
EDUCATION

# Evaluation of the Creating College and Career Readiness Initiative in Kentucky

Andrea Phillips, John F. Pane, Andy Bogart

For more information on this publication, visit www.rand.org/t/RR2745

Published by the RAND Corporation, Santa Monica, Calif.

# Preface

This report presents findings from the evaluation of an Investments in Innovation Development grant awarded to the Kentucky Valley Educational Cooperative. From the 2013–2014 school year to the 2016–2017 school year, the Kentucky Valley Educational and Green River Regional Educational Cooperatives partnered to implement the Creating College and Career Readiness in Kentucky initiative. The initiative invited schools to use a suite of personalized software from WIN Learning that had not yet been used in the kindergarten–12th grade setting. Findings from the quasi-experimental study address implementation of the initiative and the effects on student outcomes.

This study was undertaken by RAND Education, a unit of the RAND Corporation that conducts research on prekindergarten, kindergarten–12th grade, and higher education issues, such as assessment and accountability, choice-based and standards-based school reform, vocational training, and the value of arts education and policy in sustaining and promoting well-rounded communities. This study was sponsored by The Kentucky Valley Educational Cooperative. This report should be of interest to software developers and educators interested in adopting and implementing educational technology in K–12 schools.

More information about RAND can be found at www.rand.org. Questions about this report should be directed to Andrea Phillips at aphillip@rand.org, and questions about RAND Education should be directed to education@rand.org.

# Contents

# Figures

# Tables

# Summary

The Kentucky Valley Educational Cooperative and Green River Regional Educational Cooperative received an Investing in Innovation (i3) development grant from the U.S. Department of Education to implement the Creating College and Career Readiness (C3R) initiative. The initiative offered a suite of software developed by WIN Learning (WIN) to support college and career readiness (CCR) among students in grades 8 through 12. The software suite was originally created for adults in workforce development programs, and, in 2011, C3R was the first implementation of the suite in the kindergarten–12th grade context. The Kentucky Valley Educational Cooperative engaged RAND researchers to conduct an evaluation of C3R.

One hundred twenty-seven schools, including technical schools and area technical centers, implemented the C3R initiative with students in grades 8 to 12 from the 2013–2014 to 2016–2017 school years. Each year of C3R, more than 30,000 students were eligible to participate in the initiative. RAND researchers conducted an evaluation of C3R using a quasi-experimental matched comparison group design. The evaluation consisted of implementation and impact studies that relied on a variety of data sources. The implementation evaluation focused on how schools planned to use the suite of C3R software, how many students participated in the initiative, levels of participation, and factors that enabled or hindered implementation. The impact evaluation assessed the extent to which the C3R initiative was associated with improvement in student achievement, drop-out rates, and graduation rates, as well as its association with successful postsecondary transition.

The initiative involved the implementation of three software applications that aimed to prepare students for life after high school. The Career Readiness Courseware (CRC) software provided students with mastery-based instruction in English language arts and mathematics. SoftSkills offered mastery-based instruction in the social skills considered essential to succeed in the workforce. The third application, MyStrategic Compass, provided personalized counseling on postsecondary training and career planning for students. The content of each software application addressed specific aspects of the Kentucky Department of Education accountability system for students and schools (e.g., mathematics proficiency; transition after high school).

All students in grades 8 through 12 in the participating schools are intended to use the three WIN software applications and participate in C3R annually. Yet significantly fewer students logged into the software than intended. Across the four years of the initiative, fewer than 20 percent of students eligible to participate logged in to the CRC software. No more than 10 percent of students logged any time in SoftSkills, and roughly 1 percent of students used MyStrategic Compass. Fewer than 5 percent of students in participating schools used each software application in a year. Although the C3R initiative intended for all students to participate, an analysis of implementation plans revealed that schools planned for a small subset

of students to use each of the software applications. Schools' plans for implementation were notably different from those of the software developer.

WIN also established usage and mastery levels that students needed to meet or exceed to achieve measurable gains in the state accountability system. Among the students who used the software, very few students participated in an individual application at the prescribed levels. Roughly 2 percent of students who logged any time in the CRC software reached the recommended usage level, while approximately 20 percent of students who engaged with SoftSkills achieved fidelity. Very few students met the MyStrategic Compass usage levels. No students participated in the overall C3R initiative at the prescribed levels, which required meeting fidelity for each software application. Within the context of all students eligible to participate in C3R, the percentage of students who met or achieved fidelity for each software application and the overall initiative was zero.

There were no discernable effects of C3R on student outcomes. Given the small fractions of students who were exposed to the C3R component software applications, this was not surprising. Even if the software improved outcomes for the students who actively participated, the use of school-level measures in the impact study meant that differences were hard to detect.

Technical issues with C3R were identified as the primary barrier to implementing the initiative as designed. The single-access portal developed at the request of schools presented widespread challenges. During the first two years of the initiative, students often could not log in to the portal or lost connectivity while using the software applications. Schools frequently experienced both of these technical issues. Unreliable software created frustrations for teachers and students, and poor reliability resulted in teachers allocating little to no time for C3R, even though educators thought of it as high quality. Interview participants perceived that technical issues had improved, as did implementation support from WIN during the third and fourth years. Although there were challenges in implementing the initiative, educators and cooperative staff remained supportive of the initiative at the end of the four years of C3R. Educators perceived that C3R and its components could support students' readiness for life after high school if implemented well.

This study offered useful insights about planning and implementation to school-based personal and program developers interested in using educational technology in schools. Considerations for future implementations included approaching adoption of software applications in a new context as a partnership; clearly communicating how educational technology supports goals to garner buy-in for implementation; establishing implementation goals that reflect the perspectives of software developers and educators; developing tools and resources to support implementation planning; convening meetings to discuss implementation execution; and conducting robust assessments of technical capabilities and infrastructure prior to widespread usage. Attention to lessons learned from the C3R initiative could make it easier for software developers and schools to successfully implement educational technology interventions.

# Acknowledgments

Many people from the Kentucky educational cooperatives supported this study and the production of this report. We would like to thank Jeffrey Hawkins, Dessie Bowling, and Angie Duff, who led this work at the Kentucky Valley Educational Cooperative. George Wilson, Stacey Owen, Andrea Curtis, and Mike Hughes from the Green River Regional Educational Cooperative provided leadership; we are grateful for their partnership. This work would not be possible without the participation of districts and schools from the Kentucky Valley Educational Cooperative and Green River Regional Educational Cooperative. We are grateful for their partnership and collegiality throughout the project.

WIN Learning staff also partnered on this study. Teresa Chasteen, Steve Fain, Nicole Stanley, Suzanne Bazarian, and Tom Mills provided the support and data necessary for this evaluation. We would also like to recognize the contributions of former WIN Learning staff, including Joseph Goins, Kristen Freude, Dan Pelletier, Greg Greiwe, Anita Sprayberry, Barbara Thomas, Joan Mason, and the many others at the organization that contributed to data requests over the years.

Several RAND Corporation colleagues contributed to the data analyses and therefore to this report. Kun Yuan, Courtney Kase, Emma Lee, and Lindsey Thompson contributed to various aspects of data analyses. Matt Cefalu served as a statistical consultant on this project. Melanie Rote also contributed to the project and this report.

Cathy Stasz provided valuable assistance over the life of the project. She oversaw the quality assurance of this document and production process. Our peer reviewers, Catherine Augustine and Jenny Scala, provided insightful feedback that helped us improve this report.

# Abbreviations

| | |
|---|---|
| ASVAB | Armed Services Vocational Aptitude Battery |
| C3R | Creating College and Career Readiness |
| CCR | college and career readiness |
| CRC | Career Readiness Courseware |
| CTE | Career and Technical Education |
| ELA | English language arts |
| EOC | end-of-course |
| GRREC | Green River Regional Educational Cooperative |
| GED | general equivalency diploma |
| i3 | Investing in Innovation |
| ILP | Individual Learning Plan |
| ITT | intent-to-treat |
| KDE | Kentucky Department of Education |
| KOSSA | Kentucky Occupational Skills Standards Assessment |
| KYOTE | Kentucky Online Testing Exam |
| KVEC | Kentucky Valley Educational Cooperative |
| NCES | National Center for Education Statistics |
| WIN | WIN Learning |

# 1. Introduction

In 2011, two educational cooperatives in Kentucky received an Investing in Innovation (i3) development grant from the U.S. Department of Education to implement the Creating College and Career Readiness (C3R) initiative. C3R commenced in January 2012, led by the Kentucky Valley Educational Cooperative (KVEC), with the Green River Regional Educational Cooperative (GRREC) as a partner. KVEC engaged the RAND Corporation as the evaluation partner, and this report presents findings from that evaluation.

The initiative offered a suite of software applications for member districts of the two cooperatives to support college and career readiness (CCR) among students in grades 8 through 12. Developed by WIN Learning (WIN), the software suite included:

1. *Career Readiness Courseware* (CRC) provides individualized support and practice in applied mathematics and informational text to build students' skills for academic and workplace success. It also provides individualized support and practice in college mathematics and English language arts (ELA) skills (WIN, 2013a).
2. *Soft Skills* helps students build foundational skills and learn behavior and attitudinal skills that are critical for workplace and college success (WIN, 2013b).
3. *MyStrategic Compass* helps students explore job descriptions, review educational and training requirements, and develop individual career pathways to guide their course selection and planning through graduation (WIN, 2013c).

At the time of the i3 award, this software suite had not been implemented in the kindergarten–12th grade (K–12) setting. WIN originally created it for adults in workforce development and readiness programs. The C3R initiative innovated by adopting it for use in the K–12 setting. C3R's goals were to increase graduation rates, increase academic achievement, improve CCR rates, and increase the number of students who successfully transitioned to postsecondary training or workforce after graduation. One hundred twenty-seven schools, including technical schools and area technical centers, implemented the C3R initiative with students in grades 8 through 12 from the 2013–2014 to 2016–2017 school years. More than 30,000 students were eligible to participate in C3R each year of the initiative.

Previous evidence on the efficacy of WIN software in the workforce development context was correlational. In its own research, WIN found that among individuals in a general equivalency diploma (GED) program, 88 percent of those who earned a certificate of mastery in the CRC passed the GED exam. WIN also found that individuals in a Job Corps program who used CRC improved their academic achievement and experienced higher passing rates on the Test for Adult Basic Education. A Syracuse University study found that students who spent more time using CRC scored higher on mathematics certification exams (Hadlick, 2011). An evaluation by the Florida Department of Education of the statewide Florida Ready to Work

program found jobseekers with the CRC credential were 15 percent more likely to be employed and had 25 percent higher wages (Florida Department of Education, 2009).

The use of adaptive, mastery-based software to deliver personalized instruction to K–12 students has grown in popularity. Schools are increasingly adopting such software to deliver instruction to students in content areas like reading and mathematics. In a blended learning environment, adaptive software could allow teachers to allocate instructional time to individual students that otherwise would have been used to provide instruction to the whole class (Pane et al., 2017). Although adoption is perceived to enable more-personalized instruction, evidence of the efficacy of these software applications on student achievement is limited and mixed. A 2010 study of a geometry curriculum that includes an intelligent tutoring system found significant negative effects; however, a study of a similar curriculum for algebra found significant positive effects (Pane et al., 2010; Pane et al., 2014). Other recent studies of personalized learning approaches found positive effects, although they were not always statistically significant (Pane et al., 2015; Pane et al., 2017). Each of these studies identified key challenges to implementing personalized learning approaches and noted that contextual factors (e.g., high school use, first-year adopters) can be highly relevant to success. Given the inconsistent results to date and the increased allocation of instructional time to personalized, online learning, it is important to conduct rigorous evaluations of these approaches.

We carried out qualitative research to study the implementation of C3R and used quasi-experimental methods to assess its effects on student outcomes. The following research questions guided this evaluation:

1. How was the C3R initiative implemented in schools?
2. How many students participated in C3R, by software and overall?
3. At what levels did students participate in C3R, by software and overall?
4. What factors enabled or hindered the implementation of C3R?
5. To what extent was the C3R initiative associated with improvements in student achievement and in dropout and graduation rates?
6. To what extent was the C3R initiative associated with a successful postsecondary transition to work, the military, two- or four-year college, or training or certification programs?

In Chapter 2 of this report, we describe the methods and data used in the evaluation. Chapter 3 describes C3R and the context of CCR in the state of Kentucky. Chapter 4 focuses on implementation-related research questions. We then explore effects on student outcomes in Chapter 5. Finally, the report concludes with lessons learned and recommendations for the field. The appendix provides details on the impact study.

# 2. Methods

The evaluation of the C3R initiative consisted of implementation and impact studies. The U.S. Department of Education funded C3R for five years (see Table 2.1). The first year of funding (the 2012–2013 school year) was a pilot year and therefore not included in the study. KVEC, GRREC, and WIN agreed that a pilot year was important to allow school staff and students to explore the suite of tools and to plan how the tools could be incorporated in the K–12 context. There were no existing models or guides for schools to refer to on how to implement the software with their curriculum or programs. This evaluation considered the 2013–2014 school year as year 1. This chapter describes the design of the implementation and impact studies, as well as study limitations.

**Table 2.1. C3R Initiative Timeline**

| School Year | Implementation Year |
|---|---|
| 2012–2013 | Pilot |
| 2013–2014 | 1 |
| 2014–2015 | 2 |
| 2015–2016 | 3 |
| 2016–2017 | 4 |

## Implementation Study

The implementation study largely assessed the extent to which C3R was implemented as designed. Table 2.2 lists the four questions for the implementation study, as well as the data sources analyzed to address each.

**Table 2.2. Implementation Study Research Questions and Data Sources**

| Research Question | Data Source |
|---|---|
| 1. How was C3R implemented in schools? | Implementation plans created by school and WIN staff; observations of professional development; case study visits; participation in C3R leadership team meetings; interviews with WIN, KVEC, and GRREC staff |
| 2. How many students participated in C3R, by software and overall? | WIN usage logs; Kentucky Department of Education (KDE) administrative data |
| 3. At what levels did students participate in C3R, by software and overall? | WIN usage logs; KDE administrative data |
| 4. What factors enabled or hindered the implementation of C3R? | Observations of professional development; case study visits; participation in C3R leadership team meetings; interviews with WIN, KVEC, and GRREC staff |

The implementation study first examined how C3R was implemented in schools (research question 1). We conducted observations of professional development sessions and workshops hosted by WIN for school staff. During these sessions, the research team noted how the WIN staff described the design principals for each software application and the overall initiative. The research team also noted discussions about how and where schools could incorporate the initiative so that students would participate in C3R. We observed the majority of trainings delivered during the pilot and first two years of implementation that were delivered to large groups of teachers (e.g., regional meetings with several teachers from each school and all school staff). The team observed fewer sessions in the later years of implementation because professional development trainings were largely in small groups or individual and on demand. Across pilot and implementation years, we observed more than 30 professional development sessions.

Given that the suite of WIN software was not previously used in the K–12 context, WIN and school staff designed implementation plans each year. Plans outlined which software application would be used, how or where in the school schedule, and the populations of students which would use it. We analyzed implementation plans created annually to understand how each school aimed to use the software. Analysis aimed to address three of our four research questions: how schools planned to implement the initiative (research question 1), the intended number of participating students (research question 2), and whether students participated at the prescribed levels (research question 3).

Insights on implementation came from a variety of sources. The research team attended full-day regional meetings with WIN, GRREC, and KVEC staff. Meetings of the C3R leadership team (KVEC, GRREC, and WIN staff) involved a discussion of individual schools and how each implemented C3R to date. Meetings occurred quarterly. The team took notes on each school's implementation planning and actual enactment each year. Themes for implementation supports and barriers (research question 4) emerged when analyzing regional meeting notes.

Each school year (2013–2014 through 2016–2017), we conducted site visits in at least one middle, and high school in six districts (12 total school visits). We selected schools from each region based on district-level usage data provided by WIN. Schools were placed in one of three groups: low, middle or high usage. Discussions in C3R Leadership Team meetings suggested that there may be variations in factors related to implementation (e.g., internet connectivity, support for the initiative) among districts in these usage groups. Schools from each usage category in the GRREC and KVEC regions were selected. We visited these schools for four consecutive years. After the first year of school visits, we reviewed usage data to identify schools with notable changes in usage from the prior year. We added schools to site visits if they moved across usage groups, as they could lend additional insights to implementation factors. In all, we conducted 60 school visits.

Each school visit included interviews with teachers using C3R in the current year, teachers who had used C3R in previous years but did not in the current year, teachers who never used C3R, school leaders, and a guidance counselor. Interview questions addressed school and district goals, knowledge and awareness of the C3R initiative, and support for the initiative, as well as which software applications were incorporated in classes, how they were incorporated with the class content, the extent to which students benefited from the initiative, and factors related to implementation. We conducted more than 200 interviews over the four years of the implementation study. We also observed a total of 40 classes over the four years during which students used the software. Informal observations of classes in which students used the software provided snapshots of how schools integrated C3R in their courses (research question 1) and factors that enabled or hindered implementation (research question 4). Finally, we conducted annual individual, confidential interviews with WIN, KVEC, and GRREC staff. Interviews focused on schools' engagement in planning for and implementation of C3R. We conducted 30 of these interviews over the period of the study.

Questions about actual student participation in C3R (research question 2) and the extent to which those students participated with fidelity (research question 3) relied on two data sources. WIN provided usage data for each software application at the student level. Data indicated whether students logged in, what activities and modules they completed while logged in, their performance on pretests and posttests, and other content (e.g., time spent on modules). Publicly available data sets from KDE provided the number of students enrolled in each grade level in a school. We aggregated raw data for each student in grades 8 through 12 in each school to determine whether the respective software and overall initiative was implemented with fidelity at the student level. WIN defined student-level fidelity for each software application (see Table 2.3); fidelity for the overall initiative was achieved by meeting fidelity for each software in a year. For school-level fidelity, we aggregated the fidelity of implementation for all students enrolled in a school to determine whether the students received the full intervention hours distributed across the software as recommended by the courseware developer and for the initiative.

**Table 2.3. Student-Level Fidelity for Each Software and C3R Initiative**

| Software | Fidelity |
|---|---|
| CRC | 18 usage hours or mastery certificate |
| SoftSkills | Nine usage hours or mastery certificate |
| MyStrategic Compass | Nine usage hours |

Enablers and challenges to implementation were derived from observations of professional development, case study visits to schools, participation in C3R Leadership Team meetings, as well as interviews with WIN, GRREC and KVEC staff. Notes from all of these activities were analyzed iteratively at the school level and across schools each year to identify themes. We also analyzed data across years to identify changes in enablers and barriers over time (e.g., improvements in internet connectivity, support for the initiative).

## Impact Study

The impact study used a quasi-experimental matched comparison group design to examine the effects of the C3R program in four outcome domains: student academic achievement, CCR, high school completion, and transition. Two research questions guided the impact study:

1. To what extent was the C3R initiative associated with improvements in student achievement, dropout, and graduation rates?
2. To what extent was the C3R initiative associated with a successful postsecondary transition to work, the military, a two- or four-year college, or a training or certification program?

### *Measures of Student Outcomes*

In a study such as this, where all schools within the jurisdiction of the participating organizations are invited to participate, we must look outside those organizations to find nonparticipating schools that might provide the comparative data needed to estimate the effects of participation. Generally, nonparticipating schools and districts have no incentive to provide such data. Given this, our research design relies on publicly available data from state and national sources. Those data were reported at the school level; student-level data were not available from these sources.

As such, all of the outcome measures used in this study are school-level measures from publicly available KDE data sets. Additional school-level covariate data were obtained from the National Center for Education Statistics (NCES). Table 2.4 lists the research questions for the impact study, domains, and data sources for the impact study.

**Table 2.4. Impact Study Research Questions, Domains, Measures and Data Sources**

| Research Question | Domain | Measures | Data Source |
|---|---|---|---|
| To what extent was the C3R initiative associated with improvements in student achievement, dropout, and graduation rates? | Academic | Algebra II end-of-course (EOC) test; English II EOC test; ACT; PLAN | KDE administrative data |
| | CCR | CCR | KDE administrative data |
| | High school completion | Graduation rate; dropout Rate | U.S. Department of Education; KDE administrative data |
| To what extent was the C3R initiative associated with a successful postsecondary transition to work, military, two- or four-year college, or a training or certification program? | Transition | Transition failure rate | KDE administrative data |

In the student academic achievement domain, we examined the effect of C3R on the school-level proficiency percentages on the state-required Algebra II and English II EOC exams, as well as the school-level composite scores for the ACT and PLAN exams. Statewide use of the PLAN exam discontinued after the 2014–2015 school year. Thus, there were three measures of academic achievement across all years of the initiative.

For the CCR domain, we used the percentage of high school graduates who were considered ready for college and a career according to standards set by KDE. Students needed to meet the Kentucky Council on Postsecondary Education Systemwide Benchmarks for reading, English, and mathematics on any administration of the ACT exams to be considered college-ready. To be considered career-ready, students needed to meet the benchmarks for the Armed Services Vocational Aptitude Battery (ASVAB), the ACT WorkKeys, or the Kentucky Occupational Skills Standards Assessments and receive an industry-recognized career certificate. KDE collects information about whether each student meets these requirements and publishes school-level CCR percentage annually.

For the high school completion domain, we examined graduation and dropout rates. According to KDE, the graduation rate was calculated as the average freshman graduation rate before 2013, after which the four-year adjusted cohort graduate rate (U.S. Department of Education, 2012) is used. For the dropout rate, we used the dropout rate for students in grades 9 through 12. According to KDE, *dropout* is defined as students who dropped out during a full school year, including students who dropped out over the summer.

For the transition domain, we analyzed the transition failure rate. The transition data was collected in the fall of each year when the school personnel surveyed graduates from the

previous year. Students who were admitted into two- or four-year colleges or vocational or technical schools, who went to the military, or who were working full- or part-time were counted as successfully completing the transition. The transition failure rate was the percentage of graduates who did not make any of the transitions listed. Transition failure rates were not released by the KDE in the 2013–2014 school year but were available for the other three years of the impact study.

### *Sample*

The analysis sample included 34 schools in districts that participated in C3R and 72 comparison schools from elsewhere in the state. The sample was restricted to schools serving the high school grades. Thus, elementary schools or middle schools serving only eighth-grade students were not included in the sample. Technical schools were also excluded because KDE reports outcome data for students enrolled in technical classes with the high school of record for a student. Missing data were very uncommon; we imputed baseline per-pupil spending for one school and the percentage of students who were proficient or distinguished in algebra for five schools by setting the missing value equal to the mean among all schools in the analytic sample. Comparison schools that did not match with treatment schools on key covariates were also excluded to obtain better equivalence between treatment and comparison groups. For instance, magnet schools were excluded from the comparison group because none of the treatment schools were magnet schools.

### *Analytic Method*

We assessed comparability of the treatment and comparison schools on baseline variables, including: school size, Title I eligibility and provision of Title 1 services, poverty as measured by the eligibility for free or reduced-price lunch, race/ethnicity, rurality, student-computer ratio, spending, average years of teaching experience of the staff, and the same variables we would be using for outcomes (academic achievement, CCR, dropout and graduation rates, and transition failure rate). The groups differed on some of these baseline variables, so we undertook a propensity weighting approach (McCaffrey, Ridgeway, and Morral, 2004) to make them more similar. In general, this process improved balance considerably. Although no group differences remained statistically significant after weighting, the standardized group difference for some variables were still somewhat large. Table A.1 in the appendix summarizes the balance between the treatment and comparison groups before and after these weights were applied. In order to provide additional control over baseline differences after weighting, we included all of the same variables as covariates in our outcome models. This doubly robust approach has been found to be useful in further reducing potential differences between two groups at baseline when estimating the potential impact of intervention programs (Guo and Fraser, 2009).

The study used an intent-to-treat (ITT) analysis, which includes all treatment group schools, regardless of whether they actually participated in the program (Shadish, Cook, and Campbell,

2002). We conducted a propensity-weighted school-level regression analysis, in which the outcome of interest in a particular project year was regressed on the school's treatment status and school-level baseline covariates. A separate outcomes model was run for each of the eight outcomes of interest for each school year under study from 2013–2014 to 2016–2017.

We used the method from Benjamini and Hochberg (1995) to adjust for multiple comparisons within each year, within each domain that had more than one outcome tested. The rationale for conducting the adjustments separately by year was that we considered the early years to be assessing preliminary results and the final year as consisting of the confirmatory tests for the effects of C3R.

## Limitations

The evaluation of C3R was limited in several ways. The implementation study was informed by implementation plans developed by schools with support from WIN staff. Although WIN intended for all schools to develop plans, not all schools did so. As an example, in year 1, about 50 percent of schools did not submit an implementation plan. Furthermore, the quality of plans varied to the extent that it was sometimes difficult to determine what the plan entailed. For example, one school planned to use the software during the Response to Intervention block but did not note whether all students or only a subset would use the software. In another plan, a school included SoftSkills with a suite of other software applications that students could opt to use during an advisory period.

During case study visits, we intended to conduct interviews with a variety of school staff and observe implementation of C3R in classrooms. We scheduled the visits in advance, but there were occasionally unforeseen circumstances on the day of the visit that prevented an interview. In low-implementing schools, few teachers could be interviewed because there were very few with experience implementing the WIN suite of software. Overall, interview data represent self-reports and can suffer from a variety of problems, including poor recall or social desirability bias. Additionally, case study schools may not be representative of the implementation issues across all schools in the initiative, and discussions of implementation at regional meetings may not have identified the spectrum of implementation factors encountered.

WIN usage data were also limited. Usage records with incomplete ten-digit student or school identifiers were excluded from analyses because they could not be associated with a student and/or school for the implementation analyses. Across the four years of implementation data, we dropped nearly 3 percent of usage records. While analyzing usage data, we found records of continuous use exceeding 90 minutes. We adopted a threshold of 90 minutes for these individual records because implementation plans indicated schools did not permit this amount of continuous use. Cooperative and WIN staff confirmed that school schedules and implementation plans did not support 90 minutes of continuous use during the school day. Continuous use suggested technical issues that could not be explained. The 90-minute threshold applied to very few

individual records. It is also possible that data provided by WIN did not represent all student usage. In interviews, principals and teachers reported the software application did not capture all usage; work completed a previous day appeared as incomplete the next day. Thus, there might have been more participation than recorded in the WIN system.

Lastly, our achievement data were at the school level, which limits our ability to assess whether within-school variation in participation in C3R may have differentially impacted student outcomes. These aggregated analyses may "wash out" or be unable to detect all the changes that may have occurred in particular schools that could be improving outcomes for some students. Moreover, the matched comparison group design with propensity weighting may be vulnerable to selection bias, either due to unresolved group differences after weighting or other differences that may not be visible in the baseline variables.

# 3. The C3R Initiative

This chapter describes the context for CCR in the state of Kentucky, where C3R was implemented. It provides an overview of the C3R initiative and its components, theory of action, and goals. We also note how the initiative aligns with the broader accountability standards in the state of Kentucky. The final section offers demographics on C3R schools. The information in this chapter is derived from several data sources: "WIN Narrative and Learning Plans," which was distributed by WIN to communicate implementation expectations and support schools as they planned implementation (WIN Learning 2013a; WIN Learning 2013b; WIN Learning 2013c); artifacts from professional development sessions; the WIN website and C3R systems (e.g., materials within the single login portal); and KDE.

## Occupational Landscape and Measures of Student Preparedness

A primary objectives of the C3R project were to raise awareness among students of the likely career opportunities that will be available to them and the educational demands of those careers, and to help ensure that they completed the necessary education and training for the careers to which they aspired.

The Kentucky Office of Employment and Training projected that employment in the state would increase by 326,097 jobs, or 15 percent between 2014 and 2024, with two general types of jobs administrative support and sales accounting for nearly one-quarter of employment (Kentucky Center for Workforce Statistics, 2016). Positions related to health care, technical services, and social services were projected to be among the fastest-growing occupations (Kentucky Center for Workforce Statistics, 2016; Bollinger et al., 2018). All of these occupations require a high school diploma and many require some training after high school. Middle-skills jobs requiring an education after high school, but not a four-year degree, make up the largest part of both Kentucky and U.S. labor markets (National Skills Coalition, 2017; U.S. Department of Labor, 2016). According to state workforce data, there will be many more job openings for workers with at least a high school diploma, and the highest growth rate jobs will require at least some postsecondary education (Kentucky Center for Workforce Statistics, 2016). According to an analysis in the *Kentucky Annual Economic Report*, a bachelor's degree added about 50 percent to an individual's earnings in both the more urban and more rural parts of the state (Bollinger et al., 2018).

Throughout the past decade, Kentucky legislators and KDE have supported policies intended to provide students with a quality education to meet workforce needs. State Senate Bill I, passed in 2009, sought to align K–12 and postsecondary expectations and increase the number of high school graduates ready for college. Kentucky Senate Bill 38 (2012) aimed to provide a career

pathway process for students in secondary education. State House Bill 207, signed in 2013, united the state's two career and technical education (CTE) systems under KDE in order to increase efficiency of the systems and improve outcomes (Southern Regional Education Board, 2014). In 2015, the Kentucky Department of Workforce Investment held a Workforce Innovation and Opportunity Act State Plan Partner Round Table event with participants from Adult Education, Economic Development, Vocational Rehabilitation, the Kentucky Workforce Investment Board, KDE, and local workforce development areas. The group's conclusions emphasized early intervention in the Career Pathways system for students; ensuring a direct connection between occupational areas of demand and careers through active engagement of employers and the educational system; and understanding the differences in rural and urban areas of Kentucky (U.S. Department of Labor, 2016).

KDE developed standards to identify students who were "college- and/or career-ready" and used these standards as part of the accountability model for schools (Table 3.1). As defined by KDE, students are college-ready if they meet the Council on Postsecondary Education benchmarks in reading, mathematics and English on various exams, including the ACT, COMPASS, and Kentucky Online Testing Exam (KYOTE). Students are career-ready if they meet specific academic benchmarks on the ASVAB or ACT WorkKeys assessments, and either meet technical benchmarks on the Kentucky Occupational Skills Standards Assessment (KOSSA) or earned an industry certification (U.S. Department of Labor, 2016). Students fulfilling requirements of both were designated as college- and career-ready.

**Table 3.1. KDE College- and/or Career-Ready Standards**

| CCR Definitions | Academic Standard | Technical Standard |
|---|---|---|
| College-Ready | Meets or exceeds ACT benchmarks for reading, English, and mathematics on any administration of the ACT<br>OR<br>Passes COMPASS or KYOTE College Placement tests | N/A |
| Career-Ready | Meets or exceeds benchmarks for Career Ready Academic on ASVAB or ACT WorkKeys | Meets or exceeds Career-Ready Technical on KOSSA or received a KDE Industry Recognized Career Certificate |
| College- and Career-Ready | Meets or exceeds ACT benchmarks for reading, English, and mathematics on any administration of the ACT<br>OR<br>Passes Compass or KYOTE College Placement tests | Meets or exceeds Career-Ready Technical on KOSSA or received a KDE Industry Recognized Career Certificate |

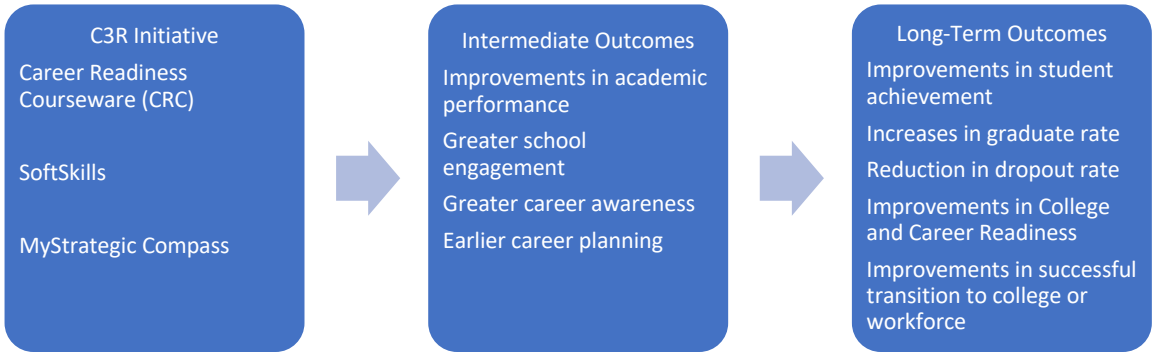
The KDE also held schools accountable for preparing Kentucky students for the academic and social demands of adulthood. Accountability standards included a measure of successful

postsecondary transitions to the workforce, military, or advanced education and training (technical or college).

## Overview of C3R

C3R aimed to increase graduation rates, improve academic achievement, improve CCR, and increase the number of students who successfully transition to life after high school graduation. The C3R logic model (see Figure 3.1) illustrates the theory of action. Students who engaged in the three C3R components were expected to experience both intermediate and long-term benefits. The intermediate benefits include improved academic performance, greater student engagement in school, increased career awareness, and increased planning for postsecondary life. Over the long term, the expected benefits include decreased dropout rates, increased graduation rates, improved student achievement, and more successful transitions to postsecondary training or the workforce.

**Figure 3.1. Logic Model for C3R Initiative**




The three components of the C3R initiative were CRC, SoftSkills, and MyStrategic Compass. These software applications were all developed by WIN. We describe each of these in turn.

### *CRC*

The CRC software is focused on academic content needed to be "career-ready" or "college-ready." According to WIN, CRC aligns with the COMPASS assessment, a component of the KDE accountability system. It can also serve as a support in preparing students for the ACT (WIN, 2013a).

CRC has two modules: Career Readiness Courseware (known as the Career-Ready module) and College Ready Courseware (known as the College-Ready module) (see Table 3.2). The Career-Ready module covers foundational academic skills that focus on the core communication, reasoning, and problem-solving skills required for 21st century opportunities, from entry level to

professional. It includes an applied mathematics course and two ELA courses, reading for information, and locating information. The College-Ready module also provides courses in mathematics (pre-algebra, algebra, geometry) and ELA (reading, writing, English).

**Table 3.2. CRC Modules and Content**

| Content Area | Career-Ready | College-Ready |
|---|---|---|
| Mathematics | Applied Mathematics | Pre-algebra<br>Algebra<br>Geometry |
| ELA | Reading for Information;<br>Locating Information | Reading<br>Writing and English |

Students have autonomy to work on any course within either module. The CRC software uses competency-based progression. Each course begins with a pretest that assesses students' knowledge and skills. Students who receive an 80 percent or higher on the pretest are deemed to have already mastered the course. Otherwise, pretest results determine the student's unique learning path, covering only content that they have not already mastered. Students receive online instruction in the remaining content and practice these emerging skills by completing exercises. When all the exercises are complete, the student takes a posttest. Students who achieve 80 percent or more progress to the next level; otherwise, the level is repeated. When all levels within a course have been mastered, the course is considered mastered and students receive a course mastery certificate.

### *SoftSkills*

WIN describes SoftSkills as building "mastery around the behavioral, attitudinal, and school skills employers and postsecondary programs demand" (WIN, 2013b). SoftSkills is intended to prepare students for the KOSSA, KDE's accountability assessment of career readiness.

The curriculum includes four modules: (1) Conveying Professionalism, (2) Communicating Effectively, (3) Promoting Teamwork and Collaboration, and (4) Thinking Critically and Solving Problems. The skills covered in each module are outlined in Table 3.3. SoftSkills uses a mastery-based approach similar to CRC. Each module begins with a pretest. Students who earn an 80 percent or higher on the pretest are considered to have already mastered the module; otherwise, they receive instruction in the content. Upon mastery of all four modules, students receive a SoftSkills mastery certificate.

**Table 3.3. SoftSkills Module Content**

| Module | Skills |
|---|---|
| Conveying Professionalism | Strong work ethic<br>Personal images<br>Positive attitude<br>Customer relations<br>Dependability<br>On-time<br>Motivation<br>Work habits |
| Communicating Effectively | Communication skills<br>Listening skills<br>Use of communication tools<br>Etiquette<br>Conflict resolution |
| Promoting Teamwork and Collaboration | Learning to be a good team member<br>Diversity<br>Sensitivity<br>Teamwork<br>Collaboration<br>Leadership skills |
| Thinking Critically and Solving Problems | Critical thinking<br>Evidence<br>Reasoning<br>Fallacies |

### *MyStrategic Compass*

The MyStrategic Compass software provides a personalized, electronic counseling tool to support students' planning for postsecondary transitions. MyStrategic Compass includes ten activities that can be completed once or numerous times as students grow and interests change before completing high school.

The early MyStrategic Compass activities focus on helping students identify their interests and work values. Students complete "profiler" activities that gather information about their interests. It then creates a career profile showing career paths that align with the student's interests. Students can explore the career paths to learn about the training required for positions within the career path, salary information, and current labor market demands both locally and across the nation. As an example, a student with interests that align with the health care industry can learn about home health care, phlebotomy technician, medical lab technician, nursing, and biomedical engineer careers. Students explore the postsecondary training required to receive an entry-level job in each of those careers and the institutions that provide the requisite training. Students can then assess their interest in or readiness for pursuing a specific career.

After identifying careers of interest, MyStrategic Compass uses publicly available labor data to identify employment opportunities. The local and national demands for positions can be important for students who may be interested in specific jobs but want to live in a particular area.

MyStrategic Compass also includes activities like “Budget your life,” which provides students an opportunity to budget the lives they would like to live with a specific salary. Students can assess whether their desired lifestyle is feasible within a given salary. Students can also develop professional resumes using a resume builder.

Overall, MyStrategic Compass provides students with the information needed to develop a plan for life after high school and to replan as interests change (WIN, 2013c).

## C3R Schools

As regional education agencies, KVEC and GRREC seek opportunities to improve educator and student outcomes on behalf of districts that belong to their cooperative. When the C3R initiative was funded, KVEC and GRREC invited their member districts and schools to participate. Eighteen KVEC districts (representing 94 schools) agreed to participate in C3R. The GRREC region secured participation agreements from 15 districts and 46 schools. Across the state of Kentucky, 33 districts that housed a total 182 schools agreed to participate in C3R (see Table 3.4).

The vast majority of districts from both regions are rural; 76 percent of districts are designated rural and 21 percent qualify as a town. In the majority of districts (76 percent), more than 90 percent of students are white. In one-third of the districts (10 of 33), 75 percent or more of students qualify for free or reduced-priced lunch.

Two districts that initially agreed to participate withdrew from the initiative. Thus, 31 districts and 127 schools participated in the four years of C3R.

**Table 3.4. Demographics of Original C3R Districts, 2013–2014**

| School District | District Urban-Centric Locale Category[a] | Number of Participating Schools[b] | Participating School Enrollment (Grades 8–12)[b] | District Percentage, White[b] | District Percentage, Free or Reduced- Price Lunch[b] |
|---|---|---|---|---|---|
| Barren County | Rural: Fringe | 4 | 1,876 | 94 | 53 |
| Breathitt County | Town: Remote | 3 | 756 | 98 | 77 |
| Campbellsville Independent | Town: Remote | 3 | 350 | 75 | 66 |
| Caverna Independent | Rural: Fringe | 2 | 265 | 76 | 83 |
| Edmonson County | Rural: Distant | 2 | 753 | 94 | 59 |
| Floyd County | Rural: Distant | 11 | 2,132 | 99 | 75 |
| Grayson County | Rural: Fringe | 3 | 1,554 | 96 | 67 |
| Green County | Rural: Distant | 3 | 607 | 93 | 69 |
| Hancock County | Rural: Fringe | 2 | 596 | 95 | 46 |
| Hardin County | Suburb: Small | 11 | 5,458 | 70 | 52 |
| Harlan County | Rural: Fringe | 11 | 1,357 | 96 | 81 |
| Hazard Independent | Town: Remote | 3 | 374 | 86 | 59 |
| Jackson Independent | Town: Remote | 2 | 119 | 96 | 64 |
| Jenkins Independent | Rural: Remote | 1 | 215 | 98 | 76 |
| Johnson County | Rural: Fringe | 3 | 1,387 | 98 | 69 |
| Knott County | Rural: Remote | 8 | 897 | 97 | 82 |
| LaRue County | Rural: Fringe | 2 | 957 | 87 | 60 |
| Lee County | Rural: Remote | 3 | 388 | 97 | 79 |
| Leslie County | Rural: Distant | 6 | 598 | 99 | 69 |
| Letcher County | Rural: Remote | 9 | 1,136 | 98 | 70 |
| Magoffin County | Rural: Remote | 3 | 763 | 99 | 83 |
| Metcalfe County | Rural: Remote | 2 | 573 | 97 | 70 |
| Owsley County | Rural: Remote | 1 | 273 | 98 | 88 |
| Paintsville Independent | Town: Remote | 1 | 337 | 95 | 44 |
| Perry County | Rural: Fringe | 12 | 1,357 | 97 | 72 |
| Pike County | Rural: Distant | 14 | 3,389 | 98 | 69 |
| Pikeville Independent | Rural: Fringe | 1 | 441 | 90 | 36 |
| Russell County | Rural: Remote | 3 | 1,075 | 92 | 70 |
| Russellville Independent | Rural: Fringe | 2 | 371 | 58 | 70 |
| Simpson County | Town: Distant | 2 | 1,115 | 81 | 62 |
| Taylor County | Town: Remote | 2 | 1,049 | 93 | 61 |
| Union County | Rural: Distant | 3 | 860 | 85 | 55 |
| Wolfe County | Rural: Remote | 2 | 484 | 98 | 76 |

[a] Data from U.S. Department of Education.
[b] Administrative data from KDE.

# 4. Implementation of C3R

This chapter describes implementation of C3R. After briefly touching on implementation planning, we describe participation or engagement in each component of C3R. We then assess the extent to which students and schools participated as intended. Finally, we discuss barriers and supports to implementing C3R. The data sources for these findings are shown in Table 2.2 in Chapter 2.

## Implementation Planning

WIN designed the C3R initiative, which included the CRC, SoftSkills, and MyStrategic Compass software applications, and set implementation goals. WIN staff intended for all students in grades 8 through 12 in the participating schools to use C3R and at specified levels. These expectations were outlined in the "Narrative and Learning Plans" for each software application and distributed to schools. During the pilot year, WIN staff used the learning plan, which described best practices and outlined recommendations for student pathways through the software for each grade level, to assist with planning the integration of these tools. They also provided an implementation planning tool to enable each school to create its own plan for how to engage all students with the software each year. Planning occurred through regional and local meetings.

## Participation in C3R

In this section, we address two research questions: (1) How many students participated in C3R, by software application and overall? and (2) At what levels did students participate in C3R, by software and overall?

As context for the participation numbers presented below, we first looked at the number of students eligible to participate. Table 4.1 shows enrollment in grades 8 through 12 in the participating schools during each year of implementation. WIN intended for all of them—more than 30,000 students per year—to use the C3R software. The aim for all students to use each software application was included in the proposal, distributed to schools, and registered prior to the first implementation year with the national evaluation of i3 grants. We discuss the percentage of students in grades 8 through 12 who participated in each software application and C3R overall. The percentage of all students was derived by dividing the number of unique students participating by the number of students enrolled in C3R schools.

**Table 4.1. Number of Students Enrolled in C3R Schools by Year**

| Implementation Year | Number of Students |
|---|---|
| 1 | 31,278 |
| 2 | 31,138 |
| 3 | 34,241 |
| 4 | 33,053 |

Analysis of implementation plans revealed that schools could not implement C3R as intended by WIN. Schools' perspective on fit of the software with their curriculum and school schedule differed from the software developer. We report the overall participation in software applications and the overall C3R initiative to gauge how likely it is that C3R will affect school-level outcome measures. Participation estimates derived from implementation plans assess how well schools implemented what they planned.

### *CRC*

Roughly 5,000 students used the Career-Ready modules of CRC each year. The majority of these students used the Applied Mathematics module. Except during the first year, slightly more students used the Locating Information module than the Reading for Information module. The number of students using the College-Ready modules (see Table 4.2) was relatively smaller. Student usage for College-Ready modules was highest the first year at 2,154 students, dropping to 843 students by year 4. The most notable decline was between years 3 and 4. As with the Career-Ready modules, more students engaged with the mathematics modules than with ELA modules.

**Table 4.2. Overall Participation in CRC Content, by Module, Course, and Year**

| Module | Course | Year 1 | Year 2 | Year 3 | Year 4 |
|---|---|---|---|---|---|
| **Career-Ready** | **Unique students** | **5,213** | **5,210** | **5,243** | **4,980** |
| | Applied Mathematics | 4,390 | 4,295 | 4,463 | 4,493 |
| | Locating Information | 2,248 | 3,561 | 3,463 | 3,734 |
| | Reading for Information | 3,177 | 3,210 | 3,245 | 3,253 |
| **College-Ready** | **Unique students** | **2,154** | **1,652** | **1,520** | **843** |
| | Pre-algebra | 1,469 | 1,014 | 1,029 | 671 |
| | Algebra | 930 | 686 | 625 | 483 |
| | Geometry | 726 | 459 | 472 | 377 |
| | Reading | 1,183 | 739 | 755 | 398 |
| | Writing and English | 769 | 673 | 611 | 341 |
| **CRC Overall** | **Unique students** | **5,883** | **5,754** | **5,793** | **5,178** |
| | **Percentage of all students** | **19** | **18** | **17** | **19** |
| | **Percentage of planned participation, estimated** | **200[a]** | **60** | **34** | **70** |

[a] Schools that did not complete implementation plans assigned a subset of students to use CRC and more students than estimated used CRC in a few schools. Thus, actual participation exceeded the estimated planned participation.

In total, student participation in CRC was relatively consistent over the four years of C3R. Across modules and courses, 5,000 to 6,000 students engaged with CRC each year of implementation (Table 4.2). Shown in Table 4.2, participation was highest in the first year of implementation and relatively stable for the next two years, after which use declined.

There are two perspectives for examining the take up rate of CRC. The first relies on the expectations of participation communicated by WIN, while the second uses implementation plans developed by schools. WIN intended for all students in grades 8 through 12 to use CRC each year, yet fewer than 20 percent of students actually did so. Overall, C3R fell short of the goal for all students to engage with CRC. However, an analysis of implementation plans indicated that not all schools planned to use CRC. Counting enrollment in just the schools that planned to use the software, we estimated that 21 percent of students would actually have opportunities to use CRC, not far from the realized numbers.

Schools largely opted to use CRC in career pathway or technical (e.g., Business, Carpentry, Nursing), advisory, and Response to Intervention classes, in addition to freshman seminar. A school-selected subset of students enrolled in these courses. Schools rarely planned to integrate CRC in core classes, such as mathematics, science, or ELA. Students in career and technical classes largely used CRC as test preparation for the WorkKeys, an assessment used by KDE to identify students as meeting the career-ready academic standards for CCR. Using estimated student participation to assess how well schools implemented CRC as planned, more students

used CRC in the first year than planned (200 percent). This is largely because schools that did not submit implementation plans assigned students to use CRC. Most students whom schools intended to use CRC did so in years 2 and 4 (60 and 70 percent, respectively). Implementation plans indicated more students would use CRC than in year 3 than in other years, but there was not a significant increase in the number of individual students using CRC (see Table 4.2). As a result, there was a decline in the percentage of planned participation in the third year.

### *SoftSkills*

Student engagement in SoftSkills was highest in the first year, when 3,057 students logged usage time (see Table 4.3). Participation decreased over time, to 2,051 by the last year. Among the SoftSkills modules, more students used Communicating Effectively than the other modules. There was some variation in the relative ranking of the other modules.

**Table 4.3. Overall Student Participation in SoftSkills, by Module and Year**

| Module | Year 1 | Year 2 | Year 3 | Year 4 |
|---|---|---|---|---|
| Conveying Professionalism | 1,529 | 2,025 | 1,857 | 1,609 |
| Communicating Effectively | 2,319 | 2,596 | 2,282 | 1,828 |
| Promoting Teamwork and Collaboration | 2,101 | 2,115 | 1,783 | 1,474 |
| Thinking Critically and Solving Problems | 1,256 | 1,725 | 1,566 | 1,402 |
| **Unique students** | **3,057** | **2,825** | **2,539** | **2,051** |
| **Percentage of all students** | **10** | **9** | **7** | **6** |
| **Percentage of planned participation, estimated** | **106[a]** | **30** | **20** | **30** |

[a] More students used SoftSkills in year 1 than estimated from implementation plans. Actual participation exceeded estimates of participation.

The number of unique students using SoftSkills was far below the intended level. WIN aimed for all students to use at least one module of SoftSkills in a given year, but the actual portion participating was 10 percent or less.

Again, as with CRC, this lower level of use aligned with implementation plans. Most schools did not plan to use SoftSkills at all. Schools largely planned to use SoftSkills with students in an advisory class, a high school transition class, or in a CTE course. CTE classes largely used SoftSkills as test preparation for the KOSSA. Students taking the KOSSA are largely enrolled in career pathways (e.g., Nursing, Business, Automotive). Although all students may benefit from engaging in modules that build the social skills required for success in the 21st-century job market, schools did not integrate SoftSkills with the programs or courses that enroll most students. Using estimated participation based on implementation plans, more students than estimated from implementation plans used SoftSkills in the first year of the initiative (106 percent). Participation in years 2 to 4 varied between 20 percent and 30 percent of students.

Actual participation fell short of what they planned. Schools planned for more students to participate in the third year than in other years. Combined, the increase in projected participation and decline in actual participation yielded an estimated 20 percent of students projected to participate in SoftSkills doing so.

### *MyStrategic Compass*

Very few students used MyStrategic Compass. In year 1, 714 students used the software, declining to 442 in year 3. Data were not available for year 4 due to technical changes in the software (see Table 4.4).

**Table 4.4. Participation in MyStrategic Compass, by Year, Number, and Percentage of Students**

| | Year 1 | Year 2 | Year 3 | Year 4 |
|---|---|---|---|---|
| Unique students | 714 | 663 | 442 | N/A |
| **Percentage of all students** | **2** | **2** | **1** | **N/A** |
| **Percentage of planned participation, estimated** | **32** | **7** | **27** | **N/A** |

Far fewer than the intended 100 percent of students used MyStrategic Compass. In reviewing implementation plans, schools rarely planned to use this software, largely because it duplicated functionality already provided statewide. According to schools, using the system managed by the state was more convenient and placed fewer time and technical demands on teachers.

KDE requires all students in grades 6 through 12 to annually complete an Individual Learning Plan (ILP). Although students could complete the ILP on paper, the state also allows it to be prepared online using a system called Career Cruising. Within Career Cruising, students can also complete career assessments to identify career options that match their interests and skills, explore updated career profiles, access college and financial aid information, develop resumes through a resume builder, and complete their ILPs. For accountability purposes, KDE directly accessed Career Cruising to assess if schools met the ILP requirements. Schools using MyStrategic Compass had to upload individual student activities into Career Cruising for KDE to recognize completion of ILP requirements.

As a result, students largely used MyStrategic Compass to supplement activities available in Career Cruising or when, from the teacher's perspective, the quality of a MyStrategic Compass activity exceeded that of Career Cruising. Of the students estimated to use MyStrategic Compass from implementation plans, roughly 30 percent of the school-planned students did so in years 1 and 3. Fewer students than planned by schools used MyStrategic Compass in year 2, which resulted in a decrease in the percentage of planned participation. Seven percent of the students projected to use MyStrategic Compass did so.

### *Overall Initiative*

Overall participation in C3R was also low. Table 4.5 shows the number of students using one, two, or three of the software applications each year. Over the four years, between 18 percent and 23 percent of the more than 30,000 eligible students used at least one software application, with participation declining across the four years. Participation in year 4 may be slightly underestimated due to lack of data on use of MyStrategic Compass. Although these participation percentages are quite low, we reiterate they are reflective of schools' actual implementation plans.

**Table 4.5. Student Participation in C3R Initiative by Year**

| Number of Software Applications | Year 1 | Year 2 | Year 3 | Year 4 |
|---|---|---|---|---|
| One | 5,177 | 4,943 | 5,134 | 4,649 |
| Two | 1,607 | 1,458 | 1,574 | 1,290 |
| Three | 421 | 461 | 164 | N/A |
| **Unique students** | **7,205** | **6,862** | **6,875** | **5,939** |
| **Percentage of all students** | **23** | **22** | **20** | **18** |

## Fidelity of Implementation

Participation data is one dimension of exposure to the C3R components; a second dimension is how much was accomplished by students who used the software. WIN staff set fidelity of implementation goals for each software application and the overall initiative. For each component of C3R, WIN staff established a benchmark of usage hours for a student to indicate participation at intended levels. They communicated these goals to schools in their planning sessions prior to the first year of implementation. We use the fidelity benchmarks communicated by WIN to assess whether the students who participated did so at the intended levels. The impact of C3R on student outcomes uses school-level measures. To assess the extent to which students in a school participated in the components of C3R and overall initiative as intended, fidelity benchmarks were set at the school level. This section examines the extent to which students who participated in C3R did so at the intended levels and, in turn, achieved implementation fidelity.

### *CRC*

WIN established two ways for students to meet implementation fidelity with CRS. The first approach relied on usage hours: a student who engaged in one or several modules of CRC for at least 18 hours in a given school was considered to have received the intended dosage. In the second year of implementation, WIN designed and launched mastery certificates for CRC, which introduced a second approach to meet implementation fidelity. The certificate approach required

a student to earn mastery certificates for the Career-Ready module and the College-Ready mathematics and ELA modules.

Table 4.6 displays the number of students who met CRC fidelity goals by hours or certificate. All the students who met the goals did so by the hours metric; none did so through the certificate approach. More students met the fidelity goals in year 3 than in other years. However, even that year, only 2 percent of students who logged any CRC usage time met fidelity goals. Very few of the students (1 percent) whom the schools planned as participants in CRC met fidelity goals.

**Table 4.6. Students Meeting CRC Fidelity Goals**

| Fidelity Approach | Year 1 | Year 2 | Year 3 | Year 4 |
|---|---|---|---|---|
| Met hours goal | 12 | 43 | 122 | 46 |
| Met mastery certificate goal | N/A | 0 | 0 | 0 |
| **Total number of students who met fidelity goals** | **12** | **43** | **122** | **46** |
| **Percentage of CRC users** | **0** | **0** | **2** | **1** |
| **Percentage of all students** | **0** | **0** | **0** | **0** |
| **Percentage of planned participation, estimated** | **0** | **0** | **1** | **1** |

The school-level benchmark for implementing CRC with fidelity in a given year was for 90 percent of all students enrolled in grades 8 to 12 at the school to achieve fidelity. No school accomplished this goal in any year.

### *SoftSkills*

WIN offered two ways for students to achieve SoftSkills software fidelity goals each year: either using the software for at least nine hours or earning a mastery certificate. Mastery certificates were available starting in year 2. The vast majority of students who achieved fidelity goals did so with a mastery certificate (Table 4.7). Overall, in years 2 through 4, approximately 20 percent of students who engaged with SoftSkills met the fidelity goals. Of the estimated student population in school implementation plans, around 5 percent of students met fidelity goals.

**Table 4.7. Students Meeting SoftSkills Fidelity Goals**

| Fidelity Approach | Year 1 | Year 2 | Year 3 | Year 4 |
|---|---|---|---|---|
| Met hours goal | 27 | 1 | 7 | 1 |
| Met mastery certificate goal | N/A | 582 | 576 | 489 |
| **Total number of students who met fidelity goals** | **27** | **583** | **583** | **490** |
| **Percentage of SoftSkills users** | **1** | **21** | **23** | **24** |
| **Percentage of all students** | **0** | **0** | **0** | **0** |
| **Percentage of planned participation, estimated** | **1** | **6** | **5** | **7** |

In interviews, teachers and WIN staff suggested that usage data in years 3 and 4 may underestimate students' mastery of SoftSkills content. During these years, teachers largely assigned specific modules to students, rather than requiring them to complete all modules. Teachers first directed students to complete the KOSSA assessment. If the student did not pass, the teacher assigned the SoftSkills module related to the unmastered WorkKeys content. After this, the student re-took the KOSSA, and teachers reported that they almost always passed. In this case, they said, there was no further need for the student to engage with SoftSkills.

Consistent with CRC, the school-level benchmark for implementing SoftSkills with fidelity was for 90 percent of eligible students to achieve fidelity. No school accomplished this goal in any year.

### *MyStrategic Compass*

There was only one way for students to achieve MyStrategic Compass fidelity goals each year, by using the software for at least 9 hours. The number of students meeting the fidelity benchmark was highest in Year 1 (Table 4.8), with 97 students meeting the goal, or about 14 percent of students who used the software at all. There was a notable decline in the next two years, both in raw numbers and percentages. It was not possible to assess fidelity in year 4 due to technical changes in the software.

**Table 4.8. Students Meeting MyStrategic Compass Fidelity Goals**

| | Year 1 | Year 2 | Year 3 | Year 4 |
|---|---|---|---|---|
| Total number of students who met fidelity goals | 97 | 10 | 3 | N/A |
| **Percentage of MyStrategic Compass users** | 14 | 2 | 1 | N/A |
| **Percentage of all students** | 0 | 0 | 0 | N/A |
| **Percentage of planned participation, estimated** | 4 | 0 | 0 | N/A |

Like the other software applications, the school-level benchmark for implementing MyStrategic Compass with fidelity was for 90 percent of eligible students to achieve fidelity. No school accomplished this goal in any of the years we have data for.

### *Overall Initiative*

WIN set the student-level goal for overall fidelity of implementation as meeting the fidelity goals of each component. No student met this goal in any year. Table 4.9 displays the number of students who met fidelity requirements for one, two, or three of the software components of C3R. With no students meeting fidelity goals, schools also did not meet school-level fidelity goals.

**Table 4.9. Number of Students Meeting Fidelity Goals for One, Two, or All Three Software Components**

| Students Meeting Fidelity Goals for … | Year 1 | Year 2 | Year 3 | Year 4 |
|---|---|---|---|---|
| … one software component | 136 | 631 | 693 | 532 |
| … two software components | 0 | 2 | 5 | 2 |
| **… three software components (C3R goal)** | **0** | **0** | **0** | **N/A** |

## Factors Influencing Implementation

Interview participants (schools, cooperatives, and WIN staff) identified various factors that influenced participation. One factor was technical issues related to the online portal through which students accessed the three software applications. This single-access portal was developed by WIN at the request of schools during the pilot year. However, accessing this portal presented widespread challenges. Principals, teachers, and cooperative staff reported students could not log in or lost connectivity while using the software. District technology coordinators; WIN; KDE; and, ultimately, external technical experts hired by WIN made numerous efforts to resolve these problems. However, problems persisted through year 3 for some of the schools. In year 4, after determining that high levels of simultaneous use were part of the problem (prior deployments in the workforce development context had not encountered such high simultaneous demand), WIN added capacity to their systems, resulting in noticeable improvements.

According to educators, there were also technical issues related to data loss, likely related to losses of connectivity. Principals and teachers reported students often completed work only to find that the software had not recorded their progress, and teachers had to develop their own monitoring and tracking systems to keep accurate records of student accomplishments. Systems created by teachers duplicated data captured in the software, but these independent systems allowed teachers to consistently capture progress and mastery. According to educators, these

issues consumed valuable instructional time and negatively influenced student and teacher confidence in the systems, inhibiting future usage attempts.

There were also non-technical hindrances to implementing C3R as intended. While these were described as less severe than the technical issues, they presented challenges nonetheless.

- **Availability of a range of other software.** Some teachers reported that the district had other software that provided similar student supports as the C3R software. Teachers were more familiar with these other options and preferred to use them. Some that tried the C3R software reverted to other online products after encountering the technical barriers.
- **Availability of computers or devices.** According to KDE administrative data, the vast majority of schools were low-resourced schools with limited access to computers or other devices during the C3R school years. Administrators and teachers in a few schools noted there were two computer labs and two laptop carts. It was difficult to schedule computer time for C3R when there were competing priorities coming from other classes. Some teachers reported reluctance to schedule computers for C3R because they were concerned that the limited resource would not be used productively due to the technical issues discussed earlier. Finally, the C3R software was not compatible with all devices in a school, in part due to Adobe Flash requirements.
- **Lack of coherent implementation plans.** Schools that developed an implementation plan were more likely to participate in C3R. However, not all schools created implementation plans. Among schools that completed plans, some schools planned to use only one or two of the software applications. Furthermore, implementation plans indicated that schools rarely intended for all students to use each software application. Finally, for those students and software for which usage was intended, the planned usage levels were low. Overall, only one school planned for implementation that approached the vision of the initiative—for 100 percent of students in the school to participate. The plan was in place for year 1 but not sustained in subsequent years, largely due to technical issues.
- **Not enough time to supplement the standard curriculum.** In interviews, core content teachers reported that there was insufficient time to deliver the standard curriculum in the given school year. Teachers of classes with EOC assessments felt even more pressure to deliver the course content before testing dates. Creating time for a supplement like the C3R software was not a priority for teachers of core content. Teachers reported that it was more appropriate to include the C3R software in supplemental or remedial classes or advisory courses. Furthermore, teachers of core classes were unclear of the extent to which C3R software was aligned with or would prepare students for EOC assessments or the ACT, which all students in the state of Kentucky are required to take.
- **In some cases, lack of knowledge and awareness.** Some teachers were unfamiliar with the C3R initiative at the time of our interviews. Teachers expressed interest in learning more about the software that comprises C3R and identified ways they might be able to incorporate it into their course content. If a school did not plan for teachers to use C3R software in their course, teachers were less likely to be familiar with it.

School staff also identified factors that supported implementation.

- **Support for the goals of the initiative.** Educators and cooperative staff who participated in interviews supported the goals of C3R and reported that it was highly aligned with

each school's improvement goals. The components of C3R directly related to the accountability system each school was measured on. Stakeholders universally agreed that students needed these academic and social skills for a successful transition to adulthood. They also reported that it was necessary to deliver personalized college and career counseling because there was little exposure to and knowledge of careers in their rural communities.

- **High-speed internet in schools.** KDE provides and manages high-speed internet in schools across the state. The access provided by the state eliminated some of the most basic barriers to implementing an online intervention. Furthermore, according to KVEC, GRREC, and school staff, the internet service provided by KDE far exceeded the quality of internet available to students at home. In many communities, high-speed internet was not available at all.
- **Regional meetings in the early years to learn from other schools.** During the pilot year and first two years of the initiative, WIN and cooperative staff coordinated regional meetings for school staff. Individuals who attended identified these as key levers in learning about how C3R could be integrated with existing programs and in improving planning. Without these meetings, there would have been few opportunities for leaders of different districts to convene and learn from each other. The meetings also offered an opportunity for attendees to discuss technical issues with WIN and staff from other districts.
- **Perceptions that the software prepared students for assessments.** Teachers and leaders reported that CRC and SoftSkills software prepared students for assessments used in the accountability system in Kentucky. Across the years, teachers and leaders noted the following:

> We think our improved CCR (College and Career Readiness) scores are because students used WIN. We pushed the high school to use WIN with all of their students to improve the CCR scores for the whole school. (School leader)

> Many of our students need extra practice and we have time set aside for this practice. WIN is a great fit, but we can't rely on it [because of technical issues]. (Teacher)

> Most of the teachers don't know about WIN. I think if they did, more teachers [would] use it and we would see better scores for our accountability. (Teacher)

In combination, CRC and SoftSkills were viewed as a lever for increasing CCR scores for career-ready students. They provided students with the supports to earn the requisite score on the WorkKeys and KOSSA.

- **Quality of the software.** School and cooperative staff described the content as "better than" or "just as good as" other software available in the district. Educators consistently identified MyStrategic Compass as better than the software offered by the state. It was described as more comprehensive and provided students with more relevant data to inform their decisions. However, the time demands placed on teachers to upload work

completed in MyStrategic Compass did not outweigh the strengths of MyStrategic Compass over the state-mandated Career Cruising. In addition to improving students' career-ready status, SoftSkills was credited for building skills to successfully manage social situations in the classroom (e.g., teamwork, professionalism). Educators perceived CRC as a tool for preparing students for the COMPASS assessment more so than the ACT. CRC was described as a useful support in a remedial curriculum for academically struggling students because it provided practical, workplace applications for reading and mathematics skills.

- **Perceptions of improved support from WIN.** In the third year, WIN staff reported shifting the approach to partnering with schools. Planning and support focused on the needs of a school and its students rather than the participation goals and fidelity levels. Throughout years 3 and 4, principal and teacher interview participants commented on improved support and responsiveness from WIN staff. Interview participants also noted fewer technical issues in the final year of C3R. In an effort to provide ongoing support to schools after the end of C3R, WIN also provided student licenses for the 2017–2018 school year to all schools at no cost.

## Summary

The C3R initiative did not approach its original goal for all students in grades 8 through 12 to participate each year. Approximately 20 percent of eligible students logged any usage time in a component of C3R and, on average, 5 percent of students used more than one software application in a year. In the cases in which students did use the software, usage did not meet the levels intended. No student used CRC, SoftSkills and MyStrategic Compass at the prescribed levels in any year. As a result, no schools implemented C3R as initially intended.

Stakeholders identified technical issues with C3R as the primary barrier to implementing the initiative as designed. Students were unable to access the software at all due to issues with the internet. Some schools resolved the problems with limited effort, while others were unable to solve the problems even after considerable efforts by many parties. There were other issues with the reliability of the C3R software. When students did log in, they were often "kicked out" and the software did not retain records of their work. Unreliable software created frustrations for teachers and students, and poor reliability resulted in teachers allocating little to no time for C3R, even though educators thought it was high quality. Limited access to computers or devices, as well as incompatibility with devices, created additional barriers in classes.

Schools did not plan for all students to engage with CRC, SoftSkills, and MyStrategic Compass in a school year; therefore, the goal of 100 percent participation proved unrealistic. There was not enough time in the year for all students to engage in C3R as intended. According to teachers, there was barely enough time to deliver instruction in the core curriculum. Interview participants also noted that not all students needed to use each of the software applications or at the levels specified by WIN. A small group of teachers that we interviewed were not familiar with C3R but stated that they might have adopted the software on their own, had they known about it and its relationship to their core content.

Despite obstacles to C3R, school-level educators and cooperative staff who participated in interviews identified its goals as aligned with school and district priorities. Improving CCR and tools that supported these improvements were a primary focus in all schools. Stakeholders consistently identified CRC, SoftSkills, and MyStratgic Compass—the components of C3R—as high-quality supports to achieve these goals. Most schools persisted with implementation planning even if they experienced technical challenges. Overall, schools participating in C3R were supportive of the initiative and valued the ways the software could help prepare students for life after high school. At the close of the study, WIN offered to continue use of CRC, SoftSkills, or MyStrategic Compass at no cost in the 2017–2018 school year. According to district-level usage data provided by WIN, 16 districts continued to use CRC and 19 districts used SoftSkills.

# 5. Effects of C3R on Student Outcomes

This chapter describes our evaluation of the impact of C3R on student outcomes. Table 5.1 summarizes the results of outcomes analyses. Focusing first on Year 4, which is our primary set of confirmatory outcomes, there are no statistically significant treatment effects in any of the four domains. In the analyses of preliminary effects in the earlier years, only one test (proficiency rates on the algebra EOC exam in year 1) produced a significant treatment estimate. Because this isolated result is not replicated in subsequent years, we conclude that it is most likely spurious.

**Table 5.1. Results of Outcomes Analysis**

| | Year 1 (2013–2014) | Year 2 (2014–2015) | Year 3 (2015–2016) | Year 4 (2016–2017) |
|---|---|---|---|---|
| **Academic Achievement Domain** | | | | |
| Algebra EOC proficiency rate | 14%[a] | 2% | 1% | 4% |
| English EOC proficiency rate | 0% | –2% | –1% | 3% |
| PLAN score (standardized) | 0.12 | 0.23 | N/A | N/A |
| ACT score (standardized) | 0.03 | 0.16 | –0.18 | 0.19 |
| **CCR Domain** | | | | |
| College- and career-ready rate | 4% | –1% | 0% | –4% |
| **School Completion Domain** | | | | |
| Graduation rate | 1% | 0% | 0% | 0% |
| Dropout rate | 0% | 0% | 0% | 0% |
| **Transition Domain** | | | | |
| Transition failure rate | N/A | 0% | –1% | 0% |

NOTE: Values in table are estimated effect of C3R on rates (where percentages are shown) and points on the test scale otherwise.
[a] There is statistical significance after adjustment for multiple hypothesis tests.

We conclude that there were no discernable effects of C3R on student outcomes. Given the small fractions of students who were exposed to the C3R component software applications, this is unsurprising. Even if the software improved outcomes for the students who actively

participated, the effects may have been too diluted to discern in the school-level measures available for this analysis.

# 6. Conclusions and Recommendations

C3R aimed to provide rural students with access to software that supports academic readiness for college and careers, the social skills required for success in life, and access to online-counseling software. CRC provided students with personalized, mastery-based instruction for career- and college-ready mathematics and ELA. SoftSkills focused on preparing students' social skills for the workforce with a personalized, mastery-based curriculum. MyStrategic Compass delivered personalized college or career planning.

The goals of the initiative were for students in grades 8 through 12 to use all three software applications each year. However, the number of students who used even a single software application in a year was extremely low. Very few students used all three software products every year. Approximately 20 percent of students eligible to participate in C3R—as a proportion of the total population of students in participating schools—engaged with at least one software application in a given year.

Implementation fidelity benchmarks set by WIN required students to use each software at a specified level each year, either in terms of usage hours or by being awarded mastery certificates. Among the students who participated in C3R, no students met the WIN fidelity benchmarks for all three software products in any year. For the purpose of school-level fidelity, 90 percent or more of students were to meet fidelity for each software product. Given low participation in the C3R initiative, very few students achieved fidelity for a single software, and no students met fidelity for the overall initiative.

The impact study found no effects of C3R. This is unsurprising, given that no school implemented C3R as intended. Even if C3R had the potential to produce positive effects, an insufficient number of students participated, and those who did participate did not do so at sufficiently high dosages. The design for the implementation and impact studies was developed in advance of the first year of implementation for the national evaluation of i3 grants and based on communication about the initiative to schools. There were limitations in adapting the study design to reflect the realities of low participation and fidelity.

School-level educators did not plan for all students to use each software in a year, let alone at the levels prescribed by WIN. There were several other issues that largely related to inconsistent and uninterrupted access. Educators persisted with planning and usage despite these challenges; however, actual usage did not match projected usage from implementation plans. There was reluctance to rely on C3R to serve as the primary instructional supplement or fully integrate it with existing programs or practices because of the technical challenges experienced with each software application. At the end of the four years of C3R, educators and cooperative staff remained supportive of the initiative. Educators still perceived C3R and its components could support students' readiness for life after high school.

Findings from this study provide some useful insights about planning and implementation to school-based personal and program developers interested in using educational technology in schools. We offer the following recommendations:

- **Approach the adoption as a partnership between software developers and educators, particularly when adopting software in a new context.** School-based personnel and program developers each contribute expertise. School-based personnel know the context of their school (e.g., availability of resources) and students, as well as their needs. Developers offer expertise on the product, potential benefits, and lessons learned from implementation in other contexts. Leveraging these complementary experiences in a partnership arrangement could facilitate adoption and implementation. In interviews for this study, creation of a single login portal for the C3R initiative was described as a strength partly because it helped to create a sense of partnership among cooperative, school, and WIN staff early in the project.
- **Clearly communicate how educational technology supports school or district goals in order to build buy-in.** Interview participants familiar with the C3R initiative described how each software application addressed KDE accountability measures. Further, participants reported how the accountability measures related to school and district improvement goals. Strong buy-in resulted in implementation planning and usage despite considerable technical difficulties in years one and two of C3R.
- **Establish implementation goals that jointly reflect perspectives of software developers and educators.** There was a disconnect between the implementation goals developed by WIN and the implementation plans developed by schools. WIN planned for all students to use each application at a specified level for the purpose of the evaluation. Schools reportedly designed plans that supported their accountability goals and the needs of their students. The differing goals created tension in the early years of the partnership, particularly in the context of persistent technical difficulties. Implementation goals that reflect perspectives of developers and educators enhances perceptions of a partnership and may support strong implementation. Additionally, realistic implementation goals would support the design of an evaluation.
- **Develop tools and resources to support implementation planning.** WIN developed Narrative and Learning Plans that provided an overview of each software and its relationship to the state accountability system. The documents included templates for planning which classes, teachers, and students would use each software. Schools that completed such plans were more likely to use the software than schools that did not. Moreover, planning tools can also support implementation monitoring, an important consideration for districts leaders and evaluators.
- **Convene regular meetings of educators and software developers to discuss successes, challenges, and future directions.** Interview participants identified regular meetings between educators and WIN as important opportunities to discuss implementation successes and challenges. Regional meetings, in particular, provided an opportunity for educators to discuss the scope and scale of technical difficulties in the first and second years of the initiative. Meetings also provided educators opportunities to ask each other how C3R was integrated in existing programs. Interview participants described regional meetings as a support for implementation execution.

- **Assess technical capabilities of software and infrastructure (e.g., broadband, administrative settings, connectivity) prior to wide-scale usage.** Technical capabilities created the greatest challenges to implementation and perceptions of partnership in the first two years of C3R. A white paper distributed by WIN to schools outlining technical specifications supported basic assessments of capabilities. However, there were many challenges that could not be determined or resolved with this type of support. As an example, the demands on a system in job training centers were considerably different from the simultaneous and continuous usage of up to 30,000 students. There were also compatibility issues with some devices widely adopted in the K–12 setting (e.g., Adobe Flash requirements), and the software could not be used on these devices. Early and consistent assessments of capabilities and infrastructure may have alleviated barriers and tensions around implementation.

Consideration of these recommendations may help software developers and schools to successfully launch interventions using educational technology.

# Appendix A: Technical Appendixes

This section provides the technical appendixes from the study. This appendix contains information about the balance of treatment and control schools for the C3R initiative, as well as statistical model output for impact analyses.

**Table A.1. Assessment of Treatment-Comparison Group Balance Before and After Weighting**

| | | | Unweighted Balance | | | | Weighted Balance | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Treatment Mean | Treatment SD | Control Mean | Control SD | Standardized Effect Size | *p* Value | Control Mean | Control SD | Standardized Effect Size | *p* Value |
| Student Membership | 703.029 | 358.834 | 758.764 | 377.262 | –0.155 | 0.461 | 691.604 | 360.299 | 0.032 | 0.885 |
| Title I Eligible | 0.588 | 0.5 | 0.736 | 0.444 | –0.296 | 0.141 | 0.715 | 0.455 | –0.253 | 0.289 |
| Percentage, Female | 0.481 | 0.026 | 0.492 | 0.022 | –0.429 | 0.032 | 0.489 | 0.023 | –0.333 | 0.152 |
| Percentage, Free or Reduced-Price Lunch | 0.611 | 0.127 | 0.522 | 0.107 | 0.695 | 0.001 | 0.565 | 0.124 | 0.362 | 0.14 |
| Percentage, White | 0.929 | 0.104 | 0.891 | 0.114 | 0.372 | 0.084 | 0.871 | 0.168 | 0.558 | 0.206 |
| Per Student Spending | 7722.559 | 1887.453 | 7457.97 | 1263.592 | 0.14 | 0.455 | 7811.527 | 1803.722 | –0.047 | 0.866 |
| Transition Failure | 6.858 | 7.099 | 6.161 | 4.981 | 0.098 | 0.604 | 6.998 | 5.003 | –0.02 | 0.922 |
| Average Years of Teaching Experience | 12.341 | 2.486 | 11.379 | 1.744 | 0.387 | 0.043 | 11.445 | 1.89 | 0.36 | 0.095 |
| Student-Computer Ratio | 2.685 | 1.339 | 2.528 | 1.106 | 0.118 | 0.549 | 2.461 | 1.064 | 0.168 | 0.426 |
| Graduation Rate | 81.791 | 7.929 | 78.943 | 7.577 | 0.359 | 0.081 | 79.183 | 9.896 | 0.329 | 0.295 |
| Percentage College- or Career-Ready | 45.615 | 14.555 | 53.519 | 10.683 | –0.543 | 0.005 | 50.094 | 12.415 | –0.308 | 0.188 |
| Percentage Proficient or Distinguished | 46.15 | 9.644 | 49.921 | 10.065 | -0.391 | 0.065 | 46.31 | 12.12 | –0.017 | 0.955 |

| | | | Unweighted Balance | | | | Weighted Balance | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Treatment Mean** | **Treatment SD** | **Control Mean** | **Control SD** | **Standardized Effect Size** | ***p* Value** | **Control Mean** | **Control SD** | **Standardized Effect Size** | ***p* Value** |
| English | | | | | | | | | | |
| Percentage Proficient or Distinguished Algebra | 31.574 | 12.949 | 37.105 | 16.176 | –0.427 | 0.06 | 35.043 | 15.967 | –0.268 | 0.29 |
| Mean Score ACT | 18.141 | 0.996 | 18.614 | 0.937 | –0.474 | 0.021 | 18.221 | 1.323 | –0.08 | 0.802 |
| Mean Score PLAN | 16.582 | 0.711 | 16.899 | 0.651 | –0.445 | 0.029 | 16.646 | 0.813 | –0.09 | 0.754 |
| Dropout Rate | 1.2 | 0.934 | 1.306 | 0.919 | –0.113 | 0.584 | 1.365 | 1.136 | –0.177 | 0.57 |

**Table A.2. Statistical Model Output for Analysis of Effect on Graduation Rates**

| | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2013–2014 School Year | | | 2014–2015 School Year | | | 2015–2016 School Year | | | 2016–2017 School Year | | |
| (intercept) | 49.063 | 29.062 | 0.095 | –2.073 | 31.908 | 0.948 | 57.887 | 23.977 | 0.018 | 66.751 | 18.417 | 0.000 |
| **Treatment Effect on Graduation Rate** | **0.528** | **0.969** | **0.587** | **–0.352** | **1.055** | **0.740** | **–0.199** | **1.024** | **0.846** | **0.216** | **0.725** | **0.766** |
| Student Membership | –0.002 | 0.002 | 0.172 | –0.001 | 0.002 | 0.665 | –0.003 | 0.002 | 0.039 | –0.003 | 0.002 | 0.066 |
| Title I Eligible | –1.419 | 1.074 | 0.190 | –1.552 | 1.135 | 0.175 | –1.135 | 0.957 | 0.239 | –0.375 | 0.805 | 0.642 |
| Percentage, Female | 37.257 | 27.646 | 0.181 | 65.867 | 28.265 | 0.022 | 39.759 | 25.904 | 0.128 | 31.524 | 21.305 | 0.143 |
| Percentage, Free or Reduced-Price Lunch | 1.517 | 8.319 | 0.856 | 11.368 | 8.454 | 0.182 | 1.988 | 6.165 | 0.748 | 3.620 | 5.440 | 0.508 |
| Percentage, White | –1.843 | 4.381 | 0.675 | 6.698 | 5.253 | 0.206 | 2.547 | 5.220 | 0.627 | 8.423 | 4.062 | 0.041 |
| Per-Pupil Spending | 0.000 | 0.000 | 0.849 | 0.001 | 0.000 | 0.076 | 0.000 | 0.000 | 0.717 | 0.000 | 0.000 | 0.090 |
| Average Years of Teaching Experience | 0.011 | 0.198 | 0.956 | –0.117 | 0.182 | 0.521 | –0.103 | 0.164 | 0.533 | 0.252 | 0.174 | 0.151 |
| Student-Computer Ratio | 0.057 | 0.446 | 0.899 | 0.335 | 0.489 | 0.496 | 0.518 | 0.388 | 0.185 | 0.525 | 0.271 | 0.057 |
| Graduation Rate | 0.071 | 0.058 | 0.223 | 0.078 | 0.067 | 0.247 | 0.035 | 0.050 | 0.491 | 0.053 | 0.035 | 0.136 |
| Percentage, College- or Career-Ready | 0.024 | 0.043 | 0.577 | 0.019 | 0.057 | 0.745 | –0.059 | 0.041 | 0.152 | 0.040 | 0.024 | 0.095 |
| Percentage, Proficient or Distinguished English | –0.040 | 0.086 | 0.640 | –0.114 | 0.094 | 0.227 | –0.071 | 0.086 | 0.406 | –0.041 | 0.053 | 0.447 |
| Percentage, Proficient or Distinguished Algebra | 0.009 | 0.040 | 0.831 | –0.048 | 0.043 | 0.272 | 0.002 | 0.039 | 0.962 | –0.053 | 0.044 | 0.229 |
| Mean Score ACT | 2.063 | 0.838 | 0.016 | 2.602 | 0.952 | 0.008 | 2.056 | 0.783 | 0.010 | 0.819 | 0.536 | 0.131 |
| Mean Score PLAN | –0.637 | 1.371 | 0.643 | 0.236 | 1.444 | 0.871 | –0.793 | 1.334 | 0.554 | –0.694 | 0.831 | 0.405 |
| Dropout Rate | –1.706 | 0.633 | 0.008 | –1.198 | 0.876 | 0.175 | –1.097 | 0.568 | 0.057 | –0.828 | 0.468 | 0.080 |
| Transition Failure | –0.248 | 0.108 | 0.024 | –0.418 | 0.124 | 0.001 | –0.384 | 0.085 | 0.000 | –0.217 | 0.066 | 0.001 |

## Table A.3. Statistical Model Output for Analysis of Effect on College and Career Readiness

| | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2013–2014 School Year | | | 2014–2015 School Year | | | 2015–2016 School Year | | | 2016–2017 School Year | | |
| (intercept) | 31.003 | 82.176 | 0.707 | –30.379 | 84.388 | 0.720 | –44.268 | 93.296 | 0.636 | 123.109 | 114.471 | 0.285 |
| **Treatment Effect on CCR** | **4.277** | **3.246** | **0.191** | **–0.667** | **2.516** | **0.792** | **–0.381** | **2.765** | **0.891** | **–3.512** | **2.837** | **0.219** |
| Student Membership | –0.006 | 0.005 | 0.279 | –0.004 | 0.004 | 0.333 | –0.001 | 0.005 | 0.778 | 0.001 | 0.006 | 0.911 |
| Title I Eligible | –6.265 | 3.731 | 0.097 | –7.971 | 3.116 | 0.012 | –6.237 | 2.388 | 0.011 | –6.535 | 2.940 | 0.029 |
| Percentage, Female | 103.351 | 77.301 | 0.185 | 17.074 | 68.298 | 0.803 | 108.815 | 74.604 | 0.148 | 39.260 | 81.584 | 0.632 |
| Percentage, Free or Reduced-Price Lunch | 2.756 | 21.806 | 0.900 | 23.979 | 16.674 | 0.154 | 0.579 | 15.852 | 0.971 | –15.648 | 23.600 | 0.509 |
| Percentage, White | 26.889 | 13.254 | 0.046 | 14.642 | 13.215 | 0.271 | 25.510 | 13.537 | 0.063 | 32.166 | 15.547 | 0.042 |
| Per-Pupil Spending | 0.000 | 0.001 | 0.985 | –0.001 | 0.001 | 0.494 | 0.001 | 0.002 | 0.516 | 0.000 | 0.001 | 0.813 |
| Average Years of Teaching Experience | –0.314 | 0.733 | 0.670 | –0.124 | 0.483 | 0.798 | –0.451 | 0.445 | 0.313 | 1.842 | 0.408 | 0.000 |
| Student-Computer Ratio | –0.614 | 1.289 | 0.635 | 0.889 | 1.102 | 0.422 | 0.789 | 1.143 | 0.492 | 2.220 | 1.604 | 0.170 |
| Graduation Rate | 0.138 | 0.237 | 0.563 | 0.005 | 0.180 | 0.978 | –0.063 | 0.159 | 0.694 | –0.279 | 0.193 | 0.151 |
| Percentage, College- or Career-Ready | 0.165 | 0.167 | 0.325 | –0.041 | 0.129 | 0.750 | –0.227 | 0.126 | 0.075 | –0.351 | 0.130 | 0.008 |
| Percentage, Proficient or Distinguished English | 0.363 | 0.251 | 0.151 | 0.063 | 0.226 | 0.781 | –0.151 | 0.236 | 0.523 | –0.006 | 0.216 | 0.978 |
| Percentage, Proficient or Distinguished Algebra | 0.074 | 0.150 | 0.623 | –0.065 | 0.110 | 0.553 | –0.045 | 0.110 | 0.685 | 0.101 | 0.132 | 0.448 |
| Mean Score ACT | –0.941 | 2.317 | 0.685 | 1.909 | 2.326 | 0.414 | 3.345 | 3.007 | 0.269 | 0.564 | 2.216 | 0.800 |
| Mean Score PLAN | –2.473 | 3.727 | 0.509 | 3.464 | 3.477 | 0.322 | 1.334 | 3.333 | 0.690 | –3.888 | 3.997 | 0.333 |
| Dropout Rate | 0.460 | 2.786 | 0.869 | 1.037 | 1.655 | 0.533 | –0.632 | 1.700 | 0.711 | –5.544 | 1.878 | 0.004 |
| Transition Failure | 0.110 | 0.229 | 0.632 | 0.154 | 0.192 | 0.423 | –0.065 | 0.245 | 0.792 | 0.047 | 0.285 | 0.868 |

## Table A.4. Statistical Model Output for Analysis of Effect on Percentage Proficient or Distinguished, English

| | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2013–2014 School Year | | | 2014–2015 School Year | | | 2015–2016 School Year | | | 2016–2017 School Year | | |
| (intercept) | 46.420 | 45.957 | 0.315 | 90.092 | 36.744 | 0.016 | –3.923 | 35.755 | 0.913 | 65.048 | 51.898 | 0.214 |
| **Treatment Effect on English** | **0.034** | **1.483** | **0.982** | **–1.530** | **1.439** | **0.291** | **–0.822** | **1.432** | **0.568** | **3.017** | **1.476** | **0.044** |
| Student Membership | –0.003 | 0.003 | 0.363 | 0.003 | 0.002 | 0.145 | 0.004 | 0.002 | 0.053 | 0.000 | 0.003 | 0.949 |
| Title I Eligible | –1.496 | 1.556 | 0.339 | –1.774 | 1.666 | 0.290 | –1.125 | 1.441 | 0.437 | –0.922 | 2.029 | 0.651 |
| Percentage, Female | 12.304 | 34.955 | 0.726 | –23.270 | 24.462 | 0.344 | 20.950 | 35.945 | 0.562 | 54.819 | 37.941 | 0.152 |
| Percentage, Free or Reduced-Price Lunch | –18.805 | 8.675 | 0.033 | –20.321 | 9.712 | 0.039 | –5.192 | 9.334 | 0.580 | –35.082 | 12.085 | 0.005 |
| Percentage, White | 2.426 | 6.815 | 0.723 | 13.783 | 6.058 | 0.025 | 10.338 | 6.259 | 0.102 | 15.752 | 7.377 | 0.036 |
| Per-Pupil Spending | –0.001 | 0.001 | 0.114 | 0.001 | 0.000 | 0.013 | 0.001 | 0.000 | 0.001 | 0.000 | 0.001 | 0.991 |
| Average Years of Teaching Experience | 0.017 | 0.292 | 0.952 | –0.210 | 0.288 | 0.468 | 0.099 | 0.218 | 0.651 | 0.468 | 0.413 | 0.260 |
| Student-Computer Ratio | 0.576 | 0.680 | 0.400 | 1.134 | 0.607 | 0.065 | 1.320 | 0.516 | 0.012 | –0.127 | 0.726 | 0.862 |
| Graduation Rate | 0.031 | 0.121 | 0.796 | 0.328 | 0.092 | 0.001 | 0.009 | 0.062 | 0.882 | –0.022 | 0.113 | 0.847 |
| Percentage, College- or Career-Ready | 0.078 | 0.066 | 0.237 | –0.090 | 0.061 | 0.146 | 0.097 | 0.045 | 0.036 | 0.004 | 0.061 | 0.951 |
| Percentage, Proficient or Distinguished English | 0.185 | 0.135 | 0.175 | 0.536 | 0.088 | 0.000 | 0.382 | 0.131 | 0.004 | 0.054 | 0.136 | 0.695 |
| Percentage, Proficient or Distinguished Algebra | 0.024 | 0.075 | 0.746 | –0.018 | 0.070 | 0.797 | –0.024 | 0.044 | 0.595 | 0.084 | 0.067 | 0.211 |
| Mean Score ACT | 2.365 | 1.335 | 0.080 | –2.940 | 1.043 | 0.006 | –0.129 | 0.898 | 0.886 | –1.740 | 1.490 | 0.246 |
| Mean Score PLAN | –2.342 | 2.273 | 0.306 | –1.535 | 1.464 | 0.297 | 0.538 | 2.173 | 0.805 | –0.245 | 2.232 | 0.913 |
| Dropout Rate | –0.117 | 0.909 | 0.898 | –1.412 | 0.957 | 0.144 | –0.452 | 0.938 | 0.631 | –1.827 | 1.051 | 0.086 |
| Transition Failure | –0.311 | 0.127 | 0.017 | –0.061 | 0.083 | 0.468 | –0.496 | 0.078 | 0.000 | –0.535 | 0.157 | 0.001 |

## Table A.5. Statistical Model Output for Analysis of Effect on Percentage Proficient or Distinguished, Algebra

| | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2013–2014 School Year | | | 2014–2015 School Year | | | 2015–2016 School Year | | | 2016–2017 School Year | | |
| (intercept) | 100.014 | 141.795 | 0.483 | 360.005 | 72.321 | 0.000 | 279.147 | 87.704 | 0.002 | 144.988 | 92.967 | 0.123 |
| **Treatment Effect on Algebra** | **14.381** | **4.612** | **0.002** | **1.652** | **2.811** | **0.558** | **1.225** | **3.591** | **0.734** | **4.127** | **3.374** | **0.225** |
| Student Membership | –0.007 | 0.007 | 0.295 | 0.010 | 0.004 | 0.027 | 0.017 | 0.006 | 0.003 | 0.008 | 0.007 | 0.258 |
| Title I Eligible | 3.133 | 4.306 | 0.469 | –5.088 | 2.631 | 0.056 | –0.023 | 2.739 | 0.993 | –3.279 | 3.867 | 0.399 |
| Percentage, Female | –174.186 | 114.059 | 0.130 | –167.195 | 56.210 | 0.004 | –49.723 | 74.473 | 0.506 | –13.679 | 76.743 | 0.859 |
| Percentage, Free or Reduced-Price Lunch | –16.322 | 24.280 | 0.503 | –50.597 | 15.315 | 0.001 | –39.154 | 17.068 | 0.024 | –28.252 | 17.921 | 0.119 |
| Percentage, White | –58.446 | 17.395 | 0.001 | –4.887 | 11.485 | 0.672 | –27.165 | 12.408 | 0.031 | 4.606 | 13.926 | 0.742 |
| Per-Pupil Spending | –0.002 | 0.002 | 0.190 | -0.002 | 0.001 | 0.034 | –0.002 | 0.001 | 0.047 | –0.001 | 0.001 | 0.431 |
| Average Years of Teaching Experience | –0.797 | 0.759 | 0.297 | –0.882 | 0.526 | 0.097 | –0.210 | 0.511 | 0.682 | –0.464 | 0.657 | 0.482 |
| Student-Computer Ratio | 0.081 | 1.709 | 0.962 | –1.528 | 1.175 | 0.197 | –0.686 | 1.263 | 0.589 | 0.937 | 1.567 | 0.551 |
| Graduation Rate | 0.159 | 0.283 | 0.575 | 0.137 | 0.194 | 0.483 | 0.061 | 0.149 | 0.684 | –0.288 | 0.233 | 0.218 |
| Percentage, College- or Career-Ready | –0.119 | 0.135 | 0.382 | –0.136 | 0.077 | 0.082 | –0.271 | 0.113 | 0.018 | –0.117 | 0.142 | 0.413 |
| Percentage, Proficient or Distinguished English | 0.735 | 0.334 | 0.030 | 0.642 | 0.202 | 0.002 | 0.495 | 0.254 | 0.054 | –0.072 | 0.281 | 0.800 |
| Percentage, Proficient or Distinguished Algebra | 0.395 | 0.146 | 0.008 | 0.287 | 0.101 | 0.006 | 0.276 | 0.135 | 0.044 | 0.484 | 0.125 | 0.000 |
| Mean Score ACT | 6.597 | 3.429 | 0.058 | 2.119 | 1.668 | 0.207 | 5.358 | 1.928 | 0.007 | 2.122 | 2.484 | 0.395 |
| Mean Score PLAN | –4.872 | 6.000 | 0.419 | –15.600 | 4.291 | 0.000 | –16.757 | 4.477 | 0.000 | –5.851 | 4.719 | 0.218 |
| Dropout Rate | 6.795 | 2.921 | 0.022 | –1.116 | 1.457 | 0.446 | –4.618 | 1.619 | 0.005 | –3.361 | 2.103 | 0.114 |
| Transition Failure | 0.381 | 0.387 | 0.328 | –0.909 | 0.180 | 0.000 | –0.347 | 0.187 | 0.067 | –0.614 | 0.255 | 0.018 |

## Table A.6. Statistical Model Output for Analysis of Effect on Mean Score ACT

| | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2013–2014 School Year | | | 2014–2015 School Year | | | 2015–2016 School Year | | | 2016–2017 School Year | | |
| (intercept) | 11.053 | 4.223 | 0.010 | 14.182 | 5.474 | 0.011 | 21.869 | 4.377 | 0.000 | 15.466 | 4.443 | 0.001 |
| **Treatment Effect on ACT** | **0.026** | **0.138** | **0.853** | **0.162** | **0.162** | **0.320** | **–0.178** | **0.178** | **0.322** | **0.194** | **0.201** | **0.339** |
| Student Membership | 0.000 | 0.000 | 0.193 | 0.000 | 0.000 | 0.346 | 0.000 | 0.000 | 0.279 | 0.000 | 0.000 | 0.367 |
| Title I Eligible | –0.096 | 0.185 | 0.606 | 0.021 | 0.171 | 0.902 | 0.112 | 0.204 | 0.582 | 0.029 | 0.195 | 0.884 |
| Percentage, Female | –4.856 | 4.166 | 0.247 | –4.505 | 4.295 | 0.297 | –3.724 | 3.949 | 0.348 | –4.409 | 6.435 | 0.495 |
| Percentage, Free or Reduced-Price Lunch | –0.302 | 1.058 | 0.776 | –2.956 | 0.851 | 0.001 | –2.462 | 1.120 | 0.031 | –1.514 | 1.175 | 0.201 |
| Percentage, White | –0.502 | 0.723 | 0.490 | –0.224 | 0.780 | 0.775 | –0.862 | 1.001 | 0.391 | -0.004 | 1.079 | 0.997 |
| Per-Pupil Spending | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.771 | 0.000 | 0.000 | 0.645 | 0.000 | 0.000 | 0.741 |
| Average Years of Teaching Experience | –0.026 | 0.023 | 0.270 | –0.036 | 0.032 | 0.254 | 0.017 | 0.031 | 0.590 | 0.034 | 0.037 | 0.365 |
| Student-Computer Ratio | 0.004 | 0.051 | 0.937 | -0.094 | 0.081 | 0.250 | –0.022 | 0.086 | 0.803 | 0.110 | 0.073 | 0.136 |
| Graduation Rate | –0.001 | 0.008 | 0.936 | 0.003 | 0.015 | 0.852 | 0.019 | 0.011 | 0.096 | 0.015 | 0.013 | 0.239 |
| Percentage College- or Career-Ready | 0.001 | 0.006 | 0.850 | -0.001 | 0.005 | 0.912 | –0.008 | 0.006 | 0.184 | 0.004 | 0.008 | 0.645 |
| Percentage, Proficient or Distinguished English | 0.004 | 0.012 | 0.713 | 0.016 | 0.015 | 0.275 | 0.029 | 0.012 | 0.014 | 0.004 | 0.015 | 0.816 |
| Percentage Proficient or Distinguished Algebra | 0.012 | 0.007 | 0.098 | 0.005 | 0.006 | 0.411 | 0.006 | 0.007 | 0.343 | 0.003 | 0.006 | 0.659 |

| | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2013–2014 School Year | | | 2014–2015 School Year | | | 2015–2016 School Year | | | 2016–2017 School Year | | |
| Mean Score ACT | 0.421 | 0.127 | 0.001 | 0.574 | 0.118 | 0.000 | 0.182 | 0.119 | 0.129 | 0.350 | 0.136 | 0.012 |
| Mean Score PLAN | 0.234 | 0.198 | 0.240 | –0.140 | 0.322 | 0.664 | –0.317 | 0.195 | 0.107 | –0.093 | 0.260 | 0.721 |
| Dropout Rate | –0.042 | 0.092 | 0.649 | –0.032 | 0.092 | 0.730 | –0.262 | 0.090 | 0.005 | –0.225 | 0.126 | 0.079 |
| Transition Failure | 0.002 | 0.011 | 0.829 | –0.015 | 0.012 | 0.214 | 0.006 | 0.011 | 0.624 | –0.040 | 0.012 | 0.001 |

**Table A.7. Statistical Model Output for Analysis of Effect on Mean Score PLAN**

| | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2013–2014 School Year | | | 2014–2015 School Year | | | 2015–2016 School Year | | | 2016–2017 School Year | | |
| (intercept) | 5.347 | 4.146 | 0.201 | 7.878 | 2.906 | 0.008 | — | — | — | — | — | — |
| **Treatment Effect on PLAN** | **0.124** | **0.120** | **0.307** | **0.230** | **0.132** | **0.086** | — | — | — | — | — | — |
| Student Membership | 0.000 | 0.000 | 0.858 | 0.000 | 0.000 | 0.438 | — | — | — | — | — | — |
| Title I Eligible | –0.102 | 0.139 | 0.466 | 0.312 | 0.134 | 0.022 | — | — | — | — | — | — |
| Percentage, Female | –5.905 | 3.883 | 0.132 | –2.635 | 2.785 | 0.347 | — | — | — | — | — | — |
| Percentage, Free or Reduced-Price Lunch | –0.978 | 0.842 | 0.249 | –1.186 | 0.818 | 0.151 | — | — | — | — | — | — |
| Percentage, White | 1.936 | 0.633 | 0.003 | 0.934 | 0.689 | 0.179 | — | — | — | — | — | — |
| Per-Pupil Spending | 0.000 | 0.000 | 0.694 | 0.000 | 0.000 | 0.008 | — | — | — | — | — | — |
| Average Years of Teaching Experience | –0.073 | 0.025 | 0.004 | –0.051 | 0.024 | 0.041 | — | — | — | — | — | — |
| Student-Computer Ratio | 0.024 | 0.063 | 0.708 | –0.024 | 0.061 | 0.692 | — | — | — | — | — | — |
| Graduation Rate | 0.012 | 0.010 | 0.236 | 0.025 | 0.009 | 0.008 | — | — | — | — | — | — |
| Percent College and/or Career Ready | –0.012 | 0.005 | 0.037 | 0.000 | 0.004 | 0.924 | — | — | — | — | — | — |

| | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2013–2014 School Year | | | 2014–2015 School Year | | | 2015–2016 School Year | | | 2016–2017 School Year | | |
| Percentage, Proficient or Distinguished English | –0.004 | 0.011 | 0.725 | 0.006 | 0.007 | 0.415 | — | — | — | — | — | — |
| Percentage, Proficient or Distinguished Algebra | 0.007 | 0.006 | 0.243 | 0.003 | 0.005 | 0.614 | — | — | — | — | — | — |
| Mean Score ACT | 0.421 | 0.099 | 0.000 | -0.083 | 0.075 | 0.269 | — | — | — | — | — | — |
| Mean Score PLAN | 0.346 | 0.209 | 0.102 | 0.520 | 0.134 | 0.000 | — | — | — | — | — | — |
| Dropout Rate | –0.023 | 0.079 | 0.767 | –0.001 | 0.069 | 0.988 | — | — | — | — | — | — |
| Transition Failure | –0.002 | 0.009 | 0.862 | 0.002 | 0.008 | 0.783 | — | — | — | — | — | — |

**Table A.8. Statistical Model Output for Analysis of Effect on Transition Failure Rates**

| | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2013–2014 School Year | | | 2014–2015 School Year | | | 2015–2016 School Year | | | 2016–2017 School Year | | |
| (intercept) | — | — | — | –0.125 | 0.305 | 0.683 | –0.304 | 0.275 | 0.274 | 0.809 | 0.713 | 0.261 |
| **Treatment Effect on Transition Failure Rates** | — | — | — | **0.128** | **1.032** | **0.901** | **–0.728** | **1.281** | **0.571** | **–0.045** | **2.396** | **0.985** |
| Student Membership | — | — | — | 0.000 | 0.000 | 0.005 | 0.000 | 0.000 | 0.354 | 0.000 | 0.000 | 0.783 |
| Title I Eligible | — | — | — | 0.023 | 0.011 | 0.043 | 0.020 | 0.012 | 0.098 | 0.015 | 0.026 | 0.561 |
| Percentage, Female | — | — | — | 0.249 | 0.295 | 0.400 | –0.467 | 0.253 | 0.069 | 0.006 | 0.595 | 0.992 |
| Percentage, Free or Reduced-Price Lunch | — | — | — | 0.080 | 0.068 | 0.245 | 0.219 | 0.075 | 0.004 | -0.043 | 0.129 | 0.742 |
| Percentage, White | — | — | — | –0.078 | 0.060 | 0.198 | 0.070 | 0.056 | 0.215 | 0.049 | 0.095 | 0.607 |
| Per-Pupil Spending | — | — | — | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.128 | 0.000 | 0.000 | 0.834 |
| Average Years of Teaching Experience | — | — | — | 0.002 | 0.002 | 0.430 | –0.002 | 0.002 | 0.392 | 0.005 | 0.004 | 0.248 |
| Student-Computer Ratio | — | — | — | 0.008 | 0.004 | 0.046 | 0.007 | 0.004 | 0.087 | 0.018 | 0.007 | 0.016 |
| Graduation Rate | — | — | — | 0.000 | 0.001 | 0.797 | 0.001 | 0.001 | 0.293 | –0.001 | 0.002 | 0.706 |
| Percentage, College- or Career-Ready | — | — | — | –0.001 | 0.000 | 0.060 | –0.001 | 0.001 | 0.318 | –0.001 | 0.001 | 0.417 |

| | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2013–2014 School Year | | | 2014–2015 School Year | | | 2015–2016 School Year | | | 2016–2017 School Year | | |
| Percentage, Proficient or Distinguished English | — | — | — | –0.002 | 0.001 | 0.105 | 0.001 | 0.001 | 0.417 | 0.001 | 0.002 | 0.386 |
| Percentage, Proficient or Distinguished Algebra | — | — | — | 0.000 | 0.000 | 0.684 | -0.001 | 0.000 | 0.157 | 0.000 | 0.001 | 0.939 |
| Mean Score ACT | — | — | — | 0.021 | 0.011 | 0.049 | 0.010 | 0.011 | 0.376 | –0.033 | 0.024 | 0.165 |
| Mean Score PLAN | — | — | — | –0.010 | 0.012 | 0.385 | 0.008 | 0.013 | 0.570 | –0.015 | 0.026 | 0.552 |
| Dropout Rate | — | — | — | 0.269 | 0.540 | 0.620 | 1.103 | 0.647 | 0.092 | –3.813 | 2.266 | 0.097 |
| Transition Failure | — | — | — | 0.703 | 0.102 | 0.000 | 0.798 | 0.100 | 0.000 | 1.390 | 0.380 | 0.000 |

**Table A.9. Statistical Model Output for Analysis of Effect on Dropout Rates**

| | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2013–2014 School Year | | | 2014–2015 School Year | | | 2015–2016 School Year | | | 2016–2017 School Year | | |
| (intercept) | 0.164 | 0.060 | 0.007 | 0.121 | 0.049 | 0.016 | 0.137 | 0.046 | 0.004 | 0.120 | 0.046 | 0.011 |
| **Treatment Effect on Dropout Rates** | **–0.340** | **0.195** | **0.084** | **-0.319** | **0.187** | **0.091** | **0.113** | **0.202** | **0.576** | **–0.083** | **0.147** | **0.575** |
| Student Membership | 0.000 | 0.000 | 0.520 | 0.000 | 0.000 | 0.085 | 0.000 | 0.000 | 0.932 | 0.000 | 0.000 | 0.167 |
| Title I Eligible | 0.000 | 0.002 | 0.832 | –0.004 | 0.002 | 0.014 | 0.003 | 0.002 | 0.086 | 0.000 | 0.001 | 0.792 |
| Percentage, Female | –0.028 | 0.050 | 0.581 | –0.041 | 0.041 | 0.325 | –0.087 | 0.054 | 0.109 | –0.071 | 0.040 | 0.083 |
| Percentage, Free or Reduced-Price Lunch | –0.017 | 0.013 | 0.187 | –0.014 | 0.011 | 0.197 | –0.016 | 0.012 | 0.179 | –0.014 | 0.011 | 0.214 |
| Percentage, White | –0.008 | 0.009 | 0.379 | 0.002 | 0.008 | 0.810 | –0.011 | 0.008 | 0.154 | –0.008 | 0.006 | 0.184 |
| Per-Pupil Spending | 0.000 | 0.000 | 0.286 | 0.000 | 0.000 | 0.020 | 0.000 | 0.000 | 0.985 | 0.000 | 0.000 | 0.552 |
| Average Years of Teaching Experience | 0.000 | 0.000 | 0.165 | 0.001 | 0.000 | 0.004 | 0.000 | 0.000 | 0.335 | 0.000 | 0.000 | 0.516 |
| Student-Computer Ratio | 0.000 | 0.001 | 0.894 | –0.002 | 0.001 | 0.020 | 0.000 | 0.001 | 0.870 | 0.000 | 0.001 | 0.497 |
| Graduation Rate | 0.000 | 0.000 | 0.350 | 0.000 | 0.000 | 0.456 | 0.000 | 0.000 | 0.267 | 0.000 | 0.000 | 0.145 |
| Percentage, College- or Career-Ready | 0.000 | 0.000 | 0.070 | 0.000 | 0.000 | 0.079 | 0.000 | 0.000 | 0.724 | 0.000 | 0.000 | 0.337 |

| | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value | Estimate | Standard Error | *p* value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **2013–2014 School Year** | | | **2014–2015 School Year** | | | **2015–2016 School Year** | | | **2016–2017 School Year** | | |
| Percentage, Proficient or Distinguished English | 0.000 | 0.000 | 0.625 | 0.000 | 0.000 | 0.465 | 0.000 | 0.000 | 0.437 | 0.000 | 0.000 | 0.289 |
| Percentage, Proficient or Distinguished Algebra | 0.000 | 0.000 | 0.105 | 0.000 | 0.000 | 0.568 | 0.000 | 0.000 | 0.170 | 0.000 | 0.000 | 0.127 |
| Mean Score ACT | –0.004 | 0.001 | 0.007 | -0.002 | 0.001 | 0.194 | -0.004 | 0.001 | 0.001 | –0.004 | 0.001 | 0.002 |
| Mean Score PLAN | –0.002 | 0.003 | 0.335 | -0.003 | 0.002 | 0.213 | 0.000 | 0.002 | 0.936 | 0.000 | 0.002 | 0.904 |
| Dropout Rate | 0.116 | 0.146 | 0.429 | 0.190 | 0.120 | 0.117 | 0.336 | 0.125 | 0.009 | 0.044 | 0.114 | 0.702 |
| Transition Failure | 0.023 | 0.018 | 0.210 | 0.048 | 0.019 | 0.014 | 0.061 | 0.013 | 0.000 | 0.044 | 0.019 | 0.021 |

# References


Benjamini, Y., and Y. Hochberg, "Controlling the False Discovery Rate: A Practical and Powerful Approach to Multiple Testing," *Journal of the Royal Statistical Society Series B*, Vol. 57, 1995, pp. 289–300.

Bollinger, C. R., W. H. Hoyt, D. Blackwell, and M. T. Childress, *Kentucky Annual Economic Report: 2018*, Lexington, Ky.: University of Kentucky, 2018.

Florida Department of Education, *Ready to Work Program Performance Report: July 2007–December 2008*, Tallahassee, Fla., 2009. As of September 13, 2018: http://www.fldoe.org/core/fileparse.php/3/urlt/rtwevaluation.pdf

Guo, S., and M. W. Fraser, *Propensity Score Analysis: Statistical Methods and Applications*, 1st ed., Thousand Oaks, Calif.: SAGE Publications, 2009.

Hadlick, T., *Using the WIN Courseware to Prepare for the National Work Readiness Credential: The Industrial Certification and Training Program*, Syracuse University, 2011. As of September 13, 2018: https://www.hmhco.com/~/media/sites/home/education/disciplines/adult-education/adult/career-pathways/syracuse-report-130131.pdf

Kentucky Center for Workforce Statistics, *Kentucky Occupational Outlook to 2024: A Statewide Analysis of Wages, Employment, Growth, and Training*, Frankfort, Ky., June 2016. As of September 13, 2018: https://kystats.ky.gov/Content/Reports/2014-2024%20KY%20Occupational%20Outlook.pdf

Kentucky Senate Bill 38, Career Pathway Bill of 2012, April 19, 2012.

McCaffrey, D. F., G. Ridgeway, and A. R. Morral, "Propensity Score Estimation with Boosted Regression for Evaluating Adolescent Substance Abuse Treatment," *Psychological Methods,* Vol. 9, No. 4, 2004, pp. 403–442.

National Skills Coalition, *Kentucky Middle Skills Fact Sheet*, Washington D.C., 2017.

Pane, J. F., D. F. McCaffrey, M. E. Slaughter, J. L. Steele, and G. S. Ikemoto, "An Experiment to Evaluate the Efficacy of Cognitive Tutor Geometry," *Journal of Research on Educational Effectiveness*, Vol. 3, No. 3, 2010, pp. 254–281.

Pane, J. F., B. A. Griffin, D. F. McCaffrey, and R. Karam, "Effectiveness of Cognitive Tutor Algebra I at Scale," *Educational Evaluation and Policy Analysis*, Vol. 36, No. 2, 2014, pp. 127–144.

Pane, John F., Elizabeth D. Steiner, Matthew D. Baird, and Laura S. Hamilton, *Continued Progress: Promising Evidence on Personalized Learning*, Santa Monica, Calif.: RAND Corporation, RR-1365-BMGF, 2015. As of September 13, 2018: https://www.rand.org/pubs/research_reports/RR1365.html

Pane, John F., Elizabeth D. Steiner, Matthew D. Baird, Laura S. Hamilton, and Joseph D. Pane, *Informing Progress: Insights on Personalized Learning Implementation and Effects*, Santa Monica, Calif.: RAND Corporation, RR-2042-BMGF, 2017. As of September 13, 2018: https://www.rand.org/pubs/research_reports/RR2042.html

Shadish, W. R., T. D. Cook, and D. T. Campbell, *Experimental and Quasi-Experimental Designs for Generalized Causal Inference*, Boston: Houghton-Mifflin, 2002.

Southern Regional Education Board, *Kentucky Report: From Two Systems to One World-Class System of Technical Centers*, Atlanta, Ga., 2014. As of September 13, 2018: https://education.ky.gov/cte/cter/documents/sreb_ky_report_final.pdf

U.S. Department of Education, "States Report New High School Graduation Rates Using More Accurate, Common Measure," press release, November 26, 2012. As of September 20, 2018: https://www.ed.gov/news/press-releases/states-report-new-high-school-graduation-rates-using-more-accurate-common-measur

U.S. Department of Labor, *Workforce Innovation and Opportunity Act State Plan for the Commonwealth of Kentucky*, Washington, D.C., 2016. As of September 13, 2018: https://www2.ed.gov/about/offices/list/osers/rsa/wioa/state-plans/ky.pdf

WIN—*See* WIN Learning.

WIN Learning, *Kentucky College and Career Readiness: Career Readiness Courseware Narrative and Learning Plan*, Kingston, Tenn., 2013a.

WIN Learning, *Kentucky College and Career Readiness: SoftSkills Narrative and Planning Plan*, Kingston, Tenn., 2013b.

WIN Learning, *Kentucky College and Career Readiness: MyStrategic Compass Narrative and Learning Plan*, Kingston, Tenn., 2013c.