The difference in the Dual Enrollment students and non-Dual Enrollment students who completed an Associate in Arts degree was between 12% and 16%. The average number of hours earned as a Dual Enrollment student between 1994 and 1998 ranged from 7.6 to 9.8 hours. The difference in graduation rate between the Dual and non-Dual students

implies that the Dual Enrollment program is serving high achievers who can benefit from exposure to college-level courses while still in high school. "

"The main difference between the groups was in graduation rate. In essence, both groups move through the FCCS toward graduation in an extremely efficient manner. They had almost no excess hours. Graph III, below, shows the rate at which students in each of the high school cohorts completed an AA degree at the community college. The years shown represent the year the cohort graduated from high school. Students were then tracked for four years. This is the graduation rate that is shown. As can be seen in Graph III, both groups had extremely high graduation rates compared to community college students as a whole. The non-Dual rates were in the 53 to 56 percent range, while the Dual rates were in the 65 to 72 percent range.



Florida Department of Education. 2004. *Impact of Dual Enrollment on High Performing Students*. Data Trend # 26. April 2004.

Arizona Studies

Studies of dual enrollment students in Arizona show positive postsecondary outcomes for participants, though it is not clear that the research controlled for students' likely outcomes without dual enrollment experience. Still over 90 percent of students who received their college instruction on a college campus graduated from high school, as compared to the average of 49 percent for the seven high schools from the Maricopa Community College District (Finch, 1997, in Puyear, Thor and Mills, 2001).

A survey of dual enrollment students from another Arizona program found that students' first semester grades were higher than those of a typical community college transfer student (Finch, 1997, in Puyear, Thor and Mills, 2001).

A third study, conducted at University of Arizona (in Puyear, Thor and Mills, 2001), found that dual enrollment participants had lower drops in GPA upon entering the university than did other students, even when prior academic achievement was controlled for.

Puyear D.E., Thor L.M., and Mills, K.L. (2001). "Concurrent Enrollment in Arizona: Encouraging Success in High School." In Robertson, P.F., Chapman, B.G. and Gaskin, F. (2001) *"Systems for Offering Concurrent Enrollment at High Schools and Community Colleges."* New Directions for Community Colleges. No. 113. San Francisco: Jossey-Bass.

KnowledgeWorks Foundation Study

Research presented in Washington at a conference sponsored by *Jobs of the Future* suggests that the early college approach may be achieving substantial gains for students who participate. Of the 130 early college high schools around, only 17 are old enough to have had high school graduations. But enough high schools now have several years of data to show that the students start to show educational gains in their first year in the program, that the students can pass college-level courses, and that participation shifts students to more rigorous curricula.

Other data presented at the meeting showed that students in the early college programs:

- Report significantly greater confidence in math and writing skills.
- Earn passing grades, with many A's and B's, in their college courses.
- Report significant increases from year to year in their knowledge about going to college and the number of discussions they have about applying to college.
- Show a slight decrease over their time in high school about paying for college.
- Are, for those graduating from the high school programs, winning college admission and scholarships at rates that far exceed those in their socioeconomic groups.

Marge Mott, a field manager for the *KnowledgeWorks Foundation* said that the bottom line about these programs is that they are serving students for whom *"there are dismal college attainment rates" and helping the students end up in colleges."*

Research reported in http://www.InsideHigherEducation.com/news/10/05/Early. October 5, 2007.

"College Now" and Wisconsin's "Youth Options Program"

High School Seniors in New York's College Now program (who took early college courses) were compared with other University of New York freshman who did not participate in the program. Compared with other University of New York freshman, "College Now" graduates earned more college credit than and were more likely to graduate from college on time (Bailey, Hughes Karp and Mechur, 2002).

Kleiman (2001) studied "College Now" participants at Kingsborough Community College. As a group, College Now participants had high levels of postsecondary success. When compared to CUNY freshman who did not participate, College Now students who enrolled in the CUNY system were twice as likely to graduate from college on time and less likely to need remedial coursework.

Wisconsin's Youth Options program provided high school students college opportunities to expand their curricular options, particularly in vocational subjects. Youth Options was found to have had a discernible impact in providing a wide array of curricular options to high school students, particularly in rural schools. The authors concluded that both New York's College Now and Wisconsin's Youth Options programs have the potential to improve preparation for college.

Bailey, Thomas R., Hughes, Katherine L.; Karp, Melinda Mechur. *What Role Can Dual Enrollment Programs Play in Easing the Transition between High School and Postsecondary Education?* Office of Vocational and Technical Education, Washington, DC. April 4, 2002.

Kleiman, N.S. (2001, June). Building a Highway to Higher Ed: How Collaborative Efforts are Changing Education in America. New York: The Center for an Urban Future.

Institutional Mathematics Study

Also, Fajen and Prentice (2002) quote Hebert (2001) that among 700 students who took dual enrollment math at their high school received better grades in subsequent coursework who took same dual credit course from college faculty on campus.

Fajen, A.L. and Prentice, C.M. *"Dual Credit Policy: The Missouri Experience."* Kaleidoscope Consulting, Policy Issue Brief, 2002. See also Hans A. Andrews, *"Dual Credit Research Outcomes For Students"*, Community College Journal of Research and Practice, 28:415-0422 2004 and Welsh, John, Nick Brake, and Namok Choie, *"Student participation and performance in dual credit courses in a reform environment,"* Community College Journal of Research and Practice, 29: 199-213, 2005.

Middle College Results Positive

"Middle colleges" are high schools situated on community college campuses—target low performing youth and offer, among other things, a combination of rigorous course work, extensive supports and personalization, and internships in the community. Interim findings from an evaluation of five middle colleges show that students achieved nearly a 100 percent pass rate in their college courses (Lieberman 2004).

Lieberman, Janet E. 2004. *Early College High Schools: Requisites for Success.* Boston, MA: Jobs for the Future.

Another recent report found that students in two California middle colleges were outperforming peers in their respective districts on statewide assessments and standardized tests (Cavalluzzo, Corallo, and Jordan 2002).

Cavalluzzo, Lina, Christopher Corallo, and Will Jordan. 2002. *Case Studies of High Schools on College Campuses: An Alternative to the Traditional High School Program.* Charleston, WV: AEL.

Salt Lake City Community College Study

Salt Lake City Community College 13 year-old dual enrollment program was assesses for effectiveness against other students not enrolled in early college courses. Dual enrolled English students had a mean GPA of 3.48, compared with 3.29 for other students. Dual enrolled Math students enjoyed a GPA of 2.48 compared with 2.44 for other students.

Krile, D.J. and P. Parmer. *"Tech Prep: Pathways to Success? The Performance of Tech Prep and Non-Tech Prep Students at a Midwestern Community College."* Sinclair Community College. Dayton, Ohio. Office of Institutional Planning and Research. 2002.

Kansas Study

This study examined the relationship between participation and location of dual credit enrollment and the educational aspirations of high school students. Results indicated that participation in dual credit programs had a positive and significant relationship with educational aspirations. Other independent variables that demonstrated strong positive predictive importance for educational aspirations were parents' educational levels and grades.

Smith, D. *"Why Expand Dual-Credit Programs."* Community College Journal of Research and Practice." Volume 31, Number 5: 371-387, May 2007.

City College of San Francisco Study

CCSF students that participated in early college opportunities outperformed their peers who did not participate in early college opportunities and matriculated to CCSF. Students with prior early college experience passed

58% of their units once matriculated at CCSF while students without prior experience passed 53% of their units.

Spurling, S. and R. Gabriner (2002). *"The Effect of Concurrent Enrollment Programs upon Student Success at City College of San Francisco: Findings."* City College of San Francisco, CA. Office of Institutional Development, Research and Planning: 5.

Acceleration Study

Rogers examined the issue of educational acceleration as a curricular option and suggests that bright students benefit academically from a more challenging learning environment and that, contrary to popular opinion, they are not harmed socially or psychologically. This was a meta analysis of 19 major research syntheses.

Rogers, K.B. and R.D. Kimpston (1992). *"Acceleration: What We Do vs. What We Know."* Educational Leadership 50(2):58.

Students' Perceptions of Dual Enrollment

"There is evidence that students enjoy their participation in dual enrollment programs, find it useful and motivating, and are generally satisfied with their experience. (Orr, 2002; see also Robertson, Chapman and Gaskin, 2001)"

The majority of dual enrollment completers from Salt Lake Community College believed that their participation in dual enrollment encouraged them to attend college (Peterson, Anjewwierden, and Corser, 2001)

Peterson M.K., Anjewierden J., and Corser, C. (2001) *"Designing an Effective Concurrent Enrollment Program."* In Robertson, P.F., Chapman, B.G. and Gaskin, F. (2001) *"Systems for Offering Concurrent Enrollment at High Schools and Community Colleges."* New Directions for Community Colleges. No. 113. San Francisco: Jossey-Bass.

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NIACC's 16 Assessment Studies of Student Learning Outcomes in Dual Credit Courses Compared with Regular On-Campus Student Outcomes

For a number of years NIACC faculty have conducted assessment studies of student outcomes in dual credit courses. The following represents a synopsis of the studies:

a. Communications Skills I

Site: Clear Lake Community School District

Course: Communications Skills I

Methodology: Final writing papers from a traditional NIACC Communication Skills course (25 students) and the PSEO course (28 students in two sections at Clear Lake) were collected. The names of the students and any other identifying characteristics were removed from the papers. The papers were shuffled and then submitted to Dr. James Zirnhelt, instructor and Division Chair, for assessment. Each paper was graded on a 0 to 4 scale on six separate criteria: purpose, content, organization, sentences, diction, and mechanics.

Findings: The null hypothesis that the means of the two groups were not significantly different at .05 probability was accepted.

Conclusion: Student writing outcomes are equal, as assessed by an evaluation of final writing papers.

b. General Psychology

Site: Garner-Hayfield Community School District

Course: General Psychology

Methodology: As the Garner students had an average 89th ITED percentile score, a matched pair methodology was employed. That is, a NIACC psychology instructor matched Garner students with high ability traditional students in his class. Outcomes were assessed on the basis of a 100-point multiple-choice exam.

Findings: The Garner class mean was 84.35 with a standard deviation of 8.82. Campus mean was 84.82 with a standard deviation of 7.76. The t-test revealed no significant difference between the two groups at .05 probability.

Conclusion: Psychology outcomes as measured by a final exam are equal.

c. Criminal Law I

Site: Mason City Community School District

Course: Criminal Law I

Methodology: The final test was utilized for the evaluation. Nineteen students were enrolled in the Mason City PSEO class while 21 students were enrolled in the NIACC on-campus class.

Findings: The mean of the Mason City High School group was 42.37 with a standard deviation of 4.425. This compared to the NIACC mean score of 45.62 with a standard deviation of 8.43. A t-test was utilized to test the null hypothesis that there was no significant difference between the means. The null hypothesis was accepted at .05 probability.

Conclusion: Outcomes for the telecommunications course, Criminal Law I, as measured by the final exam were not significantly different for the PSEO class as compared to the NIACC on-campus class.

d. General Psychology

Site: North Central Community School District, Manly

Course: General Psychology

Methodology: A final exam was given to both the PSEO and traditional NIACC classes. As group size varied, it was agreed that the NIACC instructor would use the first 14 names in his grade book to compare with the 14 TAG (Talented and Gifted) students in the Manly class.

Findings: The mean of the Manly TAG class was higher, 3.53, than the mean of the traditional NIACC class, 3.03. A t-test was utilized to test the null hypothesis that there was no significant difference between the means. The null hypothesis was accepted at .02 probability.

Conclusion: Outcomes for the General Psychology as measured by the final exam were not significantly different for the PSEO class as compared to the NIACC on-campus class.

e. General Psychology

Site: Garner-Hayfield Community School District

Course: General Psychology

Methodology: As the Garner students represent a very high ability group, a matched pair methodology was employed. That is, a NIACC psychology instructor matched Garner students with high ability traditional students in his class.

Findings: The Garner class mean was 81.2 with a standard deviation of 7.23. The campus mean was 83.1 with a standard deviation of 6.36. The t-test revealed no significant difference between the two groups at .05 probability.

Conclusion: Psychology outcomes as measured by a final exam are equal.

f. Business Statistics

Site: Garner-Hayfield Community School District

Course: Business Statistics

Methodology: As the Garner students represent a very high ability group, a matched pair methodology was employed. ACT scores were used to create the matched pairs.

Findings: The Garner class mean was 68.4 with a standard deviation of 4.49. The campus mean was 54.4 with a standard deviation of 6.12. The Garner class mean was higher than the campus class mean. However, the sample size was only five students, so the t-test revealed no significant difference between the two groups at .01 probability.

Conclusion: Business statistics outcomes as measured by a final exam are equal.

g. Business Statistics

Site: CAL Community School District

Course: Business Statistics

Methodology: As the CAL students represent a very high ability group, a matched pair methodology was employed. ACT scores were used to create the matched pairs.

Findings: The CAL class mean was 47.7 with a standard deviation of 6.02. The campus mean was 50.3 with a standard deviation of 1.89. The t-test revealed no significant difference between the two groups at .01 probability.

Conclusion: Business statistics outcomes as measured by a final exam are equal.

h. Introduction to Statistics

Site: North Central and Northwood-Kensett Community School Districts

Course: Introduction to Statistics

Methodology: A common final exam was given to both the PSEO and traditional NIACC classes.

Findings: For the PSEO group the mean score was 37 with a median score of 37.5. The NIACC class mean was 31.67 with a median score of 32. Based on the data and the p-value for the two sample t-test, the higher mean score of the PSEO group's final exam is statistically significant.

Conclusion: The PSEO group outperformed the traditional NIACC class.

i. Developmental Psychology

Site: Garner-Hayfield Community School District

Course: Developmental Psychology

Methodology: A common final was given to both the PSEO (Garner) and traditional NIACC (on-campus) classes.

Findings: For the PSEO group the mean final exam score was 33.67. There were three sections of Developmental Psychology at NIACC the same semester. The mean final exam scores for these sections were 35.08, 33.00, and 31.56. Based on two-sample t-tests, the Garner mean was not significantly different from any of the NIACC means, at .05 probability.

Conclusion: The performance of the PSEO (Garner) group was not significantly different from the performance of the NIACC groups.

j. Developmental Psychology

Site: Hampton-Dumont Community School District

Course: Developmental Psychology

Methodology: A common final was given to both the PSEO (Hampton) and traditional NIACC (on-campus) classes.

Findings: For the PSEO group the mean final exam score was 33.05. There were three sections of Developmental Psychology at NIACC the same semester. The mean final exam scores for these sections were 35.08, 33.00, and 31.56. Based on two-sample t-tests, the Hampton mean was not significantly different from any of the NIACC means, at .05 probability.

Conclusion: The performance of the PSEO (Hampton) group was not significantly different from the performance of the NIACC groups.

k. Biological Principles

Site: North Iowa High School (NIHS), Buffalo Center

Course: Biological Principles

Methodology: A common final was given to both the PSEO (NIHS) and traditional NIACC (on-campus) classes.

Findings: For the PSEO group the mean final exam score was 22.55. For the section taught on the NIACC campus that semester, the mean final exam score was 15.25. Based on a two-sample t-test, the NIHS mean was significantly higher than the on-campus mean, at .05 probability.

Conclusion: The performance of the PSEO (NIHS) group was significantly higher than the performance of the NIACC groups.

l. Introduction to Computers

Sites: Hampton-Dumont School District and Mason City School District

Course: Introduction to Computers

Methodology: A common final was given to both the PSEO (Hampton-Dumont and Mason City) and traditional NIACC (on-campus) classes.

Findings: For the PSEO groups the mean final exam scores were 68.92 (Hampton-Dumont) and 74.66 (Mason City). The mean final exam score for the section at NIACC was 81.19. Based on two-sample t-tests, the Hampton-Dumont mean score was significantly lower than the NIACC mean score. The Mason City mean was not significantly different from the NIACC mean, at .05 probability.

Conclusion: The performance of the Hampton-Dumont group was significantly lower than the performance of the NIACC group. The performance of the Mason City group was not significantly different from the performance of the NIACC group.

m. Beginning Web Page Development

Sites: North Butler, Hampton-Dumont, Mason City, Rockwell-Swaledale, Osage

Course: Beginning Web Page Development

Methodology: Three judges scored a capstone web site project developed by the students.

Findings: In all five of the categories evaluated 1) Web Design, 2) Completeness 3)Coolness, 4) Mastery and 5) Overall Score no significant differences were observed between high school students and regular NIACC students.

Conclusion: The performance of high school students in five distinct high schools matched the performance of students in the regular college course on the NIACC campus.

n. Composition II

Sites: Belmond, C-A-L, Mason City, Forest City, Garner, West Hancock

Course: Composition II

Methodology: In Spring 05 semester four highly experienced instructors from two community colleges other than NIACC were hired as essay readers to read and score 89 essays, randomly

chosen from a pool of approximately 750 students enrolled in Composition II (45 from on-campus classes and 44 from off-campus classes). All essay readers scored all 89 essays, using a rubric measuring five attributes and scoring from one to four points for each attribute. The essay reader then averaged the five attributes, assigning equal value for each attribute, which resulted in a final score between one and four--a score, not a grade. Because NIACC has been using Writer's Workbench (WWB) for over twenty years, the Communication faculty used WWB to compare the essays by using seven of its most commonly used programs. Use of these programs provided a "consistent measuring stick" by which to objectively assess certain elements of writing.

Findings: The average scores of 2.20 for the 45 students on campus and 2.18 for the 44 students off campus showed a statistically insignificant difference. Of the seven attributes being measured, four met the standards of WWB both on and off campus, and three fell slightly outside the standards both on and off campus. Outcomes were consistent.

Conclusions: The scores from both the essay readers (arguably subjective, albeit highly experienced and using a standard) and from the Writer's Workbench (totally objective in application of standards) showed very high degrees of consistency between the results of essays written in courses taught both on-campus and off-campus. The results provide both assessment of results of current teaching and assessment for improvement of instruction.

o. Educational Media

Sites: Forest City High School and North Butler High School

Course: Educational Media

Methodology: Every student in the high school based sections and every student in the section taught on campus completed a common set of 13 course assignments. Each instructor used the same rubric for scoring the assignments.

Findings: The average total scores for the high school based sections were 93% for Forest City and 97% for North Butler. The average total score for the campus based section was 89%.

Conclusion: Students in the high school based sections performed at least as well as the campus based section.

p. Introductory Biology

Site: North Iowa High School
Course: Introductory Biology

Methodology: A common final was given to both the high school based class (North Iowa High School) and the NIACC (on-campus) class.

Findings: For the high school-based class the mean final exam score was 22.11. The mean final exam score for the section at NIACC was 18.00. Based on a two-sample t-test, the North Iowa High School mean score was not significantly different from the NIACC mean score, at .05 probability.

Conclusion: The performance of the North Iowa High School class was not significantly different from the performance of the NIACC group.