

University of Denver

Digital Commons @ DU

Electronic Theses and Dissertations

Graduate Studies

11-1-2013

Concurrent Enrollment Programs and Acquired Social Capital for Students from Impoverished Backgrounds: An Examination of High School and College Outcomes

Dan D. Jorgensen
University of Denver

Follow this and additional works at: <https://digitalcommons.du.edu/etd>



Part of the [Educational Assessment, Evaluation, and Research Commons](#)

Recommended Citation

Jorgensen, Dan D., "Concurrent Enrollment Programs and Acquired Social Capital for Students from Impoverished Backgrounds: An Examination of High School and College Outcomes" (2013). *Electronic Theses and Dissertations*. 325.

<https://digitalcommons.du.edu/etd/325>

This Dissertation is brought to you for free and open access by the Graduate Studies at Digital Commons @ DU. It has been accepted for inclusion in Electronic Theses and Dissertations by an authorized administrator of Digital Commons @ DU. For more information, please contact jennifer.cox@du.edu, dig-commons@du.edu.

CONCURRENT ENROLLMENT PROGRAMS AND ACQUIRED SOCIAL CAPITAL
FOR STUDENTS FROM IMPOVERISHED BACKGROUNDS:
AN EXAMINATION OF HIGH SCHOOL AND COLLEGE OUTCOMES

A Dissertation

Presented to

The Faculty of the Morgridge College of Education

University of Denver

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Philosophy

by

Dan D. Jorgensen

November 2013

Advisor: Dr. Kent Seidel

© Copyright by Dan D. Jorgensen 2013

All rights reserved

Author: Dan D. Jorgensen

Title: CONCURRENT ENROLLMENT PROGRAMS AND ACQUIRED SOCIAL CAPITAL FOR STUDENTS FROM IMPOVERISHED BACKGROUNDS: AN EXAMINATION OF HIGH SCHOOL AND COLLEGE OUTCOMES

Advisor: Dr. Kent Seidel

Degree Date: November 2013

Abstract

Poverty has been linked to reduced workforce opportunities, reduced college-going rates, increased social-emotional challenges, and even negative health consequences. Postsecondary educational opportunities, offered during high school, that contribute to the acquisition of social capital may improve academic outcomes for students from impoverished backgrounds. The Colorado concurrent enrollment legislation, provides one opportunity for students to enroll in college level coursework and receive college credits with tuition being paid through state funding while in high school. Concurrent enrollment (CE) programs support the college application, financial aid and enrollment processes. Most importantly, they also support the development of social networks that may foster beneficial secondary and postsecondary outcomes. This dissertation examines the participation and representation rates of free and reduced lunch (FRL) students in CE programs at the state and local level. Next, the impact of CE participation on secondary and postsecondary outcomes in students from impoverished backgrounds is examined. The quasi-experimental research design included a matched control group generated by logistic regression and propensity score matching techniques. A sensitivity analysis was conducted to estimate unaccounted for variance that may have

contributed to any observed between-group differences. Between-group differences were examined for a range of outcomes at the high school and postsecondary level. The study analysis was replicated utilizing two additional groups of program participants across two years to increase confidence in the obtained findings.

Overall, the findings indicate that FRL students were underrepresented as concurrent enrollment participants during the 2010 and 2011 academic years. A limited number of local education agencies had FRL student participation rates that exceeded enrollment expectations. Statistical analysis indicated that FRL students earned CE credits at a lower rate than their non-eligible peers. In contrast, the FRL students enrolled for a larger number of CE credits than non-eligible students. Additional analysis revealed that a number of positive secondary and postsecondary outcomes were related to concurrent enrollment participation for economically disadvantaged students. The results of sensitivity analyses indicate that other, unaccounted for variables were unlikely to have impacted the obtained findings.

The findings of this study indicate that concurrent enrollment opportunities may mitigate some of the deleterious impacts of poverty by improving academic achievement and college-going rates. The beneficial role of social capital for achievement of postsecondary success is discussed.

Keywords: accelerated programs, concurrent enrollment, dual credit, dual enrollment, postsecondary educational opportunities, poverty, poverty cycle, social capital

Acknowledgements

I want to begin by recognizing the support of my committee members. Your feedback contributed greatly to the improvement of this dissertation. Also, my utmost gratitude goes to Dr. Linda Brookhart for getting me back on the academic path.

I would be remiss if I failed to specifically acknowledge Lori Kohl, Adena Miller, and Jane Walsh for participating in our Saturday work group. It definitely made the work of writing a dissertation a bit easier and much more enjoyable than it might have been otherwise.

My deepest thanks go to my family. My wife and children, Amy, Mercedes, Adina, and Evan, provided me with the encouragement to further my education. I appreciate all of your sacrifices that allowed me to pursue my dream. There's nothing more important than my relationship with each of you. It is Phyllis and Gailen who gave me the skills, resources, and motivation to first step into a college classroom. Thank you both. I'm blessed to have you as parents.

This dissertation has raised my awareness of the plight of children that reside in poverty. We must always remember that these children are the future neighbors, friends, and work colleagues of our own children. We can't do what's right for our own children if we don't support all of the children within the communities in which we live.

I dedicate this dissertation to the loving memory of Jo Hanson who was my cousin, friend and mentor. You were a true teacher and scholar. You are dearly missed.

Table of Contents

Abstract.....	ii
Acknowledgements.....	iv
Table of Contents.....	v
List of Tables.....	viii
List of Figures.....	x
Chapter One: Introduction	1
Background.....	1
Rationale and Significance of Study.....	4
Need for the Study	5
Research Questions.....	9
Limitations.....	10
Summary.....	12
Definition of Terms.....	13
Academic Outcomes	13
Behavioral Outcomes.....	13
Concurrent Enrollment.....	14
Concurrent Enrollment Credit.....	14
Dual Enrollment.....	14
Free and Reduced Lunch	15
Impacted Students.....	15
Local Education Agencies.....	15
Low-Income Students.....	15
Postsecondary Enrollment Opportunities.....	16
Poverty.....	16
Remedial Education.....	16
Social Capital.....	16
Chapter Two: Literature Review	18
Social Capital Theory	18
Social Capital and Education.....	19
Quality of Life and College Completion	20
Impact on Health.....	21
Impact on Earnings	22

Equity and Access to College	25
Poverty	25
Race and Ethnicity	26
Dominant Cultural Norms and Values.....	27
Concurrent Enrollment Programs	27
Colorado Concurrent Enrollment.....	31
Concurrent Enrollment Program Act.....	31
Impact of Legislation on Student Outcomes.....	33
Key Components of Effective CE Programs	34
Summary	36
Chapter Three: Methodology	38
Background.....	38
Study Design.....	40
CE Participation and Representation Rates	43
CE Program Impacts in High School and College.....	44
Data Sources & Operational Definitions	44
Population and Cohort Description.....	46
Analysis.....	47
Data Analysis Software Tools	47
Missing Data Analysis Procedures	48
Propensity Score Matching (PSM)	49
Logistic Regression Procedure	50
Case Matching Procedure	51
Sensitivity Analysis	52
Between-Group Comparisons.....	53
Independent/Dependent Samples <i>t</i> -tests	53
Mann-Whitney <i>U</i> -Tests	54
Chapter Four: Results	55
CE Representation Rates of FRL Students within the State of Colorado.....	55
Recruitment of FRL Students by Local Education Agencies.....	58
Credit Accumulation and Remediation Rates.....	61
CE Participation Rates by Economically-Disadvantaged Graduates.....	63
CE Program Participation Outcomes.....	66
Logistic Regression & Propensity Score Analysis Matching.....	66
Sensitivity Analysis	74

Between-Group Comparison of Impact During High School and College	74
CE1 Results.....	75
CE2 Results.....	76
CE1/2 Results.....	76
Chapter Five: Discussion	81
Introduction	81
Relationship with Previous Research.....	82
Implications.....	83
Barriers to Program Effectiveness & Participation.....	83
The Relationship of CE Programs and Colorado Policy	85
CE Program Development	85
Limitations of the Study.....	85
Recommendations for Future Research	88
References.....	91
Appendix A. IRB Approval Letter: University of Denver	101
Appendix B. IRB Approval Letter: Colorado Department of Education.....	103
Appendix C. District FRL Participation in CE Programs by Year.....	105

List of Tables

Table 1. Data Elements for Propensity Score Matching Procedure.....	51
Table 2. CE Participation Rates by Year and FRL Status.....	57
Table 3. Representation Rates of FRL Students Compared to State FRL Membership.....	58
Table 4. CE Participation Rates based on FRL Status between years for Largest Providers.....	60
Table 5. CE Credits Attempted and Earned based on FRL Status between years.....	61
Table 6. Percent of CE Students Enrolling in Remedial Coursework by FRL Status.....	62
Table 7. Remedial Credits Attempted by Subject, FRL Status, and Year.....	63
Table 8. CE Participation Rates by Graduate Class of 2009, 2010, 2011, & 2012.....	65
Table 9. CE Participation Rates by Graduates with FRL Eligibility: Class of 2011 & 2012.....	65
Table 10. Logistic Regression Coefficients for PSM Procedure by CE Sample (Cohorts).....	68
Table 11. CE Participants and Matched Groups: Counts by Cohort.....	69
Table 12. Demographic Composition of Unmatched and Matched Groups (CE1).....	71
Table 13. Demographic Composition of Unmatched and Matched Groups (CE2).....	72
Table 14. Demographic Composition of Unmatched and Matched Groups (CE1/2).....	73
Table 15. Sensitivity Analysis of Ranked-Pairs.....	74
Table 16. Between-Group Differences in CE1 Outcome Measures by Free and Reduced Lunch Status.....	78
Table 17. Between-Group Differences in CE2 Outcome Measures by Free and Reduced Lunch Status.....	79

Table 18. Between-Group Differences in CE1/2 Outcome Measures by Free and
Reduced Lunch Status.....80

List of Figures

Figure 1. Career Salary Projections based on Level of Education.....	22
Figure 2. Proposed Relationship between Education and Earnings.....	24
Figure 3. Proposed Relationship between Education and Income Poverty.....	24
Figure 4. Quasi-Experimental Design with Matched Control Group.....	41
Figure 5. Demographic Comparisons of Treatment and Unmatched/Matched Control Groups of FRL Students for CE1.....	71
Figure 6. Demographic Comparisons of Treatment and Unmatched/Matched Control Groups of FRL Students for CE2.....	72
Figure 7. Demographic Comparisons of Treatment and Unmatched/Matched Control Groups of FRL Students for CE1/2.....	73

Chapter One: Introduction

Background

A vast body of research in education, sociology, public policy and criminal justice is showing that poverty, as a single factor, and the poverty cycle, in its cumulative aspects, may be the one of the largest challenges in the achievement of societal successes for an individual, a community and our Nation (Brooks-Gunn & Duncan, 1997; Gamoran & Long, 2006; PRRAC, 2011). Per the 2012 "Kids Count" report, the percentage of children living in poverty increased by nearly a third between 2000 and 2010, and rose 16 percent between 2005 and 2010. The number of school-aged children that reside in poverty in the United States is now over 16 million children (2012). Approximately 22% of all children live in families with incomes below the federal poverty level – \$23,550 a year for a family of four (National Center for Children in Poverty, 2013).

It has been argued that poverty may serve as the primary factor in inhibiting access to and achievement in postsecondary educational opportunities which, in itself, will limit upward economic mobility for many children. With a college degree, children born to parents in the bottom quintile of incomes reduce their chance of remaining at that

level by up to two thirds (Ferguson, Bovaird, & Mueller, 2007; Haskins, Holzer, & Lerman, 2009).

Yet, the dichotomy does not lie within the agreed fact that with a college degree, children in poverty situations are positioned to significantly improve their economic future; it lies in the fact that the rate for children in these poverty situations earning an advanced degree is low (Choy, 2002; Provasnik & Planty, 2008; Aud et al., 2012). This low rate of college completion serves to perpetuate generational poverty by excluding individuals from employment opportunities that provide higher salaries. Providing an answer to breaking the poverty cycle without providing the tools to achieve that solution are discouraging.

In today's increasingly competitive, global economy, all students need to graduate from high school prepared for postsecondary education. Almost 85 percent of current jobs and 90 percent of new jobs in occupations with both high growth and high wages will require workers with at least some postsecondary education (The Alliance, 2007). With the low rate of college completion of students in poverty situations comes the creation of a perpetuate generational poverty cycle by creating a ceiling that will exclude individuals from career advancement or employment opportunities that provide higher salaries and more financial security. In effect, access to high paying jobs in a post-industrial workforce is increasingly based on having a college degree and/or specialized postsecondary training.

In the past, the prevailing societal expectations of who should attend college, paired with a lack of financial resources, and lack of postsecondary social networks served to marginalize the impoverished populations that were most in need of these opportunities. This occurred even though it had been shown that increased postsecondary opportunities support the amelioration of the cycle of poverty (Haskins, Holzer, Lerman, 2009).

In 2009, the Colorado General Assembly unanimously passed the Concurrent Enrollment Programs Act (Colorado Department of Education, 2010). Instead of focusing attention on highly able, college-bound students, the Concurrent Enrollment Programs Act extended the delivery of college-level courses to all eligible students in high schools throughout Colorado, grades 9-12. In addition, the legislation addressed gaps in student achievement by; authorizing the delivery of ‘remedial’ courses to students in their 12th grade year. Finally, the legislation merged the K-12 and postsecondary education systems by creating the nation’s first statewide “fifth year” dual degree program, called (ASCENT). According to the Education Commission of the States, at that time, no state in the nation had a comprehensive, statewide 5th-year option available to all public high schools. In 2011-12 approximately 24,000 students participated in some type of dual enrollment program in Colorado (Bean, White, & Ruthven, 2013).

This study focuses on the ability and necessity to position students to successfully participate and achieve in concurrent enrollment programs. This participation is proposed, via this research, to improve academic and social outcomes for impoverished

students by increasing access to social capital. Social capital, in its simplest form, refers to social relations that have productive benefits (Claridge, 2004). All individuals have access to their own acquired social capital. However, some marginalized groups may have reduced access to a form of social capital that is best able to support college going pursuits. In this study, social capital refers to an increase in both social networks and activities resulting from Concurrent Enrollment participation that support the college enrollment, attendance, and expectations process. This includes newly established or expanded relationships with teachers and counselors. It may also include familial relationships that become more supportive by fostering more favorable perceptions of postsecondary activities. All of these relationships may promote college going values and norms that support the pursuit of additional postsecondary pursuits while also improving high school academic performance and social behaviors.

Rationale and Significance of Study

This dissertation explores the impact of participation in the Colorado concurrent enrollment program to improve academic and social outcomes for students of poverty during both high school and college. The increasing number of students that reside in economically-disadvantaged environments, the growing need for postsecondary education for successful workforce transitions, and the recognition of differential access to community and social resources that lead to successful college-going behaviors are the platform for this dissertation. It is hypothesized that increased access to postsecondary opportunities will foster improved academic and behavioral outcomes for historically

underserved students. It is expected that the recruitment and participation of these students in concurrent enrollment programs will strength a student's perception of the value of postsecondary advancement, facilitate student engagement in their academic position, support the development of important social networks and mentorships, and will introduce the student to the norms and expectations of the college-going experience.

It is believed that concurrent enrollment participation will serve as a catalyst for both short and long term changes in secondary and postsecondary school engagement and achievement. The college experience will foster the norms regarding academic relationships, achievement, and behavior that will improve high school outcomes and postsecondary success. The impact during high school is expected to include improved graduation rates and achievement along with a reduction in expulsions and dropouts. It is believed that the need for college remediation will be reduced while college-going rates will increase. In addition, enhanced early academic performance in college is expected. These positive outcomes are expected to result from increased access to the social capital that fosters student success in both high school and college.

Need for the Study

An increasing number of students are entering the public education system from impoverished backgrounds (Aud et al., 2011). The exposure of children to poverty has been linked to a number of unfavorable academic and social outcomes that impact the professional opportunities and long-term success of these students (O'Rand, Hamil-Luker, & Elman, 2009). This includes lower college going rates, lower achieved salaries,

and poor health outcomes (2009). The purpose of this study is to examine the concurrent enrollment (CE) program as one possible approach to mitigate the negative impacts of poverty and to improve college going rates by the removal of social and financial barriers to college participation. This study will provide an initial, comprehensive examination of the effect(s) of CE program participation on reducing some of the adverse effects of exposure to poverty. The acquisition of social capital will be evidenced from improved high school academic performance and behavior. Similarly, postsecondary outcomes are expected to improve as evidenced by a reduction in the need for remediation, higher college-going rates, and improved achievement scores during the first year of college. The inferred relationship between outcomes and social capital will serve as a first step towards demonstrating the importance of social networks on educational outcomes.

The foundation of this study is related to the theoretical social capital perspective (Coleman, 1988/1994; Putnam, 2000, Smith, 2009). Social capital theory is based on the assumption that our social relationships matter (Field, 2008). It has been argued, “...increasing evidence shows that social cohesion is critical for societies to prosper economically and for development to be sustainable” (World Bank, 1999). Robert Putnam (2000) explains social capital in the following manner:

Whereas physical capital refers to physical objects and human capital refers to the properties of individuals, social capital refers to connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them. In that sense social capital is closely related to what some have called “civic virtue.” The difference is that “social capital” calls attention to the fact that civic virtue is most powerful when embedded in a sense network of reciprocal social relations. A

society of many virtuous but isolated individuals is not necessarily rich in social capital. (Putnam, 2000, page 19).

A wide range of benefits have been linked to higher levels of social capital including favorable child development, public spaces being cleaner with streets being safer, and people tending to be healthier (Putnam, 2000; Wilkinson & Pickett, 2009). Possibly of greatest relevance, is the recognition that the availability of social capital may serve to negate the deleterious effects of socioeconomic disadvantage (Putnam, 2000). As previously established, students from lower socioeconomic strata, tend to have less access to social capital, which has been argued is central to a student's educational success (Walpole, 2003). In turn, this relationship implies an impact on an individual's socioeconomic mobility. Prior research has suggested that students from low-income backgrounds may be less likely to enroll in college because of reduced access to social capital (Sandefur, Meier, Campbell, 2006). These students may lack understanding of college-going norms and expectations that are typically obtained in more affluent groups from family members and high school staff (Nagaoka, Roderick, & Coca, 2009). Social capital theory examines the ability of privileged groups to control merit and hold an unfair advantage in regards to resources including access to educational opportunities (Huang, J., van den Brink, H.M., & Groot, W., 2009; Bonilla-Burke & Johnstone, 2004). It is proffered that the existence of an established meritocracy reduces college participation based on exclusion of those individuals who lack access to the required social capital. The establishment of programs that remove the merit requirement would

have the potential to alleviate differential participation and improve outcomes for those who lack access to the culturally established norms and skills typically linked to college participation.

The concurrent enrollment program is one initiative that can be implemented free from restrictive eligibility requirements that may lead to a variety of positive outcomes for participating students. Some of the proposed benefits include: a smoother transition between high school and college, faster degree completion, reduced college costs, reduced dropout rates, reduced remediation rates, enhanced high school curriculum, easing student recruitment, and even enhancing opportunities for underserved populations (Allen, 2010). A number of these claims have yet to be supported within the research literature; specifically, very few studies have examined programmatic impacts on underserved, high-poverty populations utilizing rigorous analytic approaches during high school and college. Studies conducted by Hoffman (2005) and Hughes, Rodriguez, Edwards, and Belfield, (2012) allude to possible positive effects of CE participation for students from a wide-range of demographic backgrounds. In addition, Turner's (2010) study of Latino students from impoverished backgrounds revealed that significant changes to concurrent enrollment programs may be required to occur to effectively address their needs and promote recruitment efforts. One additional study revealed that CE participants from impoverished backgrounds have a greater likelihood of completing a college degree than similar students who didn't participate in the program (An, 2013). Unfortunately, the ability of concurrent enrollment programs to improve a wider range of

academic and social outcomes for students of poverty has not been systematically examined using rigorous quantitative methods and analytics.

A rigorous study that examines both secondary and postsecondary outcomes associated with concurrent enrollment program participation that is focused on students of poverty and allows for causal attributions has yet to be identified in the empirical literature. This dissertation includes a research design/analysis methodology that helps to support such claims. Most significantly, this dissertation expands on research that explores mechanisms that may improve academic outcomes from groups of students that have, in the past, been largely marginalized from college participation.

Research Questions

This dissertation examined the ability of concurrent enrollment program participation to contribute to improved academic outcomes during high school and college for economically disadvantaged students. The research questions guiding this study included:

1. **Recruitment:**

Has the CE participation of students identified, through the National School Lunch Program, as free or reduced lunch eligible increased since the CE legislation was first implemented? Do participation rates by free and reduced lunch eligible students reflect rates that would be expected based on their representation within state and district membership? Are some local education agencies more effective in recruiting these students to participate in their CE

programs? Are more free and reduced lunch eligible students graduating with CE credits since the program was first implemented?

2. Impacts: During High School

What are the academic and behavioral impacts of participation in a concurrent enrollment program for economically disadvantaged students during high school compared to matched non-participants?

3. Impacts: First-year College

What impact does concurrent enrollment program participation have on first-year college-going rates, remediation rates, and college achievement for the economically disadvantaged student compared to matched non-participants?

Limitations

The purpose of this study is to better understand the impact of concurrent enrollment programs on the amelioration of gaps in achievement, deterrent behaviors, and matriculation into college for students of poverty through acquired social capital. This study relies on free and reduced lunch data as a proxy for poverty and it should be recognized that some bias may be associated with its use and application in research studies (Harwell & LeBeau, 2010). It has been shown to be underreported at the high school level (2010). Also, FRL status is an imprecise proxy for poverty given that it includes both free and reduced lunch status categories that differ from each other with both exceeding the absolute fiscal standard for poverty. In turn, the reported FRL status

fails to serve as a precise measure of the absolute level of poverty experienced by individuals within a community or school. Given the large degree of income variability that is associated with the FRL designation, a high FRL percentage in one school must be recognized to not necessarily be equivalent to other schools that serve the same reported percentage of FRL students.

A second limitation is specific to the research design itself. A quasi-experimental design that utilizes propensity scores serves to adjust for the lack of random assignment by creating a matched control sample based on a number of covariates. This serves to reduce the impact of confounding factors that may contribute to any observed differences between groups (Guo & Fraser, 2010; Shadish, Cook, and Campbell, 2002). However, the design fails to guarantee group equivalence due to the possibility that many unaccounted variables may still be present. The use of random assignment is the only proven and conceptually sound method for ensuring group equivalence that can generate unbiased estimates of average treatment effects (Rosenbaum, 1995). However, research has shown that quasi-experimental designs can at least partially account for preexisting differences between groups to support causal attributions (Dehejia & Wahba, 2002; Fortson, Verbisky-Savitz, Kopa, and Gleason, 2012).

A final identified limitation associated with this study is its inability to identify the characteristics of the concurrent enrollment programs that contribute to any observed favorable outcomes for students from lower socioeconomic strata. The study will not identify the program attributes and/or the mechanisms by which social capital contributes

to the observed outcomes. This may limit the application of this study due to its inability to identify the specific factors, related to program implementation, that contribute to any favorable outcomes. However, the demonstration of impact has the potential to lead to an expanded future research agenda that will examine the key attributes associated with successful CE programs.

Summary

Education, opportunity, and relationships can serve as ways to ameliorate poverty and may serve to modulate the persistent underlying conditions that create and sustain poverty (Erwin, 2008). This dissertation examines data related to the ability of concurrent enrollment programs to improve academic achievements and behavioral outcomes for students of poverty during their secondary and postsecondary educational experiences. With the creation of educational opportunities for disadvantaged students comes the possibility of breaking the cyclical effects that keep individuals, families and communities in poverty.

Concurrent enrollment programs provide students with the ability to participate in college courses and earn postsecondary credit. Simultaneously, the programs provide structured social networks that support future postsecondary pursuits. These experiences have the potential to provide traditionally marginalized students access to increased social capital that may impact their future earning potential and quality of life. The social capital theory helps to explain limited postsecondary participation of impoverished students in the past. It is anticipated that participation in concurrent enrollment programs

during high school will contribute to a range of positive outcomes. Specifically, it is expected that dropout rates will be reduced along with expulsion rates in high school. Also, academic achievement may increase due to increased engagement resulting from the relevance of the coursework offered. Most importantly, the college-going rates of the CE participants following high school graduation is expected to be higher than those of non-participating matched peers. In addition, a reduced need for remediation is expected to occur and improved first year college grade point average is expected.

Definition of Terms

The terms below are referred to throughout this dissertation. The operational definitions related to these terms, when applied to the research methodology, will be described in chapter three.

Academic Outcomes: The term refers to any achievement outcome linked to participation in high school or college coursework that may be utilized to determine the impact of participation in the concurrent enrollment program. The performance of students on standardized assessments are one such outcome and will comprise much of the focus of this study.

Behavioral Outcomes: The term refers to any social behavioral outcome linked to participation in high school or college coursework that may be utilized to determine the impact of participation in the concurrent enrollment program. In this study, behavioral outcomes include high school graduation rates and dropout rates.

Concurrent Enrollment (CE): “Refers to the simultaneous enrollment of a qualified student in a local education provider and in one or more postsecondary courses, including academic or career and technical education courses, at an institution of higher education” (Colorado School Law, 2011). Concurrent enrollment programs have been identified by numerous names such as dual enrollment programs and postsecondary enrollment opportunities. For the purposes of this study, no distinction of significance is made regarding these terms as both refer to the acquisition of college credit during high school. However, the multiple terms do serve to expand the breadth of the literature review to ensure that all relevant research studies are identified. It should also be noted that this study fails to identify the particular means of CE delivery. Thus, CE participation, for the purposes of this study refers to both in-school and out-of-school participation options.

Concurrent Enrollment Credit: In this study, concurrent credit refers to college credit hours earned through participation in programs operating within the defined parameters of the concurrent enrollment programs act (HB09-1319). The data obtained and reported does not include hours earned in other programs such as the postsecondary enrollment opportunity act, Fast Track, and institutional programs like CU succeeds.

Dual Enrollment (DE): This term refers to programs that permit high school students the opportunity to enroll simultaneously in a higher education or vocational course (Allen, 2010). This allows the student to qualify for both high school and college level credit at the same time.

Free and Reduced Lunch (FRL): This refers to a student being eligible for subsidized and/or free meals based on federal criteria that links federal poverty guidelines to household income criteria (Harwell & LeBeau, 2010). For our study, the identification of a free or reduced lunch status on this variable reflects a proxy for a student's socioeconomic status. The calculation of free and reduced lunch status is based on one of two criteria (2010). First, students may be eligible for a reduced price lunch if the income of their household is less than 185% of the federal poverty guidelines and for a free lunch if their income is less than 130% of the guideline. Also, if a student receive direct certification, based on household receipt of food stamps, has foster children in the home, or participates in at least one federally funded program such as TANF or WIC they would be deemed eligible (2010).

Impacted Students: This term refers to students who may be at increased risk of failing or dropping out of high school due to exposure to poverty. It may also include students who possess other attributes or life histories that create unique educational challenges that are associated with less favorable educational outcomes.

Local Education Agencies (LEA): This term refers to any identified school district within the state of Colorado that provides or has the opportunity to provide CE opportunities to students via Colorado concurrent enrollment legislation.

Low-Income Students: A term that is applied to students that qualify for free or reduced price lunch based on federal eligibility criteria. This dissertation also refers to

these students as students from impoverished backgrounds, impoverished students, low-SES students and FRL eligible students.

Postsecondary Enrollment Opportunities (PSEO): A term that may be used synonymously with concurrent enrollment or dual enrollment opportunities. Also, it is sometimes used to identify other college transition programs that allow one to obtain college credit (e.g. Advanced Placement & International Baccalaureate; Allen, 2010). In Colorado, PSEO referred to dual enrollment opportunities and legislation that preceded Concurrent Enrollment Act legislation. This legislation required tuition payment prior to participation with later reimbursement provided directly by the Local Education Agency (see Colorado School Laws, 22-35-101 CRS).

Poverty: A term that has been defined in regards to income and one's ability to obtain a minimum level of calories (Tilak, 2002). For the purposes of this study, poverty refers to students who meet the free and reduced lunch eligibility criteria (i.e. see previous definition for free and reduced lunch).

Remedial Education: This term refers to coursework intended to adequately prepare students for college level course work. In Colorado, remedial coursework is currently identified and tracked for reading, writing, and math (CDHE, 2012). This study examines enrollment rates in all three areas.

Social Capital: This term, as applied to postsecondary access, refers to the ability of a student to access college information, understand the norms for college, and have available the actual guidance and supports necessary to enter college (Coleman, 1988;

Smith 2009). This study proposes that acquired social capital will be obtained from participation and lead to a number of beneficial outcomes.

Chapter Two: Literature Review

Social Capital Theory

The social capital theory is based on the central thesis that ‘social networks are a valuable asset’ (Field, 2008). Social networks have the capacity to both directly and indirectly bring benefits to individuals by the development of trust (Smith, 2009).

Trust between individuals thus becomes trust between strangers and trust of a broad fabric of social institutions; ultimately, it becomes a shared set of values, virtues, and expectations within society as a whole. Without this interaction, on the other hand, trust decays; at a certain point this decay begins to manifest itself in serious social problems... The concept of social capital contends that building or rebuilding community and trust requires face-to-face encounters (Baem, 2009).

Putnam (2000) points out three ways in which social capital may be important.

Foremost, social capital supports the resolution of collective problems. People will often be better off if they cooperate and provide support to each other when possible. Second, social capital creates less costly repeated interactions with fellow citizens creating more smoothly running communities. Finally, social capital increases individual awareness of the ways that we are linked to others. When people lack connections to other individuals they are unable to test their perspectives through conversation and are more likely to be influenced by poor judgment (2000). In sum, the presence of social capital can be viewed as a primary force in supporting the movement of people to larger individual and

collective capacity. The increased access to social capital results in established relationships that may support personal and professional success leading to an improved quality of life.

Social Capital and Education. Empirical research is beginning to reveal a reciprocal relationship between education and social capital (Huang, Van den Brink, Groot, 2009; Plagens, 2010). In the past, scholars and researchers have primarily focused on how social capital may be enhanced within the family and community (Bourdieu, 1986; Coleman 1987; Coleman 1988). A limited body of research examined how schools may cultivate increased social capital and lead to improved student outcomes. More recently, social capital has been explored in relation educational achievement outcomes; positive relationships have been revealed (Coleman and Hoffer, 1987; Putnam, 2000; John, 2005; Plagens and Stephens, 2009).

One meta-analysis involving 286 evaluations on social participation revealed that education levels serve as a strong correlate of individual social capital (Huang et al., 2009). This finding may indicate that educational persistence may eventually be shown to be a causal mechanism that leads to increased social capital and produces favorable life outcomes. Another recent study explored the question of why some schools, with similar resources have disparate rates of performance (Plagens, 2010). It was concluded by the use of teacher and principal perception data that social capital levels within schools are related to student achievement. The mechanism mediating this relationship wasn't identified within the study (2010). However, clearly defined expectations and guidance

for students lacking familiarity with college may serve as a catalyst for student achievement (Karp & Bork, 2012). Lastly, one study identified a positive impact of social capital, as identified by parental investment, as contributing to improved educational achievement outcomes thus serving to minimize at least one negative impact of poverty (Hango, 2007).

It may be surmised, based on the aforementioned studies that when social capital is tied to improved social networks that support the college going and participation process the likelihood of college completion may be increased. Similarly, if programs exist within schools that provide for the acquisition of social capital in regards to college-going a number of positive and temporally proximate outcomes may also result. The acquired skill-sets may lead to improvement in achievement and behavior that corresponds with college level expectations. The described connection between social capital and improved college-going rates has the ability to contribute to improved quality of life, better health, and improved earnings for individuals from impoverished backgrounds.

Quality of Life and College Completion

A number of studies have established the beneficial consequences associated with college participation. Two key outcomes include improved physical health and greater expected career earnings. In effect, some of the most deleterious consequences associated with poverty have the potential to be mitigated by college participation. The relationship between college attendance, health outcomes, and earning power are described below.

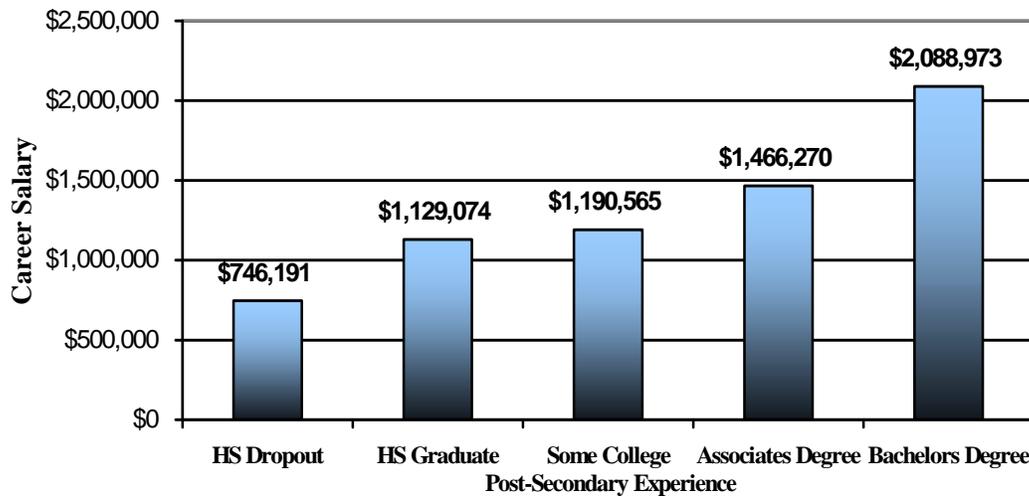
Impact on Health. In their paper, "Education and Health: Evaluating Theories and Evidence," David M. Cutler and Adriana Lleras-Muney (2006) findings reflect that: better educated people have lower morbidity rates from the most common acute and chronic diseases, independent of basic demographic and labor market factors; life expectancy is increasing for everyone in the United States, yet differences in life expectancy have grown over time between those with and without a college education; health behaviors alone cannot account for health status differences between those who are less educated and those who have more years of education; the mechanisms by which education influences health are complex and are likely to include (but are not limited to) interrelationships between demographic and family background indicators, effects of poor health in childhood, greater resources associated with higher levels of education, a learned appreciation for the importance of good health behaviors, and one's social networks.

The completion of a college degree has been shown to be related to a reduced risk of mortality along with other positive health outcomes (Ferguson, Bovaird, and Mueller, 2007). For students in poverty, they tend to experience higher rates of "asthma, ear infections, stomach problems, and speech problems" (Duffield, 2001, p. 326). Also, their eating is more sporadic, including missed meals, and not eating healthy well-balanced meals (Milner IV, 2013). In sum, a robust relationship between educational experiences and beneficial health consequences has been established in the research literature (2013).

The relation that exists between a positive health status and advanced education attainment is clear.

Impact on Earnings. The U.S. Census Bureau continues to provide data that demonstrates a strong relationship between college experience and an individual’s annual career salary (U.S. Census Bureau, 2012; see figure one).

Figure 1. Career Salary Projections based on Level of Education



Note. The salary projections were obtained from the U.S. Census Bureau, 2012.

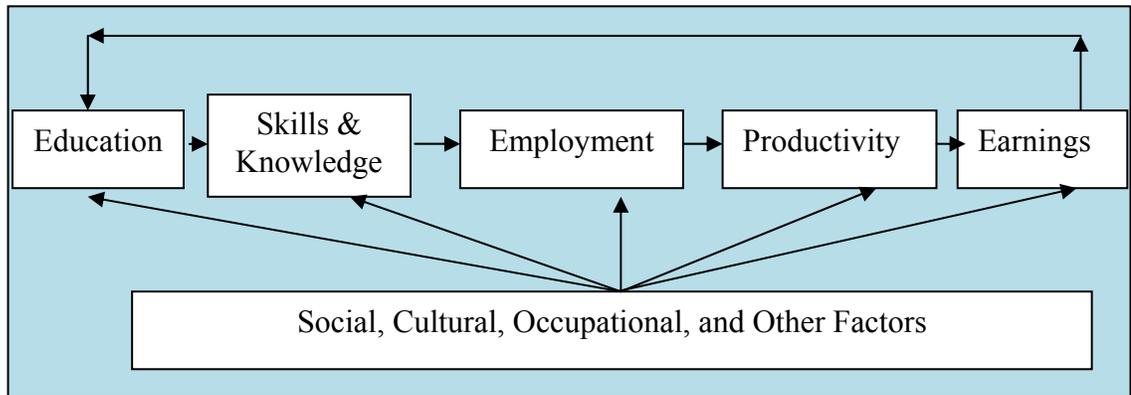
It has been estimated that a typical high school dropout can be expected to earn approximately \$746,191 dollars during their career compared to well over \$2 million dollars for those individuals who complete a Bachelor’s degree (2012). The Census Bureau has also produced data that indicates even limited college experience can have a sizable and positive impact on lifetime earnings. For example, an individual with just a few college credits is likely to earn nearly five hundred thousand dollars more than a high

school dropout during the course of their careers. For a high school graduate, compared to those with some college credits, differences continue to exist with approximately \$71,000 dollars more earned for the latter group (2012). Furthermore, for ethnic minorities the difference in average career earnings may be more pronounced due to the relationship between race and the percentage of families that reside below the poverty line. Across all minority groups, approximately 56.2% of families reside below the poverty line while for whites only 9.4% of families fit into this category (Milner IV, 2013). As pointed out by Munin (2012),

“Families of color are more likely to live in poverty and thereby have less access to societal benefits granted to the economically privileged. However, it is important to point out that this [race and poverty] is not a perfect correlation. Not all people of color are poor, nor are all white people rich. It is very difficult to live in poverty regardless of one’s race.” (p.7).

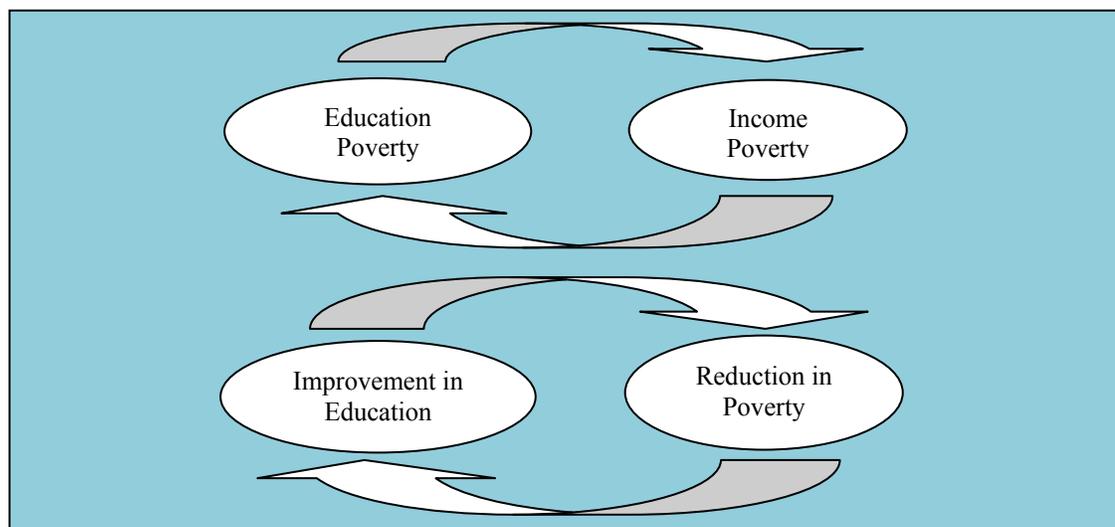
In effect, for all individuals from impoverished backgrounds, the probability of obtaining a college degree is low, while the obtained benefits for doing so are large. The relationship between education and earnings has been described within a framework that hypothesizes the mechanisms of action that impact earnings (see figure two; Tilak, 2002). The model proposes that while education directly contributes to skills and knowledge, thus ultimately impacting earnings, the level of earnings also contribute to the educational opportunities available to the individual. This feedback loop is bound by social, cultural, and occupational systems. Each system has the capacity to directly inhibit or promote the functions of any part of the model that comprise the totality of the feedback loop.

Figure 2. Proposed Relationship between Education and Earnings



Tilak (2002) has also proffered another relationship between education and income poverty (see figure three). He suggests educational deficiencies will directly contribute to income poverty which will reciprocally lead to a further impact on education poverty (2002). It may be inferred by this model that any improvement in the quality of educational opportunities or reduction in poverty will lead to a situation in which the negative effects of poverty are mitigated.

Figure 3. Proposed Relationship between Education and Income Poverty



The model suggests that numerous negative outcomes resulting from poverty may be directly impacted by addressing deficiencies in the educational experience of children from impoverished backgrounds. It may be speculated that improved social relationships, in regards to the college-going experience, may facilitate improved outcomes during the high school years. If educational programs provide access to college credits while improving the social networks related to postsecondary education the probability of escaping the cycle of poverty may be increased.

Equity and Access to College

The ubiquitous presence of the benefits related to college attendance leads one to consider the factors that have historically reduced the pursuit of such opportunities. The largest contributing factors may include poverty, race/ethnicity, and the dominant cultural norms that have served to marginalize students. Each factor has contributed both independently and in combination with the other factors to reduce college-going rates for a large number of students (Payne, 1986; Aud, Fox, & KewalRamani, 2010; Perna, 2000; Delpit, 2006; Stephens, Townsend, Markus, & Phillips, 2012).

Poverty. It has long been recognized that poverty plays a significant role in a wide range of academic, social, and community outcomes (Payne, 1986; National Center for Children in Poverty, 2012). This is especially significant given that 22% of all children under the age of 18 are identified as living in poverty (U.S Bureau of the Census, 2010). The increased number of educational opportunities being provided by some school systems has likely failed to adequately account for the unique needs of students

brought about by differential access to economic resources and social capital. It could be argued that the current and persistent achievement gaps for students of poverty provides confirmatory evidence of this situation. One example, based on research that examined the relationship between family resource's and children's academic performance has shown that lower income is related an increased likelihood of repeating a grade (Kim, 2004). The lack of equity of access to high impact educational programs along with reduced social capital has been scarcely examined. However, it can be posited that without these social supports being available many students of poverty will continue to be excluded from these postsecondary opportunities. As sociologist Annette Lareau stated in her book, *Home Advantage*, "The standards of the school are not neutral; their requests for parental involvement may be laden with the social and cultural experiences of intellectual and economic elites."(2000, p.8) One may conclude that the school system itself may inhibit the acquisition of social capital by marginalizing some students and families from these opportunities. The failure to address these needs serves to reinforce the cycle of poverty and maintain social stratification.

Race and Ethnicity. The race of a student has been shown to be related to college going rates (Aud, Fox, & KewalRamani, 2010). The disproportionate participation rates in college may be based on oppressive historical practices tied to institutional racism and the failure to account for cultural differences and needs within the college application and admission process. More recently, research is beginning to show increased rates of college participation by ethnic minorities (2010). However, substantial participation gaps

continue to exist between races (2010). Specifically, the college-going rate of white students ages 18 to 24 was approximately 44% in 2008. In contrast, the rate for Hispanics was 26% and for African-Americans the rate was 32% (2010).

Dominant Cultural Norms and Values. Possibly of greatest significance is how have the norms and values of the dominant Anglo-European culture within the United States served to maintain an inherently unfair system of participation for certain groups of students including the aforementioned groups. The dominant cultural values have supported a system that reduced the postsecondary opportunities for those from both impoverished backgrounds and ethnic minority groups. In addition, the prevailing culture has created barriers within the K-12 educational system that have inhibited many forms of postsecondary participation (Delpit, 2006). Similarly, for those first-generation student who choose to participate in college they tend to report more negative emotions and experience higher stress than their peers (Stephens, Townsend, Markus, and Phillips, 2012). These outcomes are largely thought to result from differences in culture. This indicates that if a lack of cultural support occurs then the likelihood of college completion may be reduced (2012).

Concurrent Enrollment Programs

The availability of postsecondary opportunities during high school may be essential for providing access to high-paying jobs and may serve to prevent the recurrence of generational poverty by providing social capital to those student traditionally marginalized by the educational system (Bedolla, 2010; Burke & Johnstone,

2004). Concurrent enrollment (CE), dual enrollment (DE), and postsecondary educational outcomes programs (PSEO) are one type of program that exists to ease the transition to postsecondary institutions. The focus of these programs has been to increase the college-going rates and postsecondary preparedness of participating high school students. The concurrent enrollment program is best characterized as collaborative efforts between high schools and colleges which allow high school students to enroll in college courses (Plucker, Chien, & Zaman, 2006). These programs allow for students to earn college credits prior to high school graduation (2006). Concurrent enrollment programs have been implemented in all fifty states for more than thirty years (Plucker et. al, 2006; Bailey, Hughes, & Karp, 2002). Eighteen states have mandated programs that allow students to receive college credit and 71% of high schools in the United States offer dual credit courses (Plucker et al, 2006).

A large body of research exists regarding the effectiveness of concurrent enrollment programs. However, until recently, very few studies were conducted that utilized rigorous statistical methods to control for selection bias that potentially impact outcomes associated with program participation (Bailey et. al., 2002). A 2007 study conducted by the National Research Center for Career and Technical Education, revealed moderate support for the causal impact of concurrent enrollment programs on both achievement and postsecondary outcomes for students in both Florida and New York City (Karp, Calcagno, Hughes, & Bailey, 2007). Program participants had numerous favorable statistically-significant outcomes that exceeded those found in demographically

matched non-participants (2007). In Florida, dual enrollment was positively related to students' likelihood of earning a high school diploma. Other findings revealed a positive relationship between enrollment in college and program participation (2007). Concurrent enrollment students were more likely to persist in college while also having higher grade point averages one year and three years following high school graduation (2007). Also, concurrent enrollment students had earned more postsecondary credits three years after high school graduation than non-participating peers (2007). For the New York City study, findings were similar albeit not identical to the Florida study (2007). The program participants were also more likely than peers to pursue an undergraduate degree (2007). Other research has documented that students participating in dual enrollment programs, had a larger number of college credits earned, a reduced need for remedial coursework, and an increased likelihood of attaining a degree (An, 2009). A further study, utilizing a national database of student records showed that students who gained college credits through dual enrollment were more likely to enter college immediately after high school and persist to the second year of college (Swanson, 2008). A recent number of unpublished studies, primarily dissertations, provide additional support for dual-enrollment effectiveness (Carter, 2009; Duffy, 2009; Hartman, 2007; Pyong, 2009). At a minimum, these studies indicate that dual enrollment programs are being increasingly viewed as a viable method to support the successful transition of high schools students to postsecondary institutions. The existing research studies have applied a wide-range of analytic techniques and have thoroughly documented numerous, favorable program

outcomes (Hartman, 2007; Fowler, 2007; Sell, 2008; Saltorelli, 2008). The findings of these studies include: dual enrollment students performed better than average academically in their freshman year of college (Hartman, 2007); the odds of student graduation and postsecondary enrollment improved by almost three times for dually-enrolled students (Fowler, 2007); and dual enrolled students were slightly more likely to enroll full time rather than part time in a community college (Sell, 2008).

Research that has examined the beneficial impacts of CE program participation on students of poverty has been limited. It is speculated that this paucity of research may result from the limited number of economically disadvantaged students that have historically participated in such programs due to restricted program accessibility and/or recruitment efforts. To present, only one study has been identified that attempted to empirically demonstrate the impact of CE participation on college graduation rates of low-SES students (An, 2013). This study identified higher rates of college degree attainment for low-income students compared to a demographically similar group of students (2013). The study lacked analysis of other proximate consequences of CE participation, including outcomes such as college going rates, remediation rates, high school referral rates, and standardized test scores. It should be recognized that studies have also just begun to explore the ability of concurrent enrollment programs to address the needs of minority groups such as Latino populations (Turner, 2010). In effect, the ability of CE programs to positively impact student subgroups has scarcely been examined to present using rigorous methodologies.

Colorado Concurrent Enrollment. The state of Colorado, while dealing with increasing poverty levels is also serving to import individuals with college degrees from other states. Specifically, although Colorado ranks high among states with the number of adults having college degrees, it ranks near the bottom among states with high school students who participate in college and receive college degrees (Caley, 2011). In order to reverse this trend policymakers have focused on increasing postsecondary opportunities for Colorado students to enhance college-going rates. It was expected that by increasing the education levels of Colorado high school students it would drive new economic opportunities while reducing the need for highly skilled workers from other states. This approach assumes that additional postsecondary opportunities will alleviate poverty by increasing the skill set(s) of the Colorado worker. One piece of legislation, crafted to help reach this goal, was related to increasing the accessibility of concurrent enrollment opportunities that target underserved student populations. The concurrent enrollment program was proffered as at least a partial solution to some of the educational challenges facing the state of Colorado. The program has the potential to increase participation of underserved students in a postsecondary opportunity that was previously, largely inaccessible.

Concurrent Enrollment Program Act. The “Concurrent Enrollment Program Act” or CRS 22-35-101 of Colorado school law was enacted by the legislature of the state of Colorado to improve state coordination of such programs, to focus on quality and

consistency, and to define accountability standards (Colorado State Law, 2011).

Specifically, the legislation points out:

“(d) historically, the beneficiaries of concurrent enrollment programs have often been high-achieving students. The expanded mission of concurrent enrollment programs is to serve a wider range of students, particularly those who represent communities with historically low college participation rates” (2011, p. 425). In addition, the legislation says, “Creating pathways between high schools and institutions of higher education is essential to fulfilling the Colorado promise of doubling the number of postsecondary degrees earned by Coloradans and reducing by half the number of students who drop out of high school in the state” (2011, p. 425).

The legislation outlines a number of key implementation requirements for districts (Colorado Department of Education, 2010). First, all high schools were required to operate all concurrent enrollment programs under the Concurrent enrollment program act by 2012 with the beginning of implementation occurring during the 2009-2010 school year. The districts must enter into a cooperative agreement with institutes of higher education to offer concurrent enrollment opportunities. All of the school districts must reimburse concurrent courses at the in-state community college tuition rate with all enrolled students being identified as Colorado resident for the establishment of tuition setting. A wide range of courses qualify as CE eligible. Lastly, students in grades 9 to 12 are eligible to participate if they have received approval for their academic plan of study, applied for CE participation within a certain timeframe and meet the prerequisites for the course while not being required to meet all higher education admission requirements (2010).

State involvement includes the funding of students at the full per-pupil operation revenue rate for concurrent enrollment participation given that the student meets attendance and instructional time requirements. The program oversight, including the establishment of cooperative agreements with institutes of higher education is tasked to the local education agency. This system reduces the burden on the student with the sole focus being on class participation (2011). The ability to reduce the impact of poverty and to provide social capital for future success may be facilitated by providing access to programs that would not otherwise be available to impoverished students.

The state of Colorado's concurrent enrollment legislation emphasizes this possibility by claiming that the programs have the potential to reduce the dropout rate of Colorado secondary students and increase the college-going rates of underserved student populations with historically low participation rates (Colorado School Law, 2011). During the 2010-2011 school year approximately 15,000 students participated in some type of dual enrollment program within Colorado (CDHE, 2010). The number of these students that are eligible for free-or-reduced lunch, a proxy variable for poverty, was not reported (2010).

Impact of Legislation on Student Outcomes. The Colorado Concurrent Enrollment Program Act has yet to be closely examined in regards to its impact on underrepresented groups of students. The adopted legislation provides direction to school districts that has likely facilitated the college application process, addressed tuition needs, and placed the student directly in the college classroom. In effect, resources are likely

directed in a manner that provides social capital to participating students. It is expected that the acquired social capital may provide both short-term and long term benefits for participating students.

A more developed understanding of the impact of the CE legislation on secondary and postsecondary outcomes for students of poverty will support a more comprehensive research agenda into the future. The research will examine the specific mechanisms that constitute acquired social capital and serve to improve college going rates. This research agenda will include the identification of programmatic components that best support the needs of traditionally underrepresented students. Similarly, it will identify the variables that facilitate program recruitment of underserved populations.

Key Components of Effective CE Programs

A number of factors within American public schools have reduced the availability of social capital for some student groups which has in turn reduced college accessibility. The availability of concurrent enrollment programs, as established by the Colorado Concurrent Enrollment Program Act, may serve to increase college-going rates for these students. However, the ability of the CE programs to increase college-going rates will largely be contingent on the effectiveness of the implementation methods utilized by local education agencies.

The most effective CE program will likely include a number of key components. Foremost, the ability to participate in the program must be conveyed to all students to support equity of access. If traditional informational delivery routes are utilized to

inform students about CE program availability then it's possible the program will continue to serve the same student populations as in the past. The dissemination of information concerning the program must be made accessible to all students and not just those who come from more affluent households that oftentimes already possess greater access to social capital.

The enrollment process must be clear and supported by school staff to reduce the likelihood that marginalized students would choose not to participate based on their perception of the difficulty of the admission process and/or the appropriateness of the program to meet their educational needs. The most effective programs will also account for the payment of any fees, textbooks, and tuition. The Colorado CE programs address the payment of tuition by the district directly. However, additional costs may discourage the recruitment of students lacking the resources to cover these expenses.

Students that are admitted to the program must have access to social capital that's deliberately embedded within the CE experience. Once enrolled, the students need to be provided with relevant college curriculum within a classroom of college-going peers. It may be that class work that occurs directly within the postsecondary institution will provide the greatest value for establishing of college level social networks. However, the availability and quality of school counselors and faculty members may also serve as another source of social capital, in all educational environments, for impacted students (e.g. African-American students; Farmer-Hinton & Adams, 2006). Finally, the program must maintain high academic and behavioral expectations for students to foster beneficial

outcomes (Brophy, 1983; Weinstein, 1995). The benefits of participation, including the newly acquired social networks, will be reinforced by the observation of one's own ability to perform at a higher level in line with these more rigorous expectations.

This study is not examining the systems that have been put into place by local education agencies. All causal attributions are based on CE participation alone and not specific program characteristics. However, if a connection is made between program participation and outcomes then the aforementioned systems may serve as the foci for future studies trying to identify program attributes that contribute to any favorable outcomes. Conversely, if no program impact is identified it must be considered that differences in program implementation may require a more intense examination to ensure that it is not a mitigating factor that led to weak or non-existent outcomes within this study and/or within any similar studies.

Summary

Concurrent enrollment programs, and the accessibility of social, emotional and financial platforms they present, serve as a potentially significant solution to improve secondary and postsecondary achievement outcomes for traditionally underrepresented populations. To present, limited research exists that has examined the impact of dual enrollment participation on students from low-income families. This paucity of research has founded this study's focus on students from impoverished backgrounds and their educational advancements. Social capital theory is applied as the underlying conceptual framework to shape our understanding of how the CE program may positively impact

students from impoverished backgrounds. This study explores the concurrent enrollment program as one mechanism to support poverty alleviation by increasing college-going rates for underserved students. It is believed that CE programs are best understood by the economic and social resources they provide to students (i.e. social capital). The recognition of this implicit connection leads to an exploration of the impact of CE participation on students from impacted backgrounds. The obtained findings will be discussed in relation to the issue of low college participation rates by traditionally underrepresented student populations. The discussion will also consider the impact of CE legislation and program implementation on desired outcomes.

Chapter Three: Methodology

Background

This dissertation examined a range of high school and postsecondary outcomes for CE participants from impoverished backgrounds. It was expected that CE participation would positively impact high school performance as evidenced through improved assessment scores, improved graduation rates, and reduced dropout and expulsion rates. Also, students that participate in the program were expected to matriculate at a higher rate to college, have a reduced need for remediation, and have a better college grade point average during their first year of enrollment. In addition, this study examined the participation rates of FRL students and how it changed between years. This analysis also included comparisons based on CE credits enrolled and earned (i.e. including remedial credits).

The primary research methodology applied, to examine impact of participation on measured outcomes, was a quasi-experimental design that applied propensity score matching techniques (Shadish, Cook, & Campbell, 2002). Moreover, single-year snapshots of participation were examined to describe the participation rates of students identified as free and reduced lunch eligible (i.e. research question one). The focus years included 2010-2011 and 2011-2012 which reflect the second and third years of district

implementation of CE programs (i.e. the Concurrent Enrollment Program Act was adopted in 2009). The 2009 data was obtained from the Colorado Department of Higher Education but was omitted from this study as the file failed to identify the number of credits that CE students were enrolled for during that year. Given that this file reflected the initial year for reporting of CE participation it is believed that the accuracy of the reported data may be reduced. Similarly, the lack of credit data further prevented a reliable determination of program participation.

The complete list of addressed research questions included:

1. Has CE participation of students identified as FRL eligible increased each year since the concurrent enrollment legislation was first implemented? Do participation rates by FRL students reflect rates that would be expected based on their representation within state membership? Do some local education agencies appear to be more effective with the recruitment of these students into their CE program? Has the percentage of graduating students (i.e. free or reduced lunch eligible) earning concurrent enrollment credit increased since the concurrent enrollment legislation was first implemented?
2. What is the impact of participation in a concurrent enrollment program for economically disadvantaged students during high school compared to matched non-participants?

3. What impact does concurrent enrollment program participation have on college going rates and first-year grade point average for the economically disadvantaged students compared to the matched non-participants?

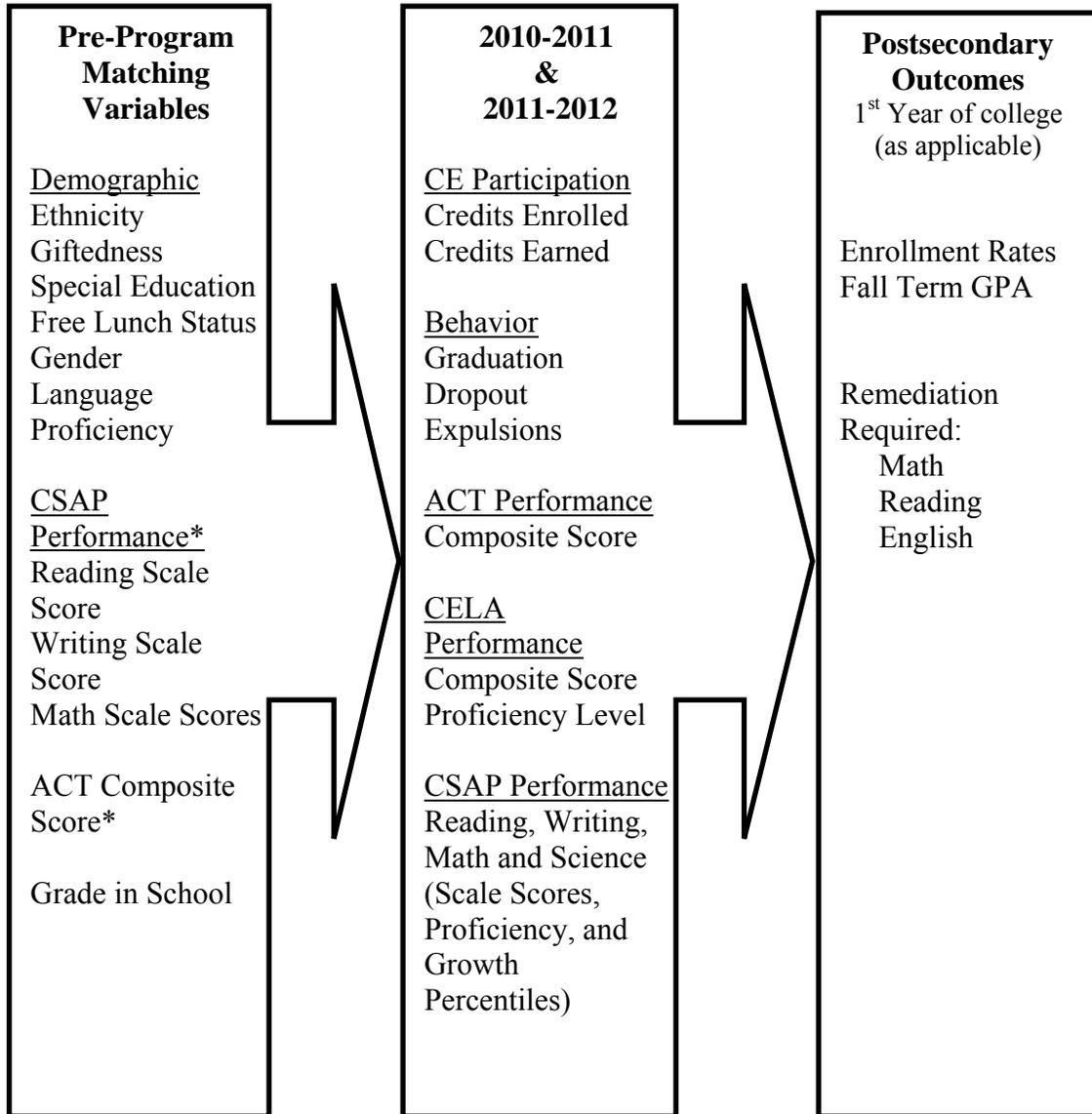
Study Design

The identified research questions were addressed by cross-sectional and longitudinal analyses. A snapshot of the research design including key variables is presented in figure four.

The first research question was addressed by examining cross-sectional data for each year from 2010-2011 to 2011-2012. The remaining questions are addressed by examining three groups of FRL concurrent enrollment students from 2010-2011 and 2011-2012. This includes two groups of one-year participants and one group with two year CE participants. In addition, matched cohorts of non-participants that are academically and demographically similar to the CE participants were constructed for comparisons of high school and postsecondary outcomes.

The quasi-experimental research design was selected for utilization in this dissertation due to its ability to support causal attributions related to the proposed research questions (Shadish, Cook, and Campbell, 2002). The study includes data representing all of the CE participants from the first two years of full legislative and district implementation. This study is based on extant data as a randomized control trial was not conducted. A quasi-experimental design is the single best method to support causal attributions with the available data due to the lack of random assignment.

Figure 4. Quasi-Experimental Design with Matched Control Group



Note. *: These variables were initially considered for matching but were ultimately removed from analysis due to missing data that would result in a substantial number of lost cases.

The randomized experimental control trial has shown itself to be the “gold standard” for attributions of causal inference (Greeno, 2002; Fortson, Verbitsky-Savitz, Kopa, and Gleason, 2012). The ability to randomly assign subject to conditions generates group equivalence and reduces error that serves to localize the impact of the independent variable providing for causal attributions (Rosenbaum, 1995). However, the use of the experimental design was not possible for this study due to the inability of the researcher to randomly assign individual students to participate in the CE program. A quasi-experimental design provides a conceptually sound alternative that supports causal attributions. The most common research designs fitting into this approach include studies utilizing nonequivalent control groups, regression discontinuity, or time-series designs (Shadish, Cook, & Campbell, 2002; Trochim, 2005). The available data makes the generation of a matched nonequivalent control group the strongest design to address the identified research questions. Most importantly, the matched control group as determined by propensity score matching techniques provides a point of comparison to determine treatment impacts. The other quasi-experimental methods were not amenable to the extant data available to investigate the questions of interest since a clear point of program implementation fails to exist within the data sample (2002).

The design has one significant methodological limitation that must be recognized to support proper data interpretation and analysis. The longitudinal phase of the study, including the generation of propensity scores serves to equate groups on a range of covariates. This method, while empirically sound, fails to provide definitive causal

attributions. This occurs due to the inability of matching procedures to account for all group differences that may contribute to the observed outcomes. For example, the available data-set doesn't allow for the matching of students based on school curriculum, teacher quality, or supplemental programmatic opportunities. Sensitivity analysis was applied to determine the possible impact of unaccounted variables.

CE Participation and Representation Rates

In order to address the initial research question a cross-sectional examination of CE participation within the state of Colorado for the 2010-2011 and 2011-2012 school years occurred. A comparison of the percentages of the free and reduced lunch students participating in the program to the overall 9th to 12th grade free and reduced lunch percentages of the local education agencies in which they are enrolled occurred. Also, overall comparisons were made to the 9th to 12th grade free and reduced lunch rate for Colorado. These comparisons allowed for a determination of representation rates of FRL students within CE programs at the district and state levels. The obtained rates were examined between the two years to identify any changes in the percentage of impoverished students that are participating in the CE program. The same comparison also occurred for high school graduates. It was also determined if graduates from impoverished backgrounds are becoming more likely to have received CE credit. Similarly, the number of CE credits earned and enrolled in was determined for CE participants by FRL status.

CE Program Impacts in High School and College

The remaining research questions are all tied to the quasi-experimental examination of outcomes that involved comparisons between CE participants and demographically matched non-participants. The students that enrolled for a minimum of one CE credit during the 2010-2011 or 2011-2012 school year constitute the treatment group. The comparison groups were generated by the matching of non-participants on a host of demographic and achievement measures. Statistical analyses involved comparisons of between-group performance during high school and the first semester of college (i.e. where applicable).

Data Sources & Operational Definitions

The data, utilized in this study, was obtained from the Colorado Department of Education (CDE) and the Colorado Department of Higher Education (CDHE). All CDE file specifications are located at, www.cde.state.co.us. The Colorado Department of Education files included:

1. October count and end-of-year submission data that included district/school of attendance, student graduation status, exit codes (i.e. dropouts and expelled), and demographic data for program participants (i.e. grade, ethnicity, free-lunch status, age, special education status, language proficiency, and giftedness designation).
2. Colorado Student Assessment Program (aka CSAP) files for math, reading, writing and science including proficiency levels, overall scale scores, student

growth percentiles (i.e. for math/reading; reflecting a normative measure) and adequate growth percentiles that identify the level of growth necessary to move students to proficiency and/or for them to maintain proficiency within three years or by 10th grade (see Bonk, 2012).

3. Colorado English Language Assessment (aka CELA) files that include overall scale scores and proficiency levels for all participating students along with the grade of the test (data available for spring 2010 & 2011 only).
4. American College Testing (aka ACT) data file for 11th grade students with composite and performance scores.

The files provided by the Colorado Department of Higher Education were obtained from CDE via a data-sharing agreement and included:

1. Concurrent enrollment participation files for the 2009-2010, 2010-2011, and 2011-2012 academic years that included the following data: all students that participated in a concurrent enrollment course, the total number of concurrent enrollment credits attempted, and the total number of concurrent enrollment credits earned by the student. Also, the number of credits taken that addressed remedial needs in reading, writing, and math was provided. The CE participant lists only included students that had confirmed attendance from higher education institutions and were identified as enrolled for at least one credit hour in the provided data files (i.e. except for 2009-2010 in which credit information was not provided so the file was omitted). Additional details

regarding CE enrollment such as on-site or off-site coursework, type of classes, etc. weren't identified within the provided data files.

2. A comprehensive data file reflecting all Colorado high school graduates including GED recipients along with college enrollment information for the graduating classes of 2011 and 2012. The enrollment information included both in-state and out-of-state enrollment.
3. The number of credits earned and the college grade point average during the first year of postsecondary enrollment for the graduating classes of 2010, 2011, and 2012.

A comprehensive description of the data provided by institutes of higher education that are maintained by the Colorado Department of Higher Education is available at: www.highered.colorado.gov/Data/html.

Population and Cohort Description

The study includes data from all CE participants since the first year the program offered. The data files reflect academic years 2008-2009 to 2011-2012. The 2008 file ensured that data from all students, prior to program participation, were available for appropriate statistical matching. In order to determine programmatic impacts artificial control groups were created for comparisons. It was expected that the total CE enrollment would not exceed 12,000 students based on historical reports (Bean et al., 2012). Given that student identifiers provided by the DHE were required to be validated by Institutions of Higher education, CE enrollment was lower than that previously reported as many of

our cases failed to identify any credits enrolled for within our CE participant lists. Also, the focus of this study was on FRL students thus substantially reducing the sample sizes for the student groups used to address research questions two and three.

It has been reported that entry into high school corresponds with a reduced willingness by some students to apply for and/or receive free or reduced price lunches. This is evidenced by a reduction in free and reduced lunch applications following the middle school years (Data First, 2012). In addition, it has also been suggested that, “the use of FRL as a measure of SES can expect a significant percentage of students, perhaps as high as 20% to be misclassified” (Harwell & LeBeau, 2010). This misclassification likely results in underreported poverty levels. For this dissertation, matching will only occur for those self-identified FRL students between the treatment and matched control group. Thus, biased reporting of eligibility should not impact any outcome findings related to our final three questions. For the initial question regarding participation it is possible that the accuracy of the reported number of FRL students may be reduced if such reporting bias exists within the analyzed student populations.

Analysis

Data Analysis Software Tools. The IBM Statistical Package for the Social Sciences (SPSS), version 20 was utilized for all statistical procedures that constitute this study (IBM Corporation, 2011) along with a SPSS R plug-in. The R version 2.12.0 software program was applied for matching procedures by use of a custom SPSS dialog box for propensity score matching (see Thoemmes, 2012). The building of the master

data file occurred by the use of a Microsoft Access relational database, 2010 version. The database served to consolidate the disparate files provided by the Colorado Department of Education and Colorado Department of Higher Education into three student level tables that were imported into SPSS for use with all statistical analysis procedures.

Missing Data Analysis Procedures. The constructed data set was examined for missing data for all variables prior to analysis. Based on the extent of missing data, appropriate analytics were to be selected and applied to address any gaps in reported data that could impact analysis (Enders, 2010). The possibilities for addressing these issues ranged from no adjustment to the use of multiple imputation methods (2010). In sum, the demographic data were complete for all cases due to the Colorado reporting requirements for local education agencies regarding the state submissions in which this data was obtained (i.e. missing data was not permitted). However, prior year achievement scores for CSAP and ACT were more likely to be missing primarily due to the grade levels of the CE participants. Approximately 80% of each sample consisted of 11th or 12th grade students. This means that the 11th grade students would have CSAP scores only while the 12th grade students had ACT scores only from the prior year. Thus, the inclusion of these fields would omit most of the sample since they would be missing one or both of these assessment data points. In order to facilitate the most effective matching, while preserving cases, the assessment data was omitted from the logistic regression equations. In effect, the logistic regression models that were utilized contained no additional adjustments for missing data.

Propensity Score Matching (PSM). The inability to randomly assign individuals to participate in the concurrent enrollment program led to the utilization of the propensity score matching technique to provide for the determination of program effectiveness. The propensity score is best described as the “conditional probability of assignment to a particular treatment given a vector of observed covariates” (Rosenbaum & Rubin, 1983). A control group is constructed based on similarity of obtained group conditional assignment probabilities with that of the program participants (Rudner & Peyton, 2006). This “constructed” control groups then allows for comparisons between matched groups that have been created to minimize group differences that exist independent of program participation. The adopted methodology parallels the three-step procedure outlined by Guo and Fraser (2010). The steps include: (1) Logistic Regression analysis between-groups. This includes a dependent variable reflecting the log odds of receiving treatment (i.e. CE participation), searching for an appropriate set of matching variables, and obtaining estimated propensity scores with predicted probability (p) or $\log[(1-p)/p]$, (2) matching with appropriate caliper method that may include case replacement, and (3) post matching analysis of treatment cases to matched sample cases (2010). The propensity score analysis technique is recognized by the “What Works Clearinghouse” as an appropriate method to support claims of internal validity in regards to a quasi-experimental research design and is recognized as meeting evidence standards with reservation (What Works Clearinghouse, 2008).

Logistic Regression Procedure. A logistic regression procedure was utilized in this study to identify the variables in which the program participant and control groups can be reliably discriminated. The logistic models were used to discriminate program participants from non-participants based on the obtained criterion measure (i.e. treatment or non-treatment condition). This allows for the development of a matched sample of cases based on the obtained value of the criterion variables (i.e. representing the log odds of being a member of the treatment group). In turn, the matching procedure served to generate a control group that best matched the CE participant group based on the range of covariates that is summarized by the obtained criterion value. The final predictor variables included within the logistic regression equations, for each CE cohort, are identified in table one.

The variables included both achievement and demographic measures. The variables were entered into the logistic regression equation utilizing a direct-entry procedure. The dependent variable reflects the obtained log odds of participating in the CE program and was saved for each CE student. This generated propensity score was then utilized for the matching process described below. The procedure was repeated for the 2010-2011 CE participants, 2011-2012 CE participants, and the two-year CE participants that were identified as free or reduced lunch eligible (i.e. ineligible students are excluded from these analyses). The free and reduced lunch variable was entered into the logistic equation due to its integral role in addressing the key research questions and to account for absolute differences in free or reduced lunch participation status between

years. In sum, all of the included variables were selected for inclusion based on availability and relevance for group discrimination.

Table 1.

Data Elements for Propensity Score Matching Procedure

Identified Predictors/Covariates	Category	Description/Values
FRL	Demographic	Free: 1; Reduced: 0
Gender (male)	Demographic	Male: 1; Female: 0
Race (Hispanic)	Demographic	Not Hispanic:0, Hispanic:1
Race (White)	Demographic	Not White:0, White:1
Giftedness	Demographic	0: Not, 1: Gifted
Special Education	Demographic	0: Not Special Education, 1: Special Education
Language Proficiency	Academic/Demographic	NEP: 1; LEP: 2; FEP: 3; 4: Not ELL
Grade in School	Academic Achievement	9 th -12 th

Note. All data utilized for matching was obtained from files that included data from the year prior to CE program participation. This allowed for matching of attributes that were present prior to program participation.

Case Matching Procedure

The propensity scores obtained from the logistic regression analysis for the CE participants was matched with the control group estimated scores by use of a statistically appropriate matching procedure (Guo & Fraser, 2010). The matching procedure was

determined following review of the regression results including the variability in the log odds obtained from cases for potential matching. A ‘caliper’ method was applied that matched cases based on a narrow range of scores (2010). CE participants were matched using calipers of width equal to 0.2 of the standard deviation of the logit of the estimated propensity score. This caliper width has been found to result in strong matching within a variety of settings (Rosenbaum & Rubin, 1985; Austin, 2010).

The large number of cases available to serve in the matched control group removed the need for case replacement within the non-participant data file. The unmatched comparison sample allowed for matching ratios of greater than 3:1. Prior research has suggested that a 3:1 matching ratio is likely to lead to reasonable case matching (see Guo & Fraser, 2010). The quality of the obtained matches was determined based on an examination of descriptive statistics and frequency distributions of the variables that served as model predictors. Also, the pre-program participation assessment data was examined to help account for any possible preexisting differences between groups. Due to the strong alignment of the matches for each year, no additional procedures were utilized.

Sensitivity Analysis

A sensitivity analysis occurred following generation of propensity scores to evaluate how results would have differed based on the presence of bias resulting from unmeasured variables (Guo & Fraser, 2010; AERA, 2010). This procedure serves to increase our confidence in our statistical matching procedures and informs us off the

thoroughness of the matching procedure to capture relevant covariates. The method employed was a Wilcoxon's signed-rank test for sensitivity analysis of ranked pairs. The procedure includes the following steps: compute the ranked absolute differences d_s , compute the Wilcoxon signed-rank statistics for outcome differences between treatment and control groups, and compute the needed statistics for obtaining the one-sided significance level for the standardized deviate. (Guo & Fraser, 2010).

Between-Group Comparisons

All outcomes measures were examined for differences between the Colorado concurrent enrollment participants and control group that was identified based on propensity scores. The selected between-group statistical analyses depended on the properties of the specific data to be examined. The outcome data included frequencies, ratio-level data, along with percentile data that all required unique analytics to determine between-group differences. The three statistical tests utilized included independent samples t -tests, dependent samples t -tests, and Mann-Whitney U -tests.

Independent/Dependent Samples t -tests. The t -test is the most commonly used method to evaluate the difference in outcome means between two groups that are measured on interval or ratio scales. The independent samples t -test allowed for between-group comparisons on a single dependent variable of interest. The results of the test inform us of the probability that the observed differences between groups were due to chance (Keppel & Zedeck, 1989; Schweigert, 1994). The t -test allows for small sample comparisons provided that the observed variables are normally distributed and the

variation of the scores in the groups is not appreciably different. The normality assumption can be tested by an examination of the distribution of data or by performing a normality test. The equality of variances can be evaluated by the use of the Levene's test. If the conditions are not met then a non-parametric alternative such as the Wilcoxon rank-sum test can be applied (1994). The independent-samples *t*-test was applied to all measures that meet the aforementioned criteria. In addition, the established significance levels were adjusted from .05 to .01 for all tests of between-group differences, in order to reduce the likelihood of family-wise Type I error (see Keselman, Cribbie, & Holland, 2001).

Mann-Whitney *U*-Tests. The percentile scores associated with the Colorado growth model are not amenable to examination with parametric statistics due to the obtained distributions of scores that fail to meet the statistical assumptions required by parametric tests (i.e. lack of normality). Similarly, some of the other presented outcome measures failed to meet the statistical assumptions required by parametric tests (e.g. adequate growth). In these cases, the Mann-Whitney *U*-test was utilized. This test is a non-parametric statistical test that, like the *t*-test, examines the difference between groups. The Mann-Whitney *U*-Test examines the differences between score distributions. It is recognized that *U*-Tests are more effective for comparisons, compared to the *t*-test, when dealing with non-normal distributions (Schweigert, 1994).

Chapter Four: Results

The purpose of this dissertation was to examine the participation rates of underprivileged, Colorado students in the state's concurrent enrollment program and to ascertain the impact of such participation on both academics and behavior during high school and college. The initial set of research questions examined the participation and representation rates of FRL students within Colorado concurrent enrollment programs and within high school graduating classes. An additional analysis of differences in credits hours attempted and credits earned was conducted between the FRL and non-FRL students. The remaining questions addressed the impact of participation on high school academic outcomes, high school graduation and dropout rates, college-going rates, and first year college achievement. The obtained results are presented by research question below.

CE Representation Rates of FRL Students within the State of Colorado

The initial research questions examined if, 1.) CE participation of students identified as free or reduced eligible increased between-years since the concurrent enrollment legislation was first implemented and if, 2.) Participation rates by free and reduced lunch students reflect rates that would be expected based on their representation within district and state membership?

The obtained results reveal that overall CE participation rates vary substantially between years. Per legislation, the initial implementation year that local education agencies could operate under the Concurrent Enrollment Act in Colorado was during the 2009-2010 school year (SY). This inaugural year was marked by the lowest participation rate, to date, with many students still taking courses under the previous Postsecondary Enrollment Opportunities act (PSEO). The first year in which all PSEO programs were required to be replaced by the concurrent enrollment programs was SY 2012-2013.

The overall participation rates for the first two full years of program implementation by free and reduced lunch status are reflected in Table 2. At the time of this study, data for SY 2012-2013 was not available. For the first-year, 2009-2010, CE enrollment information is not presented as the credit hours ‘earned and attempted’ was not provided within the available data file, thus reducing confidence in the accuracy of the participant list. Provided that this was the first year of program implementation, it is expected that the accuracy of the reported numbers may have been impacted due to the lack of familiarity and practice by districts with the new reporting structures. For 2009-2010 the number of students included in the file without reference to credits enrolled was 1,455.

During SY 2011-2012, approximately 31% of CE participants were identified as free or reduced lunch eligible. This reflects a 3.7% overall decline from the 2010-2011 academic year. It should be noted, the count of free and reduced eligible participants did increase by 1,314 students between these two years. In addition, the absolute percentage

of reduced lunch eligible students increased by 0.2%. However, the increase in the number of participants identified as not FRL eligible increased at a much faster rate with the addition of 4,005 students between years.

Table 2.

CE Participation Rates by Year and FRL Status

FRL Status	2010-2011		2011-2012		Change (2-Yr)	
	% of Total	Total Count	% of Total	Total Count	% Change	Change in Count
Free	27.6%	2289	23.7%	3223	-3.9%	+934
Reduced	6.8%	567	7.0%	947	+0.2%	+380
Not Eligible	65.6%	5449	69.4%	9454	+3.8%	+4005

Note. Presented values reflect an unduplicated count of students reported as being enrolled for at least one credit hour. 2010-2011 Total n=8,305; and 11-12 Total n=13,624. All students without reported FRL eligibility status were included within the not eligible category (i.e. for 2010-2011: n=152; 2011-2012: n=289).

Utilizing the free and reduced lunch eligibility variable, an examination of CE participation rates reveals that economically disadvantaged students are underrepresented compared to expectations based on state FRL membership during 2011-2012 (see Table 3). During SY 2011-2012, the free lunch students were participating at a rate that was approximately 4.5% less than would be expected based on their membership in the state population. For SY 2010-2011, the rate of participation was within 1% of that expected based on state FRL rates. This difference between years reflects a widening participation gap by free-lunch students with 4% fewer participating between the two years. The

reduced lunch representation rate has remained relatively stable and consistent with the state during the two year period (i.e. 10-11: +0.8% above state rate; 11-12: +0.6% above state rate).

Table 3.

Representation Rates of FRL Students Compared to State FRL Membership

Year	CE Participants		State		% Diff. (CE-State)	
	Free Lunch	Reduced Lunch	Free Lunch	Reduced Lunch	Free Lunch	Reduced Lunch
10-11	27.6%	6.8%	27.1%	6.0%	0.5%	0.8%
11-12	23.7%	7.0%	28.2%	6.4%	-4.5%	0.6%

Note. The state FRL percentages are based on grades 9-12; calculated from official October count enrollment files.

The examination of absolute participation of FRL students, based on the presented data, provides secondary and postsecondary educators, counselors and administrators with information about the success rates and trends in the recruitment of underserved populations. The findings indicate that the free lunch eligible students are slightly underrepresented in Colorado concurrent enrollment programs. It should be noted that the causal factors contributing to the observed underrepresentation rate is not explained by the presented analysis.

Recruitment of FRL Students by Local Education Agencies

In order to identify the effectiveness of the recruitment efforts of districts in regards to enrolling FRL students to CE courses it was asked, are some local education

agencies (LEA) more successful in recruiting economically disadvantaged student populations into their CE programs?

The number of participants by LEA, the number of FRL CE participants and the overall district free and reduced lunch percentages for both 2010 and 2011 are presented in appendix C. For 2010-2011, 16.7% (i.e. 11 of 66) of the presented districts had economically disadvantaged students participating in their CE program at a rate that met or exceeded the observed FRL rate within their district populations. For 2011, the percentage of districts achieving this criterion was 16.8% (i.e. 16/95). It should be noted that while relatively rare, sixteen LEAs had participation rates by FRL students at the rate expected or even exceeding expectations based on the district free and reduced lunch membership. The average gap between the FRL rates within the district compared to the FRL rates for CE participants was 8.4% during 2010 and 9.3% during 2011. The percentage of LEAs that administered a CE program both years and experienced an increase in the percentage of students that were FRL was 48.4% (i.e. 30 of 62 districts with a ten count CE participation minimum for both years). This indicates a positive change for some LEAs that is not evident within the previously described state level analysis.

For 2011, the five districts with the largest number of CE students had markedly different success rates in regards to the recruitment of low-SES students to their CE programs (see Table four). The presented districts account for 49.5% of CE enrollment during 2011-2012. Four of the districts experienced increases in FRL enrollment

between years with only one experiencing a decline (i.e. 0880: -3.3%). For two of the local education agencies, FRL students were overrepresented in CE program compared to what was expected based on the district FRL membership (i.e. for 2011-2012). In contrast, for the three remaining agencies, the percentage of FRL participants were less than expected based on membership rates.

Table 4.

CE Participation Rates based on FRL Status between Years for Largest LEA Providers

LEA #	2010 Total CE	2010 FRL% (CE)	2010 FRL% (K-12)*	2011 Total CE	2011 FRL% (CE)	2011 FRL% (K-12)*	Btwn-Yr Ch. CE FRL %
0180	949	46.6%	58.4%	1191	47.5%	58.7%	+0.9%
0130	940	17.6%	23.4%	1470	81.2%	23.0%	+63.6%
0900	1070	5.4%	9.9%	1572	5.5%	9.7%	+0.9%
0880	1182	74.4%	68.8%	1289	70.1%	69.9%	-3.3%
1420	155	9.7%	26.1%	1227	20.2%	28.4%	+10.5%

Note. Green highlights indicate that the FRL participation in CE programs meets or exceeds the district FRL percentage for the presented year (i.e. 9th-12th grades).

The reason for these differences is not identified. Future research may include comparative studies of these districts to determine the precise factors contributing to the different levels of recruitment success.

Credit Accumulation and Remediation Rates

Beyond absolute CE participation rates, an examination of remedial credits attempted (i.e. for math, English, and reading) occurred for FRL students compared to non-FRL CE participants (see Tables 5-7). The results of independent samples *t*-test indicated significant differences in the number of credits attempted and earned between the two groups. The non-FRL eligible students earned a greater number of credit hours compared to the FRL students during both 2010 ($t(8295)=-4.85, p<.001$) and 2011 ($t(13604)=-4.23, p<.001$). However, FRL students were more likely to enroll for more credit hours during both 2010 ($t(8295)=2.14, p<.01$) and 2011 ($t(13604)=2.65, p<.01$).

Table 5.

<i>CE Credits Attempted and Earned based on FRL Status Between-Years</i>					
Year	Credits Earned			Credits Attempted	
	Status	Mean±SD	<i>t</i> -value	Mean±SD	<i>t</i> -value
10-11	FRL	4.66±5.17	-4.85**	7.25±5.62	2.14*
	Non-FRL	5.25±5.29		6.97±5.56	
11-12	FRL	5.98±5.71	-4.23**	7.51±5.80	2.65*
	Non-FRL	6.43±5.72		7.23±5.76	

Note. FRL: free or reduced lunch eligible. Non-FRL: not FRL eligible. * $p<.01$.
** $p<.001$.

Additional analysis indicates that the percentage of FRL eligible students that enrolled in remedial math, reading, and English courses was greater during both years for FRL

students compared to non-FRL eligible students (see Table 6). The largest remediation rates were associated with math. Approximately 9% of FRL students enrolled in a remedial math course during the 2011 academic years. This compares to a 3.1% enrollment rate for non-FRL students.

Table 6.

Percent of CE Students Enrolling in Remedial Coursework by FRL Status

Year	Math		English		Reading	
	FRL	Non-FRL	FRL	Non-FRL	FRL	Non-FRL
10-11	9.1%	3.1%	3.6%	0.7%	0.2%	0.1%
11-12	7.7%	2.3%	4.1%	1.0%	0.4%	0.2%

During SY 2010-2011, an examination of the number of remedial credits attempted by content area indicated no statistical differences in enrollment rates between FRL and non-FRL status for all three content areas (t 's <1 , p 's $>.05$). For the 2011-2012 year, CE students eligible for free or reduced lunch that were enrolled in remedial classes attempted a greater number of credit hours in both math and English (t 's >1.90 , p 's $<.05$). No statistically significant differences were identified between groups for reading ($t(35)=.973$, $p>.05$).

Table 7.

Comparison of Remedial Credits Attempted by Subject, FRL Status, and Year

Yr	Status	Math		English		Reading	
		Mean±SD	t-value	Mean±SD	t-value	Mean±SD	t-value
10-11	FRL	4.23±1.14	-.101	3.62±1.22	-1.19	3.00±.000	--
	Non-FRL	4.25±1.27		3.90±1.39		3.00±.000	
11-12	FRL	4.47±1.65	1.918*	3.89±1.36	3.27**	3.00±.000	.973
	Non-FRL	4.21±1.34		3.37±0.99		2.95±.053	

Note. FRL: free or reduced lunch eligible. Non-FRL: not FRL eligible. *p<.05, **p<.001. The 2010-2011 findings were not significant with p>.05.

CE Participation Rates by Economically-Disadvantaged Graduates

The next set of questions addressed asks if the percentage of graduating students (i.e. free or reduced lunch eligible) earning concurrent enrollment credit has increased between-years since the concurrent enrollment legislation was first implemented. With a follow-up question asking, what is the average number of credits students have earned prior to graduation for both FRL and non-FRL students?

In order to address these questions the Colorado Department of Higher Education provided data files that reflect all high school graduates including general equivalency diploma recipients from 2009, 2010, 2011, and 2012. Included with this data was the cumulative number of CE credits earned. A free-and-reduced lunch determination was

made by linking appropriate October count enrollment data files obtained from CDE that included the FRL status during the students final year of enrollment (i.e. prior to graduation). The data analysis indicates that during the first year of CE policy implementation (i.e. 2009-2010) no students were coded as participants that were also graduates. It is likely that participation in college courses was recorded within prior post-secondary enrollment options as required memorandums of understanding with Institutes of Higher Education (IHE) were likely still being established.

For the two years in which data was available, the absolute number of CE participating graduates increased by 3,453 students (see Table 8). This represents a 6.7% increase between years in the percentage of high school graduates that earned CE credits. CE participants graduated with an average of eight credit hours (i.e. roughly equivalent to two or three college courses). For the class of 2012, the mean score had increased by approximately one credit hour per student (2011: mean=7.39; 2012: mean=8.59).

In order to identify differences between students in regards to the percentages of students graduating with CE credit in addition to the mean number of credits earned the data was further disaggregated by FRL status. The results of the disaggregation are available in table nine for both FRL and ineligible students. During 2012 the FRL graduating students surpassed the average number of credits earned by graduating students that were not eligible for free or reduced lunch. The participation rates were approximately the same between groups for both years. For credits earned, the FRL

Table 8.

CE Participation Rates by Graduate Class of 2009, 2010, 2011, & 2012

Grad Year	# of High School Graduates	# With CE Credits Passed	% with CE Hours Passed	CE Credits Earned/Passed	
				Total Credits Passed	Mean±SD
2009*	50,184	--	--	--	--
2010*	51,702	--	--	--	--
2011	52,261	3,310	6.3%	24,473	7.39±5.45
2012	52,012	6,763	13.0%	58,141	8.59±7.57
Total (2-Yr)	104,273	10,073	9.6%	82,614	8.20±6.97

Note. The count of students reflects an unduplicated count of students that graduated from high school (including GEDs) and earned at least one CE credit during the identified year. *2009, 2010: graduate counts provided for comparison purposes.

Table 9.

CE Participation Rates by Graduates with FRL Eligibility: Class of 2011 & 2012

Grad Year	FRL Status	# of High School Graduates	# With CE Credits Passed	% with CE Hours Passed	CE Credits Earned/Passed	
					Total Credits Passed	Mean±SD
2011	FRL	13,182	899	6.8%	6,642	7.39±5.56
2011	Not Eligible	39,079	2411	6.2%	17,831	7.40±5.41
2012	FRL	13,938	1,816	13.0%	16,980	9.35±8.37
2012	Not Eligible	38,074	4,947	13.0%	40,577	8.37±7.99

Note. All students without FRL eligibility identified were coded as not eligible.

students in 2012 acquired roughly one credit hour more than non-eligible students (FRL, mean=9.35; not eligible, mean=8.37).

CE Program Participation Outcomes

The final set of questions related to this study involved the comparison of FRL-eligible CE program participants to FRL-eligible non-participants that were matched on a host of demographic and achievement variables. The purpose of the matching was to equate groups on a number of covariates to allow for the assessment of the causal impact of program participation. The initial analysis involves the generation of matched control groups. The analytic process is documented within the logistic regression and matching results section below.

Logistic Regression & Propensity Score Analysis Matching Results

This study involved the generation of three distinct cohorts of free-and-reduced lunch CE participants. The first two cohorts reflect one year CE participants while the third group includes CE participants from both years. Hereafter, the cohorts are referred to as CE1 (i.e. 2010-2011; single-year participants), CE2 (i.e. 2011-2012; single-year participants), and CE1/2 (i.e. 2010-2011 & 2011-2012; two-year participants).

Initial work involved constructing data files that contained all eligible matched cases for each cohort. For example, cohort one (i.e. 2010-2011 CE Participants) were flagged within the 2010 October count file. This file reflects all students enrolled within a Colorado school at the beginning of the school year and prior to CE participation for the treatment group. All of the demographic variables for case matching were included from

this file including language proficiency status, free or reduced lunch status, gender, grade, ethnicity and special education status. Next, spring CSAP scores were appended to this master file along with the various outcome measures including subsequent year CSAP scores, CELA scores, ACT scores, and expulsion information. Lastly, for all reported seniors the graduation status, college enrollment, and first year college grade point average were added. For the two year cohort (i.e. CE1/2), matching occurred with students that were only enrolled within a Colorado school during both years (i.e. to coincide with the CE participants). Also, an additional year of assessment outcome data was included.

As an initial step in the propensity score matching analyses, logistic regression analyses were conducted for all three samples using CE participation as the criterion variable (i.e. treatment condition). All participants were coded as a “1” with non-participants coded as “2”. For all cases, propensity scores were generated indicating the probability that an identified student was assigned to the treatment condition (i.e. CE participation). The logistic regression equations were generated using all of the previously detailed matching variables with a direct entry procedure. Table 10 reflects the variable statistics for the logistic regression equations including coefficients and standard errors for all three samples. The three models were able to discriminate between the treatment and matching samples at moderate rates. All models had reclassification rates between 75.2% and 78.7% with reported Nagelkerke R-squared values from .165 to .224. The demographic variables were the largest contributors to each model.

Tables 10.

Logistic Regression Coefficients for PSM Procedure by CE Sample (Cohorts)

Variable	CE1		CE2		CE1/2	
	<i>b</i>	SE	<i>b</i>	SE	<i>b</i>	SE
(Intercept)	11.49*	.362	10.61*	.359	13.48*	.713
FRL	.151*	.070	-.271*	.051	-.174*	.094
Gender (male)	.133*	.054	-.238*	.042	-.174	.094
Race (Hispanic)	-.146	.078	-.102	.063	-.818*	.159
Race (White)	.318*	.087	-.065	.066	-.289	.172
Giftedness	-.846*	.094	.981*	.087	-1.07*	.150
Special Education	.802*	.112	-1.02*	.090	-1.38*	.221
Language Proficiency	-.058	.038	-.139*	.031	-.181*	.070
Grade	-1.90*	.056	-.827*	.031	-.928*	.057
<hr/>						
Nagelkerke R ² :	.224		.165		.217	
N:	9,191		13,920		3,104	
%	78.7%		75.2%		77.2%	
Reclassification:						
<hr/>						

Note. FRL: Free or reduced lunch status only. *b*: regression coefficient; SE: standard error. *: $p < .05$.

The focus of the matching procedure was to establish a statistical balancing of students who were the most similar based on the obtained vector of scores reflected within the estimated propensity score, so unmatched students were to be excluded. In order to maximize matching this study selected a random sample of non-participants to serve as the base for generating the matched comparison group. The large comparison samples increased the likelihood of strong matching across all variables with the selected sample size set to allow for a 3:1 ratio between CE participants and potential non-participant matches (see Table 11). Given the large unmatched samples no replacement of cases was required.

Table 11.

<i>CE Participant and Matched Groups: Counts by Cohort</i>		
Cohort	CE Participants (Treatment)	Unmatched Sample
CE1	2,157	7,034
CE2	3,472	10,448
CE1/2	699	2,405

The applied matching methodology was based on the nearest neighbor selection with a ‘caliper’ applied of 0.2 of the standard deviation of the logit. For duplicate matches the case closest to the obtained propensity score was utilized. If multiple cases

fell within the identified caliper region with the same obtained values, a single case was randomly selected. Once matching was complete, tables were generated that illustrate the matching concordance of individual variables to the control sample both prior to and following the matching process (see Tables 12-14; Figures 5-7). An examination of pre-program participation demographics and achievement variables indicates that the groups (i.e. CE participants and matched sample) were much better aligned following matching than they were prior to the statistical procedure. Similarly, the presented values within the tables are well aligned between years thus improving our confidence in the effectiveness of the process. As can be seen, a larger percentage of the FRL participants were identified as gifted with special education students being represented at lower rates. Hispanics tend to be the largest ethnic population that participated in CE opportunities (i.e. for FRL students). Also, females were slightly more likely to participate than males. Lastly, while assessment scores were omitted from the logistic regression equations for the derivation of the propensity scores; it should be recognized that the procedure did improve alignment of scores between the treatment and matched control group, albeit, indirectly. Specifically, the ACT composite scores demonstrated much better alignment following the matching process thus increasing confidence that pre-program participation achievement variables had a limited role in creating differences in outcome measures between groups.

Figure 5. Demographic Comparison of Treatment and Unmatched/Matched Control Groups of FRL Students for CE1

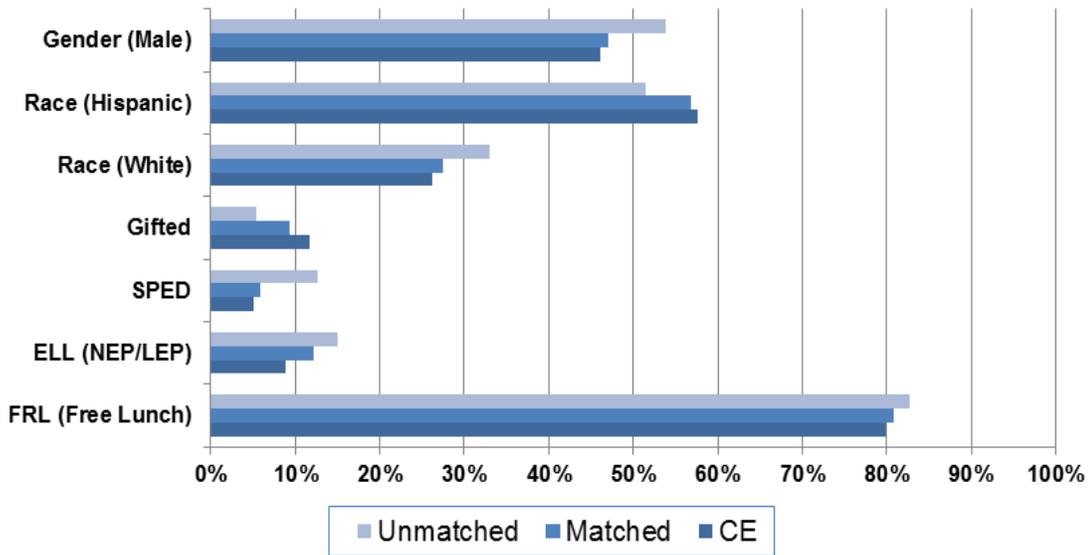


Table 12.

Demographic Composition of Unmatched and Matched Groups (CE1)

Matching Variable	CE (FRL) Participants		Non-Participants (FRL)	
	Unmatched	Matched	Unmatched	Matched
FRL (Free Only)	79.8%	80.9%	82.7%	80.9%
ELL (NEP/LEP)	8.9%	12.1%	15.0%	12.1%
SPED (Yes/No)	5.0%	5.8%	12.6%	5.8%
Gifted (Yes/No)	11.7%	9.4%	5.4%	9.4%
Race (White)	26.3%	27.5%	33.0%	27.5%
Race (Hispanic)	57.7%	56.9%	51.5%	56.9%
Gender (Male)	46.1%	47.1%	53.9%	47.1%
Grade in School	11.4±.90	11.2±1.0	10.3±1.1	11.2±1.0
CSAP Math (SS)*	571±61.7	551±72.2	547±70.9	551±72.2
CSAP Reading (SS)*	661±49.1	645±55.1	638±57.8	645±55.1
CSAP Writing (SS)*	551±65.9	530±71.7	529±70.2	530±71.7
ACT (Composite)*	18.1±3.9	18.2±4.3	16.9±4.3	18.2±4.3

Note. Values reflect data collected prior to CE program participation. CE participants, n= 2,157; Non-participants (unmatched) n= 7,034. Presented values reflect percent of total or Mean±SD when applicable. *: variables were excluded from logistic regression calculations and are presented for information concerning the effectiveness of matching procedures.

Figure 6. Demographic Comparison of Treatment and Unmatched/Matched Control Groups of FRL Students for CE2

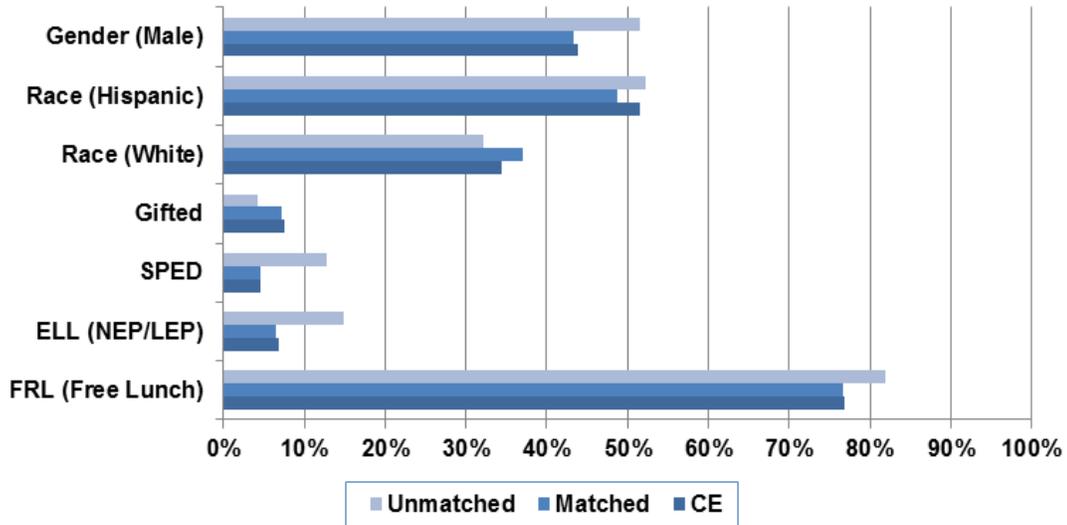


Table 13.

Demographic Composition of Unmatched and Matched Groups (CE2)

Matching Variable	CE (FRL)	Non-Participants (FRL)	
	Participants	Unmatched	Matched
FRL (Free Only)	76.9%	81.9%	76.6%
ELL (NEP/LEP)	6.8%	14.8%	6.5%
SPED (Yes/No)	4.6%	12.8%	4.6%
Gifted (Yes/No)	7.6%	4.3%	7.2%
Race (White)	34.5%	32.2%	37.0%
Race (Hispanic)	51.5%	52.3%	48.7%
Gender (Male)	43.9%	51.6%	43.4%
Grade in School	11.1±0.9	10.4±1.1	10.8±1.1
CSAP Math (SS)*	592±56.9	548±66.7	590±56.8
CSAP Reading (SS)*	675±44.3	637±55.3	668±45.1
CSAP Writing (SS)*	575±60.6	533±67.1	572±62.4
ACT (Composite)*	18.8±4.0	16.7±4.3	18.7±4.1

Note. Values reflect 2010 data (i.e. prior to CE program participation). CE participants (FRL) n= 3,472; FRL Non-participants (unmatched) n= 10,448. Presented values reflect percent of total or Mean±SD when applicable. *: variables were excluded from logistic regression calculations and are presented for information concerning the effectiveness of matching procedures.

Figure 7. Demographic Comparison of Treatment and Unmatched/Matched Control Groups of FRL Students for CE1/2

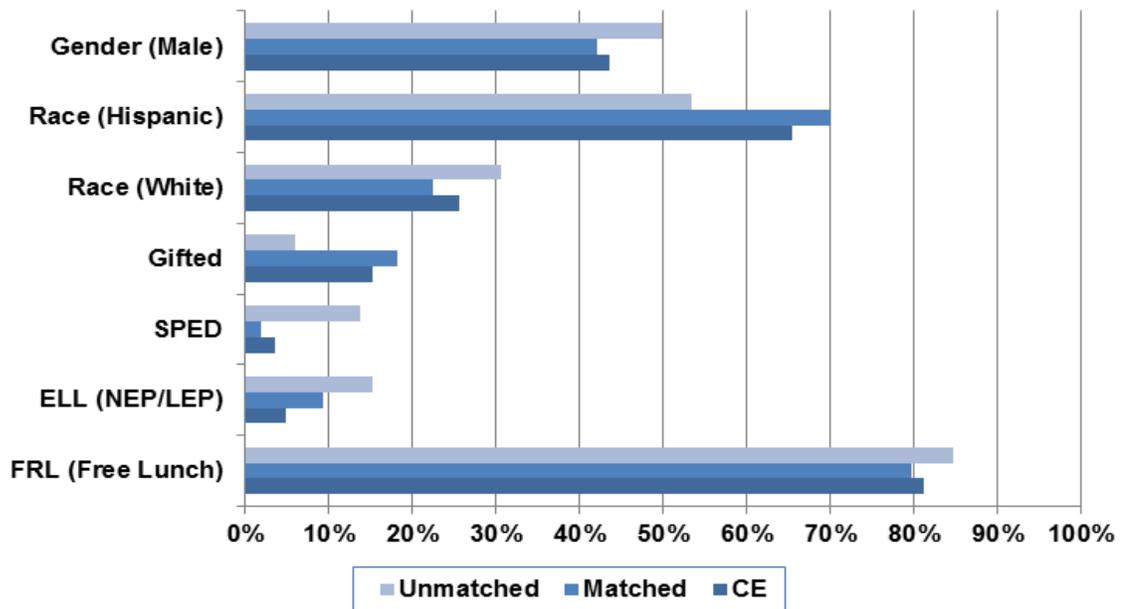


Table 14.

Demographic Composition of Unmatched and Matched Groups (CE1/2)

Matching Variable	CE (FRL)	Non-Participants (FRL)	
	Participants	Unmatched	Matched
FRL (Free Only)	81.1%	84.6%	79.7%
ELL (NEP/LEP)	4.8%	15.2%	9.3%
SPED (Yes/No)	3.6%	13.7%	1.9%
Gifted (Yes/No)	15.3%	5.9%	18.1%
Race (White)	25.6%	30.6%	22.4%
Race (Hispanic)	65.4%	53.3%	70.1%
Gender (Male)	43.5%	49.9%	42.0%
Grade in School	10.6±0.73	9.9±0.88	10.0±.8
CSAP Math (SS)*	595±52.1	546±70.3	593±56.8
CSAP Reading (SS)*	680±41.4	637±57.6	670±46.2
CSAP Writing (SS)*	573±60.2	529±68.7	567±64.6
ACT (Composite)*	18.9±3.7	14.4±3.3	19.5±4.5

Note. Values reflect 2009 data (i.e. prior to CE program participation). CE, 2-year (FRL) n=699; FRL Non-participants (unmatched) n= 2,405. Values reflect percent of total or Mean±SD when applicable. *: variables were excluded from logistic regression calculations and are presented for information concerning the effectiveness of matching procedures.

Sensitivity Analysis

Following matching, a sensitivity analysis was conducted to determine the extent to which unaccounted for variables contributed to any observed differences between groups. The sensitivity analysis consisted of a Wilcoxon's signed-rank test for sensitivity analysis of ranked pairs. The procedure includes the following steps: compute the ranked absolute differences d_s , compute the Wilcoxon signed-rank statistics for outcome differences between treatment and control groups, and compute the needed statistics for obtaining the one-sided significance level for the standardized deviate. (Guo & Fraser, 2010). This process was repeated for all three samples of propensity scores. The results of the analysis are presented in Table 15.

Table 15.

<i>Sensitivity Analysis of Ranked-Pairs</i>		
Sample	Ranked Absolute Difference (d_s)	Significance
CE1	Median difference equals 0	$p=.512$
CE2	Median difference equals 0	$p=.819$
CE1/2	Median difference equals 0	$p=.286$

Note. Comparisons were made by use of Wilcoxon signed-rank tests.

The results of all analyses indicated that unaccounted covariates are unlikely to have impacted the quality of the obtained matches between groups. The ranked absolute difference score approximated zero for all three samples. This finding, paired with the previous examination of the quality of matches between -groups, indicates that any

differences are likely resultant from CE program participation and not extraneous, unaccounted for variables.

Between-Group Comparisons of Impact during High School and College

The final analysis, of this dissertation, explored the impact of CE participation on a variety of academic and behavioral outcomes at the secondary and postsecondary levels. The analysis was replicated for all three samples. The obtained results are presented in Tables 15-17. Due to the large number of comparisons utilized the alpha level was reduced to .01 to reduce the likelihood of Type I error.

CE1 Results. The 2010-2011 CE Participants were shown to have assessment scores that were significantly greater than those of the matched control groups for all three CSAP content areas (t 's > 1.08, p 's < .05). The Colorado ACT composite score and the CELA overall scale scores failed to reveal statistically significant differences. However, in both cases, the mean scores were greater for the CE participants as compared to the matched non-participants. In addition, the CSAP Reading median growth percentiles of CE participants were shown to be significantly greater for the program participants than those of non-participants (p < .01). The median growth percentiles for math and writing were larger for CE participants but failed to achieve statistical significance. Lastly, a larger percentage of 12th grade CE participants were reported as graduates, attending college, and having a higher college 1st semester grade point average compared to their non-participating counterparts. Specifically, 6.9% more

graduated from high school with 7.7% more going on to attend college during the fall term following their graduation.

CE2 Results. The 2011-2012 CE participants had results similar to CE1. In terms of assessment and growth results the findings were identical, except that significant differences were also noted for math and writing median growth percentiles between groups. Similarly, the graduation rate, college matriculation rate, and college grade point average all exceeded those reported for the matched control group. For this group, 3.6% more graduated from high school and 14.1% more went on to attend college during their fall term following graduation. The 1st term grade point average was 2.06 compared to 1.77 for non-participants which reflects a statistically significant difference.

CE1/2 Results. The results for the two year cohort included additional measures for subsequent testing years. The obtained findings, related to standardized assessments, tend to coincide with those previously mentioned. However, a few of the assessment results failed to show statistically significant differences between-groups. Specifically, math and writing didn't differ between groups at statistically-significant rates. In addition, the CE participants had larger mean assessment scores in 2011 compared to non-participants. In contrast, non-participants tended to have greater mean scores in 2012.

The percentage of CE participants going to college exceeded the rates reported for non-participants for this cohort (i.e. by 17.2%). In addition, the fall term college grade

point average remained higher for the CE group than the non-participants at statistically significant levels (CE: mean=2.23; Control: mean=1.71).

For most assessment measures, adequate growth percentiles were higher than those reported for non-participants for CE2 and CE1/2. This indicates the growth requirements are higher for CE participants in order to achieve proficiency. However, that being said, the median growth is higher for these groups so the adequate growth benchmarks are more likely to be reached. For CE1, the adequate growth percentiles tend to be lower with median values continuing to be high for participants. This obtained pattern of results reduces the meaningfulness of the adequate growth percentile results. In sum, no explanation is immediately evident for the mixed results.

Table 16.

Between-Group Differences in CEI Outcome Measures by FRL Status

Outcome Measure	CE Participants (Mean± SD)	Matched Control (Mean± SD)	t-value	p-value
Math (SS)	573.79±62.59	548.81±69.80	4.69	*
Math (MGP) ¹	57	48	--	*
Math (AGP) ¹	97	99	--	ns
Reading (SS)	658.13±47.33	644.97±54.28	5.37	*
Reading (MGP) ¹	57.5	48	--	*
Reading (AGP) ¹	25	54	--	*
Writing (SS)	560.42±63.01	516.31±72.04	-8.03	*
Writing (MGP) ¹	55.5	51	--	ns
Writing (AGP) ¹	69	84	--	*
CELA (Overall)	563.29±34.05	555.39±43.76	2.08	ns
ACT (Composite)	17.69±4.38	17.03±4.05	2.24	ns
College Fall GPA	2.05±1.26	1.88±1.36	2.67	ns
% Graduates	89.7%	82.8%	--	--
% Dropouts	n<5	n<5	--	--
% College Matriculation	54%	46.3%	--	--

Note. CE: reflects all students with any CE credit earned during the identified year. All SS & MGP reported reflects CSAP Scale Scores and median growth percentiles for identified content area. Comparisons were conducted using independent sample *t*-tests except for median growth percentiles, comparisons were made with Mann-Whitney U-tests. ¹: reflects median data only and utilized Mann-Whitney U-test. CELA excluded in table 18 due to lack of availability of 2012 data. *:Significance set at less than or equal to .01 to reduce the likelihood of family-wise Type I error. ns: not statistically significant.

Table 17.

Between-Group Differences in CE2 Outcome Measures by FRL Status

Outcome Measure	CE Participants (Mean± SD)	Matched Control (Mean± SD)	t-value	p-value
Math (SS)	593.29±62.11	590.56±61.97	0.98	ns
Math (MGP)	55	48	--	*
Math (AGP)	87	80	--	ns
Reading (SS)	677.09±44.19	671.88±44.68	2.59	*
Reading (MGP)	58	50	--	*
Reading (AGP)	50	15	--	ns
Writing (SS)	576.29±66.88	570.58±64.30	1.94	ns
Writing (MGP)	60	51	--	*
Writing (AGP)	57	48	--	ns
CELA (Overall)	569.53±34.39	558.59±46.41	3.07	*
ACT (Composite)	19.32±4.24	19.29±4.41	0.12	ns
College Fall GPA	2.06±1.31	1.77±1.41	3.90	*
% Graduates	88.5%	84.9%	--	--
% Dropouts	0.1%	1.1%	--	--
% College Matriculation	56.4%	41.3%	--	--

Table 18.

Between-Group Differences in CEI/2 Outcome Measures by FRL Status

Outcome Measure	Year	CE Participants (Mean± SD)	Matched Control (Mean± SD)	t-value	p-value
Math (SS)	2011	595.51±57.51	593.84±63.55	0.34	ns
	2012	585.71±55.1	605.22±63.94	-2.33	ns
Math (MGP)	2011	55.5	50	--	ns
	2012	54.5	46	--	ns
Math (AGP)	2011	88	74	--	ns
	2012	98.5	74	--	*
Reading (SS)	2011	682.28±45.54	670.65±47.61	3.11	*
	2012	675.10±34.78	681.66±41.60	1.21	ns
Reading (MGP)	2011	67	52	--	*
	2012	52	44	--	ns
Reading (AGP)	2011	16	19	--	ns
	2012	24	9	--	ns
Writing (SS)	2011	575.49±57.90	566.95±62.64	1.75	ns
	2012	561.70±54.74	576.47±66.95	-1.7	ns
Writing (MGP)	2011	51.5	48	--	ns
	2012	63	57	--	ns
Writing (AGP)	2011	46	50	--	ns
	2012	82	50	--	*
ACT (Composite)	2011	19.19±4.04	19.51±4.54	-.872	ns
	2012	19.65±4.27	19.23±4.55	.910	ns
College GPA	Fall 2012	2.23±1.25	1.71±1.52	3.34	*
% Graduate:	11/12	85%	91%	--	--
% Dropouts:	11/12	n<5/n<5	n<5/n<5	--	--
% College:	Fall 12	61.1%	43.9%	--	--

Chapter Five: Discussion

Introduction

Social capital is thought to contribute to college-going and professional success (Sandefur, Meier, Campbell, 2006; Plagens, 2010). Thus, educational programs that support the acquisition of social capital may lead to favorable short- and long-term academic outcomes. The Colorado concurrent enrollment program legislation provides low-SES students a college-going opportunity that is based on exposure to the all aspects of the post-secondary landscape. This experience includes the establishment of social networks that support an understanding of all aspects of post-secondary work, norms, and relationships. As can be argued from this study, the opportunity to earn social capital, including its corresponding favorable results, fail to guarantee the participation of underserved students. It may be necessary to obtain social capital to achieve post-secondary success but its presence alone fails to guarantee equitable programmatic access for all students.

This study revealed that within the state of Colorado, student enrollment in concurrent enrollment coursework was less than would be expected for students from low-SES backgrounds. That being said, the FRL students that did participate enrolled in more college courses than their non-eligible peers (i.e. as evidenced by credit hours

enrolled). This willingness to attempt more credit hours makes sense given the context of a new, valued educational opportunity. The availability of this opportunity may serve as a catalyst for students to enroll for more credit hours and to work harder while the resources remain available. The challenge of participation remains, the data indicates that the actual number of credits earned was still less for the low-SES students than their higher SES peers.

It was also shown that low-SES students, who participated in the program, experienced more favorable high school and postsecondary outcomes. In general, this included higher standardized assessment performance, higher graduation rates, higher college going rates, and higher fall semester grade point average during their initial year of college. This provides preliminary evidence, within the context of the applied methodology, of the benefits associated with CE participation for low-SES students.

Relationship with Previous Research

A paucity of research exists that examines the impact of CE participation on students from impoverished backgrounds in regards to high school and postsecondary outcomes. To present, only a single study was identified that examined the impact of CE participation on students from impoverished backgrounds. This study revealed that low-income students that participated in CE program were more likely to achieve college degrees (An, 2013). This dissertation expanded on that study by examining proximate impacts of program participation. The observed outcomes included test scores, grade matriculation, early college grade point average, and remediation rates. Additionally, the

recruitment and representation of low-income students in CE programs was examined to better understand the extent of the impact of policy adoption. The findings of this study are congruent with the findings presented in previous research regarding concurrent enrollment. It is believed that the positive outcomes documented within this dissertation are reasonable precursors to the increased college graduation rates of low-SES students that were identified within the Bryan An study (2013).

Implications

This study revealed a positive impact of CE participation on a wide range of academic outcomes. This relationship suggests at the possible importance of the availability of social capital, obtained via educational opportunities, to support disadvantaged students in achieving postsecondary success. The lower rate of participation by students from backgrounds of poverty highlights the need to better understand the specific components of social capital that exist within CE programs and how they may foster beneficial outcomes. Similarly, local education agencies that are more successful in recruiting underserved students should be studied to determine the specific factor(s) that account for the observed success. A number of barriers may serve to mitigate recruitment success. These barriers should also be examined to determine how some local education agencies have most effectively addressed these factors within their own practices.

Barriers to Program Effectiveness & Participation. A number of factors may contribute to reduced participation of low-SES students in CE programs. These factors

should be explored in future research studies to better understand how to effectively deliver programmatic opportunities to targeted student populations. A few possible barriers to participation may include: communication of program availability, student transportation/employment restrictions, supplemental costs of participation, and/or a district emphasis on non-CE programming.

In the case of poverty, communication of program availability is central to the successful recruitment of low-SES students. Since poverty is expected to limit access to e-mail, phone, and social media it is more likely that personal contact will be necessary for CE student recruitment. The failure to engage at this level may serve to sustain selective recruitment practices that continue to marginalize highly impacted students. For example, if e-mail is unavailable to some parents that are being notified of CE opportunities then it's more likely that the percentage of low-SES participating will be reduced.

Another barrier to recruitment may be tied to the availability of transportation options for program participants. If transportation is not available to off-site CE locations and/or CE opportunities are available on-site but prohibit regular transportation options (e.g. access to bus), prior to or following regular school hours, then the student may decline participation due to time and/or distance restrictions. Similarly, many students in poverty are required to maintain employment to achieve a base level of familial subsistence. If CE opportunities coincide with employment hours it may prevent

participation. The participation rate could also be reduced if the student is responsible for oversight of siblings or other family members which may also reduce available time.

The presence of supplemental costs may inhibit participation by some students. The CE legislation allows for the payment of tuition directly by the district. This reduces the burden experienced by all families that choose to have their student participate in CE coursework. However, additional expenses may not be covered by the district. Some possibilities may include such things as the costs of books, lab fees, and/or any other required materials.

A final possible barrier to concurrent enrollment participation may be the availability of other existing postsecondary opportunities within districts and schools. An example would be a locale in which, Advanced Placement offerings are emphasized. This emphasis may serve to reduce the overall recruitment of students into concurrent enrollment opportunities as it's not being offered as a viable alternative for students. It is possible that the Advanced Placement offerings are still at times inaccessible to FRL-students due to cost or recruitment practices which marginalize students from participation and/or testing for credit.

The Relationship of CE Programs and Colorado Policy. This study revealed a number of favorable outcomes that likely result, at least indirectly, from the adopted concurrent enrollment legislation. However, the adoption of the legislation appears to be insufficient to solely drive the desired outcomes in which it details. Ultimately, the adoption of research-based strategies related to effective CE program implementation

provides for the greatest likelihood of both increasing the graduation rate while mitigating the dropout rate of underserved students. It may be argued that the success of a concurrent enrollment system is based on comprehensive and responsive program development by local education agencies. The adopted legislation while necessary may not be sufficient to guarantee achievement of its desired ends. The most effective programs, while operating within the framework of the adopted legislation, will rely on nuanced implementation that best address the needs of the students that are served by the educational agency.

CE Program Development. One of the most significant findings associated with this study is that differential success rates exist in regards to CE programs and their efficacy in recruiting and supporting disadvantaged students. Concomitantly, it is erroneous to believe that mere participation in CE programs will lead to favorable outcomes for all disadvantaged students. Instead, it is more likely that key programmatic elements lead to the observed outcomes. Recently, William Tierney posits that a number of key actions may serve to increase access to college and create a college-going culture in low-performing schools (Tierney, 2013; Tierney, Bailey, Constantine, Finkelstein, & Farmer Hurd, 2009). These recommendations are based on information collected by the author from a range of empirical sources and life experiences (2013). All of the recommendations appear to be related to what are often considered the defining attributes of social capital (see Fields, 2008; Beem 1999; Halpern 2009). It could be argued that successful adoption of the provided recommendations may be integral to effective CE

program development. The key recommendations likely include: First, offer coursework that prepares students for college-level work (Tierney, 2013). This is what participation in concurrent enrollment coursework delivers. The participation in college coursework helps students understand the requirements surrounding the transition to post-secondary opportunities. Second, surround students with adults and peers who support their college going pursuits (2013). In terms of program development, this includes the availability of career counselors. In addition, coursework on college campuses may facilitate exposure to peers that are more familiar with college level expectations. Third, engage and assist students in completing critical steps for college entry (2013); and last, increase families financial awareness, and assist with the financial aid process (2013). All of these actions already are likely to comprise successful CE programs and relate closely to prior descriptions of social capital.

Limitations of the Study

This study provides preliminary data regarding the impact of concurrent enrollment participation on a variety of outcomes in students from impoverished backgrounds. However, three primary limitations exist in regards to the adopted design. Foremost, the link between program participation and any favorable outcomes is inferred to result from acquired social capital. It is expected that social capital is enhanced from CE participation which in turn is causally related to improvement in the measured outcomes. However, this study fails to explicitly define, identify and/or directly measure the source of social capital. This observation indicates that described relationships

between variables is tenuous and necessitates additional research. A follow-up study would likely focus on programs that have been successful at recruiting underserved populations and show improved outcomes for these children compared to matched controls. The quality of CE program implementation within local education agencies could then be linked to outcomes to ascertain the relative impact of identified social capital.

It should also be recognized that the underrepresentation rates of low-income students may indicate pre-existing differences that account for the observed, positive between-group findings. However, given that the groups were also shown to be indirectly matched on assessment performance reduces the probability of this occurrence. In effect, if differences exist then the propensity score matching procedure should have already largely controlled for these differences. Also, the sensitivity analysis supports programmatic inferences due to an estimate of variance which informs us of the likelihood that additional unaccounted variables contributed to the differences.

Recommendations for Future Research

This study highlights the possible importance of programs that provide social capital to impoverished students but fails to identify the specific programmatic mechanisms that contribute to the observed outcomes. It is believed that the quality of support students receive during high school regarding the college going process may lead to more successful transitions to college. This finding is in agreement with recent studies that have examined the impact of counselors providing college related social resources on

college application rates and enrollment (Bryan, Moore-Thomas, Day-Vines, & Holcomb-McCoy, 2011; Stephan & Rosenbaum, 2013). The findings suggested that the increased availability of social resources to disadvantaged students improved high school to college transition rates (2013).

Future studies should examine successful CE programs to identify additional program components that may contribute to student success in matriculation to college. This would be valuable to support the development and implementation of a range of programs that foster the acquisition of social capital that leads to more favorable outcomes for students from disadvantaged backgrounds. Possible research questions to be addressed include:

1. What are the most effective recruitment strategies utilized to promote CE participation? How do these recruitment strategies address the previously discussed concerns regarding communication of program availability, transportation, need for work, peer expectations and supplemental costs?
2. Do students attend CE courses on-site or off-site and does it impact outcomes? It may be argued that participation at the institute of higher education may contribute more in regards to social capital.
3. What are the non-course processes that may contribute to favorable outcomes (e.g. course registration, engaging in the financial aid process, etc.)?
4. How is social capital made available within CE programs and how does it relate to any observed differences in outcomes between local education agencies?

A comprehensive exploration of these questions will contribute to an increased theoretical understanding of social capital while also serving to support the development of more responsive programs to meet the needs of historically underserved student populations.

References

- The Alliance (2007). *High school teaching for the twenty-first century: preparing students for college*. Alliance of Excellent Education, Issue Brief.
- An, B.P. (2013). The impact of dual enrollment on college degree attainment: do low-ses students benefit. *Educational Evaluation & Policy Analysis*, 35,1, 57-75.
- An, B.P. (2009). *The impact of dual enrollment on college performance and attainment*. Unpublished doctoral dissertation, University of Wisconsin-Madison.
- Appleton, J.J., Christenson, S.L., and Furlong, M.J. (2008). Student engagement with school: critical conceptual and methodological issues of the construct. *Psychology in the Schools*, 45(3), 369-386.
- Aud, S., Fox, M.A., and KewalRamani (2010). *Status and Trends in the Education of Racial and Ethnic Groups* (NCES2010-05). Washington, DC: U.S. Department of Education, National Center for Education Statistics.
- Aud, S., Hussar, W., Johnson, F., Kena, G., Roth, E., Manning, E., ...Zhang, J. (2012). *The Condition of Education 2012* (NCES 2012-045). Washington, DC: U.S. Department of Education, National Center for Education Statistics.
- Aud, S., Hussar, W., Kena, G., Bianco, K., Frohlich, L., Kemp, J. and Tahan, K. (2011). *The Condition of Education 2011* (NCES 2011-033). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.
- Austin, P. C. (2010a). Optimal caliper widths for propensity-score matching when estimating differences in means and differences in proportions in observational studies. *Pharmaceutical Statistics*.doi:10.1002/pst.433
- Bailey, T.R., Hughes, K.L., and Karp, M.M. (2002). *What role can dual enrollment programs play in easing the transition between high school and postsecondary education?*, Report prepared for the Office of Vocational and Adult Education, U.S. Department of Education.
- Bean, B., White, T., & Ruthven, M. (2013). *Annual Report on Concurrent Enrollment: 2011-2012 School Year*, Prepared on behalf of the Colorado Department of Education and the Colorado Department of Higher Education, February 20, 2013.

- Bedolla, L.G. (2010). Good ideas are not enough: considering the politics underlying students' postsecondary transitions. *Journal of Education for Students placed at risk*, 15: 9-26.
- Beem, C. (1999). *The necessity of politics reclaiming American public life*, Chicago: University of Chicago Press.
- Bonk, W.J. (2012). *The Colorado growth model: using norm- and criterion- referenced growth calculations to ensure that all students are held to high academic standards*. Colorado Department of Education, Technical report. Retrieved from: <http://www.cde.state.co.us/sites/default/files/documents/accountability/downloads/growthstandardsaccountability.pdf>
- Gunn, J.B. & Duncan, G.J. (1997). The effects of poverty on children. *Children and Poverty*, 7, 2, 55-71.
- Brophy, J.E. (1985). Research on the self-fulfilling prophecy and teacher expectations. *Journal of Educational Psychology*, 75, 5, 631-661.
- Bryan, J., Moore-Thomas, C., Day-Vines, N.L., & Holcomb-McCoy, C. (2011). School counselors as social capital: the effects of high school counseling on college application rates. *Journal of Counseling and Development*, 89, 190-199.
- Bourdieu, P. (1986). The Forms of Capital. In *Handbook of Theory and Research for the Sociology of Education*, edited by J.G. Richardson. New York: Greenwood Press.
- Burke, J.B., & Johnstone, M. (2004). Access to higher education. The hope for democratic schooling in America. *Higher education in Europe*, XXIX(1), 19-31.
- Caley, N. (2011). *Redefining the Colorado paradox: as minority populations rise, higher ed prepares for the students of the future*. February 1, 2011. www.cobizmag.com
- Carter, K.G. (2009). *Efficacy of dual enrollment in rural southwest Virginia*. Dissertation. Old Dominion University.
- Choy, S. (2002). *Nontraditional undergraduates* (NCES 2002-012). Washington, DC: U.S. Department of Education, National Center for Education Statistics. Retrieved from <http://nces.ed.gov/programs/coe/analysis/2002a-sa01.asp>

- Claridge, T. (2004). *Social Capital Research*. www.socialcapitalresearch.com
- Coleman, J.S. (1987). Families and Schools. *Educational Researcher*, 16, 6, 32-38.
- Coleman, J.S. (1987). Norms as Social Capital. In *Economic Imperialism: The Economic Approach Applied Outside the Field of Economics*, edited by G. Radnitzky and P. Bernholz. New York: Paragon House Publishers.
- Coleman, J.S. (1988). Social capital in the creation of human capital. *The American Journal of Sociology, Supplement: Organizations and Institutions: Sociological and Economic Approaches to the Analysis of Social Structure*, 94, S95-S120.
- Coleman, J.S. (1994). *Foundations of Social Theory*, Cambridge, Massachusetts, Harvard University Press.
- Colorado Department of Education (2010). *HB 09-1319 and SB09-285 fact sheet: the concurrent enrollment programs act of 2009*. Obtained from www.cde.state.co.us
- Colorado Department of Higher Education (2012). *2012 Legislative Report on Remedial Education*. Submitted April 16, 2013. Obtained from www.cdhe.edu.
- Colorado Department of Higher Education (2010). *All high school concurrent enrollment: fall term enrollment, 2010 report*. Obtained from www.cdhe.edu.
- Cooper, H., Hedges, L., & Valentine, J. (2009). *The Handbook of Research Synthesis and Meta-Analysis*. 2nd edition, New York, Russell Sage Foundation Publications.
- Cutler, D.M. & Muney, A.L. (2006). *Education and health: evaluating theories and evidence*. National Bureau of Economic Research, working paper 12352. Obtained from: http://www.chrp.org/pdf/Cutler_Lieras-Muney_Education_and_Health.pdf
- Data First (2012). *What is the poverty level of our school(s)?* Center for Public Education. Obtained from <http://www.data-first.org/data/what-is-the-poverty-level-of-our-schools>.
- Dehejia, R.H. & Wahba, S. (2002). Propensity score-matching methods for nonexperimental causal studies. *The Review of Economics and Statistics*, 84(1), 151-161.

- Delpit, L. (2006). *Other people's children: cultural conflict in the classroom*. New York: New Press.
- Duffield, B. (2001). The educational rights of homeless children. *Educational Studies*, 32, 323-336.
- Duffy, W.R. (2009). *Persistence and performance: the relationship between dual credit and persistence and performance at a four-year university*. Dissertation. The University of Memphis.
- Enders, C. (2010). *Applied Missing Data Analysis*, New York, NY: The Guildford Press.
- Erwin, P. (2008). Poverty in America: How Public Health Practice Can Make a Difference, *American Journal of Public Health*, 98(9): 1570–1572.
- Farmer-Hinton, R.L. & Adams, T.L. (2006). Social capital and college preparation: exploring the role of counselors in a college prep school for black students. *The Negro Educational Review*, 57, 1-2, 101-116.
- Ferguson, H.B., Bovaird, S., & Mueller, M.P. (2007). The impact of poverty on educational outcomes for children. *Paediatr Child Health*, 12, 8, 701-706.
- Field, J. (2008). *Social Capital*, second edition, London: Routledge Press.
- Fortson, K., Verbisky-Savitz, N., Kopa, E., and Gleason, P. (2012). *Using an experimental evaluation of charter schools to test whether nonexperimental comparison group methods can replicate experimental impact estimates*. Institute of Education Sciences Report, United States Department of Education.
- Fowler, M.D. (2007). *A program evaluation of achieving a college education plus*. Unpublished doctoral dissertation, Northern Arizona University.
- Gamoran, A. & Long, D.A. (2006). *Equality of Educational Opportunity: A 40-year retrospective* (WCER Working Paper No. 2006-9). Madison: University of Wisconsin-Madison, Wisconsin Center for Education Research. Retrieved from: <http://www.wcer.wisc.edu/publications/workingPapers/papers.php>
- Greeno, C.G. (2002). Major alternatives to the classic experimental design. *Family Processes*, 41, 4, 733-736.

- Guo, S. & Fraser, M.W. (2010). *Propensity Score Analysis: Statistical Methods and Applications (Advanced Quantitative Techniques in the Social Sciences Series)*. Sage Publications, Inc. Los Angeles, California.
- Halpern, D. (2009). *The Hidden Wealth of Nations*. Cambridge: Polity.
- Hango, D. (2007). Parental investment in childhood and educational qualifications: can greater parental involvement mediate the effects of socioeconomic disadvantage? *Social Science Research*, 36, 1371-1390.
- Hartman, T.E. (2007). *The impact of dual-enrollment programs on first-year academic success*. Unpublished doctoral dissertation, University of Northern Colorado
- Harwell, M. & LeBeau, B. (2010). Student eligibility for a free lunch as an SES measure in education research. *Educational Researcher*, 39, 2, 120-131.
- Haskins, R., Holzer, H., & Lerman, R. (2009). *Promoting economic mobility by increasing postsecondary education*. Economic Mobility Project Report.
- Henderson, A.T. (1987). *The evidence continues to grow: parent involvement improves student achievement*. An annotated bibliography. National Committee for citizens in education special report.
- Hoffman, N. (2005). *Add and Subtract: dual enrollment as a state strategy to increase postsecondary success for underrepresented students*. Boston: Jobs for the Future. Retrieved from: <http://www.jff.org/Documents/Addsubtract.pdf>
- Huang, J., Van den Brink, H.M., & Groot, W. (2009). A meta-analysis of the effect of education on social capital. *Economics of Education Review*, 28, 454-464.
- Hughes, K.L., Rodriguez, O., Edwards, L., & Belfield, C. (2012). *Broadening the benefits of dual enrollment: reaching underachieving and underrepresented students with career-focused programs*. Report from Community College Research Center, Teachers College, Columbia University.
- IBM Corporation, released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, New York: IBM Corp.
- John, P. (2005). The contribution of volunteering, trust, and networks to educational performance. *The Policy Studies Journal*, 33, 4, 635-656.

- Jorgensen, D.D. & French, J.A. (1998). Individuality but not stability of marmoset long calls. *Ethology*, 104, 729-742.
- Karp, M.M. & Bork, R.H. (2012). *They never told me what to expect, so I didn't know what to do": defining and clarifying the role of a community college student*. Report from the Community College Research Center, Teachers College, Columbia University.
- Karp, M.M., Calcagno, J.C., Hughes, K.L., & Bailey, T.R. (2007). *The postsecondary achievement of participants in dual enrollment: an analysis of student outcomes in two states*. National Research Center for Career and Technical Education: Technical Report, University of Minnesota.
- Keppel, G. & Zedeck, S. (1989). *Data analysis for research designs: analysis of variance and multiple regression approaches*. W.H. Freeman and Company: New York.
- Keselman, H.J., Cribbie, R. & Holland, B. (2002). Controlling the rate of type I error over a large set of statistical tests. *British Journal of Mathematical and Statistical Psychology*, 55, 27-39.
- Kids Count (2012). *Kids Count data book*. Prepared by the Annie E. Casey Foundation. Information obtained from www.aecf.org.
- Kim, H.J. (2004). Family resources and children's academic performance. *Children and Youth Services Review*, 26, 529-536.
- Lareau, A. (2000). *Home advantage: Social class and parental intervention in elementary education* (2nd ed.). Lanham, MD: Rowman & Littlefield Publishers
- Milner IV, R.H. (2013). Analyzing poverty, learning, and teaching through a critical race theory lens. *Review of Research in Education*, 37, 1-53.
- Munin, A. (2012). *Color by number: understanding racism through facts and stats on children*. Sterling, VA: Stylus.
- Nagaoka, J., Roderick, M., & Coca, V. (2009). *Barriers to college attainment, Lessons from Chicago*. Center for American Progress, Information obtained from www.americanprogress.org.
- National Center for Children in Poverty (2013). *Child Poverty*. Mailman School of Public Health, Columbia University.

- National Center for Children in Poverty (2012). Data on poverty. Information obtained from www.nccp.org.
- O’Rand, A.M., Hamil-Luker, J., & Elman, C. (2009). Childhood adversity, educational trajectories, and self-reported health in later life among U.S. women and men at the turn of the century. *Z Erziehungswiss*, *12*, 409-436.
- Perna, L.W. (2000). Differences in the decision to attend college among African Americans, Hispanics, and Whites. *The Journal of Higher Education*, *71*, 2, 117-141.
- Plagens, G.K. (2010). Social capital in schools: perceptions and performance. *The International Journal of Interdisciplinary Social Sciences*, *5*, 6, 17-30.
- Plagens, G. & Stephens, M. (2009). *School performance and social capital: how interpersonal relations influence organizational outcomes*. Akron, Ohio.
- Plucker, J.A., Chien, R.W., & Zaman, K. (2006). Enriching the high school curriculum through postsecondary credit-based transition programs. *Education Policy Brief*, 4,2,1-10: Center for Evaluation and Education Policy.
- Provasnik, S., & Planty, M. (2008). Community colleges: special supplement to the condition of education 2008 (NCES 2008-033). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics.
- PRRAC (2011). *Annotated bibliography: the impact of school-based poverty concentration on academic achievement and student outcomes*. Report prepared by the Poverty and Race Research Action Council. Obtained from www.prrac.org.
- Putnam, R.D. (2000). *Bowling Alone. The collapse and revival of American Community*, New York, Simon and Schuster.
- Pyong An, B. (2009). *The impact of dual enrollment on college performance and attainment*. Dissertation submitted to University of Wisconsin-Madison.
- Rosenbaum, P. R., & Rubin, D. B. (1985). Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *The American Statistician*, *39*, 33–38.

- Rosenbaum, P.R. & Rubin, D.B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70, 1, 41-55.
- Rosenbaum, P.R. (1995). *Observational Studies*. New York: Springer-Verlag.
- Rudher, L.M. & Peyton, J. (2006). Consider Propensity Scores to Compare Treatments. Graduate Management Assessment Council Research Reports, RR-06-07, p. 1-8.
- Saltorelli, C.A. (2008). *An examination of the relationship between early college credit and higher education achievement, persistence, and time to graduation, of students in South Texas*. Unpublished doctoral dissertation, Texas A&M University-Kingsville and Texas A&M-Corpus Christi.
- Sandefur, G.D., Meier, A.M., & Campbell, M.E. (2006). Family resources, social capital, and college attendance. *Social Science Research*, 35, 2, 525-553.
- Schweigert, W. (1994). *Research Methods and Statistics for Psychology*. Belmont, California: Brooks/Cole Publishing Company.
- Sell, A.B. (2008). *A study of community college students who participated in a dual-enrollment program prior to high school graduation*. Unpublished doctoral dissertation, East Tennessee State University
- Shadish, W.R., Cook, T.D., & Campbell, D.T. (2002). *Experimental and Quasi-Experimental Designs for Generalized Causal Inference*. Houghton Mifflin Company, Boston, MA.
- Smith, M.K. (2009). 'Social Capital', the encyclopedia of informal education, www.infed.org/biblio/social_capital.htm.
- State of Colorado (2011). *Colorado School Laws 2011*. Matthew Bender & Company, Inc. Charlottesville, Virginia.
- Stephan, J.K. & Rosenbaum, J.E. (2013). Can high schools reduce college enrollment gaps with a new counseling model? *Educational Evaluation and Policy Analysis*, 35, 2, 200-219.
- Stephens, N.M., Townsend, S.M., Markus, H.R., & Phillips, L.T. (2012). A cultural mismatch: independent cultural norms produce greater increases in cortisol and more negative emotions among first-generation college students. *Journal of Experimental Social Psychology*, 48, 1389-1393.

- Swanson, J.L. (2008). *An analysis of the impact of high school dual enrollment course participation on postsecondary academic success, persistence and degree completion*. Unpublished doctoral dissertation, University of Iowa.
- The World Bank (1999). *What is social capital?*, PovertyNet, <http://www.worldbank.org/poverty/scapital/whatsc.htm>
- Thoemmes, F. (2012). *Propensity score matching in SPSS*. Technical report, obtained from <http://arxiv.org/abs/1201.6385>
- Tierney, W.G. (2013). 2013 AERA presidential address, beyond the ivory tower: the role of the intellectual in eliminating poverty. *Educational Researcher*, 42, 6, 295-303.
- Tierney, W.G., Bailey, T., Constantine, J., Finkelstein, N., & Farmer Hurd, N. (2009). *Path to college: what high school can do* (NCEE 2009-4066). Washington, DC: U.S. Department of Education, Institute of Education Sciences.
- Tilak, J.B. (2002). Education and Poverty. *Journal of Human Development*, 3, 2, 192-207.
- Trochim, W.M. (2005). *Research methods: The concise knowledge base*, Cengage Learning: Mason, Ohio
- Turner, M.R. (2010). *Embracing resistance at the margins: first-generation Latino students' testimonies on dual/concurrent enrollment high school programs*. Unpublished doctoral dissertation. University of Denver.
- U.S. Bureau of the Census (2012). How the census bureau measures poverty. Retrieved from <http://www.census.gov/hhes/www/poverty/about/overview/measure.html>
- U.S. Bureau of the Census (2010). *Income, Poverty, and Health Insurance Coverage in the United States: 2010*, Report P60, n. 238, Table B-2, pp. 68-73.
- Walpole, M. (2003). Socioeconomic status and college: How SES affects college experiences and outcomes. *Review of Higher Education*, 27, 45-73.
- Weinstein, R.S., Madison, S.M., and Kuklinski, M.R. (1995). Raising expectations in schooling: obstacles and opportunities for change. *American Education Research Journal*, 32, 1, 121-159.

What Works Clearinghouse (2008). *What works clearinghouse evidence standards for reviewing studies, version 1.0*. <http://ies.ed.gov/ncee/wwc/>

Wilkinson, R. & Pickett, K. (2009). *The spirit level. Why more equal societies almost always do better*. London: Allen Lane.

Appendix A

IRB Approval Letter: University of Denver

University of Denver

Emily Caldes, MA
Manager, Regulatory Research Compliance

Tel: 303-871-4052

Certification of Human Subjects Approval

June 10, 2013

To,
Dan Jorgensen, PhD (Candidate)

Subject **Human Subject Review**

TITLE: Concurrent Enrollment Programs and Acquired Social Capital for Students from Impoverished Backgrounds: An Examination of Impact on Behavior and Academic Performance

IRB# : 2013-2582

Dear Jorgensen,

The Institutional Review Board for the Protection of Human Subjects has reviewed the above named project. The project has been approved for the procedures and subjects described in the protocol at the 06/10/2013 meeting (or through expedited review). This approval is effective for twelve months. We will send you a courtesy continuation reminder for this project. However, it is the responsibility of the Principal Investigator to keep track of the expiration date of each protocol. This form must be submitted to the Office of Research and Sponsored Programs if the project continues. This information must be updated on a yearly basis, upon continuation of your IRB approval for as long as the research continues. No human subjects-related work can take place during an expiration period.

NOTE: Please add the following information to any consent forms, surveys, questionnaires, invitation letters, etc you will use in your research as follows: This survey (consent, study, etc.) was approved by the University of Denver's Institutional Review Board for the Protection of Human Subjects in Research on 06/10/2013. This information must be updated on a yearly basis, upon continuation of your IRB approval for as long as the research continues. This information will be added by the Research Compliance Office if it does not already appear in the form(s) upon continuation approval.

The Institutional Review Board appreciates your cooperation in protecting subjects and ensuring that each subject gives a meaningful consent to participate in research projects. If you have any questions regarding your obligations under the Assurance, please do not hesitate to contact us.

Sincerely yours,



Paul Olk, PhD
Chair, Institutional Review Board
for the Protection of Human Subjects

Approval Period: 06/10/2013 through 06/09/2014

Review Type: EXPEDITED - NEW

Funding:

SPO:

Investigational New Drug :

Appendix B

IRB Approval Letter: Colorado Department of Education



COLORADO DEPARTMENT of EDUCATION

201 East Colfax Avenue • Denver, Colorado 80203-1759
303-856-5600 • www.cde.state.co.us

Robert K. Hammond
Commissioner of Education

Keith Owen, Ph.D.
Deputy Commissioner

Colorado Department of Education Institutional Review Board

Certification of Institutional Review Board Approval

September 26, 2013

Dan Jorgensen
2018 South Flanders Street
Aurora, Colorado 80013

Subject: IRB Review

Dear Mr. Jorgensen:

The CDE Institutional Review Board has completed review of your project, "Concurrent Enrollment Programs and Acquired Social Capital for Student from Impoverished Backgrounds: An Examination of High School and College Outcomes". The study has been approved based on the submitted proposal. The approval is effective for twelve months. If a continuation beyond that time is required for the completion of the project, please contact the Executive Director or the Accountability and Data Analysis office. The contact information of the principal investigator must be updated every twelve months for as long as the research continues. Any changes to the original application during a subsequent twelve month period must be documented and submitted to the IRB for further review.

The Institutional Review Board appreciates all the effort you put into your proposal. If you have any further question, please feel free to contact me.

Sincerely,

Jill Hawley
Associate Commissioner of Achievement and Strategy
Colorado Department of Education

cde Improving
Academic
Achievement

Appendix C

District FRL Participation in CE Programs by Year

CE Participation Rates by Local Education Agency & FRL Status (2010 & 2011)

LEA #	2010 Total CE	2010 FRL% (CE)	2010 FRL% (9th-12th)	2011 Total CE	2011 FRL% (CE)	2011 FRL% (9th-12th)	Btwn-Yr Ch. CE FRL %*
0140	139	10.8%	12.2%	250	90.4%	13.9%	+
0030	61	67.2%	72.8%	83	85.5%	77.3%	+
0130	940	17.6%	23.4%	1470	81.2%	23.0%	+
2810	19	78.9%	79.2%	10	80.0%	85.7%	+
2535	15	73.3%	82.0%	<10	--	82.2%	na
8001	<10	--	34.6%	124	74.2%	55.0%	na
0880	1182	74.4%	68.8%	1289	70.1%	69.9%	-
0120	48	27.1%	41.6%	40	70.0%	42.3%	+
0770	113	61.9%	65.6%	121	66.9%	66.2%	+
0010	147	60.5%	62.3%	174	63.8%	63.1%	+
2560	17	35.3%	58.0%	11	63.6%	52.9%	+
3140	31	38.7%	58.3%	21	61.9%	58.6%	+
2530	74	54.1%	71.4%	60	61.7%	75.1%	+
2670	35	60.0%	66.7%	34	58.8%	66.2%	-
0070	<10	--	73.7%	26	53.8%	77.9%	na
0100	123	58.5%	56.9%	114	53.5%	56.9%	-
0550	11	81.8%	61.4%	16	50.0%	60.5%	-
1160	--	--	60.0%	12	50.0%	53.4%	na
1600	11	9.1%	31.4%	<10	--	31.4%	na
1760	16	68.8%	73.7%	10	50.0%	63.2%	-
2740	14	71.4%	51.9%	20	50.0%	54.7%	-
0180	949	46.6%	58.4%	1191	47.5%	58.7%	+
0290	17	64.7%	66.2%	26	46.2%	72.8%	-
2520	155	51.6%	65.8%	112	44.6%	60.7%	-
3120	316	50.9%	49.4%	237	43.9%	50.3%	-
2690	<10	--	56.0%	355	43.7%	55.8%	na
2680	19	47.4%	50.0%	26	42.3%	50.0%	-
0310	31	51.6%	51.8%	41	41.5%	54.7%	-
2540	60	35.0%	41.2%	42	40.5%	42.5%	+
0250	36	41.7%	54.5%	30	40.0%	55.8%	-
2570	39	33.3%	32.8%	45	37.8%	39.3%	+
1510	--	--	61.3%	16	37.5%	61.9%	na

LEA #	2010 Total CE	2010 FRL% (CE)	2010 FRL% (9 th -12 th)	2011 Total CE	2011 FRL% (CE)	2011 FRL% (9 th -12 th)	Btwn-Yr Ch. CE FRL %*
1580	97	39.2%	53.6%	89	37.1%	51.9%	-
2515	--	--	57.6%	22	36.4%	46.9%	na
3220	--	--	42.4%	11	36.4%	48.4%	na
2650	16	37.5%	66.2%	25	36.0%	64.2%	-
2035	<10	--	51.3%	79	35.4%	44.6%	na
0480	<10	--	15.1%	17	35.3%	15.3%	na
1140	--	--	41.7%	223	35.0%	42.5%	na
1390	26	61.5%	71.5%	15	33.3%	69.2%	-
1850	23	30.4%	39.7%	24	33.3%	39.0%	+
2750	<10	--	39.5%	12	33.3%	39.1%	na
3080	32	12.5%	42.4%	<10	--	45.9%	na
2660	142	40.1%	58.8%	145	33.1%	51.0%	-
1560	217	22.6%	24.0%	208	32.7%	28.8%	+
1520	43	4.7%	20.7%	41	31.7%	23.6%	+
1400	31	35.5%	54.7%	19	31.6%	44.6%	-
2395	--	--	43.7%	62	30.6%	43.2%	na
1430	21	38.1%	32.8%	24	29.2%	35.0%	-
3200	50	16.0%	38.6%	45	28.9%	53.2%	+
1180	--	--	28.6%	21	28.6%	26.0%	na
1590	<10	--	38.6%	14	28.6%	30.4%	na
1860	29	24.1%	41.7%	14	28.6%	34.0%	+
2070	10	0.0%	40.9%	18	27.8%	52.3%	+
0870	31	29.0%	43.9%	249	27.7%	40.0%	-
3130	34	23.5%	38.0%	26	26.9%	32.7%	+
0123	41	70.7%	64.5%	19	26.3%	70.7%	-
0040	71	22.5%	24.9%	148	25.7%	27.0%	+
3090	83	26.5%	42.1%	91	24.2%	42.8%	-
2700	<10	--	29.2%	245	23.3%	34.2%	na
2620	30	23.3%	42.8%	31	22.6%	31.7%	-
2720	50	16.0%	24.6%	27	22.2%	22.1%	+
2840	17	52.9%	32.3%	9	22.2%	29.4%	-
2780	30	20.0%	26.9%	41	22.0%	32.2%	+
1420	155	9.7%	26.1%	1227	20.2%	28.4%	+
0260	13	53.8%	47.2%	<10	--	39.0%	Na

LEA #	2010 Total CE	2010 FRL% (CE)	2010 FRL% (9 th -12 th)	2011 Total CE	2011 FRL% (CE)	2011 FRL% (9 th -12 th)	Btwn-Yr Ch. CE FRL %*
2020	189	15.9%	32.7%	175	20.0%	33.7%	-
2760	<10	--	30.3%	10	20.0%	29.6%	na
2055	<10	--	25.1%	51	19.6%	33.0%	na
1550	350	19.1%	22.8%	471	19.5%	26.7%	+
0490	--	--	31.1%	52	19.2%	37.1%	na
1150	--	--	40.2%	26	19.2%	34.6%	na
1828	121	10.7%	38.5%	126	19.0%	37.9%	+
2180	--	--	46.0%	70	18.6%	42.7%	na
2600	<10	--	30.6%	11	18.2%	35.0%	na
2862	29	27.6%	10.4%	28	17.9%	8.6%	-
3110	28	32.1%	32.4%	28	17.9%	32.8%	-
1220	<10	--	49.9%	35	17.1%	43.1%	na
2710	69	8.7%	12.9%	91	16.5%	21.2%	+
2000	<10	--	37.5%	274	15.3%	36.8%	na
0470	111	9.9%	25.7%	192	15.1%	26.8%	+
0910	--	--	28.7%	240	14.6%	33.9%	na
0520	17	5.9%	23.0%	14	14.3%	47.2%	+
1195	--	--	30.6%	14	14.3%	39.5%	na
2630	26	23.1%	34.0%	22	13.6%	31.5%	-
1500	--	--	39.7%	37	13.5%	44.4%	na
2580	<10	--	30.0%	15	13.3%	29.8%	na
3085	14	14.3%	21.0%	15	13.3%	24.8%	-
0020	<10	--	23.4%	62	12.9%	24.2%	na
2590	15	20.0%	20.6%	32	12.5%	27.8%	-
0230	21	14.3%	32.7%	17	11.8%	28.0%	-
3030	36	27.8%	33.1%	27	11.1%	24.3%	-
3000	--	--	21.7%	99	10.1%	24.9%	na
2770	--	--	10.2%	43	9.3%	10.5%	na
2505	--	--	34.0%	12	8.3%	23.1%	na
2730	<10	--	48.2%	12	8.3%	54.4%	na
0900	1070	5.4%	9.9%	1572	5.5%	9.7%	+
1330	--	--	25.6%	12	0.0%	22.4%	na
1750	21	0.0%	12.9%	13	0.0%	12.8%	No change

Note. Districts are presented only if CE enrollment is ≥10 for either year. Green highlights indicate that the FRL participation in CE programs meets or exceeds the district FRL percentage (i.e. 9th-12th grades). *: reflects direction of change between years in %FRL of CE participants.