Opportunities and Outcomes

The Study of Deeper Learning: College Enrollment, Persistence, and Degree Completion in the First 6 Years After High School

JUNE 2022

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Acknowledgments

The Study of Deeper Learning: College Enrollment, Persistence, and Degree Completion in the First 6 Years After High School

June 2022

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Abstract

The Study of Deeper Learning: Opportunities and Outcomes examined schools that were part of networks focused on deeper learning, which is defined as the combination of interpersonal, intrapersonal, and cognitive competencies believed to be essential for success in school, career, and civic life. The study aimed to determine whether students attending network high schools with a mature and at least moderately well-implemented approach to promoting deeper learning actually experienced greater deeper learning opportunities and achieved better short- and long-term outcomes than they would have if they did not attend these schools. In this report, we examined longer term impacts on students' college enrollment and degree completion up to 6 years after expected high school graduation.

Analyses included study participants who attended 12 matched pairs of deeper learning network schools and comparison schools in California and New York City. Overall, the study team found that attending a deeper learning network school did not affect students' college enrollment and degree completion outcomes, but we also found that the impact of attending a deeper learning network school differed between students who attended high school in California and those who attended high school in New York City.

1. *Overall:* We did not observe a significant impact of attending a deeper learning network school on enrollment in a 2- or 4-year college within the first 2 years after expected high school graduation, persistence in college, or degree completion outcomes.

2. *California:* Students who attended network schools were significantly more likely than students who attended non-network schools to enroll in college by the end of the second year after expected high school graduation (64% versus 60%). However, network school students in California were significantly less likely to complete a bachelor's degree within 6 years after expected high school graduation than non-network school students in California (14% versus 17%).

3. *New York City:* We did not observe a significant impact of attending a deeper learning network school on college enrollment or college persistence among students who attended high school in New York City. However, network school students were significantly more likely than non-network school students to complete a bachelor's degree within 5 years after expected high school graduation (14% versus 11%) and within 6 years after expected high school graduation (17% versus 14%).

Focusing on a subset of study participants who responded to a high school survey in spring 2013, additional analyses explored relationships between self-reports of deeper learning opportunities and competencies during high school and subsequent degree completion outcomes. Although we observed few significant relationships between opportunities for deeper learning in high school and college degree completion outcomes, opportunities to receive feedback from peers and teachers and opportunities to learn how to learn were significantly and positively associated with bachelor's degree completion within 6 years after expected high school graduation. In addition, among the study's measures of deeper learning competencies, students with higher levels of locus of control, perseverance, self-efficacy, and self-management were significantly more likely to complete a bachelor's degree. Students' self-reports of locus of control and perseverance during high school also were significantly and positively associated with the completion of an associate's degree or certificate within 3 years after expected high school graduation, although relationships were somewhat weaker than those observed for the bachelor's degree completion outcome. The study findings do not provide strong evidence of the longer term impact of attending a deeper learning network school on civic engagement and workforce outcomes. Other life experiences since high school (e.g., college experiences, local economies) may overshadow more distal high school experiences. Positive correlations between high school experiences of opportunities for deeper learning and civic engagement outcomes, however, suggest longer term benefits of these experiences regardless of the type of school students attend.

Although the study findings do not provide consistent evidence of the longer term impact of attending a deeper learning network school on college outcomes, they do suggest that several deeper learning competencies associated with academic mindsets are positively related to students' success in college.

Introduction

Today's high school students enter a rapidly changing society upon graduation. An increasingly polarizing democracy, a globally expanding workforce, and quickly evolving technology demand skilled workers who can navigate complex relationships and systems and apply their academic knowledge to a variety of real-world situations. However, public education has generally fallen short in aligning instruction to the skills demanded of students outside school walls. The history of education policy in the United States reflects this misalignment. Under the pressure of the accountability requirements of the No Child Left Behind Act of 2001, for example, schools and teachers disproportionately spent resources and instructional time on teaching reading and mathematics skills, at the expense of providing opportunities for students to develop other types of competencies necessary to thrive during college and careers.

Recognizing the potentially negative and inequitable consequences of a narrow test-based accountability system, increasing numbers of policymakers and educators have sought in recent years to re-prioritize a wider array of student learning outcomes and learning experiences focused on whole child development. The widespread adoption of the Common Core State Standards in the 2010s encouraged district and school leaders to foster critical thinking skills in students and help students master core topics in greater depth. Concurrently, business and philanthropic organizations advocated for essential interpersonal skills (e.g., collaboration, communication) and intrapersonal competencies (e.g., self-management, perseverance) that students will need for their long-term success after high school in the 21st century.

The Concept of Deeper Learning

The William and Flora Hewlett Foundation has served as a leader in the national initiative to promote "deeper learning" in schools, defining deeper learning as "a set of competencies students must master to develop a keen understanding of academic content and apply their knowledge to problems in the classroom and on the job" (William and Flora Hewlett Foundation, 2013, p. 1). The foundation's initial deeper learning framework highlighted the following six interconnected competencies: mastery of core academic content, critical thinking and complex problem-solving skills, effective communication skills, collaboration skills, an understanding of how to learn, and academic mindsets (Chow, 2010; Trilling, 2010; William and Flora Hewlett Foundation, 2013). In the report titled *Education for Life and Work*, the National Research Council (NRC) classified these and related competencies into the interpersonal, intrapersonal, and cognitive domains; examined existing research relating these skills to college and workforce outcomes; and described the need for more rigorous research on deeper learning (NRC, 2012).

In 2011–12, the Hewlett Foundation commissioned the Deeper Learning Community of Practice, which brought together 10 well-established networks of public schools that supported school structures, cultures, and practices to foster deeper learning competencies among students. Box 1 contains a list of the school networks that participated in the Deeper Learning Community of Practice. By equipping students with deeper learning competencies, which are transferrable across disciplines and real-world contexts, the goal of the foundation and the deeper learning networks has been to enable students to successfully navigate new situations and problems they encounter during college, career, and civic life.

Box 1. Networks That Participated in the Hewlett Foundation's Deeper Learning Community of Practice

Asia Society: http://asiasociety.org/international-studies-schools-network

Big Picture Learning: http://www.bigpicture.org/

ConnectEd: http://www.connectedcalifornia.org/

EdVisions Schools: https://edvisions.org/

Envision Schools: http://www.envisionschools.org/

EL Education (previously Expeditionary Learning): https://eleducation.org/

High Tech High: http://www.hightechhigh.org/

Internationals Network for Public Schools: https://www.internationalsnetwork.org/

New Tech Network: http://www.newtechnetwork.org/

New Visions for Public Schools: http://www.newvisions.org/

The Study of Deeper Learning

The Study of Deeper Learning: Opportunities and Outcomes, funded by the Hewlett Foundation, set out in 2011 to understand student and teacher experiences at deeper learning network high schools and evaluate the impact of attending those schools on a range of student outcomes. In this "proof of concept" study, the study team aimed to determine whether students who attended network high schools with a mature and at least moderately well-implemented approach to promoting deeper learning (henceforth referred to as "deeper learning network schools") actually experienced greater deeper learning opportunities and outcomes than they would have if they did not attend these schools. The study used a quasi-experimental study design to match students who attended network high schools with similar students who attended traditional high schools in the same district or a nearby district to compare the outcomes of similar students attending the two types of schools. Study reports released in 2014 showed evidence of the positive, short-term impacts of attending a deeper learning network school on high school experiences and student outcomes during and immediately after high school. Namely, the team found positive impacts of attending a deeper learning network school on students' opportunities for deeper learning in their core academic classes during high school, acquisition of key deeper learning competencies (e.g., self-efficacy, collaboration skills), and high school graduation (Bitter et al., 2014; Rickles et al., 2019; Zeiser et al., 2014). A follow-up analysis also revealed initial evidence of a positive impact on enrollment in 4-year colleges by fall 2015, which allowed for up to the fifth year after expected high school graduation for the oldest study participants (Rickles et al., 2019; Yang et al., 2016).

This follow-up to the *Study of Deeper Learning* extends beyond short-term effects to examine the long-term impacts of attending a deeper learning network high school on students' college outcomes. Specifically, we provide findings related to the long-term impacts on college enrollment, persistence, and degree completion outcomes that are measured up to 6 years after expected high school graduation.[1] In addition, using survey data collected while students were still enrolled in high school, we examined relationships between students' self-reported opportunities for deeper learning, deeper learning competencies, and degree completion outcomes. Finally, through interviews with a small sample of study participants in fall 2020 (6 or 7 years after

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[1] In this report, we define "expected high school graduation" as 4 years after entering Grade 9. Although some students may have taken longer to graduate from high school, and some students may not have graduated from high school, college outcomes are measured for all study participants for the same period of time.

expected high school graduation), we explored students' perceptions of their high school experiences and how high school prepared them for college. This report addresses the following four research questions (RQs):
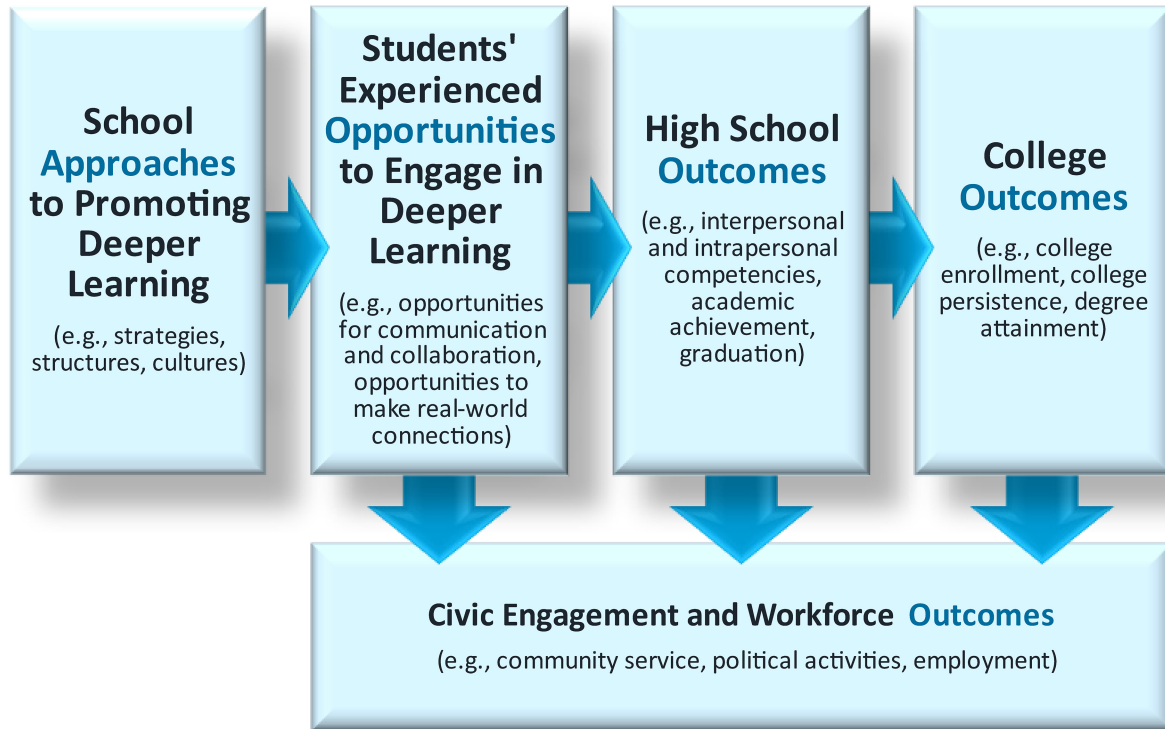
1. What is the impact of attending a mature deeper learning network high school on students' postsecondary enrollment and college persistence?

2. What is the impact of attending a mature deeper learning network high school on students' college degree completion outcomes 6 years after expected high school graduation?

3. How do students' experiences with opportunities for deeper learning and deeper learning competency outcomes during high school relate to their degree completion outcomes?

4. In what ways did students perceive that their high schools prepared them, or could have better prepared them, for college?

The remainder of this report describes the theory of action underlying this study, existing research findings related to deeper learning and college outcomes, the design of the study, and study findings associated with each RQ. The report concludes with a discussion of the implications of study findings for both practice and future research.

The Deeper Learning Theory of Action

The theory of action for the *Study of Deeper Learning* presented in Exhibit 1 illustrates the key hypothesized relationships among school approaches to promoting deeper learning, students' opportunities to engage in deeper learning, and their short- and long-term outcomes. This theory of action hypothesizes that schools with an explicit, schoolwide focus on deeper learning will establish structures, cultures, and instructional strategies that differ from those typically found in traditional comprehensive high schools. These schoolwide approaches to deeper learning would lead to increases in students' experienced opportunities to engage in deeper learning (e.g., opportunities to collaborate; to connect learning to real-world problems; and to communicate their learning and receive feedback from teachers, peers, or other adults in the community) during the school day. (See Box 2 for examples of school approaches to deeper learning and students' opportunities to engage in deeper learning.) These opportunities are theorized to result in improved high school outcomes, including the development of interpersonal and intrapersonal competencies, academic achievement, and high school graduation, which, in turn, are likely to positively influence college enrollment and degree attainment outcomes. Finally, the theory of action shows that the opportunities to engage in deeper learning during high school and students' outcomes in high school and college may all affect their civic engagement and workforce outcomes (e.g., community service, political activities, and employment) in adulthood.

Exhibit 1. Deeper Learning Theory of Action

School Approaches to Promoting Deeper Learning

(e.g., strategies, structures, cultures)

→

Students' Experienced Opportunities to Engage in Deeper Learning

(e.g., opportunities for communication and collaboration, opportunities to make real-world connections)

→

High School Outcomes

(e.g., interpersonal and intrapersonal competencies, academic achievement, graduation)

→

College Outcomes

(e.g., college enrollment, college persistence, degree attainment)

Civic Engagement and Workforce Outcomes

(e.g., community service, political activities, employment)

Box 2. What Does Deeper Learning Look Like in Schools?

During the 2012–13 school year, members of the original *Study of Deeper Learning* research team conducted site visits at deeper learning network schools to gain a better understanding of what deeper learning looks like in schools. They also interviewed principals at both network and non-network schools to explore how strategies, structures, and cultures differed across school settings. What follows are excerpts from *The Shape of Deeper Learning*, where Huberman et al. (2014) highlight examples of strategies, structures, and practices that schools used to foster deeper learning competencies among their students.

School approaches to promoting deeper learning

1. **Strategies.** Interviews with principals at network and non-network schools revealed that network schools employed certain instructional strategies designed to foster deeper learning competencies to a greater extent than did non-network schools, particularly in the areas of project-based learning, internship opportunities, collaborative group work, longer term cumulative assessments, and the development of intrapersonal competencies.

2. **Structures.** Most network schools supported the implementation of instructional approaches aligned with deeper learning through the development of specific structural elements, including advisory classes, alternative scheduling, and personalized learning environments.

3. **Cultures.** School staff and leaders from all network schools in the study discussed the creation of personalized school cultures and learning environments as a way to engage students in their education, create an environment where students feel supported in their learning, and ensure that individual students meet learning goals (and receive supports, when necessary, to do so). Almost half of the network schools explicitly described their school cultures as "families" with high levels of trust, respect, and support.

Students' opportunities to engage in deeper learning

1. **Opportunities for collaboration and communication.** Collaboration and communication skill development was an explicit goal reported by staff at a majority of the network schools in the study. Schools sought to achieve this goal through collaborative group work and longer term assessments, such as portfolios and exhibitions, in which students had to present and defend their work.

2. **Opportunities to make real-world connections.** Three quarters of the network schools in the study provided real-world connections through internship opportunities for students. At two schools, internships were considered central to learning and occurred 2 or 3 days per week across all 4 years. The remaining 12 schools incorporated internships for a portion of students at some point in their school career to provide career-related experience, boost life skills, or help with the transition from high school to college and careers.

3. **Opportunities to learn how to learn.** Almost half of the network schools reported having explicit goals related to learning how to learn and academic mindsets, and they used a variety of strategies to encourage the development of these competencies, such as study groups and student participation in decision making.

What Does Research Show?

The NRC (2012) concluded that more rigorous research on deeper learning and its effects on longer term student outcomes was needed. Since the release of the NRC report, few rigorous analyses of the impacts of deeper learning approaches have emerged. To provide context for the follow-up analyses, we reviewed the existing literature regarding college outcomes associated with deeper learning approaches as well as the more general body of literature on factors that contribute to college success. In this section, we begin by reviewing the limited

research associating deeper learning competencies and college success. Next, we discuss obstacles that may prevent more rigorous evaluations of deeper learning in high school and college outcomes. We then describe studies that examined the college outcomes of students who attended high schools with schoolwide approaches to deeper learning. This section concludes with a summary of evaluations of programs and school models similar to deeper learning that explored longer term impacts on college outcomes.

A few studies have established positive associations between deeper learning competencies and early college outcomes, such as the first-year adjustment to college and grade point average. For example, a recent literature review demonstrates that intrinsic motivation, planning, and reflective learning skills, as well as critical thinking skills and good quality relationships with peers, predict first-year college academic achievement (van der Zanden et al., 2018). In addition, students with better time- and self-management skills experienced better well-being in the first year at college (Wrench et al., 2013), and students with higher levels of self-efficacy adapted easier to the first year of college than students with lower levels of self-efficacy (Morton et al., 2014). Although these findings appear to support the theory that deeper learning competencies may positively influence college success, these studies look only at college students and do not consider students who do not successfully transition from high school to college.

One obstacle to investigating the effects of deeper learning in high school on college outcomes is that instructional practices and student supports commonly associated with deeper learning often vary within school buildings and depend on the classes that students take or the teachers to whom they are assigned. Deeper learning can and does happen in a variety of educational settings, and it is common for schools to have specific pockets (or tracks) where deeper learning may be more integrated into the curriculum (Mehta & Fine, 2019). For example, in traditional comprehensive high schools, more advanced classes may incorporate greater opportunities for collaborative project work and opportunities for students to practice their written and oral communication skills. In such a setting, it would not be possible to determine whether differences in college outcomes were driven by students' opportunities for deeper learning or differences in the rigor of the classes that students took during high school. In fact, a recent review of the effectiveness of project-based learning found evidence suggesting potentially positive impacts on student achievement, motivation, and other short-term student outcomes, but the authors acknowledged that these studies were limited in their ability to make causal claims based on their study designs (Kokotsaki et al., 2016).

For the *Study of Deeper Learning*, we were able to avoid this obstacle of students' inequitable access to deeper learning opportunities by focusing on schools with an explicit schoolwide focus on deeper learning. This research design also allowed us to demonstrate how deeper learning approaches could be beneficial to traditionally underserved students. Examination of data from *The Study of Deeper Learning* revealed higher levels of, as well as less variation in, students' opportunities for deeper learning in sampled deeper learning network high schools relative to traditional, comprehensive high schools serving similar student populations (Zeiser et al., 2020a). Moreover, analyses revealed that positive relationships between opportunities for deeper learning and students' interpersonal and intrapersonal competencies were similar across student populations (Zeiser et al., 2020b). This evidence supported networks' claims that deeper learning was occurring at scale within these schools, and all students similarly benefitted from these opportunities. Because of the expected, more consistent presence of deeper learning opportunities schoolwide, these deeper learning networks became a focus of researchers' efforts to understand the effects of deeper learning on college outcomes.

Much of the research related to the effects of schoolwide approaches to deeper learning and college outcomes is mainly descriptive and centered on specific deeper learning networks. Several studies followed high school students from specific deeper learning networks into college and reported that these students fared better in terms of college enrollment, persistence, and degree attainment outcomes compared with the national average. For example, Big Picture Learning followed two graduating classes from three of their campuses and compared their rates of college enrollment, persistence, and degree attainment to the national averages (MPR

Associates Inc., 2012). Compared with the national average of 31% of students at schools with similar demographic composition, 44% of the Big Picture Learning graduates enrolled in 4-year colleges within 1 year of high school graduation. Although they were unable to report national averages for college persistence and degree completion outcomes among students who enrolled in college within the first year after high school graduation, the percentage of students who persisted to the second year of college ranged from 83% to 91% across the three Big Picture Learning schools, and 50% of the students who graduated from these high schools in 2006 completed a college degree within 5 years of high school graduation (MPR Associates Inc., 2012).

Similarly, college outcomes that exceeded the national average were observed among student cohorts who graduated from the City Arts & Tech (CAT) High in Envision Schools, another deeper learning network (Lewis-Charp & Law, 2014). The average college or postsecondary training enrollment rate of CAT students who graduated between 2008 and 2012 ranged from 86% to 98% compared with the national average college enrollment rate of 40%.[2] Of the student cohort that graduated in 2008, 70% persisted through 4 or 5 years, which is a favorable outcome compared with the national average of 65% that either graduate or are still enrolled after 6 years of enrollment.

Given the absence of causal evidence that attending a deeper learning network school improves college success, we also reviewed literature on other interventions and high school models for which research has explored impacts on college enrollment and degree completion. According to the What Works Clearinghouse (WWC), a source of scientific evidence on education programs and practices managed by the Institute of Education Sciences within the U.S. Department of Education, the majority of strategies that have positively affected college success take place during college. Only two high school strategies reviewed by the WWC show evidence of positive effects on college enrollment: dual enrollment programs (WWC, 2017) and Facilitating Long-Term Improvements in Graduation and Higher Education for Tomorrow (WWC, 2019). Similar to deeper learning, both programs offer students opportunities for rigorous instruction, engaging experiences in school, and personalized student supports. However, these programs also provide students with specific guidance on applying for college, identifying scholarships and other sources of financial aid, and dual enrollment programs in particular provide students with the opportunity to begin accruing college credits during high school at little or no cost to students and their families. Because college advising is not an explicit focus for deeper learning network schools, one might anticipate a smaller overall impact on college enrollment outcomes.

Although WWC reviews of Career Academies have focused on positive impacts on high school graduation, research demonstrates mixed evidence of the impact on college enrollment outcomes. Similar to deeper learning, Career Academies are a multiyear program that provide students with opportunities for project-based learning, internships, and connections between topics in class and real-world experiences, particularly potential employment opportunities in the local community. In addition, the Career Academies program encourages students to participate in career and technical education courses, a curricular focus that was not common across the networks in the Deeper Learning Community of Practice. Two separate evaluations of Career Academies found no effect on college enrollment outcomes (Hemelt et al., 2019; Kemple, 2001), although the more recent evaluation found a positive impact on college enrollment specifically for male students (Hemelt et al., 2019).

In summary, although prior research has demonstrated potentially positive relationships between deeper learning competencies and success at the college level, a review of literature surrounding the transition to college revealed limited evidence of positive impacts of schoolwide approaches to deeper learning, or high school programs, models, and interventions similar to deeper learning, on college outcomes. This report expands on this literature to examine the impacts of attending deeper learning network schools with mature, schoolwide

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[2] For this study, researchers supplemented administrative college enrollment data with additional information from CAT graduates and teachers on students' placement in other training programs and the military. Because data on other training programs and the military were not available for the national sample, these numbers are not directly comparable.

strategies to promote deeper learning on college enrollment, persistence, and degree completion up to 6 years after expected high school graduation.

Study Design

As noted earlier, this report presents findings of follow-up analyses for the *Study of Deeper Learning: Opportunities and Outcomes,* a proof of concept study that focused on a small number of high schools associated with networks participating in the Deeper Learning Community of Practice that had well-established approaches to deeper learning. Because deeper learning network schools did not randomly select students to enroll in their schools, this study uses a quasi-experimental design with a matched comparison group to determine the impact of attending a deeper learning network high school on college outcomes. This study also uses longitudinal data to examine the extent to which students' self-reported opportunities for deeper learning and deeper learning competencies during high school relate to their degree attainment outcomes. In this section, we describe the study sample, the data sources and measures, and the analysis methods we used to address the RQs guiding this study.

Sample

The sample for these follow-up analyses consists of a subset of schools participating in the original study of deeper learning. Located in either California[3] or New York City, the network schools included in the original study were identified by leaders of the 10 participating networks as operating in the network during or before the 2007–08 school year and implementing the network model at least moderately well. For each selected network school, the original study team identified a non-network school from the same district or a neighboring district that served students with similar demographic characteristics, socioeconomic backgrounds, and prior achievement in mathematics and English language arts. All the schools included in the original study had nonselective admission policies and had 200 or more enrolled students, of whom at least 30% were eligible for free or reduced-price lunch.

For 12 of the 15 pairs of schools included in the original study, we obtained college enrollment and degree completion data through the National Student Clearinghouse (NSC) for four cohorts of students who entered Grade 9 between 2007–08 and 2010–2011. Exhibit 2 illustrates the progression of these four Grade 9 cohorts through high school and after high school, and it identifies the years in which we collected data for the study participants. These four student cohorts from the 12 pairs of schools provide the sample to address the first two RQs for this follow-up study (i.e., examining impacts on college enrollment, persistence, and degree completion up to 6 years after expected high school graduation).[4]

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[3] Sampled schools in California were in three urban school districts and one large suburban school district.
[4] In two school pairs in this study, students may have experienced opportunities for deeper learning in middle schools associated with the deeper learning network. To ensure that the results reflect differences between students who were otherwise similar before entering high school, students who attended network middle schools were excluded from the study.

Exhibit 2. Entering Grade 9 Cohorts Included in the Study of Deeper Learning

School year	Cohort 1	Cohort 2	Cohort 3	Cohort 4
2007–08	Grade 9			
2008–09	Grade 10	Grade 9		
2009–10	Grade 11	Grade 10	Grade 9	
2010–11	Grade 12	Grade 11	Grade 10	Grade 9
2011–12	AHS1	Grade 12	Grade 11	Grade 10
2012–13		AHS1	**Grade 12[a]**	**Grade 11[a]**
2013–14			AHS1	Grade 12
2014–15				AHS1
2015–16				
2016–17	**AHS6[b]**			
2017–18		**AHS6[b]**		
2018–19			**AHS6[b]**	
2019–20				**AHS6[b]**

Note. AHS = after high school. Cells with boldface text indicate the timing of high school survey or college outcome measures.
[a] AIR administered a high school survey to students in Cohort 3 and Cohort 4 in spring 2013. [b] College outcomes are measured up to 6 years after expected high school graduation.

To address RQ3 (i.e., examining relationships between deeper learning opportunities and competencies in high school and degree completion), we used the NSC data previously described along with data from a survey that the original study team administered in spring 2013. The survey sample was restricted to a smaller sample of students from the two youngest cohorts, who entered Grade 9 in 2009–10 and 2010–11 and were in Grades 11 and 12, respectively, at the time of survey administration.[5] The survey response rate was 76% (79% of network school students and 75% of non-network school students). More information about the study's sampling procedures and the characteristics of the study sample is in the Technical Appendix.

To address RQ4, we drew on interviews with study participants in early adulthood. In spring 2019, we launched a follow-up study to administer a survey focused on workforce and civic engagement outcomes to students who were in the original study.[6] Using email addresses collected through the follow-up survey, we conducted a small exploratory study, inviting a subset of survey respondents to participate in 60-minute telephone interviews to collect detailed information about study participants' experiences after high school related to college, civic engagement, and employment. In fall 2020, we conducted telephone interviews with a convenience sample of 20 study participants (11 who attended network high schools and nine who attended non-network high schools). We acknowledge that the qualitative sample is not representative of the sample of students included in the impact analyses (RQ1 and RQ2) because respondents to the follow-up survey were more likely to have enrolled in college and completed a college degree than the overall study sample. (See Zeiser et al., 2021, for more information about the follow-up survey sample).

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[5] Three of the school pairs with NSC data did not participate in the survey in spring 2013 because of low rates of active parental consent in these schools.
[6] Results of analyses of these follow-up survey data can be found in the report *Deeper Learning and Civic Engagement Outcomes*.

The Study of Deeper Learning: College Enrollment, Persistence, and Degree Completion in the First 6 Years After High School

Data and Measures

Student Background Characteristics

The original study team collected student demographic information and prior (Grade 8) state test scores from the participating schools and districts. Specifically, they collected data on students' gender, race and ethnicity, English learner (EL) status, individualized education program (IEP) status, and socioeconomic status (SES). Depending on the data provided by districts, students with low SES were defined as those (a) who were eligible for free or reduced-price lunch or (b) whose parents' highest level of education was a high school diploma or less.[7] Grade 8 test scores in mathematics and English language arts were standardized by state and cohort within the analytic sample.

Outcome Measures

To measure college enrollment, persistence, and degree completion outcomes, we collected data using the NSC's StudentTracker Service. The NSC collects data on student enrollment and degree completion from more than 3,600 degree-granting higher education institutions across the United States, and it currently covers more than 98% of all student enrollments in public and private colleges and universities in the United States (NSC, 2022). The NSC data collected in spring 2021 provide the postsecondary outcome data for all four student cohorts in this study for up to 6 years after their expected high school graduation.

Box 3 lists the college outcome measures examined in this study. We defined most college outcome measures in relation to when the students in the sample would have been expected to complete high school. For example, we measured college enrollment within the first and second years after expected high school graduation. For students who entered Grade 9 in 2009–10, the expected year of high school graduation was 2012–13. Thus, the first year after expected high school graduation was 2013–14. Acknowledging that students from lower SES backgrounds and recent immigrants are less likely to graduate within 4 years of high school entry and less likely to enroll in college immediately after high school, we examined college enrollment outcomes within both the first and second years after expected high school graduation.

In addition, the study includes measures of persisting in college regardless of the timing of students' initial college enrollment. For example, we examined whether students were enrolled in college for two consecutive fall or spring semesters and whether they enrolled in college for two, three, or four consecutive semesters (not including the summer).

The primary degree completion outcomes include completion of a bachelor's degree within 6 years after expected high school graduation and completion of an associate's degree or certificate within 3 years after expected high school graduation.[8] For students who entered college immediately after high school, these degree completion outcomes are equivalent to 150% of the normative time to completion at 2- and 4-year colleges that colleges use to report to the National Center for Education Statistics in compliance with the 1990 Student Right to Know Act.

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[7] Only two districts provided information on students' eligibility for free or reduced-price lunch, and the remaining districts provided data on the education level of students' parents.
[8] In the NSC data, the degree type was not always specified for each completion record. When the degree type was missing, we assumed that degrees earned at a 2-year college were associate's degrees, and degrees earned at a 4-year college were bachelor's degrees.

Box 3. College Outcome Measures

College Enrollment Outcomes

- Enrollment in any college, enrollment in a 2-year college, and enrollment in a 4-year college within the first year after expected high school graduation (three measures)

- Enrollment in any college, enrollment in a 2-year college, and enrollment in a 4-year college within the second year after expected high school graduation (three measures)

Persistence Outcomes

- Enrollment in college in both the fall of the first year and the fall of the second year after expected high school graduation (one measure)

- Regardless of the timing of the initial college enrollment, enrollment in two consecutive fall semesters or in two consecutive spring semesters within 6 years after expected high school graduation (one measure)

- Regardless of the timing of the initial college enrollment, enrollment in college for two, three, or four consecutive semesters (not counting summers) within 6 years after expected high school graduation (three measures)

Degree Completion Outcomes

- Completion of an associate's degree or certificate within 2, 3, or 4 years after expected high school graduation (three measures)

- Completion of a bachelor's degree within 4, 5, or 6 years after expected high school graduation (three measures)

High School Survey Measures

As part of the original study of deeper learning, the original study team administered a 1-hour survey in spring 2013 to a subset of students in nine pairs of network and non-network schools. The survey was designed to measure students' self-reports of (a) opportunities they experienced in their core classes related to developing deeper learning competencies and (b) the deeper learning competencies that are hypothesized to be important for college success. Specifically, the high school survey included items that, when combined to form survey scales, measured nine opportunities for deeper learning and eight interpersonal and intrapersonal competencies.[9] As shown in Box 4, between four and 22 survey items comprise each measure. We used Rasch analysis to combine information across survey items to create a single Rasch score for each measure. For analyses involving these scales, we standardized the Rasch scores for each scale so that the scale scores have a mean of 0 and a standard deviation of 1.

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[9] For the original study, the study team administered the Organisation for Economic Co-operation and Development's PISA-Based Test for Schools to measure cognitive competencies.

Box 4. High School Survey Measures

Opportunities for Deeper Learning

- *Opportunities for assessments aligned with deeper learning (9 items, α = 0.86):* The extent to which students engage in various forms of assessment, including assessments of problem solving, communication, and collaboration

- *Opportunities to collaborate (9 items, α = 0.93):* The degree to which students collaborate on assignments, provide feedback on each other's work, and collaborate in other ways

- *Opportunities to communicate (12 items, α = 0,90):* The extent to which students have opportunities to practice written and oral communication skills

- *Opportunities for complex problem solving (22 items, α = 0.93):* The degree to which students engage in complex problem solving by analyzing ideas, judging the value and reliability of an idea or source, constructing new ideas, and applying knowledge to solve new problems

- *Opportunities for creative thinking (5 items, α = 0.88):* The extent to which students have opportunities to engage in creative thinking in their core academic classes, such as thinking of original solutions to problems and new ways to do things, creating new ideas, and using their imagination

- *Opportunities for interdisciplinary learning (4 items, α = 0.82):* The degree to which students engage in interdisciplinary learning, in which two or more disciplines are combined to enhance inquiry and knowledge generation

- *Opportunities to learn how to learn (4 items, α = 0.78):* The degree to which students practice monitoring and directing their own work and learning

- *Opportunities for real-world connections (9 items, α = 0.89):* The degree to which students engage in instructional activities that emphasize real-world connections

- *Opportunities to receive feedback (6 items, α = 0.84):* The degree to which students receive written and oral feedback on their work from teachers, peers, and others

Deeper Learning Competencies

- *Academic engagement (10 items, α = 0.77):* The degree to which a student agrees that he or she is interested and engaged in learning and participates actively in classroom learning activities

- *Collaboration skills (10 items, α = 0.91):* The extent to which a student perceives that he or she works well in a group (e.g., positive personal interactions and the ability to pay attention, share ideas, be prepared, and do his or her part) and cooperates to identify or create solutions

- *Creative thinking skills (5 items, α = 0.84):* The extent to which a student perceives that he or she can think of original ideas and solutions

- *Locus of control (5 items, α = 0.83):* The extent to which a student feels that he or she has control over what happens to him or her rather than the student's circumstances being controlled by chance or fate

- *Motivation to learn (5 items, α = 0.81):* The degree to which a student is motivated to do well academically and to become more knowledgeable, as measured by the student's perceived importance of coursework as well as preference for challenge and mastery goals

- *Perseverance (5 items, α = 0.88):* The degree to which a student agrees that he or she maintains effort and interest despite failure, adversity, and plateaus in progress

- *Self-efficacy (7 items, α = 0.91):* The degree to which a student tends to view him- or herself as capable of meeting task demands in a broad array of contexts

- *Self-management (10 items, α = 0.85):* The extent to which a student feels that he or she can independently manage his or her work and schedules to meet goals

For each opportunity measure, students responded to a set of items asking about the number of core content classes (including English, mathematics, science, and social studies) in which they engaged in activities relevant to the measure. Response options included: 0 = none of my classes; 1 = one of my classes; 2 = two of my classes; 3 = three or more of my classes. For each competency measure, students were asked to respond to a set of items asking about the extent to which they agreed with various statements related to the measure. Response options ranged from 0 (never or almost never true) to 3 (always or almost always true).

Qualitative Data

Interviews with a small subset of study participants covered topics related to college outcomes, workforce experiences, and civic engagement since high school. In addition, interview questions asked participants about ways in which their high school prepared them, or could have better prepared them, for life after high school. Example questions from the interview protocol included the following:

- What factors influenced your decisions about going to college and the college you chose? In what ways, if any, did your experiences in high school affect these decisions?
- To what extent, and in what ways, did your experiences in high school prepare you for the types of teaching approaches (e.g., lectures, group work, independent learning) you experienced in college?
- Is there anything your high school could have done to better prepare you for college?

Analysis Methods

This section briefly describes the analyses we performed to address the RQs. Because the students attended high school in either California or New York City, and research has shown that state education policies can influence students' college outcomes even after considering student-level characteristics (Lowry, 2019; Perna & Titus, 2004), each set of quantitative analyses was conducted for the overall sample and separately for the California and New York City student samples. A more detailed description of the analysis methods is in the Technical Appendix.

- **Estimating the Impact of Attending a Network High School (RQ1 and RQ2).** Because students were not randomly assigned to attend network and non-network schools, the analyses estimating the impact of attending a network school adjusted for preexisting differences in the characteristics of students attending the two groups of schools by using both inverse probability of treatment weighting (Hirano et al., 2003) and statistical controls for student background characteristics. We estimated the average effects of attending a deeper learning network school on students' college outcomes using a hierarchical linear model, which accounted for the clustering of students within school pairs.
- **Estimating the Relationships Between Deeper Learning Opportunities and Competencies During High School and College Outcomes (RQ3).** To examine the extent to which opportunities for deeper learning and deeper learning competencies in high school were related to degree completion outcomes, we estimated statistical models that accounted for the nesting of students within the high schools they attended and controlled for student background characteristics. Each high school measure was examined in a separate statistical model.
- **Exploring Students' Perceptions of College Preparation (RQ4).** We systematically analyzed data collected through telephone interviews with 20 study participants to identify themes related to respondents' post–high school experiences and how their high schools prepared them, or could have better prepared them, for life after high school. When sufficient numbers of responses were available, we compared responses from participants who attended network schools and participants who attended non-network schools to identify possible differences.
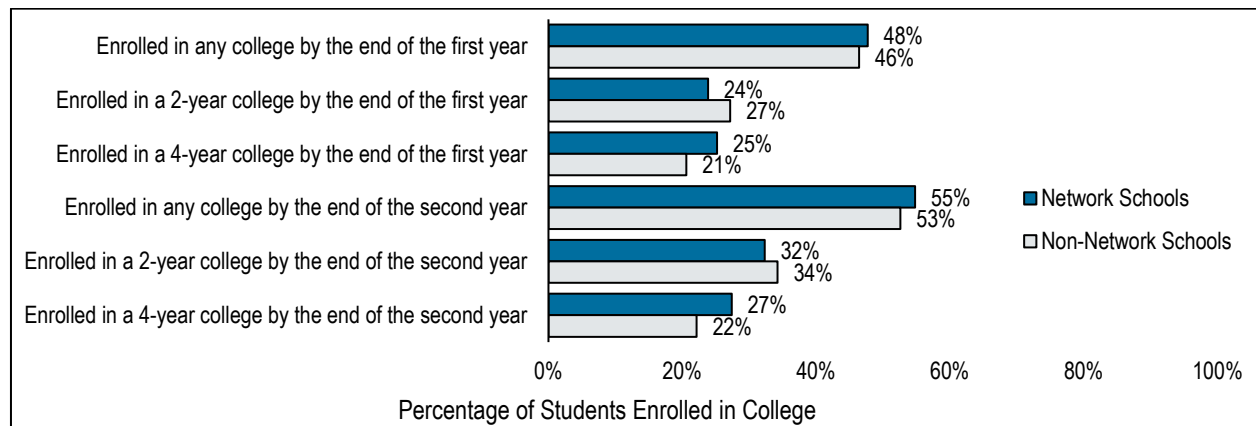
Findings

This section describes the study findings related to the four main RQs. Tables of detailed findings can be found in Section V of the Technical Appendix.

What is the impact of attending a mature deeper learning network high school on students' postsecondary enrollment and college persistence?

Effects on College Enrollment

By the end of the first year after expected high school graduation, network and non-network school students were similarly likely to have enrolled in both 2- and 4-year colleges. Within a year of expected high school graduation, 48% of the students who attended network schools had enrolled in a 2- or 4-year college, which did not significantly differ from the college enrollment rate (46%) for non-network school students (see Exhibit 3). Enrollment rates also did not significantly differ between students who attended network and non-network schools when we looked separately at enrollment in 2-year colleges (24% versus 27%) and enrollment in 4-year colleges (25% versus 21%) within the first year after expected high school graduation. Although college enrollment rates generally increased by the end of the second year after expected high school graduation, enrollment rates did not significantly differ between students who attended network and non-network schools.[10]

Exhibit 3. Percentage of Students Enrolling in 2- and 4-Year Colleges Within the First or Second Year After Expected High School Graduation, for Students Who Attended Network and Non-Network Schools
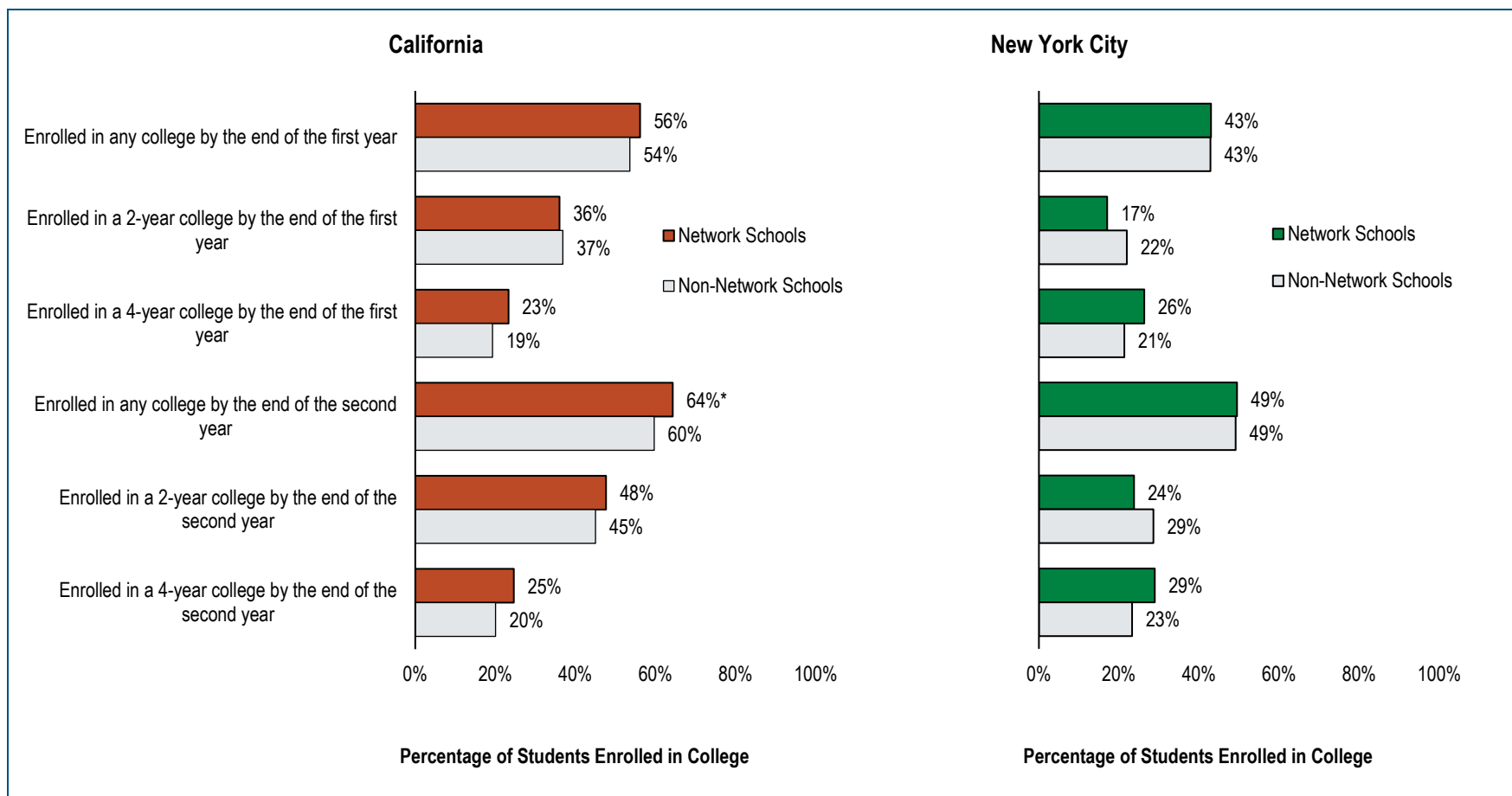

Note. Reported averages for non-network school students are based on statistical adjustments that account for the nesting of students in school pairs and differences in background characteristics between groups. Results are based on the full sample of 17,075 study participants within 12 matched pairs of network and non-network schools (3,547 network school students and 13,528 non-network school students).

Effects on Enrollment: Findings for Schools in California and New York City

With one exception, we did not observe significant differences in college enrollment outcomes between students who attended network schools and students who attended non-network schools in either California or New York City (see Exhibit 4). Among students who attended high school in California, students who attended deeper learning network schools were significantly more likely to enroll in college by the end of the second year after expected high school graduation (64%) compared with students who attended non-network schools (60%).

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[10] The magnitude of the difference in 4-year college enrollment rates (4–5 percentage points) between students from network and non-network schools is similar to the magnitude of the difference reported in prior reports from the original study (Rickles et al., 2019). However, in the current analyses, the difference is not significant. This discrepancy is likely caused by the somewhat different sample included in the current analyses (12 school pairs versus 11 school pairs previously) and a slightly different definition of college enrollment in the current analysis (i.e., enrollment in a 4-year college in the first or second year after expected high school graduation versus enrollment in a 4-year college by fall 2015 previously, which allowed for up to the fifth year after expected high school graduation for the oldest cohort of students).

Exhibit 4. Percentage of Students Who Attended Network and Non-Network Schools Enrolling in 2- and 4-Year Colleges Within the First or Second Year After Expected High School Graduation, for California and New York City

Note. Reported averages for non-network school students are based on statistical adjustments that account for the nesting of students in school pairs and differences in background characteristics between groups. Results for students who attended high school in California are based on the sample of 11,475 study participants with outcome data (1,272 network school students and 10,203 non-network school students). Results for students who attended high school in New York City are based on the sample of 5,600 study participants with outcome data (2,275 network school students and 3,325 non-network school students).
*p < .05.

Effects on College Persistence

Based on the theory of action, we hypothesized that network school students would demonstrate a higher level of persistence in college than non-network school students because exposure during high school to instruction and school culture focused on deeper learning would help develop deeper learning competencies that are integral for college success. However, the findings did not support this hypothesis. We did not observe a significant difference in the probability of persisting from one fall (or spring) semester to the subsequent fall (or spring) semester between network school students and non-network school students (see Exhibit 5). Likewise, within the first 6 years after expected high school graduation, we did not observe a significant difference between the two groups of students in the probability of enrolling in college for two, three, or four consecutive semesters. This was true both for the overall sample and when we examined results separately in California and New York City. (See Exhibit 5.2 in the Technical Appendix for results for California and New York City for the persistence outcomes.)

Exhibit 5. Percentage of Students Enrolling in College for Consecutive Years or Consecutive Semesters, for Students Who Attended Network and Non-Network Schools

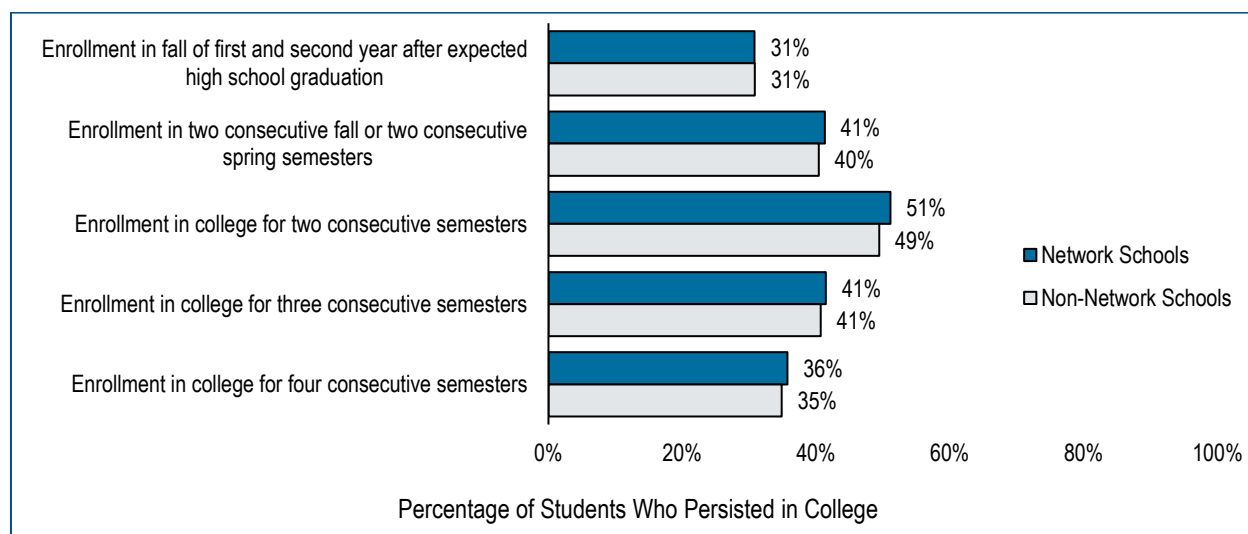*Note.* All persistence outcomes were measured within 6 years after students' expected high school graduation. Reported averages for non-network school students are based on statistical adjustments that account for the nesting of students in school pairs and differences in background characteristics between groups. Results are based on the full sample of 17,075 study participants within 12 matched pairs of network and non-network schools (3,547 network school students and 13,528 non-network school students).

What is the impact of attending a mature deeper learning network high school on students' college degree completion outcomes 6 years after expected high school graduation?

Effects on Degree Completion

In the overall sample, degree completion rates did not significantly differ between students who attended network schools and students who attended non-network schools during the time period examined (see Exhibit 6). Across the six degree-completion outcomes, differences in degree completion rates between the two groups of students did not exceed 1 percentage point. For example, by the end of the fourth year after

expected high school graduation, 5% of the students who attended network schools and 6% of the students who attended non-network schools had completed an associate's degree or certificate, and 8% of the students who attended network schools and 7% of the students who attended non-network schools had completed a bachelor's degree. By the end of the sixth year after expected high school graduation, 16% of the network school students had completed a bachelor's degree, which also was comparable to the rate for non-network school students (15%).

Exhibit 6. Percentage of Students Completing a Degree Up to 6 Years After Expected High School Graduation, for Students Who Attended Network and Non-Network Schools

Note. AA = associate's degree; BA = bachelor's degree. Reported averages for non-network students are based on statistical adjustments that account for the nesting of students in school pairs and differences in background characteristics between groups. Results are based on the full sample of 17,075 study participants within 12 matched pairs of network and non-network schools (3,547 network school students and 13,528 students non-network school students).
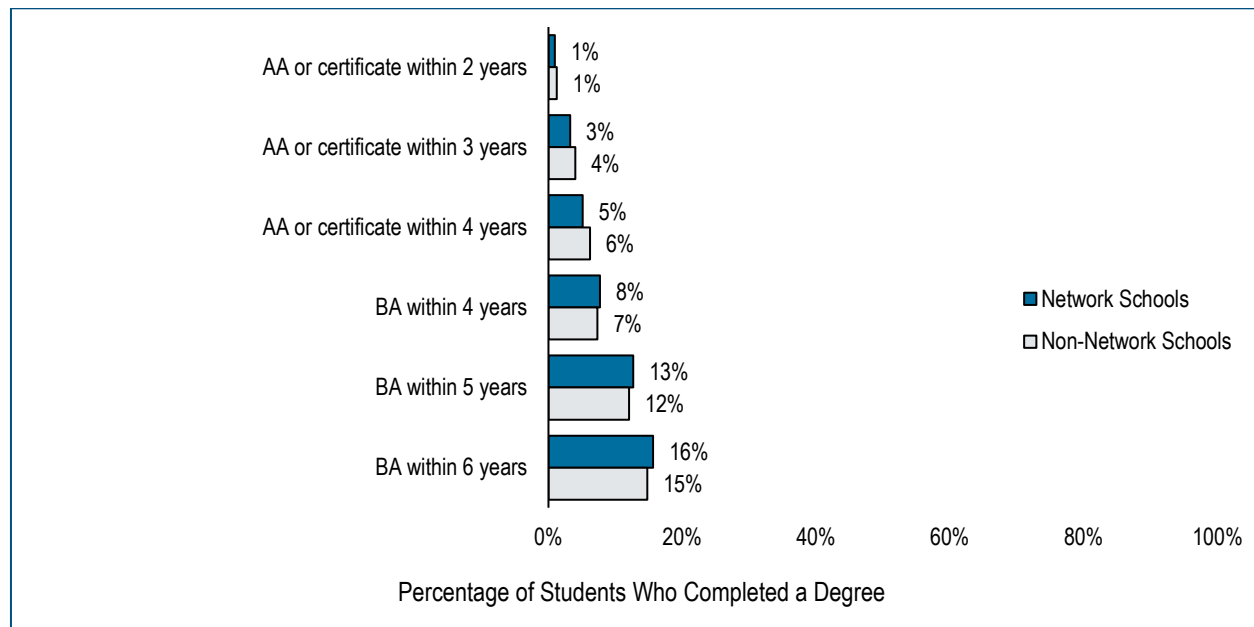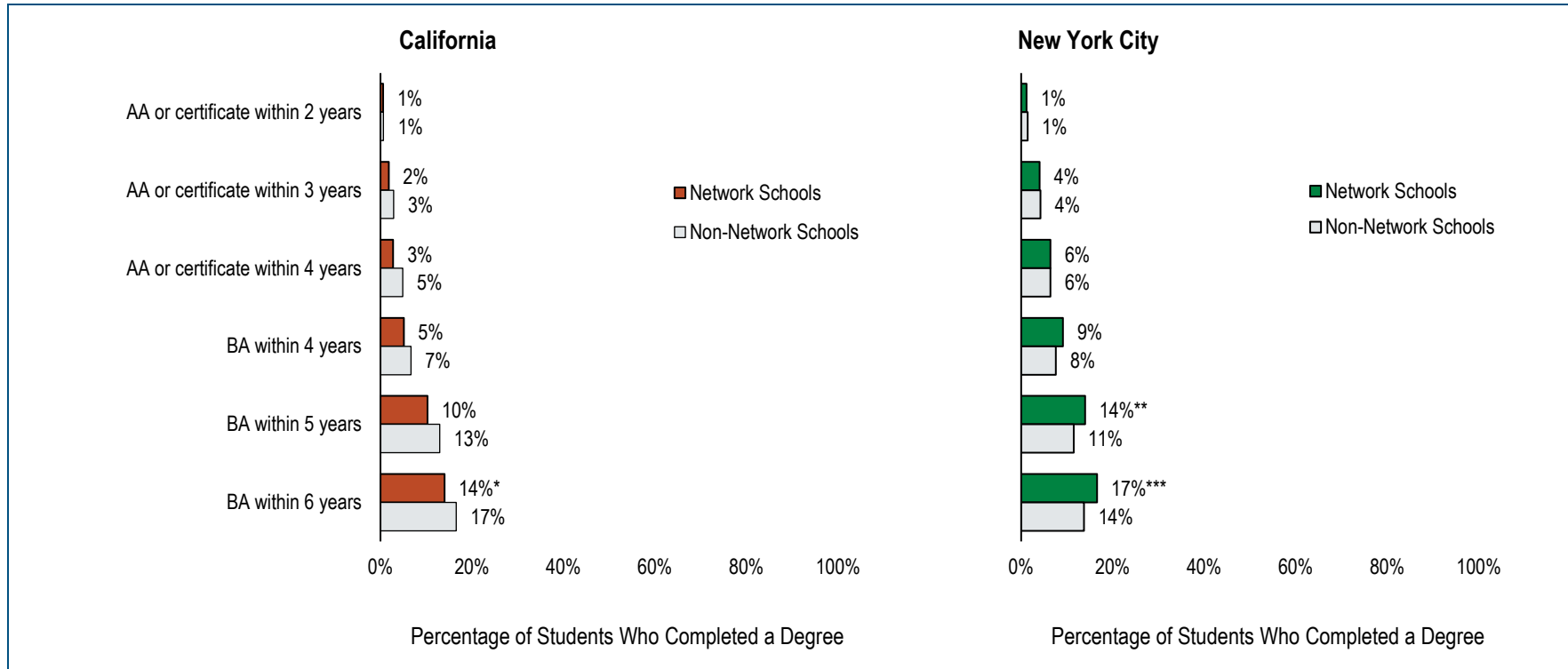
Effects on Degree Completion: Findings for Schools in California and New York City

The nonsignificant impact estimates for bachelor's degree completion outcomes for the overall study sample mask differences in the results between students who attended high school in New York City and students who attended high school in California. Specifically, among students who attended high school in New York City, there was a significant, positive impact of attending a deeper learning network school on completing a bachelor's degree both within 5 years and within 6 years after expected high school graduation. Within 6 years after expected high school graduation, 17% of the students who attended network schools and 14% of the students who attended non-network schools had completed a bachelor's degree (see Exhibit 7). In contrast, for the subsample in California, we observed a significant, negative impact on bachelor's degree completion within 6 years after expected high school graduation, with 14% of the network school students and 17% of the non-network school students having completed a bachelor's degree within 6 years after expected high school graduation. In both California and New York City, we did not observe a significant impact on rates of completing an associate's degree or certificate.

Exhibit 7. Percentage of Students Who Attended Network and Non-Network Schools Completing a Degree Up to 6 Years After Expected High School Graduation, for California and New York City

Note. AA = associate's degree; BA = bachelor's degree. Reported averages for non-network school students are based on statistical adjustments that account for the nesting of students in school pairs and differences in background characteristics between groups. Results for students who attended high school in California are based on the sample of 11,475 study participants with outcome data (1,272 network school students and 10,203 non-network school students). Results for students who attended high school in New York City are based on the sample of 5,600 study participants with outcome data (2,275 network school students and 3,325 non-network school students).
*p < .05. **p < .01. ***p < .001.

How do students' experiences with opportunities for deeper learning and deeper learning competency outcomes during high school relate to their degree completion outcomes?

To address RQ3, we first examined the relationships between participants' self-reported opportunities for deeper learning in high school and two key degree completion outcomes: completion of an associate's degree or certificate within 3 years after expected high school graduation and completion of a bachelor's degree within 6 years after expected high school graduation. These analyses revealed that none of the nine survey-based measures of opportunities for deeper learning were significantly related to the completion of associate's degrees or certificates within 3 years after expected high school graduation.

However, two opportunity measures significantly predicted bachelor's degree completion within 6 years after expected high school graduation: opportunities to receive feedback from teachers and peers and opportunities to learn how to learn (see Exhibit 8). For each measure, a one standard deviation increase in the opportunity measure was associated with an increase of approximately 2–3 percentage points in the bachelor's degree completion rate.

Exhibit 8. Summary of Relationships Between Opportunities for Deeper Learning and Degree Completion Outcomes

Measures of opportunities for deeper learning	Completion of an associate's degree/certificate within 3 years	Completion of a bachelor's degree within 6 years
Assessments aligned with deeper learning	0.0%	0.8%
Collaboration	-0.6%	2.2%
Communication	-0.1%	0.4%
Complex problem solving	0.9%	1.4%
Creative thinking	0.8%	0.3%
Feedback to students	-0.2%	**2.7%***
Interdisciplinary learning	-0.2%	-0.9%
Learning how to learn	0.5%	**2.2%***
Real-world connections	0.0%	1.0%

Note. The number in each cell represents the percentage point change in a given degree completion outcome associated with an increase of one standard deviation in a given opportunity measure. Values that are highlighted and in bold are significant at the .05 level.
*p < .05.

The pattern of findings for schools in California and New York City (see Exhibit 5.6 in the Technical Appendix) is similar to the overall results presented earlier with a few exceptions. First, opportunities for assessments aligned with deeper learning were significantly and negatively related to completion of an associate's degree or certificate within 3 years after expected high school graduation in New York City. Second, opportunities for learning how to learn and feedback to students were only significantly and positively related to bachelor's degree completion among students who attended high school in California.

We also examined the relationships between students' self-reported deeper learning competencies, as measured by the high school survey, and the two degree-completion outcomes. We found that three competency measures were significantly related to the completion of an associate's degree or certificate, and four of the analyses for bachelor's degree completion revealed significant, positive relationships (see Exhibit 9). Locus of control and

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perseverance were significantly related to both degree completion outcomes, whereas self-efficacy and self-management also significantly predicted students' probability of completing a bachelor's degree within 6 years after expected high school graduation. The strength of the relationships appeared to be somewhat stronger for bachelor's degree completion than for completion of an associate's degree or certificate. For example, a one standard deviation increase in perseverance was associated with an increase of about 1 percentage point in associate's degree/certificate completion rates, whereas the same change in perseverance was associated with an increase in bachelor's degree completion rates of almost 4 percentage points.

Exhibit 9. Summary of Relationships Between Deeper Learning Competency Outcomes and Degree Completion Outcomes

Measures of deeper learning competencies	Completion of an associate's degree/certificate within 3 years	Completion of a bachelor's degree within 6 years
Academic engagement	0.8%	1.6%
Collaboration skills	**1.3%***	2.1%
Creative thinking skills	0.6%	1.3%
Locus of control	**1.5%***	**3.8%****
Motivation to learn	1.3%	1.4%
Perseverance	**1.3%****	**3.7%****
Self-efficacy	0.8%	**3.3%****
Self-management	0.7%	**3.6%****

Note. The number in each cell represents the percentage point change in a given degree completion outcome associated with an increase of one standard deviation in a given deeper learning competency measure. Values that are highlighted and in bold are significant at the .05 level or below.
*$p < .05$. **$p < .01$. ***$p < .001$.

When we examined relationships between deeper learning competencies and college degree completion outcomes by geographic region (see Exhibit 5.7 in the Technical Appendix), we found that relationships between deeper learning competency measures and associate's degree/certificate completion did not achieve statistical significance in New York City. This is likely caused by the smaller survey sample in New York City relative to California. However, in both California and New York City, locus of control, perseverance, and self-efficacy significantly predicted bachelor's degree completion within 6 years after expected high school graduation.

In what ways did students perceive that their high schools prepared them, or could have better prepared them, for college?

The analyses of college outcome data provided limited evidence of the impact of deeper learning experiences in high school on college enrollment and persistence. To explore possible reasons for these nonsignificant results, we examined qualitative data collected through interviews with a small number of former students from the network and non-network schools. The goal of these interviews was to dig more deeply into how the network and non-network schools prepared students for college and to understand what experiences and other contextual factors may have influenced students' college choices and persistence.

After high school, 11 of the students we interviewed had enrolled directly in 4-year colleges and six had enrolled in 2-year colleges, allowing us to learn from participants who had enrolled in a range of postsecondary

programs. Across the interviews, we examined the high school experiences that students felt most prepared them for college, ways in which their high schools could have better prepared them for college, and any specific challenges or obstacles that students faced during the transition from high school to college.

We asked respondents to describe what high school experiences most prepared them for college. Among former network school students, the most common responses included the opportunities students had in high school to engage in collaborative or group work (four respondents) and develop advocacy or communication skills (four respondents). For example, one respondent described the benefits of engaging in collaborative work while in high school: "Sometimes working with people isn't the easiest, but having to do that in high school, it kind of made it easier for me to be able to just work with anyone I was partnered with [in college]." In addition, a few respondents reported that opportunities to participate in internships (three respondents), develop strong relationships with teachers (three respondents), and engage in project or portfolio assignments (two respondents) supported their transition to college. For example, one respondent described how their senior project prepared them well for college-level assignments: "My senior project . . . was in and of itself a class. That really exposed us to a lot of different things . . . it helped me, it was like a starting step for bigger projects in college." These reported benefits align well with the approaches and features of the deeper learning network schools that we observed during the original study (see Huberman et al., 2014) and suggest that these approaches may provide a strong foundation for the transition to college work.

In contrast, the most commonly reported experience reported by former non-network school students as most helpful for preparing for college was the opportunity to enroll in Advanced Placement (AP) coursework (five respondents). For example, one former student described, "In my senior year I took AP calc, and I think that was one that most prepared me . . . the way he taught it was very college-esque . . . he was more hands off instead of holding your hand the whole way." Only one respondent from a network school reported AP enrollment in high school as a helpful experience for college preparation.

Interviewees also were asked how their high schools could have better prepared them for college. Several former students from both network and non-network schools reported that more rigorous courses and opportunities for AP coursework in high school would have been beneficial (four network school students, three non-network school students). Former network school students also noted that more preparation for working independently (three respondents), more test-taking preparation and practice (two respondents), and more preparation for the workload and teaching strategies of college (two respondents) would have been beneficial. For example, one respondent from a network school noted, "[In college] you have to be independent, you have to be able to schedule your own time of study and you really have to be able to write your papers and reread it multiple times." Another interviewee noted, "[My high school] doesn't necessarily focus too much on testing . . . I just feel like I didn't really learn how to study properly when I was in high school." Several additional non-network students noted the need for more preparation for the workload and teaching strategies of college (five respondents). For example, a respondent from a non-network school described instruction in high school that did not align well with college instructional strategies: "When you get to college, your professors are really challenging you to think abstractly and critically . . . A lot of my classes in high school, I felt like it was just say the answer, and that's it. I was never challenged to think outside the box." In addition, one non-network school student noted the drawbacks of a focus on test preparation: "It just seems like more of the classes were geared towards making sure we passed the tests rather than actually learning anything."

Both former network school and non-network school students reported facing similar challenges when starting college, including financial challenges, academic challenges, adjustment to a larger school or the lecture format, and indecision related to career goals. Although we interviewed only a small number of students, the interviewees' feedback on the experiences that helped prepare them for college, as well as areas of improvement, suggest some possible explanations for the mixed results that are worth exploring further. For example, several responses suggested that although the deeper learning network high schools may prepare

students for collaboration, discussion, and project work in college, the larger, more traditional non-network schools may offer more opportunities for advanced coursework, such as AP courses, and for students to develop independent learning skills. Based on notes from site visits to network schools in spring 2013, only three of the 13 network schools included in this study offered AP courses.

Study Limitations

In a study of this nature, there will always be limitations, and this deeper learning study is no exception. Box 5 details the limitation of the study.

Box 5. Study Limitations

The study has multiple strengths, particularly the quasi-experimental matched comparison design; the long follow-up period; the combination of administrative records, survey, and interview data; and the inclusion of network schools in both California and New York City. At the same time, there are some limitations. First, it is possible that network and non-network school student groups may have differed in unmeasured student characteristics that were not captured in district administrative data. To the extent that these unmeasured student characteristics were related to the college outcomes we examined, estimated effects of network school attendance may be biased.

To maximize the similarity of student characteristics and schooling experiences prior to entering high school, the study systematically excluded students who attended deeper learning middle schools. The study is therefore focused exclusively on the impact of exposure to deeper learning during high school assuming that students did not have prior deeper learning experiences. In addition, we acknowledge that deeper learning was present at some level in both network and non-network schools. Previous analyses of student survey data showed a great amount of variation in students' self-reported opportunities for deeper learning both within and across network and non-network schools (Zeiser et al., 2020a). It is possible that this variation in student opportunities both within and across schools weakened our ability to detect longer term impacts of attending deeper learning network schools.

Furthermore, the analyses did not take into account student transfers following Grade 9 entry. Following an "intent-to-treat" approach, we identified students as attending network schools based on Grade 9 entry regardless of whether they continued enrollment in network schools. Therefore, to the extent that network school students transferred to non-network schools during high school, or vice versa, the effects of network school attendance may be diluted as these network school students did not experience the full 4 years of opportunities for deeper learning, and some non-network school students may have entered deeper learning network schools prior to high school graduation.

Finally, because the network schools included in this study were not representative of the population of deeper learning network schools, the results of this study do not generalize to the full population of network schools.

Discussion

Deeper learning network schools strive to support and empower their students to manage their own learning, communicate with diverse audiences, take what they learned in class and apply it to new situations, and collaborate with others to succeed. As high school students enter college and the labor market after graduation, these types of interpersonal and intrapersonal competencies are increasingly considered important for success. Although the deeper learning theory of action suggests that students' exposure to opportunities for deeper learning in high school should lead to improved postsecondary outcomes, this report

on the longer term impact of attending deeper learning network high schools on college outcomes produced mixed results. This section discusses contextual factors that may explain the mixed findings of the impact analyses, summarizes key opportunities for deeper learning and deeper learning competencies that we found to significantly predict degree completion outcomes, and discusses potential areas for future deeper learning research.

For the overall sample, we did not find a significant impact of attending a deeper learning network high school on college enrollment, persistence, or degree completion. However, when examining the results separately for students who attended high school in California and New York City, we observed somewhat different findings:

- In California, students who attended network schools were significantly more likely than students who attended non-network schools to enroll in college within 2 years after expected high school graduation, but they also were significantly less likely to complete a bachelor's degree within 6 years after expected high school graduation by about 3 percentage points.
- In New York City, students who attended network schools were significantly more likely to complete a bachelor's degree within 5 and 6 years after expected high school graduation compared with students who attended non-network schools by about 3 percentage points.

These results suggest that the local or educational context may have an influence on the extent to which a deeper learning approach affects student outcomes. This finding aligns with prior research demonstrating that state context and policy have an effect on college outcomes (Perna & Titus, 2004). The interviews with study participants also provide some evidence of potential contextual influences. For example, interviewees' responses suggest that advanced coursework and the development of test-taking skills may be important for preparing students for the typical college setting, yet they may be less available or emphasized in deeper learning schools.[11] However, students from New York City were expected to pass multiple Regents Examinations as a requirement for high school graduation, which may have helped expose students from that state to testing practices that are common in the college setting, even if their individual schools did not focus on test preparation.

Another contextual factor that differed by state was the size of the non-network schools. In New York City, both network and non-network schools were similarly small, but the non-network schools in California were much larger than the California-based network schools. Larger schools are likely to have programs and resources to support college preparation that are typically less available in smaller schools. For example, smaller schools often do not offer AP or International Baccalaureate courses that are more common in larger, comprehensive high schools (Zarate & Pachon, 2006). Indeed, of the former students interviewed, five students from California schools (one from a small network school and four from larger non-network schools) noted the benefits of having enrolled in AP courses in high school. Only one student from a non-network school in New York City noted having taken an AP course, and no students interviewed from New York City–based network high schools discussed AP coursework.

Although the impact analyses produced mixed results regarding the impact of attending a deeper learning network school on students' postsecondary outcomes, correlational analyses provided support for the theory positing that deeper learning competencies would be positively related to degree completion outcomes. Of the eight deeper learning competency measures examined, four were significantly and positively related to bachelor's degree completion within 6 years after expected high school graduation: locus of control, perseverance, self-efficacy, and self-management. A one standard deviation increase in each deeper

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[11] Two students who attended network schools that we interviewed as young adults noted that they could have benefited from additional test-taking practice in preparation for the kinds of assessments (e.g., midterms and finals) that are traditionally encountered in the college setting.

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learning competency measure was associated with an increase in bachelor's degree completion rate ranging from 3.3 percentage points to 3.8 percentage points. Locus of control and perseverance also were significantly related to the completion of an associate's degree or certificate within 3 years after expected high school graduation. These findings align well with the theory behind deeper learning; that is, if students have the mindsets and skills to persevere and manage their learning, they will be better prepared to succeed in college and careers.

We also found that two types of deeper learning opportunities significantly predicted bachelor's degree completion within 6 years after expected high school graduation: opportunities to receive feedback from teachers and peers and opportunities to learn how to learn. This finding provides further evidence that strategies to develop deeper learning competencies in high school, regardless of a schoolwide focus on deeper learning, hold promise as a way to prepare students to persist in college. However, it also is important to note that several competency areas and most opportunity measures did not significantly predict degree attainment. Further exploration of possible reasons for these findings will help better define which interpersonal and intrapersonal competencies, and which types of educational opportunities for deeper learning, may be most impactful.

Future Directions

Results from this study have implications for the field as well as future research. Positive impacts of attending a deeper learning network school on enrollment in 4-year colleges and bachelor's degree completion in New York City provide evidence that school structures, cultures, and instructional strategies focused on deeper learning can increase students' chances for success in college. However, the negative impact of attending a deeper learning network school on bachelor's degree completion in California suggests that the theorized positive influence of deeper learning may not be equally effective across different educational contexts.

These findings highlight the importance of understanding the influence that state-level differences in college types, entrance requirements, relationships between 2- and 4-year colleges, and state policies may have on students' enrollment decisions, college-going experiences, and ability to persist and succeed in college. To produce more generalizable findings regarding college outcomes, some researchers have conducted larger studies that include students from across the country without explicitly examining how results may vary across states. In contrast, while other researchers have examined college outcomes within a single state context, some may use findings from state-specific research studies to justify the introduction of a program or policy in another state without considering how the state context may influence its implementation or effectiveness. This study highlights that differences in the postsecondary options available to students and state/local policies may facilitate or inhibit students' enrollment and persistence in college and may lead to variations in intervention or program effectiveness across geographic locations. Future research on deeper learning, as well as other programs, interventions, and policies that support students' college and career readiness, should examine impacts on postsecondary trajectories across more diverse settings to better understand the variation in impact across educational contexts.

The findings from this study also highlight the need for research to more closely examine deeper learning in traditional settings without the "network school" label. The results from this study demonstrated that deeper learning competencies, such as self-efficacy, self-management, locus of control, and perseverance, all significantly predicted bachelor's degree completion. Although it may be cost prohibitive for schools to engage in all the practices associated with deeper learning network schools, high school programs and interventions that focus on fostering these specific interpersonal and intrapersonal competencies should be identified and studied to determine whether they can promote college success in more traditional settings.

In conclusion, *The Study of Deeper Learning* has been quite unique in its rigor and the extended period of time during which researchers followed study participants, from the time they entered Grade 9 as early as fall 2007 to degree completion as of spring 2020. Although extended longitudinal studies are logistically challenging and require early planning to ensure continued respondent contact and consent for data collection, the results of the study demonstrate the value that a longer term examination of outcomes has for the field. With this study, the impact on college outcomes observed soon after high school graduation only told part of the story. Throughout the subsequent years, students were exposed to new opportunities and experiences, including multiple transitions in and out of postsecondary institutions and employment. It is important for the field to have structures in place to enable researchers to track study participants over time, better understand the factors that influence students' trajectories after graduation, and build the evidence of what works to prepare students for college, careers, and beyond.

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