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Equitable Opportunities for Deeper Learning:

Exploring Differences Between Traditional and Network Schools

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Executive Summary

In the United States, more than 500 schools are associated with formal school networks that promote deeper learning competencies,[1] which may be defined as interpersonal, intrapersonal, and cognitive skills that prepare students for success in college, career, and civic life. Previous research suggests that students who attend schools that promote deeper learning see improved academic achievement, as measured by GPA[2] and test scores.[3] Other studies connect deeper learning exposure with improved college readiness and retention[4] and with the development of interpersonal and intrapersonal skills (e.g., communication and collaboration skills, self-efficacy).[5] More recently, researchers at the American Institutes for Research found that students who attended schools that focused on deeper learning attained higher achievement test scores and reported higher levels of collaboration skills, academic engagement, motivation to learn, and self-efficacy than similar students who attended comparison schools.[6] They also found that students who attended schools with an explicit focus on deeper learning, or deeper learning network schools, were more likely to graduate from high school within 4 years of Grade 9 entry (by about 8 percentage points) and were more likely to enroll in 4-year colleges (by about 4 percentage points), than were similar students who attended comparison schools.[7]

Because deeper learning network schools have an explicit mission to provide deeper learning opportunities to *all* students, we would expect to observe *more equitable* learning opportunities in network schools than in traditional schools. In this brief, we use data from the Study of Deeper learning to examine whether students attending deeper learning network schools do indeed report more equitable learning opportunities than students in comparison schools. Using student-level demographic data and self-reports of high school experiences for students attending 13 network schools and 10 matched comparison schools, we examine equity in student opportunities in two ways.

First, we examine the extent to which students who were enrolled in the same high school varied in their reports of opportunities for deeper learning and whether the within-school variation in opportunities differed in network and comparison (i.e., traditional) high schools. Second, we test whether students' reports of opportunities for deeper learning differ for different types of students enrolled in the same school—especially traditionally underserved students (e.g., Black and Hispanic students and students who are eligible for free or reduced-price lunch).

We found that within-school variation in some but not all of our measures of opportunities for deeper learning differed by school type. Specifically, we observed less within-school variation in network schools than in comparison schools for four of the nine measures of opportunities for deeper learning, indicating that these opportunities were experienced more equitably across the student population in the network schools than in the comparison schools. The four measures included opportunities for

- learning how to learn,
- feedback,
- communication, and
- collaboration.

Within-school variation for the remaining five measures of opportunities for deeper learning were similar in network and comparison schools: opportunities for aligned assessment, creative thinking, real-world connections, complex problem-solving, and interdisciplinary learning.

In addition, we found that students were more likely to report similar opportunities for deeper learning across student groups in network schools. This means there were fewer reported *gaps* in opportunities for deeper learning in network schools than in comparison schools. In particular, gaps in reports of opportunities for deeper learning by gender, race/ethnicity, and prior achievement were smaller in network schools than in comparison schools.

The findings in this study show that opportunities for deeper learning are present in both traditional and network high schools but that the network high schools in this study were more successful at providing these opportunities more equitably across students within their schools. These findings indicate that schools should examine their policies and practices to ensure that structural and social barriers are not preventing traditionally underserved students from experiencing the opportunities for deeper learning that their more socially advantaged peers experience. As a larger number of schools and districts are turning their attention toward "fifth indicators" of student success, it will be important to ensure that opportunities to develop academic and non-academic skills and mindsets are provided to all students equitably.

Introduction

While measures of student performance on standardized tests and rates of on-time graduation dominated the discussion of student success in the No Child Left Behind era, since the passage of the Every Student Succeeds Act in 2015, states and districts are beginning to focus on a range of skills that prepare students for success in college and career. To successfully participate in an increasingly diverse democracy and engage in the evolving workplace, students need to be able to communicate their ideas, work together with others to solve problems, think creatively, and manage their own learning.[8,9,10] They also need dispositions and mindsets that help them to overcome obstacles, take initiative, and persevere through setbacks.[11,12] However, while schools focus on improving these skills, there is concern that focus on these skills and mindsets is primarily limited to traditionally advantaged students, such as White students, those who are more affluent, and those who are higher-achieving.[13]

In this brief, we focus on the extent to which students' opportunities for "deeper learning" are equitably distributed within different types of schools. By exploring the amount of variation in students' opportunities within different types of schools, as well as identifying which students consistently report fewer opportunities for deeper learning, we highlight the need for schools to consider how policies and practices may need to be adjusted to ensure more equitable opportunities for all of their students.

Although national estimates of the number of schools that focus on deeper learning do not exist, in the United States, more than 500 schools are associated with formal school networks that promote deeper learning competencies.[14] Deeper learning competencies may be defined as the skills and mindsets that are prerequisites for success in college, career, and civic life.[15,16,17] The concept of deeper learning has been used to describe both (1) a set of outcome competencies or goals for students and (2) the process of developing deeper learning competencies and the ability to apply those competencies to new and varying situations. The National Research Council defines deeper learning as the "process through which an individual becomes capable of taking what was learned in one situation and applying it to a new situation" and groups student skills into three domains of competence: the cognitive domain (e.g., mastery of content knowledge, critical thinking), the interpersonal domain (e.g., communication, collaboration), and the intrapersonal domain (e.g., academic mindsets).[18] The interpersonal and intrapersonal domains capture many of the competencies commonly referred to as "21st Century" or "noncognitive" skills.

In the recent AIR Study of Deeper Learning researchers examined opportunities for deeper learning, as well as interpersonal and intrapersonal competencies. The goal of the project was to compare strategies and cultures, students' deeper learning opportunities, and student outcomes between students who attended schools with an explicit focus on deeper learning and students who attended traditional high schools. Using a sample that included both high schools involved in deeper learning networks[19] and similar traditional ("comparison") high schools, researchers at the American Institutes for Research (AIR) found that students who attended the deeper learning network high schools reported higher levels of deeper learning opportunities[20] and demonstrated higher levels of academic engagement, motivation to learn, self-efficacy, and collaboration skills[21] than students in matched comparison schools.

These results were promising; however, questions remained. While these results from the Study of Deeper Learning provided information about the *average levels* of opportunities and outcomes among

students attending network and comparison high schools, the study did not look closely at variation in opportunity based on student characteristics. To minimize achievement and attainment gaps and ensure equitable learning outcomes, schools must consider the extent to which student opportunities vary among students in their schools.

In this study, we re-examine data from the Study of Deeper Learning in an effort to understand the within-school ***distribution*** of student opportunities. Because network schools have an explicit mission to provide deeper learning opportunities to *all* their students, we would expect to observe a ***more equitable distribution***—in addition to higher average levels—of opportunities in network schools than in comparison schools. Specifically, we theorize that gaps in opportunities for deeper learning will be smaller between students who are traditionally underserved (e.g., female students, racial/ethnic minorities, English language learner [ELL] students, low-income students, lower achieving students, and students with disabilities) and their more advantaged peers in deeper learning network high schools than in traditional, comparison high schools.

In traditional high schools, gaps in opportunities may result from longstanding structures, such as tracking, that allocate students to different kinds of curriculum opportunities and, often, different levels of teaching quality.[22] In addition, social and cultural norms may reinforce traditional barriers to opportunities for some groups. For example, lingering stereotypes may deter female students and students of color from signing up to participate in project-based science, technology, engineering, and mathematics (STEM) opportunities, and may deter some teachers or counselors from encouraging them to do so.[23,24,25] Furthermore, as levels of parental involvement can vary by socioeconomic status, students from higher income families may be more aware of and more likely to take advantage of certain educational opportunities than students from lower income households.[26]

In contrast, the personalized culture and schoolwide focus on building students' interpersonal and intrapersonal skills in deeper learning network schools are designed to minimize traditional gaps in students' experiences. As described by Huberman and colleagues,[27] these schools substantially eliminated tracking, offering students pathways to college as well as careers, along with opportunities to learn in heterogeneous classrooms. Nearly all have also instituted school-wide efforts to infuse project-based learning and performance based assessments, often including portfolios and school-wide exhibitions of learning, as well as internships. These projects and exhibitions provide structured opportunities to develop the metacognitive skills of planning and organizing inquiries, conducting and communicating research, and reflecting on and revising work. Collaborative group work and explicit development of interpersonal skills are common. Finally, schools in the deeper learning networks support student success through personalized learning environments and advisory systems in which each student belongs to a smaller family group and teachers who serve as advisors support students in their academic progress as well as their social-emotional learning. All of these features change the way in which students experience school.

In this brief, we analyze data from the Study of Deeper Learning to explore the distribution of opportunities for deeper learning in both network and comparison schools. In particular, we examine the following research questions:

1. How much do opportunities for deeper learning differ *among students who attended the same school*? Does the within-school variation of deeper learning differ for network and comparison schools?
2. To what extent do deeper learning opportunities differ by gender, race/ethnicity, ELL status, prior achievement, and free or reduced-price lunch eligibility (FRPL) *for students enrolled in the same school*? Do these gaps differ for network and comparison schools?

Data and Sample

For the Study of Deeper Learning, AIR administered a 30-minute student survey to 2,577 students in Grades 10–12 across 23 schools in California and New York City. Thirteen of these schools participated in a network focused on deeper learning (i.e., network schools), and 10 were comparison schools that were similar to the network schools in student composition and location but did not participate in a deeper learning network.[28] Table 1 presents information about the network and matched comparison schools included in this study.

Table 1. Characteristics of Network and Comparison Schools Included in This Study

School characteristic	Network schools (13)	Comparison schools (10)
Enrollment	Average: 400	Average: 1,500
	Range: 300–600	Range: 400–2,600
Percentage female	Average: 53%	Average: 50%
	Range: 40%–70%	Range: 40%–60%
Percentage Black	Average: 12%	Average: 15%
	Range: 0%–40%	Range: 0%–40%
Percentage Hispanic	Average: 45%	Average: 48%
	Range: 10%–100%	Range: 20%–100%
Percentage eligible for free or reduced-price lunch	Average: 58%	Average: 57%
	Range: 30%–100%	Range: 20%–90%

Note. School demographics from the 2010–11 Common Core of Data (CCD).

In addition to matching network schools and comparison schools based on geography and school composition, students were purposefully selected to participate in the student survey so that samples of students were similar in terms of demographic characteristics and prior achievement between matched network and comparison schools. (For more information about sample selection, see Appendix A.) For this brief, we focus on a sample of 2,298 students who participated in the student survey and for whom we were able to obtain demographic and prior achievement data. This sample includes 1,077 students who attended deeper learning network schools and 1,221 students who attended matched comparison

schools. The sample of comparison school students was selected to minimize differences between groups in demographic characteristics and prior achievement. The exact number of students included in each analysis differs across survey measures, as students must have responded to at least half of the relevant survey questions to be included in the analysis (see Appendix A for more details about the study sample).

Measures and Methods

The student survey contained a variety of questions that addressed students' opportunities for deeper learning. Each survey measure is composed of between 4 and 22 survey questions, which were all answered on a scale of 1 to 4. Measures of opportunities for deeper learning are summarized in the box below. We also provide an example of the survey items used to measure one of the survey constructs.[29] Details of how we calculated each measure based on individual survey responses are provided in Appendix A.

Measures of Opportunities for Deeper Learning Based on the Student Survey

1. ***Opportunities for complex problem-solving:*** 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
2. ***Opportunities for creative thinking:*** 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
3. ***Opportunities to communicate:*** The extent to which students have opportunities to practice written and oral communication skills
4. ***Opportunities to collaborate:*** The degree to which students collaborate on assignments, provide feedback on each other's work, and collaborate in other ways
5. ***Opportunities to learn how to learn:*** The degree to which students practice monitoring and directing their own work and learning
6. ***Opportunities to receive feedback:*** The degree to which students receive written and oral feedback on their work from teachers, peers, and others
7. ***Assessments aligned with deeper learning:*** The extent to which students engage in various forms of assessment, including assessments of problem-solving, communication, and collaboration
8. ***Opportunities for interdisciplinary learning:*** The degree to which students engage in interdisciplinary learning, in which two or more disciplines are combined to enhance inquiry and knowledge generation
9. ***Opportunities for real-world connections:*** The degree to which students engage in instructional activities that emphasize real-world connections

We asked students to respond to a set of items about the number of core content classes (including English, mathematics, science, and social studies) in which they engaged in activities relevant to the opportunity measure. Response options were 0 (*none of my classes*), 1 (*one of my classes*), 2 (*two of my classes*), and 3 (*three or more of my classes*). Opportunities for interdisciplinary learning were measured on the following response scale: 0 (*none of the time*), 1 (*some of the time*), 2 (*most of the time*), and 3 (*all of the time*). We used Rasch modeling to create scale scores from the survey items for each measure. The scale scores were standardized to have a mean of 0 and a standard deviation of 1 in the full analytic sample of surveyed students.

Example: ***Opportunities to Learn How to Learn***

Please think about your ***English, math, science, and social studies classes*** this school year. ***For how many of these classes*** is each statement true?

- My teacher lets me test or try out my ideas to see if they work.[a]
- My teacher helps me learn to use different sources of information.
- My teacher asks me to think about how I learn best.
- My teacher gives us activities to do, other than just listening to him or her.[a]

[a] Survey items adapted from the Measures of Effective Teaching [MET] 2009–2011 Student Perceptions Survey—Year 1 Secondary Students Questionnaire (http://www.icpsr.umich.edu/icpsrweb/METLDB/studies/34345).

To address the first research question, we assessed within-school variation by calculating the interquartile range (IQR) within each school for each deeper learning opportunity measure. The IQR describes the middle 50% of values. It is the difference between the 75th percentile (i.e., the value at which only 25% of survey respondents in the school have a higher value) and the 25th percentile (i.e., the value at which only 25% of survey respondents in the school have a lower value) in the survey measure. A larger IQR value indicates there is more variation in students' reports of opportunities for deeper learning within the school. We then compared the average IQR values for network and comparison schools.

To answer the second research question, we examined within-school gaps in opportunities for deeper learning for different subgroups of students. (See Appendix A for more information on the statistical models used.) Separate models were estimated for network schools and comparison schools as well as for each of the subgroup comparisons (i.e., gender, race/ethnicity, ELL status, level of prior English language arts [ELA] achievement, and FRPL eligibility).

In this brief, we first examine whether the within-school variation in opportunities for deeper learning differed between network and comparison schools. We then explore whether traditionally underserved students (e.g., Black and Hispanic students,[30] low-income students) reported significantly fewer opportunities than their more socially advantaged counterparts (e.g., White students, higher income students) within network and comparison schools.

Results

Table 2 presents information about within-school variation for the nine measures of opportunities for deeper learning. Results are presented on the original 1–4 scale, where 1 represents experiencing the opportunity in 0 classes and 4 represents experiencing the opportunity in 3 or more classes. Therefore, an IQR of 1 indicates the difference between the 25th and 75th percentiles in student responses is approximately one class period.[31]

As shown in Table 2, there was more within-school variation for some opportunity measures than others. For example, there was more within-school variation in opportunities for creative thinking and interdisciplinary learning (with an IQR of approximately 1.0) than in opportunities for complex problem-solving, opportunities to learn how to learn, and opportunities for collaboration (with an IQR of approximately 0.8).

Table 2. Interquartile Range (IQR) of Student-Reported Opportunities for Deeper Learning for Network Schools and Comparison Schools

Survey measure	School type	Average 25th percentile	Average 50th percentile (median)	Average 75th percentile	Interquartile range	Difference (comparison–network)
Opportunities to learn how to learn	Network schools	3.15	3.51	3.81	0.66	0.29**
	Comparison schools	2.8	3.32	3.76	0.96	
Opportunities for communication	Network schools	2.68	3.09	3.49	0.81	0.22**
	Comparison schools	2.12	2.63	3.16	1.03	
Opportunities for feedback	Network schools	2.8	3.22	3.59	0.79	0.20*
	Comparison schools	2.37	2.89	3.37	0.99	
Opportunities for collaboration	Network schools	2.96	3.34	3.66	0.69	0.15*
	Comparison schools	2.51	2.94	3.36	0.85	
Opportunities for aligned assessments	Network schools	2.7	3.16	3.51	0.81	0.11
	Comparison schools	2.41	2.86	3.33	0.92	
Opportunities for creative thinking	Network schools	2.56	3.09	3.57	1.00	0.09
	Comparison schools	2.23	2.78	3.32	1.09	
Opportunities for real-world connections	Network schools	2.5	2.99	3.38	0.89	0.02
	Comparison schools	2.22	2.68	3.13	0.91	
Opportunities for complex problem-solving	Network schools	2.32	2.71	3.11	0.79	0.00
	Comparison schools	2.08	2.47	2.87	0.79	
Opportunities for interdisciplinary learning	Network schools	2.11	2.59	3.13	1.03	-0.06
	Comparison schools	1.71	2.19	2.67	0.96	

Source. Secondary analysis of data from the Study of Deeper Learning.
* $p < .05$. ** $p < .01$.

The results in Table 2 also indicate that the average amount of exposure to deeper learning was higher in the network schools at the median and at every quartile for every indicator. There was also less variation in opportunities for deeper learning in network schools than in comparison schools for four measures of opportunities: opportunities for learning how to learn, feedback, communication, and collaboration. Moreover, differences between network schools and comparison schools were statistically significant, indicating that these differences did not occur by chance. For these measures, students' opportunities for

deeper learning were more regularly and more equitably experienced across the student population in the network schools than in the comparison schools. In contrast, differences in average IQR values were smaller and not significant for other opportunity measures.

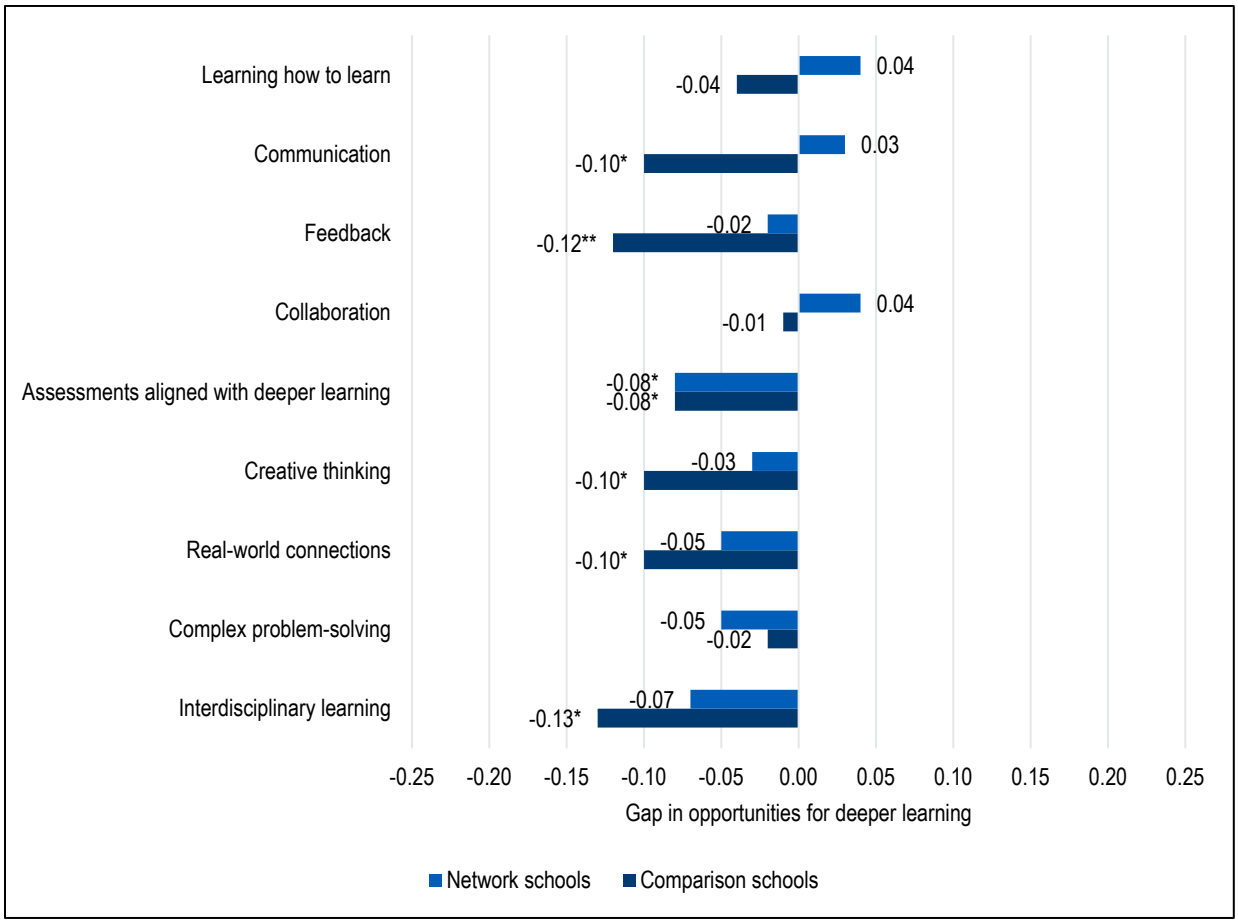
To further explore within-school variation in students' opportunities for deeper learning, we estimated within-school gaps in opportunity measures across student subgroups (see Appendix B for detailed results). Results revealed a smaller number of significant gaps in opportunities for deeper learning by gender, level of prior achievement, and race/ethnicity in network schools than in comparison schools, again indicating that the distribution of student experiences was more equitable in the network high schools (see Table 3).[32] Observed gaps in student reports of opportunities for deeper learning between ELL and native English speakers were similar in network and comparison schools.

Table 3. Number of Within-School Gaps in Opportunities for Deeper Learning Across Nine Survey Measures

Subgroup comparison	School type	Number of significant gaps across 9 survey measures
Females compared with males	Network	1
	Comparison	6
Students with below-average prior achievement compared with students with above-average prior achievement	Network	1
	Comparison	3
Black students compared with White students	Network	1
	Comparison	5
Hispanic students compared with White students	Network	4
	Comparison	6
ELLs compared with native English speakers	Network	2
	Comparison	3
Students eligible for FRPL compared with students not eligible for FRPL	Network	0
	Comparison	0

Gender. In network schools, differences between females and males were observed for only one measure: opportunities for assessments aligned with deeper learning (see Figure 1). In comparison schools, females reported fewer opportunities than their male counterparts for six measures: assessments aligned with deeper learning, creative thinking, feedback, communication, real-world connections, and interdisciplinary learning. These findings suggest that there may be social factors that prevent female students from being exposed to, learning about, or taking advantage of opportunities for deeper learning in traditional high schools but that these barriers have been mitigated in network high schools.

Figure 1. Within-School Gaps in Reports of Opportunities for Deeper Learning by Gender (female students compared with male students)



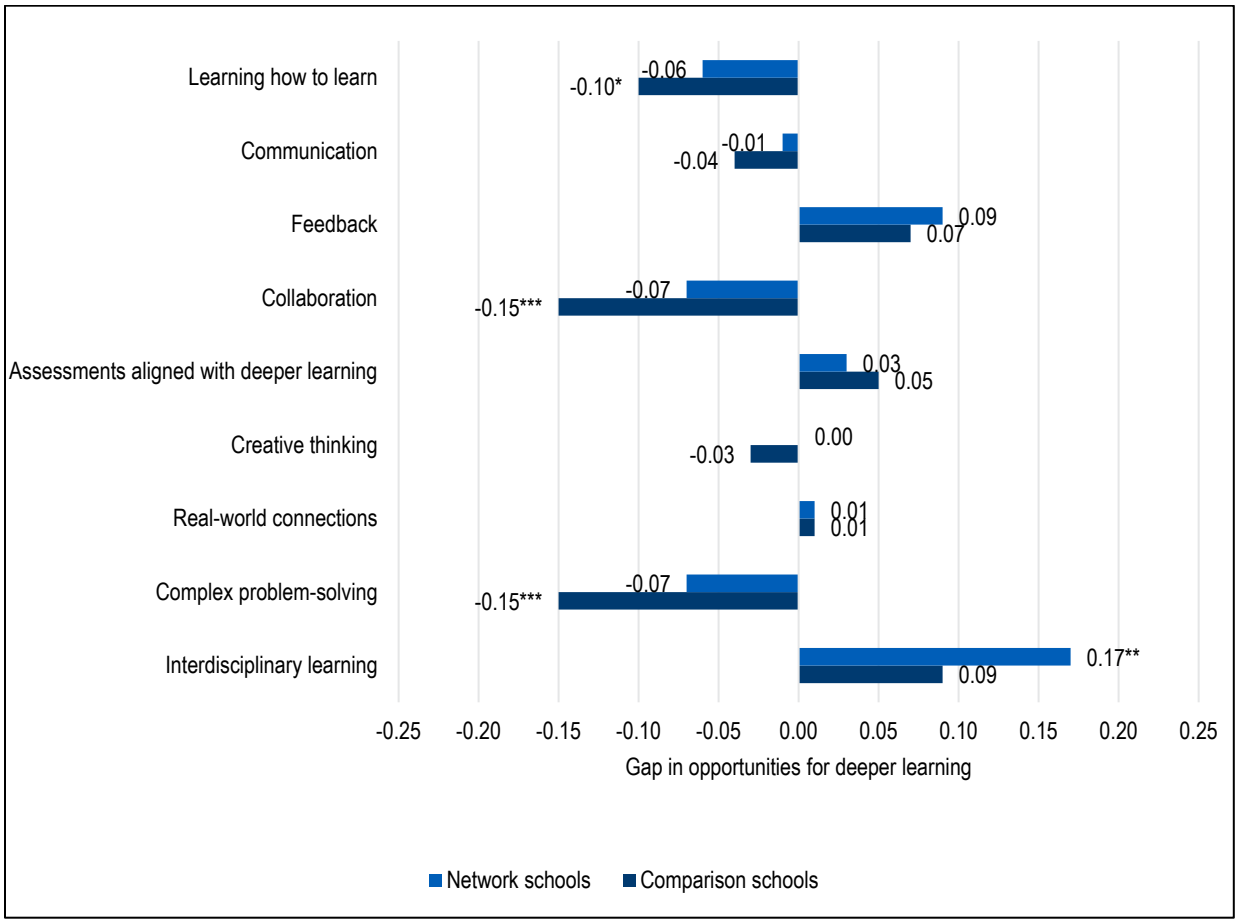
Note. Values greater than 0 indicate a gap favoring female students; values less than 0 indicate a gap favoring male students. Survey measures are ordered by the size of the difference in variation between network schools and comparison schools (see Table 2). A difference of 1 would approximate the difference of one additional class.

Source. Secondary analysis of data from the Study of Deeper Learning.

* $p < .05$. ** $p < .01$.

Prior achievement. In the network schools in our study, students with below-average prior achievement reported significantly greater opportunities for interdisciplinary learning than their peers with above-average prior achievement (see Figure 2). In contrast, in comparison schools, students with below-average prior achievement reported *fewer* opportunities than their peers with above-average prior achievement for three measures: opportunities for learning how to learn, collaboration, and complex problem-solving. These findings indicate that, although lower achieving students perceived fewer opportunities to develop higher-order thinking skills in comparison schools, such gaps in opportunities were not observed in the deeper learning network schools.

Figure 2. Within-School Gaps in Opportunities for Deeper Learning by Prior Achievement (students with below-average prior achievement compared with students with above-average prior achievement)



Note. Values greater than 0 indicate a gap favoring students with below-average prior achievement; values less than 0 indicate a gap students with above-average prior achievement. Survey measures are ordered by the size of the difference in variation between network schools and comparison schools (see Table 2). A difference of 1 would approximate the difference of one additional class.

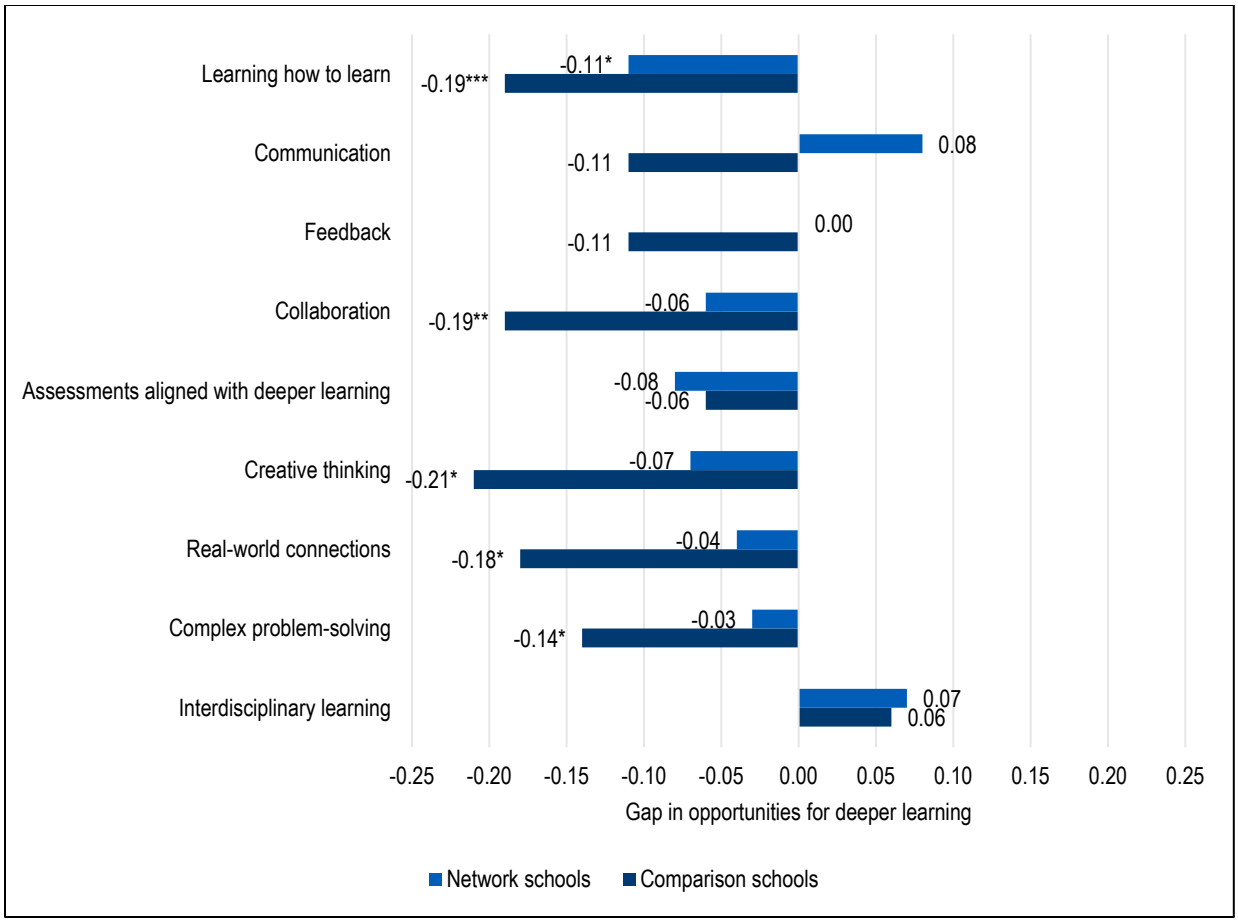
Source. Secondary analysis of data from the Study of Deeper Learning.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Race/ethnicity. In network schools, differences between Black and White students were observed for only one measure: opportunities for learning how to learn (see Figure 3). In comparison schools, Black students reported fewer opportunities than their White counterparts for five measures: opportunities for learning how to learn, creative thinking, collaboration, real-world connections, and complex problem-solving. We also examined gaps in opportunities for deeper learning between Hispanic students and White students in the same school. In network schools, Hispanic students reported fewer opportunities than White students for four measures: learning how to learn, creative thinking, collaboration, and complex problem-solving (see Figure 4). In comparison schools, Hispanic students reported fewer opportunities than White students for six measures: opportunities for learning how to learn, creative thinking, collaboration, complex problem-solving, communication, and real-world connections. These

findings suggest that, in both network and comparison schools, there might be social or structural barriers to exposure to opportunities for deeper learning that students of color face, but White students do not face. These barriers appear to be greater in the comparison schools.

Figure 3. Within-School Gaps in Opportunities for Deeper Learning by Race/Ethnicity (Black students compared with White students)

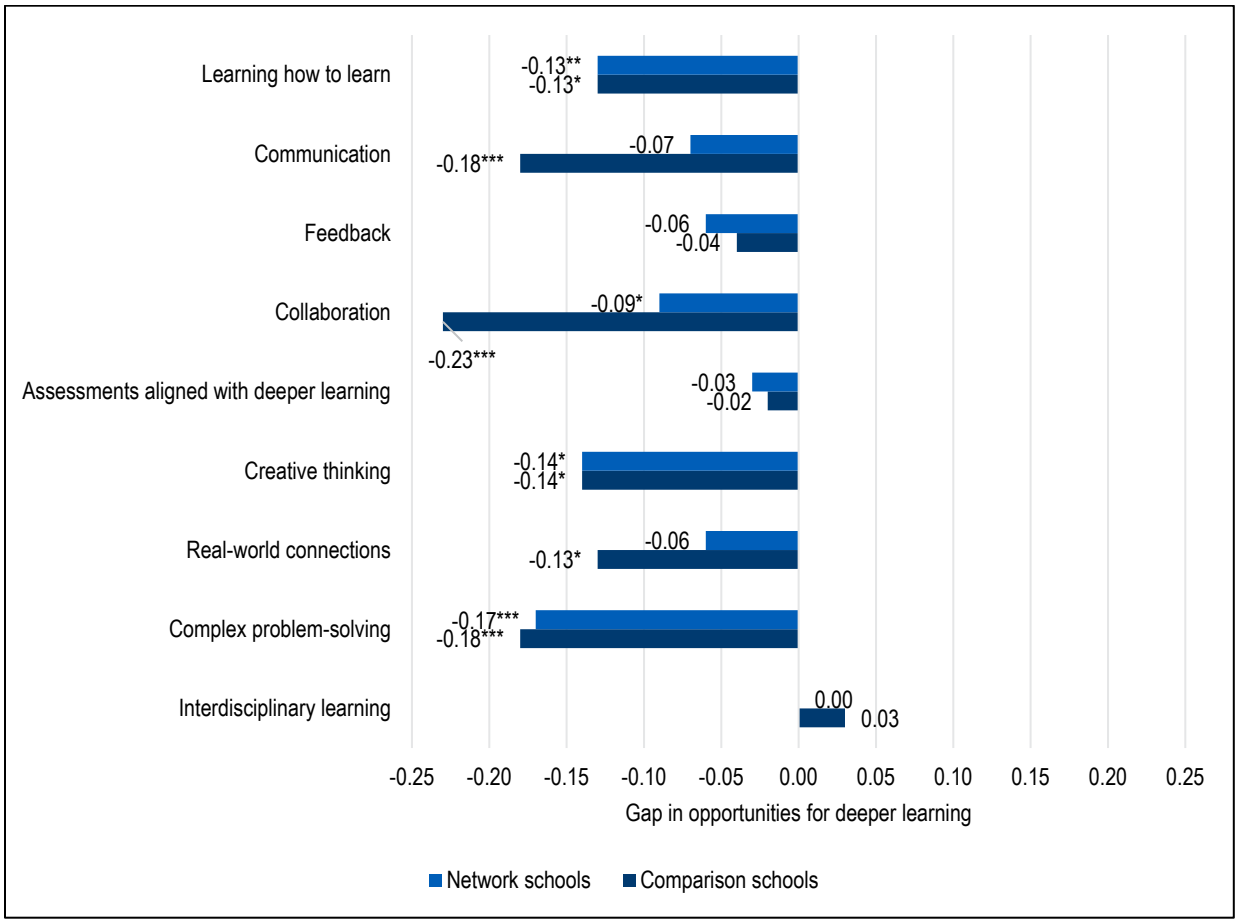


Note. Values greater than 0 indicate a gap favoring Black students; values less than 0 indicate a gap favoring White students. Survey measures are ordered by the size of the difference in variation between network schools and comparison schools (see Table 2). A difference of 1 would approximate the difference of one additional class.

Source. Secondary analysis of data from the Study of Deeper Learning.

* $p < .05$. ** $p < .01$. *** $p < .001$.

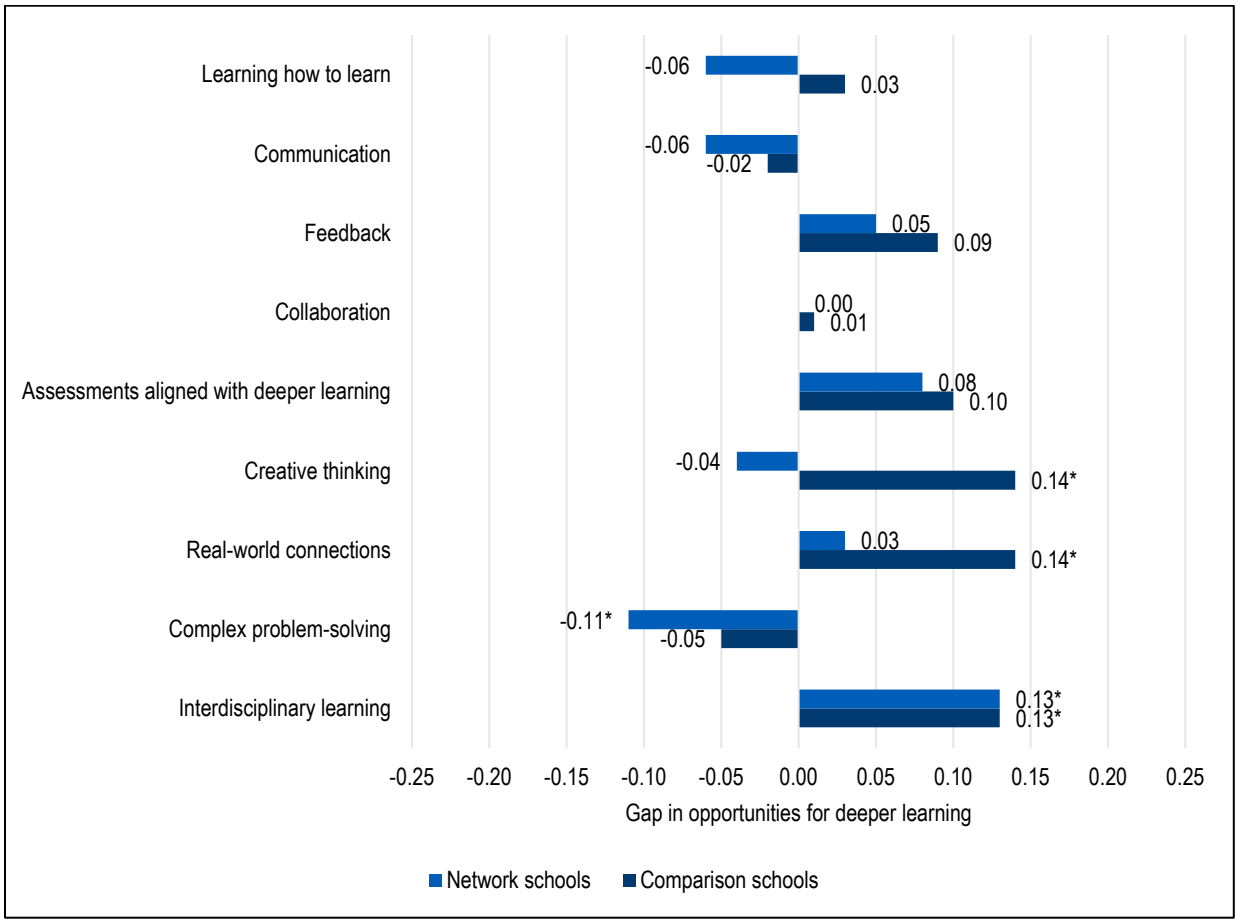
Figure 4. Within-School Gaps in Opportunities for Deeper Learning by Race/Ethnicity (Hispanic students compared with White students)



Note. Values greater than 0 indicate a gap favoring Hispanic students; values less than 0 indicate a gap favoring White students. Survey measures are ordered by the size of the difference in variation between network schools and comparison schools (see Table 2). A difference of 1 would approximate the difference of one additional class.
Source. Secondary analysis of data from the Study of Deeper Learning.
* $p < .05$. ** $p < .01$. *** $p < .001$.

English language learner (ELL) status. In comparison schools, ELL students reported more opportunities than their native English-speaking counterparts for three measures: opportunities for creative thinking, real-world connections, and interdisciplinary learning (see Figure 5). In network schools, we observed gaps in opportunities for deeper learning by ELL status for two measures. Specifically, ELL students in network schools reported more opportunities for interdisciplinary learning than their native English-speaking counterparts, but fewer opportunities for complex problem-solving.

Figure 5. Within-School Gaps in Opportunities for Deeper Learning by ELL Status (ELL students compared with native English speakers)



Note. Values greater than 0 indicate a gap favoring ELL students; values less than 0 indicate a gap favoring native English speakers. Survey measures are ordered by the size of the difference in variation between network schools and comparison schools (see Table 2). A difference of 1 would approximate the difference of one additional class.
Source. Secondary analysis of data from the Study of Deeper Learning.
* $p < .05$.

Free or reduced-price lunch (FRPL) status. We did not find significant differences in opportunities for deeper learning by FRPL status for either network or comparison schools (see Table B.1 in Appendix B).

Discussion

While previous research has demonstrated that students who attend schools that focus instruction on deeper learning experience more opportunities for deeper learning ***on average*** than students who attend traditional high schools, that research has not examined whether these opportunities are equitably distributed across students within schools. For this brief, we examined the extent to which students who were enrolled in the same high school varied in their opportunities for deeper learning and assessed whether the within-school variation in opportunities differed between network and comparison schools.

We found that the average amount of exposure to deeper learning was higher in the network schools for every indicator. There was also less variation in opportunities for deeper learning in network schools than in comparison schools for four measures of opportunities: opportunities for learning how to learn, feedback, communication, and collaboration. For these measures, students' opportunities for deeper learning were more regularly and more equitably experienced across the student population in the network schools than in the comparison schools.

Relative to other measures of opportunities for deeper learning, we observed a larger amount of within-school variation in opportunities for creative thinking and interdisciplinary learning in *both* network and comparison schools. We found that although some of the opportunities were distributed more equitably in network schools than in comparison schools (i.e., opportunities for learning how to learn, communication, feedback, and collaboration), the amount of within-school variation for the other measures did not differ by school type. The differences we observed by school type were relatively small in size: as student opportunities were measured based on the number of classes in which students reported experiencing opportunities for deeper learning, differences by school type did not exceed one-third of a class. However, differences were large enough to indicate that they did not occur by chance, and therefore our findings do suggest that schools that provide a schoolwide focus on deeper learning may be more likely to provide more equitable opportunities across the student population.

Whereas most researchers and practitioners focus on increasing the prevalence of opportunities for deeper learning across schools, these findings suggest that schools also should reflect on the extent to which they provide ***all their students*** with similar opportunities for deeper learning.

We also examined within-school gaps in opportunities for deeper learning across student subgroups. We observed fewer significant gaps in student reports of opportunities for deeper learning in network schools than in comparison schools. Specifically, within comparison schools, female students, lower achieving students, and racial/ethnic minorities reported fewer opportunities for deeper learning than their male, higher achieving, and White counterparts. Many of these gaps were not present in network schools, suggesting that a schoolwide, explicit focus on deeper learning may help to address some of the inequities in instructional opportunities that traditionally underserved students typically experience.

However, we found that within-school gaps in opportunities for deeper learning between Hispanic students and White students, and between ELL students and native English speakers, occurred within both network high schools and comparison high schools. For example, although we generally observed a smaller number of gaps in opportunities for deeper learning in network schools, especially for Black students, we found that Hispanic students reported fewer opportunities for learning how to learn, creative thinking, collaboration, and complex problem-solving than their White counterparts in network schools.

Therefore, while opportunities for deeper learning were generally distributed more evenly across the student populations in network schools, the fact that gaps remain indicates that network schools also must consider the extent to which they ensure opportunities are provided equitably to all students.

It is important to note a few limitations when interpreting the study findings. First, the sample included in this study was not geographically diverse. Although the schools included in our study were located in urban areas in California and New York City, we do not have reason to believe that policies or educational contexts within these locations are driving our findings. Future research conducted in other states, as well as in suburban and rural areas, could explore whether geography plays a role in the equitable distribution of student opportunities. In addition, due to the small number of schools in our sample, the purposeful way in which we selected schools for our study, and the correlational nature of our methods, we acknowledge that the field would benefit from a more rigorous study design to determine whether a focus on deeper learning can enable schools to address issues of equity and reduce gaps in instructional opportunities.

Although findings in this brief indicate more equity in the distribution of opportunities for deeper learning in network high schools, it appears that all schools would benefit from an examination of structures (and other factors that might prevent students from being exposed to and experiencing opportunities for deeper learning.

Appendix A. Technical Details

Study Sample Details

In 2011–12, the Hewlett Foundation selected 10 school networks to participate in what would become the Deeper Learning Community of Practice. The purpose of this community of practice was to share strategies, tools, and lessons that both contribute to the work of the networks themselves and build the broader knowledge base of deeper learning. The 10 networks represented in this study have a well-established history of promoting deeper learning, and all share an emphasis on providing educational opportunities for minority students and students from low-income families to prepare them for college and careers. The network schools were drawn from 10 different networks, and the treatment evaluated in this study is therefore heterogeneous. As discussed in Huberman and colleagues, although the networks' approaches varied, the approaches in the sampled high schools typically encompassed several common elements, including engagement in project-based learning involving collaboration and real-world experiences, use of authentic assessment (such as portfolios and exhibitions) to measure student achievement and progress, and development of personalized learning environments. [33]

To select comparison schools, AIR researchers identified schools with a population of incoming Grade 9 students similar to the incoming Grade 9 students at the network schools. They identified eligible comparison schools located in the same school district as the network school (if the network school was operated by a school district) or within the surrounding school district of the network school (if the network school was operated by a charter school management organization).

Analyses in this brief are based on students who entered Grade 9 in 2009–10, 2010–11, or 2011–12 and consented to participate in study data collection during spring 2013. At that time, most students were in Grades 10–12. Within each school pair, we sampled all consented students from network schools. In addition, we sampled all consented students from small comparison schools (all New York City schools were small) and from one large comparison school in which a small number of students consented to participate in the study. In the remaining large comparison schools, we subsampled consented students by selecting students based on propensity scores that were calculated based on students' Grade 8 demographic and test score data.

For this brief, we focus on a sample of 2,298 students in 23 schools who participated in the student survey and for whom we obtained demographic and prior achievement data. The exact number of students included in each analysis varies across survey measures, as students must have responded to at least half of the relevant survey questions to be included in analyses for each survey measure (see Table A.1). For the first research question, the number of students attending network schools ranged from 856 to 1,077 across survey measures, whereas the number of students attending comparison schools ranged from 982 to 1,216 across survey measures. For the second research question, the number of students and schools included differed for each student background characteristic, due to both the availability of the relevant background data and whether schools enrolled a sufficient number of students in particular subgroups (e.g., English language learners).

- ***Gender analysis:*** All participating schools had information on student gender, and the percentage of survey respondents who were female ranged from 39% to 75% across schools.

- ***Racial/ethnic analysis:*** In this brief, we compare Black students and Hispanic students to their White peers, including students identified as Asian or an "other" race with Whites for these analyses. Seven schools were omitted from the analyses of racial/ethnic gaps because fewer than 5% of survey respondents were identified as White, Asian, or "other." In the remaining schools, the percentage of students identified as Hispanic ranges from 19% to 88%, the percentage of students identified as Black ranges from 3% to 41%, and the percentage of respondents identified as White, Asian, or "other" ranges from 9% to 70%.
- ***English language learner (ELL) analysis:*** Two schools were excluded because no survey respondents at those schools were ELLs. In the remaining schools, the percentage of students identified as ELLs ranged from 4% to 89%.
- ***Prior achievement analysis:*** Four schools did not have information on Grade 8 English language arts (ELA) achievement because these schools largely serve recent immigrants who were not required to take the state exams. Across the remaining study schools, the percentage of students identified with a low level of prior achievement (i.e., a test score below the average score for students in the same state and of the same grade level in the sample) ranged from 17% to 69%.
- ***Eligibility for free or reduced-price lunch (FRPL) analysis:*** Only two districts (with 12 schools) provided information on FRPL eligibility; therefore, these analyses exclude 11 schools that do not have information on FRPL eligibility. The percentage of survey respondents identified as eligible for FRPL ranges from 33% to 87% across the schools with available data.

Table A.1. Sample Sizes for Subgroup Analyses

	Network schools		Comparison schools	
Subgroup analysis	**Number of schools**	**Number of students**	**Number of schools**	**Number of students**
Females (versus males)	13	856–1,077	10	982–1,216
Black students and Hispanic students (versus White students)	10	633–814	6	725–944
ELLs (versus native English-speakers)	12	797–982	9	936–1,142
Students with below-average prior achievement (versus students with above-average prior achievement)	11	757–958	8	860–1,092
Students eligible for FRPL (versus students not eligible for FRPL)	6	350–427	6	526–636

Note. ELL = English language learner; FRPL = free or reduced-price lunch. The number of students included in analyses varies across survey measures, as students must have responded to at least half of the relevant survey items to be included in the analysis.

Rasch Modeling

A preliminary round of analyses for this brief used scale scores that were calculated by taking a simple average of student responses to each item in the scale. However, following this approach, we found that IQR values were affected by missing data: The values of the 25th and 75th percentiles could differ based not only on the pattern of responses to survey items but also on whether students responded to all relevant survey items or only to a subset of survey items.[34] To avoid this data issue, we calculated Rasch scores for each survey scale among students who responded to at least half of the relevant survey items. Rasch scores were converted back to the original 1–4 scale for the results presented in this brief.

We calculated Rasch scores using a one-parameter partial credit model, estimated with the Winsteps program. We chose a one-parameter model because it is simple to interpret, and, given that we do not have evidence that some items within the scale are more important than others, it assumes that all items contribute equally to the Rasch scores. In addition, in contrast to the rating scale model,[35] the partial credit model does not require the item structures to be the same across all items. Rasch scores and item threshold parameters were generated separately for each survey measure.

To convert Rasch scores back to the original 1–4 scale, for each survey measure, we obtained the threshold estimates for each item. Because all the items have the same number of rating categories and thus the same number of threshold parameters, we were able to calculate the average threshold parameter for each category across all items within the measure, giving us an "average item" with the average threshold parameters for each scale.

Using the estimated Rasch scores and the threshold parameters for the average item, we were able to generate, for each student and for each scale, the probability of scoring at each rating scale level, based on the following formula:

$$\Pr\{X_{ni} = x, x > 0\} = \frac{\exp \sum_{k=1}^{x} (\beta_n - \tau_{ki})}{1 + \sum_{j=1}^{m_i} \exp \sum_{k=1}^{j} (\beta_n - \tau_{ki})};$$

$$\Pr\{X_{ni} = 0\} = \frac{1}{1 + \sum_{j=1}^{m_i} \exp \sum_{k=1}^{j} (\beta_n - \tau_{ki})}$$

In the formula, 0 represents the lowest level (a score of 1 in our study) and m_i represents the highest level (a score of 4 in our study). Beta represents the Rasch scores and tau represents the average item threshold estimates. Using the probabilities of scoring at each level for the average item, we then calculated the expected score for the survey measure by summing the products of each of the four probabilities. The expected score will be between 1 and 4 and is treated as if converted to the original 1–4 ordinal scale.

Methods

To address the first research question, we calculated the interquartile range (IQR) for each school and for each deeper learning opportunity measure. The IQR, which is a measure of within-school variation, is equal to the difference between the 75th percentile (i.e., the value at which only 25% of survey respondents in the school have a higher value) and the 25th percentile (i.e., the value at which only 25% of survey respondents in the school have a lower value) in the survey measure. A larger IQR value indicates more variation in students' responses to relevant survey questions in the school.[36] We compared the average IQR values for network and comparison schools, using *t*-tests to assess the statistical significance of the difference based on the sample of 23 schools. Due to the relatively small sample size for these analyses, we present findings that are significant at the 0.10 level.

To address the second research question, we estimated two-level hierarchical linear regression models to predict each of the nine measures of opportunities for deeper learning. Separate models were performed for network schools and comparison schools as well as for each of the following student background characteristics: gender, race/ethnicity, ELL status, level of prior ELA achievement, and FRPL eligibility. Student background characteristics were group-mean centered (i.e., centered within schools), allowing us to estimate the average within-school difference between student subgroups. We used results from these models to compare the number of opportunity measures in network and comparison schools for which we observed significant gaps. We acknowledge that, with nine opportunity measures and analyses performed for five different subgroups, a total of 45 estimates are summarized in this report, and we do not adjust for multiple comparisons. Rather than focus on the significance of individual estimates, our findings focus on the patterns of differences between groups and school types across measures, and they should be interpreted as descriptive in nature.

In addition, we conducted alternative analyses that tested whether the magnitude of within-school gaps in opportunity measures significantly differed by school type. These two-level models included both network and comparison schools, and they included group-mean-centered student background characteristics (i.e., subgroup indicators), a dichotomous indicator for whether the school was a deeper learning network school, and an interaction term between this network school indicator and the subgroup indicator. Results of these analyses are available upon request. Although the estimated gaps in opportunity measures are identical to the results presented in this brief, the significance test of the interaction term allowed us to estimate whether the magnitude of the within-school gap in the opportunity or competency measure significantly differed between network schools and comparison schools. We found that only three of the interaction terms we estimated achieved statistical significance. Therefore, although the conclusions in our brief highlight patterns of within-school gaps in opportunities for deeper learning, we found very few instances where the magnitude of a specific gap significantly differed between network schools and comparison schools.

Appendix B. Detailed Results of Subgroup Analyses

Table B.1. Within-School Gaps in Opportunities for Deeper Learning by School Type, Gender, Prior Achievement, Race/Ethnicity, English Language Learner Status, and Eligibility for Free or Reduced-Price Lunch

Subgroup comparison	School Type	Learning how to learn	Communication	Feedback	Collaboration	Assessments aligned with deeper learning	Creative thinking	Real-world connections	Complex problem-solving	Interdisciplinary learning
Females compared with males	Network	0.04	0.03	-0.02	0.04	-0.08*	-0.03	-0.05	-0.05	-0.07
	Comparison	-0.04	-0.10*	-0.12**	-0.01	-0.08*	-0.10*	-0.10*	-0.02	-0.13**
Students with below-average achievement compared with students with above-average achievement	Network	-0.06	-0.01	0.09	-0.07	0.03	0.00	0.01	-0.07	0.17**
	Comparison	-0.10*	-0.04	0.07	-0.15***	0.05	-0.03	0.01	-0.15***	0.09
Black students compared with White students	Network	-0.11*	0.08	0.00	-0.06	-0.08	-0.07	-0.04	-0.03	0.07
	Comparison	-0.19**	-0.11	-0.11	-0.19**	-0.06	-0.21*	-0.18*	-0.14*	0.06
Hispanic students compared with White students	Network	-0.13**	-0.07	-0.06	-0.09*	-0.03	-0.14*	-0.06	-0.17***	0.00
	Comparison	-0.13*	-0.18***	-0.04	-0.23***	-0.02	-0.14*	-0.13*	-0.18***	0.03
ELLs compared with native English speakers	Network	-0.06	-0.06	0.05	0.00	0.08	-0.04	0.03	-0.11*	0.13*
	Comparison	0.03	-0.02	0.09	0.01	0.10	0.14*	0.14*	-0.05	0.13*
Students eligible for FRPL compared with students not eligible for FRPL	Network	-0.01	0.04	0.04	0.08	0.12	-0.10	-0.10	0.07	0.01
	Comparison	0.03	0.05	0.00	0.01	-0.04	0.01	0.09	0.01	0.04

Source. Secondary analysis of data from the Study of Deeper Learning.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Endnote

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[19] While instruction focused on deeper learning may take many forms and may be present for at least some students in a variety of schools across the country, it is important to point out that the network schools included in this study provided a schoolwide focus on deeper learning. These schools were often small in size (with an annual average enrollment ranging from 200 to 700 students), avoided the use of tracking, and provided opportunities for students to revise their work to demonstrate mastery of core content. These network high schools also tended to have leadership structures and practices that supported the schoolwide implementation of instruction focused on deeper learning, creating a culture in which teachers were more likely to adopt student-centered instructional practices and express greater belief in their ability to address the needs of all students in the school (Huberman, M., Duffy, H., Mason, J., Zeiser, K., & O'Day, J. (2016). *School features and student opportunities for deeper learning: What makes a difference?* Washington, DC: American Institutes for Research). Schools (and sometimes networks) provided both formal and informal opportunities for adult learning and collaboration, including instructional rounds where teachers observe and provide feedback to one another, regular grade-level and content area team meetings, access to instructional coaching, and professional learning communities where teachers bring a problem of practice to the table for discussion among colleagues.

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[28] The 10 deeper learning networks included in the Study of Deeper Learning are Asia Society, Big Picture Learning, ConnectEd/Linked Learning, EdVisions Schools, Expeditionary Learning (now EL Education), High Tech High, Internationals Network for Public Schools, New Tech Network, Envision Schools, and New Visions for Public Schools.

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[30] This study examines disparities in high school experiences and deeper learning competencies for Black and Hispanic students due to historical inequities that students of color have faced. While other student groups, including Native Americans and Pacific Islanders, also face equity issues in the classroom, small sample sizes prevented us from examining responses for these students.

[31] The measure of opportunities for interdisciplinary instruction also is measured on a 1–4 scale, but for this measure, 1 represents *never* and 4 represents *all of the time*.

[32] In this brief, we describe the number of measures for which we found within-school gaps in opportunities for deeper learning for network and comparison schools. We also tested whether the magnitude of specific gaps (e.g., the gender gap in opportunities for creative thinking) significantly differed by school type. We found that the magnitude of subgroup gaps did not significantly differ by school type. Results of analyses by ELL status and FRPL eligibility, where we found few gaps in opportunities for deeper learning, can be found in Table B.1 in Appendix B. It is important to note that, while results suggest that patterns of within-school gaps in opportunities for deeper learning differ between network and comparison schools, this does not necessarily indicate that the focus on deeper learning itself caused students to experience more equitable opportunities.

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[34] For example, for a survey scale with six items, a student who responds with the maximum value of 4 for three of the items and with a value of 3 for three of the items would have an average scale score of 3.5. If another student responds to five of the six survey items, giving the maximum value of 4 to three of the survey items and a value of 3 to the remaining two items, the average scale score would be 3.6. If these students were clustered around the 25th or 75th percentile, the value of the IQR may be affected by the existence of missing data rather than responses to survey items.

[35] Partial credit models and rating scale models are the two types of one-parameter IRT models. The rating scale model is a special type of partial credit model wherein the threshold parameters are the same across items when overall item difficulty is partialed out.

[36] We also calculated within-school standard deviations to examine the within-school variation in deeper learning opportunities and competencies. In contrast to IQRs, standard deviations are more strongly influenced by extremely high or extremely low values of survey measures. Findings of the analyses of standard deviations, which largely resemble the findings using IQR values, are available upon request.

To learn more about AIR's research on Deeper Learning, contact Kristina Zeiser at kzeiser@air.org

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