LEARNING WITH OTHERS

A Study Exploring the Relationship Between Collaboration, Personalization, and Equity

Final Report

Wendy Surr, Kristina L. Zeiser, Olivia Briggs, and Kimberly Kendziora, American Institutes for Research

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OCTOBER 2018

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Bridging the worlds of research, practice, and policy, JFF's Student-Centered Learning Research Collaborative investigates student-centered approaches to improve outcomes for learners from all backgrounds, particularly those who have been marginalized or underserved by the current system. This bold initiative began in 2016 with a core group of scholars, school leaders, policymakers, practitioners, and funders—each known for their impact and influence—coming together to clarify and catalyze the field. Since that time, the Research Collaborative has supported:

- multiple research teams employing a diverse set of research methods to build the evidence base for student-centered learning;
- a variety of field-advancing projects that accelerate innovation and generate investment in student-centered practices;
- a cohort of Students at the Center Distinguished Fellows who show what's possible when applications of student-centered practices are driven by rigorous research and a commitment to equity;
- and a series of public-facing resources designed to scale implementation and ensure all students flourish in our schools.

American Institutes for Research (AIR) conducted this study as part of the Research Collaborative's initial cycle of research. The team at AIR worked alongside fellow scholars, educators, and policymakers to investigate the impact of specific student-centered practices and then translate their findings for cross-sector audiences. This report represents their work over the past two years as they examined the impact of collaboration on learners in student-centered classrooms and how that impact varied by race and ethnicity.

Other Research Collaborative studies in this cycle include:

- *Implementation of Student-Centered Learning Approaches,* American Institutes for Research
- *"In theory it's a good idea": Understanding implementation of proficiency-based education in Maine*, Education Development Center
- *Abolishing the phrase "I'm not a math person",* High Tech High Graduate School of Education

For more information about and additional resources derived from this study from American Institutes for Research and the Student-Centered Learning Research Collaborative, visit sclresearchcollab.org.

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Study Overview

Personalized learning is often equated with individual learning using technology. Yet for many students, learning on their own may not effectively meet their needs. The aim of this study was to explore racial differences in experiences and benefits associated with collaboration. We collected data from a variety of sources for students, teachers, and classrooms within four racially diverse high schools that emphasized both personalization and collaboration. Our sample included 892 students, 138 teachers, and 30 classrooms. Our qualitative analyses identified emergent themes from focus groups and interviews, and our quantitative analyses examined associations among opportunities for collaboration, classroom experiences, and outcomes, testing whether these associations differed for Black students versus White students. We found that, for all students, reports of high-quality collaboration were strongly associated with positive classroom experiences and mind-set/ dispositional outcomes such as motivation, engagement, and self-efficacy. Moreover, high-quality collaboration was strongly associated with students' perceptions of personalization—and personalization, in turn, was strongly associated with outcomes. At the same time, focus group discussions revealed that Black students perceived less relevance in collaborative activities, more frequent experiences of exclusion and marginalization, and lower support from teachers during collaborative group work than did non-Black peers. Findings from this study suggest that collaborative experiences could be among the factors that contribute to positive changes in the academic trajectories of Black students, particularly when these opportunities reflect high-quality features. Thus, schools and educators aiming to address equity through personalization should consider increasing opportunities for high-quality collaboration.

Introduction

What Does It Mean to Personalize Learning for Students?

Student-centered learning is an approach to teaching and learning that draws from the learning sciences as well as from other theories and trends within education and related disciplines.[1] Key to a student-centered learning approach is that *learning is personalized*.[2] Personalized learning aims to offer "learning experiences that customize education to an individual's personal needs and interests as well as connect the individual to adults and peers in a larger community of learners" (p. 1).[3] This is in direct contrast to traditional approaches to instruction, which are typically aimed at the "average" learner.[4] and rely heavily on whole-class instruction such as lecture and demonstration.[5,6,7]

As illustrated in Exhibit 1, in a personalized learning approach, educators engage with students to design learning experiences that meet each students' varying needs in multiple domains. From the right academic difficulty level; to appropriate modality and pace; to a topical focus that taps into their personal interests, culture, and goals; to students' needs for social-emotional support and exchange, a personalized learning approach aims to maximize learning for each individual student.

> [T]here are systematic differences in how we learn—including how we approach, interpret, and process information as well as how we progress along learning pathways.[8,9] Contextual factors such as culture have been found to influence how students respond to learning experiences.[10]

The field of learning science lends support for such a personalized learning approach. Research suggests that learners come with their own unique needs, interests, prior knowledge, and learning patterns, all of which serve as both the starting point and individual context for all learning.[11,12] This research further suggests that there are systematic differences in how we learn—including how we approach, interpret, and process information as well as how we progress along learning pathways.[13,14] Contextual factors such as culture have been found to influence how students respond to learning experiences.[15] These findings, combined with other research that has examined the benefits of personalized and student-centered approaches for underserved students,[16,17] suggest that offering students a wide variety of learning experiences and attending to students' individual needs for differing modalities, pacing, academic level, and social interaction may be particularly valuable for students from diverse cultural, economic, and linguistic backgrounds who have been underserved within traditional classroom settings that rely primarily on a single mode of instruction.

Exhibit 1. Multiple Domains for Personalizing Learning

Academic Difficulty
Personalized to the right academic performance level and need for challenge

Topical Focus
Personalized to a learner's interests, values, culture, and goals

Personalization Mechanisms:
Teacher
Student
Technology
Peers

Modality/Pace
Personalized to how the learner best learns: modality, activities, pacing, and access

Social and Emotional
Personalized to a learner's needs and preferences for social-emotional support, challenge, verbal exchange, and feedback from teachers and peers

What Is the Role of Collaboration in the Personalization of Learning?

One important but less commonly noted aspect of personalization is attending to students' varying needs for social-emotional support and verbal exchange. Collaborative learning is one educational strategy that could help address students' social-emotional needs and has been associated with a range of additional benefits for students, from enhanced motivation[18] to a deeper understanding of core concepts.[19]

> One important but less commonly noted aspect of personalization is attending to students' varying needs for social-emotional support and verbal exchange.

Collaborative learning is a classroom approach that typically involves groups of students working together to reach a common goal. Students working in collaborative groups assume roles and

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responsibilities and exercise key social skills such as communication, decision making, and negotiation as they help one another build understanding, solve problems, and reflect on learning.[20]

Research evidence suggests that interpersonal factors in the classroom, including collaboration, may influence and support student's personal learning needs in at least three ways. First, students' emotions, such as whether they feel connected to or supported by others, have been found to affect their behavior and their capacity to focus their attention on learning.[21,22,23] Neuroscience research has also provided evidence for the integral role of emotions and social exchange in the learning process.[24] Second, research suggests that social interactions, such as collaboration, may be essential to building students' deep conceptual understanding by allowing them to test out their ideas, receive feedback, and subsequently refine and sharpen their thinking.[25] Such interactions may lead to a range of positive learning outcomes for students.[26,27,28,29] Third, social exchange may influence student outcomes through the social norms and expectations for learning and performance created within classrooms by way of social influences. Classrooms are social settings,[30] and these settings can have strong effects on student engagement, on students' intrapersonal competencies such as self-concept, and on students' academic learning. Peer groups can provide acceptance, belonging, and status to students,[31] which may positively influence academic motivation,[32] self-concept,[33] and, ultimately, academic achievement.[34]

Simply placing students in collaborative groups provides no guarantee that they will benefit.

Simply placing students in collaborative groups provides no guarantee that they will benefit. Research on collaboration[35,36,37] suggests that high-quality collaboration includes specific structural and dynamic quality elements. By *structural quality*, we mean those aspects of high-quality collaborative opportunities that are planned in advance by educators, such as in the design of activities or the intentional composition of collaborative groups. We use the term *dynamic quality* to refer to those aspects of high-quality collaborative opportunities that are realized in real time as students engage in a collaborative task, interact with their peers, and respond to teacher facilitation strategies. For the purposes of the current study, the AIR research team identified and measured the following structural and dynamic elements associated with high-quality collaboration.[a]

Elements of High-Quality Collaboration	
Structural Quality Elements	**Dynamic Quality Elements**
▪ Student-centered, culturally responsive activities	▪ Responsive, respectful, and inclusive interactions
▪ Activity requires group interdependence	▪ Constructive exchange
▪ Balanced group composition	▪ Shared leadership and decision making
▪ Group norms and task clarity	▪ Perceived inclusion

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[a] The study team also examined perceived exclusion during collaborative experiences. However, our tests of measurement invariance indicated that we could not use survey measures to compare experiences of exclusion between White and Black students. Therefore, this report focuses on perceptions of inclusion. See page 62. For more information refer to the Technical Appendix.

Personalization, Collaboration, and Equity

Although an important hallmark of personalized learning is addressing the full range of students' learning needs, emerging trends suggest that personalization is often equated with individual learning. This approach to personalization often relies heavily on the use of technology to enable students to learn independently and progress at their own pace. For example, in their report *Next Generation Learning: The Intelligent Use of Technology to Develop Innovative Learning Models and Personalized Educational Pathways,*[38] the authors offered a vision of personalized learning that emphasized the individual use of technology-enabled platforms to match a student's current academic performance level. They explained that personalization can occur using "a learning algorithm to match students with activities that best suit them, based on a diagnostic assessment of their performance at the end of the previous day" (p. 3).[39] Other approaches to personalization focus primarily on meeting students' individual academic needs, interests, and preferred learning modalities and contexts. For example, some schools craft individual learning plans, design independent study opportunities, and enable students to learn anytime and anywhere, such as through internship opportunities as they progress along their individualized learning paths.[40] These personalized learning approaches address multiple aspects of student learning needs but may limit students' opportunities to learn with others. True personalization recognizes students' needs for social support and exchange.

> **Although an important hallmark of personalized learning is addressing the full range of students' learning needs, emerging trends suggest that personalization is often equated with individual learning.**

Educational trends that emphasize personalization but limit students' opportunities for collaborative learning may have implications for equity. Research findings suggest that social interaction may be particularly valuable for students from diverse cultural, economic, and linguistic backgrounds who have been underserved within classroom settings that rely primarily on a single mode of instruction.[41,42] For example, Noguera et al., summarizing a review of the literature on group learning, argued that "low-income students, students of color, and urban students tend to see even greater benefits from group work than do other students" (p. 9).[43] Illustrating this point, Farrington et al. highlighted earlier research showing that providing ninth-grade students with teacher support and an opportunity to participate in small learning communities was associated with marked increases in attendance, course completion, and grade promotion, particularly for minority students[44] (see the Talent Development High School Model studies[45,46]).

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> Educational trends that emphasize personalization but limit students' opportunities for collaborative learning may have implications for equity.

Providing rich social learning opportunities may be particularly important for Black students. In his Students at the Center report titled "Literacy Practices for African-American Male Adolescents," Alfred Tatum argued that Black male students need culturally meaningful opportunities, rich language experiences, access to challenging texts, and opportunities to participate in strong learning communities to build their literacy skills.[47] Tatum concluded that the approaches and personal factors key to these students' literacy development could be met through a student-centered learning model emphasizing the kinds of opportunities associated with collaborative learning. Conversely, an overreliance on the types of independent learning often emphasized in some personalized learning models may inadvertently result in a new form of tracking. As noted by Tatum, Black students are often tracked into remedial classes, where they experience less challenge, lower quality learning opportunities, and increased social isolation.[48] If the current trend in personalized learning continues to emphasize individual learning, educators may inadvertently be shortchanging the learning needs of those students who are already at a disadvantage.

Theoretical Model for the Study

The aims of this study were to examine how collaboration was linked to personalization and explore racial/ethnic differences in experiences and benefits associated with collaboration. As illustrated in Exhibit 2, we theorized that the path between high-quality collaborative opportunities and outcomes would be mediated by students' perceptions of their classroom experiences. In other words, students who had the chance to collaborate in class would report higher levels of perceived social-emotional support, greater opportunities and expectations for learning, and an enhanced perception that their individual needs as learners were being met (i.e., personalization). In turn, students' classroom experiences were theorized to be related to students' mind-sets and dispositions, such as intrinsic motivation, engagement, and self-efficacy as learners. Finally, these mind-sets and dispositions were theorized to influence students' attendance and grades. We also theorized that the relationships among these factors would be moderated by student racial/ethnic characteristics, such that Black students would be more likely to demonstrate a stronger, more positive relationship between reported opportunities for collaboration, perceptions of their classroom experiences, and positive student outcomes.

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Exhibit 2. Theorized Effect of Collaboration on Outcomes in Student-Centered Classrooms

Contextual Factors (including school and teacher)

High-Quality Collaborative Opportunities

Moderated by Student Race/Ethnicity

Students' Classroom Experience
- Peer support
- Expectations for learning
- Learning from and with peers
- Personalization

Outcomes Areas

Dispositions and Mindsets
- Engagement
- Intrinsic motivation
- Self-efficacy

Academic
- Rates of school attendance
- Grades in core courses

Research Questions

The study was designed to address three research questions:

1. What are the relationships between opportunities for collaboration, classroom experiences, and outcomes, particularly for Black students?

2. To what extent do students have opportunities to participate in high-quality collaborative learning experiences?

3. What contextual, school-level factors do teachers identify as helping or hindering their ability to provide opportunities for high-quality collaboration in diverse, student-centered classrooms?

Study Methods

To address our research questions, we designed a descriptive and correlational study to explore the extent to which opportunities for high-quality collaboration were associated with positive perceptions of the classroom environment and with outcomes, particularly for Black students. This section presents a description of our study methods.

School Sites

Our study had an explicit focus on collaboration and the personalization of student learning. Our four schools were purposefully recruited to meet the following selection criteria:[b]

- **School Model:** Selected schools had to embrace a student-centered learning model that had been implemented for at least two years and included:

  - a focus on personalization including one or more of the following: use of personalized or individualized learning plans for all students, learner profiles, or advisories (advisories could be individual or small group).

  - regular opportunities for student collaboration, at least twice monthly, in which students were expected to work as part of a group or team within their courses on a shared project or assignment that counted for credit and required more than one class period to complete.

  - a diverse student population including at least 20 percent Black, Non-Hispanic and 20 percent White, Non-Hispanic students. Our final school sample met these criteria, as shown in Exhibit 3.

- **Governance and Configuration:** Public high schools serving students in Grades 9–12 (schools could be charter, magnet, or other publicly funded schools of choice available to all students, but they could not have selective admission criteria).

- **School Size:** Our preferred enrollment for recruitment was 320–1,600 students in Grades 9–12. The final school sample had an average enrollment of 872 students, ranging from 419 to 1,201.

- **Location:** We initially targeted only schools in New England. However, we ultimately expanded our geographic focus to recruit sites from New England, the Midwest, and the Southeast.

We recruited four sites that all satisfied the selection criteria. Exhibit 3 and Exhibit 4 provide an overview of the characteristics of the four participating schools.

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[b] We determined whether schools met our selection criteria by reviewing the school website and other materials describing their model, and by interviewing school leaders.

Exhibit 3. Characteristics of Participating School Sites

Site	Type	Total Approximate Yearly Enrollment	Location	Student-Centered Model Meets Criteria	Student Demographics Meet Criteria
1	Public, comprehensive	1,200	Southeast	Yes	Yes
2	Public, charter	670	Midwest	Yes	Yes
3	Public, comprehensive	1,200	Southeast	Yes	Yes
4	Public, magnet	400	New England	Yes	Yes

Exhibit 4. Racial/Ethnic Composition of Participating School Sites
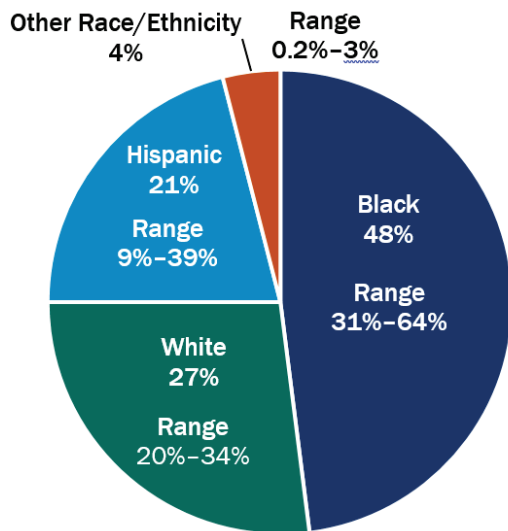
Exhibit 5. Self-Reported Racial/Ethnic Characteristics of Student Survey Sample
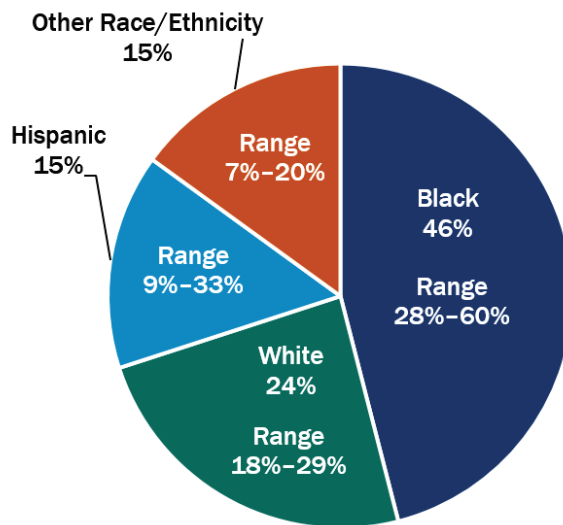
Student Sample

All students attending the four schools were eligible to participate in the study.[c] Student data were collected from three sources: online student surveys, focus groups, and demographic and academic records, which were provided for all students who completed the survey. Overall, 892 consented students participated in the study (see Exhibit 6). As shown in Exhibits 4 and 5, the racial/ethnic characteristics of the survey sample generally reflected the racial/ethnic composition of the participating schools.

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[c] Only students whose parents provided written consent were permitted to participate in data collection. In one of the sampled schools, participation in the study was covered under the annual permission that parents gave for their students to participate in educational research.

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Exhibit 6. Student Sample by Data Source

	Students in Survey	Survey, Mathematics	Survey, ELA	Black Focus Group	Mixed-Race Focus Group	
Total	892	432	429	8	4 (n= 26)	4 (n = 26)
		869		8 (n = 52)		
Range	175–312 per school	79–157	62–155	No range	No range	
		149–312				

Teacher Sample

Data were collected from, and about, classroom teachers from three sources: online teacher surveys, teacher interviews, and observations made during classroom visits to teachers who participated in interviews. Overall, 138 teachers participated in the study (see Exhibit 7).

Exhibit 7. Teacher Sample by Data Source

	Survey, All Core Subjects	Survey, Mathematics	Survey, ELA	Teacher Interviews, Mathematics	Teacher Interviews, ELA	Classroom Visits, Mathematics	Classroom Visits, ELA
Total number of teachers	138	29	25	14	14	14	16
Range	17–56 per school	2–11 per school	4–10 per school	2–4 per school	2–4 per school	2–5 per school	4 per school

Study Measures and Data Collection

Measures

As outlined in our theoretical model (Exhibit 2) our study sought to measure three areas: high-quality collaboration, the classroom environment, and outcomes. As shown in Exhibits 8, 9 and 10, each of these three measures included multiple components.

Exhibit 8. Components of High-Quality Collaborative Opportunities

Structural Quality	1. **Student-centered, culturally responsive activities:** The extent to which collaborative activities are authentic, problem-focused, and reflect students' interests, cultural background, and lived experiences.
	2. **Group interdependence:** The extent to which collaborative activities require students to work together to be successful.
	3. **Group norms and task clarity:** The extent to which collaborative activities have clearly stated objectives and instructions for how students are to work collaboratively.
	4. **Balanced group composition:** The extent to which the composition of collaborative groups is balanced for race, gender, and ability, and for students that groups include other students they feel comfortable working with.
Dynamic Quality	5. **Responsive, respectful interactions:** The extent to which students listen to and respond to one another respectfully and include others in group discussions and work.
	6. **Constructive exchange:** The extent to which students engage in the frequent and substantive exchange of ideas and opinions, build off one another's ideas, and explore areas of disagreement.
	7. **Shared leadership and decision making:** The extent to which students share in the responsibility for making decisions and completing group tasks.
	8. **Perceived inclusion:** The extent to which students feel comfortable with peers and accepted within the group.

Exhibit 9. Student Perceptions of the Classroom Environment

Social-Emotional Support and Connection	1. **Perceived peer support:** Students feel recognized, included, and emotionally supported by peers.
	2. **Perceived microaggression:** Students experience subtle verbal and behavioral slights or indignities that they feel are disrespectful or derogatory to their race, ethnicity, or gender.
	3. **Social comparison concerns:** Students compare themselves to their peers and experience doubt about their group status and ability to perform as well as their peers.
High Expectations for Learning	4. **Teacher expectations for learning:** Students believe that teachers set high expectations for their learning and have confidence that they will succeed.
	5. **Peer support for learning:** Students feel that their classroom peers offer them academic help and feedback.
Personalization	6. **Perceived teacher support:** Students believe that their teacher understands and supports their individual needs as a learner and is culturally sensitive.
	7. **Personal learning needs are met:** Students believe that classroom experiences are tailored to their interests and needs.

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Exhibit 10. Students' Mind-Sets and Dispositions

Engagement	1. **Emotional engagement:** Students report the extent to which they feel emotionally invested, having a personal association with and an overall positive feeling about their learning and classroom tasks.
	2. **Behavioral engagement:** Students report the extent to which they fully participate in class, put forth effort, and adhere to classroom norms.
Intrinsic Motivation	3. **Task valuing:** Students report the extent to which classroom tasks have meaning and are relevant to their learning and future goals.
	4. **Mastery orientation:** Students report the extent to which they feel driven to genuinely learn, deepen their understanding, and improve their skills.
Self-Efficacy	5. **Academic self-efficacy:** Students report the extent to which they feel they have the capacity to succeed academically.
	6. **Social self-efficacy:** Students report the extent to which they believe they have the capacity to succeed socially in the classroom.

Data Sources

Study data were collected through a range of sources, including the following:

■ Teacher surveys

■ Student surveys

■ Student focus groups

■ Teacher interviews

■ Classroom observations

■ Student demographic and academic records

Most study data were collected during the spring of 2017. Teacher and student surveys were administered online. The remaining data (from teacher interviews, student focus groups, and classroom observations) were collected during site visits of a day and a half made to each of the four participating schools. During the summer of 2017, districts and schools provided student demographic and academic data for the 2016–17 school year for all consented students. The following section presents a brief description of each of the study measures and an overview of the data collection procedures. Details on study measures and data collection procedures are included in the Technical Appendix. Copies of the student and teacher survey instruments and construct maps showing items for each measurement area are available here: Student Survey Construct Map and Teacher Survey Construct Map.

Analysis of Study Data

To answer our three research questions, we used both quantitative and qualitative approaches to analyze our data. Exhibit 11 shows the analytic approaches used, by method and data source.

Exhibit 11. Approaches to Analyzing Quantitative and Qualitative Data

Analytic Approach	Data Sources	Types of Analyses
Qualitative	• Teacher interviews • Student focus groups	• Coding of emergent themes • Frequencies of coded excerpts to assess the strength of identified themes • Cross-source (e.g. focus groups, interviews and classroom observation) analyses to identify themes with strongest sources of evidence and refine themes • Organization of thematic findings by research question
Quantitative	• Teacher surveys • Student surveys • Student demographic, grades, and attendance data	• T-tests • Ordinary least squares (OLS) regression • Chi square • Correlations • Exploratory factor analyses • Structural equation modeling
	• Classroom observations	• Descriptives (e.g., averages/ranges) • Analysis of covariance (ANCOVA)

For details about our analytic methods, please refer to the Technical Appendix.

Study Findings

	The study sought to answer three questions:
1	What are the relationships between opportunities for collaboration, classroom experiences, and outcomes, particularly for Black students?
2	To what extent do students have opportunities to participate in high-quality collaborative learning experiences?
3	What contextual, school-level factors do teachers identify as helping or hindering their ability to provide opportunities for high-quality collaboration in diverse, student-centered classrooms?

Our analyses of study data included an in-depth examination of data within each data source and an examination of data across sources—to identify cross-cutting themes, to document the breadth of evidence supporting each result, and, finally, to synthesize these results to form key findings. Our set of 27 key findings are organized by our three main question areas and associated subquestions. These findings, along with the evidence supporting these results, are as follows.

? Research Question 1: What are the relationships among opportunities for collaboration, classroom experiences, and outcomes, particularly for Black students?

Research Question 1 was at the heart of our study. The aim of this question was to explore the extent to which high-quality collaborative opportunities were associated with positive classroom experiences and, in turn, with positive outcomes for students. The study was particularly focused on exploring the extent to which the relationships among these factors differed across racial and ethnic groups, particularly for Black students.[d] See Exhibits 8, 9, and 10 for descriptions of these measures.

We divided this research question into three subquestions:

1a. What are the relationships among high-quality collaboration, perceptions of the classroom environment, and outcomes for all students?

1b. What are the relationships among high-quality collaboration, perceptions of the classroom environment, and outcomes for Black students?

1c. To what extent did the relationships among high-quality collaboration, perceptions of the classroom environment, and outcomes differ for Black and White students?

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[d] Student surveys asked students to self-identify their race. Our analyses of racial/ethnic differences are based on these student self-identified categories rather than district administrative data.

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To address each of these three subquestions, we analyzed data from three of the six data sources (i.e., student surveys, student demographic and academic data, and student focus groups). This resulted in the identification of 16 key findings related to Research Question 1. A summary of the key findings and the evidence supporting these results is presented in the following sections.

1a. What are the relationships among high-quality collaboration, perceptions of the classroom environment, and outcomes for all students?

Research Question 1: All Students—Big Takeaways

For all students ...

- High-quality collaboration was strongly and positively linked to students' perceptions of the classroom environment.
- High-quality collaboration was strongly and positively linked to all six measured mind-set and dispositional outcomes.
- There was a weak but positive and significant relationship between high-quality collaboration and grades.
- The relationship between high-quality collaboration and academic grades was influenced by several of the mind-set and dispositional outcomes.
- Perceptions of the classroom environment partially explained the relationship between high-quality collaboration and mind-set/dispositional outcomes and grades.
- Reports of high-quality collaborative experiences were positively and strongly associated with students' perceptions of personalization—and personalization, in turn, was strongly associated with outcomes.

Our first subquestion focused on the relationships among collaborative opportunities, perceptions of the classroom environment, and outcomes for all students. To answer this question, we analyzed data from student survey responses and academic data[e] and identified the following key findings for **all** students.

For the study, the construct of high-quality collaboration was comprised of eight subscales associated with the structural and dynamic elements of collaboration. Our theory posited that students who had opportunities for high-quality collaboration would be more

What is a construct?

The term "construct" is used to refer to an aspect of classroom practice, student experience, or student mind-set or dispositional area that is sufficiently complex that it cannot be measured accurately by using a single survey item.

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[e] We also included student demographic data in these analyses. This allowed us to control for student characteristics (e.g., gender, grade, English language learner status) so that we could more accurately measure our factors of interest without the influences of these other variables.

likely to adopt more positive perceptions of the classroom environment in three domains: social-emotional support and connection, high expectations for learning, and personalization.

To test this theory, we examined the strength of the direct relationships between student reports of high-quality collaboration and each of the seven classroom environment measures within these three classroom environment domains, after controlling for student demographic information, grade level, and the school that students attended.

This finding provides evidence to confirm the first part of our theory—that if students report having high-quality collaborative experiences, they are more likely to also report positive perceptions of their classroom.

As shown in Exhibit 12, the results of these analyses showed that for **all students, high-quality collaboration was strongly and positively linked to students' perceptions of the classroom environment.** We found a significant relationship between student reports of high-quality collaboration and positive perceptions of the classroom environment in six of the seven classroom environment areas. For the seventh area, "social comparison concerns," (i.e., students experiencing doubt about their group status and ability to perform as well as their peers), we expected a negative relationship. In other words, we expected that students with high-quality collaborative opportunities would report fewer social comparison concerns. The results of our analyses confirmed the direction of this expected relationship. This finding provides evidence to confirm the first part of our theory: If students report having high-quality collaborative experiences, they are more likely to also report positive perceptions of their classroom.

Exhibit 12. Strength of Relationships Between High-Quality Collaboration and Perceptions of Classroom Environment
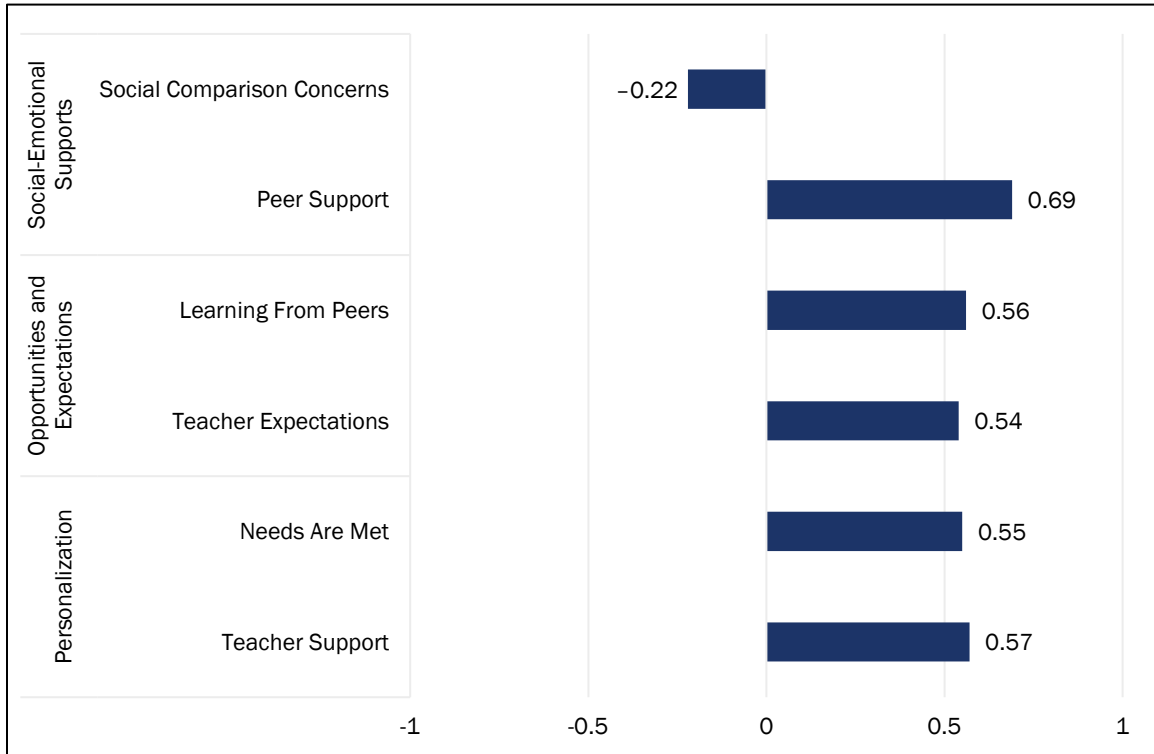
Note. Relationships between high-quality collaboration and classroom experiences are expressed as standardized effects and can be interpreted in terms of standard deviations (e.g., an increase of 1.0 standard deviations in high-quality collaboration is associated with an increase of 0.69 standard deviations in peer support). The relationship between high-quality collaboration and social comparison concerns is negative: an increase of 1.0 standard deviations in high-quality collaboration is associated with a decrease of 0.22 standard deviations in social comparison concerns. All associations are significantly different from 0 at the 0.05 confidence level.

> This finding provides evidence to confirm the second part of our theory, that if students report having high-quality experiences, they are more likely to adopt more positive mind-sets and dispositions.

Our initial theory further posited that students who had opportunities for high-quality collaboration would also be more likely to demonstrate positive mind-sets and dispositions in three domains: engagement, intrinsic motivation, and self-efficacy. To test this theory, we conducted another set of structural equation models examining the direct relationship between student reports of high-quality collaboration and six mind-set and dispositional outcomes. As shown in Exhibit 13, the results of these analyses showed that for **all students, high-quality collaboration was strongly and positively linked to all six measured mind-set and dispositional outcomes.** Among these outcome areas, the relationship between high-quality collaboration and student self-reports of social self-efficacy was particularly strong. This finding was further supported by student reports during focus groups. When asked how they felt they benefitted from collaboration in their classrooms, students from five of the

eight focus groups mentioned that collaborative group work allowed them to develop and exercise their social skills of working with others. This finding confirms the second part of our initial theory, that if students report having high-quality experiences, they are more likely to adopt more positive mind-sets and dispositions.

Exhibit 13. Strength of Relationships Between High-Quality Collaboration and Mind-Set and Dispositional Outcomes and Grades

Note. Relationships between high-quality collaboration and student outcomes are expressed as standardized effects and can be interpreted in terms of standard deviations (e.g., an increase of 1.0 standard deviations in high-quality collaboration is associated with an increase of 0.61 standard deviations in social self-efficacy). All associations are significantly different from 0 at the 0.05 confidence level.

Finally, our initial theory posited that students who had opportunities for high-quality collaboration would be more likely to show positive academic outcomes, such as good grades and school attendance.

To test this theory, we examined the direct relationships between student reports of high-quality collaboration and student school attendance and course grades in mathematics and English language arts. To ensure that the me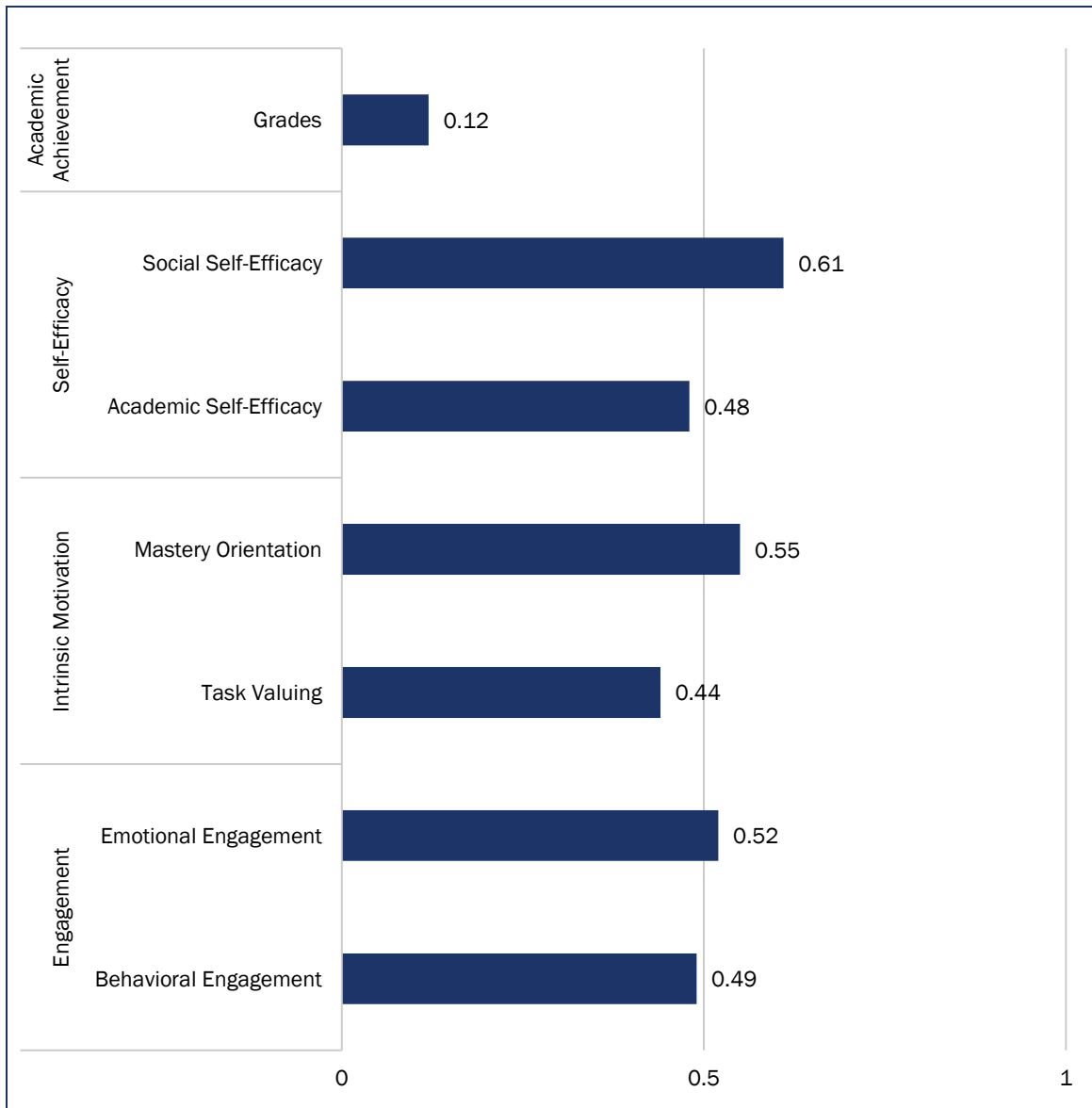asured relationship between high-quality collaboration and current grades was not due to a students' overall academic trajectory, we included statistical controls in our analyses to control for students' prior grades. As shown in Exhibit 8, the results of these analyses for all students showed **a weak but positive and significant relationship between high-quality collaboration and current grades, after accounting for prior grades.** As shown in Exhibit 15, the standardized regression coefficient between high-quality collaboration and grades was 0.12. We did not find any relationship between student absenteeism and high-quality collaboration.

The final step in our analyses aimed to test our theory that the relationship between high-quality collaboration and outcomes might depend on students' classroom experiences. In other words, our theory was that students' high-quality collaborative experiences would lead to positive perceptions of the classroom and that these perceptions, in turn, would contribute to positive outcomes for students. Exhibits 14a and 14b help illustrate the theorized paths between high-quality collaboration and outcomes.

In Exhibit 14a, we illustrate a direct relationship between high-quality collaboration and classroom experiences, shown by the thick arrow. Exhibit 14a also shows a direct relationship between high-quality collaboration and outcomes. In Exhibit 14a, the link between high-quality collaboration and outcomes suggests that this relationship is not dependent on classroom experiences. In Exhibit 14b, we show how the direct relationship between high-quality collaboration and outcomes might depend on students' perceptions of the classroom. Exhibit 14b illustrates how high-quality collaboration might have a weak direct relationship to outcomes, shown by the thin arrow, but the strongest path to outcomes is through students' positive perceptions of the classroom, and these positive perceptions contribute to student outcomes. In other words, perceptions of the classroom might serve as a critical bridge linking high-quality collaboration to outcomes.

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Exhibit 14a. Theorized Link: High-Quality Collaboration Is Directly Linked to Outcomes, Regardless of Classroom Experiences
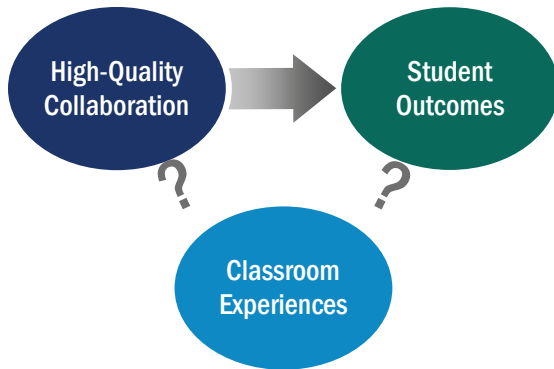
Exhibit 14b. Theorized Link: High-Quality Collaboration Is linked to outcomes, but the Relationship Is Dependent on Students' Classroom Experiences
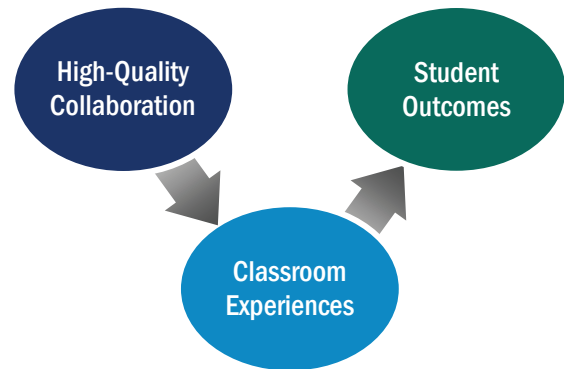
To test this theory, we examined the network of relationships among the three factors of high-quality collaboration, perceptions of the classroom environment, and outcomes. The first set of analyses examined the relationships associated with grades. We found that **for all students, the relationship between high-quality collaboration and academic grades was influenced by several of the mind-set and dispositional outcomes.** Mind-sets and dispositions served as the critical bridge between high-quality collaboration and grades (see Exhibit 15). The three factors of high-quality collaboration, mind-sets and dispositions, and grades were interconnected.

Exhibit 15. Relationships Between High-Quality Collaboration (HQC) and Grades, Before and After Accounting for Mind-Set and Dispositional Outcomes
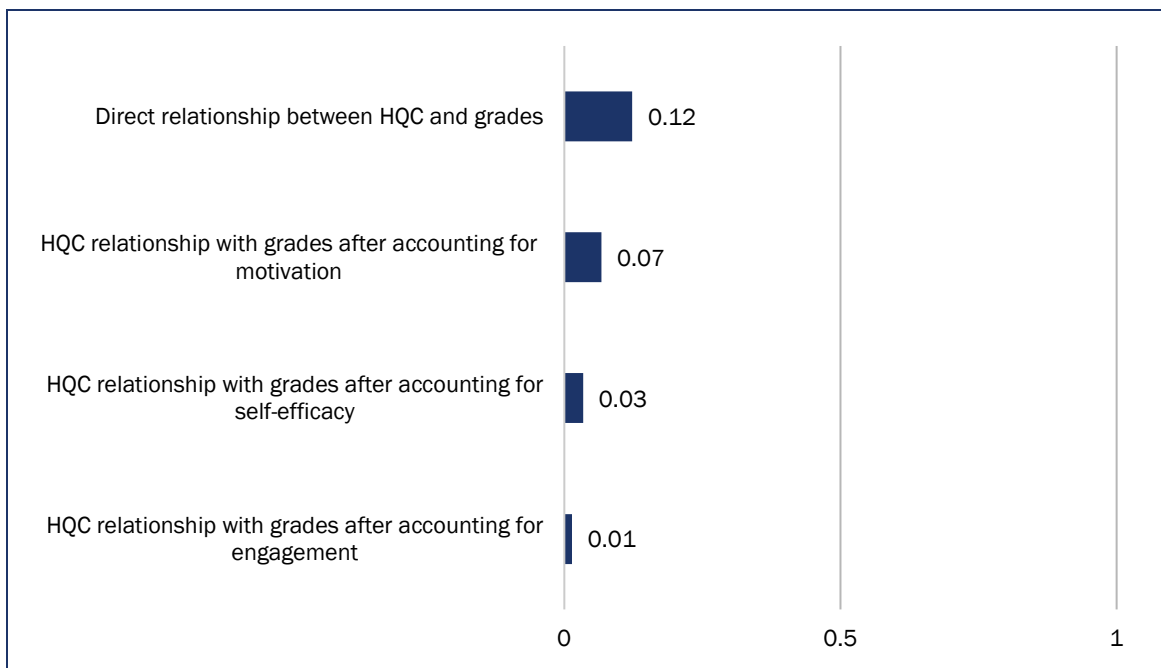
These findings provide evidence for the third part of our initial theory—that the relationship between high-quality collaborative opportunities and grades is mediated by other factors, including how students perceive their classroom environment and their mind-sets and dispositions.

We then tested the network of relationships linking high-quality collaboration and the mind-set and dispositional outcomes (see Exhibits 16 through 19). **For all students, perceptions of the classroom environment partially explained the relationship between high-quality collaboration and mind-set/dispositional outcomes and grades.** In other words, if students reported high-quality collaborative opportunities, they were likely to perceive their classrooms environments more positively and, in turn, were more likely to adopt positive mind-sets and dispositions. These three factors of high-quality collaboration, perceptions of the classroom, and mind-sets and dispositions were interconnected with students' perceptions of the classroom, serving as a critical bridge between high-quality collaboration and outcomes.

Exhibit 16. Relationships Between High-Quality Collaboration and Mind-Set and Dispositional Outcomes and Grades, Before and After Accounting for Perceptions of Personalization
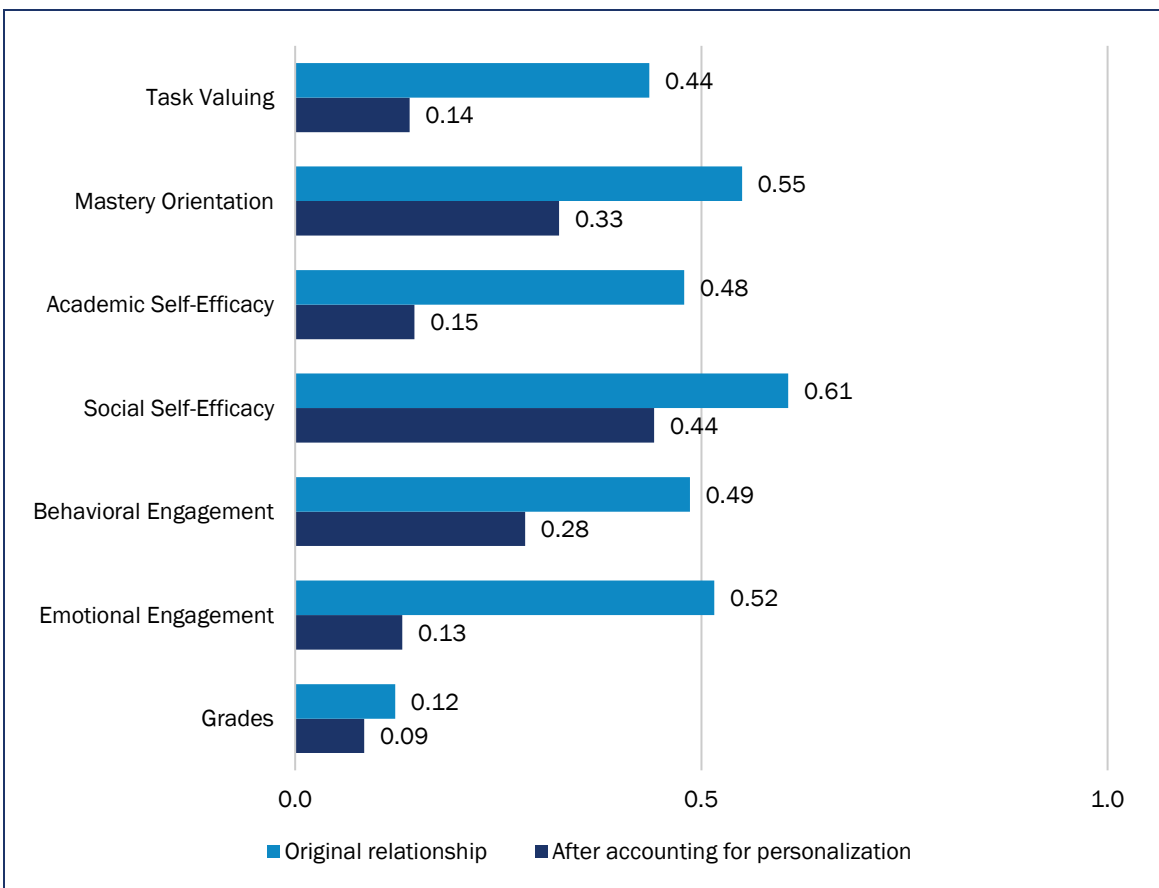
Exhibit 17. Relationships Between High-Quality Collaboration and Mind-Set and Dispositional Outcomes and Grades, Before and After Accounting for Perceptions of Teacher Expectations

Task Valuing — Original relationship: 0.44; After accounting for teacher expectations: 0.33
Mastery Orientation — Original relationship: 0.55; After accounting for teacher expectations: 0.36
Academic Self-Efficacy — Original relationship: 0.48; After accounting for teacher expectations: 0.25
Social Self-Efficacy — Original relationship: 0.61; After accounting for teacher expectations: 0.51
Behavioral Engagement — Original relationship: 0.49; After accounting for teacher expectations: 0.36
Emotional Engagement — Original relationship: 0.52; After accounting for teacher expectations: 0.39
Grades — Original relationship: 0.12; After accounting for teacher expectations: 0.09

■ Original relationship   ■ After accounting for teacher expectations

Exhibit 18. Relationships Between High-Quality Collaboration and Mind-Set and Dispositional Outcomes and Grades, Before and After Accounting for Perceptions of Social Comparison Concerns

Task Valuing — Original relationship: 0.44; After accounting for social comparison concerns: 0.44
Mastery Orientation — Original relationship: 0.55; After accounting for social comparison concerns: 0.57
Academic Self-Efficacy — Original relationship: 0.48; After accounting for social comparison concerns: 0.47
Social Self-Efficacy — Original relationship: 0.61; After accounting for social comparison concerns: 0.59
Behavioral Engagement — Original relationship: 0.49; After accounting for social comparison concerns: 0.48
Emotional Engagement — Original relationship: 0.52; After accounting for social comparison concerns: 0.50
Grades — Original relationship: 0.12; After accounting for social comparison concerns: 0.11

■ Original relationship   ■ After accounting for social comparison concerns

Exhibit 19. Relationships Between High-Quality Collaboration and Mind-Set and Dispositional Outcomes and Grades, Before and After Accounting for Perceptions of Learning From and With Peers

	Original relationship	After accounting for learning from and with peers
Task Valuing	0.44	0.34
Mastery Orientation	0.55	0.44
Academic Self-Efficacy	0.48	0.36
Social Self-Efficacy	0.61	0.20
Behavioral Engagement	0.49	0.39
Emotional Engagement	0.52	0.44
Grades	0.12	0.10
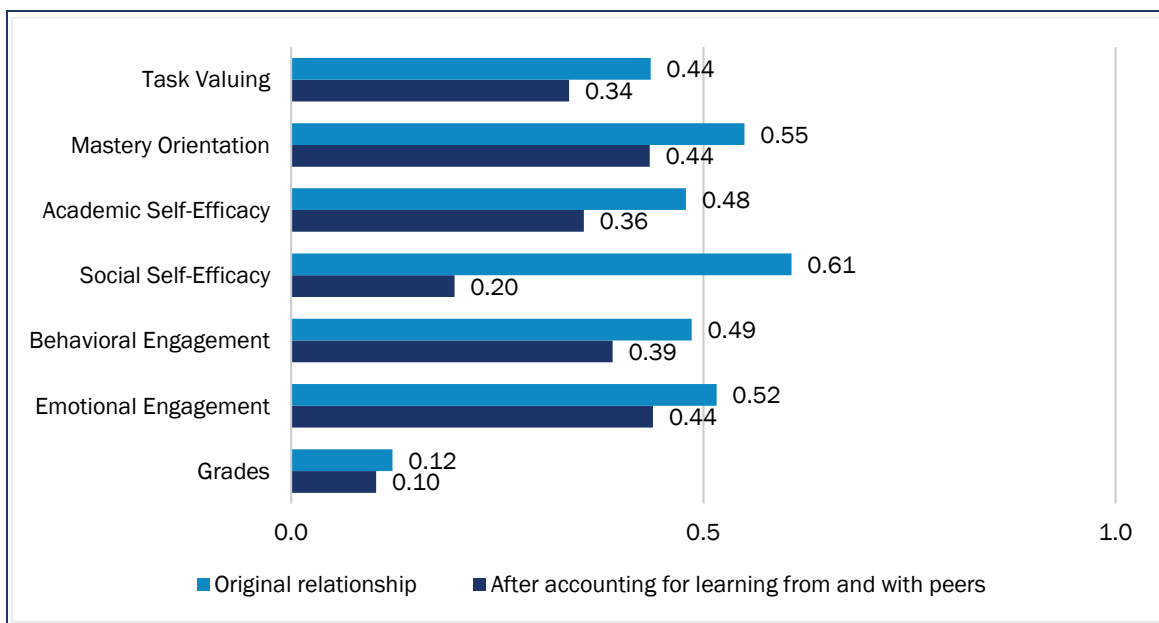
Some aspects of the classroom environment influenced the relationship between high-quality collaboration and mind-set and dispositional outcomes more than others. **For all students, reports of high-quality collaborative experiences were positively and strongly associated with students' perceptions of personalization—and personalization, in turn, was strongly associated with outcomes.**

In fact, much of the relationship between high-quality collaboration and mind-set and dispositional outcomes could be explained by whether students felt that their classroom learning was personalized, and in particular, whether their learning needs were being met. As illustrated in Exhibit 16, this finding indicates that students' perceptions of personalization were not only a critical link to outcomes for students but also served as a critical bridge between high-quality collaboration and outcomes. Although accounting for other classroom experience measures did not consistently reduce the direct relationship between high-quality collaboration and student outcomes to such a large extent, learning from and with peers explained 72 percent of the relationship between high-quality collaboration and social self-efficacy (see Exhibit 19). In other words, increases in high-quality collaboration were associated with increases in social self-efficacy, but this relationship depended almost entirely on students' perceptions of learning from and with peers.

High-quality collaboration was strongly and positively associated with students' perceptions of the classroom environment and with their mind-sets and dispositions, including engagement, intrinsic motivation, and self-efficacy. We also found that reports of high-quality collaborative opportunities were significantly and positively associated with students' grades, although this relationship was weaker.

Exhibit 20. Illustration of Finding That High-Quality Collaboration and Mind-Set and Dispositional Outcomes Were Dependent on Students' Perceptions of Personalization in the Classroom
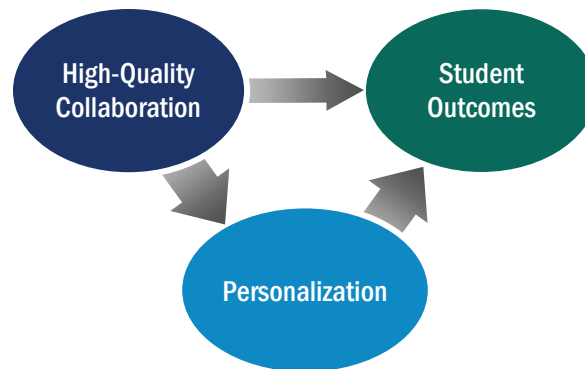
1b. What are the relationships among high-quality collaboration, perceptions of the classroom environment, and outcomes for Black students?

Research Question 1: Black Students: Big Takeaways

- High-quality collaboration was positively associated with perceptions of the classroom environment by Black students, similar to all students.
- High-quality collaboration was strongly and positively associated with a range of mind-set and dispositional outcomes for Black students, similar to all students.
- High-quality collaboration was positively, weakly, and significantly associated with grades for Black students.
- For Black students, similar to all students, the relationship between high-quality collaboration and grades was dependent on mind-set and dispositional outcomes.
- Black students' perceptions of personalization, particularly whether their needs were met, was key to explaining the relationship between high-quality collaboration and a range of outcomes.

An essential focus of our study was to better understand the collaborative experiences of Black students and the extent to which the relationship between collaborative experiences, perceptions of the classroom, and outcomes might differ for these students.

To address this question, we analyzed the survey data from student respondents who self-identified as Black. Similar to our approach for examining relationships for all students, we examined the strength of the direct relationships between Black students' reports of high-quality collaboration and each of the seven classroom environment measures within the three classroom environment domains and identified five key findings.

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As shown in Exhibit 21, the results of these analyses showed that **high-quality collaboration was positively associated with perceptions of the classroom environment by Black students, similar to all students.**

Exhibit 21. Strength of Relationships Between High-Quality Collaboration and Perceptions of Classroom Environment Among All Students and Among Black Students
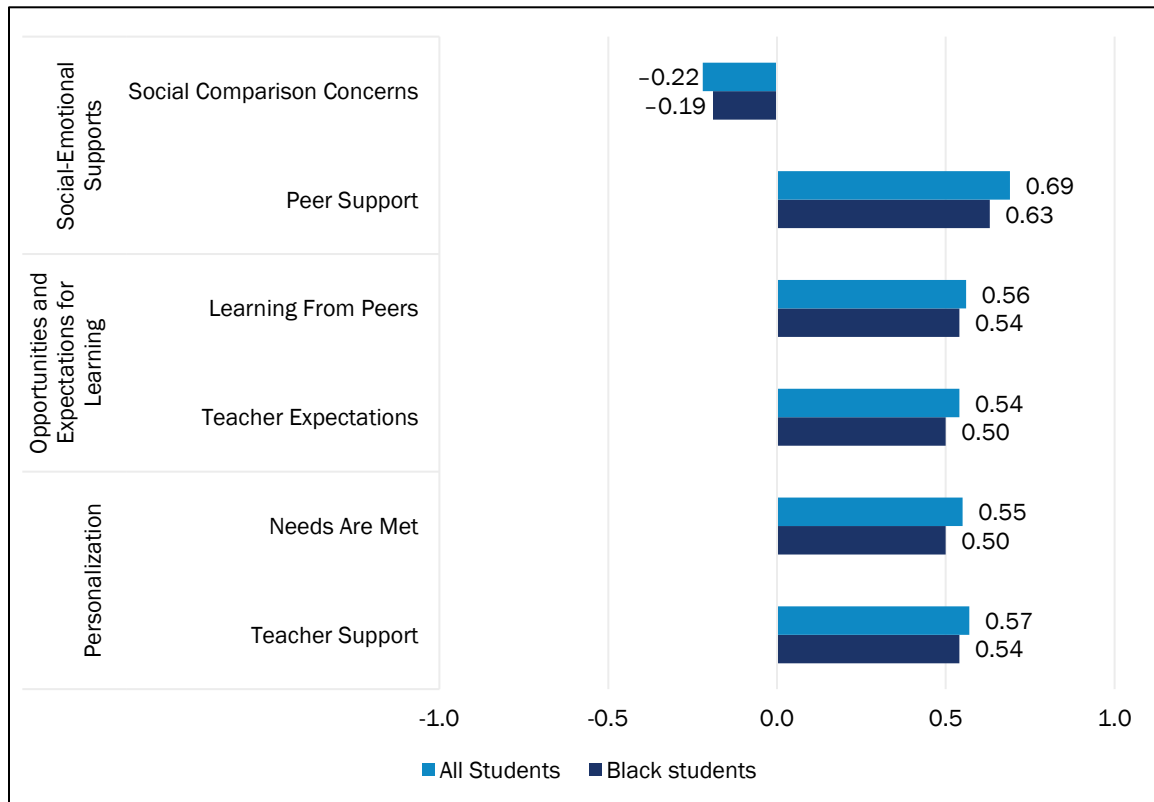
Our next set of analyses examined whether Black students who had opportunities for high-quality collaboration would be more likely to demonstrate positive mind-sets and dispositions in three domains: engagement, intrinsic motivation, and self-efficacy. To test this theory, similar to the analyses we conducted for all students, we conducted a set of structural equation models, this time examining the direct relationship between Black student reports of high-quality collaboration and their responses to survey items measuring each of the six mind-set and dispositional outcomes. As shown in Exhibit 22, the results of these analyses again showed similar results for Black students and all students. **High-quality collaboration was strongly and positively associated with a range of mind-set and dispositional outcomes for Black students, similar to all students.** Four classroom features—personalization, teacher expectations, learning with and from peers, and peer support—were strongly associated with mind-set and dispositional outcomes for Black students.

Exhibit 22. Strength of Relationships Between High-Quality Collaboration and Mind-Set and Dispositional Outcomes Among All Students and Among Black Students
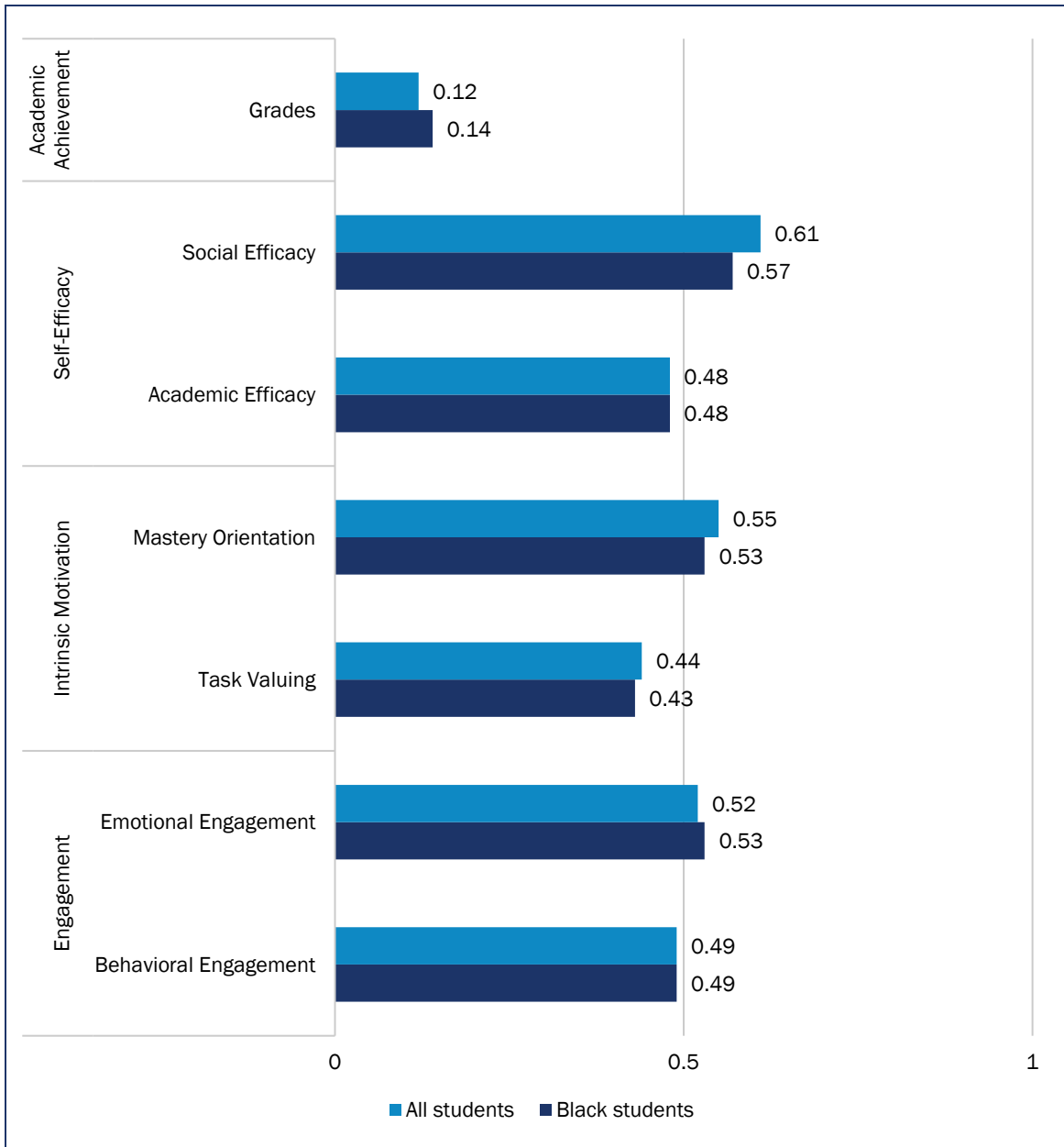
Finally, our initial theory posited that Black students who had opportunities for high-quality collaboration would be more likely to show positive academic outcomes, such as higher grades and school attendance. To test this theory, we conducted a set of structural equation models, similar to the analyses conducted for all students. We examined the direct relationship between Black student reports of high-quality collaboration and Black student school attendance and course grades in mathematics and English Language arts (ELA) during the 2016–17 school year. To ensure that the measured relationship between high-quality collaboration and current grades was not due to a student's overall academic trajectory, we controlled for Black students' prior grades, so these analyses

examine the relationship between high-quality collaboration and current grades apart from effects of prior grades. **High-quality collaboration was positively, weakly, and significantly associated with grades for Black students.** The standardized regression coefficient of 0.14 was similar to what was found for all students (0.12).

> For Black students, mind-set and dispositional outcomes served as a critical bridge between high-quality collaboration and grades.

Finally, similar to the analyses we conducted with all students, our last step was to explore the networks of relationships among these factors for Black students. As shown in Exhibit 23, we found that **for Black students, similar to all students, the relationship between high-quality collaboration and grades was dependent on mind-set and dispositional outcomes.**[f] Student engagement could fully explain the relationship between high-quality collaboration and grades. In other words, engagement represented the path from high-quality collaboration to grades for Black students. A similar pattern was observed for all students.

Exhibit 23. Relationships Between High-Quality Collaboration (HQC) and Grades Among Black Students, Before and After Accounting for Mind-Set and Dispositional Outcomes

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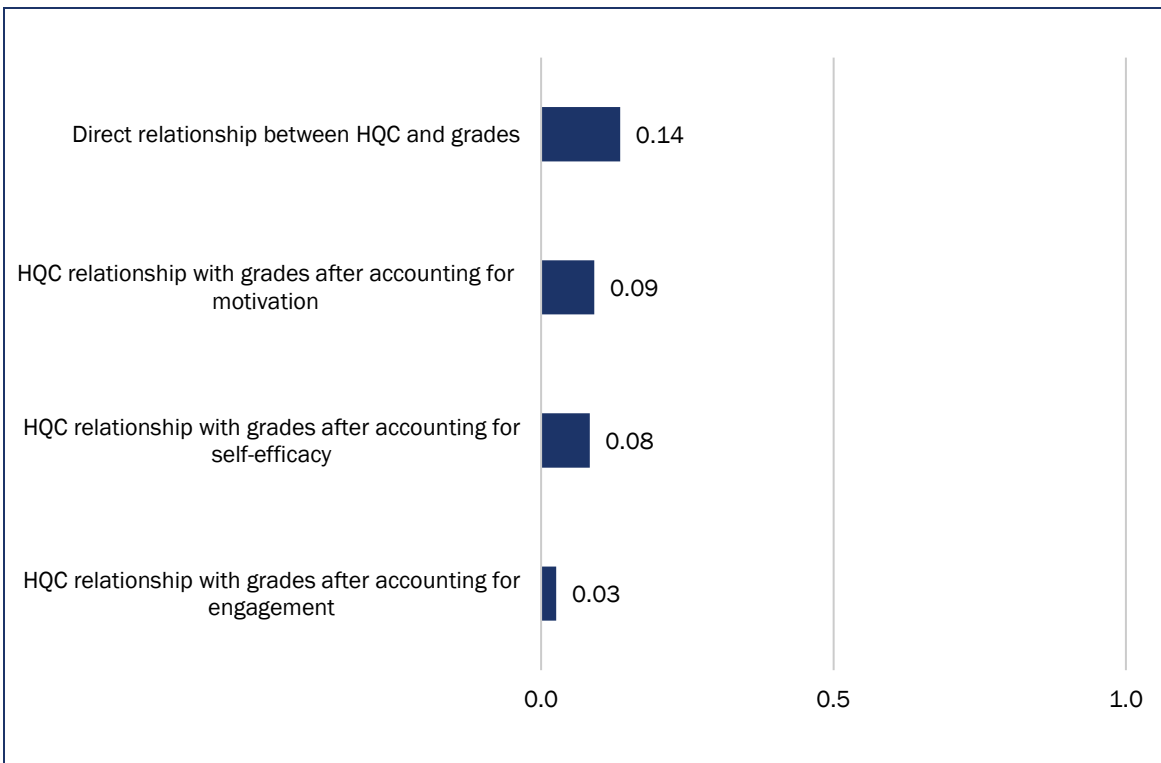
[f] Intrinsic motivation explained 50 percent of the relationship, and engagement and self-efficacy 100 percent of the relationship between high-quality collaboration and grades for Black students.

We tested the network of relationships linking high-quality collaboration and mind-set and dispositional outcomes. For Black students, perceptions of the classroom environment served as the critical bridge between high-quality collaboration and mind-set/dispositional outcomes. In other words, the relationship between high-quality collaboration and mind-set and dispositional outcomes was largely driven by Black students' perceptions of the classroom environment. Again, similar to all students, one aspect of the classroom environment more strongly influenced the relationship between high-quality collaboration and outcomes: **Black students' perceptions of personalization, particularly whether their needs were met, was key to explaining the relationship between high-quality collaboration and a range of outcomes.** This factor was key to explaining the relationship between high-quality collaboration and a range of outcomes for Black students, particularly emotional engagement, academic self-efficacy, and task valuing.

Exhibit 24. Relationships Between High-Quality Collaboration and Mind-Set and Dispositional Outcomes Among Black Students, Before and After Accounting for Perceptions of Personalization

Bar chart showing relationships for each outcome. Values:

Outcome	Original relationship	After accounting for personalization
Task Valuing	0.43	0.18
Mastery Orientation	0.53	0.38
Academic Self-Efficacy	0.48	0.21
Social Self-Efficacy	0.57	0.41
Behavioral Engagement	0.49	0.32
Emotional Engagement	0.53	0.21
Grades	0.14	0.12

■ Original relationship   ■ After accounting for personalization
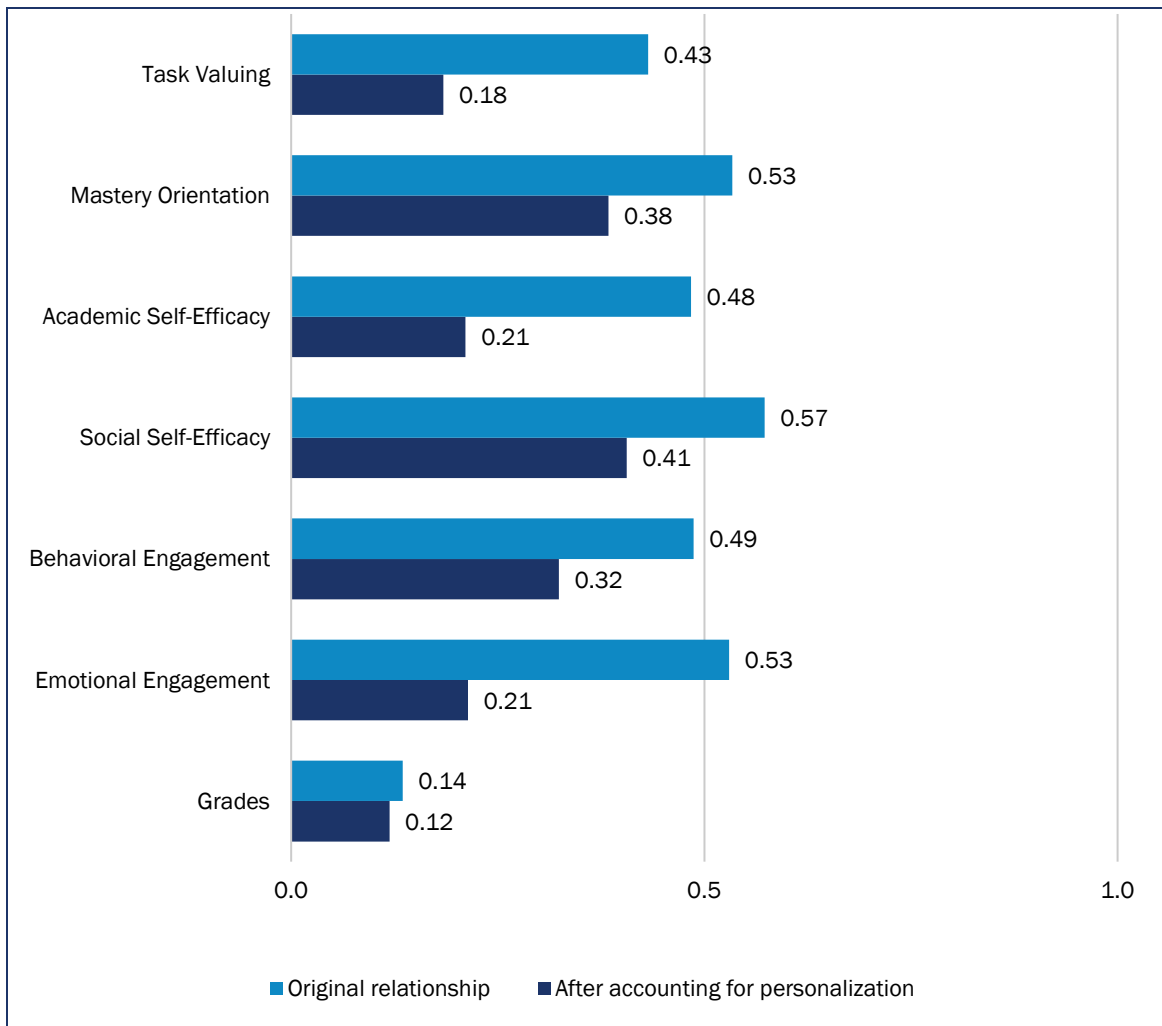
Exhibit 25. Relationships Between High-Quality Collaboration and Mind-Set and Dispositional Outcomes Among Black Students, Before and After Accounting for Perceptions of Teacher Expectations

Outcome	Original relationship	After accounting for teacher expectations
Task Valuing	0.43	0.38
Mastery Orientation	0.53	0.42
Academic Self-Efficacy	0.48	0.31
Social Self-Efficacy	0.57	0.49
Behavioral Engagement	0.49	0.44
Emotional Engagement	0.53	0.45
Grades	0.14	0.10
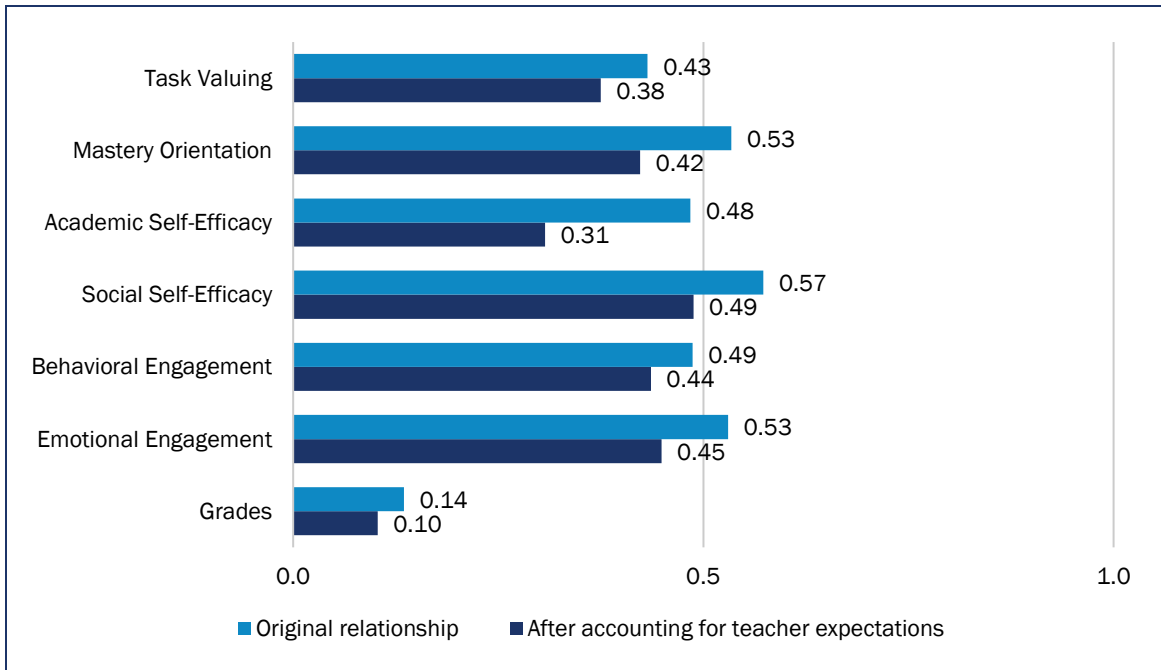
Exhibit 26. Relationships Between High-Quality Collaboration and Mind-Set and Dispositional Outcomes Among Black Students, Before and After Accounting for Perceptions of Social Comparison Concerns

Outcome	Original relationship	After accounting for social comparison concerns
Task Valuing	0.43	0.45
Mastery Orientation	0.53	0.55
Academic Self-Efficacy	0.48	0.48
Social Self-Efficacy	0.57	0.57
Behavioral Engagement	0.49	0.49
Emotional Engagement	0.53	0.54
Grades	0.14	0.14
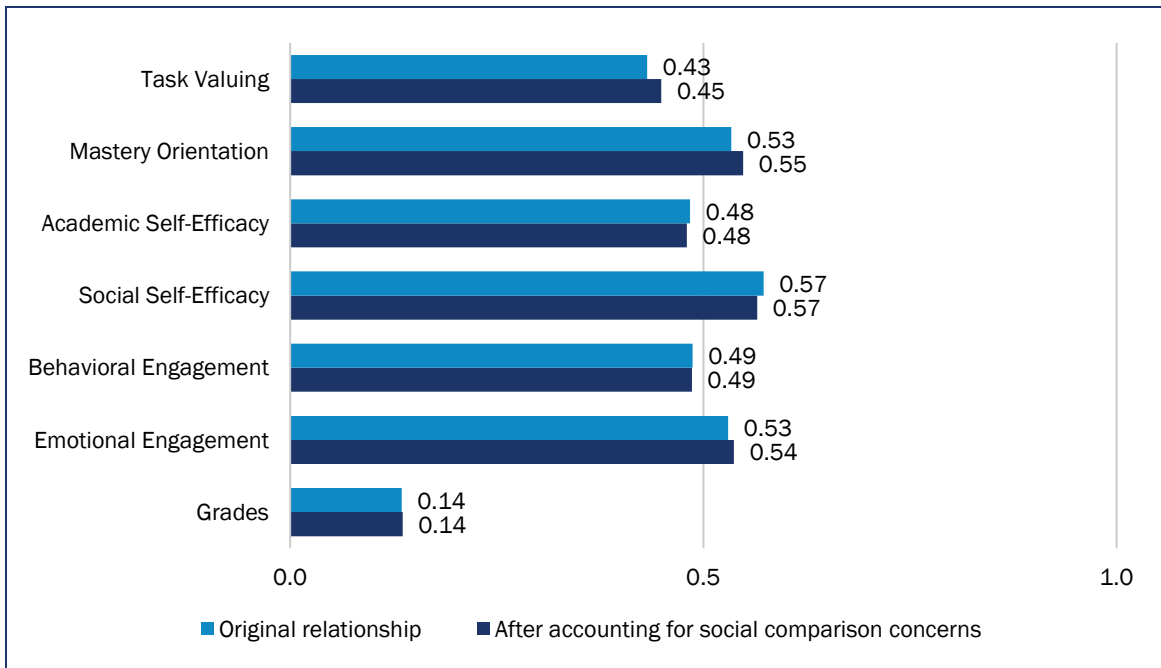
Exhibit 27. Relationships Between High-Quality Collaboration and Mind-Set and Dispositional Outcomes Among Black Students, Before and After Accounting for Perceptions of Learning From and With Peers

Task Valuing: 0.43 / 0.36
Mastery Orientation: 0.53 / 0.48
Academic Self-Efficacy: 0.48 / 0.35
Social Self-Efficacy: 0.57 / 0.16
Behavioral Engagement: 0.49 / 0.38
Emotional Engagement: 0.53 / 0.51
Grades: 0.14 / 0.13

■ Original relationship   ■ After accounting for learning from and with peers
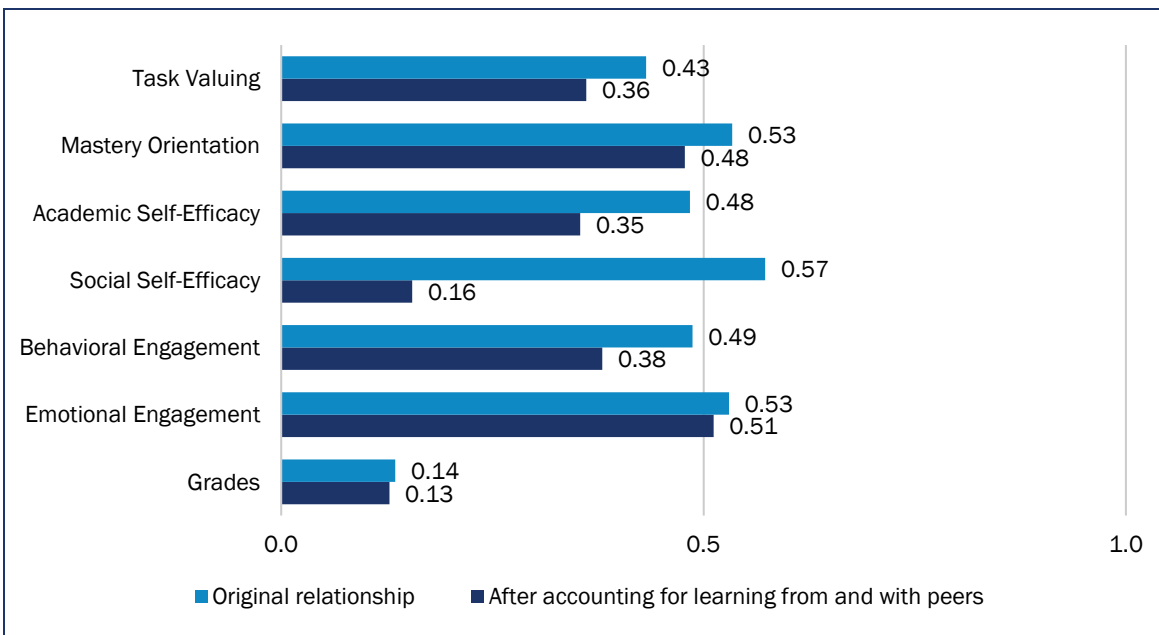
1c. To what extent did the relationships among high-quality collaboration, perceptions of the classroom environment, and outcomes differ for Black and White students?

Research Question 1: Racial/Ethnic Differences: Big Takeaways

- Black students assigned higher ratings on surveys for many aspects of their collaborative experiences than did White students.

- Student reports of high-quality collaboration were positively associated with grades for Black students, regardless of their prior academic performance. For White students, high-quality collaboration was no longer related to grades after accounting for prior academic performance.

- The strength and pattern of relationships between high-quality collaboration, perceptions of the classroom environment, and outcomes differed for Black and White students in several areas.

- Students in all-Black focus groups reported lower perceived relevance of collaborative activities; more frequent experiences of exclusion, stereotyping, and marginalization; and lower perceived support from teachers for collaborative group work than did students participating in mixed-race focus groups.

Subquestion 1c aimed to compare results for Black and White students for high-quality collaboration, perceptions of the classroom environment, and student outcomes. The results of these comparative analyses showed three key differences between Black and White students.

To explore any differences in the perceived quality of students' collaborative opportunities by race, we tested whether the average ratings assigned by Black students differed from ratings assigned by White students for each of the nine quality areas in the student survey. These statistical tests controlled for the school students attended; students' grade level, gender, ELL status, and special education status; and whether students were responding about their math or English class. In other words, these tests ensured that any racial/ethnic differences we found would be due solely to race/ethnicity and not the other student demographic factors.

As illustrated in Exhibit 28, our results showed that **Black students assigned higher ratings on surveys for many aspects of their collaborative experiences than did White students.** In fact, Black students rated the quality of collaborative opportunities higher than did White students in four areas; all of these related to the dynamic quality of collaborative opportunities. These areas included higher ratings assigned by Black students for the quality of (1) responsive, respectful interactions among students; (2) constructive exchange; (3) shared leadership and decision making; and (4) perceived inclusion. Black students also assigned higher ratings for the classroom environment measures of perceived peer support and perceived teacher support. Black students' ratings of the structural quality areas (the extent to which activities were student centered, well organized, and had a balanced composition) did not differ from those of White students.

Exhibit 28. Student Survey Rating Differences Between Black and White Students in Four Collaborative Quality Areas
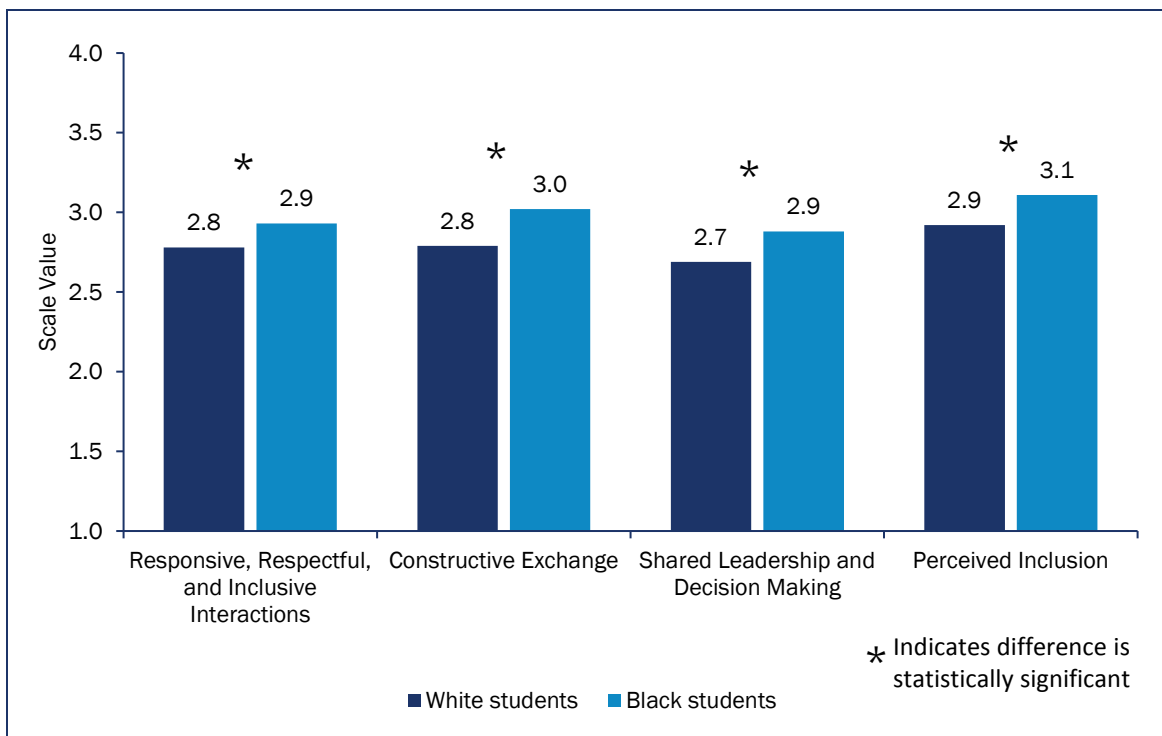
Note. Scale values indicate reported frequency of collaboration experiences, where 1 = never/rarely, 2 = some of the time, 3 = most of the time, and 4 = all of the time.

> **High-quality collaboration was positively associated with grades for Black students, regardless of their prior academic performance. For White students, high-quality collaboration was no longer related to grades after accounting for prior academic performance.**

Student reports of high-quality collaboration were positively associated with grades for Black students, regardless of their prior academic performance. For White students, high-quality collaboration was no longer related to grades after accounting for prior academic performance. After controlling for students' prior grades, we found that Black students' survey ratings of high-quality collaboration were positively and directly linked to grades.[g] Regardless of Black students' prior academic performance, having opportunities for high-quality collaboration had a positive effect on these students' grades. We did not find this same result for White students.

The strength and pattern of relationships between high-quality collaboration, perceptions of the classroom environment, and outcomes differed for Black and White students in several areas. We found that the strength of the relationship between high-quality collaboration and mind-set and dispositional outcomes was similarly positive and strong for both Black and White students.[h] However, when we conducted additional analyses to explore how high-quality collaboration was linked to outcomes, we found a few instances where patterns of relationships differed for Black and White students. For instance, as shown in Exhibit 30, for White students, teacher expectations strongly and positively influenced the relationships between high-quality collaboration and the outcomes of task valuing, mastery orientation, and academic self-efficacy. For Black students, teacher expectations had far less of an influence on the positive relationship between high-quality collaboration and these outcomes. These differences between Black and White students in the network of relationships among factors were statistically significant.

> **These findings suggest that high-quality collaboration is associated with positive outcomes for both Black and White students. However, the path from high-quality collaboration to outcomes for Black students was much less clear.**

One of the most notable differences between Black and White students was related to social self-efficacy (see Exhibits 30 and 31. Whereas relationships between high-quality collaboration and academic self-efficacy were similar for White and Black students, the relationship between high-quality collaboration and social self-efficacy was about 34 percent stronger among White students than it was among Black students. In addition, the way in which the classroom environment measure of social comparison concerns influenced the relationship between high-quality collaboration and social self-efficacy differed between Black and White students. Social comparison concerns were more strongly related to both high-quality collaboration and social self-efficacy for White students than for Black students, and therefore accounting for social comparison concerns reduced the negative relationship between high-quality collaboration and social self-efficacy more for White students than for Black students.

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[g] Showing a statistically significant but weak effect size of .14.
[h] One exception was the correlation coefficient with social self-efficacy, which was 0.73 for White students and 0.57 for Black students.

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Exhibit 29. Relationships Between High-Quality Collaboration and Mind-Set and Dispositional Outcomes Among Black and White Students, Before and After Accounting for Perceptions of Personalization
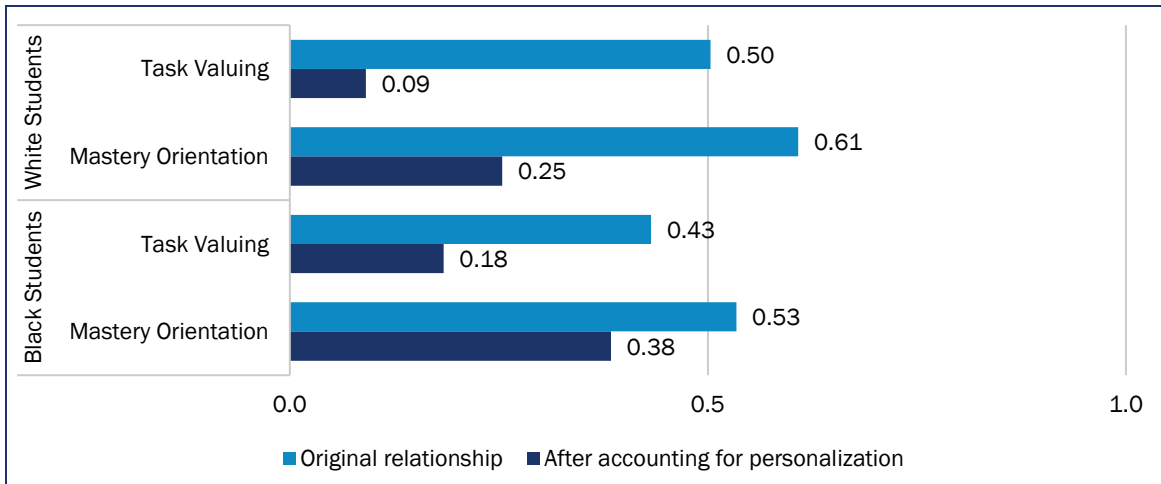
Exhibit 30. Relationships Between High-Quality Collaboration and Mind-Set and Dispositional Outcomes Among Black and White Students, Before and After Accounting for Perceptions of Teacher Expectations
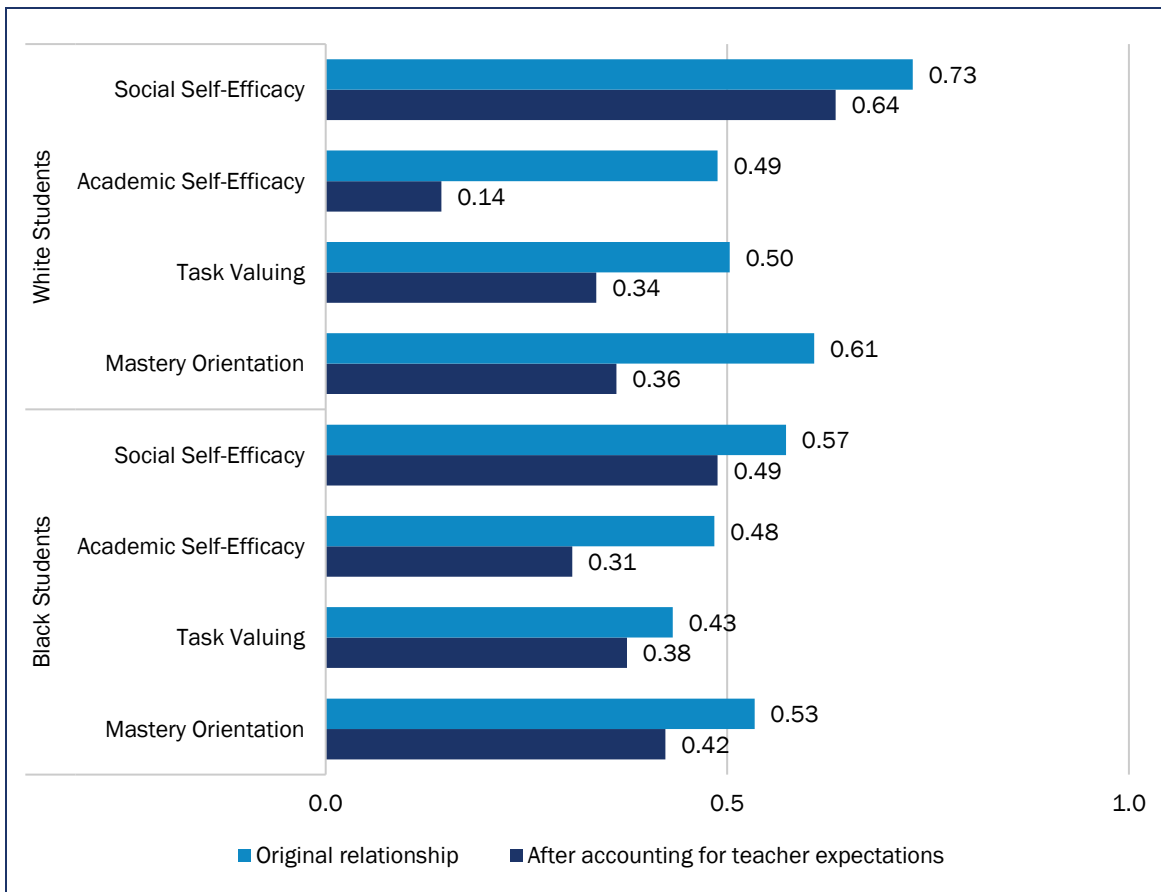
Exhibit 31. Relationships Between High-Quality Collaboration and Mind-Set and Dispositional Outcomes Among Black and White Students, Before and After Accounting for Perceptions of Social Comparison Concerns

White Students		
Social Self-Efficacy	0.73	0.67
Academic Self-Efficacy	0.49	0.48

Black Students		
Social Self-Efficacy	0.57	0.57
Academic Self-Efficacy	0.48	0.48

■ Original relationship ■ After accounting for social comparison concerns
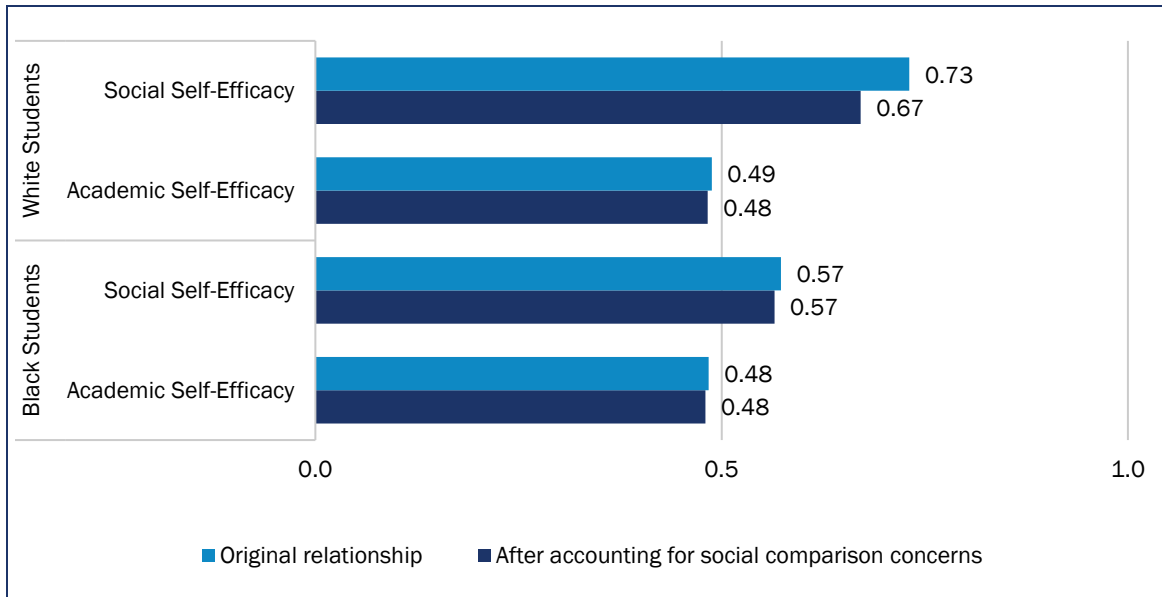
FOCUS GROUP FINDINGS: A Window into Black Students' Collaborative Experiences

Exploring Differences in Students' Collaborative and Classroom Experiences

Our survey analyses suggest that high-quality collaboration is associated with positive outcomes for both Black and White students. The results of our analyses also allowed us to clearly explain the paths from collaboration to outcomes for White students, but the path to outcomes for Black students was much less clear.

> Student reports shared during focus groups comprised solely of Black students provided rich information on students' experiences, revealing some of the ways in which Black students experienced collaboration and the classroom environment.

Student focus groups were designed to help us better understand the perspectives on collaboration of Black students and to provide an opportunity for Black students to discuss their perspectives in two different settings. At each school, one of the two focus groups included only students who self-identified as Black or African American. The other focus group at each school included students representing a mix of differing racial/ethnic groups, including Black students. The following section provides a summary of the results of our qualitative analyses using data from the eight focus groups and fifty-two students participating in our study. Student reports shared during focus groups comprised solely of Black students provided rich information on students' experiences, revealing some of the ways in which Black students in our study sample experienced collaboration and the classroom environment. Comparisons with students participating in mixed race focus groups suggest some potential differences in student experiences between these two groups. However, it is important to note that these results are based on a small sample, and, therefore, we cannot draw general conclusions about racial differences based upon these observed trends.

Focus group data were examined using qualitative analyses that sought to identify emergent themes. A comparative analysis of the themes identified in student focus group transcripts revealed three areas where the reported experiences of those students in our sample from all-Black focus groups differed from those reported by students in the mixed-race focus groups. In particular, **students in all-Black focus groups reported lower perceived relevance of collaborative activities; more frequent experiences of exclusion, stereotyping, and marginalization; and lower perceived support from teachers for collaborative group work than did students participating in mixed-race focus groups.** A summary of these three areas follows.

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Differences in the perceived personal relevance of collaborative activities. Black students participating in all-Black focus groups differed in their reports of the perceived personal relevance of collaborative activities. In response to the question "Do you find collaborative activities interesting and relevant to you?" the number of remarks made in all-Black focus groups indicating a *lack of relevance* for collaborative activities to their personal life far exceeded the number of remarks made by students participating in the mixed-race focus groups expressing a similar sentiment (20 vs. 4 remarks). In particular, some of these Black students reported that they felt that teachers and school leaders actively discouraged students from engaging in activities and conversations that focused on topics related to students of color. As one student shared,

> *You know, we don't even talk about Black Lives Matter here? …*
> *We get in trouble about that type of stuff. I think that's something important to talk about in school. We talk about the slavery, though, and the white people. We talk about that kind of stuff.*
>
> —Black Student in All Black Focus Group

Differences in experiences of exclusion, stereotyping, and marginalization. A second area where reports by Black students from all-Black focus groups differed from responses made by students in mixed-race focus groups was related to their reported experiences of exclusion, racial stereotyping, and marginalization. Black students in the Black-only focus groups differed in their verbal reports of racial stereotyping, bias, and feelings of marginalization, both during collaboration and within the classroom environment generally. Of the eight focus groups, students from three focus groups (one mixed race and two all Black) reported feelings of marginalization, exclusion, and racial stereotyping that made collaborative group work challenging. Overall, remarks related to feelings of exclusion, stereotyping, and marginalization were far more prevalent in these two all-Black focus groups than in the mixed-race focus group, with 12 student remarks expressing these feelings by students in all-Black groups versus only one student remark made in the mixed-race focus group. When discussing these experiences, remarks by Black students ranged from perceptions of explicit bias to incidents where they experienced more subtle forms of microaggression. For example, in one all-Black focus group, students shared their perception of explicit stereotyping:

> *Like, they think all Black people are just based off the hood, things that you'll see on movies, Black people that don't know anything and just want to stick to drugs and gangs. That's what they really think, that all of us just don't have any knowledge, that we have nothing to do with our lives and we don't have a career path.*
>
> —Black Student in All Black Focus Group

Other students shared their experiences with more subtle and insidious experiences of bias and marginalization. For instance, one student shared as follows:

> *If someone asks a question out loud and, say me and somebody else is trying to answer and the other student is a White person—everyone in the group is going to focus their attention on that White person.*
>
> —Black Student in All Black Focus Group

Students, particularly Black students participating in all-Black focus groups, felt that race implicitly influenced their decisions about self-selection of groups. For instance, students in five of the eight focus groups shared that they didn't necessarily choose to work with peers because of their race, but when self-selecting groups, they mostly ended up in groups with students who shared their race or cultural background. Some explained that this was likely due to the increased social comfort they feel when in groups where they shared the same race.

Students from five of the eight focus groups also felt that race affected group dynamics. Again, this perspective was stronger among Black students participating in all-Black focus groups. Of the nine references made to race affecting group dynamics, six remarks were made by Black students participating in all-Black focus groups, with only three comments shared about race affecting group dynamics made by students participating in mixed-race focus groups.

Excerpts from all-Black student focus groups helped illustrate the ways in which these students felt that race affected their group selection, level of comfort, and social dynamics within their collaboratives.

One student remarked:

> *I prefer working with people of my race or my background because it's easier to, like, talk to them and get the work done. It's just easier. We can laugh and joke and play around but, like, about certain stuff that we have that—their race or whatever have, but—you can't do that with somebody of a different background. They'll look at you strange, like what are you talking about? Why are you talking about this with me?*
>
> —Black Student in All Black Focus Group

Another student shared:

> *It's not that I'm comfortable, it's not that I'm uncomfortable, I just don't have any feelings towards it. People are human beings. It's like [it has] no effect whether you're White, Black, Mexican, Hispanic, Chinese, Asian. It doesn't matter what you are. Only thing that—[the] only benefit would be … you're not going to be judged off of stereotype. If you're with Black people, you're not going to be Black stereotyped around other Black people. … [Y]ou can all act your normal ways around each other.*

> —Black Student in All Black Focus Group

Another student added:

> *I choose them [other Black students] because I can relate to them. I can talk to them about stuff. And other people that I don't know and they don't have the same background as me, I can't talk to them about certain things because they all, like, look at me and some of them even judge me like that.*
>
> —Black Student in All Black Focus Group

Differences in levels of perceived teacher support. A third area in which Black students participating in all-Black focus groups differed from students in mixed-race focus groups was in the strength of their belief that they do not receive sufficient support from teachers during collaborative group time. Students across most focus groups reported not receiving sufficient guidance or assistance from teachers to support their group activities. Although an equal number of Black and mixed-race groups reported not receiving sufficient teacher support, remarks in this domain made by Black students in all-Black focus groups were more prevalent[i] than remarks made by students in mixed-race focus groups. In particular, Black students elaborated on how it felt to be rebuffed by teachers when asking for help. For instance, Black students shared these remarks:

> *Most of the time, if you have a question, they'll either talk to you like you're slow or something or make you feel like you're dumb when you're just trying to understand what the work is so you won't fail.*
>
> *It's like there's no more guidance in education anymore.*
> *It's like teachers are just babysitters. They don't teach us anything here. Basically, we're all just on our own for learning.*
>
> —Black Students in All Black Focus Groups

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[i] Seven remarks about lack of teacher support from all-Black focus groups versus three remarks expressing the same sentiment from mixed-race focus groups.

? Research Question 2: To what extent do students have opportunities to participate in high-quality collaborative learning experiences?

Research Question 2 was designed to gauge the extent to which students in our participating schools had access to regular opportunities for high-quality collaboration.

We established three subquestions:

2a. What is the frequency and duration of collaborative opportunities?

2b. What is the quality of collaborative opportunities?

2c. To what extent do student and teacher perspectives on the quality of collaborative opportunities differ?

To address each of these subquestions, we analyzed data from all six data sources (student surveys, teacher surveys, teacher interviews, student focus groups, classroom observations, and student demographic data). The study's key findings and the evidence supporting these results are provided in the following sections.

Research Question 2: Student Opportunities for High-Quality Collaboration: Big Takeaways

- Approximately half of the students in the participating schools had opportunities for collaboration at least once per week.

- The frequency of collaborative opportunities varied within and across schools but did not systematically differ between mathematics and English classrooms.

- Overall, the duration of collaborative activities was more likely to be short than long. Collaborative opportunities lasting five or more class periods were more likely to occur in ELA than in mathematics classes.

- The reported quality of collaborative opportunities was lower in mathematics than in ELA for several of the structural and dynamic features.

- Student opportunities to engage in student-centered, culturally relevant activities were far less prevalent than opportunities for other structural quality features, especially in mathematics.

- Opportunities for constructive exchange among students, while low overall, were higher during collaborative groups than during other classroom activities.

- Students and teachers differed in their perspectives on collaborative opportunities in two areas: cultural relevance of the activities and perceived guidance and support from teachers

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2a. What is the frequency and duration of collaborative opportunities?

Our first subquestion focused on the frequency and duration of collaborative opportunities available to students in our four participating schools. We analyzed data from student and teacher survey responses, teacher interviews, and classroom observations and identified three key findings.

> The frequency of collaborative opportunities offered to students varied substantially within and between schools.

Students and teachers reported on the frequency of collaborative opportunities in surveys. We examined the percentage of responses for each of the frequency categories provided and the extent of variability in these responses w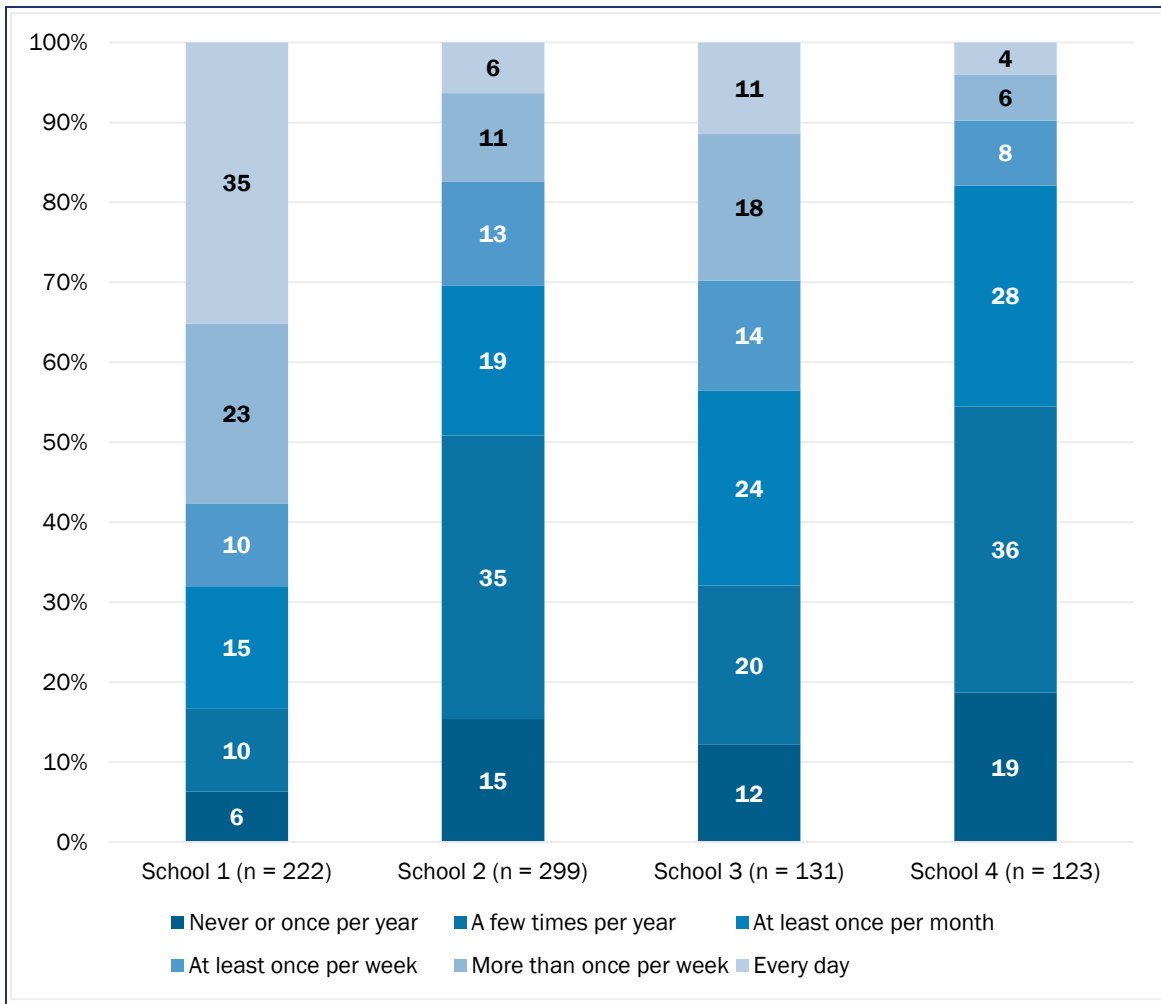ithin and across schools. In addition, using student and teacher responses to selected frequency categories, we were also able to statistically test any differences in responses across academic subjects (i.e., math and ELA). As illustrated in Exhibits 32 and 33, **approximately half of the students in the participating schools had opportunities for collaboration at least once per week (Finding 2.1.a).** This finding was not surprising, given that it closely reflected our selection criteria for our four study sites. However, what is notable is that the frequency of collaborative opportunities varied substantially within schools and to a lesser extent across schools. Despite this overall variation, **the frequency of collaborative opportunities did not systematically differ between mathematics and English classrooms (Finding 2.1.b).**

Findings from teacher interviews and classroom observations supported these survey findings. For instance, the majority of teachers interviewed (17 out of 28) reported that they offered students collaborative activities at least 2–3 days per week. However, teachers also reported that the frequency of collaborative opportunities often varied by subject or by a given class. Similarly, during our 30 classroom visits, we observed collaborative opportunities in approximately half of these classrooms. However, the prevalence of collaborative opportunities varied substantially by school—ranging from a low of 25 percent of classrooms in one school to a high of 88 percent of the classrooms in another school. These combined results suggest that although schools aim to offer regular opportunities for collaboration, the actual frequency of collaborative opportunities available to any given student from one class to another is likely to vary substantially.

Exhibit 32. Student Reports of the Frequency of Collaboration Across All Four Study Sites

Legend:
- Never or once per year
- A few times per year
- At least once per month
- At least once per week
- More than once per week
- Every day

School 1 (n = 222): 6, 10, 15, 10, 23, 35
School 2 (n = 299): 15, 35, 19, 13, 11, 6
School 3 (n = 131): 12, 20, 24, 14, 18, 11
School 4 (n = 123): 19, 36, 28, 8, 6, 4

Exhibit 33. Teacher Reports of the Frequency of Collaboration Across All Four Study Sites
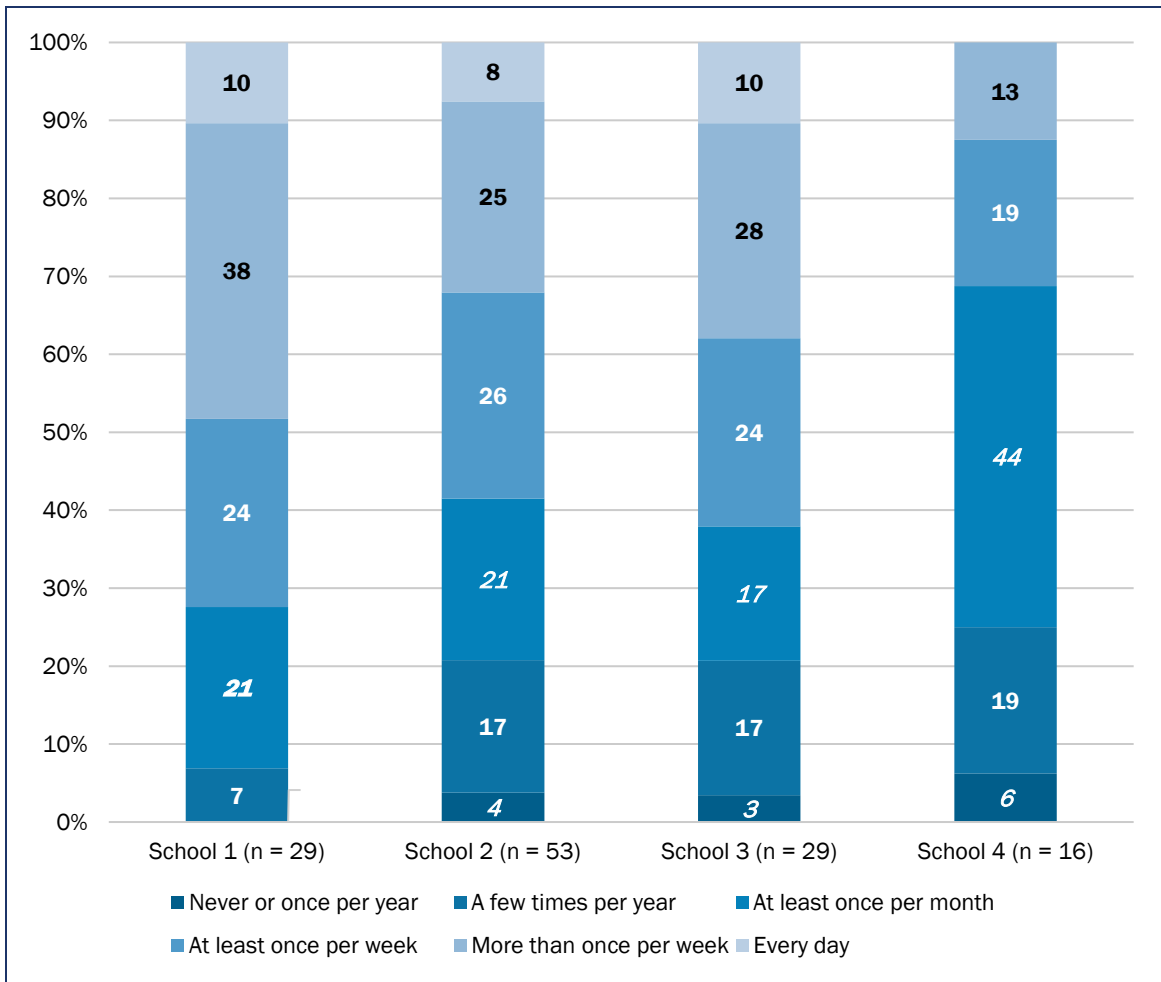
The duration of collaborative opportunities also varied. **Overall, the duration of collaborative opportunities was more likely to be short than long. Collaborative opportunities lasting five or more class periods were more likely to occur in ELA than in mathematics classes.**

Exhibit 34. Student Survey Reports of Length of Collaborative Activities in Mathematics and English Classes

2b. What is the quality of collaborative opportunities?

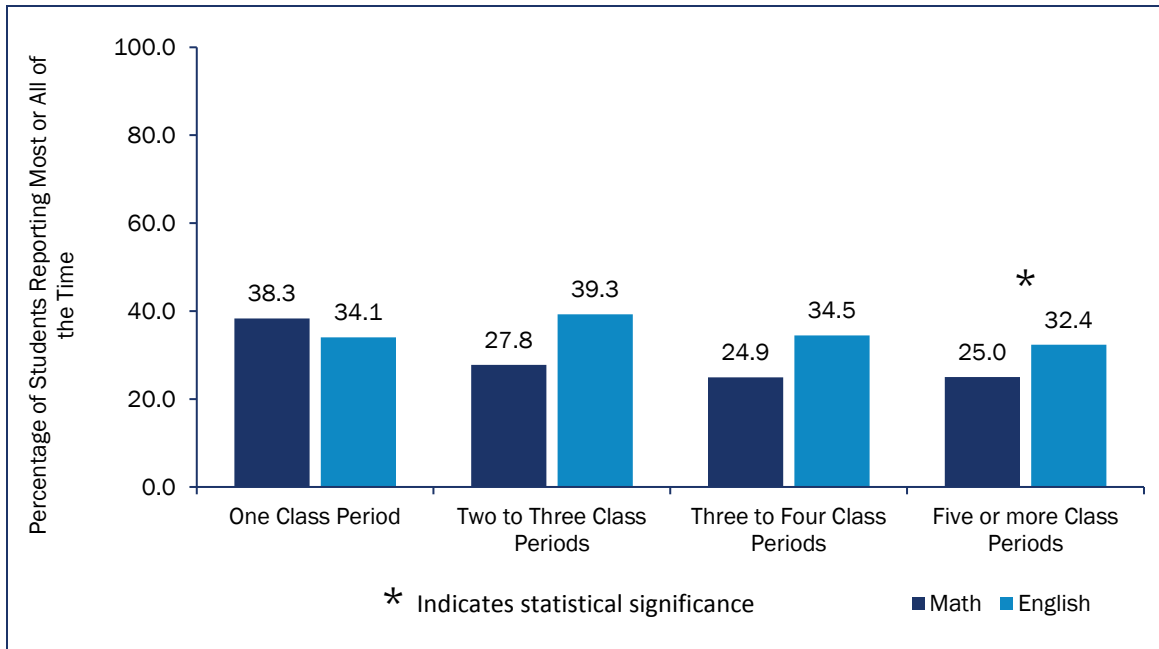To answer our second subquestion regarding the quality of collaborative opportunities, we examined data from multiple data sources (i.e., teacher and student surveys, teacher interviews, student focus groups, and classroom observations). Across these sources, we identified three key findings related to the quality of collaborative opportunities offered to students in our participating schools.

Our analyses of ratings from surveys and observations indicated that the quality of collaborative opportunities varied between classrooms within schools. Overall, the level of quality of collaborative opportunities was generally in the midrange of possible scores, with some variation in quality across structural and dynamic features.

> The reported quality of collaborative opportunities was lower in mathematics than in ELA for several of the structural and dynamic quality elements.

Using student and teacher surveys, we tested differences in the ratings within the two quality domains: structural quality and dynamic quality by academic subject. We found that **the reported quality of collaborative opportunities was lower in mathematics than in ELA for several of the structural and dynamic quality elements.** We also found that these subject-area differences were particularly true for the teacher reports. Teacher data showed subject-area differences in five of the seven quality areas (see Exhibits 37 and 38). In contrast, students only reported subject-area differences in two of the seven quality areas; see Exhibits 35 and 36.

Exhibit 35. Student Survey Reports of the Dynamic Quality Features of Collaborative Groups
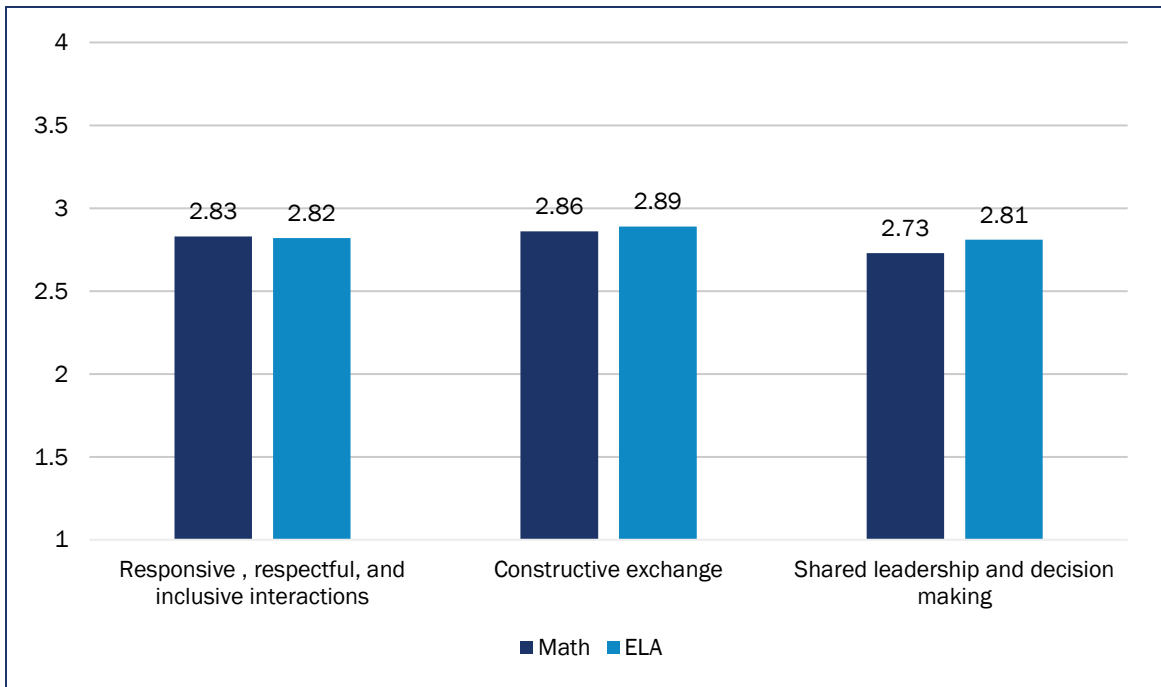
Exhibit 36. Student Survey Reports of the Structural Quality Features of Collaboration in Mathematics and English Classes
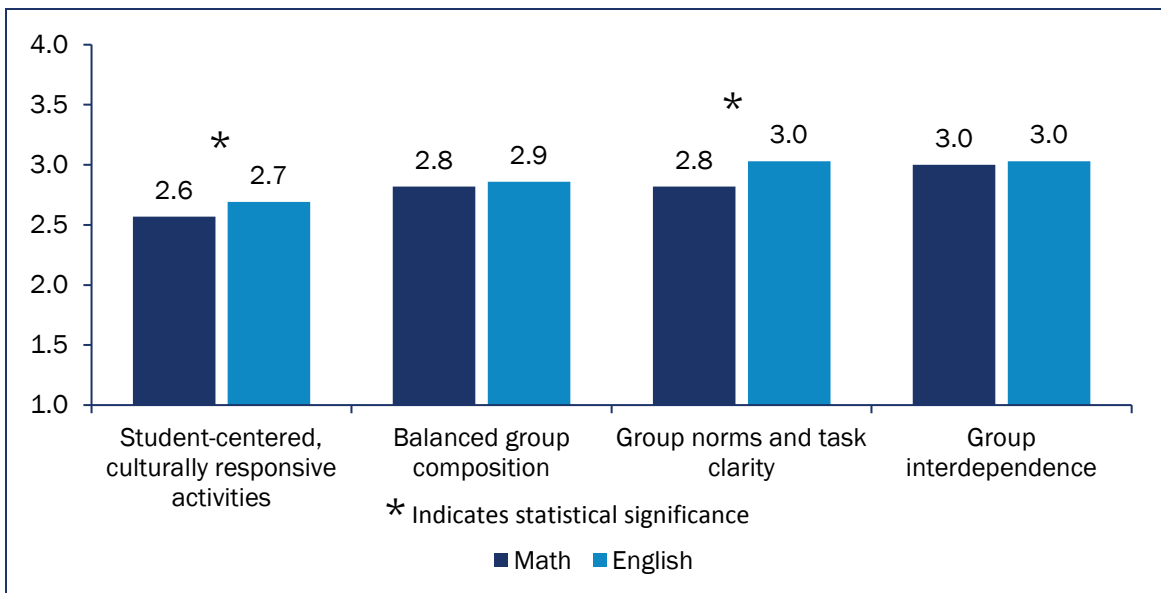
Exhibit 37. Teacher Survey Reports of the Structural Quality Features of Collaborative Groups

* Indicates statistical significance ■ Math ■ ELA
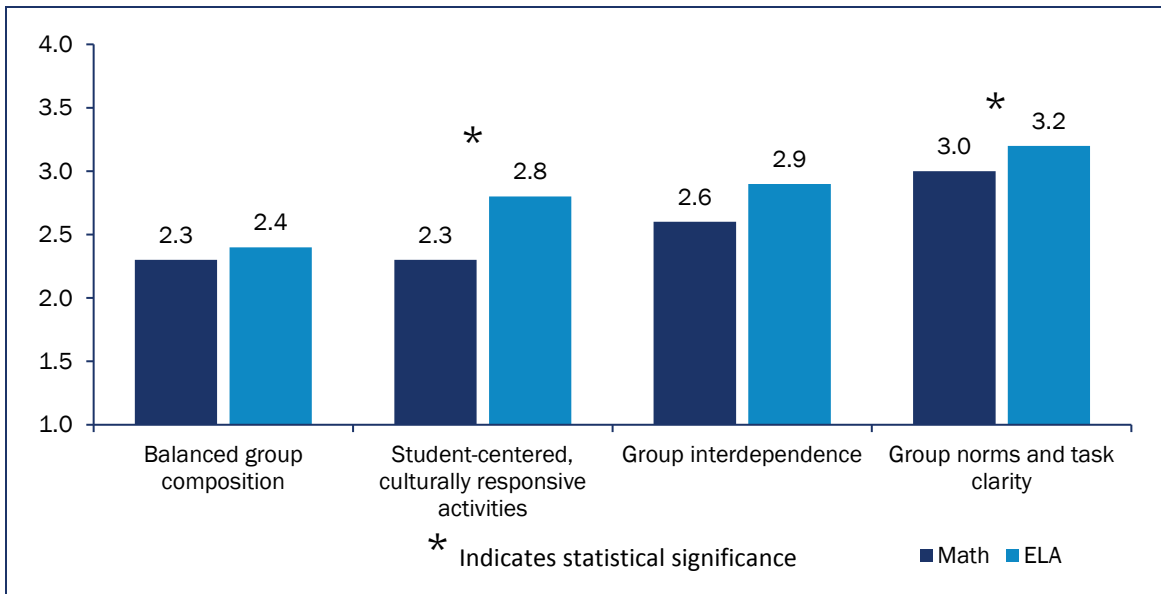
Exhibit 38. Teacher Survey Reports of the Dynamic Quality Features of Collaborative Groups

* Indicates statistical significance ■ Math ■ ELA
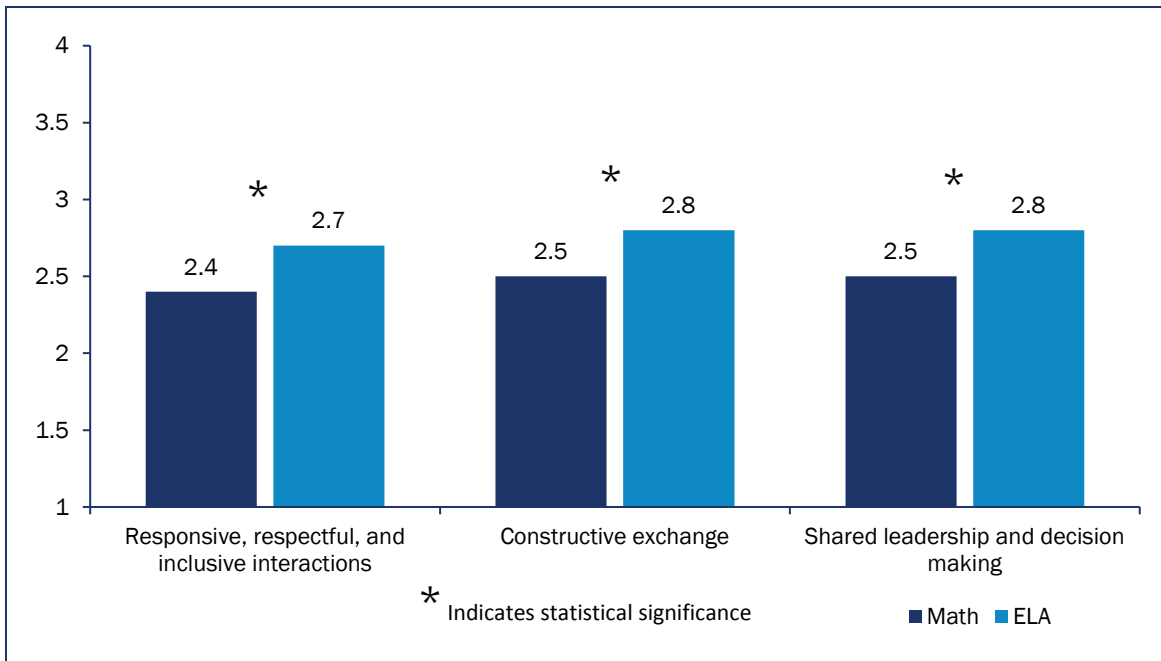
Our next step was to explore variations in quality across the individual structural and dynamic elements within these two quality domains. Among the four structural quality elements, we found that **student-centered, culturally relevant activities were far less prevalent than opportunities for other structural quality features, especially in mathematics.**

This finding was strongly and consistently supported across multiple data sources. For instance, ratings from classroom visits indicate that student-centered, culturally responsive activities were the lowest-rated quality feature of all 16 observation items. This was especially true in mathematics classrooms.

> **Student opportunities to engage in student-centered, culturally relevant activities were far less prevalent than opportunities for other structural quality features, especially in mathematics.**

As illustrated in Exhibit 36, student survey ratings of the extent to which collaborative activities were felt to be student centered and culturally relevant was far lower than ratings assigned for any of the other structural aspects of collaborative activities. Results from statistical tests found that both teacher and student ratings of the extent to which collaborative activities were student centered and culturally relevant were lower in math than in ELA (Exhibits 36 and 38).

Verbal reports made by students participating in focus groups offered further evidence for this finding. Students from five of the eight focus groups reported that they felt that collaborative activities were only "sometimes" or "never" interesting. Students from seven of the eight focus groups reported that classroom activities did not feel connected to their life, culture, or family. As shared by one student,

> *Nothing we ever do work-wise has to do with anything culture-wise relating to Blacks besides slavery in English class. We learn about the same thing about slavery every year—it's just a new piece added on to it, a new president or something, it never changes.*
>
> —Black Student in All-Black Focus Group

Overall, these combined findings provide strong evidence to suggest that collaborative opportunities for student-centered, culturally relevant activities were substantially less evident than other structural quality features, especially in math.

> **Statistical tests of differences showed that the quality of constructive exchange among students was higher during collaborative activities than during other classroom activities.**

Our analyses of teacher and student survey yielded fewer differences across the dynamic quality elements of high-quality collaboration. However, as illustrated in Exhibit 39, the analyses of ratings assigned during classroom visits indicate that two of the dynamic quality elements, shared leadership and constructive exchange among students, were assigned lower ratings than the other dynamic quality areas. As shown in Exhibit 39, statistical tests showed that **opportunities for constructive exchange among students, while low overall, were higher during collaborative groups than during other classroom activities.** Although not statistically significant, these analyses also indicated a trend toward teachers being more likely to promote substantive exchange among students during collaborative group work than during other classroom activities.

Exhibit 39. Classroom Observations: Comparison of Ratings Assigned During Collaborative Groups Versus Other Classroom Activities
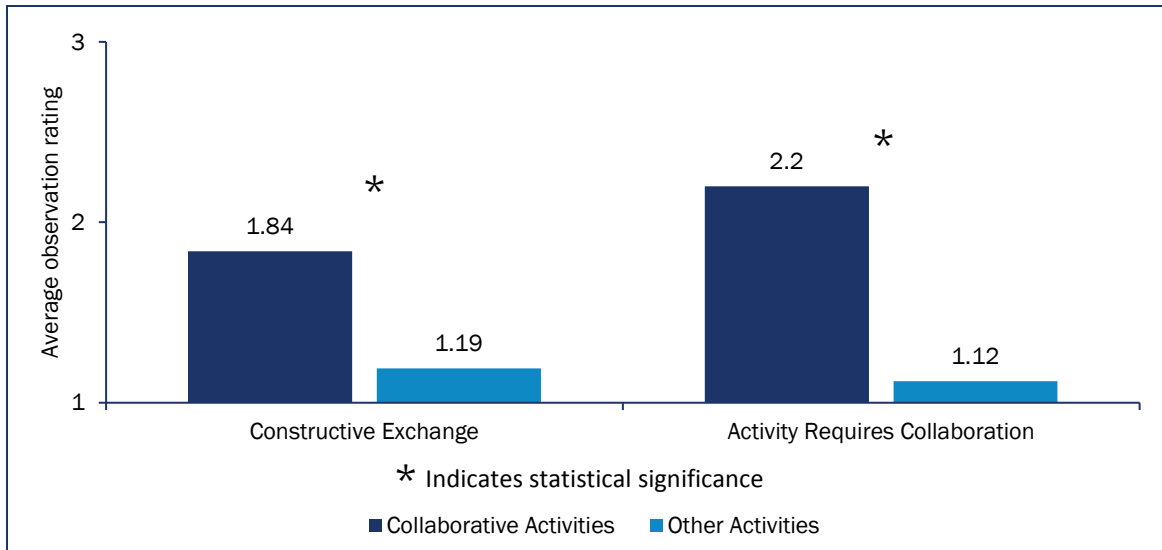
* Indicates statistical significance

■ Collaborative Activities ■ Other Activities

2c. To what extent do student and teacher perspectives on the quality of collaborative opportunities differ?

Our third subquestion focused on the extent to which perspectives on the quality of collaborative opportunities might differ between teachers and students.

Based on our qualitative analyses of teacher interviews and student focus groups, we found that students and teachers differed in their perspectives on collaborative opportunities in two areas: cultural relevance of the activities and perceived guidance and support from teachers.

> Perspectives about the quality of collaborative opportunities expressed in interviews and focus groups differed between students and teachers.

First, teachers and students differed on the extent to which they believed that the collaborative opportunities offered were student centered and relevant to students. Of the 15 teachers who discussed the importance of collaborative group activities connecting with students' lives and cultural background, 13 indicated that they believed that they design group activities that are challenging, student centered, and culturally responsive (i.e., connected to students' life outside of the classroom). For instance, one teacher shared as follows:

> *The number one hated question in math is how does this pertain to real life? I have a lot of young men that love basketball … so when we do statistics, I'll be like, [name of basketball player] scored this many points this game and he's going to score 55 the next game. How many does he need to score to average a triple, double, or something? … So I relate questions back all the time. … Relating it to their culture makes them want to learn.*

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Another teacher shared:

> *Well, I think it's really important, because in literature—literature is really about life and you. It's not really about the poet and the poem. ... Classes where kids bring in what their grandmother said or "It reminds me of a time how I saw my aunt change from this to this" ... it just makes it all worth it. That's the whole point of doing it.*

Contrary to these teacher perspectives, students from seven of the eight focus groups indicated that the activities done in class did not feel interesting or connected to their life, culture, or family background outside of school.

The second area in which teachers and students differed in their perspectives was in the level of perceived teacher support during collaborative group work. The majority of teachers interviewed (20 out of 28) reported their role during collaborative group work as one of facilitator, with many (8 of those 20) explaining that they adjust their role depending on the nature of the task or level of support students need—that is, teachers provide more instructional support than the group needs. For instance, one teacher explained:

> *You have to be very perceptive as a teacher as you're walking around and watching and observing. So I just have to watch and see if someone looks like they have a confused look on their face. If I look at their papers and there's not much progress at all, then I have to try to present it in a different way or, you know, go through the directions again or bring out some of my manipulatives to that group and ask, "Would this help if we had a model of this?"*

In contrast, when students were asked about the role of the teacher during collaborative groups, students across most focus groups (six of the eight) reported not receiving sufficient guidance or assistance from teachers during group activities. In fact, in four of the groups, students suggested that much was being self-taught during collaborative group time. For instance, one student shared:

> *Even though we learn on our own, we still need that guidance and we still need their help, but I guess they just look on that and just look at this as personalized learning, learn on your own.*
>
> —Student in Focus Group

Another student remarked:

> *As the facilitator, what they do is, they tell you what your assignment is, they stand there, they sit back down and they tell you to get to work.*
>
> —Student in Focus Group

Research Question 3: What contextual, school-level factors do teachers identify as helping or hindering their ability to provide opportunities for high-quality collaboration in diverse, student-centered classrooms?

Our third research question sought to uncover the attitudes, beliefs, and contextual factors that might influence teachers' capacity to offer and support collaboration in the classroom. To answer this question, we analyzed two sources of data: teacher interviews and teacher survey responses. We identified three subquestions:

3a. What do teachers perceive to be the benefits and challenges associated with collaboration?

3b. Which school-level policies and structures do teachers perceive as helping or hindering their capacity to offer collaborative opportunities?

3c. To what extent do teachers believe that school leaders support them in offering collaborative opportunities?

Research Question 3: Contextual, School-Level Factors—Big Takeaways

- Overall, ELA teachers had a stronger belief in the benefits of collaboration than did mathematics teachers.

- Teacher survey and interview responses suggested that "meeting the needs of struggling students" and "keeping students focused when they are engaged in collaborative activities" were key challenges.

- School-level factors that were perceived to be particularly helpful by teachers were class schedules, including the length of class periods, and the amount of autonomy given to teachers.

- Among the school policies and structures that might help or hinder teachers' capacity to offer collaborative activities, the number one perceived obstacle identified by teachers was the wide range of student needs within their classes.

- Although teacher survey responses indicate that teachers mostly agree that school leaders provide support for collaboration and personalization, ELA teachers perceived greater support from school leaders than did mathematics teachers in nearly all areas.

3a. What do teachers perceive to be the benefits and challenges associated with collaboration?

Teachers were asked to rate a set of survey questions related to the perceived challenges and benefits associated with collaboration. Teacher survey responses indicated a belief that collaborative opportunities were associated with a range of benefits for students related to collaboration, such as "deepening students' learning of core academic concepts and skills" and being "better able to meet the

learning needs of individual students." Similar themes emerged from teacher interviews, particularly with respect to better meeting the individual needs of students. For instance, one teacher shared:

> *Collaboration is good because it enhances the whole personalized profile.*

Another shared:

> *[During collaboration] everyone's bringing in a different perspective, which is already differentiated. So I'm going to bring in my learning style, you bring in yours, and we're going to put it together to make something.*

Although both math and ELA teachers assigned high ratings for the perceived benefits associated with collaboration, our study findings indicated that **overall, ELA teachers had a stronger belief in the benefits of collaboration than did mathematics teachers.**

Exhibit 40. Teacher Survey Mean Ratings: Perceived Benefits of Collaboration
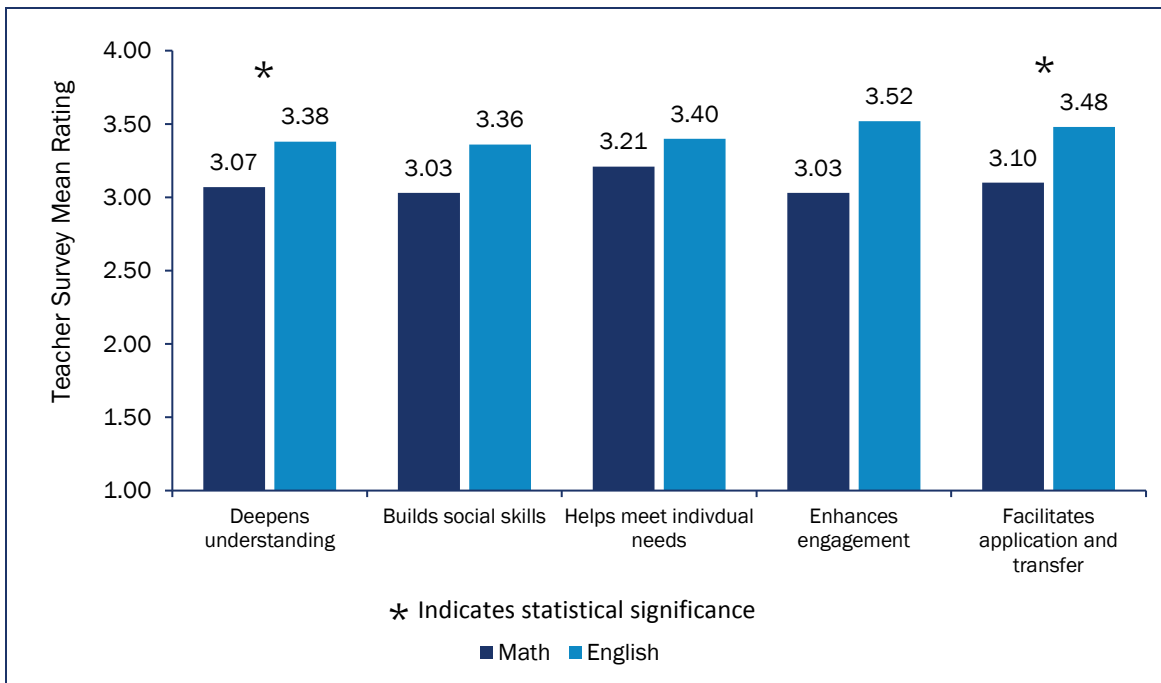
Teachers were asked about the perceived challenges associated with collaboration. **Teacher survey and interview responses suggested that "meeting the needs of struggling students" and "keeping students focused when they are engaged in collaborative activities" were key challenges.** During interviews, teachers reported the same two key challenge areas: difficulty keeping students focused and "on task" and the difficulties they perceived in meeting the needs of a wide range of academic levels in the classroom through collaborative opportunities. For instance, one teacher shared:

The challenging portion of collaboration, I think, is more or less trying to get students to realize that okay, yes, you're in a group, but you have a goal to do and your goal is not to sit and talk about other things that's not related to what you're supposed to be doing.

Another teacher said:

I think our kids vary academic-wise—and I don't like to usually limit kids, but reading levels does affect stuff. If a kid has a first-grade reading level and a kid has a 12th-grade reading level, that 12th-grade reading level wants to do a little more advanced stuff and this kid can't. So there are limitations there, so it gets hard; a lot of times, that kid might get frustrated.

Exhibit 41. Teacher Survey Mean Ratings: Perceived Challenges Associated With Collaboration
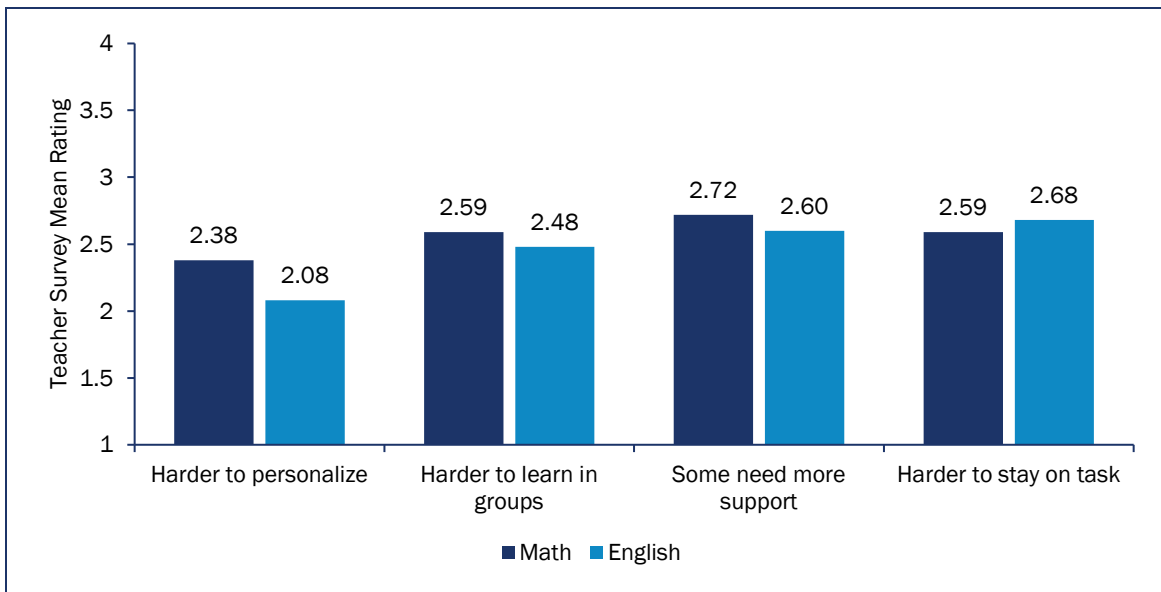
Although we did not find many differences in the perceived challenges by academic subject, math teachers did identify "having too much content to cover" as a more substantial challenge than did ELA teachers.

Exhibit 42. Teacher Survey Mean Ratings: Perceived Challenges Associated With Collaboration
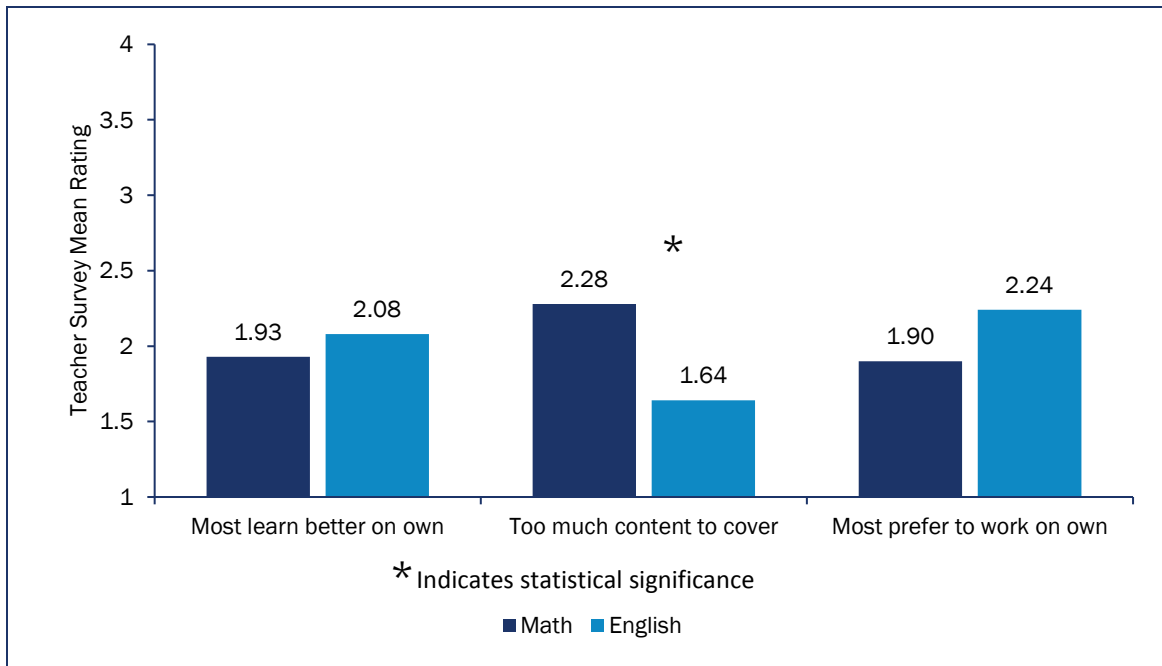
3b. Which school-level policies and structures do teachers perceive as helping or hindering their capacity to offer collaborative opportunities?

A related set of survey and interview questions aimed to solicit teacher perspectives on the school-level policies and structures they felt might help or hinder their efforts to offer collaboration. The majority of teachers interviewed (22 out of 28) reported that their school's contextual factors were instrumental in enabling them to offer successful collaborative opportunities for students in the classroom. Examples of instrumental contextual factors included school schedules (18) and staff collaboration (14). Responses on surveys indicated that the **school-level factors that were perceived to be particularly helpful were class schedules, including the length of class periods, and the amount of autonomy given to teachers.**

Among the school policies and structures that might help or hinder teachers' capacity to offer collaborative activities, the number one perceived obstacle identified by teachers was the wide range of student needs within their classes. Three other areas also emerged as key challenges: the size of classes, the amount of content that teachers need to cover, and the amount or lack of planning time they are given. Similar themes emerged during teacher interviews. The two key perceived obstacles reported by teachers were curricular constraints and the nature of the student population in their school. For instance, one teacher said:

> *I think, for math, there is a very strict curriculum that the district has told us that we have to cover, and it is very hard time-wise to get this whole curriculum in. … If you were just having a teacher lecturing, doing math problems, and moving on, that's a lot faster, but when you take time to do the collaborative activities, that helps the students to really apply and become deep thinkers about that particular thing. But then we can't cover as much material, so the curriculum that they require us to do and have these common assessments related to it is very difficult when you're trying to do collaborative activities.*

Another teacher shared:

> *So we have in the class of 28 now, we might have five, maybe six that will actually do the work and ask a few questions where they understand it. But the majority of them are struggling students, so they need more help.*

3c. To what extent do teachers believe that school leaders support them in offering collaborative opportunities?

Teachers were asked about the nature and level of support they receive from school leaders. The areas in which all teachers perceived the most support was in the beliefs of school leaders that collaboration and personalized learning for students are important school-wide priorities. For instance, one teacher exclaimed:

> *At school during our planning period meetings or our department chair meetings, we all are brainstorming about how to make personalized learning and collaboration more effective.*

Although teacher survey responses indicate that teachers mostly agree that school leaders provide support for collaboration and personalization, ELA teachers perceived greater support from school leaders than did mathematics teachers in nearly all areas. See Exhibit 43.

Exhibit 43. Teacher Survey Mean Ratings: School Leader Support for Collaboration
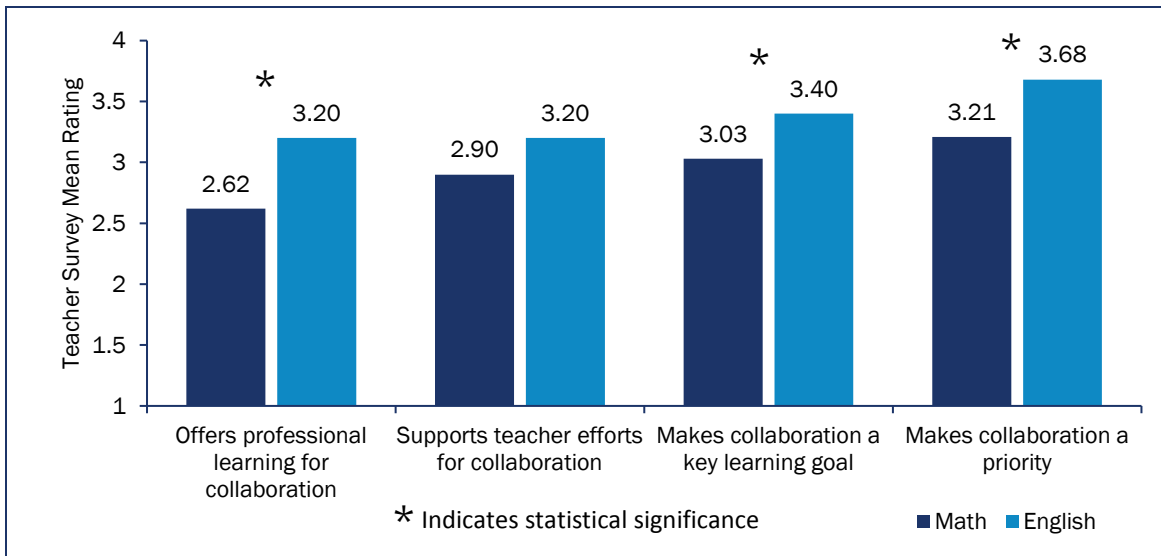
Exhibit 44. Teacher Survey Mean Ratings: School Leader Support for Personalization
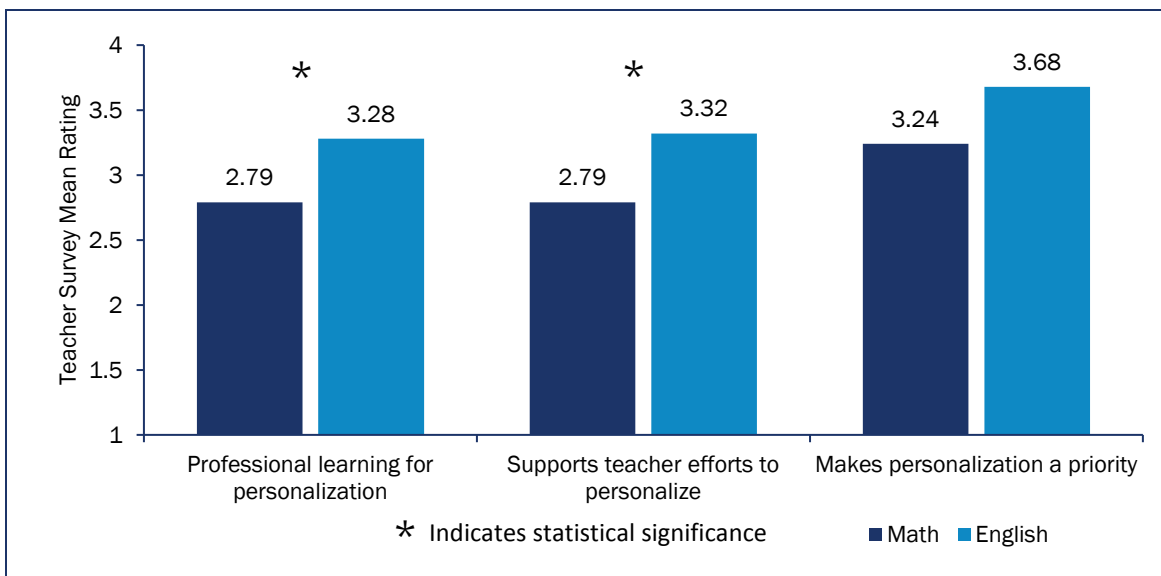
Discussion of Findings

The aim of this study was to explore racial/ethnic differences in experiences and outcomes associated with collaboration within four high schools that had an explicit focus on personalization, offered regular opportunities for collaboration, and served a diverse student body. The study sought to examine the relationship between opportunities for collaboration, classroom experiences, and outcomes and the extent to which the relationships among these factors differed for Black students.

We theorized that high-quality collaboration would be linked to student outcomes and perceptions of personalization, and that the path between high-quality collaborative opportunities and outcomes would be mediated by students' perceptions of their classroom experiences. Based on prior research, we also theorized that the relationships among these factors would be moderated by student racial/ethnic characteristics, such that Black students would be more likely to demonstrate a stronger, more positive relationship between reported opportunities for collaboration, perceptions of student classroom experiences, and positive student outcomes.

A discussion of our results in the context of our initial hypotheses is provided in this section. We have divided our discussion into two parts: a discussion of findings relevant to all students and a discussion of findings for Black students.

Discussion of Findings for All Students

■ **Opportunities for high-quality collaboration appear to benefit students.** Our original hypothesis was that high-quality collaboration would be associated with benefits for students. Our results supported this prediction. We found that for all students, high-quality collaboration was strongly and positively associated with students' perceptions of the classroom environment and with their mind-sets and dispositions, including engagement, intrinsic motivation, and self-efficacy. We also found that reports of high-quality collaborative opportunities were significantly and positively associated with students' grades, although this relationship was weaker.

■ **High-quality collaborative experiences were strongly associated with perceived personalization, and personalization, in turn, was linked to outcomes.** Our original hypothesis was that to truly meet the varying needs of students, personalization should include opportunities for learning with others in collaborative groups. Our findings offer evidence to support this initial idea. Results suggest that high-quality collaboration is strongly associated with perceptions of personalization (i.e., students' needs are met) and, in turn, that personalization was strongly associated with student outcomes.

■ **High-quality collaborative experiences were linked to grades, but this relationship depended on students' classroom experiences and their mind-sets and dispositions.** Our original hypothesis was that high-quality collaboration would be linked to grades by influencing students' mind-sets and dispositions, including engagement, intrinsic motivation, and self-efficacy. Indeed, high-quality collaboration was highly associated with all intermediary outcomes, and the link between high-quality collaboration and grades was no longer statistically significant after accounting for these mind-sets and dispositions.

- **Opportunities for high-quality collaboration were greater in ELA than in math.** We did not expect to find differences in the quality of collaborative opportunities by subject area. However, we found several areas where ratings by students, and even more so ratings by teachers, indicated that there were greater opportunities for high-quality collaboration in ELA than in math. For instance, we found that collaborative activities lasting an extended period of time were more likely to occur in ELA than in math and that the quality of student-centered, culturally responsive activities; group norms and task clarity; responsive, respectful interactions; constructive exchange; and shared student leadership and decision making were all higher in ELA than in math.

- **ELA and math teachers perceived collaboration benefits and available supports differently.** We theorized that contextual factors might influence the extent to which teachers were able to effectively offer and support collaboration in the classroom. Although we were not able to statistically test differences based on teachers' differing perceptions of collaboration, we did find that ELA and math teachers perceived collaboration benefits, challenges, and available supports differently. Both math and ELA teachers reported many benefits associated with collaboration and perceived support from school leaders. However, ELA teachers reported more benefits and perceived greater levels of support for collaboration from school leaders than did math teachers.

- **Teachers reported struggling to balance their interest in offering collaboration with the challenges they saw in meeting the varying needs of their students through group work.** We theorized that teachers might face challenges in trying to meet students' individual needs through collaboration. Our findings support this prediction. Teacher survey responses suggested that meeting the needs of students who are struggling and keeping students focused when they are engaged in collaborative activities were key challenges associated with collaboration. In addition, when asked which school-level factors helped or hindered their capacity to offer collaboration, the number one obstacle identified by teachers was meeting the wide range of student needs within their classes. These combined findings suggest that teachers may sometimes see collaboration and personalization as incompatible strategies and struggle to balance their interest in offering more opportunities for collaboration with the challenges they foresee in meeting the varying individual needs of their students through group work.

Discussion of Findings for Black Students

- **Black students' reports of collaborative and classroom experiences differed from other students' reports in key areas.** Our original hypothesis was that collaboration would be important for Black students but that they might experience collaboration differently than White students. Our findings offer evidence to support this notion. High-quality collaboration was strongly and positively associated with classroom experiences and mind-set and dispositional outcomes for Black students, but their experiences of collaboration and associated perceptions of the classroom differed from other students' experiences in several areas. In particular, Black students participating in all-Black focus groups were more likely to report experiences of exclusion and lower perceived support from teachers, and they were less likely to feel that collaborative activities were relevant to their lives. Excerpts from all-Black student focus groups helped illustrate the ways in which these students felt that race affects their group selection, level of comfort, and the social dynamics within their collaborative groups.

- **High-quality collaboration was positively associated with grades for Black students, regardless of their prior academic performance**. Our original hypothesis was that collaboration would be more important for experiences and outcomes for Black students than for White students; our findings offered partial support. We found strong, positive relationships between Black students' ratings of high-quality collaboration and their classroom experiences and mind-sets and dispositions. However, the strength of these relationships was similar to what was found for all students. We also found that Black students' survey ratings of high-quality collaboration were linked to grades, even after accounting for their prior grades. This finding was similar to what we found for all students; however, it is important to note that our student sample was 46 percent Black. We did not find this same result for White students. This suggests that opportunities for high-quality collaboration could be among the factors that help contribute to positive changes in the academic trajectory of Black students.

- **The ways in which high-quality collaboration, classroom experiences, and outcomes were linked differed between Black and White students.** Our original hypothesis was that the path from high-quality collaboration to classroom experiences to outcomes might differ for Black students, and be stronger. Our findings partially supported this prediction. Overall, we did not find that the relationships among factors were stronger for Black students. However, we found several ways in which the experiences, outcomes, and relationships among factors differed between Black and White students. Therefore, the classroom experience measures we used did a better job of explaining the relationship between high-quality collaboration and mind-set and dispositional outcomes among the White students in our study than it did for the Black students in our study. In other words, for Black students, how high-quality collaboration was positively linked to outcomes was less clear.

Where Do We Go From Here?

The study findings provide important implications for the field—for educators as well as other researchers. A list of these implications follows.

Implications for Schools and Educators

- Opportunities for high-quality collaboration could be among the factors that help contribute to positive changes in the academic trajectory of **Black** students. We have new evidence that collaboration is linked to higher grades for Black students, even when we accounted for prior grades. We did not find this same result for White students. These findings suggest that for Black students, having the chance to engage in high-quality collaborative activities may help boost academic success. Schools and educators interested in addressing equity issues should consider increasing opportunities for high-quality collaboration as a potential strategy for maximizing success for students from varying backgrounds.

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- **Collaboration is strongly linked to personalization.** We have new evidence to suggest that student reports of collaboration are strongly linked to students' perceptions of personalization. Together, collaborative experiences and perceptions of personalization are positively related to students' mind-sets and dispositions. Schools and educators interested in meeting the personalized learning needs of students as a strategy for enhancing learning outcomes should adopt a definition of personalization that includes social learning opportunities and recognize that opportunities for collaboration are strongly linked to students' mind-sets and dispositions, such as engagement, intrinsic motivation, and self-efficacy.

- **Collaboration and personalization are not mutually exclusive strategies.** Teachers in our study perceived challenges with trying to meet the varying needs of individual students through group work and, to a large extent, felt that collaboration was not always conducive to personalizing learning for students. For instance, some teachers felt that grouping struggling students with higher ability students might not allow students to receive sufficient academic support. Schools and educators may need to find different and more effective strategies for designing and facilitating group work so that teachers feel more confident that they can meet a wider array of student needs through collaborative group work.

- **Caution: Not all collaborative learning is high quality.** Our study found that the elements that compose high-quality collaboration are strongly interrelated but that some aspects of high-quality collaboration were less prevalent than others. To ensure that students can benefit from collaborative opportunities, schools and educators should be mindful of the core dynamic and structural elements of collaboration and be aware that offering student-centered, culturally responsive activities and promoting constructive exchange might be particularly challenging to achieve.

- **Lean in a bit more.** Students reported receiving insufficient support from teachers during collaborative group time. This perception was especially true for Black students. Educators and school leaders should reexamine how teachers support collaborative group work and how they convey access to that support. Teachers also should recognize that Black students may associate teacher efforts to promote autonomy with lower available support from teachers—and could be more reluctant to ask for help or direction when they need it.

- **Black students' classroom experiences may differ from those of non-Black students.** Schools and educators should recognize that Black students may experience collaboration and the classroom environment differently from non-Black students—and should take extra steps to gather feedback directly from Black students to ensure that their collaborative and classroom experiences are positive and reflect desired quality elements.

- **Math teachers need more support for offering collaboration.** Math teachers in our study reported lower support from their school leaders and were more likely to believe that covering course content made it difficult to find time for collaboration. Schools and educators should recognize that teachers may perceive more challenges implementing collaboration in math courses; therefore, they may need to see evidence of success and have a set of strategies they can use to cover content through group work.

Implications for Researchers

- **Interpret student data with care.** Our study found that survey measures, even those that are carefully designed and tested ahead of time, did not accurately capture the experiences of varying student groups equally well in all areas. For example, responses to the item "I feel as if I am not given anything important to do to help our group" were more strongly associated with items addressing exclusion based on race and gender for Black students than for White students. This suggests important limitations in our survey instruments for accurately and consistently capturing perceptions of perceived exclusion for different groups of students. Researchers should invest more time in developing appropriate measures in partnership with students and should double-check that survey measures are truly equivalent across racial/ethnic groups before making comparisons across groups.

- **Race and data collection methods matter.** Our study found that Black students responded differently across data sources. For example, Black students reported experiences of marginalization and microaggression related to collaborative group work more often when participating in a racially homogenous, all-Black focus group rather than in a mixed-race focus group. As noted earlier, we also found that Black students and White students interpreted survey items related to microaggression and exclusion differently. The measurement shortcomings, and inconsistencies in Black student responses by data source suggest that researchers interested in studying racial/ethnic differences should consider how the data source and the grouping of students for focus groups might influence student responses—particularly when the topic is focused on race. Researchers may also want to employ a study team that matches the student sample of interest and be sure to use a range of data collection methods when gathering information about student experiences from marginalized student groups.

Areas for Future Study

Although findings from our study contributed to our understanding of relationships between high-quality collaboration, classroom experiences, and student outcomes, they also raised new questions that might help guide areas for future study:

- What other drivers underlie the path from high-quality collaboration to outcomes for Black students? How can we better understand how and why Black students benefit from collaboration?

- How do variations in the racial/ethnic composition of a school population influence students' collaborative experiences? Is collaboration more beneficial for Black students in homogeneously Black schools or in racially diverse schools—or when teachers share their race?

- Why might constructive exchange and student-centered, culturally responsive activities be more challenging for teachers to implement? What specific contributions do these two aspects of high-quality collaboration make to student experiences and outcomes? How can we help teachers design activities that are truly student centered and culturally responsive and promote constructive exchange?

- Why is collaboration such a challenge for math teachers? Does collaboration really "slow down" progress in addressing required content? What collaborative strategies can math teachers use to accelerate student learning of important math concepts and skills?

- Why do teachers struggle with meeting individual student needs through group work? What additional design and facilitation strategies do teachers need to effectively meet (or believe they can meet) individual needs through group work?

- What are experiences and outcomes associated with collaboration for other student groups, including other race/ethnicities, special education students, English language learners, and LGBTQ students?

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