Addressing Inequity: Expanding Access to College-Level Courses for High School Students

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Abstract:

The opportunity to take college courses in high school (dual enrollment) is becoming increasingly prevalent, but access is not equitably distributed. Certain populations, such as economically disadvantaged students and students who are members of racial and ethnic groups historically underrepresented in college, are less likely to take dual enrollment courses. This paper presents findings from an evaluation of the College and Career Readiness Expansion Project, an effort to expand participation in dual enrollment courses within the context of broader changes in high schools. A quasi-experimental impact study showed that the project successfully expanded access, particularly for economically disadvantaged students. Implementation data showed that the schools participating in the project used a variety of strategies to expand access, including (1) understanding and using data; (2) increasing students' awareness of college courses and their importance; (3) supporting students' college readiness; (4) removing eligibility barriers; and (5) providing support for students taking college classes.

Keywords: inequity | high school students | dual enrollment | early college | College and Career Readiness program

Article:

Introduction

Dual enrollment courses—college-level courses that students take while in high school—are becoming more common in secondary education experiences. Over 82 percent of high schools nationally offer dual enrollment courses, and the number of students taking them has continued to increase (Fink, Citation2021; Taie & Lewis, Citation2020). The intent of dual enrollment is to increase students' readiness for postsecondary education, thereby facilitating the transition to college. Indeed, previous research shows dual enrollment participation positively impacts postsecondary enrollment and degree completion (An, Citation2013; An & Taylor, Citation2019; Institute of Education Sciences, Citation2017; Miller et al. Citation2018; Struhl & Vargas, Citation2012).

However, dual enrollment access and participation—and the attendant benefits—are not equitably distributed. There is substantial evidence to suggest that White students participate in dual enrollment at higher rates than Black and Hispanic students and that these gaps have been consistent over time (Xu, Solanki, & Fink, Citation2021). Further, economically disadvantaged students are much less likely to participate in dual enrollment courses (Pierson, Hodara, & Luke, Citation2017).

This paper reports on findings from the College and Career Readiness Expansion (CCRE) project, an effort to increase the number of high school students ready for college and careers focused on economically disadvantaged students and students who are members of racial or ethnic groups historically underrepresented in college. In 2016, Columbus State Community College began a 5-year U.S. Department of Education Investing in Innovation (i3) grant to implement CCRE with low-income school districts in Central Ohio. A core component of the project was expanding access to college-level courses, particularly for those target populations. We use results from a formal evaluation of the program to answer two research questions:

1. To what extent was CCRE successful at expanding access to college courses for economically disadvantaged students and students who were members of racial and ethnic groups historically underrepresented in college?
2. What strategies were used by schools to expand access?

We found that CCRE more than doubled the percentage of economically disadvantaged students and underrepresented students (defined as students who are members of underrepresented racial and ethnic groups historically underrepresented in higher education, including Black/African-American; Hispanic/Latino and Native American students) taking dual-enrollment courses in the Columbus area. The schools began by providing students with access to college courses and course pathways that could lead to industry-recognized credentials, stackable certificates, and degrees. They also used a variety of strategies to ensure that underrepresented students could have access to these courses, including (1) understanding and using data; (2) increasing students' awareness of college courses and their importance; (3) supporting students' college readiness; (4) removing eligibility barriers; and (5) providing support for students taking college classes.

Literature review

Dual enrollment courses, also called dual credit or concurrent enrollment courses, are college-level courses available to high school students through a postsecondary institution. Students can take these courses taught by college faculty at the college campus or online. Many high schools also offer dual enrollment courses on their own campus, where the classes are taught either by college faculty who come to the high school or high school teachers who have met the college's requirements and serve as adjunct faculty. Students who pass a dual enrollment class earn credits that can transfer to a postsecondary institution.

Benefits of dual enrollment

Research has shown that taking dual enrollment courses benefits students (1) when they are in high school and preparing for college and (2) once they get to college.

Dual enrollment can benefit students in high school as they prepare for college in various ways. Students start to see themselves as college students, which may change their post-high school plans (Kanny, 2015). Relatedly, students get exposure to college expectations, which can help them learn how to navigate more rigorous coursework independently in college (Edmunds et al., Citation2017a). Dual enrollment courses allow students to try on the role of a college student and "may act as a socializing organization" by providing "students with a transitional period where they begin to learn the normative rules and behaviors of being a college student" (An & Taylor, Citation2019, p. 131). Taking college courses in high school can also increase students' expectations, particularly in their senior year when many high school students are experiencing "senioritis" and essentially "checking out" (An & Taylor, Citation2019).

Once students get to college, the credits they earned in high school can provide them with academic momentum (An & Taylor, Citation2019). Earning college credits in high school can also save students money if they apply credits to their program of study and graduate with a postsecondary degree more quickly (Grubb, Scott & Good, 2017; Miller et al., Citation2018).

Generally, research has found that students who take dual enrollment courses have better long-term outcomes. They are more likely to enroll in postsecondary education (Allen & Dadgar, Citation2012; An, Citation2013), although there is evidence that in some situations, students may shift their enrollment from a four-year to a two-year college (Cowan & Goldhaber, Citation2015). Dual enrollment students have higher levels of academic performance in college (An & Taylor, Citation2019) and are more likely to persist in college (Struhl & Vargas, Citation2012). The current research suggests that dual enrollment students are also more likely to finish college and earn a postsecondary credential (An & Taylor, Citation2019; Struhl & Vargas, Citation2012).

A recent review of the literature indicates a consensus that these benefits accrue to students of all backgrounds, including low-income students, first-generation college-goers, and students who are members of underrepresented groups (An & Taylor, Citation2019). However, there are mixed results about which students benefit the most from taking dual enrollment courses. For example, one study found that dual enrollment's impacts on postsecondary performance were highest for lower-performing students compared to the high-performing students (Karp et al., Citation2007). On the other hand, some studies found that dual enrollment benefits White and high-income students the most (Struhl & Vargas, Citation2012; Taylor, Citation2015).

Access to dual enrollment

Despite its advantages, participation in dual enrollment courses is not equitable. Researchers have documented that certain groups of high school students are less likely to have access to college-level courses. These populations include economically disadvantaged students, and students who are members of certain racial and ethnic groups underrepresented in college, including Black, Hispanic/Latino, and Native American students (Pierson et al., Citation2017). Recent analyses of national dual enrollment data have found that White students participate in dual enrollment courses at approximately twice the rate of Black and Hispanic students (Xu, Solanki, & Fink, Citation2021). Another study found economically disadvantaged students are substantially less likely to take college courses (Hart, Friedmann, & Hill, Citation2018). Students who take dual enrollment courses are also more likely to be higher achieving (An & Taylor, Citation2019), which is not surprising given that the courses are taught at a college level and often have eligibility requirements.

Some researchers argue that the disparity might be due at least partially to the students' schools (An & Taylor, Citation2019). For example, schools with higher percentages of underrepresented racial and ethnic groups are less likely to have dual enrollment courses (Thomas, Marken, Gray, & Lewis, Citation2013). However, evidence suggests that schools with more economically disadvantaged students have higher dual enrollment participation rates (Gagnon, Liu, & Cherasaro, Citation2021), suggesting that there may be other factors beyond school provision of dual enrollment courses that limit student participation. For example, one study found that in schools that offered dual enrollment, economically disadvantaged students and students from underrepresented racial and ethnic groups were less likely to be enrolled in college-level courses (Education Trust, Citation2020).

There are other possible explanations for differences in coursetaking. Some researchers argue that differential enrollment might be because underrepresented students and low-income students enter high school with lower levels of achievement and less challenging coursework, making them less prepared for dual enrollment courses. However, research shows that Black and low-income students are less likely to participate in dual enrollment even when analyses account for previous academic achievement (Giani, Alexander, & Reyes, Citation2014). Another potential explanation is that high school course tracks today allow substantial flexibility in course assignment, which gives families and parents the ability to "curate" their child's education. The opportunity for curation is most likely to be taken advantage of by families with the cultural capital to navigate this system (An & Taylor, Citation2019). These latter findings suggest that there are actions that institutions can take to expand access to dual credit courses.

Strategies used to expand access to dual enrollment

Policymakers and practitioners are aware of the disparities in dual enrollment participation and have been taking steps to increase access for underserved groups. Our review of the literature suggests that expanding access to dual enrollment comes from actions taken at three different levels: (1) establishing state legislation and policies that support dual enrollment; (2) offering dual enrollment courses in schools; and (3) ensuring that historically underserved students have access to and support to succeed in these courses. In this paper, our emphasis is on the second two levels, although we briefly summarize the state level below and in our explanation of the intervention.

Legislation and state-level policies

A review of state efforts related to dual enrollment access identified four primary themes: (1) reducing costs; (2) removing barriers to participation; (3) expanding eligibility; and (4) increasing qualified educators (Pompelia, Citation2020). Because financial considerations can prevent students from taking dual enrollment courses, states have moved to fully funding or subsidizing dual enrollment courses so that the cost of taking dual enrollment courses is not a barrier (Mansell & Justice, Citation2014). States have addressed other barriers by exploring ways of providing transportation and expanding the number and type of courses that students are allowed to take (Pompelia, Citation2020). States have also undertaken efforts to increase the number of eligible students, usually by making dual enrollment available to students in more grades. Finally, states also can provide assistance to high school teachers in earning the credentials necessary to teach dual enrollment courses.

Making courses available at the school

In order to make dual enrollment courses available in schools, districts and high schools must partner with a postsecondary institution and provide courses to students either on the college campus, online, or in the high school. Offering courses at the high school or online may be the best option in situations where there is no nearby college or where students might face transportation challenges. Results are mixed about whether outcomes are better when courses are taken on a college campus or a high school campus (An & Taylor, Citation2019), but this suggests that offering college courses on the high school campus might be a valid way of expanding access.

Expanding access to underserved students

Once a school has college courses available for its students, there are extra steps that schools need to take to ensure that historically underserved populations can access these courses. Many schools are increasing specific programming opportunities to help these students enroll and succeed in dual enrollment programs. A recent report, The Dual Enrollment Playbook: A Guide to Equitable Acceleration for Students (Mehl, Wyner, Barnett, Fink, & Jenkins, Citation2020) includes findings from case studies of schools that successfully reduced racial and ethnic gaps in dual enrollment. The authors placed the issue of access within a broader context of an equitable environment and identified five specific strategies to increase access.

The first strategy was building early awareness and aspirations by creating a culture in which students of all backgrounds have access to and are expected to participate in advanced coursework. The second was improving outreach to the families of students in underrepresented groups so that parents clearly understood the advantages of dual enrollment. The third strategy was recruiting students for the courses actively and strategically, using data to identify and reach out to qualified students who might not otherwise be aware of dual enrollment. The fourth strategy was limiting the significance of placement testing by expanding access to placement testing, preparing students for the placement tests, and developing alternative approaches for allowing students to show that they are ready for college courses. The final strategy was addressing costs and logistics, including helping students with the costs of textbooks and providing ways of address concerns that students may have about accessing transportation or other barriers to participating in courses.

Once students enroll in dual enrollment courses, schools need to support students to improve their likelihood of postsecondary success. School support activities include advising, tutoring, study skills workshops, and college application assistance and financial aid counseling (Marken, Gray, & Lewis, Citation2013). As shown in the results section below, the schools in our study used many of these access and support strategies.

Although work such as the Playbook provides helpful information for practitioners, there is a paucity of empirical research on the success of strategies to expand dual enrollment (An & Taylor, Citation2019). This paper begins to address this issue by examining the impact of an intervention intended to expand access to dual enrollment.

The CCRE model

The College and Career Readiness Expansion project (CCRE) was a five-year research project funded by the U.S. Department of Education and implemented by Columbus State Community

College in Central Ohio. Below we share key information about the context of the project and the model's components.

State and local context

Ohio offers dual enrollment through its College Credit Plus (CCP) policy. Under the policy, which came into effect during the 2015–16 school year, Ohio students in grades 7–12 can apply to any public college or university in Ohio or one of several participating private institutions in the state. After meeting the entrance requirements for the institution, such as a qualifying score on a placement test, students may enroll in college courses at public institutions and earn transferable college credit. The state pays for tuition, books and fees for public school students but does not provide funding for transportation to courses that meet face-to-face.

Columbus State Community College is a large community college serving the Columbus, Ohio region. The college has played a central role in providing academic credentials to the region's workforce by leading an effort called the Central Ohio Compact. The College viewed dual enrollment courses as a viable strategy for increasing the region's workforce readiness; as a result, they partnered with Jobs for the Future and The Educational Service Center of Central Ohio on a grant from the U.S. Department of Education's Investing in Innovation program to support CCRE.

Columbus State implemented the CCRE project in 16 high schools across seven districts targeting districts where at least 40% of students were considered economically disadvantaged. The participating schools and districts represented the geographic diversity of the Central Ohio area. Based on NCES locale codes from the Common Core of Data, four (25%) were urban, nine (56%) were suburban, and three (19%) were rural. The CCRE schools differed greatly in size, ranging from a few hundred students to close to 2,000 students with an average enrollment of approximately 950 students.

CCRE model

The project was based on the early college model, an evidence-based model which emphasizes dual-enrollment opportunities combined with broader school changes to enhance students' postsecondary readiness (Edmunds et al., Citation2017b; Edmunds, Unlu, Furey, Glennie, & Arshavsky, Citation2019; Haxton et al., Citation2016; Song, Zeiser, Atchison, & Brodziak de los Reyes, Citation2021). Schools participating in CCRE focused on restructuring their practices to ensure student readiness for college and career. One of the project's core goals was to increase the number of students taking college-level courses, emphasizing expanding access for historically underrepresented populations. To help meet this goal, Columbus State Community College implemented the program in local schools with highly diverse student populations. For example, 57% of CCRE students were considered economically disadvantaged compared to 48% of students statewide in Ohio, and 46% of students in CCRE schools identified as members of a racial and ethnic group historically underrepresented in college, compared to 23% of students in Ohio public high schools.

The efforts to increase college credit accrual were accompanied by a broader set of changes in each school. CCRE schools were expected to implement four Design Principles: (1) a Career and College-Ready Academic Program; (2) a Career and College Headstart; (3) Wraparound Student Supports; and (4) School-level Organizational Practices.

A Career and College-Ready Academic Program included an academic program of study that allowed almost all students to prepare for college and attain college credit while still in high school. The project leadership expected schools to expand opportunities for all students to earn at least three college credits. Part of this expansion included the creation of pathways that focused student coursetaking so that the courses could contribute to a major or a credential. These pathways included work-based learning experiences when appropriate. Finally, this Design Principle also focused on classroom practices and instructional strategies to enhance rigor.

A Career and College Headstart focused on providing students with early exposure to the culture and norms of college through college readiness skills instruction and college readiness support activities. College readiness activities included advising on the courses needed for college and taking students to visit college campuses.

The Wraparound Student Supports Design Principle included providing students with comprehensive academic supports, social and emotional programming and support, and assistance with college and financial aid applications. These supports involved school staff developing and sustaining relationships with students, providing academic assistance outside of regular class time, and employing systems that identify student needs and suggest targeted interventions. The schools were also expected to provide logistic support for dual enrollment, such as assistance with registering for placement tests and courses, navigating college procedures, and understanding how to use college resources.

The final CCRE Design Principle addressed School-Level Organizational Practices that needed to be in place to ensure effective implementation of the other Design Principles. These practices entailed: (1) developing structures to support personalized relationships; (2) establishing a college-going culture; (3) offering ongoing job-embedded professional development; (4) using data-based decision-making; and (5) providing time and support for teacher collaboration.

To assist schools in implementing these Design Principles, the project partners provided supports including professional development, coaching, technical assistance, course materials, and funding for personnel and software. Figure 1 presents a logic model that shows the project components and the expected outcomes. The evaluation report contains detailed information about the project and its evaluation (Edmunds, Grebing, Coyle, Henson, Rosof & Cardwell, Citation2021).

Materials and methods

The results presented in this paper are part of a larger evaluation that used mixed methods—a rigorous, quasi-experimental design to assess the project's impacts coupled with in-depth data collection about implementation from surveys, interviews, and site visits. Below we describe the methods and approaches used to answer the two research questions in this paper.

RQ1: impact on college coursetaking

The first research question concerned the extent to which CCRE increased students' coursetaking, particularly for economically disadvantaged students and members of racial and ethnic groups historically underrepresented in college.

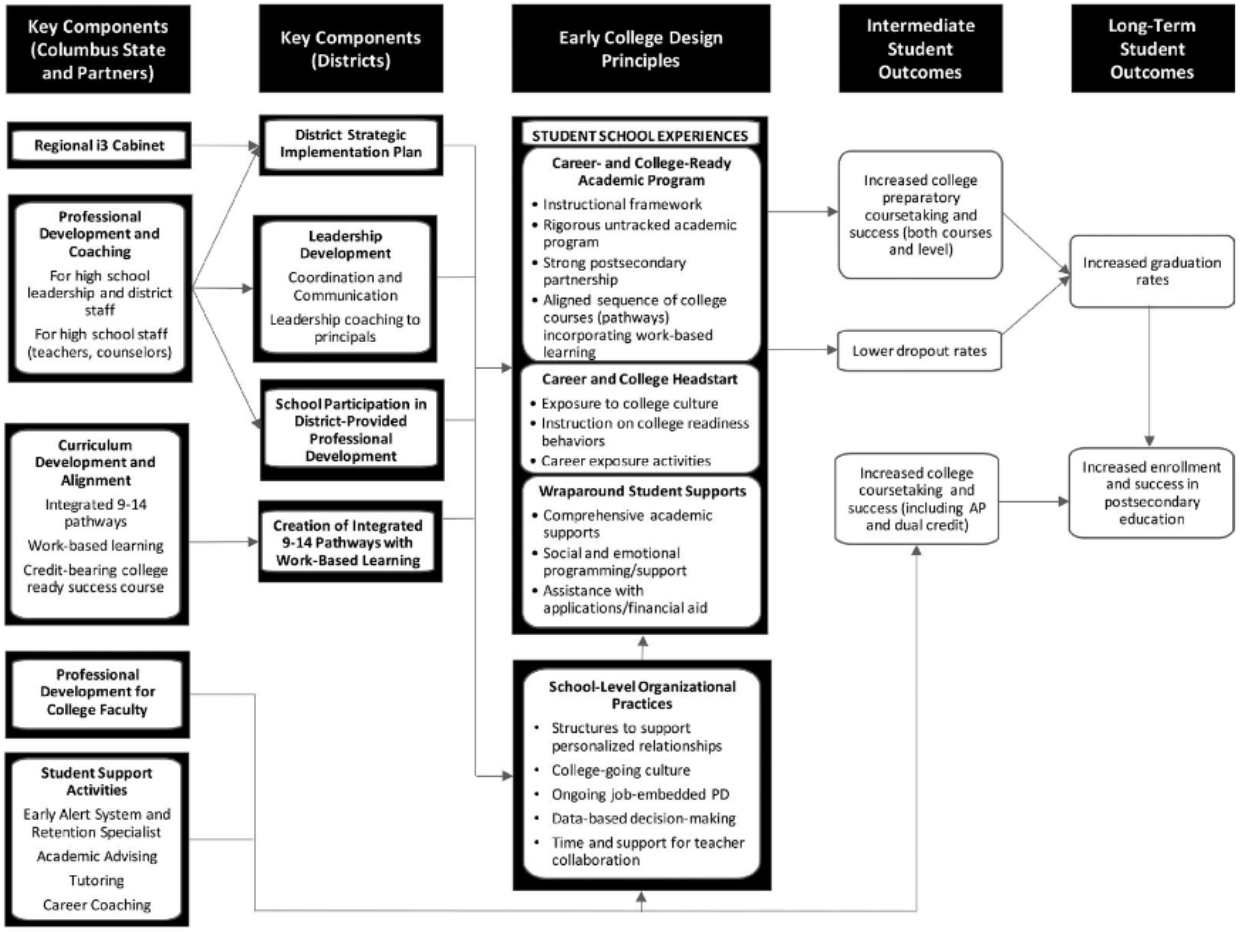

Figure 1. College and career readiness expansion logic model.

Research design

We used a quasi-experimental framework in which we identified a group of comparison schools that closely matched the CCRE program schools (treatment schools) on various demographic and performance variables the year before the program began. Using a comparison group allowed us to determine the program's impact based on the differences in outcomes between schools who participated in CCRE versus other Ohio high schools not participating in the program. We matched each of the 16 treatment schools to two comparison schools (for a total of 32 comparison schools) selected from a pool of 394 schools in Ohio. This pool excluded schools within Columbus State's service region, charter schools, stand-alone early college high schools, alternative schools, and schools with missing data. After determining a matched set of schools on school-level measures in the baseline year, we tested the samples for student-level baseline equivalence on demographic and study outcomes in the baseline year. Table 1 shows baseline equivalence for the CCRE (treatment) and the comparison groups at the school level. As the table shows, the schools in both samples were equivalent at baseline with differences of less than .14 standard deviations on all measures.

Table 1. School-level baseline equivalence—baseline school-level demographics.

	Treat *N*	Comp *N*	Weighted treatment mean	Weighted comparison mean	Effect size [a]
Pct Underrepresented Race/Ethnicity (2015–16)	15,416 (16 sch)	30,999 (32 sch)	44.5%	46.7%	−.08
Pct Economically Disadvantaged (2015–16)	15,416 (16 sch)	30,999 (32 sch)	60.9%	59.7%	.04
Pct Students with a Disability (2015–16)	15,416 (16 sch)	30,999 (32 sch)	14.5%	14.9%	−.08
Percentage of Schools with Grades 7–12 (2015–16)	16 sch	32 sch	3.7%	6.6%	−.12
Enrollment in Grades 9–12 (2015–16)	15,416 (16 sch)	30,999 (32 sch)	969 (*SD* = 468)	964 (*SD* = 404)	.01
Dropout Rate in Grades 9–12 in 2015–16	14,373 (16 sch)	28,389 (32 sch)	3.3%	3.1%	.04
Pct of Students in Grades 10–12 Taking One or More Dual-enrollment courses (CCP) in 2015–16	10,603 (16 sch)	22,161 (32 sch)	9.3%	9.0%	.02
Pct of Students in Grades 10–12 Taking One or More AP Courses in 2015–16	10,603 (16 sch)	22,161 (32 sch)	14.5%	11.8%	.14
Mean College Credits Earned by Class of 2016	2,665 (16 sch)	6,039 (32 sch)	2.45 (*SD* = 5.85)	2.51 (*SD* = 6.62)	−.01

a The effect size calculations use Hedges' g for continuous variables and Cox's Index for dichotomous variables.

Table 2. Baseline equivalence for the college coursetaking analytic samples.

	Treat *N*	Comp *N*	Adj. treat. mean	Unadj. comp. mean	Diff. (Beta)	Effect size[a] (SD)
Sample 1: All Grades 10–12 Students Pooled						
Pct Economically Disadvantaged	20,929 (16 sch)	41,628 (32 sch)	.627	.593	.034	.09
Pct Underrepresented Race/Ethnicity	20,929 (16 sch)	41,628 (32 sch)	.509	.483	.026	.06
ELA Baseline Z-Score	20,929 (16 sch)	41,628 (32 sch)	−.192 (*SD* = .971)	−.188 (*SD* = .985)	−.004	.00
Math Baseline Z-Score	20,929 (16 sch)	41,628 (32 sch)	−.082 (*SD* = .967)	−.089 (*SD* = .967)	.008	.01
Sample 2: EDS Grades 10–12 Students Pooled						
Pct Economically Disadvantaged	12,758 (16 sch)	24,685 (32 sch)	1.000	1.000	.000	.00
Pct Underrepresented Race/Ethnicity	12,758 (16 sch)	24,685 (32 sch)	.695	.653	.042	.12
ELA Baseline Z-Score	12,758 (16 sch)	24,685 (32 sch)	−.432 (*SD* = .930)	−.459 (*SD*=.926)	.026	.03
Math Baseline Z-Score	12,758 (16 sch)	24,685 (32 sch)	−.329 (*SD* = .908)	−.402 (*SD* = .922)	.073	.08
Sample 3: Not EDS Grades 10–12 Students Pooled						
Pct Economically Disadvantaged	8,171 (12 sch)	15,886 (21 sch)	.000	.000	.000	.00
Pct Underrepresented Race/Ethnicity	8,171 (12 sch)	15,886 (21 sch)	.200	.237	−.037	−.13
ELA Baseline Z-Score	8,171 (12 sch)	15,886 (21 sch)	.207 (*SD* = .937)	.205 (*SD*=.935)	.001	.00
Math Baseline Z-Score	8,171 (12 sch)	15,886 (21 sch)	.336 (*SD* = .859)	.366 (*SD* = .974)	−.030	−.03
Sample 4: Underrepresented Race/Ethnicity (Grades 10–12)						
Pct Economically Disadvantaged	9,928 (16 sch)	20,126 (32 sch)	.832	.800	.032	.13
Pct Underrepresented Race/Ethnicity	9,928 (16 sch)	20,126 (32 sch)	1.000	1.000	.000	.00
ELA Baseline Z-Score	9,928 (16 sch)	20,126 (32 sch)	−.515 (*SD* = .916)	−.555 (*SD* = .871)	.040	.05
Math Baseline Z-Score	9,928 (16 sch)	20,126 (32 sch)	−.449 (*SD* = .890)	−.518 (*SD* = .869)	.069	.08
Sample 5: Not Underrepresented Race/Ethnicity (Grades 10–12)						
Pct Economically Disadvantaged	11,001 (16 sch)	21,458 (29 sch)	.416	.399	.017	.04
Pct Underrepresented Race/Ethnicity	11,001 (16 sch)	21,458 (29 sch)	.000	.000	.000	.00
ELA Baseline Z-Score	11,001 (16 sch)	21,458 (29 sch)	.072 (*SD* = .961)	.155 (*SD* = .961)	−.083	−.09
Math Baseline Z-Score	11,001 (16 sch)	21,458 (29 sch)	.222 (*SD* = .879)	.313 (*SD* = .979)	−.090	−.10

a The effect size calculations use Hedges' g for continuous variables and Cox's Index for dichotomous variables.

Outcomes and data sources

We examined the outcomes of students who took at least one dual enrollment course. The information came from the Ohio Department of Education administrative data, including coursetaking records for every student.

Sample

Our student-level analytic sample included students in Grades 10–12 in the 48 sample schools enrolled in the school for at least half a year. We kept students who dropped out in the analyses. Although we already knew that our schools were equivalent at baseline (Table 1), we also wanted to ensure that the populations of students in our analytic sample were also similar at baseline. Table 2 shows the equivalence for the full sample and the following subgroups: (1) students who are economically disadvantaged and students who are not economically disadvantaged; and (2) students who are members of racial and ethnic groups historically underrepresented in college (African-American, Hispanic/Latinx and Native American) and students who are members of non-underrepresented groups (all other races/ethnicities). As the table shows, the samples were similar with effect size differences of less than .13 standard deviations.

Analysis

We used hierarchical linear modeling (HLM) (Raudenbush & Bryk, Citation2002) as the general analytic framework to account for the nested structure of the data. For all analyses, students were nested within schools. The analytic models included a fixed treatment effect at level 2, the primary effect of interest. The following model includes the general specifications for all outcomes:

$$y_{ij} = \beta_{0j} + \sum_{p=1}^{p} \beta_{pj} COV_{pij} + e_{ij}$$

where y_{ij} = outcome of interest for student i in school j COV_{pij} = p-th student-level covariate included in the final model (these covariates may differ across specific outcome measures)

β_{0j} = adjusted mean outcome of interest for school j controlling for differences in student-level covariates

β_{pj} = the association between the p-th student-level covariate and outcome of interest e_{ij}
= random effect of student i in school j assumed to be distributed with a mean of zero and variance of σ^2_e

Level 2 (school level):

$$\beta_{0j} = \gamma_{00} + \gamma_{01} T_j + \sum_{k=1}^{K} \gamma_{0(k+2)} X_j^k + u_{0j}$$

$$\beta_{pj} = \gamma_{p0}$$

where

X^k_j = k-th (k = 1,2, …, K) school-level measure used in the matching process, such as percentage enrolled in and succeeding in college prep courses in 9th grade, percentage taking college courses and number of college credits earned in grades 9–12, dropout rate, percentage economically disadvantaged, percentage of minority students, and school enrollment

γ_{00} = adjusted mean of the outcome of interest in the comparison group

γ_{01} = overall fixed treatment effect adjusted for the covariates

γ_{p0} = pooled within-school regression coefficient for student-level covariate p

u_{0j} = random effect of school j, assumed to be distributed with a mean of zero and variance of σ^2_u. This term is also assumed to be independent of the student-level error term, e_{ij}.

We adapted this generic model to each outcome, and we estimated using a two-tailed significance test at the $p < .05$ significance level. The coefficient $\gamma 01$ represented the overall treatment effect in each model. All variables included in the impact model are listed in Table 3.

Table 3. Variables included in impact model.

School-level variables	Student-level variables
• % of 9th Grade Students On Track (2015–16) • % of Students Taking a CCP Course (2015–16) • % of Students Taking an AP Course (2015–16) • Mean Number of College Credits Earned (CCP and AP) (Graduates in 2015–16) • Dropout Rate (2015–16) • % Economically Disadvantaged (2015–16) • % Underrepresented Race/Ethnic (2015–16) • Enrollment in Grades 9–12 in 1000s of Students (2015–16)	• Economically Disadvantaged (Yes/No) • Underrepresented Race/Ethnic (Yes/No) • Gender • Disability Status (Yes/No) • Limited English Proficient Status (Yes/No) • Math Baseline Z Score • ELA Baseline Z Score

We first analyzed the full sample and repeated the analysis described above for four different demographic subgroups: (1) economically disadvantaged students; (2) not economically disadvantaged students; (3) students from underrepresented racial/ethnic groups; and (4) students from not underrepresented racial/ethnic groups. We replaced the baseline school-level variables with measures specific to the subgroup for each subgroup analysis. For example, all analyses of economically disadvantaged students included baseline covariates specific to that group (e.g., the school-level percentage of economically disadvantaged students taking dual enrollment courses).

RQ2: strategies to support expanded access

The second research question examined strategies that schools used to support the expansion of access. The different districts and schools approached the work differently, and each developed individual approaches to implementing the project.

Research design

We used a case study design to identify and describe strategies that supported expanded access. We chose a purposive sample of six schools in four districts in consultation with Columbus State staff and district coordinators in Summer 2017, one year into the project's implementation. The sites were selected to represent a diversity of settings. Each site highlighted different approaching to implementing CCRE, including differing approaches to and progress in pathway development, instruction, student support, and connections to local businesses for work-based learning opportunities.

Data sources

The case studies incorporated data from a variety of sources including: (1) site visits with interviews and observations; (2) a review of relevant documents such as annual district plans, meeting minutes, and participation records; and (3) interviews with project and district staff. The research team conducted the site visits in the fall of 2017, 2018, and 2019. Each site visit included a full day of on-site interviews with teachers, counselors, principals, and other key staff for CCRE. The interviews documented progress toward the project goals and perspectives of school-level personnel on project implementation. The visits also included student focus groups and classroom observations of teachers involved in CCRE. The evaluation team interviewed 72 school-based individuals in 2017–18, 71 in 2018–19, and 62 in 2019–20. The semi-structured interviews included questions focused on understanding the implementation of the CCRE supports and the school-level implementation of the Early College Design Principles. The evaluation team collected project documents from all schools, including reports outlining their strategic plans and the development of course pathways. We supplemented the site visits with an additional 70 interviews with college, project partner, and district staff across the five project years. These interviewees had relevant information about all schools in the district participating in CCRE, not just the schools selected for site visits. These interviews focused primarily on implementation at the program- or district-level and included reflections on implementation at individual schools.

Analyses

After each site visit, the interviews were transcribed, and the evaluation team analyzed the data using Atlas.ti software. We used the project documents and detailed logic model to determine codes aligned to the program's supports and the early college model. We also developed codes related to general project implementation, including goals, lessons, buy-in, challenges, and feedback for the implementation team. Team members coded a small set of transcripts based on the initial codebook. Each coder identified additional codes or themes that emerged through the analytic process. The group then met to calibrate their coding and identify new codes. Once the team reached agreement, we coded two common transcripts to establish reliability before individual coding. Each year the team jointly coded a set of transcripts to ensure a common understanding of the codes before working independently. Across the years of the project, the same group of 4–5 team members coded the transcripts. After the final site visits, research team members used the collected information, coupled with information from a survey that we administered to program staff annually, project records, and other interviews, to create a case study write-up for each school. The team conducted a cross-case analysis that included information about strategies and practices for expanding dual enrollment access.

It is important to note that the qualitative data are descriptive, and the research design did not link specific practices with specific outcomes. Nevertheless, they provide insight on practices that schools may use to expand access to dual enrollment courses for underrepresented students.

Results and discussion

Expanding access to college courses

For the 2018–19 and 2019–20 school years combined, 20.7% of 10th–12th graders in CCRE schools enrolled in dual-enrollment courses, compared to 13.4% in non-CCRE schools, a statistically significant difference. This represents the school-level impact estimate ($\gamma 01$) in the impact model. Figure 2 shows positive impacts, particularly for economically disadvantaged students; the rate of economically disadvantaged students taking dual-enrollment courses in CCRE schools was more than double the rate in comparison schools. This rate is equivalent to an additional 1,150 economically disadvantaged students taking dual-enrollment courses in the treatment schools. Figure 2 also shows that CCRE schools had doubled the enrollment rates for underrepresented students in dual-enrollment courses compared to non-CCRE schools. A detailed table with these findings is in the appendix.

These data also show that while coursetaking gaps remained between student demographic groups, these gaps were smaller for economically disadvantaged students in CCRE schools. For example, there was an 11.4-percentage point coursetaking gap between economically disadvantaged students and non-economically disadvantaged students in CCRE schools (27.6% minus 16.2%), compared to a 15.7-percentage point gap at non-CCRE schools between the same groups of students (22.8% minus 7.1%). Although CCRE did increase dual enrollment coursetaking for underrepresented students, it did not reduce the gap for this population. The gap between underrepresented and non-underrepresented students was essentially the same in both CCRE and comparison schools: 12.5 percentage points in CCRE schools (or 27.3% minus 14.8%) and 12.0 percentage points in comparison schools (19.2% minus 7.2%). Figure 3 shows the gaps between different groups.

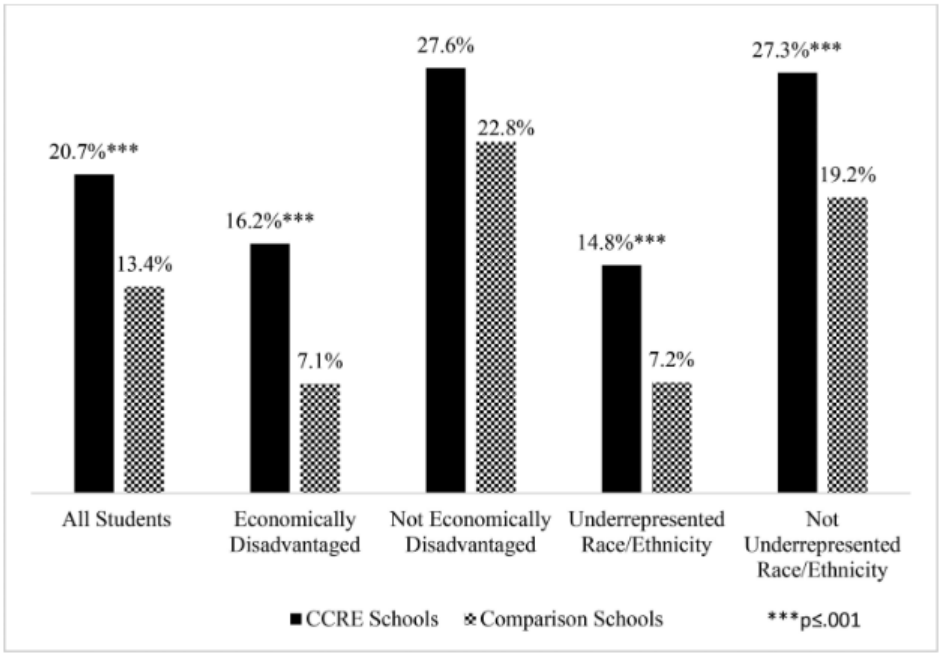

Figure 2. Impact on dual enrollment coursetaking, by sub-group.

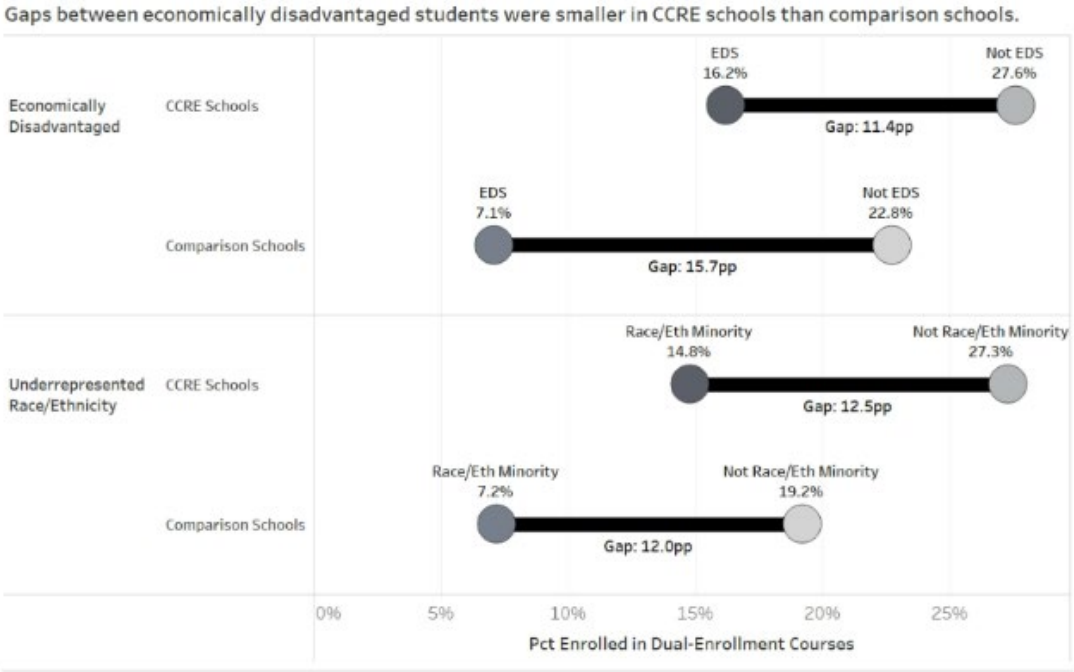

Figure 3. Gaps in coursetaking, by sub-group.

CCRE aimed to expand dual enrollment access to populations historically underrepresented in college, and the trends seen in the CCRE project run counter to national data. In the U.S., dual-enrollment expansion primarily occurs among non-underrepresented and non-economically disadvantaged students (Pierson et al., Citation2017). How did CCRE "buck the trend" and begin to address issues of inequity?

Strategies used to expand access

To answer this question, we first looked at the expansion of access to college courses in the site visit schools. As shown in Figure 4, on average, the schools expanded access to dual enrollment courses at a similar level to the non-site visit treatment schools and more than the comparison schools. As the figure shows, there was a jump in enrollment in 2018–19, when two site visit schools dramatically increased enrollment in dual enrollment courses, followed by a drop the following year when both had to retrench because of a higher than desired number of student failures in the courses. Another site visit school did not expand participation in their dual enrollment courses at all over the duration of the project.

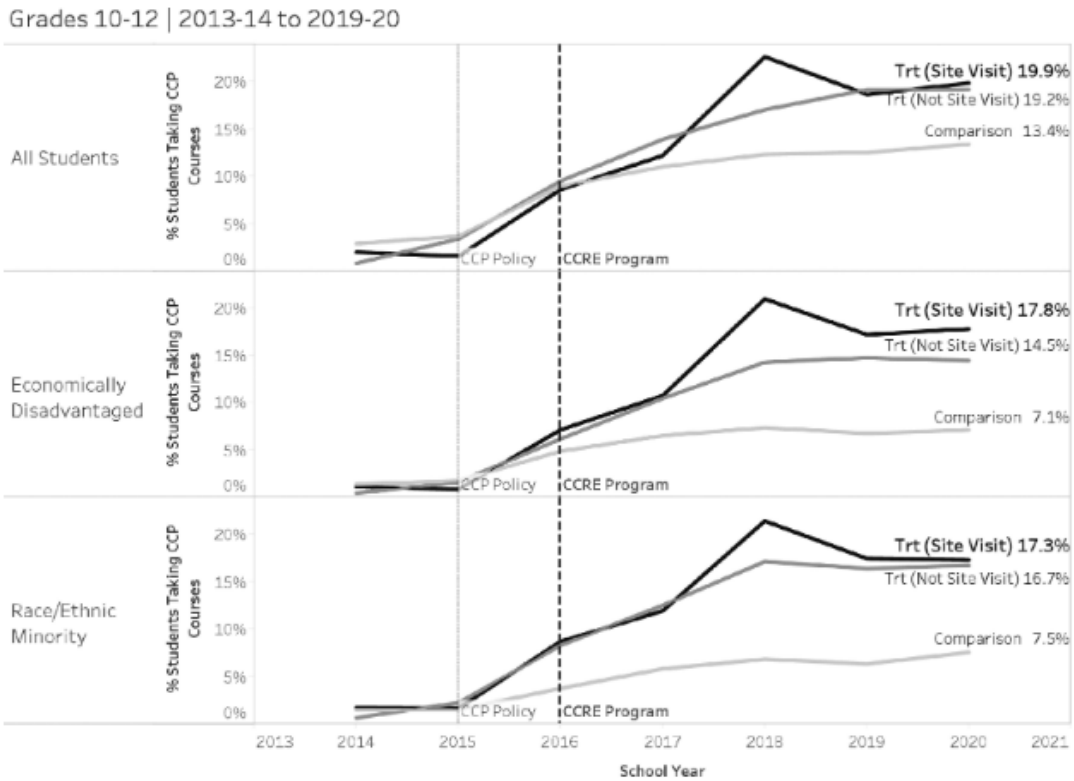

Figure 4. Enrollment in dual enrollment courses (CCP) by subgroup and treatment/site visit status.

We present results from the qualitative data focusing on the two school-based levels that we described in the literature review. First, making dual enrollment courses available at the school level, and second, once courses are available, ensuring that historically underrepresented students have access to and can succeed in those courses.

Making courses available at the school

Ensuring that college courses were available to students was an essential part of the project. In the CCRE high schools, dual-enrollment courses were structured in three primary ways. First, students could take college courses on the Columbus State campus. Second, students could take college-level courses on the high school campus taught by an adjunct college faculty member, usually a high school teacher who met the Columbus State qualifications. Third, the college course could take the form of a facilitated course. In the facilitated course setting, students enrolled in a regular high school course (e.g., Chemistry) and would also participate in a corresponding online college course with additional assignments and exams. The high school teacher served as a facilitator, answering questions and facilitating the college curriculum. The Columbus State faculty member was the teacher of record for the college course, setting the coursework and curriculum. These varying structures meant schools could find a strategy that worked for their students. For example, high schools could use the facilitated model if they did not have any teachers with the necessary credentials, which might be a challenge in low-income schools with fewer resources.

As described in more depth below, many schools also offered an introductory college success course, COLS 1101, for college credit. Even if this was the only college-level class students took, it allowed students to dip their toes in the college waters. It also allowed them to become familiar with college expectations and procedures, such as the Blackboard course management system, interacting with college faculty, and the level of rigor of college assignments. A district coordinator described that this course was a way of expanding access by providing students with a relatively low-stakes postsecondary opportunity that allowed them to enroll in the community college system.

Although increasing college course offerings was a goal of the project, the aim was not to have students take only one course or take isolated courses—what is sometimes referred to as "random acts of college credit." Instead, CCRE schools were expected to offer dual enrollment courses as part of a pathway. The purpose of these pathways was to ensure that students' dual enrollment courses helped them progress toward educational or career goals. According to the project team, pathways: (1) included a thoughtful sequence of courses that spanned multiple years; (2) potentially led to an industry-recognized credential, certificate, or degree; and (3) were aligned to an area of workforce need that would provide students with sustainable opportunities after high school. Columbus State provided technical assistance to aid schools and districts in developing and implementing pathways. Districts found the process to be challenging and slow-moving; by the end of the five-year project, each participating district had planned at least one pathway, but they were in varying stages of implementation. Areas of study included software development, allied health, marketing, pre-nursing, and pre-engineering.

As noted earlier, even though this was a core part of the program, not all schools increased their dual enrollment offerings. One school did not prioritize creating these opportunities, and the number of dual enrollment offerings at that school remained stagnant throughout the project.

Expanding access to underserved students

Analysis of the site visit data showed that, for the schools that had increased their offerings, they worked collaboratively with the college to ensure that underrepresented populations had access to these courses by using five primary approaches, approaches which are consistent with those presented in the existing literature (Mehl et al., Citation2020): (1) understanding and using data;

(2) increasing students' awareness of college courses and their importance; (3) supporting students' college readiness; (4) removing eligibility barriers; and (5) embedding support for students taking college classes. As noted above, because the evaluation only assessed the project's overall impact, the evaluation team could not determine the relative impact of each of the strategies on expanded access. However, these are strategies that any school may want to consider to increase student enrollment in college-level courses.

Understanding and using data. A key lesson learned from the project was the importance of reviewing student data and examining dual enrollment participation particularly for certain populations in each district. Columbus State and its partners engaged the districts in data analysis exercises that used a racial equity lens. For example, Columbus State provided college-level course participation data by race and ethnicity. Schools then received coaching through CCRE to make sense of their data. According to one of the coaches, "Every single one of the districts is [now] much better at diagnosing equity issues." One district staff member described how their work changed throughout the project:

> It's really now evolved into being more explicit with our minority and underrepresented populations and creating an advising system that really is targeting students based on their college-/career-readiness indicators and data. … So we're not having general conversations now; we're being very explicit.

A project objective was to improve districts' ability to track students' college and career readiness by embedding indicators into existing systems the schools had for identifying students experiencing challenges. Creating these systems proved difficult for many districts; however, at least two developed and implemented systems to track college readiness. For example, one district described how, before the CCRE project, their early alert system involved synthesizing data from five or six different sources into an Excel spreadsheet. Then, according to a district staff member, "We'd have to do all the voodoo that it required to…make sense of it." During CCRE, they revamped their system using Tableau (data visualization software) to integrate the data and create a series of dashboards that would allow the district to identify students at risk or who needed acceleration. With the impetus of the CCRE project, the district also incorporated college and career readiness indicators. The dashboards helped school staff look at various indicators, such as students' enrollment and success in dual enrollment courses. The district also provided training to school leadership teams on effectively accessing and using the data.

One school used a data-based advising strategy in which students took a survey with a series of questions to measure characteristics like resilience and grit. Staff members identified students who scored highly in these areas but were not taking college courses. Many of those students were members of underrepresented groups and economically disadvantaged students. The counselors then met with each identified student individually to discuss the opportunity to take college-level courses.

Developing students' awareness of and interest in college courses. CCRE districts believed that expanding access to college-level courses for underserved students required students to be interested in and see the relevance of these courses. CCRE schools worked to ensure that students had a vision for their life after high school, which we have elsewhere called a "future orientation" (Edmunds et al., Citation2021). This approach includes an emphasis on planning for both college and career during high school. As one staff member said, CCRE aimed to "benefit the student and family beyond high school." One school talked to their students regularly about what

they called "The Three Es," or the idea that all students should plan to be Enrolled, Employed, or Enlisted after high school. Many schools engaged in typical college-orientation-building activities such as campus visits and college-awareness days to create this future orientation. Advisors—from both the high schools and from Columbus State—also helped build students' awareness of dual-enrollment courses and their impact on students' postsecondary education. Many schools and counselors used career-advising software, such as Naviance, to help students identify their career interests and develop a plan to work toward career goals during high school. Most CCRE schools also partnered with a college-access program called I Know I Can. Located in Central Ohio, this organization provided college and career counseling supports to students in schools and supplemented the high school counselors' work. One student described how their I Know I Can counselor helped them understand more about college:

> I know for college stuff, we're so fortunate to have the I Know I Can people come in….My brother graduated in 2017 and they didn't have those resources. He didn't know any of the college stuff; he didn't know how to apply. So, he just ended up not going to college at all.

Some schools also made broad announcements about the availability of dual enrollment courses. One school gathered all ninth graders in the auditorium to hear about the dual enrollment opportunities in their school. As described above, another school took a more targeted approach, meeting with specific students identified from surveys as having the mindset to do well in college-level courses.

Supporting students' college readiness. The CCRE project team recognized that the goal of enrolling more students in college-level courses came with the need to ensure that students were prepared for those courses so that they could succeed in them. As a result, CCRE schools undertook a variety of strategies to increase students' college readiness.

The CCRE program emphasized high school classroom instruction as a meaningful contributor to college and career readiness. Teacher professional development and coaching focused on student-centered strategies intended to enhance students' ability to think and communicate effectively. Some schools, including those in one district that saw large performance gains over the grant period, focused on the six strategies in the Common Instructional Framework identified by Jobs for the Future (Jobs for the Future, Citation2012). These strategies are: (1) collaborative group work; (2) writing to learn (frequent, low-stakes writing activities); (3) scaffolding; (4) questioning; (5) classroom talk; and (6) literacy groups that engage with complex texts.

Schools utilized software to help build students' literacy and math skills, bringing them up to grade level. The software also prepared students for placement exams required to enroll in college courses in Ohio. Some schools found that these computer software programs helped improve students' readiness, although other schools did not find them effective. These programs, along with other college-readiness activities, were often incorporated into advisory periods. In one school, all ninth graders had a 30-minute daily advisory period during which students worked on academic readiness and executive function skills.

Most schools offered a college success course that students could take for college credit to build college readiness. Columbus State provided the curriculum for a class, COLS 1101 (mentioned earlier), that they adapted for high school students, and some high schools further customized the course for their population. Two site-visit schools offered COLS 1101 for college

credit and made it available to all interested 10th-graders. Another district had almost all its ninth-grade students take a course titled "College and Career Readiness," with a district-developed curriculum built on the COLS 1101 curriculum. Overall, these courses had a dual role in expanding access; they were designed to improve students' ability to succeed in college courses and, in some districts, they provided students an opportunity to earn college credits.

Readers might wonder the extent to which the expansion in college coursetaking was due to students taking these college readiness courses instead of courses designed to lead to a degree or a credential. Unfortunately, the coursetaking data that we utilize in this paper are not sufficiently detailed for a course-specific analysis. However, we have analyzed coursetaking data from Columbus State showing that the number of courses taken by students in participating schools increased from 2,149 in the first pre-CCRE year to 5,213 in Year 4. Of the 3,064 additional courses taken at Columbus State, 555 of them (18%) were college readiness courses (Edmunds et al., Citation2021). This suggests that the college readiness courses contributed to the expansion but only partially explain the increase.

Removing barriers to eligibility. Both the school districts and Columbus State revised policies to remove unnecessary barriers to eligibility. Ohio's College Credit Plus dual-enrollment program has a GPA requirement of 3.0 that students must meet to be eligible to take college-level courses. Columbus State applied for and, as of the spring of 2021, was granted a waiver from the eligibility requirements for the CCRE districts, which meant students with lower GPAs could qualify to enroll in college classes through alternate assessment methods. As part of this waiver, the state required data collection to assess the efficacy of the policy.

In addition, some partnering districts changed their policies about placement tests for college-level classes. One district described how it used the grant to expand access to more students by making the ACCUPLACER (a college course placement test) available to everyone. The district coordinator described how this changed the way schools perceived students' college eligibility:

> We've really worked hard to knock down some of the barriers related to students testing into those courses. We've made even the test itself more accessible; we've trained our counselors so that they can just offer it, and the kids don't have to try to go to a [Columbus State] campus to take the test. … A long time ago, before this grant started, the ACCUPLACER was invite-only, and we've now stopped doing that. Anybody can come and take it, and a couple of the [schools] make every kid take it. … I guess the biggest change is we assume that every kid can be [a] college student if they choose.

A different district began to offer placement testing in their building so students wouldn't have to go to Columbus State's campus.

In addition, Columbus State partnered with districts to create a collaborative approach to college readiness called "Third Space." Third Space courses provided an alternative way for students to demonstrate readiness for college courses. In the spring of 2021, Columbus State received approval from the Ohio Department of Higher Education to use a passing grade in the course as evidence of eligibility for college courses. A district coordinator described the effort:

> It's called Third Space because it's not the high school space, it's not the college space, but it's a third space where the high school and college professors and teachers have come together, [and] developed out a "semesterized" course that

> really acts as a remedial English course. And upon successful completion with an A, B, or C in this course that counts for high school credit, [students] can then take English 1100 for credit the second semester without having to become eligible through the placement test.

Providing support for students taking college courses. When more students began taking college courses, the number of students needing supplemental support increased. A Columbus State staff member noted that it was vital that the supports were proactive: "Pushing out the supports rather than waiting for [students] to come to you is… really, really important. Students don't know when they need help a lot of times; they just don't." The college and high schools used several strategies to support these students. For example, Columbus State provided dedicated advisors to the schools. These advisors helped students select and register for courses and provided academic support to students taking college courses.

Columbus State also provided high schools access to the College's early alert system. College instructors enter student attendance and performance data into the system. When students hit a pre-specified threshold, such as a certain number of days absent or assignments missed, the system triggered an alert sent via email to the student and the instructor. For students in dual enrollment courses, the alert was also sent to a high school contact, usually a counselor. The counselor was then able to follow up with the student about academic or attendance concerns. A high school counselor described how the system worked:

> I get an email and, if I log into [the system], I can also view all of those alerts. For example, right now, I got an alert from an English professor for a student that [had a] participation concern, attendance concern, class completion concern—and all for the same student. That student has [health challenges]. So, knowing that they're struggling in the class and might not be able to attend class for a while, I reached out to [the Columbus State advisor] today to see what the options were. If we have a medical note, we can drop the class without penalty of a W [on the student's transcript].

Providing high schools access to a college's early alert system is somewhat rare and was made possible by the strong partnership Columbus State had with the CCRE high schools.

Some schools implemented a support model called Supplemental Instruction. Schools hired high school students who had previously excelled in a college course to attend that course and provide tutoring and support to the other students. These Supplemental Instruction students also provided outside-of-class study groups and relayed feedback to the instructor about areas where students were struggling.

Finally, students also had access to the same supports that Columbus State provided traditional students. They could take advantage of on-campus services such as the library, in-person tutoring, or use of the writing lab, although it was often challenging for high school students to access these services on campus. Columbus State also offered academic support through an online tutoring system, NetTutor, which a growing number of dual enrollment students utilized throughout the project period.

Conclusion

Overall, the CCRE experience suggests that schools can expand access to college courses for underrepresented populations when their efforts are intentional and focused. This conclusion is similar to a primary finding from the Playbook, which makes the point that "The most equitable dual enrollment programs are driven by clear and thoughtful vision, strategy, and goals, and they make the success of all students a priority" (Mehl et al., Citation2020, p. 11). The CCRE project started by selecting schools with high percentages of students in economically disadvantaged and underrepresented racial and ethnic subgroups. They also articulated an explicit goal of expanding access to more students and regularly revisited this goal with the participating schools.

Columbus State implemented CCRE within a statewide policy context that allowed students to take dual enrollment courses and provided funding to make that happen. Supportive state policies are a basic requirement for expanding access as it would be very hard for schools to operate without them. At the school level, almost all of the CCRE schools took specific steps to create additional dual enrollment opportunities, usually within the context of an aligned sequence of courses.

For those schools that did increase their dual enrollment offerings, they used a variety of strategies to make sure historically underserved populations had access to those courses such as (1) using data to identify eligible students and track their progress; (2) increasing students' awareness of and interest in college courses, usually by helping make connections to potential long-term goals for students; (3) supporting students' college readiness to increase the number of students who could be successful in college courses; (4) removing eligibility barriers to allow more students to qualify for courses; and (5) providing supports for students enrolled in college courses. These strategies are consistent with approaches identified elsewhere as important for creating more equitable dual enrollment opportunities (Mehl et al., Citation2020). Although our study design does not allow us to disaggregate which factors are most important, we see these strategies as complementary, and schools will likely need to implement these strategies in tandem with each other.

Expanding access to dual enrollment courses is only part of the story. Once students enroll, they must be successful and earn credits. Indeed, the CCRE evaluation results also include some cautionary information on this front. As is indicated in Figure 4, two schools that expanded access rapidly faced challenges with student success in their early years of implementation and had higher-than-average numbers of students failing. Providing students access to college courses without taking steps to help them succeed in those courses is not in the best interest of students. Thus, it is particularly important to pay attention to the strategies related to college readiness and supports.

As a result, the findings from CCRE suggest that expanding access is not merely a matter of having supportive state-level policies and then making sure that the courses are available to students or even just registering students for dual-enrollment courses. Instead, these shifts must come alongside broader school change efforts, including activities to build students' interest in college and college-course readiness. Additionally, when students enroll in college courses, they need ongoing support to ensure they are successful. Only then will the promise of reducing inequity in access to dual-enrollment courses be realized.

Human subjects

This evaluation was determined to be exempt by the Institutional Review Board at the University of North Carolina at Greensboro (IRB# 16-0104). All individuals who participated in original data collection activities (surveys and interviews) indicated their consent to participate.

Disclosure statement

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Data availability statement

The data used in this paper come from the Ohio Department of Education and are used under a data-sharing agreement with the Department.

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Appendix

Table A.1. Subgroup analysis for taking dual enrollment courses.

Population	Grade levels	Treat N	Comp *N*	Adj. treat mean	Unadj. comp mean	Impact estimate	Effect size (Cox's index)	*p*-value
All Students	Grades 10–12	20,929 (16 sch)	41,628 (32 sch)	20.7%	13.4%	+7.3pp***	0.318	0.000
Economically Disadvantaged	Grades 10–12	12,758 (16 sch)	24,685 (32 sch)	16.2%	7.1%	+9.1pp***	0.560	0.000
Not Economically Disadvantaged	Grades 10–12	8,171 (12 sch)	15,886 (21 sch)	27.6%	22.8%	+4.8pp	0.155	0.123
Underrepresented Race/Ethnicity	Grades 10–12	9,928 (16 sch)	20,126 (32 sch)	14.8%	7.2%	+7.7pp***	0.494	0.000
Not Underrepresented Race/Ethnicity	Grades 10–12	11,001 (16 sch)	21,458 (29 sch)	27.3%	19.2%	+8.1pp***	0.277	0.001