



AUGENBLICK,
PALAICH AND
ASSOCIATES

Colorado Concurrent Enrollment Return on Investment and Cost Model

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Abstract

Purpose of this study is to provide an estimate of concurrent enrollment (CE) costs and return on investment (ROI) in Colorado. This report is part of a larger U.S. Department of Education, Institute of Education Sciences (IES) funded grant to develop a college access and success research partnership (R305H170049). This study is of Colorado statewide CE programs created by House Bill 09-1319 and detailed in the CE Programs Act (C.R.S. §22-35-101 et seq.). The cost model describes a process creating a statewide estimate of CE economic costs using the ingredients method and flow of money to institutions of higher education (IHEs) to support CE. The financial returns model used the estimated impact of CE from a separate impact study to estimate the increases from CE participation in individual income, state and federal taxes, and the savings to some state and federal programs (Buckley, Pendergast, Klopfenstein, 2020). The cost model estimated the statewide economic cost of CE in 2016-17 was about \$32 million for districts and \$8 million for IHE. The IHE revenue that is explicitly targeted to pay for CE are Colorado Opportunity Fund payments estimated to be about \$17 million, \$36 million in tuition, and about \$1 million in payments from districts for instructional services. IHE's then paid IHE about \$26 million for instruction services by district personnel. The impact study estimated CE increased college matriculation and post-secondary completion for a sample of CE students. This sample was created to support a rigorous evaluation and had above average reading scores. The returns estimate for a similar group of 16,965 CE students would see an increase in post-secondary completers of 4,094 students. These completers generate a lifetime increase in income of \$2,890 million, state government taxes and savings of \$274 million, and federal taxes and savings of \$472 million. The lifetime ROI for the returns sample for Colorado (which made the CE investment) is over 600%. This indicates that CE is a good investment for Colorado.

Introduction

This return on investment (ROI) report is part of a larger U.S. Department of Education (ED), Institute of Education Sciences (IES) funded grant to develop a college access and success research partnership. The partnership is between Colorado Department of Higher Education (CDHE), University of Colorado Boulder, APA Consulting, Colorado Evaluation and Action Lab, and the National Center for Higher Education Management Systems (NCHEMS). The partnership had two main tasks: study the ROI from concurrent enrollment (CE) in Colorado and develop a research agenda to reduce equity gaps and support expanded access to higher education and degree or credential attainment. This report describes the financial ROI from CE.

The ROI study has three components:

- Analysis of the **impacts** of CE in terms of persistence and completion, conducted by CU Boulder.
- Estimates of the **financial** returns from CE by monetizing the impacts of CE and subtracting the cost to create an ROI, conducted by NCHEMS.
- Estimates of the **economic costs** of implementing CE and resources assigned to CE by the state, conducted by APA Consulting.

The impact study was conducted by Dr. Pamala Buckley, Dr. Philip Pendergast, and Dr Kristin Klopfenstein and is available at <https://coloradolab.org/concurrent-enrollment-and-labor/>. This document contains the results of the cost study and monetization of the impacts of CE to arrive at the ROI of CE.

There are several different models of CE in Colorado. This study focuses only on the statewide programs created by House Bill 09-1319 and detailed in the CE Programs Act (C.R.S. §22-35-101 et seq.). Generally, with CE courses, school districts pay the course tuition for students to the institution of higher education (IHE), which offers the course at the community college tuition rate. The IHE receives Colorado Opportunity Fund (COF) support from the state on a per course hour rate, as well as fee-for-service funding from the state. This study focuses on the COF funding that is directly tied to enrollment.

Other models of CE in Colorado, such as Accelerating Students through CE Program (ASCENT) and other high school dual enrollment programs, are administered directly by postsecondary institutions, often under continuing education, which does not fall under the statutory definition of CE.

Study Overview

The goal of this analysis was to conservatively estimate the CE ROI by focusing the monetization calculations on the study sample described in the impact study. This created the key challenge of aligning the units of analysis across all three of the study components: impact, monetization, and economic costs.

The impact study constructed a sample across high school graduating classes of 2011 through 2015, whose mean 9th grade reading assessments centered around the 59th percentile and were within 1.67 standard deviations of that score. The post-secondary completion sample focused on the high school graduating classes of 2011 and 2012 with four-year degree completion by 2016. The impact sample was very limited in size in an effort to create similar or balanced treatment and comparison groups. The impact study found that students within this achievement range that participated in CE were much more likely to receive post-secondary credentials than similar students that did not participate in CE. This methodology is reported in the technical report (Buckley, Pendergast & Klopfenstein, 2020).

The financial returns study identified a sample of 16,965 CE students with similar characteristics during the period of the impact study. The monetization study identified a statewide CE participation during this time and estimated that the impact of CE could be associated with an additional post-secondary enrollment after high school graduation of 4,241 students and an additional 4,094 students completing a post-secondary credential. The monetization component identified the added income, state, and federal taxes and reduced state and federal expenses as educational levels increased in 2016. This monetization was then applied to the 4,095 additional students predicted to complete post-secondary education college due to CE participation. The results, data sources, and methodology are described in the next section.

The economic cost study estimates and reports the statewide CE economic costs and resource flow associated with CE for all students participating in CE during the 2016-17 school year. The data sources and methodology are described after the financial returns section.

In the ROI section of this report, the per-student economic costs of CE were deflated to 2012 and then applied to the sample population of 16,965 students. The ROI analysis methodology is detailed in the final section of this report.

Financial Returns from CE

The ROI from CE takes on many forms. Relative to the costs of delivering these programs, there are returns to the state, to the individuals who participate in the programs, and to the institutions that deliver them. The following calculations for returns were applied as part of this project.

Returns to the state:

- Tax revenue as a result of increased income generated by the increased likelihood of college graduation of program dual enrollment participants – income, sales, and property taxes.
- Savings on Medicaid and corrections.

Returns to the individual:¹

- Increased annual and lifetime earnings as a result of increased likelihood of college completion.

The financial returns study did not identify the tuition and fees savings to students because of credits earned in high school.

Sample, data and methods for the financial returns calculation

The returns estimate begins with the results of the impact study. These results are reproduced in Table 1 below.

¹ Savings on tuition and fees are not included in this report.

Table 1: Impact Study Postsecondary Matriculation, Persistence, and Completion Results

Research Question	Treatment	Control	Odds Ratio
Access - matriculated within 1 year of expected HS graduation date	77%	52%	3.12***
Success: For those who matriculated within 1 year of expected HS graduation date:			
a. persisted from Y1 to Y2	82%	77%	1.30***
b. completed “any” credential (or higher degree)	57%	38%	2.11***
c. completed at least a 2-year degree in 2 years	2.5%	0.6%	4.43***
d. completed a 4-year degree (or higher) in 4 years	17.3%	11%	1.69***
e. completed a 4-year degree (or higher) in 3 years	0.9%	0.2%	3.99***

Bonferroni-adjusted Significance Levels: * $p < .015$; ** $p < .0025$; *** $p < .00025$

Note: Odds Ratio (OR) quantifies the difference in outcomes between conditions (OR > 1 = greater odds).

Note: Marginal effects represent the predicted probability of the postsecondary access or success outcomes for treatment and control separately while holding other covariates (student-level free and reduced lunch status, minority status, English language learner status, and 9th grade reading achievement, as well as cohort and urbanicity) constant at their means.

The impact study focused on a segment of the total population of students enrolled in CE to allow for construction of balanced or similar treatment and control samples. These balanced samples are needed to identify the impact of CE. This study population is not representative of the entire Colorado population. For that reason, this analysis provides a return estimate for students in the study and a return estimate per student that has additional education as a result of participation in CE.

The returns are calculated for a group of 16,965 students similar to the control students in the quantitative impact study. The returns are not calculated for all students in the state. This population matches the impact sample who attended the set of control schools that were considered “concurrent-enrollment poor” compared to the concurrent-rich schools attended by the treatment sample. Treatment and control samples were matched using propensity score matching based on income, 9th grade achievement, and college-going rates, with schools exactly matched on urbanicity, resulting in 86 control schools.

From the matched control schools, a subset of students was identified that mirrored those who benefitted significantly from CE in the treatment group. This resulted in a study sample of students with 9th grade reading scores centered at the 59th percentile and all within 1.67 standard deviations of that score. A state sample of 70,879 students was identified as similar to the treatment sample. Results of the quantitative study show that 24% of students in the treatment group actually took CE, so this percentage was applied to the 70,879 students, resulting in a study population of 16,965 students.

The returns calculation then applies the change in completion rates to the study population of 16,965 students. As shown in Table 2, the increase in graduation rates results in an estimated additional 4,241 students enrolled in college—if these students had participated in CE, as seen in Table 2. CE participation would also have resulted in an additional 4,094 credentials, including certificates, associate’s, or bachelor’s degrees.

Table 2: Postsecondary Matriculation and Completion Expected

Group	Population Total	Matriculation Rates	Enrollees	Additional Enrollees	Completion Rate	Completions	Additional Degrees
Without CE	16,965	52%	8,822		38%	3,352	
With CE	16,965	77%	13,063	<u>4,241</u>	57%	7,446	<u>4,094</u>

This change in degrees is then applied to changes in income, tax rates, and governmental costs to calculate the returns from CE for this population and an individual that participated in CE. The sources of these changes are listed below in Table 3.

Table 3. ROI Measures and Data Sources

Measures	Calculations	Sources
Personal Income	Annual wage earnings by level of education (difference in wages from high school diploma and less, and certificates, associates and bachelor's degrees) multiplied by the additional number of college degree-holders generated in the model.	U.S. Census Bureau, 2016 American Community Survey (Public Use Microdata Sample)
State Income Tax Revenues	Average state income tax liability (after credits) per resident by level of education attained – difference between those with college degrees and those without (applied to the additional numbers of college degree-holders generated).	2014-16 Current Population Surveys - Public Use Microdata Samples (downloaded from IPUMS)
State Sales Tax Revenues	(Total general sales tax generated as a percent of total personal income) * the additional income generated in the model.	U.S. Census Bureau, State Government Tax Collections Summary Report: 2016
State Property Tax Revenues	Average property income tax liability (after credits) per resident by level of education attained – difference between those with college degrees and those without (applied to the additional numbers of college degree-holders generated).	2014-16 Current Population Surveys - Public Use Microdata Samples (downloaded from IPUMS)
State Medicaid Savings	Percent of 25- to 64-year-olds covered by Medicaid (and the mean person market value of those covered) by level of education attained – difference between those with college degrees and those without (applied to the additional numbers of college degree-holders generated).	2014-16 Current Population Surveys - Public Use Microdata Samples (downloaded from IPUMS)
Corrections Savings	((Probability of incarceration among college-degree holders minus probability of incarceration among adults with high school diplomas and less) * additional college degree-holders generated by the model) * state prison expenditures per prisoner. Note: The U.S. educational attainment rates for prisoners was applied to all states.	Bureau of Justice Statistics, Justice Expenditure and Employment Extracts, 2015; Prisoners in 2015.

Measures	Calculations	Sources
Federal Income Tax Revenues	Average federal income tax liability (after credits) per resident by level of education attained – difference between those with college degrees and those without (applied to the additional numbers of college degree-holders generated).	2014-16 Current Population Surveys - Public Use Microdata Samples (downloaded from IPUMS)
Federal Medicare Savings	Percent of 25- to 64-year-olds covered by Medicare (and the mean person market value of those covered) by level of education attained – difference between those with college degrees and those without (applied to the additional numbers of college degree-holders generated).	2014-16 Current Population Surveys - Public Use Microdata Samples (downloaded from IPUMS)
Welfare Savings	Percent of 25- to 64-year-olds receiving welfare (and the average welfare income of those covered) by level of education attained – difference between those with college degrees and those without (applied to the additional numbers of college degree-holders generated).	2014-16 Current Population Surveys - Public Use Microdata Samples (downloaded from IPUMS)
Food Stamp Savings	Percent of 25- to 64-year-olds receiving food stamps (and the mean person market value of those covered) by level of education attained – difference between those with college degrees and those without (applied to the additional numbers of college degree-holders generated).	2014-16 Current Population Surveys - Public Use Microdata Samples (downloaded from IPUMS)
Disability Savings	Percent of 25- to 64-year-olds receiving disability (and the average disability income of those covered) by level of education attained – difference between those with college degrees and those without (applied to the additional numbers of college degree-holders generated).	2014-16 Current Population Surveys - Public Use Microdata Samples (downloaded from IPUMS)

The next section applies the changes in income, tax revenue, and government expenses identified with these sources to the study sample.

Returns from CE

The returns analysis applies the increase in estimated increase in post-secondary completion times and the income changes associated with increases in education levels from high school degrees to having a post-secondary certificate or degree. At the individual level, having an undergraduate credential results in an annual income about \$18,000 greater than having only a high school diploma. For the individual, this would mean an additional \$706,000 over the course of their 40-year working lifetime. If the 4,094 individuals in the population who otherwise would not have received a degree had participated in CE, this would result in an additional \$72 million total in personal income annually, or \$2.9 billion over the course of their working lifetimes (40 years). Exact breakdowns of the expected revenues and savings can be found in Table 4.

Table 4: Returns at the Individual, State, and Federal Level, 2014-16 Dollars

Time	Group Size	Additional Personal Income
Annual	1 (Individual)	\$18,000
Lifetime	1 (Individual)	\$706,000
Annually	4,094 (Study sample)	\$72,249,000
Lifetime	4,094 (Study sample)	\$2,889,997,000

The next four tables provide detail on how increased educational levels due to CE is expected to impact state and federal revenues and expenses. Table 5 shows the changes in state revenue and expenses for an individual whose post-secondary degree completion has been increased by participation in CE. The improved educational outcomes are expected to result in increases in state tax revenues (income, sales, and property taxes) while also reducing Medicaid and corrections costs. This is based on the difference in the average 2016 values for the population age 25-64 with an undergraduate degree or certificate and those with only a high school diploma. Assuming each of these individuals stays at the same level of education, the state can expect an additional \$67,000 in revenue and savings over the course of their working life.

Table 5: Additional State Revenues and Savings for an Individual with More Post-Secondary Education Due to CE, 2014-16 Dollars

Time	State Income Tax Revenues	Sales Tax Revenues	Property Tax Revenues	Medicaid Savings	Corrections Savings	Total State Revenues & Savings
Annually	\$664	\$173	\$145	\$501	\$190	\$1,673
Lifetime	\$26,566	\$6,923	\$5,794	\$20,053	\$7,600	\$66,936

Table 6 shows the impact on state revenue and expenses from the impact of CE on the CE sample. Note these are shown in thousands of dollars. The state can expect an extra \$6.9 million annually and \$274 million over the lifetime in revenues generated and cost savings, including income tax, sales tax, property tax, Medicaid savings, and corrections savings.

Table 6: Additional State Revenues and Savings Due to CE for Study Sample, 2014-16 Dollars (in Thousands of Dollars)

Time	State Income Tax Revenues	Sales Tax Revenues	Property Tax Revenues	Medicaid Savings	Corrections Savings	Total State Revenues & Savings
Annually	\$2,719	\$709	\$593	\$2,052	\$778	\$6,851
Lifetime	\$108,759	\$28,345	\$23,719	\$82,097	\$31,115	\$274,035

Just as revenue and savings increase for the state government from CE they are also expected to increase for the federal level. Additional revenues and savings will be generated at the federal level based on federal income tax, as well as savings on Medicare, welfare, food stamps, and disability. The

savings for an individual that completed a post-secondary degree due to participation in CE is shown in Table 7.

Table 7: Additional Federal Revenues and Savings for an Individual with More Post-Secondary Education Due to CE, 2014-16 Dollars

	Federal Income Tax Revenues	Medicare Savings	Welfare Savings	Food Stamp Savings	Disability Savings	Total Revenue & Savings
Annually	\$2,351	\$233	\$41	\$231	\$30	\$2,885
Lifetime	\$94,025	\$9,315	\$1,649	\$9,240	\$1,184	\$115,413

Table 8 shows savings and revenue at the federal level for the study sample. Again, these are shown in thousands of dollars. The federal government should expect about \$12 million in revenue and savings annually and about \$470 million over the lifetime of sample members.

Table 8: Additional Federal Revenues and Savings Due to CE for Study Sample, 2014-16 Dollars (in Thousands of Dollars)

	Federal Income Tax Revenues	Medicare Savings	Welfare Savings	Food Stamp Savings	Disability Savings	Total Revenue & Savings
Annually	\$9,623	\$953	\$169	\$946	\$121	\$11,812
Lifetime	\$384,939	\$38,138	\$6,749	\$37,827	\$4,846	\$472,499

In total, the government return expected from CE participation for an individual of \$4,600 annually and \$182,000 over each person’s lifetime. For the total study sample the change in revenue and savings is \$18.6 million annually, or \$747 million over a 40-year period as shown in Table 9.

Table 9: Total returns at the Federal and State Level from CE Exposure, 2014-16 Dollars

Time	Group Size	Total Revenue & Savings
Annual	1 (Individual)	\$4,600
Lifetime	1 (Individual)	\$182,000
Annually	4,094 (Study sample)	\$18,663,000
Lifetime	4,094 (Study sample)	\$746,534,000

Economic Cost Study

The cost study examined two elements of CE finance:

- The **economic costs** to implement CE.
- The **funds** that flow between institutions to pay for CE.

The **economic costs** model describes the resources used to conduct the CE activities. The cost model uses the economic definition of costs, which focuses on opportunity costs, or the value that is sacrificed by using a particular resource for an activity rather than its best alternative use (Chambers 1999; Levin and McEwan 2002; Levin & Belfield, 2013).

The **funds model** describes the money that flows to and between school districts and institutions of higher education to support CE: COF payments, tuition payments, payments to districts from IHEs to conduct courses at the district, and payments to IHEs to provide instructors for courses. The **funds model** may describe new resources needed to implement a program or reallocation of existing resources to support a program. It does not capture funds paid by families for items such as fees or books.

Cost study data sources

The cost study used the following sources of data to estimate and validate various parameters in the analysis:

- Case studies of concurrent activities in four districts and three IHEs.
- CDHE data, including student-level data on course taking and COF payments.
- Review of the cooperative agreements between districts and IHEs.
- Budget books for IHEs.
- Colorado Department of Education (CDE) average salary data by district and region.
- National estimates of average costs for books and classroom space.
- Program descriptions provided by IHEs and districts through an online form.

Case studies were conducted in four Colorado school districts and three IHEs. The case studies were used to describe the two main activities associated with implementing CE, the tasks associated with each activity, the ingredients associated with each task, initial estimates of the amounts of each ingredient associated with each task, and initial costs for those ingredients. Prior to the final analysis, case study participants reviewed key components of the model through structured phone interviews.

CDHE provided two primary sources of data. First it provided student-level data on course taking. Data had a record for each student-course combination. Each record described a course taken by a student: the year, term, institution, course prefix, course number, course credit hours attempted and awarded, high school attended, and district where the high school is located. The data on high school and district is incomplete. The course data is aggregated at the term, school, and course level. This provided a count of the number of students at each school that took each course. This was used to estimate the number of classes or sections offered by IHE and the school. This data provided a link between classes offered, and the IHE and District were used to identify prices at those institutions, such as teacher or instructor salaries. CDHE also provided enrollment data by grade level, which was used to estimate the total CE courses taking during high school.

CDHE also provided data on COF payment amounts that were used to describe the flow of COF funds in the resource model.

Review of the Cooperative Agreements provided by CDE provided information on the amounts of money that flow between institutions for the resource model.

Budget books for IHEs were used to identify average salaries for instructors and administrators at the IHE level for the cost model. These books are annual reports by IHE to CDHE and the Colorado legislature.

CDE average salary by district was used to identify the average salary for instructors and administrator at the school level

National estimates were used to describe the costs of some ingredients, including books and classroom space.

Program descriptions provided through an online district and IHE questionnaires were used in the estimates of the amounts of ingredients used in the model. Thirty-two districts described their relationships with 66 IHEs. The IHEs described their relationship with 75 districts, with some districts having relationships with multiple IHEs.

Cost model methods

The model is built in a spreadsheet using data from CDHE on student-courses. This data includes the IHE and courses students took, as well as the district and high school the students attended. There is significant missing data regarding the high schools that students attended, statewide average prices were used for these students and course. The primary unit of the analysis is a student taking a course (student-course). Student-courses, and the costs associated with each, are summed at the school/IHE level and aggregated to the state level.

The model is based on a set of parameters that describe the number or amount of tasks (e.g. number of English 122 students and classes offered at Wray High school), amounts of an ingredient involved in a task (e.g. proportion of a teacher's time spent on teaching one class), and the price of an ingredient (e.g. salary of an administrator conducting CE academic affairs at an IHE). The process of estimating the parameters has three steps. First, initial parameter estimates are based on data from the case studies. These estimates are compared to information provided in the program descriptions. Finally, the parameters are reviewed with experts from CDHE, CDE and Colorado's CE Advisory Council.

Activities and tasks

The uses model begins with a process model that describes the activities that occur when CE is implemented. At the highest level, the CE cost model has two activities:

- Administration of CE programs.
- Student CE course taking.

The case studies were used to describe the tasks associated with each activity with additional supplemental data from the program descriptions.

The primary task for student course taking is the provision of classes. Student course taking occurs in classes offered at high schools, classes offered at IHEs, or in online classes. Different modes of classes: online at the high school and at the IHE have different costs and resources flows. Online classes have a different tuition rate but are assumed to have similar staffing as IHE-based courses. The costs model and resource model include estimates of the proportion of classes that are taken at each location. Classes at high schools are usually taught by high school teachers that have been approved by IHEs to teach a course. But in some instances, the IHE will provide an instructor to teach a course at a district. The cost model estimates the proportion of courses taught at high schools by IHE instructors.

Courses can be offered at the high school, at the IHE, or online. Course offered at the high school are usually taught by the regular teachers from the high school. These teachers are appointed by the IHE to their faculty and must meet IHE qualification standards, the curriculum used in the course is reviewed by the IHE, and the IHE may provide this teacher with support/oversight through observations and orientations. Most IHEs reimburse districts at a rate of 105% of tuition to pay for instructor costs. A key challenge for districts that want to offer CE courses at the high school is finding enough teachers that meet IHE qualification standards. Online courses are assumed to have the same instructional costs as

other courses. Data collected from IHEs and districts indicates that about 65% of CE courses are offered at the high school, 30% are at the IHE, and 5% are online.

Regular education courses are those traditional general education classes that include English, mathematics, history, and science courses. These courses generally have no or low course fees except for lab fees for science courses. Career and Technical Education (CTE) courses include cosmetology, criminal justice, or emergency medical services. These courses often have additional fees for course materials. These fees are paid by families or the district. The model does not have complete information on CTE courses and fees. The model does not include a full count of all CTE courses included in the base CDHE data, and whether families or districts pay the fees. The average CTE fee is assumed to average \$45 for all courses.

Case studies showed that high schools often substitute CE courses, particularly regular education courses, for existing high school courses, which means offering CE often does not require additional resources or increase total instructional costs for districts. CE courses taken at a college, particularly general education courses, increase the overall number of students and courses offered at a college campus, with may result in the use of additional resources and an increase in total instructional costs at an IHE.

The administration task begins with counseling of students on participation in CE and ends with exchanging grades and billing between the district and IHE after the course has been completed. Administration occurs at both IHEs and districts. Administration includes both academic affairs and enrollment management. Academic affairs includes coordination between institutions, setting up courses, hiring instructors/teachers/professors, approving course syllabi, supervising instructors, and administrating the flow of resources between IHEs and districts. Enrollment management includes counseling students, identifying whether students are qualified for courses, enrolling students in an IHE, registering for courses, and ensuring transcript information flows between institutions. Table 10 shows the sub-tasks associated with CE administration and provide detail on the work accomplished in these sub-tasks.

Table 10: Tasks and Sub-Tasks Associated with CE Administration

Sub-Task	Sub-Tasks Detail
Academic Affairs	Professional for coordination between institutions
	Instructor/teacher hiring, supervision and review of syllabi
	Classified staff to support academic affairs
Enrollment Management	Student Support Time (e.g. counselors)
	Assessment time to verify that students are eligible for CE
	Registrar time
	IT Time, transfer of information between institutions.
	Other professional FTE
Classified staff to support enrollment management	

These administrative costs are new expenses or costs that are associated with offering CE that occur at both the district and IHE. These costs would not have occurred if CE had not existed. Using data from case studies, the costs of administration are preliminarily estimated to be \$25 per student/course at the IHE and \$91 per student/course at the district and school.

Ingredients and prices

The costs of an activity are calculated by identifying:

- Ingredients of the activity.
- Amount of ingredients used.
- Costs or price for those ingredients.

The primary ingredient in all CE activities is the time of professionals, such as teachers, counselors, and administrators. The time used by these professionals to conduct CE activities is the amount of this primary ingredient.

The case studies identified estimates of the amount of time spent by each of the people on their tasks. This time was converted to a proportion of a person's work year or FTE. This FTE was multiplied by an estimate of the salary and benefits for each person (i.e. price). Salary estimates were provided through case study interviews and the supplemented by state sources. District personnel prices came from CDE average salary data for teachers (counselors are assumed to be paid similar salaries to teachers) and administrators. Estimates of classified staff salaries came from the Indeed.com estimate of average para-professional salary in Colorado. IHE salary estimates were extracted from IHE Budget Book data on average salaries for administrators, students support professionals, and classified staff. The costs for Academic affairs and enrollment management were summed at each institution in the case study and then divided by the total number of student/courses at those institutions to arrive at an estimate of the administrative costs per student course for IHEs and districts.

The case study administrative costs were then supplemented by data from program descriptions, including overall budgets for CE and activities paid for by those budgets. Case studies and program descriptions indicate that the amount of time per student for administration were higher in rural locations. This suggests a lack of economies of scale in conducting the administrative activities. The final administrative cost per student/course was triangulated between the case study estimate and program description cost estimate.

CE courses can have additional ingredients in the form of books and course material fees. Course fees and books are paid in some cases by districts and in some cases by families. The cost model described here does not fully describe the costs of books and fees. It does not provide a firm estimate of the proportion of book and fee costs are paid by parents or by schools. IHEs generally do not charge other fees for CE. Book costs are assumed to be paid by districts for courses that are offered at the school, and by families if courses are offered at the IHE or online. Books and fee costs are assumed to produce no net revenue for IHEs.

Additional assumptions

This model does not include all costs that are important to acknowledge but are not expected to significantly impact the final costs estimates. Costs to districts and IHEs that are not included are:

- Additional incentives or training for teacher or instructors to participate in CE.
- Technology (such as computers and internet).
- Office supplies.
- Instructor material.
- Cost of assessments, such as Accuplacer, to identify whether students are qualified for CE.

The model does not include some costs to families including:

- Transportation costs.

- Cost or value of student time.

The student time and transportation costs can be significant but do not consume or use public resources.

Description of CE Implementation

The cost study case studies describe CE implementation at IHEs and school districts for the 2016-17 school year.

During the 2016-17 school year there were 80,273 student-courses. A student-course is a count of the number of times that students enrolled in CE courses. Students can be enrolled in multiple courses. Of these student-courses: 92% were at 2-year IHEs and 8% were at 4-year IHEs.

Using data from the case studies and program descriptions, it was estimated that 70% of student-courses were provided at high schools, 24% were provided at IHEs, and 6% were provided online.

The state is paying for a student twice: per-pupil funding to districts then COF to IHEs for the same students. This analysis suggests it is enough to cover additional CE costs at the IHEs. If it were an underpayment, the state wouldn't see the growth in CE that is occurring.

Cost Model Results

The cost model estimated statewide economic costs and costs per student during both their junior and senior years. As discussed earlier, economic costs are the amount of resources invested in an activity, not the budgeted or accounting costs. The ingredients method was developed with the support of I of the US Department of Education to measure economic costs. It requires identifying the “ingredients” needed for a given intervention, determining the quantity of each ingredient that is required, and applying a price to that quantity to come up with an estimated average cost. Unlike an accounting approach, the ingredients method considers all resources associated with program implementation. In addition, the ingredients method also includes opportunity costs, or costs which may not require an expenditure of funds but still represent a tradeoff or sacrifice in the use of certain resources. Budgeting and accounting data are created to support accountability to elected leaders and the public on the uses of funds. Economic costs Student-level data is used later in this report to align the costs and returns analysis.

The cost model calculations for the 2016-17 school year are shown in Table 11. The right column shows that costs for IHEs is less than \$10 million. Since CE is adding to the overall enrollment at IHEs, the costs of CE are new costs for IHEs requiring new resources. The school costs come from serving existing students, often with existing staff teaching courses similar to what would be taught if CE were not in place. That means the instructional costs in districts are mostly existing resources that have been re-allocated to teach CE courses. As discussed above, most of the administrative costs are new for both IHE and districts. The the \$401,000 for books and fees for courses at the IHE level are paid by either districts or families.

Table 11: Total Estimated CE Cost: 2016-17 (in Thousands)

	Administrative Costs	Books & Fees	Teacher/ Instructor Salary	Space/ Facilities	Total Economic Cost
District	\$7,298	\$969	\$21,790	\$2,236	\$32,293
IHE	\$1,995	\$401	\$5,144	\$743	\$8,284
Total	\$9,293	\$969	\$26,934	\$2,979	\$40,577

Table 12 uses the same cost data in Table 11, but at the per-graduate level, using 4.36 courses as the average number of courses per graduate. The per-student costs are estimated using the observed course-taking of 92% at 2-year IHEs and 8% at 4-year IHEs, as well as the estimated provision of 70% of student-courses at high schools, 24% were at IHEs, and 6% were online. Note that because of differences in instructional and facilities costs between on-line and in-person students, the total is not the sum of all columns., The total cost per student is estimated to be about \$2,200 per graduate.

Table 12: Estimated per Graduate CE costs: 2016-17

	Administrative Costs	Books & Fees	Teacher Salary	Space/ Facilities (no on-line costs)	Total Economic Cost ⁸
District	\$ 397	\$ 53	\$ 1,685	\$ 173	\$ 1,755
IHE	\$ 108	\$ 22	\$ 942	\$ 170	\$ 469
Total	\$ 505	\$ 74	\$ 1,464	\$ 172	\$ 2,224

*total does not sum because of different costs for on-line and in-person students

Table 13 shows the flow of resources into IHEs associated with CE. It shows that IHEs received just under \$17 million from the state in the form of COF payments and an additional \$36 million from districts in the form of tuition, plus \$1.2 million to reimburse them for providing instructors to teach courses at the schools. IHEs sent about \$26 million to districts to reimburse them for courses taught by teachers at the school. Note that the net amount that IHEs receive is just under \$28 million is over the estimated \$10 million operating cost of providing CE in the estimate shown in Table 2. This indicates that for IHEs, CE is probably a net positive source of revenue. This does not mean it is a net positive for each individual institution.

Table 13: Sources of Resources for IHEs to Provide CE: 2016-17

COF	Tuition from Districts	District Reimbursement for Instructor	Reimburse Districts for Courses	Net
\$16,951,050	\$36,214,453	\$1,223,200	\$(26,011,028)	\$28,377,675

Districts (and some families) send about \$37 million to IHEs in the form of tuition and reimbursement for instructors from IHEs that come to schools to teach courses. Districts receive back from IHEs about \$26 million in reimbursement for teaching courses using existing staff.

ROI

The data that has been presented allows for a straightforward calculation of the ROI for a CE student. It is important to reiterate that the return or impact has been identified for a small sample of Colorado CE students: it is focused on those similar to students in the control sample which generally were within 1.67 standard deviations of the 59th percentile for 9th grade reading.

The results shown are the sample of students who benefited from increased education based on participation in CE. The key piece of information not presented earlier is the costs per graduate deflated to 2012 prices using the Consumer Price Index (CPI) for district costs and the Higher Education Cost Adjustment (HECA) for the IHE costs (State Higher Education Executive Officers Association, 2018). Graduates are assumed to take 4.36 courses per year based on information provided by CDHE. Table 13 shows the estimated total economic investment of about \$36 million for participation in CE for the sample population of students in the study in 2012-13.

Table 13: Economic Cost of CE in 2012 Dollars

Number of Participants	Individual HS Graduate Economic Cost	Cost Total Economic Cost of CE
16,965	\$2,130	\$36,136,000

Of the population that participated in CE, it was estimated that participation in CE would increase postsecondary degree completion for 4,094 students. This increased degree completion is expected to increase income for the students. At the same time, governmental revenue and savings will also increase as shown in Table 14.

Table 14: Total Additional Revenue and Savings Due to CE for Study Sample, 2014-16 Dollars

	Additional Income	Additional State Revenue and Savings	Additional Federal Revenue and Savings	Total Additional Revenue and Savings
Annual	\$72,249,000	\$6,851,000	\$11,812,000	18,663,000
Lifetime	2,889,997,000	\$274,035,000	\$472,499,000	746,534,000

The ROI for each level of government and the total ROI are shown in Table 15. Because the annual increase in governmental revenue of about \$18.6 million is less than the investment in CE of about \$36.1 million, the total annual ROI is negative.

Table 15: Return on Investment from CE in Colorado.

	State ROI	Federal ROI	Total ROI
Annual	-81%	-67%	-48%
Lifetime	658%	1208%	1966%

However, over the lifetime the return in governmental revenue and savings of about \$750 million is over 19 times the investment in CE. This is a ROI over the lifetime of a CE participant of over 600% for states that make the investment, close to 1,200% for the federal government, and a total return of over 1,900% for both levels of government.

Conclusions

This analysis demonstrates the application of useful analytical tools to describe CE. The financial impacts analysis describes the key data sources needed to describe the impacts of increased educational attainment on an individual's financial well-being, as well as state and federal revenues and expenditures.

The cost model describes a process for estimating CE economic costs using the ingredients method. The process of developing the model created descriptions of the activities and tasks associated with CE implementation. The case studies used to provide detail on the implementation of CE.

Finally, this analysis indicates that CE is a good investment for Colorado. The CE ROI estimate provided here suggests that investment in CE by Colorado yields a return of over 600% over the working lifetime of a high school graduate. This indicates that CE is a good investment for states. This estimate does not apply to all students that engage in CE. Instead it applies to a sample of students with a wide range of abilities (as measured with reading assessments) with an average reading achievement is slightly above normal. This sample was created to support a rigorous impact analysis.

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