WWC Intervention Report
A summary of findings from a systematic review of the evidence

INSTITUTE OF EDUCATION SCIENCES

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Dual Enrollment Programs

Program Description[1]

Dual enrollment programs allow high school students to take college courses and earn college credits while still attending high school. Such programs, also referred to as dual credit or early college programs, are designed to boost college access and degree attainment, especially for students typically underrepresented in higher education. *Dual enrollment programs* support college credit accumulation and degree attainment via at least three mechanisms. First, allowing high school students to experience college-level courses helps them prepare for the social and academic requirements of college while having the additional supports available to high school students; this may reduce the need for developmental coursework. Second, students who accumulate college credits early and consistently are more likely to attain a college degree. Third, many *dual enrollment programs* offer discounted or free tuition, which reduces the overall cost of college and may increase the number of low socioeconomic status students who can attend and complete college.[2]

Research[3]

The What Works Clearinghouse (WWC) identified five studies of *dual enrollment programs* that both fall within the scope of the Transition to College topic area and meet WWC group design standards. Two studies meet WWC group design standards without reservations, and three studies meet WWC group design standards with reservations. Together, these studies included 77,249 high school students across the United States.

The WWC considers the extent of evidence for *dual enrollment programs* to be medium to large for the following student outcome domains—degree attainment (college), college access and enrollment, credit accumulation, completing high school, and general academic achievement (high school). The WWC considers the extent of evidence for *dual enrollment programs* to be small for the following student outcome domains—staying in school, college readiness, attendance (high school), and general academic achievement (college). There were no studies that meet WWC group design standards in the five other domains eligible in the Transition to College topic area, so this intervention report does not report on the effectiveness of *dual enrollment programs* for those domains. (See the Effectiveness Summary on p. 6 for more details of effectiveness by domain.)

Effectiveness[4]

Dual enrollment programs were found to have positive effects on students' degree attainment (college), college access and enrollment, credit accumulation, completing high school, and general academic achievement (high school), with a medium to large extent of evidence. For the staying in high school, college readiness, and attendance (high school) domains, *dual enrollment programs* had potentially positive effects with a small extent of

Report Contents

This intervention report presents findings from a systematic review of *dual enrollment* programs conducted using the WWC Procedures and Standards Handbook, version 3.0, and the Transition to College review protocol, version 3.2.

evidence. *Dual enrollment programs* were found to have no discernible effects on general academic achievement (college) with a small extent of evidence.

Table 1. Summary of findings

Outcome domain	Rating of effectiveness	Improvement index *(percentile points)*		Number of studies	Number of students	Extent of evidence
		Average	Range			
Degree attainment (college)	Positive effects	+25	+6 to +42	5	77,249	Medium to large
College access and enrollment	Positive effects	+15	+12 to +19	4	67,474	Medium to large
Credit accumulation	Positive effects	+14	+13 to +16	2	56,370	Medium to large
Completing high school	Positive effects	+7	+5 to +9	2	4,052	Medium to large
General academic achievement (high school)	Positive effects	+7	+3 to +13	2	2,817	Medium to large
Staying in high school	Potentially positive effects	+16	na	1	676	Small
College readiness	Potentially positive effects	+14	na	1	1,355	Small
Attendance (high school)	Potentially positive effects	+8	na	1	1,554	Small
General academic achievement (college)	No discernible effects	–1	na	1	455	Small

na = not applicable

Program Information

Background

Dual enrollment programs are collaborations between secondary and postsecondary institutions. These programs became common in the early 1990s and, according to the National Center for Education Statistics (NCES), there were more than 2 million students enrolled in *dual enrollment programs* by 2011.[5] Initially, *dual enrollment programs* were reserved for advanced students, but over time this has changed, and now average-achieving students are also able to participate. *Dual enrollment programs* are similar to other credit-based transition to college programs, such as Advanced Placement (AP) and International Baccalaureate (IB) programs, in that they provide rigorous course work and college preparation for students. In all of these programs, students are able to earn college credits before graduating from high school. However, *dual enrollment programs* allow students to take actual college courses, often on the postsecondary institution's campus and taught by a college instructor, rather than a high school course designed to serve as part of a college-level curriculum for high school students. *Dual enrollment programs* aim to help students accumulate college credits early, thereby increasing postsecondary degree attainment.

Program details

In the five studies that meet WWC group design standards, students were able to accumulate college credits either through a *dual enrollment program* or an early college high school program. Both of these programs allow students to enroll in college-level courses while still working towards their high school diploma. Students in traditional *dual enrollment programs* continue to be students in their regular high schools while also enrolling at the college or university where they are earning college credits. Typically, students are in grades 11 and 12 when they begin taking dual enrollment courses. Upon graduation from high school, these students can continue their college-level work with a reduced period of time needed to complete a postsecondary degree.

Early college high schools are another form of *dual enrollment program*. Early college high schools typically offer an aligned curriculum that includes both high school and college courses, allowing students to earn their high school diplomas and up to 2 years of transferrable college credits. Some early college high schools allow students to earn high school diplomas and a 2-year degree as part of a 5-year program. Early college high schools tend to offer more formal support for students in the program as they work towards earning college-level credits. In addition to earning college credits offered through these schools, students are provided with more traditional college preparation help (e.g., application assistance, financial aid application assistance, etc.) in order to reduce the barriers to postsecondary access and enrollment.

Cost

Typically, there is no cost to students enrolled in *dual enrollment programs*; however, the studies included in this review did not provide specific information about the costs of dual enrollment to the state or school district. In the state of Texas, high schools and postsecondary institutions are able to receive more funds from the state in order to cover the costs of *dual enrollment programs*.[6] Additionally, the early college high school initiative was funded by the Bill and Melinda Gates Foundation along with other corporations and foundations (13 partner organizations). They have provided $806 million worth of grants to support early college high schools throughout the United States.[7]

Research Summary

The WWC identified 35 eligible studies that investigated the effects of *dual enrollment programs* for high school students. An additional 27 studies were identified but do not meet WWC eligibility criteria for review in this topic area. Citations for all 62 studies are in the References section, which begins on p. 12.

Table 2. Scope of reviewed research

Grades	9, 10, 11, 12
Delivery method	Individual, Whole class, Whole school
Program type	Practice, Curriculum

The WWC reviewed 35 eligible studies against group design standards. Two studies (Berger, Garet, Hoshen, Knudson, & Turk-Bicakci, 2014; Edmunds, Unlu, Glennie, Bernstein, Fesler, Furey, & Arshavsky, 2015) are randomized controlled trials that meet WWC group design standards without reservations, and three studies (An, 2013; Giani, Alexander, & Reyes, 2014; Struhl & Vargas, 2012) are randomized controlled trials or use quasi-experimental designs that meet WWC group design standards with reservations. Those five studies are summarized in this report. Thirty studies do not meet WWC group design standards.

Summary of studies meeting WWC group design standards without reservations

Berger et al. (2014) conducted a randomized controlled trial that examined the effectiveness of early college high schools (ECHS). Students were assigned to participate in either an ECHS or a comparison group school via a lottery system. There were a total of 1,044 students in 10 ECHS in the intervention group and 1,414 students spread across 272 high schools in the comparison group. Early college high schools aim to provide underserved students with exposure to, and support in, college while they are still in high school. Early college high schools partner with colleges and universities to offer all students an opportunity to earn an associate degree or up to 2 years of college credits toward a bachelor's degree during high school at no or low cost to the students.

Edmunds et al. (2015) conducted a randomized controlled trial to examine the effectiveness of early college high schools (ECHS). The study took place in schools in several districts in North Carolina. The sample included students who had applied to early college high schools in North Carolina in the eighth grade. Using a lottery system, these students were either offered enrollment at an Early College High school in grade 9 or not. The total sample included 1,651 students. The 19 early college high schools in the study targeted students traditionally underrepresented in college—that is, first-generation college students, those from low-income families, and/or members of underrepresented racial or ethnic minority groups. The ECHS in this study typically enrolled fewer than 400 students and included grades 9–13 or 9–12.

Summary of studies meeting WWC group design standards with reservations

An (2013) conducted a quasi-experimental study to examine the effectiveness of *dual enrollment programs*. *Dual enrollment programs* provide students with a way to enroll in college and earn college credits while still in high school. The study sample was drawn from the fourth follow-up of the National Education Longitudinal Study (NELS) of 1988, which was conducted in 2000. The intervention group was comprised of students in the 2000 NELS follow-up survey who attended postsecondary school and who had participated in a *dual enrollment program* while in high school, which included 880 students. The comparison group was comprised of NELS respondents who attended a postsecondary school who participated in other high school programs (e.g., traditional and Advanced Placement programs), but not dual enrollment, which included 7,920 students. The author used a propensity score matching process to select an observationally equivalent comparison group. A total of 8,800 students across the United States were used for the study sample.

Giani et al. (2014) used a quasi-experimental design to examine the effectiveness of taking dual credit courses. The sample included one cohort of ninth graders who had been enrolled in public high schools in Texas during the 2000–01 school year. The intervention group consisted of students who took and passed one or more dual

credit courses in their junior or senior year. Propensity score matching was used to create matched groups. The comparison group was created from the sample of students who were enrolled in districts which did not offer any dual-credit courses to minimize self-selection bias. Both the intervention and comparison group samples were comprised of 15,716 students. Students were tracked through the 2009–10 school year.

Struhl and Vargas (2012) used a quasi-experimental design to examine the effectiveness of dual enrollment participation for improving postsecondary outcomes. The study selected high school seniors in the 2003–04 academic year who had remained in the same school district all 4 years of high school, and tracked their progress over the course of 6 years. Students who participated in dual enrollment were compared to students who did not participate in dual enrollment. Propensity score matching was used to create the intervention and comparison groups. A total of 132,772 students graduated in the 2004 academic year. Achievement, income, and race variables were used for matching to select students for the intervention and comparison groups. After matching, a total of 16,454 students were selected for the intervention and comparison groups.

Effectiveness Summary

The WWC review of *dual enrollment programs* for the Transition to College topic area includes outcomes in 13 domains: general academic achievement (middle school), general academic achievement (high school), attendance (middle school), attendance (high school), college readiness, staying in high school, progressing in high school, completing high school, college access and enrollment, credit accumulation, general academic achievement (college), degree attainment (college), and labor market. The six studies of *dual enrollment programs* that meet WWC group design standards reported findings in nine of the 13 domains: (a) degree attainment (college), (b) college access and enrollment, (c) credit accumulation, (d) completing high school, (e) general academic achievement (high school), (f) staying in high school, (g) college readiness, (h) attendance (high school), and (i) general academic achievement (college). The findings below present the authors' estimates and WWC-calculated estimates of the size and statistical significance of the effects of *dual enrollment programs* for students. Additional comparisons are presented as supplemental findings in Appendix D. The supplemental findings do not factor into the intervention's rating of effectiveness. For a more detailed description of the rating of effectiveness and extent of evidence criteria, see the WWC Rating Criteria on p. 43.

Summary of effectiveness for the degree attainment (college) domain

Two studies that meet WWC group design standards without reservations and three studies that meet WWC group design standards with reservations reported findings in the degree attainment (college) domain.

Berger et al. (2014) compared student graduation rates for early college high school participants to students in the comparison group. The authors reported, and the WWC confirmed, that there was a statistically significant difference between intervention and comparison group students on high school graduation rates. The WWC characterizes this finding as a statistically significant positive effect.

Edmunds et al. (2015) reported the percentage of students in the intervention and comparison groups who earned postsecondary credentials. The authors reported, and the WWC confirmed, that there was a statistically significant positive effect on degree attainment (college) for students who participated in the program. The WWC characterizes this finding as a statistically significant positive effect.

An (2013) reported on the percentage of students in the intervention and comparison groups who obtained any college degree. The author reported, and the WWC confirmed, that there was a statistically significant positive effect on degree attainment (college) for students who participated in the program. The WWC characterizes this finding as a statistically significant positive effect.

Giani et al. (2014) reported on the number of students in the intervention group who completed a postsecondary degree or certificate as compared to students in the comparison group. The authors reported, and the WWC confirmed, that there was a statistically significant positive effect on degree attainment (college) for students who participated in the program. The WWC characterizes this finding as a statistically significant positive effect.

Struhl and Vargas (2012) reported on the number of students in the intervention group who earned a college degree versus students in the comparison group who earned a college degree. The authors reported, and the WWC confirmed, that there was a statistically significant positive effect on degree attainment (college) for students who participated in the program. The WWC characterizes this finding as a statistically significant positive effect.

Thus, for the degree attainment (college) domain, five studies found statistically significant positive effects. This results in a rating of positive effects, with a medium to large extent of evidence.

Table 3. Rating of effectiveness and extent of evidence for the degree attainment (college) domain

Rating of effectiveness	Criteria met
Positive effects *Strong evidence of a positive effect with no overriding contrary evidence.*	In the five studies that reported findings, the estimated impact of the intervention on outcomes in the *degree attainment (college)* domain was positive, because five studies show statistically significant positive effects, and no studies show statistically significant or substantively negative effects.
Extent of evidence	**Criteria met**
Medium to large	Five studies that included 77,249 students in schools across the United States reported evidence of effectiveness in *degree attainment (college)* domain.

Summary of effectiveness for the college access and enrollment domain

Two studies that meet WWC group design standards without reservations and two studies that meet WWC group design standards with reservations reported findings in the college access and enrollment domain.

Berger et al. (2014) reported the percentage of students who enrolled in college. The authors reported, and the WWC confirmed, that there was a statistically significant difference between intervention and comparison group students on college enrollment rates. The WWC characterizes this finding as a statistically significant positive effect.

Edmunds et al. (2015) reported, based on survey data collected, the number of students who planned to attend a 4-year college after high school graduation. The authors reported, and the WWC confirmed, that there was a statistically significant difference between intervention and comparison group students on plans to attend a 4-year college. The WWC characterizes this finding as a statistically significant positive effect.

Giani et al. (2014) reported the number of students who enrolled in any postsecondary institution following high school graduation. The authors reported, and the WWC confirmed, that there was a statistically significant difference between intervention and comparison group students on college enrollment rates. The WWC characterizes this finding as a statistically significant positive effect.

Struhl and Vargas (2012) reported the number of students who enrolled in a postsecondary institution following high school graduation. The authors reported, and the WWC confirmed, that there was a statistically significant difference between intervention and comparison group students on postsecondary enrollment rates. The WWC characterizes this finding as a statistically significant positive effect.

Thus, for the college access and enrollment domain, four studies found statistically significant positive effects. *Dual enrollment programs* have a positive effect on college access and enrollment with a medium to large extent of evidence.

Table 4. Rating of effectiveness and extent of evidence for the college access and enrollment domain

Rating of effectiveness	Criteria met
Positive effects *Strong evidence of a positive effect with no overriding contrary evidence.*	In the four studies that reported findings, the estimated impact of the intervention on outcomes in the staying in *college access and enrollment* domain was positive, because four studies show statistically significant positive effects, and no studies show statistically significant or substantively negative effects.
Extent of evidence	**Criteria met**
Medium to large	Four studies that included 67,474 students in schools across the United States reported evidence of effectiveness in the *college access and enrollment* domain.

Summary of effectiveness for the credit accumulation domain

Table 5. Rating of effectiveness and extent of evidence for the credit accumulation domain

Rating of effectiveness	Criteria met
Positive effects *Strong evidence of a positive effect with no overriding contrary evidence.*	In the two studies that reported findings, the estimated impact of the intervention on outcomes in the *credit accumulation* domain was positive, because two studies show statistically significant positive effects, and no studies show statistically significant or substantively negative effects.
Extent of evidence	**Criteria met**
Medium to large	Two studies that included 64,340 students in schools across the United States reported evidence of effectiveness in the *credit accumulation* domain.

Two studies that meet WWC group design standards with reservations reported findings in the credit accumulation domain.

Giani et al. (2014) reported students' persistence in college to the second year (i.e., whether students returned for their second year fall semester) and compared the intervention group to the propensity score matched comparison group sample. The authors reported, and the WWC confirmed, that there was a statistically significant difference between the two groups. The WWC characterizes this effect as a statistically significant positive effect.

Struhl and Vargas (2012) reported on the number of students who had returned to college for their second year. These numbers were compared between intervention students and the comparison group. The authors reported, and the WWC confirmed, that there was a statistically significant difference between the two groups. The WWC characterizes this effect as a statistically significant positive effect.

Thus, for the credit accumulation domain, two studies found statistically significant positive effects. This results in a rating of positive effects, with a medium to large extent of evidence.

Summary of effectiveness for the completing high school domain

Table 6. Rating of effectiveness and extent of evidence for the completing high school domain

Rating of effectiveness	Criteria met
Positive effects *Strong evidence of a positive effect with no overriding contrary evidence.*	In the two studies that reported findings, the estimated impact of the intervention on outcomes in the *completing high school* domain was positive, because three studies show statistically significant positive effects, and no studies show statistically significant or substantively negative effects.
Extent of evidence	**Criteria met**
Medium to large	Two studies that included 4,052 students in schools across the United States reported evidence of effectiveness in the *completing high school* domain.

Two studies that meet WWC group design standards without reservations reported findings in the completing high school domain.

Berger et al. (2014) reported student graduation rates for early college high school participants as compared to students in the comparison group. The authors reported, and the WWC confirmed, that there was a statistically significant difference between intervention and comparison group students on high school graduation rates. The WWC characterizes this finding as a statistically significant positive effect.

Edmunds et al. (2015) reported the 5-year graduation rate for intervention students as compared to comparison group students. The authors reported, and the WWC confirmed, that there was a statistically significant difference between intervention and comparison group students on high school graduation rates. The WWC characterizes this finding as a statistically significant positive effect.

Thus, for the completing high school domain, two studies showed statistically positive effects. *Dual enrollment programs* have a positive effect on completing high school with a medium to large extent of evidence.

Summary of effectiveness for the general academic achievement (high school) domain

Table 7. Rating of effectiveness and extent of evidence for the general academic achievement (high school) domain

Rating of effectiveness	Criteria met
Positive effects *Strong evidence of a positive effect with no overriding contrary evidence.*	In the two studies that reported findings, the estimated impact of the intervention on outcomes in the *general academic achievement (high school)* domain was positive, because two studies show statistically significant positive effects, and no studies show statistically significant or substantively negative effects.
Extent of evidence	**Criteria met**
Medium to large	Two studies that included 2,817 students in schools across the United States reported evidence of effectiveness in the *general academic achievement (high school)* domain.

Two studies that meet WWC group design standards without reservations reported findings in the general academic achievement (high school) domain.

Berger et al. (2014) reported on students' standardized English language arts and math achievement scores and high school grade point average. The authors reported, and the WWC confirmed, that there was a statistically significant difference between early college high school participants and comparison participants on standardized English language arts assessment scores. The other two outcomes in this domain were not statistically significant. The WWC characterizes the mean effect across the three measures in this domain as positive and statistically significant.

Edmunds et al. (2015) reported on the percentage of students passing the end-of-course exam in three or more college prep math courses, the end-of-course exam in Biology, the end-of-course exam in Civics and Economics, and the end-of-course exam in English I. These outcomes were obtained from transcript data collected by the North Carolina Department of Public Instruction (NCDPI). The authors reported, and the WWC confirmed, that there was a statistically significant difference between early college high school students and comparison participants. The WWC characterizes the mean effect across these four measures in this domain as positive and statistically significant.

Thus, for the general academic achievement (high school) domain, two studies showed statistically significant positive effects. *Dual enrollment programs* have a positive effect with a medium to large extent of evidence on general academic achievement (high school).

Summary of effectiveness for the staying in high school domain

Table 8. Rating of effectiveness and extent of evidence for the staying in high school domain

Rating of effectiveness	Criteria met
Potentially positive effects *Evidence of a positive effect with no overriding contrary evidence.*	In the one study that reported findings, the estimated impact of the intervention on outcomes in the *staying in high school* domain was potentially positive, because one study showed a statistically significant or substantively important positive effect, and no studies show a statistically significant or substantively important negative effect.
Extent of evidence	**Criteria met**
Small	One study that included 676 students in multiple schools in North Carolina reported evidence of effectiveness in the *staying in high school* domain.

One study that meets WWC group design standards without reservations reported findings in the staying in high school domain.

Edmunds et al. (2015) reported the percentage of students enrolled in an early college high school who stayed in school versus the percentage of students enrolled in traditional high schools who stayed in school. The authors reported, and the WWC confirmed, that there was a statistically significant difference between the intervention students and the comparison students on the percentage of students who stayed in school. The WWC characterizes this finding as a statistically significant positive effect.

Thus, for the staying in high school domain, one study showed a statistically positive effect. Dual enrollment programs have a potentially positive effect on staying in high school with a small extent of evidence.

Summary of effectiveness for the college readiness domain

Table 9. Rating of effectiveness and extent of evidence for the college readiness domain

Rating of effectiveness	Criteria met
Potentially positive effects *Evidence of a positive effect with no overriding contrary evidence.*	In the one study that reported findings, the estimated impact of the intervention on outcomes in the *college readiness* domain was potentially positive, because one study showed a statistically significant or substantively important positive effect, and no studies show a statistically significant or substantively important negative effect.
Extent of evidence	**Criteria met**
Small	One study that included 1,355 students in multiple schools in North Carolina reported evidence of effectiveness in the *college readiness* domain.

One study that meets WWC group design standards without reservations reported findings in the college readiness domain.

Edmunds et al. (2015) reported the percentage of students on track to complete college preparatory coursework at the end of high school. The authors reported, and the WWC confirmed, that there was a statistically significant difference between the intervention students and the comparison students on the percentage of students who were ready for college at the end of high school. The WWC characterizes this finding as a statistically significant positive effect.

Thus, for the college readiness domain, one study showed a statistically positive effect. *Dual enrollment programs* have a potentially positive effect on college readiness with a small extent of evidence.

Summary of effectiveness for the attendance (high school) domain

Table 10. Rating of effectiveness and extent of evidence for the attendance (high school) domain

Rating of effectiveness	Criteria met
Potentially positive effects *Evidence of a positive effect with no overriding contrary evidence.*	In the one study that reported findings, the estimated impact of the intervention on outcomes in the *attendance (high school)* domain was potentially positive, because one study showed a statistically significant or substantively important positive effect, and no studies show a statistically significant or substantively important negative effect.
Extent of evidence	**Criteria met**
Small	One study that included 1,554 students in 12 schools reported evidence of effectiveness in *attendance (high school)* domain.

One study that meets WWC group design standards without reservations reported findings in the attendance (high school) domain.

Edmunds et al. (2015) reported the number of days students who attended early college high schools were absent from school compared to students who attended traditional high schools. The authors reported, and the WWC con-

firmed, that there was a statistically significant difference between the intervention students and the comparison students on the number of days absent. The WWC characterizes this finding as a statistically significant positive effect.

Thus, for the attendance (high school) domain, one study showed a statistically positive effect. *Dual enrollment programs* have a potentially positive effect on high school attendance with a small extent of evidence.

Summary of effectiveness for the general academic achievement (college) domain

Table 11. Rating of effectiveness and extent of evidence for the general academic achievement (college) domain

Rating of effectiveness	Criteria met
No discernible effects *None of the studies show a statistically significant or substantively important effect, either positive or negative.*	In the one study that reported findings, the estimated impact of the intervention on outcomes in the *general academic achievement (college)* domain was neither statistically significant nor large enough to be substantively important.
Extent of evidence	**Criteria met**
Small	One study that included 455 students in 282 schools reported evidence of effectiveness in the *general academic achievement (college)* domain.

One study that meets WWC group design standards without reservations reported findings in the general academic achievement (college) domain.

Berger et al. (2014) reported students' grade point averages (GPAs) earned in college. The authors compared college GPAs between students in the intervention group and those in the comparison group. The authors reported, and the WWC confirmed, that there was not a statistically significant difference between intervention and comparison group students in the general academic achievement (college) domain. The WWC characterizes this finding as indeterminate. The mean effect reported is neither statistically significant nor substantively important.

Thus, for the general academic achievement (college) domain, one study showed an indeterminate effect. This results in a rating of no discernible effects, with a small extent of evidence.

References

Studies that meet WWC group design standards without reservations

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Studies that meet WWC group design standards with reservations

An, B. P. (2013). The impact of dual enrollment on college degree attainment: Do low-SES students benefit? *Educational Evaluation and Policy Analysis, 35*, 57–75. doi:10.3102/0162373712461933

Giani, M., Alexander, C., & Reyes, P. (2014). Exploring variation in the impact of dual-credit coursework on postsecondary outcomes: A quasi-experimental analysis of Texas students. *High School Journal, 97*(4), 200–218.

Struhl, B., & Vargas, J. (2012). *Taking college courses in high school: A strategy guide for college readiness: The college outcomes of dual enrollment in Texas*. Washington, DC: Jobs for the Future. Retrieved from http://eric.ed.gov/?&id=ED537253

Studies that do not meet WWC group design standards

Allen, D., & Dadgar, M. (2012). Does dual enrollment increase students' success in college? Evidence from a quasi-experimental analysis of dual enrollment in New York City. *New Directions for Higher Education, 158*, 11–19. The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

An, B. P. (2013). The influence of dual enrollment on academic performance and college readiness: Differences by socioeconomic status. *Research in Higher Education, 54*(4), 407–432. doi:10.1007/s11162-012-9278-z The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Chapa, M. (2015). *An evaluation of traditional and early college high school models and their effect on college readiness in English* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3705226). The study does not meet WWC group design standards because the measures of effectiveness cannot be attributed solely to the intervention.

Chapa, M., Leon, V. G. D., Solis, J., & Mundy, M. A. (2014). College readiness. *Research in Higher Education Journal, 25*, 1–5. Retrieved from http://eric.ed.gov/?&id=EJ1055338 The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Cowan, J., & Goldhaber, D. (2014). *How much of a "Running Start" do dual enrollment programs provide students?* (CEDR Working Paper 2014-7). Seattle: University of Washington. The study does not meet WWC group

design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Curry, P. D. (2013). *A quantitative study of the impact of early college high schools on high school dropout rates in Texas* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3575061) The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Eimers, M., & Mullen, R. (2003, May). *Dual Credit and Advanced Placement: Do they help prepare students for success in college*. Paper presented at the 43rd Annual AIR Fall Conference, Tampa, FL. Retrieved from https://uminfopoint.umsystem.edu/ The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Fara, K. J. (2010). *The relationship of college credit earned while in high school to first-semester college GPA and persistence to the second college year* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3438692) The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Fowler, M. D. (2007). *A program evaluation of achieving a college education plus* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3296083) The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Additional source:

Luna, G., & Fowler, M. (2011). Evaluation of achieving a college education plus: A credit-based transition program. *Community College Journal of Research and Practice, 35*(9), 673–688. doi:10.1080/10668920903527050

Harrington, V. S. (2005). *High school/college credit programs and university success* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3166111) The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Houselog, M. (2013). *A comparative analysis of student performance between full-time college dual credit students and advanced placement high school students* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3586993) The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Hughes, K. L., Rodriguez, O., Edwards, L., & Belfield, C. (2012). *Broadening the benefits of dual enrollment: Reaching underachieving and underrepresented students with career-focused programs*. San Francisco, CA: The James Irvine Foundation. Retrieved from http://eric.ed.gov/?&id=ED533756 The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Kanny, M. A. (2014). *Forks in the pathway? Mapping the conditional effects of dual enrollment by gender, first-generation status, and pre-college academic achievement on first-year student engagement and grades in college* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3622646) The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Karp, M. M., Calcagno, J. C., Hughes, K. L., Jeong, D. W., & Bailey, T. R. (2007). *The postsecondary achievement of participants in dual enrollment: An analysis of student outcomes in two states*. St. Paul: University of Minnesota, National Research Center for Career and Technical Education. Retrieved from http://eric.ed.gov/?&id=ED498661 The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

King, S. H. (2001). *High school/college collaborative: The impact of a co-enrollment program on student success* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3008369) The

study does not meet WWC group design standards because the measures of effectiveness cannot be attributed solely to the intervention.

Langley, J. K. (2009). *An evaluative study of the GateWay Early College High School* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3391935) The study does not meet WWC group design standards because the measures of effectiveness cannot be attributed solely to the intervention.

Martin, T. C. (2013). Cognitive and noncognitive college readiness of participants in three concurrent-enrollment programs. *Community College Journal of Research and Practice, 37*(9), 704–718. The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

McCauley, K. D. (2010). *The impact of a Louisiana dual-enrollment program on the academic success in mathematics of first year college freshmen* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3430272) The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

McMoran, M. A. (2011). *Effect of early college participation on high school student academic performance in the state of Texas* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3467963) The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Moseley, R. A. J. (2013). *A case study of a dual enrollment intervention in an urban comprehensive high school* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3597281) The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Muñoz, M. A., Fischetti, J. C., & Prather, J. R. (2014). An early college initiative in an urban, high-poverty high school: First-year effects on student achievement and non-academic indicators. *Journal of Education for Students Placed at Risk, 19*(1), 36–52. doi:10.1080/10824669.2014.927746 The study does not meet WWC group design standards because the measures of effectiveness cannot be attributed solely to the intervention.

Nash, C. J. (2015). *Spheres of educational opportunity: A mixed methods study examining the relationship between concurrent enrollment participation and students' college transition, readiness, and success* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3704779) The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Neely, A. L. (2013). *Influence of agricultural dual credit on student college readiness self-efficacy* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3607800) The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Nitzke, J. E. (2002). *A longitudinal study of dual credit enrollment of high school students as an accelerator for degree completion* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3061852) The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Prophete, K. S. (2013). *How race, gender, and Pell status affect the persistence and degree attainment rates of dual enrollment students* (Doctoral dissertation). Available from ProQuest Dissertations Publishing. (UMI No. 3576258) The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Rodriguez, O., Hughes, K. L., & Belfield, C. (2012). *Bridging college and careers: Using dual enrollment to enhance career and technical education pathways* (NCPR Working Paper). New York, NY: National Center for Postsecondary Research. Retrieved from http://eric.ed.gov/?&id=ED533873 The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Saltarelli, C. A. (2008). *An examination of the relationship between early college credit and higher education achievement, persistence, and time to graduation, of students in South Texas* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3332682) The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Sullivan-Ham, K. (2010). *Impact of participation in a dual enrollment program on first semester college GPA* (Unpublished doctoral dissertation). Walden University, Minneapolis, MN. The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Taylor, J. L. (2015). Accelerating pathways to college: The (in)equitable effects of community college dual credit. *Community College Review, 43*(4), 355–379. The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Young, R. D., Jr. (2013). *Dual credit enrollment and GPA by ethnicity and gender at Texas 2-year colleges* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3571399) The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Studies that are ineligible for review using the Transition to College Evidence Review Protocol

Adelman, N., Berger, A. R., Cassidy, L., Cole, S., Duffy, H., Edwards, S., ... Suk Yoon, K. (2009). *Fifth annual Early College High School Initiative evaluation synthesis report. Six years and counting: The ECHSI matures*. Washington, DC & Arlington, VA: American Institutes for Research & SRI International. Retrieved from http://eric.ed.gov/?&id=ED514090 The study is ineligible for review because it does not have an eligible design.

Adelman, N., Berger, A. R., Cole, S., Hall, C., Hersh, L., Knowles Keating, K., ... Walton, L. (2005). *Early College High School Initiative. Evaluation year end report: 2003-2004*. Washington, DC & Arlington, VA: American Institutes for Research & SRI International. Retrieved from http://eric.ed.gov/?&id=ED494921 The study is ineligible for review because it does not have an eligible design.

An, B. P., & Taylor, J. L. (2015). Are dual enrollment students college ready? Evidence from the Wabash National Study of Liberal Arts Education. *Education Policy Analysis Archives, 23*(58), 1–26. The study is ineligible for review because it is out of scope of the protocol.

Anonymous. (2014). The impact of early college high schools. *Community College Journal, 84*(6), 36. The study is ineligible for review because it does not have an eligible design.

Bruce, L. M. (2007). *Perceptions, motivations, and achievement of African-American students enrolled in a middle college high school.* (Doctoral dissertation). Available from ProQuest Dissertations. (UMI No. 3263479) The study is ineligible for review because it does not have an eligible design.

Cevallos, L., & Cevallos, P. (2016). *The South Los Angeles Math (SLAM) project: Year 3 report*. Hacienda Heights, CA: College Bridge. The study is ineligible for review because it does not have an eligible design.

Crockett-Bell, S. A. (2007). *The dual credit program: Measuring the effectiveness on students' transition from high school to college* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3277657) The study is ineligible for review because it does not have an eligible design.

Eisenbeck Henson, M. A. (2013). *Dual enrollment's impact on college enrollment* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3567902) The study is ineligible for review because it does not have an eligible design.

Farrell, T. L. (2009). *The early college high school and student self-perceptions of college readiness* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3411426) The study is ineligible for review because it does not have an eligible design.

Ganzert, B. (2014). Dual enrollment credit and college readiness. *Community College Journal of Research and Practice, 38*(9), 783–793. The study is ineligible for review because it does not have an eligible design.

Gossman, J. (2013). Study compares admitted, non-admitted ECHS students. *Education Daily, 46*(125), 2. The study is ineligible for review because it does not have an eligible design.

Gregory, S. W. (2009). *Factors associated with Advanced Placement enrollment, Advanced Placement course grade, and passing of the Advanced Placement examination among Hispanic and African American students in Southern California* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3388679) The study is ineligible for review because it does not have an eligible design.

Hall, A. L. (2008). *Program implementation and student outcomes at four western North Carolina early college high schools* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3319371) The study is ineligible for review because it does not have an eligible design.

Kim, J. (2014). Relationship of Tech Prep and dual credit to college readiness and retention. *College Student Journal, 48*(3), 337–346. The study is ineligible for review because it does not have an eligible design.

Kim, J., & Bragg, D. D. (2008). The impact of dual and articulated credit on college readiness and retention in four community colleges. *Career and Technical Education Research, 33*(2), 133–158. doi:10.5328/cter33.2.133 The study is ineligible for review because it does not have an eligible design.

Loftin, T. A. (2012). *Concurrent and dual credit: The bridge to postsecondary education for first-generation college students* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3522650) The study is ineligible for review because it does not have an eligible design.

Muñoz, M. D. (2011). *Early College High Schools established from 2006 through 2008 in El Paso County, Texas: Discovering factors contributing to Hispanic student success* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3534116) The study is ineligible for review because it does not have an eligible design.

Osumi, J. M. (2010). *The influence of counselors and high school organization on the selection of participants for a dual credit program* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3434485) The study is ineligible for review because it does not have an eligible design.

Payton-Adams, M. (2014). *College success of Technical College Preparation and Dual Credit program students versus non-program students: A comparative analysis at a Midwestern Community College* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3624025) The study is ineligible for review because it is out of scope of the protocol.

Pollock, C. F. (2009). *The impact of exposure to early college students on community college student academic and social integration* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3380380) The study is ineligible for review because it does not have an eligible design.

Rochford, J. A. (2010). *Ongoing proof: Results from the Canton Early College High School class of 2010*. Canton, OH: Stark Education Partnership. Retrieved from http://eric.ed.gov/?&id=ED525147 The study is ineligible for review because it does not have an eligible design.

Rowett, C. (2012). *Exploring college readiness: The role of dual credit and SES on college persistence and student success* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3543604) The study is ineligible for review because it does not have an eligible design.

Simms, R. O. (2010). *An analysis of the outcomes of dual enrollment participants in Kentucky Community & Technical Colleges: 2001-2002 to 2007-2008* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3447693) The study is ineligible for review because it does not have an eligible design.

Speroni, C. (2011). *Essays on the economics of high school-to-college transition programs and teacher effectiveness* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3450867) The study is ineligible for review because it does not have an eligible design.

Additional sources:

Speroni, C. (2011). *Determinants of students' success: the role of Advanced Placement and dual enrollment programs* (NCPR Working Paper). New York, NY: National Center for Postsecondary Research. Retrieved from http://eric.ed.gov/?&id=ED527528

Speroni, C. (2012). *High school dual enrollment programs: Are we fast-tracking students too fast?* (NCPR brief). New York, NY: National Center for Postsecondary Research. Retrieved from http://eric.ed.gov/?&id=ED533867

Thompson, C., & Onganga, K. (2011). "Flying the plane while we build it": A case study of an early college high school. *The High School Journal, 94*(2), 43–57. The study is ineligible for review because it does not have an eligible design.

Welsh, J. F., Brake, N., & Choi, N. (2005). Student participation and performance in dual-credit courses in a reform environment. *Community College Journal of Research and Practice, 29*(3), 199–213. The study is ineligible for review because it does not have an eligible design.

Williams, J. F. (2010). *Early college academic performance: Studying the effects of earning college credits from advanced placement and dual enrollment* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3390529) The study is ineligible for review because it does not use a sample aligned with the protocol.

Appendix A.1: Research details for Berger et al. (2014)

Berger, A., Garet, M., Hoshen, G., Knudson, J., & Turk-Bicakci, L. (2014). *Early college, early success: Early college high school initiative impact study*. Washington, DC: American Institutes for Research.

Additional source:

Berger, A., Cassidy, L., Ford, J., Garet, M., Haxton, C., Hoshen, G., ...Zeiser, K. (2013). *Early college, early success: Early college high school initiative impact study*. Washington, DC: American Institutes for Research.

Table A1. Summary of findings

Meets WWC group design standards without reservations

Outcome domain	Sample size	Study findings	
		Average improvement index *(percentile points)*	Statistically significant
Degree attainment (college)	2,458 students	+38	Yes
College access and enrollment	2,458 students	+12	Yes
Completing high school	2,458 students	+9	Yes
General academic achievement (high school)	2,141 students	+3	Yes
General academic achievement (college)	455 students	–1	No

Setting

The early college high schools were located in five states throughout the country: five in urban areas, three in small towns, and two in mid-sized cities. Eight of the 10 early colleges were located on college campuses. Seven had a 2-year public college partner, two had a 4-year public college partner, and one had both.

Study sample

The sample consisted of general education high school students. About half (52%) of the early college group was female versus 55% of the comparison group. Minority students comprised 52% and 54% of the intervention and comparison groups, respectively. In addition, 31% of the intervention group was first-generation college students, versus 34% of the comparison group. Low-income students comprised 47% of the intervention group and 42% of the comparison group.

Intervention group

Six early colleges were district-run schools, and the remaining four were charter schools. Most of the schools also had a subject matter focus in addition to providing opportunities to earn college credit: five had a STEM focus, and two had a teacher preparation focus. The early colleges offered a wide array of supports, with all ten early colleges providing tutoring, college preparatory information, and college access assistance that highlighted scholarships and other financial aid information. In addition, some of the early colleges offered advisories; summer, evening, and weekend classes; extended school days; and/or block scheduling. In terms of the college coursework, seven early colleges had course sequences that allowed students to earn at least 2 years of college credit, two early colleges allowed students to earn up to 1 year of college credit, and one early college allowed students to earn at least some college credit.

Comparison group

The comparison students in the study attended 272 different high schools. The comparison schools were generally much larger than the early college high schools. At the comparison schools, Advanced Placement (AP) courses were more prevalent than dual enrollment as a strategy for students to earn college credit. The majority of the students who did not attend early colleges enrolled in larger high schools with larger minority and low-income student populations. Those schools provided fewer academic supports (e.g., tutoring) and a less direct focus on college readiness for all students.

Outcomes and measurement

The study examined a number of outcomes, some measured in high school and some in college. The eligible high school outcomes were standardized English/language arts achievement, standardized math achievement, high school grade point average (GPA), and high school graduation. The eligible postsecondary outcomes were any college enrollment, any postsecondary degree, placement in developmental education in college, and college GPA. The data for the high school graduation outcomes were obtained from high school records maintained by a variety of local sources. High school standardized achievement tests in English/language arts and math were obtained from high school administrative records. High school GPAs were obtained from a student survey. The data for college enrollment and degree attainment (college) outcomes were obtained from the National Student Clearinghouse (NSC). The data for college GPAs were obtained from a student survey.

The study also reported supplemental findings for completing high school, college access and enrollment, and degree attainment (college) by gender, socioeconomic status, and ethnicity. The supplemental findings do not factor into the rating of the intervention's effectiveness. For a more detailed description of these outcome measures, see Appendix B.

Support for implementation

All but one of the early colleges had college instructors, rather than qualified high school instructors, teaching college courses. No other support for implementation was reported.

Appendix A.2: Research details for Edmunds et al. (2015)

Edmunds, J., Unlu, F., Glennie, E., Bernstein, L., Fesler, L., Furey, J., & Arshavsky, N. (2015). *Smoothing the transition to postsecondary education: The impact of the Early College Model*. Retrieved from the SERVE website: http://www.serve.org/

Additional sources:

Arshavsky, N., & Edmunds, J. A. (2014, April). *The impact of Early College High Schools on mathematics teaching and learning*. Paper presented at the National Council of Teachers of Mathematics Research Conference, New Orleans, LA.

Bernstein, L., Edmunds, J., & Fesler, L. (2014). *Closing the performance gap: The impact of the Early College High School Model on underprepared students*. Evanston, IL: Society for Research on Educational Effectiveness. Retrieved from http://eric.ed.gov/?id=ED562689

Bernstein, L., Edmunds, J., & Unlu, F. (2014, April). *Catching up underprepared students in Early College High Schools: Reducing the performance gap*. Paper presented at the annual meeting of the American Educational Research Association, Philadelphia, PA.

Bernstein, L., Yamaguchi, R., Unlu, F., Edmunds, J., Glennie, E., Willse, J., ... Dallas, A. (2010, March). *Early findings from the implementation and impact study of Early College High School*. Paper presented at the Society for Research on Educational Effectiveness (SREE) conference, Washington, DC. Retrieved from http://eric.ed.gov/?id=ED512692

Edmunds, J., Unlu, F., Glennie, E., Bernstein, L., Fesler, L., Furey, J., & Arshavsky, N. (2015, November). *Facilitating the transition to postsecondary education: The impact of the Early College Model*. Paper presented at the Association of Public Policy Analysis and Management conference, Miami, FL.

Edmunds, J., Unlu, F., Glennie, E., & Fesler, L. (2015, November). *Facilitating the transition to postsecondary education: The impact of early colleges*. Paper presented at the Association for Public Policy Analysis and Management conference, Miami, FL.

Edmunds, J. A. (2012). Early Colleges: A new model of schooling focusing on college readiness. *New Directions for Higher Education, 158*, 81–89.

Edmunds, J. A., Arshavsky, N., & Fesler, L. (2015, April). *A mixed methods examination of college readiness in an innovative high school setting*. Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Edmunds, J. A., Bernstein, L., Glennie, E., Willse, J., Arshavsky, N., Unlu, F., ... Dallas, A. (2010). Preparing students for college: The implementation and impact of the Early College High School Model. *Peabody Journal of Education, 85*(3), 348–364.

Edmunds, J. A., Bernstein, L., Unlu, F., Glennie, E., & Arshavsky, N. (2011, March). *The impact of the Early College High School Model on core 9th and 10th grade student outcomes*. Paper presented at the Society for Research on Educational Effectiveness (SREE) conference, Washington, DC. Retrieved from http://eric.ed.gov/?id=ED518187

Edmunds, J. A., Bernstein, L., Unlu, F., Glennie, E., & Smith A. (2013, April). *Graduating on-time: The impact of an innovative high school reform model on high school graduation rates*. Paper presented at the annual meeting of the American Educational Research Association, San Francisco, CA.

Edmunds, J. A., Bernstein, L., Unlu, F., Glennie, E., Willse, J., Smith, A., & Arshavsky, N. (2012). Expanding the start of the college pipeline: Ninth-grade findings from an experimental study of the impact of the Early College High School Model. *Journal of Research on Educational Effectiveness, 5*(2), 136–159.

Edmunds, J. A., Unlu, F., Glennie, E., Smith, A., Fesler, L., & Bernstein, L. (2013, November). *The impact of Early College High Schools on college readiness and college enrollment*. Paper presented at the annual meeting of the Association for Public Policy Analysis and Management, Washington, DC.

Edmunds, J. A., Unlu, F., Smith, A., Glennie, E., & Bernstein, L. (2013, April). *The impact of Early College High Schools on low-income students*. Paper presented at the annual meeting of the American Educational Research Association, San Francisco, CA.

Edmunds, J. A., Willse, J., Arshavsky, N., & Dallas, A. (2013). Mandated engagement: The impact of Early College High Schools. *Teachers College Record, 115*(7).

Edmunds, J. A., Willse, J., Unlu, F., Glennie, E., & Bernstein, L. (2014, September). *Increasing high school students' engagement: The impact of a high school reform model focused on college readiness*. Paper presented at the Fall Meeting of the Society of Research on Educational Effectiveness, Washinton, DC.

Unlu, F., Yamaguchi, R., Bernstein, L., & Edmunds, J. (2010, March). *Estimating impacts on program-related subgroups using propensity score matching: Evidence from the Early College High School study*. Paper presented at annual meeting of the Society for Research on Educational Effectiveness, Washington, DC.

Table A2. Summary of findings **Meets WWC group design standards without reservations**

Outcome domain	Sample size	Study findings	
		Average improvement index *(percentile points)*	Statistically significant
Degree attainment (college)	1,651 students	+42	Yes
College access and enrollment	676 students	+16	Yes
Completing high school	1,594 students	+5	Yes
General academic achievement (high school)	676 students	+13	Yes
Staying in high school	676 students	+16	Yes
College readiness	1,355 students	+14	Yes
Attendance (high school)	1,554 students	+8	Yes

Setting

This study took place in school districts throughout the state of North Carolina, including schools located in rural and urban settings with diverse demographics.

Study sample

All participants applied to early college high schools in the eighth grade and began their Early College High School programs or traditional high school in the ninth grade of high school (during the 2005–06, 2006–07, 2007–08, and 2008–09 school years) and were followed through the sixth year after starting ninth grade. Eighteen cohorts of students were represented in this study. The final longitudinal sample included 1,651 students (938 intervention; 713 comparison). The intervention group was 59% White, 28% Black, 9% Hispanic, and 41% male, while the comparison group was 63% White, 25% Black, 7% Hispanic, and 41% male. In both groups, 41% of the students were first-generation college students. In addition, 51% of intervention group students were free/reduced-price lunch eligible versus 50% of comparison group students. In the intervention group, 18% of the students were underprepared in math (as operationalized by passing eighth-grade standardized tests) and 21% were underprepared in reading. In the comparison group, 22% of the students were underprepared in math and 20% were underprepared in reading.

Intervention group

North Carolina's early college high school model includes a program of study (grades 9–12 or 9–13) intended to lead to an associate degree or 2 years of college credit within 4–5 years. Operationally, the model includes rigorous instruction, staff collaboration and professional development, a focus on building positive relationships between students and staff, and student supports. In contrast to traditional high schools, the ECHS in North Carolina are typically located on college campuses, are small (fewer than 400 students), have autonomous governance, and require students to complete 2 years of college credits while in high school.

Comparison group

The comparison students were assigned to the high school they would have attended if not granted admission by lottery to the early college high school.

Outcomes and measurement

The eligible outcomes in this study were taken from administrative databases maintained by the North Carolina Department of Public Instruction (NCDPI), the National Student Clearinghouse, and the North Carolina Community College System.

In the attendance domain (high school), the eligible primary outcome was absences (in days). These data were obtained from the NCDPI.

In the college readiness domain, the primary outcome was the percentage of students on track to complete college preparatory coursework at the end of high school. The supplementary outcomes in this domain included on track percentages in English, mathematics, science, and social studies. These data were available at multiple time points, including grades 9–12. The study also reported on college credits earned in high school and enrollment in college courses in high school; these outcomes did not meet review requirements because they are overaligned with the intervention. College readiness data were obtained from transcript data collected by NCDPI.

For the completing high school domain, the primary outcome was the 5-year high school graduation rate. These data were obtained from the Graduate Data Verification System.

For the general academic achievement domain (high school), the primary outcomes included the percentage of students passing the end-of-course exam in three or more college prep math courses, the end-of-course exam in Biology, the end-of-course exam in civics and economics, and the end-of-course exam in English I. The study also reported the percentage of students passing the end-of-course exam in two or more college prep math courses, the end-of-course exam in one or more college prep math courses, the end-of-course exam in Algebra I, the end-of-course exam in Algebra II, and the end-of-course exam in Geometry. These outcomes were not eligible for review because they describe a subset of the information contained in the primary outcome of passing three or more college prep math courses. These outcomes were obtained from transcript data collected by NCDPI.

For the staying in school domain, the primary outcome was the percentage of students still enrolled in high school. The percentage of students who dropped out was also reported and is included as a supplementary outcome. These outcomes were obtained from transcript data collected by NCDPI.

In the college access and enrollment domain, self-reports of the students' plans to attend a 4-year college was the primary outcome. The authors reported postsecondary enrollment and postsecondary enrollment in a 2-year or 4-year college, but these were overaligned with the intervention because the figures included enrollment in any postsecondary institution during or after high school. The data were obtained from the National Student Clearinghouse and checked against the NCDPI data.

For the degree attainment (college) domain, the primary outcome was attaining a postsecondary credential. Data were obtained from the National Student Clearinghouse.

For a more detailed description of these outcome measures, see Appendix B.

Support for implementation

The ECHS in this study collaborated with their higher education partner to develop a curriculum of high school and college courses students would take to graduate with a diploma and 2 years of transferable college credit. Two of the design principles of North Carolina's Learn and Earn ECHS model (Professionalism and Leadership) also supported implementation. As part of the Professionalism principle, teachers received ongoing professional development, collaborated with other staff members, and had collective responsibility and decision-making. As part of the Leadership principle, staff worked together to create a shared mission to improve student outcomes.

Appendix A.3: Research details for An (2013)

An, B. P. (2013). The impact of dual enrollment on college degree attainment: Do low-SES students benefit? *Educational Evaluation and Policy Analysis, 35*, 57–75. doi:10.3102/0162373712461933

Table A3. Summary of findings **Meets WWC group design standards with reservations**

		Study findings	
Outcome domain	Sample size	Average improvement index *(percentile points)*	Statistically significant
Degree attainment (college)	8,800 students	+6	Yes

Setting

Students in the dual enrollment and comparison conditions were participants in the National Education Longitudinal Study (NELS), which began in 1988 with a nationally representative sample of eighth-grade students attending school in the United States.

Study sample

The intervention group contained 880 students who had participated in dual enrollment during high school. The comparison group contained 7,920 students who had not participated in dual enrollment during high school. These students came from many schools across the United States. No sample characteristics were provided in the study.

Intervention group

The intervention group was comprised of those individuals in the NELS sample who attended college and participated in dual enrollment programs in high school. No other information about the nature or characteristics of the dual enrollment programs was provided.

Comparison group

The comparison group was comprised of NELS participants who attended college but did not participate in a dual enrollment program in high school. The comparison students participated in other high school programs (e.g., traditional high school programs or Advanced Placement programs).

Outcomes and measurement

The study measured the outcome of obtaining any college degree. Additionally, supplemental findings were reported based on student socioeconomic status (as measured by parental education level). All outcomes were derived from the NELS dataset. The supplemental findings do not factor into the intervention's effectiveness. For a more detailed description of these outcome measures, see Appendix B.

Support for implementation

No information about training or implementation was provided in the study report.

Appendix A.4: Research details for Giani et al. (2014)

Giani, M., Alexander, C., & Reyes, P. (2014). Exploring variation in the impact of dual-credit coursework on postsecondary outcomes: A quasi-experimental analysis of Texas students. *High School Journal, 97*(4), 200–218.

Table A4. Summary of findings

Meets WWC group design standards with reservations

Outcome domain	Sample size	Study findings	
		Average improvement index *(percentile points)*	Statistically significant
Degree attainment (college)	31,432 students	+13	Yes
College access and enrollment	31,432 students	+14	Yes
Credit accumulation	23,462 students	+13	Yes

Setting

The study was set in Texas and included 31,432 ninth-grade public high school students in the 2000–01 school year. Data were drawn from the Texas Education Research Center P-20 longitudinal data system. The study had 10 years of longitudinal follow-up data.

Study sample

The authors used the following sample characteristics in the propensity score matching procedure: gender, race/ethnicity, socioeconomic status, English language learner, gifted, special education, vocational education, and prior achievement. However, the study does not report descriptive information for the total sample or for the two groups, so the demographic characteristics of the sample are unknown.

Intervention group

The intervention was defined as completion of at least one dual-enrollment course in the state of Texas during the junior or senior year. No specific information about the nature of the dual enrollment courses was provided.

Comparison group

The comparison condition was created from students who attended schools that did not have access to dual-credit courses in the state of Texas during their junior or senior year.

Outcomes and measurement

The study examined three primary outcomes and three supplementary outcomes (one of which met WWC standards). Study data were obtained from administrative records held at the Texas Education Research Center at the University of Texas at Austin.

The three primary outcomes are:

1) postsecondary access (access and enrollment domain)—defined as enrollment in any vocational/technical college, community college, public university, or private university in Texas within 1 year of high school graduation;

2) postsecondary persistence (credit accumulation domain)—measured on the subsample of students who enrolled in a postsecondary institution and operationalized as enrolled in at least one of the traditional semesters (fall or spring) in the second year of possible postsecondary enrollment;

3) postsecondary completion (attainment domain)—defined as earning any degree or certificate within 6 years of completing high school.

One supplementary outcome met standards:

4) postsecondary completion "first year post" (attainment domain) defined as earning any degree or certificate within 4 years of completing high school. It was not completely clear in the study, but this was likely measured at 4 years post-high school (p. 207) on the full sample of high school graduates. The findings for this supplementary outcome did not contribute to the intervention's rating of effectiveness.

For a more detailed description of these outcome measures, see Appendix B.

Support for implementation

The study does not describe any specific supports for the implementation of dual enrollment programs in the study. In Texas, dual enrollment programs are funded at least partly by the state. In addition, all districts in the state are required to provide dual enrollment opportunities.

Appendix A.5: Research details for Struhl and Vargas (2012)

Struhl, B., & Vargas, J. (2012). *Taking college courses in high school: A strategy guide for college readiness: The college outcomes of dual enrollment in Texas*. Washington, DC: Jobs for the Future. Retrieved from http://eric.ed.gov/?&id=ED537253

Table A5. Summary of findings **Meets WWC group design standards with reservations**

		Study findings	
Outcome domain	Sample size	Average improvement index *(percentile points)*	Statistically significant
Degree attainment (college)	32,908 students	+13	Yes
College access and enrollment	32,908 students	+19	Yes
Credit accumulation	32,908 students	+16	Yes

Setting

The study took place in the state of Texas. The study used data from the entire 2004 graduating cohort of students from the state. Students came from multiple high schools and districts and were tracked for 6 years post-high school.

Study sample

The majority of students in both the intervention and comparison groups were White, with 66% in both groups. Only 6% of intervention and 7% of comparison students were Black. Roughly 18% of students in each group were considered low-income. Less than 1% in each group were limited English proficient students.

Intervention group

Students in the intervention group participated in dual enrollment courses during their eleventh- and twelfth-grade school years. These students earned college credit while still in high school.

Comparison group

Students in the comparison group did not earn college credit while in high school. They participated in regular high school courses and curricula.

Outcomes and measurement

The study addresses three eligible outcomes including postsecondary enrollment (college access and enrollment domain), returning to college a second year (credit accumulation domain), and earning a college degree (degree attainment [college] domain). Data for the study were provided by the Texas Education Research Center at the University of Texas at Austin. For a more detailed description of these outcome measures, see Appendix B.

Support for implementation

The state of Texas passed a bill in 2006 that directed all districts to offer students the opportunity to earn up to 12 college credits before graduating high school. This bill allocated $275 per-student funding that could be used for this purpose. The bill allowed high schools and postsecondary institutions to form partnerships in order to meet these requirements. In 2007, the legislature passed another bill which provided funding for innovative high school design models, including early college high schools. These new bills resulted in an increase in the number of dual enrollment participants in the state of Texas.

Appendix B: Outcome measures for each domain

Degree attainment (college)	
Any college degree	The percent of students who had earned any college degree (as cited in An, 2013) was obtained from the National Educational Longitudinal Survey (NELS) of 1988 dataset. This was measured as a dichotomous outcome. The author also reported subgroup results by parental education. The supplemental findings do not factor into the intervention's rating of effectiveness.
College completion	College completion was assessed 6 years post-high school. Completion was based on students earning a degree at either a 2-year or 4-year public college (as cited in Struhl & Vargas, 2012). This was measured as a binary outcome.
College degree attainment	College degree attainment was obtained from the National Student Clearinghouse database. The percent of students who earned any type of postsecondary credential was reported (as cited in Berger et al., 2013). Subgroup results were reported by gender, race/ethnicity, income, and first-generation student status. First-generation outcomes did not meet standards and therefore are not reported. The other subgroup results are reported in Appendix D. The supplemental findings do not factor into the intervention's rating of effectiveness.
Postsecondary completion	Postsecondary completion was defined as earning any type of degree within a specific period of time. The default was 6-years post-high school graduation (as cited in Giani et al., 2014). This was measured as a binary outcome. This study also measured one supplemental degree attainment (college) outcome: postsecondary completion within 4 years of completing high school. The supplemental findings do not factor into the intervention's rating of effectiveness.
Postsecondary credential	To measure postsecondary credential, the study authors used data from the National Student Clearinghouse. This outcome was measured as the percent of students who earned a postsecondary credential (as cited in Edmunds et al., 2015). The study authors presented supplemental findings for first-generation, not first-generation, free/reduced-price lunch, not free/reduced-price lunch, minority, and not minority subsamples. The supplemental findings do not factor into the intervention's rating of effectiveness.
College access and enrollment	
Any college enrollment	College access and enrollment was indexed by whether or not students enrolled in any type of college (as cited in Berger et al., 2013). This was reported as a percentage of students. Subgroup results were also reported by gender, race/ethnicity, income, and first-generation student status. The supplemental findings do not factor into the intervention's rating of effectiveness.
Enrollment in college	College access and enrollment was measured as students enrolling in any 2- or 4-year college (as cited in Struhl & Vargas, 2012). This was measured as a binary outcome.
Percent of students planning to attend a 4-year college	To measure the percent planning to attend a 4-year college, the study authors surveyed students in the sample (as cited in Edmunds et al., 2015). The study authors presented this outcome for students in tenth grade (primary) and ninth grade (supplemental). The supplemental findings do not factor into the intervention's rating of effectiveness.
Postsecondary access	Postsecondary access was defined as enrollment in any vocational/technical college, community college, public university, or private university in the state within 1 year of high school graduation (as cited in Giani et al., 2014). This was measured as a binary outcome.
Credit accumulation	
Persistence	Persistence was operationalized as a student returning to college a second year (as cited in Struhl & Vargas, 2012). This was measured as a binary outcome.
Postsecondary persistence	Credit accumulation was measured by postsecondary persistence of students who were enrolled in either the fall or spring semesters of the student's second year of postsecondary education (as cited in Giani et al., 2014). This was measured as a binary outcome.
Completing high school	
5-year high school graduation rate	To measure high school graduation, study authors used the Graduate Data Verification System. The outcome was operationalized as the percentage of students who graduated high school within 5 years of enrolling in ninth grade (as cited in Edmunds et al., 2015). Results were also presented for the first-generation, not first-generation, free/reduced-price lunch, not free/reduced-price lunch, minority, and not minority subgroups. These are considered supplemental findings and do not factor into the intervention's rating of effectiveness.

High school graduation	Completing high school was measured by the number of students earning their high school diploma as reported in high school records (as cited in Berger et al., 2013). This was reported as a percentage. Subgroup results were also reported by gender, race/ethnicity, income, and first-generation student status. The supplemental findings do not factor into the intervention's rating of effectiveness.
General academic achievement (high school)	
Achievement in English language arts (ELA)	Achievement in ELA was measured via standardized test scores in high school ELA tests. These scores are typically from tenth grade and are standardized using the state mean and standard deviation for each year and grade level (as cited in Berger et al., 2013).
Achievement in mathematics	Achievement in mathematics was measured via standardized test scores in high school English language arts tests. These scores are typically from tenth grade and are standardized using the state mean and standard deviation for each year and grade level (as cited in Berger et al., 2013).
High school grade point average (GPA)	To measure general academic achievement in high school, the study authors reported on students' high school GPA. High school GPA was measured via survey data and was reported as a variable between 0–4, which indicated a student's high school grade point average (as cited in Berger et al., 2013).
Passed the end-of-course exam	To measure passing end-of-course exams, the study authors used transcript data collected by the North Carolina Department of Public Instruction (NCDPI). The authors reported the percent of students who passed the end-of-course exam in several college preparatory courses, including Biology, Civics and Economics, English I, and passing three or more college preparatory mathematics courses (as cited in Edmunds et al., 2015). The study also reported the percentage of students passing the end-of-course exam in two or more college prep math courses, the end-of-course exam in one or more college prep math courses, the end-of-course exam in Algebra I, the end-of-course exam in Algebra II, and the end-of-course exam in Geometry. These outcomes were not eligible for review because they describe a subset of the information contained in the primary outcome of passing three or more college prep math courses.
Staying in high school	
Continued enrollment	To measure continued enrollment in high school, the study authors used transcript data collected by NCDPI. This outcome was measured as the percent of students who continued to be enrolled at the time point measured (as cited in Edmunds et al., 2015). Subgroup results were presented for the free/reduced-price lunch, and not free/reduced-price lunch students. Dropout was also measured by the authors. To measure dropout, the study authors used transcript data collected by NCDPI. This outcome was measured as the percent of students who dropped out of school (as cited in Edmunds et al., 2015). This is a secondary outcome because the results are reported for the free/reduced-price lunch and not free/reduced-price lunch subsamples rather than the full study sample. These supplemental findings do not factor into the intervention's rating of effectiveness.
College readiness	
On track at the end of high school	To measure college readiness, the study authors used data from the NCDPI. On track for college was defined as taking the required courses in order to enter the University of North Carolina system by the time of expected high school graduation (as cited in Edmunds et al., 2015). The authors reported this outcome at the end of grades 9–12, and the end of high school. The primary time point was at the end of high school. All other time points, subgroups (i.e., underrepresented minority, not underrepresented minority, first-generation student, not first-generation student, free/reduced-price lunch student, and not free/reduced-price lunch student), and the subject specific measures (i.e., on track in English, mathematics, science, and social studies) are secondary outcomes. The supplemental findings do not factor into the intervention's rating of effectiveness.
Attendance (high school)	
Absences (days)	To measure absences, the study authors used administrative measures from the NCDPI. This outcome was operationalized as the number of absences per student during the school year (as cited in Edmunds et al., 2015). Subgroup results for absences were reported by free/reduced-price lunch status. The supplemental findings do not factor into the intervention's rating of effectiveness.
General academic achievement (college)	
College GPA	To measure college GPA, students who had completed at least one term of college post-high school were asked via a survey to report on their college grades (as cited in Berger et al., 2013).

Appendix C.1: Findings included in the rating for the degree attainment (college) domain

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			*p*-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
An, 2013[a]								
Any college degree (%)	High school students	8,800	nr	nr	nr	0.14	+6	< .001
Domain average for degree attainment (college) (An, 2013)						**0.14**	**+6**	**Statistically significant**
Berger et al., 2013[b]								
College degree attainment (%)	High school students	2,458	25 (na)	5 (na)	20	1.15	+38	< .001
Domain average for degree attainment (college) (Berger et al., 2013)						**1.15**	**+38**	**Statistically significant**
Edmunds et al., 2015[c]								
Postsecondary credential (%)	High school students	1,651	30 (na)	4 (na)	26	1.41	+42	< .001
Domain average for degree attainment (college) (Edmunds et al., 2015)						**1.41**	**+42**	**Statistically significant**
Giani et al., 2014[d]								
Postsecondary completion	High school students	31,432	nr	nr	nr	0.32	+13	< .001
Domain average for degree attainment (college) (Giani et al., 2014)						**0.32**	**+13**	**Statistically significant**
Struhl & Vargas, 2012[e]								
College completion	High school students	32,908	nr	nr	nr	0.34	+13	< .001
Domain average for degree attainment (college) (Struhl & Vargas, 2012)						**0.34**	**+13**	**Statistically significant**
Domain average for degree attainment (college) across all studies						**0.67**	**+25**	**na**

Table Notes: For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on outcomes, representing the average change expected for all individuals who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average individual's percentile rank that can be expected if the individual is given the intervention. The WWC-computed average effect size is a simple average rounded to two decimal places; the average improvement index is calculated from the average effect size. The statistical significance of each study's domain average was determined by the WWC. Some statistics may not sum as expected due to rounding. na = not applicable. nr = not reported.

[a] For An (2013), no corrections for clustering or multiple comparisons and no difference-in-differences adjustments were needed. The *p*-value presented here was reported in the original study. Effect sizes were computed using the covariate-adjusted mean difference and standard errors reported in Table 1 of the study. This study is characterized as having a statistically significant positive effect because the estimated effect is positive and statistically significant. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

[b] For Berger et al. (2013), no corrections for clustering or multiple comparisons and no difference-in-differences adjustments were needed. The *p*-value presented here was reported in the original study. The impact estimate reported in the table is derived from a model that adjusted for clustering of students within lotteries and included the following covariates: female, minority, first-generation, low-income, prior achievement in ELA, and prior achievement in mathematics. This study is characterized as having a statistically significant positive effect because the estimated effect is positive and statistically significant. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

[c] For Edmunds et al. (2015), no corrections for clustering or multiple comparisons and no difference-in-differences adjustments were needed. The *p*-value presented here was calculated by the WWC. This study is characterized as having a statistically significant positive effect because the estimated effect is positive and statistically significant. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

[d] For Giani et al. (2014), no corrections for clustering or multiple comparisons and no difference-in-differences adjustments were needed. The *p*-value presented here was calculated by the WWC. This study is characterized as having a statistically significant positive effect because the estimated effect is positive and statistically significant. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

[e] For Struhl and Vargas (2012), no corrections for clustering or multiple comparisons and no difference-in-differences adjustments were needed. The *p*-value presented here was calculated by the WWC. This study is characterized as having a statistically significant positive effect because the estimated effect is positive and statistically significant. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

Appendix C.2: Findings included in the rating for the college access and enrollment domain

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			*p*-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
Berger et al., 2013[a]								
Any college enrollment (%)	High school students	2,458	81 (na)	72 (na)	9	0.30	+12	< .001
Domain average for college access and enrollment (Berger et al., 2013)						**0.30**	**+12**	**Statistically significant**
Edmunds et al., 2015[b]								
Planning to attend a 4-year college (%)	Tenth-grade students	676	76 (na)	62 (na)	14	0.40	+16	.01
Domain average for college access and enrollment (Edmunds et al., 2015)						**0.40**	**+16**	**Statistically significant**
Giani et al., 2014[c]								
Postsecondary access	High school students	31,432	nr	nr	nr	0.35	+14	< .001
Domain average for college access and enrollment (Giani et al., 2014)						**0.35**	**+14**	**Statistically significant**
Struhl & Vargas, 2012[d]								
Enrollment in college	High school students	32,908	nr	nr	nr	0.49	+19	< .001
Domain average for college access and enrollment (Struhl & Vargas, 2012)						**0.49**	**+19**	**Statistically significant**
Domain average for college access and enrollment across all studies						**0.39**	**+15**	**na**

Table Notes: For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on outcomes, representing the average change expected for all individuals who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average individual's percentile rank that can be expected if the individual is given the intervention. The WWC-computed average effect size is a simple average rounded to two decimal places; the average improvement index is calculated from the average effect size. The statistical significance of each study's domain average was determined by the WWC. Some statistics may not sum as expected due to rounding. na = not applicable. nr = not reported.

[a] For Berger et al. (2013), no corrections for clustering or multiple comparisons and no difference-in-differences adjustments were needed. The *p*-value presented here was reported in the original study. The impact estimate reported in the table is derived from a model that adjusted for clustering of students within lotteries and included the following covariates: female, minority, first-generation, low-income, prior achievement in ELA, and prior achievement in mathematics. This study is characterized as having a statistically significant positive effect because the estimated effect is positive and statistically significant. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

[b] For Edmunds et al. (2015), no corrections for clustering or multiple comparisons and no difference-in-differences adjustments were needed. The *p*-value presented here was reported in the original study. This study is characterized as having a statistically significant positive effect because the estimated effect is positive and statistically significant. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

[c] For Giani et al. (2014), no corrections for clustering or multiple comparisons and no difference-in-differences adjustments were needed. The *p*-value presented here was calculated by the WWC. This study is characterized as having a statistically significant positive effect because the estimated effect is positive and statistically significant. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

[d] For Struhl and Vargas (2012), no corrections for clustering or multiple comparisons and no difference-in-differences adjustments were needed. The *p*-value presented here was calculated by the WWC. This study is characterized as having a statistically significant positive effect because the estimated effect is positive and statistically significant. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

Appendix C.3: Findings included in the rating for the credit accumulation domain

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			*p*-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
Giani et al., 2014[a]								
Postsecondary persistence	College students	23,462	nr	nr	nr	0.32	+13	< .001
Domain average for credit accumulation (Giani et al., 2014)						**0.32**	**+13**	**Statistically significant**
Struhl & Vargas, 2012[b]								
Persistence	College students	32,908	nr	nr	nr	0.42	+16	< .001
Domain average for credit accumulation (Struhl & Vargas, 2012)						**0.42**	**+16**	**Statistically significant**
Domain average for credit accumulation across all studies						**0.37**	**+14**	**na**

Table Notes: For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on outcomes, representing the average change expected for all individuals who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average individual's percentile rank that can be expected if the individual is given the intervention. The WWC-computed average effect size is a simple average rounded to two decimal places; the average improvement index is calculated from the average effect size. The statistical significance of each study's domain average was determined by the WWC. Some statistics may not sum as expected due to rounding. na = not applicable. nr = not reported.

[a] For Giani et al. (2014), no corrections for clustering or multiple comparisons and no difference-in-differences adjustments were needed. The *p*-value presented here was calculated by the WWC. This study is characterized as having a statistically significant positive effect because the estimated effect is positive and statistically significant. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

[b] For Struhl and Vargas (2012), no corrections for clustering or multiple comparisons and no difference-in-differences adjustments were needed. The *p*-value presented here was calculated by the WWC. This study is characterized as having a statistically significant positive effect because the estimated effect is positive and statistically significant. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

Appendix C.4: Findings included in the rating for the completing high school domain

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			*p*-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
Berger et al., 2013[a]								
High school graduation (%)	High school students	2,458	86 (na)	81 (na)	5	0.22	+9	.05
Domain average for completing high school (Berger et al., 2013)						**0.22**	**+9**	**Statistically significant**
Edmunds et al., 2015[b]								
5-year high school graduation rate (%)	High school students	1,594	85 (na)	82 (na)	3	0.13	+5	.009
Domain average for completing high school (Edmunds et al., 2015)						**0.13**	**+5**	**Statistically significant**
Domain average for completing high school across all studies						**0.18**	**+7**	**na**

Table Notes: For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on outcomes, representing the average change expected for all individuals who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change

in an average individual's percentile rank that can be expected if the individual is given the intervention. The WWC-computed average effect size is a simple average rounded to two decimal places; the average improvement index is calculated from the average effect size. The statistical significance of each study's domain average was determined by the WWC. Some statistics may not sum as expected due to rounding. na = not applicable.

[a] For Berger et al. (2013), no corrections for clustering or multiple comparisons and no difference-in-differences adjustments were needed. The *p*-value presented here was reported in the original study. The impact estimate reported in the table is derived from a model that adjusted for clustering of students within lotteries and included the following covariates: female, minority, first-generation, low-income, prior achievement in ELA, and prior achievement in mathematics. This study is characterized as having a statistically significant positive effect because the estimated effect is positive and statistically significant. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

[b] For Edmunds et al. (2015), no corrections for clustering or multiple comparisons and no difference-in-differences adjustments were needed. The *p*-value presented here was reported in the original study. This study is characterized as having a statistically significant positive effect because the estimated effect is positive and statistically significant. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

Appendix C.5: Findings included in the rating for the general academic achievement (high school) domain

			Mean (standard deviation)		WWC calculations			
Outcome measure	Study sample	Sample size	Intervention group	Comparison group	Mean difference	Effect size	Improvement index	*p*-value
Berger et al., 2013[a]								
Achievement in English language arts	High school students	2,141	0.37 (nr)	0.23 (nr)	0.14	0.15	+6	< .001
Achievement in mathematics	High school students	1,628	0.28 (nr)	0.23 (nr)	0.05	0.06	+2	.19
High school grade point average	High school students	1,273	2.98 (nr)	2.98 (nr)	–0.004	–0.004	0	.94
Domain average for general academic achievement (high school) (Berger et al., 2013)						**0.07**	**+3**	**Statistically significant**
Edmunds et al., 2015[b]								
Passed the end-of-course exam in Biology (%)	Tenth-grade students	676	68 (na)	53 (na)	15	0.38	+15	< .001
Passed the end-of-course exam in Civics and Economics (%)	Tenth-grade students	676	80 (na)	71 (na)	9	0.30	+12	< .001
Passed the end-of-course exam in English I (%)	Tenth-grade students	676	91 (na)	86 (na)	5	0.30	+12	< .001
Passed the end-of-course exam in three or more college prep math courses (%)	Tenth-grade students	676	39 (na)	28 (na)	11	0.30	+12	< .001
Domain average for general academic achievement (high school) (Edmunds et al., 2015)						**0.32**	**+13**	**Statistically significant**
Domain average for general academic achievement (high school) across all studies						**0.20**	**+7**	**na**

Table Notes: For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on outcomes, representing the average change expected for all individuals who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average individual's percentile rank that can be expected if the individual is given the intervention. The WWC-computed average effect size is a simple average rounded to two decimal places; the average improvement index is calculated from the average effect size. The statistical significance of each study's domain average was determined by the WWC. Some statistics may not sum as expected due to rounding. na = not applicable. nr = not reported.

[a] For Berger et al. (2013), a correction for multiple comparisons was needed but did not affect whether any of the contrasts were found to be statistically significant. The effect sizes and *p*-values presented here were reported in the original study. This study is characterized as having a statistically significant positive effect because the effect for at least one measure within the domain is positive and statistically significant, and no effects are negative and statistically significant, accounting for multiple comparisons. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

[b] For Edmunds et al. (2015), a correction for multiple comparisons was needed but did not affect whether any of the contrasts were found to be statistically significant. The *p*-values presented here were calculated by the WWC. This study is characterized as having a statistically significant positive effect because the effect for at least one measure within the domain is positive and statistically significant, and no effects are negative and statistically significant, accounting for multiple comparisons. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

Appendix C.6: Findings included in the rating for the staying in high school domain

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			*p*-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
Edmunds et al., 2015[a]								
Continued enrollment (%)	High school students	676	94 (na)	89 (na)	5	0.40	+16	< .001
Domain average for staying in high school (Edmunds et al., 2015)						**0.40**	**+16**	**Statistically significant**
Domain average for staying in high school across all studies						**0.40**	**+16**	**na**

Table Notes: For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on outcomes, representing the average change expected for all individuals who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average individual's percentile rank that can be expected if the individual is given the intervention. The statistical significance of the study's domain average was determined by the WWC. Some statistics may not sum as expected due to rounding. na = not applicable.

[a] For Edmunds et al. (2015), no corrections for clustering or multiple comparisons and no difference-in-differences adjustments were needed. The *p*-value presented here was calculated by the WWC. This study is characterized as having a statistically significant positive effect because the estimated effect is positive and statistically significant. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

Appendix C.7: Findings included in the rating for the college readiness domain

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			*p*-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
Edmunds et al., 2015[a]								
On track for college at end of high school (%)	High school students	1,355	81 (na)	70 (na)	11	0.37	+14	< .001
Domain average for college readiness (Edmunds et al., 2015)						**0.37**	**+14**	**Statistically significant**
Domain average for college readiness across all studies						**0.37**	**+14**	**na**

Table Notes: For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on outcomes, representing the average change expected for all individuals who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average individual's percentile rank that can be expected if the individual is given the intervention. The statistical significance of the study's domain average was determined by the WWC. Some statistics may not sum as expected due to rounding. na = not applicable.

[a] For Edmunds et al. (2015), no corrections for clustering or multiple comparisons and no difference-in-differences adjustments were needed. The *p*-value presented here was reported in the original study. The data for this outcome were provided in Report 7 on pp. 11–12. This study is characterized as having a statistically significant positive effect because the estimated effect is positive and statistically significant. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

Appendix C.8: Findings included in the rating for the attendance (high school) domain

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			*p*-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
Edmunds et al., 2015[a]								
Absences (days)	High school students	1,554	4.70 (5.56)	6.30 (7.89)	1.60	0.20	+8	< .001
Domain average for attendance (high school) (Edmunds et al., 2015)						**0.20**	**+8**	**Statistically significant**
Domain average for attendance (high school) across all studies						**0.20**	**+8**	**na**

Table Notes: For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on outcomes, representing the average change expected for all individuals who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average individual's percentile rank that can be expected if the individual is given the intervention. The statistical significance of the study's domain average was determined by the WWC. Some statistics may not sum as expected due to rounding. na = not applicable.

[a] For Edmunds et al. (2015), no corrections for clustering or multiple comparisons and no difference-in-differences adjustments were needed. The *p*-value presented here was reported in the original study. Means for absences were provided in Report 16 on p. 16; the authors provided unadjusted standard deviations. This study is characterized as having a statistically significant positive effect because the estimated effect is positive and statistically significant. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

Appendix C.9: Findings included in the rating for the general academic achievement (college) domain

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			*p*-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
Berger et al., 2013[a]								
College grade point average	College students	455	3.07 (nr)	3.09 (nr)	–0.02	–0.024	–1	.82
Domain average for general academic achievement (college) (Berger et al., 2013)						**–0.024**	**–1**	**Not statistically significant**
Domain average for general academic achievement (college) across all studies						**–0.024**	**–1**	**na**

Table Notes: For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on outcomes, representing the average change expected for all individuals who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average individual's percentile rank that can be expected if the individual is given the intervention. The statistical significance of the study's domain average was determined by the WWC. Some statistics may not sum as expected due to rounding. na = not applicable. nr = not reported.

[a] For Berger et al. (2013), no corrections for clustering or multiple comparisons and no difference-in-differences adjustments were needed. The effect size and *p*-value presented here were reported in the study. This study is characterized as having an indeterminate effect because the estimated effect was neither statistically significant nor large enough to be substantially important. For more information, please refer to the WWC Procedures and Standards Handbook (version 3.0), p. 26.

Appendix D.1: Description of supplemental findings for the degree attainment (college) domain

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			*p*-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
An, 2013[a]								
Any college degree	High school students with parent education = HS or less	1,850	nr	nr	nr	0.16	+6	< .05
Any college degree	High school students with parent education = some college	2,810	nr	nr	nr	0.17	+7	< .01
Any college degree	High school students with parent education = bachelor's degree	960	nr	nr	nr	0.06	+3	> .10
Any college degree	High school students with parent education = post bachelor's degree	670	nr	nr	nr	0.12	+5	> .10
Berger et al., 2013[b]								
College degree attainment (%)	Female high school students	1,263	23 (na)	1 (na)	22	2.05	+48	< .001
College degree attainment (%)	Male high school students	1,193	22 (na)	3 (na)	19	1.34	+41	< .001
College degree attainment (%)	Minority high school students	960	65 (na)	1 (na)	64	3.16	+50	< .001
College degree attainment (%)	White high school students	851	23 (na)	3 (na)	20	1.37	+42	< .001
College degree attainment (%)	Low-income high school students	1,187	20 (na)	1 (na)	19	1.94	+47	< .001
College degree attainment (%)	Not low-income high school students	1,004	25 (na)	3 (na)	22	1.44	+43	< .001
Edmunds et al., 2015[c]								
Postsecondary credential (%)	First-generation	643	23 (na)	3 (na)	20	1.37	+42	< .001
Postsecondary credential (%)	Not first-generation	950	35 (na)	6 (na)	29	1.29	+40	< .001
Postsecondary credential (%)	Free/reduced-price lunch	790	23 (na)	2 (na)	21	1.63	+45	< .001
Postsecondary credential (%)	Not free/reduced-price lunch	773	37 (na)	7 (na)	30	1.25	+39	< .001

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			*p*-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
Postsecondary credential (%)	Minority	568	20 (na)	1 (na)	19	1.94	+47	< .001
Postsecondary credential (%)	Non-minority	1,061	36 (na)	6 (na)	30	1.32	+41	< .001
Giani et al., 2014[d]								
Postsecondary completion: 1-yr. post	Propensity score matched sample	31,432	nr	nr	nr	0.25	+10	< .001

Table Notes: The supplemental findings presented in this table are additional findings from studies in this report that meet WWC design standards with or without reservations, but do not factor into the determination of the intervention rating. For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on outcomes, representing the average change expected for all individuals who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average individual's percentile rank that can be expected if the individual is given the intervention. Some statistics may not sum as expected due to rounding. na = not applicable. nr = not reported.

[a] For An (2013), no corrections for clustering or multiple comparisons were needed. The *p*-values presented here were reported in the original study.

[b] For Berger et al. (2013), no corrections for clustering or multiple comparisons were needed. The *p*-values presented here were computed by the WWC using the information reported in Exhibit E.5. The impact estimates reported in the table are derived from models that adjusted for clustering of students within lotteries and covariates. The models were run using ten multiple imputation datasets; WWC attrition standards were met using unimputed sample sizes provided by the authors. The sample sizes reported in the table are the means across the ten imputed datasets, rounded to the nearest whole number, and were provided by the authors. The differences in impact estimates for degree attainment (college) were statistically significantly different for males and females, minorities and non-minorities, and low-income and non-low-income students. The study also reported on the impact of Early Colleges for first-generation college students versus non-first-generation students. This subgroup analysis did not meet WWC standards; attrition was high for the subgroups and sufficient information to establish baseline equivalence was not available.

[c] For Edmunds et al. (2015), no corrections for clustering or multiple comparisons were needed. The *p*-values presented here were calculated by the WWC.

[d] For Giani et al. (2014), no corrections for clustering or multiple comparisons were needed. The *p*-value presented here was reported in the original study.

Appendix D.2 Description of supplemental findings for the college access and enrollment domain

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			*p*-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
Berger et al., 2013[a]								
Ever enrolled in college (%)	Female high school students	1,263	81 (na)	75 (na)	6	0.21	+8	< .001
Ever enrolled in college (%)	Male high school students	1,193	78 (na)	66 (na)	12	0.37	+14	< .001
Ever enrolled in college (%)	Minority high school students	960	80 (na)	72 (na)	8	0.27	+11	< .001
Ever enrolled in college (%)	White high school students	851	83 (na)	73 (na)	10	0.36	+14	< .001
Ever enrolled in college (%)	Low-income high school students	1,187	75 (na)	64 (na)	11	0.32	+12	< .001
Ever enrolled in college (%)	Not low-income high school students	1,004	85 (na)	76 (na)	9	0.35	+14	< .001

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			*p*-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
Edmunds et al., 2015[b]								
Planning to attend a 4-year college (%)	Ninth-grade students	1,604	73 (na)	70 (na)	3	0.09	+4	.08

Table Notes: The supplemental findings presented in this table are additional findings from studies in this report that meet WWC design standards with or without reservations, but do not factor into the determination of the intervention rating. For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on outcomes, representing the average change expected for all individuals who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average individual's percentile rank that can be expected if the individual is given the intervention. Some statistics may not sum as expected due to rounding. na = not applicable.

[a] For Berger et al. (2015), no corrections for clustering or multiple comparisons were needed. The *p*-values presented here were computed by the WWC using the information reported in Exhibit E.5. The impact estimates reported in the table are derived from models that adjusted for clustering of students within lotteries and covariates. The models were run using ten multiple imputation datasets; WWC attrition standards were met using unimputed sample sizes provided by the authors. The sample sizes reported in the table are the means across the ten imputed datasets, rounded to the nearest whole number, and were provided by the authors. For this domain, the differences in impact estimates were not significantly different for males and females, minorities and non-minorities, or low-income and non-low-income students.

[b] For Edmunds et al. (2015), no corrections for clustering or multiple comparisons were needed. The *p*-values presented here were calculated by the WWC.

Appendix D.3 Description of supplemental findings for the completing high school domain

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			*p*-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
Berger et al., 2013[a]								
High school graduation (%)	Female high school students	1,263	85 (na)	83 (na)	2	0.09	+4	.11
High school graduation (%)	Male high school students	1,193	87 (na)	78 (na)	9	0.38	+15	< .001
High school graduation (%)	Minority high school students	960	87 (na)	82 (na)	5	0.23	+5	< .001
High school graduation (%)	White high school students	851	89 (na)	83 (na)	6	0.31	+12	< .001
High school graduation (%)	Low-income high school students	1,187	83 (na)	74 (na)	9	0.33	+13	< .001
High school graduation (%)	Not low-income high school students	1,004	89 (na)	87 (na)	2	0.11	+5	.07
Edmunds et al., 2015[b]								
5-year HS graduation rate (%)	First-generation	623	82 (na)	78 (na)	4	0.15	+6	.06
5-year HS graduation rate (%)	Not first-generation	915	90 (na)	86 (na)	4	0.23	+9	.001
5-year HS graduation rate (%)	Free/reduced-price lunch	767	84 (na)	75 (na)	9	0.34	+13	< .001
5-year HS graduation rate (%)	Not free/reduced-price lunch	749	92 (na)	88 (na)	4	0.27	+11	< .001

Outcome measure	Study sample	Sample size	Mean (standard deviation) Intervention group	Mean (standard deviation) Comparison group	WWC calculations Mean difference	WWC calculations Effect size	WWC calculations Improvement index	*p*-value
5-year HS graduation rate (%)	Minority	546	88 (na)	83 (na)	5	0.25	+10	.005
5-year HS graduation rate (%)	Non-minority	1026	86 (na)	81 (na)	5	0.22	+9	< .001

Table Notes: The supplemental findings presented in this table are additional findings from studies in this report that meet WWC design standards with or without reservations, but do not factor into the determination of the intervention rating. For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on outcomes, representing the average change expected for all individuals who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average individual's percentile rank that can be expected if the individual is given the intervention. Some statistics may not sum as expected due to rounding. na = not applicable.

[a] For Berger et al. (2013), no corrections for clustering or multiple comparisons were needed. The *p*-values presented here were computed by the WWC using the information reported in Exhibit E.5. The impact estimates reported in the table are derived from models that adjusted for clustering of students within lotteries and covariates. The models were run using ten multiple imputation datasets; WWC attrition standards were met using unimputed sample sizes provided by the authors. The sample sizes reported in the table are the means across the ten imputed datasets, rounded to the nearest whole number, and were provided by the authors. For completing high school graduation, the differences in impact estimates were not significantly different for males and females, minorities and non-minorities, or low-income and non-low-income students.

[b] For Edmunds et al. (2015), no corrections for clustering or multiple comparisons were needed. The *p*-values presented here were calculated by the WWC.

Appendix D.4 Description of supplemental findings for the staying in school domain

Outcome measure	Study sample	Sample size	Mean (standard deviation) Intervention group	Mean (standard deviation) Comparison group	WWC calculations Mean difference	WWC calculations Effect size	WWC calculations Improvement index	*p*-value
Edmunds et al., 2015[a]								
Continued enrollment (%)	Eleventh-grade free/reduced-price lunch	710	92 (na)	83 (na)	9	0.52	+20	< .001
Continued enrollment (%)	Eleventh-grade not free/reduced-price lunch	711	95 (na)	89 (na)	6	0.52	+20	< .001
Dropout (%)	Eleventh-grade free/reduced-price lunch	710	1.3 (na)	1.9 (na)	0.6	0.23	+9	< .001
Dropout (%)	Eleventh-grade not free/reduced-price lunch	711	0.3 (na)	0.6 (na)	0.3	0.42	+16	< .001

Table Notes: The supplemental findings presented in this table are additional findings from studies in this report that meet WWC design standards with or without reservations, but do not factor into the determination of the intervention rating. For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on outcomes, representing the average change expected for all individuals who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average individual's percentile rank that can be expected if the individual is given the intervention. Some statistics may not sum as expected due to rounding. na = not applicable.

[a] For Edmunds et al. (2015), no corrections for clustering or multiple comparisons were needed. The *p*-values presented here were calculated by the WWC.

Appendix D.5 Description of supplemental findings for the college readiness domain

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			*p*-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
Edmunds et al., 2015[a]								
On track for college at end of ninth grade (%)	Ninth-grade students	1,355	93 (na)	85 (na)	8	0.52	+20	< .001
On track for college at end of tenth grade (%)	Tenth-grade students	1,355	89 (na)	73 (na)	16	0.66	+25	< .001
On track for college at end of eleventh grade (%)	Eleventh-grade students	1,355	84 (na)	73 (na)	11	0.40	+16	< .001
On track for college at end of twelfth grade (%)	Twelfth-grade students	1,355	78 (na)	68 (na)	10	0.31	+12	< .001
On track for college by end of high school—English (%)	High school students	1,355	97 (na)	98 (na)	–1	–0.25	–10	< .001
On track for college by end of high school—math (%)	High school students	1,355	87 (na)	75 (na)	12	0.49	+19	< .001
On track for college by end of high school—science (%)	High school students	1,355	98 (na)	98 (na)	0	0	0	1.00
On track for college by end of high school—social studies (%)	High school students	1,355	99 (na)	99 (na)	0	0	0	1.00
On track for college by end of high school (%)	Minority	466	75 (na)	67 (na)	8	0.24	+9	.013
On track for college by end of high school (%)	Non-minority	861	80 (na)	68 (na)	12	0.38	+15	< .001
On track for college by end of high school (%)	First-generation	502	72 (na)	57 (na)	15	0.40	+16	< .001
On track for college by end of high school (%)	Not first-generation	814	82 (na)	75 (na)	7	0.25	+10	< .001
On track for college by end of high school (%)	Free/reduced-price lunch	621	74 (na)	59 (na)	15	0.41	+16	< .001
On track for college by end of high school (%)	Not free/reduced-price lunch	675	83 (na)	75 (na)	8	0.30	+12	< .001

Table Notes: The supplemental findings presented in this table are additional findings from studies in this report that meet WWC design standards with or without reservations, but do not factor into the determination of the intervention rating. For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on outcomes, representing the average change expected for all individuals who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average individual's percentile rank that can be expected if the individual is given the intervention. Some statistics may not sum as expected due to rounding. na = not applicable.

[a] For Edmunds et al. (2015), no corrections for clustering or multiple comparisons were needed. The *p*-values presented here were calculated by the WWC.

Appendix D.6 Description of supplemental findings for the attendance (high school) domain

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			*p*-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
Edmunds et al., 2015[a]								
Absences (days)	Eleventh-grade students free/ reduced-price lunch	710	7.7 (10.08)	8.8 (8.37)	1.1	0.04	2	.57
Absences (days)	Eleventh-grade students not free/ reduced-price lunch	711	5.6 (6.37)	7.1 (7.22)	1.5	0.16	6	.03

Table Notes: The supplemental findings presented in this table are additional findings from studies in this report that meet WWC design standards with or without reservations, but do not factor into the determination of the intervention rating. For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on outcomes, representing the average change expected for all individuals who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average individual's percentile rank that can be expected if the individual is given the intervention. Some statistics may not sum as expected due to rounding.

[a] For Edmunds et al. (2015), no corrections for clustering or multiple comparisons were needed. Unadjusted standard deviations were provided by the authors in response to an author query. The *p*-values presented here were calculated by the WWC.

Endnotes

[1] The descriptive information for this program was obtained from Hoffman et al. (2008), Hoffman (2005), Berger et al. (2015), Edmunds et al. (2015), An (2013), Giani et al. (2014), and Struhl and Vargas (2012). The WWC requests developers review the program description sections for accuracy from their perspective. Further verification of the accuracy of the descriptive information for this program is beyond the scope of this review.

[2] Hoffman, N. (2005). *Add and subtract: Dual enrollment as a state strategy to increase postsecondary success for underrepresented students*. Boston, MA: Jobs for the Future; Hoffman, N., Vargas, J., & Santos, J. (2008). *On ramp to college: A state policymaker's guide to dual enrollment*. Boston, MA: Jobs for the Future.

[3] The literature search reflects documents publicly available by March 2016. The studies in this report were reviewed using the Standards from the WWC Procedures and Standards Handbook (version 3.0), along with those described in the Transition to College review protocol (version 3.2). The evidence presented in this report is based on available research. Findings and conclusions may change as new research becomes available.

[4] For criteria used in the determination of the rating of effectiveness and extent of evidence, see the WWC Rating Criteria on p. 43. These improvement index numbers show the average and range of individual-level improvement indices for all findings across the studies.

[5] National Center for Education Statistics. (2013). *Dual credit and exam-based courses in U.S. public high schools: 2010-11*. Washington, DC: Author.

[6] Giani, M., Alexander, C., & Reyes, P. (2014). Exploring variation in the impact of dual-credit coursework on postsecondary outcomes: A quasi-experimental analysis of Texas students. *High School Journal, 97*(4), 200–218.

[7] Groark, M. (n.d.). *New investments expand and strengthen national network of early college high schools*. Seattle, WA: Bill & Melinda Gates Foundation. Retrieved from http://www.gatesfoundation.org/

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WWC Rating Criteria

Criteria used to determine the rating of a study

Study rating	Criteria
Meets WWC group design standards without reservations	A study that provides strong evidence for an intervention's effectiveness, such as a well-implemented RCT.
Meets WWC group design standards with reservations	A study that provides weaker evidence for an intervention's effectiveness, such as a QED or an RCT with high attrition that has established equivalence of the analytic samples.

Criteria used to determine the rating of effectiveness for an intervention

Rating of effectiveness	Criteria
Positive effects	Two or more studies show statistically significant positive effects, at least one of which met WWC group design standards for a strong design, AND No studies show statistically significant or substantively important negative effects.
Potentially positive effects	At least one study shows a statistically significant or substantively important positive effect, AND No studies show a statistically significant or substantively important negative effect AND fewer or the same number of studies show indeterminate effects than show statistically significant or substantively important positive effects.
Mixed effects	At least one study shows a statistically significant or substantively important positive effect AND at least one study shows a statistically significant or substantively important negative effect, but no more such studies than the number showing a statistically significant or substantively important positive effect, OR At least one study shows a statistically significant or substantively important effect AND more studies show an indeterminate effect than show a statistically significant or substantively important effect.
Potentially negative effects	One study shows a statistically significant or substantively important negative effect and no studies show a statistically significant or substantively important positive effect, OR Two or more studies show statistically significant or substantively important negative effects, at least one study shows a statistically significant or substantively important positive effect, and more studies show statistically significant or substantively important negative effects than show statistically significant or substantively important positive effects.
Negative effects	Two or more studies show statistically significant negative effects, at least one of which met WWC group design standards for a strong design, AND No studies show statistically significant or substantively important positive effects.
No discernible effects	None of the studies shows a statistically significant or substantively important effect, either positive or negative.

Criteria used to determine the extent of evidence for an intervention

Extent of evidence	Criteria
Medium to large	The domain includes more than one study, AND The domain includes more than one school, AND The domain findings are based on a total sample size of at least 350 students, OR, assuming 25 students in a class, a total of at least 14 classrooms across studies.
Small	The domain includes only one study, OR The domain includes only one school, OR The domain findings are based on a total sample size of fewer than 350 students, AND, assuming 25 students in a class, a total of fewer than 14 classrooms across studies.

Glossary of Terms

Attrition Attrition occurs when an outcome variable is not available for all participants initially assigned to the intervention and comparison groups. The WWC considers the total attrition rate and the difference in attrition rates across groups within a study.

Clustering adjustment If intervention assignment is made at a cluster level and the analysis is conducted at the student level, the WWC will adjust the statistical significance to account for this mismatch, if necessary.

Confounding factor A confounding factor is a component of a study that is completely aligned with one of the study conditions, making it impossible to separate how much of the observed effect was due to the intervention and how much was due to the factor.

Design The design of a study is the method by which intervention and comparison groups were assigned.

Domain A domain is a group of closely related outcomes.

Effect size The effect size is a measure of the magnitude of an effect. The WWC uses a standardized measure to facilitate comparisons across studies and outcomes.

Eligibility A study is eligible for review and inclusion in this report if it falls within the scope of the review protocol and uses either an experimental or matched comparison group design.

Equivalence A demonstration that the analytic sample groups are similar on observed characteristics defined in the review area protocol.

Extent of evidence An indication of how much evidence supports the findings. The criteria for the extent of evidence levels are given in the WWC Rating Criteria on p. 43.

Improvement index Along a percentile distribution of individuals, the improvement index represents the gain or loss of the average individual due to the intervention. As the average individual starts at the 50th percentile, the measure ranges from –50 to +50.

Intervention An educational program, product, practice, or policy aimed at improving student outcomes.

Intervention report A summary of the findings of the highest-quality research on a given program, product, practice, or policy in education. The WWC searches for all research studies on an intervention, reviews each against design standards, and summarizes the findings of those that meet WWC design standards.

Multiple comparison adjustment When a study includes multiple outcomes or comparison groups, the WWC will adjust the statistical significance to account for the multiple comparisons, if necessary.

Quasi-experimental design (QED) A quasi-experimental design (QED) is a research design in which study participants are assigned to intervention and comparison groups through a process that is not random.

Randomized controlled trial (RCT) A randomized controlled trial (RCT) is an experiment in which eligible study participants are randomly assigned to intervention and comparison groups.

Rating of effectiveness The WWC rates the effects of an intervention in each domain based on the quality of the research design and the magnitude, statistical significance, and consistency in findings. The criteria for the ratings of effectiveness are given in the WWC Rating Criteria on p. 43.

Single-case design A research approach in which an outcome variable is measured repeatedly within and across different conditions that are defined by the presence or absence of an intervention.

Glossary of Terms

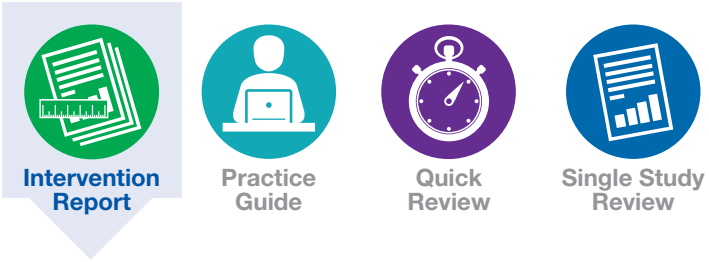
Standard deviation The standard deviation of a measure shows how much variation exists across observations in the sample. A low standard deviation indicates that the observations in the sample tend to be very close to the mean; a high standard deviation indicates that the observations in the sample tend to be spread out over a large range of values.

Statistical significance Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups. The WWC labels a finding statistically significant if the likelihood that the difference is due to chance is less than 5% ($p < .05$).

Substantively important A substantively important finding is one that has an effect size of 0.25 or greater, regardless of statistical significance.

Systematic review A review of existing literature on a topic that is identified and reviewed using explicit methods. A WWC systematic review has five steps: 1) developing a review protocol; 2) searching the literature; 3) reviewing studies, including screening studies for eligibility, reviewing the methodological quality of each study, and reporting on high quality studies and their findings; 4) combining findings within and across studies; and, 5) summarizing the review.

Please see the WWC Procedures and Standards Handbook (version 3.0) for additional details.



An **intervention report** summarizes the findings of high-quality research on a given program, practice, or policy in education. The WWC searches for all research studies on an intervention, reviews each against evidence standards, and summarizes the findings of those that meet standards.

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