REPORT 5 | FINDINGS FROM THE STUDY OF DEEPER LEARNING
Opportunities and Outcomes

School Features and Student Opportunities for Deeper Learning

What Makes a Difference?

OCTOBER 2016

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Abstract

The *Study of Deeper Learning: Opportunities and Outcomes*—funded by the William and Flora Hewlett Foundation—aimed to determine whether students attending high schools with a mature and at least moderately well-implemented approach to promoting *deeper learning* actually experienced different instructional strategies, greater deeper learning opportunities, and better outcomes than they would have had they not attended these schools. The main findings from this study, published in 2014, indicated that students in deeper learning network schools did in fact experience different instructional strategies, greater opportunities to engage in deeper learning activities, and more positive results on a range of outcomes (e.g., graduation rates, test scores) than did their matched counterparts in comparison sites (Huberman et al., 2014; Bitter et al., 2014; Zeiser et al., 2014).

This report, based on data from the same study, extends those main findings by investigating the potential facilitating role of certain school features in schools' ability to provide deeper learning opportunities for their students. We do this by examining the variation among the network schools on a set of school features that prior research has associated with higher results on traditional measures of student achievement. Specifically, we examine teachers' survey responses related to their *own beliefs about teaching*, their assessment of their *peers' professional culture*, and their assessment of the success of the principal in providing *instructional leadership and program coherence*. We then ask whether these features help to explain variation in students' reports of their opportunities to engage in deeper learning in their core classes.

Network schools varied with respect to beliefs about teaching, teachers' professional culture, and instructional leadership and coherence, as reported by teachers on surveys. In addition, teachers' reports of their own *student-centered beliefs about teaching* (i.e., giving students agency in their own learning) and their *self-efficacy for teaching* (i.e., believing in their capabilities as teachers) were the features most strongly and consistently related to greater student opportunities to engage in deeper learning. By contrast, teacher-centered beliefs about teaching were negatively related to student opportunities. Other features of the school environment were inconsistently related to particular opportunities, with observed positive relationships being driven in part by two unique schools in the sample.

Through interviews, school administrators, teachers, and network staff reported three school-level conditions that facilitated their ability to implement and sustain their approach to deeper learning: teacher collaboration and professional community, school leadership (including distributed models of leadership), and support from the network. The most commonly cited barriers to implementation and sustainability were staff burnout and turnover, lack of funding, and state and district policies related to teacher hiring practices and student assessments.

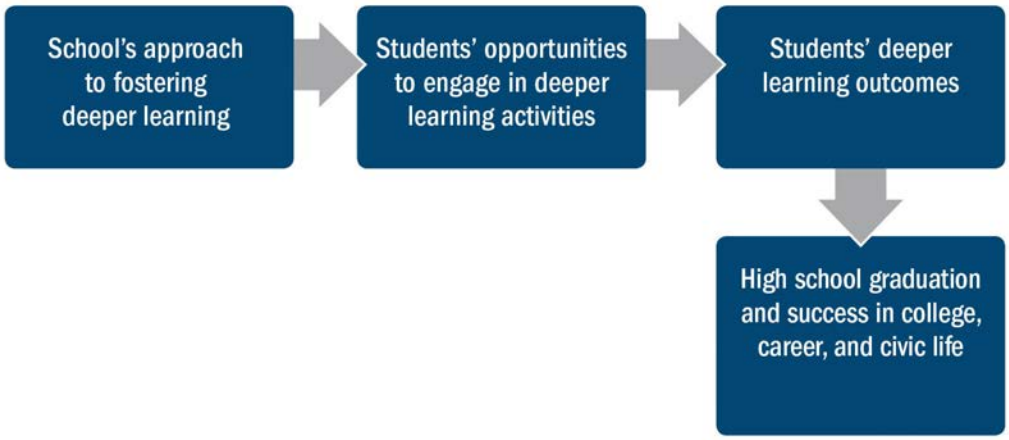
In general, conclusions from the analyses of survey data aligned with conclusions drawn from interview and site visit data. While teachers' own beliefs seemed to have the most consistent and strongest associations with the opportunities students reported experiencing in the classroom, the interview data suggested that other school features and external policies can influence teachers' beliefs about teaching and about their own teaching skills.

Introduction

The demand that schools—particularly high schools—better prepare their students to take on the challenges of college, career, and civic participation in the 21st century has intensified over the past decade. Higher standards that require students to take on more cognitively demanding tasks and apply their learning to new situations and problems is one manifestation of this trend. Equally important is the realization that such preparation includes more than academics. Other competencies deemed essential for success in a complex and rapidly changing world are *interpersonal* skills of communication and collaboration, as well as *intrapersonal* competencies, such as an ability to adapt to new situations and dispositions that foster perseverance and continued learning. This combination of cognitive, interpersonal, and intrapersonal competencies (National Research Council [NRC], 2012) encapsulates the broad learning goals of an increasing number of schools and school systems across the country. The term "deeper learning" has been used to refer both to this broad set of interacting student outcomes (William and Flora Hewlett Foundation, 2013) and to the learning process that produces them and fosters their application to new problems and situations (NRC, 2012).[1]

Underlying the call for schools to promote deeper learning is a set of connected assumptions about the role of schools in fostering that learning. The first of these assumptions is that educators can in fact design instructional approaches that more explicitly focus on deeper learning processes and outcomes than do the more traditional approaches found in most American schools. Second, as a result of these approaches, students will experience greater opportunity to engage in activities likely to foster deeper learning. And finally, through these opportunities, students in schools focused on deeper learning will develop transferable cognitive, interpersonal, and intrapersonal competencies that will translate into success in college, career, and civic life. Exhibit 1 below illustrates the relationships between these assumptions.

Exhibit 1. Assumptions Underlying Deeper Learning Initiative



[1] Consistent with a recent National Research Council report (NRC, 2012), we use "deeper learning" to refer to the process through which students learn these competencies in ways that allow their transfer to novel situations and problems. We use "deeper learning outcomes" or "deeper learning competencies" to refer to the results of this learning process. We also refer to "opportunities to engage in deeper learning" ("deeper learning opportunities," for short) and "deeper learning activities" to refer to specific aspects of the learning environment believed to foster deeper learning outcomes.

Study Overview

The *Study of Deeper Learning: Opportunities and Outcomes*, conducted by American Institutes for Research (AIR), set out to investigate these three assumptions by studying a group of 20 high schools (most of which were located in California and New York City) across 10 networks implementing varying approaches to foster deeper learning. The main findings from this study, published in 2014, indicated that students in mature deeper learning network schools did in fact experience different instructional strategies, report greater opportunities to engage in deeper learning activities, and demonstrate more positive results on a range of outcomes (e.g., graduation rates, test scores) than their matched counterparts in similar comparison sites (Huberman et al., 2014; Bitter et al., 2014; Zeiser et al., 2014).

This subsequent report, based on data from the same study, extends those main findings by investigating the potential facilitating role of three organizational features on schools' ability to provide deeper learning opportunities for their students. These features, which research has shown to be positively associated with more traditional measures of student achievement, are teachers' *own beliefs about teaching*, teachers' assessment of their *peers' professional culture*, and teachers' assessment of *their principal's instructional leadership* and ability to create programmatic coherence in the school.[2] Our first step in this analysis was to establish that schools in our sample differed with respect to the presence of the identified features. We did so by analyzing teachers' survey responses about their own beliefs and about the leadership and professional culture in their schools.[3] We then examined whether the variation we found in these features among the network schools—all of which shared a commitment to fostering deeper learning—helped to explain the variation in students' survey responses about their opportunities to engage in deeper learning activities.

As depicted in Exhibit 2, our underlying hypothesis was that these school features would moderate the relationship between a school's commitment/approach to fostering deeper learning and the actual opportunities experienced and reported by the students. To explore additional conditions that might facilitate or hinder schools' efforts, we also asked school personnel in site visit interviews about the factors that supported or challenged the implementation of their approach to deeper learning.

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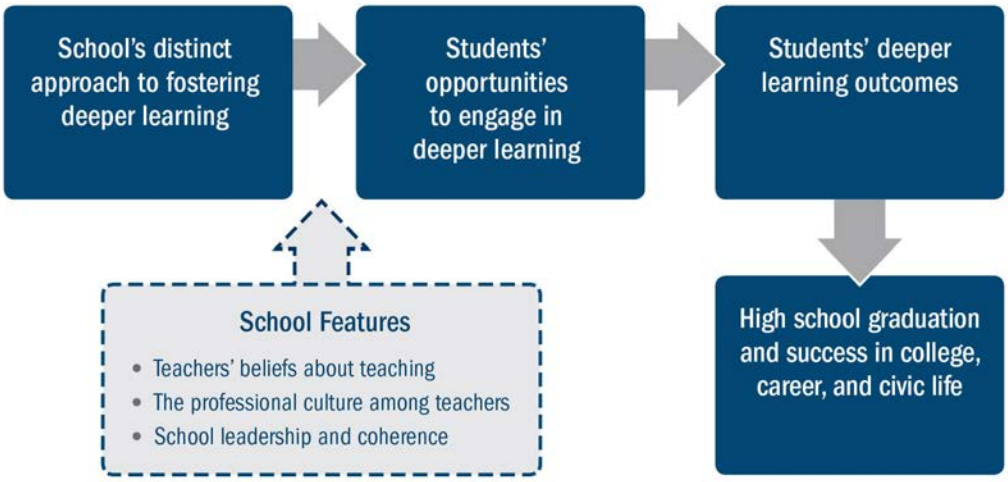
[2] See the Relevant Research section for references.

[3] We examined both the variation between network and non-network schools and the variation among the network schools themselves.

Exhibit 2. Hypothesized Influence of School Features on Student Opportunities



The Concept of Deeper Learning

Deeper learning as a goal for students has been an evolving concept, the dimensions of which are labeled and described in varying ways. Based on extensive interviews with experts in the field and a review of the relevant literature, the William and Flora Hewlett Foundation identified six dimensions of deeper learning, which have collectively become the focus of a national initiative to promote deeper learning in schools (William and Flora Hewlett Foundation, 2013; Chow, 2010; Trilling, 2010). These dimensions are:

- Mastery of core academic content
- Ability to think critically and solve problems
- Ability to communicate effectively in multiple contexts
- Ability to work collaboratively and in teams
- Ability to learn how to learn (i.e., ability to monitor and direct one's own learning) when presented with novel challenges
- Ability to demonstrate an academic mindset (i.e., have positive attitudes and beliefs about oneself as a learner)

Taking a slightly different approach, a review of theory and research across an array of disciplines led a National Research Council panel (NRC, 2012) to define deeper learning as "the process through which an individual becomes capable of taking what was learned in one situation and applying it to new situations (i.e., transfer)." The panel distinguished this process of transfer from the specific "21st century competencies" that the process of transfer produces. The NRC grouped these competencies into three domains: the cognitive domain, the interpersonal domain, and the intrapersonal domain. These domains integrate well with the six dimensions identified by the Hewlett Foundation, providing a compatible framework for the purposes of both research and practice.

Exhibit 3. Competencies Associated With Deeper Learning (Hewlett Foundation and NRC Frameworks)

Cognitive Domain	Mastery of core academic content Ability to think critically and solve problems
Interpersonal Domain	Ability to communicate effectively Ability to work collaboratively
Intrapersonal Domain	Ability to learn how to learn Ability to demonstrate an academic mindset

School Approaches to Fostering Deeper Learning

In *The Shape of Deeper Learning* (Huberman et al., 2014), we described the strategies that our study's network schools were implementing to foster deeper learning across the three domains identified by the NRC. Through analysis of qualitative data from phone interviews and site visits, five broad instructionally based strategies emerged as both (1) shared by the group of network schools and (2) more prevalent in network schools than in the comparison sites. We thus identified these as strategies that helped to distinguish the deeper learning network schools from their more typical comparison high schools.

- **Project-based learning** to provide longer term, in-depth learning
- **Internship opportunities** to provide connections to the real world
- **Collaborative group work** to develop collaboration and communication skills
- **Longer term assessments**, such as portfolios and exhibitions, to develop communication skills, among others
- **Explicit intrapersonal competency development** through teaching students skills (such as persistence, self-motivation, and self-advocacy) that encompass "academic mindsets" and "learning-to-learn"

Each of the above strategies might be considered integral to the "instructional core" (Cohen & Ball, 1999)—the ways that teachers and students interact around instructional content. In addition to these *instructional* elements, however, we identified two *structural* strategies that most of the network schools used as part of their approach to facilitate deeper learning. These were:

- **Advisory classes** to respond to students' individual learning needs and develop their interpersonal and intrapersonal competencies
- **Alternative scheduling** to create opportunities for project-based learning and internships

As noted above, we found that these seven strategies existed to a larger degree in the network schools than in the matched group of comparison schools. We hypothesized that these explicit strategies to promote deeper learning contributed to the observed differences between the network and comparison sites in the opportunities they provided for students to engage in deeper learning activities (Bitter et al., 2014).

Focus of This Report: The Role of School Features

To build on our previous work, we asked whether other differences among the schools in our sample (besides the strategies and structures above) might also help to explain variation in students' opportunities.[4] What school features might influence the ability of the school to carry out its instructional approach and to provide opportunities to students? Examples might be the quality of leadership in the school or the strength of the professional community. Indeed, decades of research on effective or successful schools have identified some consistent school features associated with greater success. More specifically, might they help to explain differences among the network schools in their ability to implement their own approaches to deeper learning?

Three research questions guided our investigation:

1. Do network schools differ in the degree to which they exhibit features of "effective schools" compared to non-network schools? Is there variation in the school features within the sample of network schools?
2. What, if any, school organizational features in the network sites are associated with greater student opportunities to engage in deeper learning?
3. What did network school personnel report as facilitating or hindering their ability to implement and sustain their schools' approaches to deeper learning?

In the remainder of the report, we provide an overview of relevant research and our study design. We then present the findings from our analysis of the relationships between school features and student opportunities for deeper learning, and conclude with a discussion of the facilitators and barriers that interview respondents reported as helping or hindering the implementation and sustainability of deeper learning.

Relevant Research

While there is a dearth of research connecting specific school features to deeper learning opportunities or outcomes, research on school effectiveness using more traditional measures of student learning has consistently pointed to a small set of school features that appear to facilitate student success, particularly in relatively high-poverty schools. We focused the analyses reported here on three conceptually and empirically based groupings of those features derived from prior research: teachers' beliefs about teaching, teachers' professional culture, and leadership and coherence. Our assumption was that if these features supported effective teaching and learning in more traditional settings, they might also do so in schools whose sights were trained on more ambitious instruction. We briefly review the research on the school features included in our analysis.

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[4] Because all of the deeper learning network schools in our sample were relatively small in size, and this report focuses on differences among network schools, we were not able to examine relationships between opportunities and school size in this paper. However, since the schools in the deeper learning networks tend—by design—to be smaller than typical comprehensive high schools, we were able to consider whether school size was related to observed differences in student opportunities between network and non-network schools. We did this by comparing differences in opportunities for deeper learning between students in network and non-network schools in California (where network schools had an average enrollment of 379 students and non-network schools had an average enrollment of 2,029 students) and in New York (where network and non-network schools were similarly small). Because the effects of attending a deeper learning network school on student opportunities were similar in New York and California, we concluded that school size was not a determining factor in explaining differences in students' opportunities for deeper learning between network and non-network schools.

Teachers' Beliefs About Teaching

Our teacher survey asked respondents to answer a series of questions concerning their own beliefs about teaching in order to tap into three broad constructs that have emerged in the literature as potentially associated with student learning: *student-centered beliefs about teaching*, *teacher-centered beliefs about teaching*, and *teacher self-efficacy*. With regard to student-centered beliefs about teaching, Cornelius-White's (2007) meta-analysis of the research showed a positive association between student-centered beliefs and student outcomes. Similarly, Staub and Stern (2002) found that German teachers' beliefs about their teaching practice or subject matter impacted their instructional practice; students of teachers with a "cognitive constructivist" perspective (i.e., more student centered), as opposed to a "direct transmission" view of teaching (i.e., more teacher directed), had higher math achievement.

Teacher self-efficacy has been connected with positive student outcomes, presumably through its effect on classroom instructional practices and increased job satisfaction. For example, researchers have found that increased self-efficacy can lead to improved instructional practice, improved teacher well-being, and stronger engagement in the classroom, which improves outcomes for students (for a review of relevant research, see Rutkowski et al., 2013). In addition, Klassen and Chiu (2010) found that increased self-efficacy was positively associated with higher job satisfaction among a sample of 1,430 Canadian teachers.

Teachers' Professional Culture

In this study, our measure of teachers' assessment of their peers' professional culture includes two constructs from the literature on effective schools: *collective responsibility* among teachers, and the development of strong *teacher professional community*. In their seminal work on collective responsibility, Lee and Smith (1996) found that teacher collective responsibility, defined as teachers taking responsibility for all students' success rather than placing the burden of success solely on students, was associated with improved student achievement. Increased collective responsibility was also associated with decreased achievement gaps between students of differing socioeconomic status levels. Teachers' expectations for students also have an effect on student achievement (for a review of recent research, see Jussim and Harber, 2005). For example, Hinnant, O'Brien, and Ghazarian (2009) found that teacher expectations were associated with student characteristics like gender or social skills, and these expectations impacted student achievement, particularly for students who were marginalized in the classroom early in their educational experience.

Other research has demonstrated that collective responsibility is positively associated with teacher behaviors and attitudes that improve student outcomes. For instance, Whalan (2012) found that collective responsibility was positively associated with program coherence, teacher buy-in to shared goals, and relational trust—characteristics that improve student outcomes. Qian, Youngs, and Frank (2013) found that collective responsibility for student learning increased the frequency

of interactions between senior and novice teachers in 11 schools in the Midwest. Similarly, new teachers in an "integrated professional culture," characterized by collective responsibility for student success, experienced strong support from leadership and professional collaboration, both of which are tied to increased student success (Kardos, Johnson, Peske, Kauffman, & Liu, 2007). These researchers' conceptions of collective responsibility differ somewhat from those of Lee and Smith; they see collective responsibility as a commitment on the part of teachers and staff as a professional community to collaboratively promote student success.

Strong teacher learning communities also appear to positively impact student achievement and success by improving teacher instructional practices and student experiences (e.g., McLaughlin & Talbert, 2006). Research has shown that professional learning communities influence teaching practice by increasing student-centered teaching, teacher collaboration, and continuing education. This improved teaching practice has led to increased student achievement in several studies, as measured by proficiency on standardized tests (for a review of this research, see Vescio, Ross, and Adams, 2008). Critical to the development of strong professional communities and resulting continuous improvement in schools is relational trust, which is developed when social interactions in schools are based on a common understanding of role relationships between different stakeholders (e.g., teacher–teacher or teacher–leader) and consistent enactment of expected roles (Bryk, Sebring, Allensworth, Luppescu, & Easton, 2010; Bryk & Schneider, 2002).

Leadership and Coherence

School leadership plays a critical role in school effectiveness and student success. Many scholars have found connections between coherent and effective leadership and increased student performance (Bryk et al., 2010; Hallinger, 2003). Goddard et al. (2015) found that when school leadership supported a collaborative teaching culture, instructional behaviors and teacher beliefs that support student achievement (e.g., teacher collaboration, self-efficacy) were increased, suggesting that there is also an indirect relationship between leadership and achievement. Research also suggests that school effectiveness is improved when school leaders communicate with staff to present a clear vision and goals, coach teachers, engage in data-driven decision making, and encourage input from teachers, students, and the community (Herman et al., 2008). In addition, distributed leadership, where the responsibility of leadership is assumed by multiple stakeholders in a school and leadership practice is developed through interactions among those different stakeholders, has been shown to improve academic outcomes (Heck & Hallinger, 2009; Spillane, 2006). Strong leadership is often accompanied by strong program coherence, which includes coherence and coordination in not only curriculum but also in teaching, assessment, and school climate (Newmann et al., 2001).

The literature on effective schools demonstrates the importance of the school features discussed above for student success. However, although researchers have found promising connections between enrollment in deeper learning schools and student outcomes (e.g., Collins, Davis-Molin,

& Conley, 2012; Guha et al., 2014; Nichols-Barrer & Haimson, 2013; Zeiser et al., 2014), there is little research on the relationships between specific school features and opportunities for deeper learning. The present study begins to fill this gap by investigating potential relationships between (1) the three broad categories of school features (teacher beliefs, teachers' professional culture, and leadership and coherence) and (2) opportunities for students to engage in deeper learning within a sample of network schools that have a distinct commitment and approach to fostering deeper learning.

Study Design

School Sample

Our sample included 20 network schools, drawn from 10 networks, including three from each of the High Tech High and EL Education networks, one from each of the EdVisions and Asia Society networks, and two schools from each of the remaining six networks (see Exhibit 4 for a full list of the networks). Ten of the schools were located in California, seven were in New York, and the remaining three were located in Massachusetts, Maine, and Minnesota. All 20 schools were non-selective;[5] seven were charter schools and 13 were regular district-managed public high schools.

The sample also included 12 non-network comparison schools, which were all regular, non-charter, public schools operating in the same district or locale as their paired network site.[6] We chose the non-network schools using criteria for demographics, years in operation, and admissions policies that were similar to those used to select network schools. The network and non-network schools were comparable with respect to poverty, race, and the percentage of English language learners. However, the network schools tended to be smaller, on average, than the non-network schools because comparable, smaller comparison schools did not exist in some districts. While the comparison schools shared the general goal of preparing students for college and career, they did not necessarily emphasize the development of interpersonal and intrapersonal competencies.

Exhibit 4. Networks Participating in the Study of Deeper Learning: Opportunities and Outcomes

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

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

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

EdVisions Schools – http://www.edvisions.com/

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

EL Education – http://eleducation.org/

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

Internationals Network for Public Schools – http://internationalsnps.org/

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

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

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[5] Non-selective here means that schools did not admit students based on high test scores or other measures of high performance. One school network (Internationals Network for Public Schools), however, did limit applicants to recent immigrants who had been in the United States four years or less at the time of admission and who scored in the bottom quartile on English language proficiency tests upon entering high school.

[6] We intended to recruit a non-network school for each network school, but in eight cases we were unable to locate a comparison school that fit our criteria and was willing to participate.

Data Sources

To address research questions 1 and 2, we used data from teacher and student surveys that were administered during the 2012–13 academic year. In this report, we use six measures of school features based on survey responses from core academic subject teachers in the network and non-network schools. The school features include three measures of teachers' own beliefs about teaching—*student-centered beliefs about teaching*, *teacher self-efficacy for teaching*, and *teacher-centered beliefs about teaching;* two measures of teachers' perceptions of the professional culture in the school—*teachers' collective responsibility and expectations* and *teacher professional community;* and one measure of *school leadership and program coherence*. (For a definition of these features, see Exhibit 5, and for an explanation of the survey measures, see the next section, Analytic Approach.[7])

[7] The teacher survey included other school features, such as parent involvement and postsecondary transition preparation, but these survey constructs were more related to school type (e.g., parent involvement was related to charter status) than to students' opportunities to engage in deeper learning activities.

Exhibit 5. School Features: Survey Categories and Constructs

Teachers' Own Beliefs About Teaching (three constructs analyzed separately)

1. **Student-Centered Beliefs About Teaching:** The degree to which teachers believe that instruction should focus on higher order thinking skills and allow opportunities for student-directed learning.
2. **Teacher Self-Efficacy for Teaching:** The degree to which teachers view themselves as capable of meeting the demands of teaching.
3. **Teacher-Centered Beliefs About Teaching:** The degree to which teachers believe that instruction should be teacher directed, with the teacher choosing classroom activities and topics and demonstrating the correct way to solve a problem.

Professional Culture

4. **Teachers' Collective Responsibility and Expectations** (an average of scores on four constructs)
   - Academic press: The degree to which teachers have high expectations and standards for student work and effort.
   - Instructional improvement culture: The degree to which teachers are committed to instructional improvement efforts, including having a clear instructional vision and reviewing student performance data to improve instruction.
   - Collective responsibility for student learning: The degree to which teachers share a commitment to improving the school, including helping to maintain discipline in the whole school and feeling responsible for all students' learning.
   - Commitment to every individual student: The degree to which teachers share a commitment to every individual student's learning, including adjusting instruction to meet the needs of each student and providing extra assistance to any student who needs it.
5. **Teacher Professional Community** (an average of scores on three constructs)
   - Teacher collaboration: The frequency with which teachers work together to plan instruction and engage in conversations and practices to improve instruction.
   - Relational trust: The degree to which teachers express mutual respect for each other, for those who lead school improvement efforts, and for those who are experts at their craft.
   - High-quality professional development: The degree to which teachers have access to professional development (PD) opportunities that are aligned with characteristics of effective PD.

School Leadership

6. **Leadership and Coherence** (an average of scores on three constructs)
   - Instructional leadership: The degree to which teachers perceive their principal as an instructional leader with respect to the teaching and learning standards, communication of a clear vision for the school, and tracking of academic progress.
   - Program coherence: The degree to which teachers perceive school programs as being coordinated with each other and with the school's mission.
   - Focus on student learning: The degree to which teachers perceive school-level decisions and policies as being made based on the impact they have on student learning.

Students' opportunities to engage in deeper learning were measured using survey responses from a sample of 11th- and 12th-grade students in network and non-network schools.[8] The student opportunities to engage in deeper learning activities include cognitive, interpersonal, intrapersonal, and assessment opportunities. (For a definition of these opportunities, see Exhibit 6, and for an explanation of the survey measures, see the next section, Analytic Approach.)

Exhibit 6. Student Opportunities for Deeper Learning Activities: Survey Categories and Constructs

1. **Cognitive Opportunities** (an average of scores on four constructs)
   - 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.
   - Opportunities for creative thinking: The extent to which students have the opportunity 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: The degree to which students engage in interdisciplinary learning, where two or more disciplines are combined to enhance inquiry and knowledge generation.
   - Opportunities for real-world connections: The degree to which students engage in instructional activities that emphasize real-world connections.
2. **Interpersonal Opportunities** (an average of scores on two constructs)
   - Opportunities to collaborate: The degree to which students collaborate on assignments, provide feedback on each other's work, and collaborate in other ways.
   - Opportunities to communicate: The extent to which students have the opportunity to practice written and oral communication skills.
3. **Intrapersonal Opportunities** (one construct)
   - Opportunities to learn how to learn: The degree to which students practice monitoring and directing their own work and learning.
4. **Assessment Opportunities** (an average of scores on two constructs)
   - Assessments aligned with deeper learning: The extent to which students engage in various forms of assessment, including assessments of problem solving, communication, and collaboration.
   - Opportunities to receive feedback: The degree to which students receive written and oral feedback on their work from teachers, peers, or others.

To address research question 3, we used qualitative data from site visits and interviews with school personnel and network leaders. Specific interview questions from the school site visits addressed personnel's perceptions of internal and external conditions that facilitated or hindered the implementation and sustainability of their schools' approaches to deeper learning.

[8] For more information about our survey methodology, see Bitter et al. (2014).

Analytic Approach

Survey Analysis: To address research questions 1 and 2, we used data from 12 network schools that provided both teacher and student survey data for which we were able to match similar non-network schools.[9] Teachers responded to survey items about school features, and we used Rasch modeling to create scales to measure the 13 constructs shown in Exhibit 5. Within the same sample of schools, students responded to items about opportunities to engage in deeper learning, and Rasch modeling was again used to create scales to measure the nine constructs shown in Exhibit 6. For the purpose of this analysis, we standardized scales across all schools that participated in data collection so differences could be understood in terms of standard deviations.[10]

To reduce the number of relationships that we examined for this analysis, we grouped the school features in Exhibit 5 into categories based on their conceptual and empirical relationships. We placed the survey constructs into categories by first determining which features were connected conceptually, and then confirming these connections through factor analysis. We then averaged the values of the three to four individual constructs within each of the categories for an overall score on that category of school features. For example, *teacher professional community* for a given teacher is actually the average of three conceptually and empirically related constructs: teacher collaboration, relational trust, and high-quality professional development. The three "teacher belief" constructs (student-centered beliefs about teaching, teacher self-efficacy for teaching, and teacher-centered beliefs about teaching) were related conceptually but not empirically to each other, so we analyzed these constructs individually. Using teacher-level data, we examined differences in school features between network and non-network schools by performing regression models within each matched pair of schools. Differences were then averaged across the matched pairs of schools. To examine relationships between school features and students' opportunities for deeper learning, these six school features measures were aggregated to the school level.

We used a similar procedure to group the opportunity constructs in the student survey, resulting in the categories presented in Exhibit 6. Measures of these opportunities included the degree to which students reported engaging in complex problem solving, creative thinking, interdisciplinary learning, and real-world connection tasks in their core content classes (opportunities for deeper learning in the cognitive domain), the degree to which students engaged in various forms of communication and collaboration activities with their peers and others (opportunities for developing interpersonal skills), and the degree to which students had the opportunity to direct their own learning (opportunities for developing intrapersonal competencies). For brevity, we labeled these as cognitive, interpersonal, and intrapersonal opportunities. We also considered the degree to which students reported engaging in assessment practices that require longer term, more integrated, and complex demonstrations

[9] Five of the 12 network schools were charter schools.

[10] The student survey scales were standardized across the 1,702 students attending 24 schools that completed the student survey; the teacher survey scales were standardized across the 609 teachers at 31 schools that completed the teacher survey.

of knowledge and skills, as well as feedback on their knowledge and skills in these three domains (assessment opportunities). Assessments that meet these criteria both reinforce messages about the learning goals and allow teachers and students to adjust the learning situation to achieve those goals.[11] Student-level opportunities within these categories were aggregated to the school level.

To examine the relationships between school features and student opportunities for deeper learning, we first examined the correlations between each of the six school feature categories and each of the four student opportunity categories, for a total of 24 correlations across the 12 network schools for which we had both teacher and student survey data. For example, we looked at the degree to which the leadership and coherence measure was correlated with the four opportunity categories: cognitive, interpersonal, intrapersonal, and assessment opportunities. To ensure that differences in demographics and governance among network schools did not affect the results, we examined whether the school features and student opportunity constructs were correlated with school size, the percentage of students who qualified for free and reduced-price lunch, and charter status. We found that these measures of school demographics and governance were not strongly associated with school features or student opportunities.

In addition to examining the individual relationships between the school features and student opportunities, we explore how the combinations of features and opportunities were clustered within schools. For example, did some schools distinguish themselves with relatively higher levels in most or all of the features *and* similarly produce higher reported opportunities for students? Did higher levels of certain school features seem to occur together? We tried several methods for exploring how the 12 schools clustered together based on their reported features and opportunities. These included simply counting the number of school feature categories in which individual schools had relatively high scores (e.g., one school might be at least 0.5 standard deviations above the mean score on three of the school features constructs while another school might not be above the mean on any). We also used various data displays and pattern matching to reveal clustering among specific features (e.g., collective responsibility and teacher professional community) as well as the presence of higher levels of particular student opportunities in these schools. Our goal was to understand whether particular *combinations of features* seemed to influence the relationships between those features and student opportunities. In the end, we decided to categorize the schools into high, medium/high, medium/low, and low categories based on their school feature and student opportunity scores separately, counted the number of schools in each category, and then looked across the two sets of categories to identify combined school feature/student opportunity classifications.

[11] For a discussion of the importance of assessment to the learning environment, see Bransford et al. (1999).

Qualitative Data Analysis: To supplement the findings from the survey analyses, we provide excerpts from interviews with teachers, school leaders, and students to illustrate how these practitioners and students perceived school features. Research question 3 focuses on school personnel's *perceptions* about the conditions inside and outside the school that support or hinder their ability to implement and sustain their approach to—and thus students' opportunities to engage in—deeper learning. To address this question, we relied on qualitative data. As described in *The Shape of Deeper Learning* (Huberman et al., 2014), we developed case reports for 19 of the 20 network schools to capture the main findings from each site visit.[12] To address the third research question, we used these case reports to identify facilitators and barriers by analyzing and summarizing relevant report sections (e.g., leadership, teacher collaboration, sustainability) that explicitly referenced facilitators and barriers across schools. We drew on qualitative findings from the full set of 19 network schools for this analysis. In addition, when reporting qualitative findings within or across network schools, we provide examples that illustrate a pattern of responses at a given network school based on the perceptions of multiple respondents. For more details about our qualitative methods, see the technical appendix from the previous report.

Given our small sample of schools, these analyses are necessarily exploratory in nature. Nevertheless, our findings shed light on the relationships between school-level features and students' opportunities for deeper learning in these schools for which we have data, as well as features that practitioners reported as helping or hindering the implementation and sustainability of deeper learning.

[12] We included 20 network schools in our sample, but we were not able to collect complete data from one school due to a lack of responsiveness from school staff.

School Features and Deeper Learning Opportunities

The primary purpose of this report is to explore the relationships between the school features discussed above and the deeper learning opportunities afforded to students in the sampled high schools. We sought to determine whether variations in our measures of students' opportunities were systematically related to variations in our measures of teacher beliefs, professional culture, and leadership in the schools in which those students were enrolled.

Variation in School Features

To address this central purpose, we first had to establish that the schools did in fact differ in the school features of interest (research question 1).

- **Overall, teachers in network schools had statistically significantly higher averages on all of the teacher survey measures related to respondents' own beliefs about teaching (apart from the teacher-centered beliefs about teaching measure, which was significantly lower), respondents' assessment of the professional culture in the school, and respondents' assessment of the leadership and coherence in the school than teachers in matched comparison schools.**

There were a few non-network schools that scored above the lowest-scoring network schools on one or more measures. These non-network schools tended to be among the smaller comparison sites, and had implemented some of the same deeper learning strategies observed in the network schools, such as project-based learning, internships, and advisories. On average, however, the network schools outscored the non-network comparison sites on all of the school features[13]—as they had done on students' reports of their opportunities to engage in deeper learning activities (Bitter et al., 2014). Because these systematic differences between the network and non-network schools could confound the relationships between school features and deeper learning opportunities (i.e., non-network schools tend to have below-average scores on both school features and opportunities for deeper learning, which would artificially strengthen observed relationships), we decided to concentrate our attention in the remaining analyses on the schools that we knew shared a commitment to and explicit strategies for promoting deeper learning—in other words, the network schools in our sample. Here again we found sufficient variation to warrant further study.

- **Network schools differed substantially from each other with respect to school features.**

Across the six school features, school averages ranged from a low score of -0.7 standard deviations (SD) below average to a high score of 1.4 SD above average.[14] For example, the range of school averages for *leadership and coherence* was -0.6 to 1.2 SD. To look at the distribution of schools across school features, we grouped schools based on their average values: high (above 0.5 SD),

[13] Teachers in network schools reported significantly lower levels of teacher-centered beliefs about teaching than teachers in non-network schools.

[14] The average was calculated using the full sample of 31 network and non-network schools.

medium/high (between average and 0.5 SD), medium/low (between -0.5 SD and average), and low (below -0.5 SD). The number of schools that were classified as high ranged from 0 (teacher-centered beliefs) to 5 (leadership and coherence). The number of schools that were classified as medium/high ranged from 2 (leadership and coherence) to 6 (student-centered beliefs), while the number of schools classified as medium/low ranged from 2 (student-centered beliefs) to 5 (teacher self-efficacy for teaching and teacher professional community). The number of schools classified as low ranged from 0 (teacher self-efficacy for teaching, collective responsibility/expectations, and teacher professional community) to 5 (teacher-centered beliefs about teaching). Detailed counts for each school feature are provided in Exhibit 7.

Exhibit 7. Variation Across School Features Within Network School Sample, by Number of Schools

School feature score	Student-centered beliefs	Teacher self-efficacy for teaching	Teacher-centered beliefs	Teachers' collective responsibility/ expectations	Teacher professional community	Leadership and coherence
High (≥ 0.5 SD)	3 schools	2 schools	0 schools	3 schools	3 schools	5 schools
Medium/High (0 to 0.5 SD)	6 schools	5 schools	4 schools	5 schools	4 schools	2 schools
Medium/Low (-0.5 to 0 SD)	2 schools	5 schools	3 schools	4 schools	5 schools	4 schools
Low (≤ -0.5 SD)	1 school	0 schools	5 schools	0 schools	0 schools	1 school

Note: The average was calculated using the full sample of 31 network and non-network schools, but only the 12 network schools that were matched to non-network schools and had teacher and student survey data are shown in the exhibit.

Because two schools (from the same network) had consistently higher school feature averages (0.5 SD or higher above the mean) across almost all measures, we ran correlational analyses with and without these "outlier" schools to determine the degree to which they affected the results.

Relationships Between School Features and Student Opportunities

Our second research question asks which, if any, school features in the network sites are associated with greater student opportunities to engage in deeper learning activities. We addressed this question first by analyzing the relationships between individual school features and student opportunities. Two main findings emerged from these analyses:

- **Across the network schools, student-centered beliefs about teaching and teachers' self-efficacy for teaching were the features most strongly and consistently related to greater student opportunities to engage in deeper learning. By contrast, teacher-centered beliefs about teaching were negatively related to student opportunities.**
- **Other school features were inconsistently related to particular opportunities, with the relationships being driven in part by two outlier schools.**

Exhibit 8 shows the 24 correlations across the six school features and four student opportunity categories. As noted above, we estimated the correlations both with and without two outlier schools. The 11 shaded cells indicate the correlations that are above 0.2 both with and without the outlier schools. *Student-centered beliefs about teaching* and *teachers' self-efficacy for teaching* were the features most strongly and consistently related to greater student opportunities to engage in deeper learning, across all four categories of opportunities. Because student-centered beliefs and teacher-centered beliefs about teaching represent two contrasting views of teaching, while student-centered beliefs are positively related to student opportunities, teacher-centered beliefs are negatively related to students' deeper learning opportunities. Most of the remaining nine cells that are not shaded have correlations above 0.2 with the outlier schools included but below 0.2 (and in some cases negative) without them. Other than student-centered beliefs and teacher self-efficacy for teaching, none of the other features demonstrated correlations above 0.2 for more than two of the four opportunity categories without the influence of the outlier schools.

Exhibit 8. Correlations Between School Features and Student Opportunities for Deeper Learning, With and Without Two Outlier Schools

	Student-centered beliefs	Teacher self-efficacy for teaching	Teacher-centered beliefs	Teachers' collective responsibility/ expectations	Teacher professional community	Leadership and coherence
Cognitive opportunities	0.74 (0.57)	0.64 (0.49)	-0.25 (-0.34)	0.60 (-0.20)	0.64 (-0.05)	0.56 (-0.25)
Interpersonal opportunities	0.75 (0.57)	0.70 (0.59)	-0.27 (-0.33)	0.65 (0.11)	0.54 (-0.16)	0.70 (0.31)
Intrapersonal opportunities	0.68 (0.24)	0.58 (0.35)	-0.06 (-0.04)	0.75 (0.31)	0.78 (0.37)	0.70 (0.12)
Assessment opportunities	0.76 (0.73)	0.64 (0.52)	-0.20 (-0.11)	0.65 (-0.03)	0.64 (0.03)	0.67 (0.18)

Note: The correlations in parentheses exclude the two outlier schools that had consistently higher averages across school feature measures (with the exception of teacher-centered beliefs); the other correlations include all schools. The 11 shaded cells indicate the correlations that are above 0.2 both with and without the outlier schools.

Specific Findings Related to Beliefs About Teaching

The analysis included three constructs capturing teachers' beliefs about teaching that we analyzed separately because they were not related to each other empirically: student-centered beliefs about teaching, teacher self-efficacy for teaching, and teacher-centered beliefs about teaching. In this section, we discuss each construct separately.

Student-Centered Beliefs About Teaching

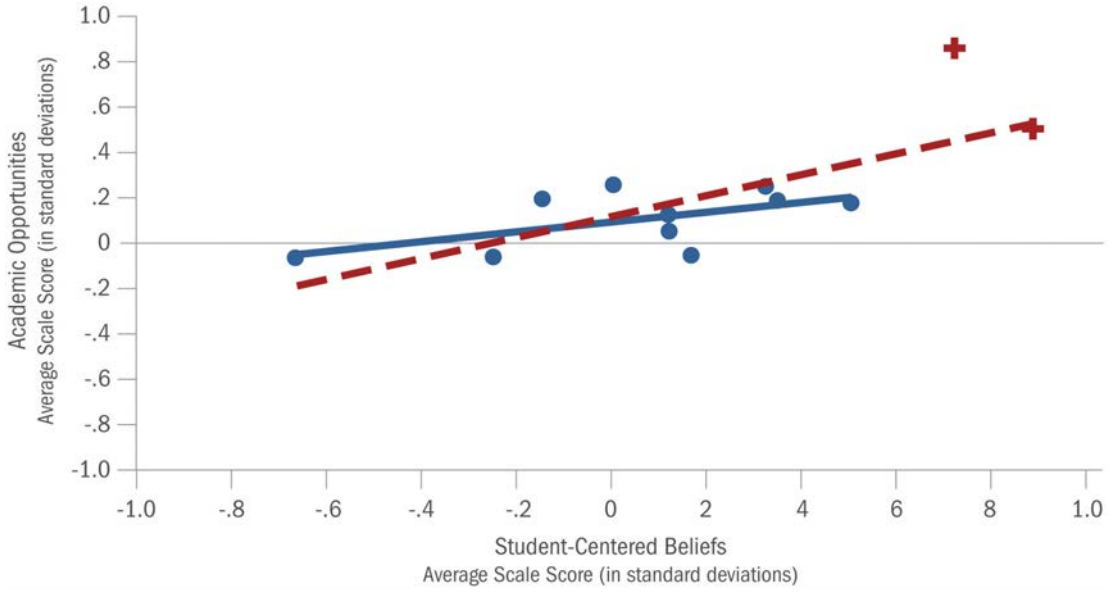
To measure the construct *student-centered beliefs about teaching*, we asked teachers to identify the degree to which they agreed or disagreed with the following statements:[15]

[15] These items are from the OECD, Teaching and Learning International Survey, 2008.

- My role as a teacher is to facilitate students' own inquiry
- Students learn best by finding solutions to problems on their own
- Students should be allowed to think of solutions to practical problems themselves before the teacher shows them how they are solved
- Thinking and reasoning processes are more important than specific curriculum content

In this group of network schools, our measure of student-centered beliefs about teaching was strongly and positively correlated (between 0.68 and 0.76) to students' cognitive, interpersonal, intrapersonal, and assessment opportunities, as shown in Exhibit 8. Even when we removed the two outlier schools from the analysis, the correlations remained between 0.57 and 0.73 for three of the four categories of opportunities (the correlation with intrapersonal opportunities was 0.24 without the outlier schools included). To illustrate one of these associations, Exhibit 9 plots the relationship between student-centered beliefs and cognitive opportunities for deeper learning activities; the graph uses two regression lines to indicate the magnitude of the positive correlation with and without the two outlier schools.

Exhibit 9. Relationship Between Student-Centered Beliefs About Teaching and Cognitive Opportunities for Deeper Learning Among Network Schools, With and Without Two Outlier Schools



Note: The red dashed line indicates the correlation among all 12 network schools (0.74). Red crosses indicate outlier schools. The blue line indicates the correlation when outlier schools are excluded (0.57).

Graphs for the other opportunities were similar: the stronger the beliefs of teachers in a student-centered approach to instruction, the higher the student reports of opportunities for deeper learning.

To provide a picture of what strong student-centered beliefs actually look like in a school, we turn to examples from our qualitative data. Although we did not probe teachers and leaders specifically about their beliefs about teaching and learning during our interviews, schools in which the surveys indicated stronger student-centered beliefs differed from other schools in the ways teachers described their approaches to curriculum development. For example, teachers in one such school reported giving students a high level of "agency" in their own learning. The principal noted that

their approach to teaching and learning provides for differentiated instruction and means that "students have choices in what they're doing." Teaching at that school has been heavily influenced by a "layered curriculum" approach in which students of all skill levels are given opportunities for success in a base layer of instruction and increasing opportunities for application and individual choice as their skills advance. Within this framework of differentiation, teachers and administrators also articulated a set of overarching learning goals related to reasoning and communication. As one mathematics teacher explained, "It's not [about] the right or wrong answer….that's great, but it's the process, it's the reasoning. How did you get there?" Demonstration of reasoning and communication skills is often oral, either with the teacher or in front of a panel as part of a portfolio assessment process. Student respondents in this school also reported that they are prompted to think about what they are doing, as demonstrated by one student saying,

> [The teachers] give us time to think about how something works. You have to think and figure out why; you have to think it out, how it works, and figure out the answer by yourself [in] different ways as much as you can. Our teachers give us time to think in science and all the subjects. We have groups of students—sometimes you figure it out by yourself and sometimes with other students. Once you figure it out, it's kind of exciting.

A second approach a student-centered curriculum in these schools included teachers soliciting explicit input from students as they developed their curriculum and classroom activities. Teachers at one such school described their approach as very much focused on the needs of students, and reported that listening to the students is an important aspect of that focus. One teacher commented that student voice matters at the school and in the classrooms, echoing a perspective expressed by other teachers. She said that the staff are focused on student success, and toward this end, student input is invaluable. She further noted that there is a sense at the school that learning is more successful if it comes *from* the students rather than just happening *to* the students.

When asked to describe their goals for students, teachers and leaders at a third school with strong student-centered beliefs most often mentioned "a strong sense of self-efficacy, resilience, and persistence," in addition to "excellence in every discipline." The principal explained that project-based learning and internships help build students' resilience. For example, during the course of projects, students might face setbacks that they must overcome. Or students might not be accepted for a particular internship. Working through these setbacks builds resilience and reinforces persistence as students work to secure another placement or solve a problem. Several teachers mentioned that they wanted their students to not be afraid to make mistakes. One teacher at the school reported that personalization of curriculum is very important to her, and that she "could not imagine" handing out a syllabus before meeting her students.

Teacher Self-Efficacy for Teaching

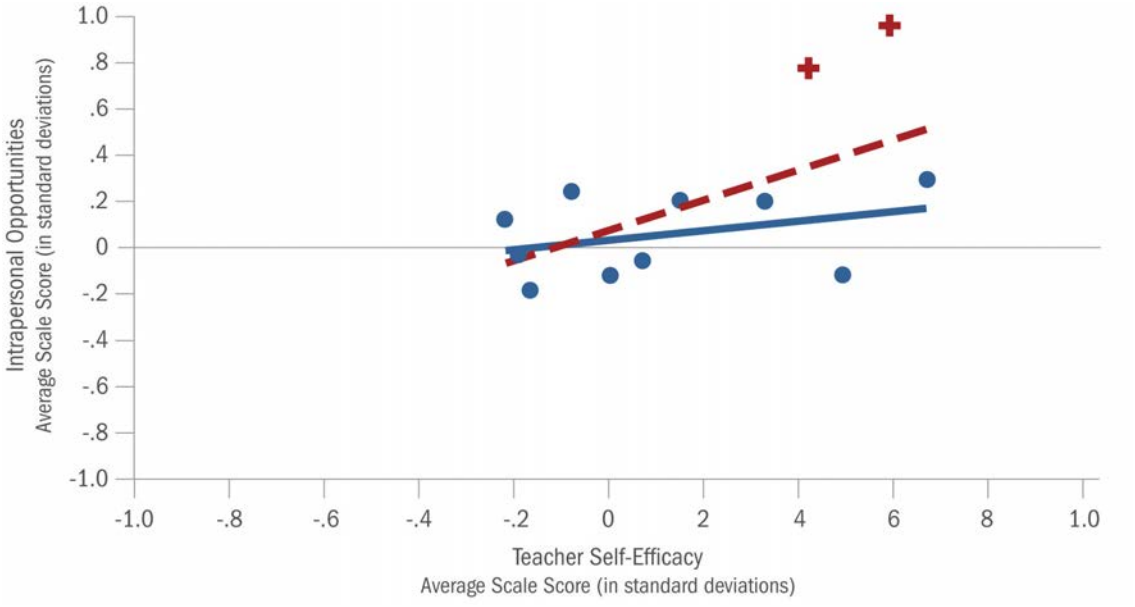
To measure the construct *teacher self-efficacy for teaching*, the survey asked teachers how much they can do (nothing or very little, some, a fair amount, or a great deal) to meet several demands of teaching:[16]

[16] These items are from Albert Bandura's Self-Efficacy Scale.

- Get through to the most difficult students
- Promote learning when there is lack of support from the home
- Keep students on task on difficult assignments
- Increase students' memory of what they have been taught in previous lessons
- Motivate students who show low interest in school work
- Get students to work together
- Overcome the influence of adverse community conditions on students' learning
- Get students to do their homework
- Control disruptive behavior in the classroom

Similar to *student-centered beliefs about teaching*, our measure of *teacher self-efficacy for teaching* was positively correlated (between 0.35 and 0.70 with and without outliers included) to students' reports of opportunities to engage in deeper learning in all four opportunity categories. To illustrate one of these associations, Exhibit 10 plots the relationship between teacher self-efficacy for teaching and student opportunities to develop intrapersonal competencies. The graph uses two regression lines to indicate the magnitude of the positive correlation with and without the two outlier schools included in the analysis.

Exhibit 10. Relationship Between Teacher Self-Efficacy for Teaching and Intrapersonal Opportunities for Deeper Learning Among Network Schools, With and Without Two Outlier Schools



Note: The red dashed line indicates the correlation among all 12 network schools (0.58). Red crosses indicate outlier schools. The blue line indicates the correlation when outlier schools are excluded (0.35).

The graphs for the other three opportunity categories show similar relationship patterns. Thus, the higher the degree to which teachers in a school viewed themselves as capable of meeting the demands of teaching, the higher the student reports of opportunities to engage in deeper learning.

How is self-efficacy among teachers manifested in practice? According to the qualitative data, schools where teachers reported higher levels of self-efficacy were places where teachers characterized themselves and their colleagues as highly committed, motivated, innovative, and collaborative. For example, a teacher at one school who had taught previously at a more traditional school described her experiences this way: "Here I feel like I can make a difference with every student." An engineering teacher in the same school said that smaller groups of students made a difference for him. "You have the small groups and you get to know students and their interests and their capabilities—and mentor them in the right directions."

Schools where teachers reported a relatively high degree of self-efficacy were also places where teachers knew their students well and had come to understand what might motivate or engage individual students. For example, students in one focus group agreed,

> What's great about this school is that we're not just a face in a sea of people, we are individuals, and teachers recognize that and they will put down their time to help us.... You're not just a number. People here actually care about you.

Teacher-Centered Beliefs About Teaching

To measure *teacher-centered beliefs about teaching*, we asked teachers the degree to which they agreed or disagreed with the following statements:[17]

- My primary role as a teacher is to help students learn the content
- Effective/good teachers demonstrate the correct way to solve a problem
- It is better when the teacher—not the student—chooses classroom activities and topics
- Instruction should be built around problems or questions with clear, correct answers

Our measure of teacher-centered beliefs about teaching was negatively related to student opportunities, in particular to students' cognitive and interpersonal opportunities, which had negative correlations from -0.34 to -0.25 with or without the outlier schools (see Exhibit 8). This is not surprising because a teacher-directed approach to teaching and learning does not encourage students to take ownership of and engage in their own learning to the same degree that a student-centered approach does. However, it may not be a matter of an either/or approach, because one would expect teachers to direct instruction at times; rather, it may be a matter of emphasis—which practices teachers use a majority of the time.

[17] These items are from the OECD, Teaching and Learning International Survey, 2008, as were the student-centered beliefs about teaching items.

Our qualitative data provide more detail about how teacher-centered beliefs are manifested in practice. Teachers in schools with higher reports of teacher-centered beliefs used terms such as "traditional" and "teacher directed" to describe their instruction. Teachers at one network school, for example, described their approaches to teaching and learning as "pretty traditional." One teacher said she lectures, then quizzes the students, then has them write a paper. Another teacher explained that she has to teach to the test to keep the students' scores up:

> A lot of times you have to go at such a slow pace to make sure that you don't lose most of the class….I teach to the bottom and I teach to the test. That seems to have worked for my test scores, but I feel horrible about what comes along with that—like the boredom. I go very, very fast at a very shallow level all year long until we have testing.

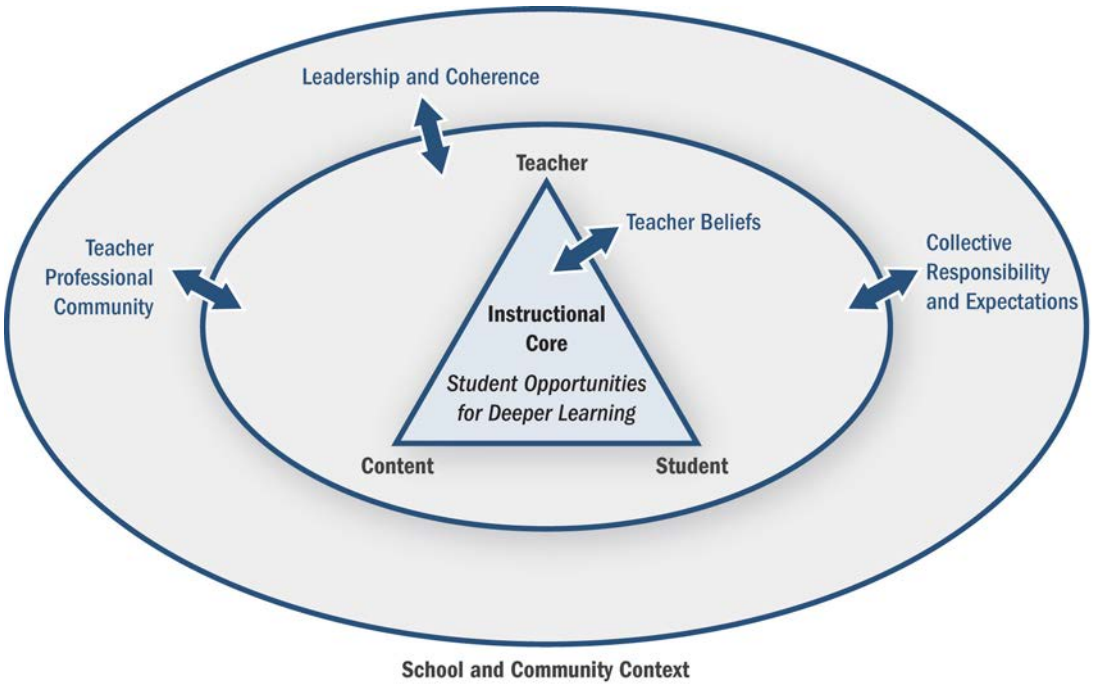
Findings Related to Other School Features

The remaining school features, *teachers' collective responsibility and expectations, teacher professional community, and leadership and coherence*, generally showed weaker relationships to student opportunities than the teacher belief constructs did. For each school feature measure, correlations with measures of student opportunities were relatively strong and positive among all 12 network schools (between 0.54 and 0.78), but relationships were much weaker after removing the two outlier schools (see Exhibit 8).

Summary of Relationships Between School Features and Student Opportunities

It is not surprising that teachers' beliefs about teaching are strongly related to students' opportunities, since these beliefs directly affect the instructional approaches that teachers implement in the classroom. We found that *student-centered beliefs about teaching* and *teacher self-efficacy for teaching* were positively associated with students' opportunities to engage in deeper learning, whereas *teacher-centered beliefs about teaching* had a negative relationship to these opportunities. Our findings also indicate that leadership, professional community, and collective responsibility may be influential, but they appear to have a weaker and likely more indirect relationship with students' opportunities for deeper learning. Exhibit 11 illustrates the relationships between the school features and the student opportunities included in our analyses. This exhibit is derived from Cohen and Ball (1999) and Finnigan and O'Day (2003), and shows the triangle of relationships between the teacher, the student, and the content (of instruction). Students' opportunities to engage in instructional activities related to deeper learning are in the "instructional core" at the center of the triangle. Exhibit 11 shows how teacher beliefs are more directly associated with the instructional core, whereas the other school features indirectly affect the instructional core through the influence on teachers' beliefs.

Exhibit 11. Relationships Between Select School Features and Student Opportunities for Deeper Learning



Clustering of School Features and Student Opportunities

Having considered the relationships between school features and student opportunities, we now turn to an analysis of how the features and opportunities were clustered—in other words, how combinations of features and opportunities were clustered across schools. However, to carry out this analysis, we first needed to determine the variation in student opportunities across network schools.

Variation in Student Opportunities

Similar to how we looked at the variation in school features across the network schools (see Exhibit 7), we determined the degree of variation across the four student opportunity measures (cognitive, interpersonal, intrapersonal, and assessment opportunities) by classifying schools into four categories (see Exhibit 12): high (above 0.5 SD), medium/high (between average and 0.5 SD), medium/low (between -0.5 SD and average), and low (below -0.5 SD).

Exhibit 12. Variation Across Student Opportunity Measures Within Network School Sample, by Number of Schools

Student opportunity score	Cognitive opportunity measure	Interpersonal opportunity measure	Intrapersonal opportunity measure	Assessment opportunity measure
High (≥ 0.5 SD)	2 schools	2 schools	2 schools	1 school
Medium/High (0 to 0.5 SD)	7 schools	8 schools	5 schools	7 schools
Medium/Low (-.05 to 0 SD)	3 schools	2 schools	5 schools	4 schools
Low (≤ -0.5 SD)	0 schools	0 schools	0 schools	0 schools

Note: The average was calculated using the full sample of 24 network and non-network schools, but only the 12 network schools that were matched to non-network schools and had teacher and student survey data are shown in the exhibit.

The same two schools scored high on almost all four opportunity measures (one of these two schools had an average of 0.49 SD for the assessment opportunities measure). In addition, four schools scored medium/high on all four measures, and an additional two schools scored medium/high on most measures but medium/low on intrapersonal opportunities. One school scored medium/low on all four opportunity measures, and the remaining three schools demonstrated a mix of medium/high and medium/low scores across the opportunity measures. These findings demonstrate that there is variation on the student opportunity measures across the network schools: while the two outlier schools were consistently high across opportunity measures, four schools had below-average scores for more than one opportunity measure.

School Feature and Student Opportunity Patterns Across Schools

We then looked at the patterns of school features and student opportunities together and determined that only four schools emerged with consistent patterns: two schools had consistently high scores, and two schools had consistently low scores across school features and student opportunities. The remaining schools had mixed patterns.

School Pattern #1: High Scores on School Features and Student Opportunities

The two schools with comparably high results (0.5 SD or higher above the mean) across almost all school features and student opportunities appeared to be true outliers.[18] These were the same two outlier schools that we identified in our earlier analysis, and they belonged to the same network.

[18] One of the two outlier schools had an average of 0.42 SD for the measure *teacher self-efficacy for teaching*. In addition, neither school had a high average for *teacher-centered beliefs about teaching*.

The two outlier schools are examples of schools where teachers have strong student-centered beliefs about teaching, combined with a strong professional community and strong leadership, which appear to provide opportunities for students to engage in deeper learning. In one of these schools, for example, providing opportunities for students to collaborate is part of the school's goal for students, and teachers model this by having a strong collaborative culture themselves. When asked how staff and students would describe their school, one of the most common terms used by respondents was "collaborative." Students work collaboratively in groups, teachers collaborate while designing their curriculum, and the curriculum is designed to provide opportunities for students to work together. As the assistant principal said, "It's not like, 'here's one handout and you're all going to have the same handout working at the same table.' They actually have specific roles… so the students are obligated to communicate with each other and to collaborate together to create a final project." Since a large portion of the students attending this school are English learners, collaborative activities are also viewed as an important way for them to develop English skills, as the students must find ways to communicate with each other in their collaboration.

School Pattern #2: Below Average Scores on School Features and Student Opportunities

Another two schools, from two different networks, showed consistently lower levels of both features and opportunities as compared to other network schools,[19] but the differences were much smaller in magnitude than the differences observed for the outlier schools.

One of these schools was going through major budget cuts at the time of the site visit for this study, which had led to declining enrollment as well as teacher turnover. Half of the school's teachers had received pink slips the previous year. The turnover of staff had created problems because of lack of experience with implementing project-based learning, curriculum integration, and differentiation of instruction. In addition, the school had had three principals in eight years. The founding principal was in place for five years. The second principal was let go within the first year, and the founding principal returned until the third and current principal was hired. However, a majority of the teachers reported concerns about the current principal's leadership. For example, one teacher described the principal's leadership style as "assertive at random times." This teacher noted that there was no consistency to when the principal was going to make somebody follow through. Thus, at this school, a number of contextual factors (e.g., budget cuts, declining enrollment, teacher and leadership turnover) might have affected the school features and in turn students' opportunity to engage in deeper learning.

School Pattern #3: Mixed Scores on School Features and Student Opportunities

The remaining schools had mixed scores on school features and student opportunities. However, interestingly, one school that scored below average on all student opportunity measures scored high on the measures of teachers' collective responsibility and expectations, teacher professional

[19] Both schools scored above average on the teacher-centered beliefs about teaching measure.

community, and leadership and coherence, but they did not score high on the three teacher belief measures. This seems to confirm our findings in the previous section that teacher beliefs have the strongest association with student opportunities to engage in deeper learning. Thus, it appears that having a strong professional community and strong leadership might be necessary but not sufficient to provide students with these opportunities.

This school with low teacher beliefs, high scores on other school features, and below-average student opportunities has a more traditional approach to teaching and learning, with a stronger focus on teacher-directed instruction. Teachers at this school reported that instruction is a constant balance between student- and teacher-driven instruction, and that the approach depends on the content and the students in the class. A science teacher, for example, said that they do labs at least once a week and that these are usually more successful if they are "more guided by the teacher, so a lot of times the student-centered [approach] doesn't seem to be the best way to go." Students reported that most instruction is teacher directed. One student said, "We choose nothing," and another noted, "Most of the time it's the teacher teaching us…instead of us picking what we have to do." However, when asked if they would rather have more freedom to choose, they said that they liked the instruction the way it is.

In this school, teacher-directed instruction is also reflected in the workshop model, which is an instructional approach used schoolwide. The principal said, "I want to see the teachers engaging in the workshop model because in [the district] right now, that is the dominant form of instructional model. So the idea is that there is a mini-lesson, then a student-centered workshop-type activity, followed by a share-out." One teacher explained, "[the mini lesson] is kind of more teacher-centered, and that's when I'm downloading information to them. And then we'll practice some problems together, and then they'll work in groups that are made based on their previous assessment or other observations I have of them." The workshop model used at this school leads to a greater balance between teacher-led instruction and student-led instruction than was observed for the other network schools in our sample.

Summary of School Pattern Findings

Overall, based on the survey data, we identified only two deeper learning network schools with consistently high scores across the school feature and student opportunity measures. The remaining schools had either mixed or low scores across the measures. However, across the different analyses in this section, we found that teacher beliefs had the strongest association with student opportunities to engage in deeper learning. But which school features did school and network staff themselves report as facilitating or hindering implementation and sustainability of their deeper learning approaches? We turn to this question next.

Perceptions of Facilitators and Barriers to Implementing and Sustaining Deeper Learning Approaches

In this section, we discuss the school features that teachers and school and network leaders nominated as important facilitators and barriers to implementing and sustaining deeper learning approaches. Since we did not ask directly about teacher beliefs or dispositions during our site visits (we only asked about teacher beliefs directly in the teacher surveys), this section describes in greater detail the features that appear outside of the triangle in Exhibit 11.

Facilitators and Barriers to Implementing Deeper Learning Approaches

School personnel most frequently highlighted three main conditions that fostered effective implementation of their approach to deeper learning: 1) the creation of a professional community committed to teacher collaboration and opportunities for adult learning, 2) school leaders who have an understanding of teaching and adult learning as well as deep knowledge of the particular approach the school is implementing, and 3) ongoing support from their district and network as the school matured.

Developing Professional Community and Collaboration

Our analyses revealed that schools where teachers reported high levels of commitment to a particular approach to teaching and learning were the same schools that exhibited high levels of both student-centered beliefs about teaching and teacher self-efficacy (identified in the teacher survey). It appears that one key strategy that allows those features to deepen among adults is an intentional development of professional community. One principal noted that building in time for adults to collaborate is crucial in developing a shared sense of collective commitment, saying, “It has turned out to be a really strong model, in that now the team feels a sense of collective responsibility for the cohort.” Schools use a number of strategies to develop that sense of professional community, including regularly scheduled meeting times within departments, grade-level meetings, common planning times, team teaching, and professional learning communities that take up a common problem of practice.

When asked about their approach to developing professional community, the teachers and leaders at the two outlier schools pointed to their master schedules, which include time for teachers to collaborate to build that sense of community. Leaders in these schools also highlighted their efforts to create teams intentionally so that newer teachers could be mentored in the school’s approach to instruction. One school leader said that at the school, “everything is professional development.” Although these schools include formal professional development as often as twice each month, the

school leader at one school said that when she plans the schedule, she includes time for grade-level teams and departments to meet, and she sees this as the time when "real" professional learning occurs. Providing these opportunities for adults to learn from and teach one another contributes to a sense of collective responsibility as well as continuous improvement and a belief that students can master rigorous academic content. In these two schools, the adult culture explicitly mirrors the kind of learning opportunities schools are trying to create for students.

Six of the 19 network schools also provide structured peer observations in which teachers can see instructional practices in action. Teachers observe each other using structured protocols and give one another feedback on instruction. Having teachers regularly observe one another makes teaching and learning public. As one teacher said, "I'm glad because [feedback] has me stop, go back, and rethink, 'so how can I step it up a notch and challenge the kids a little bit more?' So I'm very happy with these snapshots." In addition to these more structured opportunities to observe each other, two schools have shared classrooms: "I share the classroom with a history teacher on the team so when she's teaching, I'm in the room…so we are not only doing a lot of our planning together and teaching the same unit, we're right there in each other's classroom too."

Creating trust among colleagues is one of several key elements necessary for continuous school improvement that are anchored in decades of research, most notably research conducted by the Chicago Consortium for School Research (in particular, see Bryk et al., 2010). One network school leader described it as follows:

> It goes top down and bottom up… It's a culture of trust in the sense that the CEO and the chief operating officer trust me to run a successful, progressive, project-based school. And that feels really good for me as a professional. I trust our teachers with supports…But I trust our teachers to design and implement and exhibit a phenomenal overall experience educationally for these kids. These teachers trust their students. If they say they're going to the bathroom, that they'll probably go to the bathroom, and that they will probably return. And so, therefore, we do not have a hallway pass…and then the students trust each other… and all the way back up. So, when you start with that… it would be like one of your base ingredients… It's kind of the ingredient of steak in steak.

When adults trust one another and have opportunities to learn from and collaborate with one another, it is possible that they understand the challenges students might face in learning to do so. Staff in seven of the network schools we visited mentioned the important role that trust plays in creating an environment where teachers and leaders can continue to deepen instructional practices that can promote student learning. One school leader talked about the "importance of building trust, positive interdependence, and communication." He added that trust is "what makes the school a school…and if there's a great student culture in our school, it's because of the work that the adults do."

The Role of Leadership

Leadership seemed essential to the creation of the professional communities that existed in many of the network schools. One common approach (in 11 of the schools we visited) to creating a culture where adults trust and rely upon one another was to hire leaders who have worked as teachers in, or were founding leaders of, the schools that they are leading (or other schools in the network). The principal at one school described it this way: "It requires muscle memory…to remember what it's like to be a teacher." Having developed the instructional expertise demanded by the school model and that "muscle memory" allows leaders to provide the kind of feedback that can help newer teachers anticipate some of the more common challenges and can help more experienced teachers deepen their practice. Administrators at one of the outlier schools said that having been teachers at other schools within their network gives them "street cred." In addition, as former teachers, they can share projects that they have developed and can offer insights grounded in their own experiences as teachers plan and implement their lessons.

However, leadership in these schools was not always situated in the principal or even just among administrators. Respondents in our sample talked about a variety of structures that provided opportunities for administrators and teachers to share leadership activities. These include leadership teams, content teams, and grade-level teams. All of the network schools in the study had some form of leadership team. In five cases, school staff explicitly described their schools as "teacher driven." A key component of one of these schools was its emphasis on "Teacher as Designer," a model that allows teachers to develop their own curriculum (alone or in teams). The principal noted that he will occasionally "veto" certain things if they are inconsistent with the school's guiding principles, but that decisions are overwhelmingly made by teachers. One teacher described the leadership structure as follows:

> We have a director [and] we have a CEO, but they designed the school so that the teachers lead the school. So it's hard to say who the leader is basically, because that's kind of the point of the school … teachers create the curriculum and we form study groups. If we see something that we need to do, then we take the initiative and do it. So I think it's very unique in that respect.

Outside of these five teacher-led schools, the role of the leadership teams appeared to be more advisory and to serve a communications role across school staff. For example, at one school, teachers wondered "about the extent to which the Leadership Council actually has any decision-making power." However, even in schools where some questioned the degree to which the leadership teams actually had key decision-making power, teachers reported that their "opinions were listened to and valued."

Ongoing Support From Networks

Drawing upon network resources for ongoing professional development also was nominated by a majority of the network schools as an important facilitator to implementing deeper learning. All of the network schools provided time for professional development that took place in some combination of intensive summer institutes and ongoing professional development built into the school day. Staff in 14 of the schools reported that the professional development that their networks provide was an important part of their ongoing success. Some of the opportunities that networks provide include summer institutes for new and more experienced teachers as well as ongoing coaching for teachers that is focused on topics related to a school's work plan. According to network leaders, those professional learning opportunities align with the approaches to teaching and learning for each network school, and are grounded in examination of data that help schools focus their attention on specific professional development needs. Although teachers in four schools reported that they take advantage of district-provided professional development, they also said that the district professional development was often irrelevant and misaligned to their specific approaches to teaching and learning.

Challenges in Creating Professional Community, Leadership, and School Support

The most commonly cited barrier to implementation was high rates of teacher and principal turnover. While there are many reasons for teacher turnover, the most commonly cited reason was teacher burnout, in particular because of the multiple responsibilities teachers must assume in many of the network schools. High teacher turnover has an impact on the degree of trust that can be developed and the kind of consistency that can be established—in terms of both instructional and behavioral expectations. According to the principal of one of the schools that struggled with high turnover, the culture starts with adults, and "until we get some more consistency amongst the adults on our expectations, our understanding… we are going to continue to have issues."

Another barrier to effective implementation was lack of district support. In several network schools, school leaders suggested that the district had prevented essential changes or made them difficult by imposing increased regulations that were not aligned with school approaches. The principal at one school, for example, talked extensively about the need to have the right people teaching in classrooms. She thought that hiring teachers who exhibit empathy toward other people was critical, especially for supporting the school's model for collaboration. She noted that hiring teachers who want to work in a school like hers is essential. This proves difficult in districts where local policies require schools to hire from a pool of available teachers.

Finally, when teachers were asked in surveys about resource and structural barriers that might limit how they approach their instruction, teachers generally reported that they had autonomy in instructional decision making. However, almost three-fifths (59 percent) of teachers responded that lack of planning time was a structural barrier. Lack of instructional materials and high

student-to-teacher ratios were also cited as barriers by more than half of respondents. Given some of the approaches network schools take to teaching and learning—project-based learning, making rigorous academic content accessible to English learners, and assessments that capture deeper learning competencies—it is not surprising that these are challenges schools are facing in implementation.

Facilitators and Barriers to Sustaining Deeper Learning Approaches

Implementation over a few years is one thing, but how do schools maintain their deeper learning approaches over the long haul? Some of the schools in this sample had been implementing and improving on their model of deeper learning for decades. Even the newer schools had ideas about features and supports that would be essential for long-term sustainability. Not surprisingly, many of the things that school and network personnel identified as facilitators for sustainability were the same as or similar to those identified as supporting implementation more generally. Developing strategies to sustain approaches to deeper learning is particularly important when external funding ends and many of the networks transition to a "fee-for-service" model that will require schools to pay for the ongoing implementation support they receive from the networks.

Respondents nominated several factors that would facilitate their efforts, including strong leadership that is shared among adults in the school community (three schools); high quality and sustained effort of teachers who have a shared vision for teaching and learning (three schools); established school structures and systems so that schools do not "re-create the wheel" when staff turnover occurs (e.g., an online library of high-quality projects; four schools and one network leader); and school autonomy for hiring, budgeting, and using instructional time (one school and one network leader). One network leader also mentioned high-quality support from the network, including consultants, conferences, and resources (such as access to online materials and tools).

Having buy-in from the district, the board, and the community was also reported as essential by four schools and two network leaders. District support and community involvement can increase long-term support for the school and help students in the process. For example, one principal noted that "without opportunities to…get students out beyond the four walls of the school, a program that works with initially disengaged students will not be successful."

Threats to Sustainability

As the networks and schools matured and outside funding disappeared, some worried about how to continue their progress. The most commonly cited challenge that emerged during interviews and focus groups was funding—for ongoing and differentiated professional development, adequate salaries for teachers, and structures such as team teaching and smaller class sizes. Further, respondents in 12 of the 19 schools mentioned the demands their model places on teachers who must take on multiple roles, including the ongoing community outreach that teachers and leaders

must do to recruit students, internships and other real-world learning opportunities they must develop, and work to advocate for district and state policy flexibility to facilitate implementation. These demands create the potential for burnout and turnover.

Another threat to sustainability reported at two schools was over-reliance on a single leader or teacher for the success of these approaches to teaching and learning. According to a teacher at one school, the school's principal "basically wills the school to continue to improve." And another added that "if we didn't have his solid, visionary leadership, it would be really hard to do the things we do." Many of the network schools have transition plans for leaders; the leaders are often selected from within the network's schools so that they are already familiar with the model and its implementation.

State and district policies also pose threats to sustainability, including assessment and accountability policies that are not aligned with deeper learning approaches. For example, state and district policies that require all students to finish high school within four years were a barrier for some schools—particularly schools serving higher numbers of under-credited students or students who speak English as a second language. One network leader also reported trying to implement a graduation performance system that would require some flexibility from district guidelines for course creation and credit recovery. In addition, state assessments that include, as one teacher described, "50 multiple choice questions about everything from the Ming Dynasty to the Russian Revolution" also pose challenges, because they do not align with an approach that seeks to develop "a real appreciation for history." One school from our sample had negotiated flexibility in state assessments; students were able to demonstrate mastery of content and skills through an alternative assessment.

Facilitators and Barriers Summary

In sum, there were several school features that teachers and leaders suggested were essential to the implementation and the sustainability of their approaches to teaching and learning. Chief among them were strong leadership that was shared among adults in the school; strong professional communities with a shared vision for teaching and learning; and high-quality support from school networks. The most commonly cited barriers to implementation and sustainability were staff burnout and turnover, lack of funding, and state and district policies that hindered schools' approaches.

Conclusion

An extension of a larger study of deeper learning opportunities and outcomes, this report has explored the influence of certain school features on network schools' ability to provide their students with opportunities for deeper learning. We investigated this influence in two ways.

First, using responses from teacher surveys about the relevant school features and from student surveys about their learning opportunities, we estimated the associations between the identified school features and students' deeper learning experiences in their classes. These analyses revealed a strong association between teachers' reports of their own *student-centered beliefs about teaching* and *self-efficacy for teaching* on the one hand and all four categories of students' deeper learning opportunities, including cognitive, interpersonal, intrapersonal, and assessment opportunities. In contrast, *teacher-centered beliefs about teaching* were negatively related to student opportunities. Other organizational features pertaining to school leadership and professional culture, specifically *teachers' collective responsibility and expectations, teacher professional community*, and *leadership and coherence*, were also positively related to student opportunities, but these correlations appeared to be driven in large part by the influence of two outlier schools. We concluded that these associations were less consistent and likely more indirect than those for teachers' own beliefs and dispositions.

To explore the role of organizational context further, our second approach involved the analysis of data from site visits and interviews. In particular, we sought to understand what school personnel had to say directly about the organizational features and policies that facilitated or hindered their ability to implement and sustain their approach to deeper learning. Three factors emerged as key facilitators, both for implementation and for sustainability: *collaboration and professional community*, *school leadership* (including distributed models of leadership), and *support from the network*. Barriers included such factors as limited resources and time as well as district personnel or accountability policies that interfered with schools' ability to attract and retain appropriate staff or to assess students in ways conducive to deeper learning.

How should we understand the apparently different emphases from these two data sources and analytical approaches? One, the survey analyses, identified teachers' own beliefs and dispositions as key. The other, respondents' perceptions of facilitators and barriers, identified environmental features that were primarily outside the classroom. The interview data suggest that the conclusions from the different approaches are in fact quite compatible. While teachers' own beliefs seem to have the most consistent and largest association with the opportunities they provide their students in the classroom, the other school features and external policies can influence teachers' beliefs about teaching and about themselves. For example, the interview data reveal that the schools where teachers have a high level of self-efficacy are also schools with high levels of collaboration and professional community, where teachers and leaders say they trust each other and work collectively

to improve instruction and student learning. The shared commitment and problem solving may help to build the self-efficacy of the individual teachers by giving them confidence that if they encounter difficulties, they can turn to their colleagues for help. Indeed, self-efficacy is not an immutable trait independent of context. For example, the teacher's statement "*Here* I feel I can make a difference with every student" was a contrast of the supportive professional culture in her current network school with what existed at her previous school. Similarly, leaders can influence beliefs through the approach to hiring and socializing new staff, providing professional learning opportunities, and creating a culture of trust and collaboration.

Thus, our conclusion—or more accurately, our hypothesis—is that student-centered beliefs about teaching and teachers' sense of self-efficacy for teaching have the most direct and consistent influence on student opportunities in the classroom. However, the other school features—teachers' collective responsibility and professional community and the level of instructional leadership in the school—have a more indirect influence on opportunities for deeper learning, in part through the ways they help shape how teachers view themselves, their instruction, and their students.

While future research should examine this hypothesis more closely with a larger sample of schools, the consistency of these findings with earlier studies of effective and improving schools suggests that schools and districts seeking to implement a deeper learning approach should pay considerable attention to creating the conditions inside the school and in its larger environment that allow school personnel to create deeper learning opportunities for their students. Teacher and principal hiring and placement policies, for example, can help to ensure that incoming school personnel share a basic commitment to the work and the approach of the school. Providing time and resources for collaboration and removing district policies and requirements that interfere with the ability of the school to create a strong professional community are also likely to be important. Developing distributed models of leadership within the schools may be helpful for increasing the engagement, collective responsibility, and self-efficacy of the teachers and for ensuring sustainability in the face of leadership change. These and other implications of the findings reported here are consistent with previous research on effective and improving schools.

Nonetheless, given the exploratory nature of this study, many questions remain as to how these school features make a difference in creating opportunities for students to engage in deeper learning. For example, while we found that student-centered beliefs about teaching and teachers' self-efficacy for teaching were the features most strongly and consistently related to greater student opportunities, our study only began to explore how schools can actually develop these teacher beliefs. In addition, further examining interactions among school features would be an important next step in learning how to create the optimal conditions for providing students with opportunities to engage in deeper learning. That the schools with consistently higher or consistently lower scores on all the school features had similarly high and low results with respect to all the student opportunities suggests that the features are not independent but in fact may work in tandem.

We need to know more about how they interact. Finally, while our earlier reports revealed positive relationships between students' opportunities to engage in deeper learning activities and their deeper learning outcomes (Bitter et al., 2014; Rickles et al., 2016), the analyses reported here did not address student outcomes. We do not know, therefore, whether the schools that score high on both school features and student opportunities also provide students with better deeper learning outcomes. This too is an area for further study.

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