



EAB

Student-Centered Math Reforms in High School

District Leadership Forum

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Table of Contents

1) Executive Summary	4
Key Observations	4
2) Transitioning to Student-Centered Instruction	5
Definition and Motivations	5
Instructional Models.....	7
Outcomes	10
3) Implementation	13
Teacher Engagement	15
Training.....	17
Ongoing Supports.....	18
Assessing Implementation	20
5) Research Methodology	22
Project Challenge	22
Project Sources	22
Research Parameters	24

1) Executive Summary

Key Observations

Profiled districts implement student-centered instruction to optimize high school math classrooms for student learning. Administrators at profiled districts implemented student-centered math instructional reforms on the basis of qualitative, theoretical, and/or emergent research (e.g., frameworks from the National Council for Teachers of Mathematics). This research empowered profiled districts to shift high school math classrooms' emphasis from lecture-based instruction to students' development of knowledge. In student-centered math classes at profiled districts, teachers use tactics such as problem-based learning to encourage students to develop higher-level mathematical thinking. Contacts at all profiled districts share the belief that student-centered instruction—which encompasses a wide range of practices—creates learning environments that better match students' strengths, preferences, and interests (i.e., facilitates personalized learning).

Though concurrent initiatives may account for some outcomes, profiled districts report student-centered instruction improves school climate and student achievement. At District D, after administrators redesigned the high school math curriculum to create a student-centered curriculum, the number of students who achieved proficiency in high school math courses increased by 30 percentage points. In addition, contacts at most profiled districts report improvements to school climate and student engagement—for example, at District A, discipline referral rates dropped after math teachers implemented student-centered instruction. However, contacts do note that concurrent reforms (e.g., block schedules) could account for some benefits.

To overcome initial teacher resistance to student-centered instruction, center teacher trainings on self-reflection and exposure to student-centered tactics. Contacts at District C recommend that administrators design trainings in which teachers experience students' perspectives of math lessons. Specifically, contacts recommend that administrators require teachers to solve math problems using a method that does not match their preferences and learning styles. Contacts report that this type of simulation helped teachers understand that one-size-fits-all, lecture-based instruction does not suit all students' needs. In addition, contacts at District A add that administrators should share an extensive library of potential student-centered instructional tactics with teachers to provide them with a broad array of options. Contacts note that exposing teachers to a plethora of student-centered tactics helps mitigate the apprehension that might arise if administrators ask teachers to implement tactics in which teachers lack expertise.

Use graduated instructional mandates and classroom observations to hold teachers accountable to student-centered instruction. In the first year of implementing student-centered instruction at District A, administrators required teachers to lead one student-centered activity per course per semester. Three years later, teachers now implement four to five activities into every lesson. In the intervening semesters, administrators encouraged teachers to share their experiences leading student-centered activities at staff meetings to both hold teachers accountable to tactic implementation and to troubleshoot any challenges. At District B, administrators use classroom observations to ensure that teachers implement student-centered instructional tactics. If administrators identify teachers relying on lecture-based instruction, they coach these teachers toward more student-centered instruction.

2) Transitioning to Student-Centered Instruction

Definition and Motivations

Student-Centered Instruction Offers a Promising, Albeit Relatively Untested, Approach to High School Math

Contacts at all profiled districts report that student-centered instruction can transform high school math classrooms. For example, contacts at District A report that students feel more welcome and comfortable in student-centered math classrooms. Contacts at District B highlight that student-centered math classrooms—which prioritize student interests and reduce or eliminate the amount of one-size-fits all, procedural, and lecture-based instruction—empower students to learn in the way that feels most natural to them. The resulting instruction, which teachers can adjust to match the interests and strengths of each student, facilitates personalized student learning. Contacts at District C and District D report that—by developing students’ mathematical cognitive skills (e.g., critical thinking, problem solving)—student-centered instruction in math enables more in-depth understanding of course material.



What is Student-Centered Instruction?

Student-centered instructional practices—as defined in EAB’s 2019 literature review [Student-Centered Math Instruction in High Schools](#)—shift the emphasis from teachers’ instruction to students’ development of knowledge. In student-centered math classes, students reason mathematically, communicate their mathematical thinking to other students, connect math concepts to their experiences, and solve complex, real-world math problems rather than solely memorizing procedures. In one study on student-centered math classes, teachers spent only 4 percent of class time in lectures—compared with 21 percent of class time in traditional high school math classes.¹

A relatively sparse body of empirical research evaluates the effectiveness of student-centered math instruction in high schools as compared to more traditional, procedural, and lecture-based (i.e., teacher-driven) methods.² Profiled districts implemented student-centered math instructional reforms on the basis of qualitative, theoretical, and/or emergent research, such as anecdotes from consultants hired by the district, the work of Stanford University professor and researcher Jo Boaler, and the National Council for Teachers of Mathematics framework [Principles to Actions](#). This research, in concert with multiple distinct motivations across profiled districts, emboldened administrators to move forward with student-centered instruction.

1) Kirk Walters et al., “An Up-Close Look at Student-Centered Math Teaching” (Nellie Mae Education Foundation, November 2014), <https://www.nmefoundation.org/resources/student-centered-learning/an-up-close-look-at-student-centered-math-teaching>; Jo Boaler and Megan Staples, “Creating Mathematical Futures through an Equitable Teaching Approach: The Case of Railside School,” *Teachers College Record* 110, no. 3 (2008): 608–45, <https://eric.ed.gov/?id=EJ822226>.
2) Walters et al., “An Up-Close Look at Student-Centered Math Teaching.”

Motivations for Student-Centered Instruction in High School Math Classrooms at Profiled Districts

At **District C** and **District D** teachers use student-centered instruction in math courses only. At the remaining profiled districts, administrators encourage student-centered instruction in all disciplines.

Response to Other Initiatives



Revised Assessments

At District C, the math department chair and coaches evaluated existing assessments. They found that most teachers only assessed students' ability to memorize mathematical procedures. Subsequently, these instructional leaders required all teachers to revise their assessments to check for students' understanding of math concepts (for an example of this process, see **page 13**). Accordingly, teachers had to transition to student-centered instruction to teach for understanding, instead of procedural proficiency. Otherwise, students could not succeed on understanding-based assessments.



Block Schedule Implementation

At District A, administrators decided to increase the length of all instructional periods from approximately 45 to 67 minutes. In response to this upcoming change, administrators required teachers to transition to student-centered instruction, which more effectively engages students during a longer class period than does teacher lecturing. For more information on optimizing instruction for longer class periods, see EAB's report [Preparing Teachers for Effective Block Schedule Implementation](#).

Intervention for Student Success



Grant-Supported Efforts

District B and District D enroll a high proportion of English Language Learners (ELLs) and students from low socio-economic backgrounds. Contacts report these student populations often demonstrate lower graduation rates and academic achievement. These districts received large grants (i.e., over a million dollars) from the [Nellie Mae Education Foundation](#) to implement student-centered learning with the goal of mitigating barriers to student success and improving learning for all students.

Instructional Models

Require Teachers to Align Instruction with Specific Student-Centered Frameworks or Approaches

Though all profiled districts use student-centered instruction in high school math classes, districts vary in their choice of instructional model (i.e., overall approach to student-centered instruction). Administrators at profiled districts offer guiding principles, trainings, and/or curricula that dictate teachers' approaches to student-centered instruction and thus determine student-centered instructional models.

Instructional Models at Profiled Districts

Range of Teaching Practices

District C

Guiding Mandate

Administrators require all teachers to adjust their assessments and instruction to teach for understanding of concepts rather than teaching how to memorize and apply procedures.

Description of Instruction

- Though administrators train teachers on student-centered instructional tactics, teachers implement those tactics to varying degrees.

Short Lectures + Activities

District A

Guiding Principles

Citing research on the human brain and adolescents' attention spans, administrators require teachers to limit direct instruction to seven minutes at a time.

Description of Instruction

- Even during seven-minute lectures, student discussion and participation often comprises half of the lecture time.
- During the rest of the class, teachers integrate four to five student-centered activities.

Personalized Learning

District B

Guiding Trainings

Administrators required and funded all teachers' attendance at [Research for Better Teaching](#) courses on flipped classroom pedagogy and on encouraging students to talk through, develop, and demonstrate higher-level thinking. By attending these trainings, teachers learn to allow students' interests and learning preferences guide instruction.

Description of Instruction

- In one classroom at District B, the teacher shows videos demonstrating a math concept at the beginning of class, and then provides support as needed while students work through course material on their own, using the methods they most prefer.
- In another classroom, a teacher uses a popular television series to demonstrate ELA concepts and standards after students expressed interest in the series.⁴

Math Labs + Collaboration

District D

Guiding Curriculum

Administrators created a curriculum, based on the student-centered [IMP Curriculum](#) with supplemental activities. The curriculum is entirely digital, hosted on the school's Learning Management System (LMS).

Description of Instruction

- In lieu of a traditional math class, students attend a daily "math lab," where they progress through four, self-paced math units per year—each composed of 20 activities.
- Twice a week, teachers host collaborative workshops where students solve math problems that require analytical reasoning (e.g., mathematical riddles). These workshops help students develop mathematical critical thinking skills.

In flipped classrooms, teachers use digital resources to introduce instructional content, usually outside of class. Students use class time to work through problems and activities traditionally assigned as homework.³

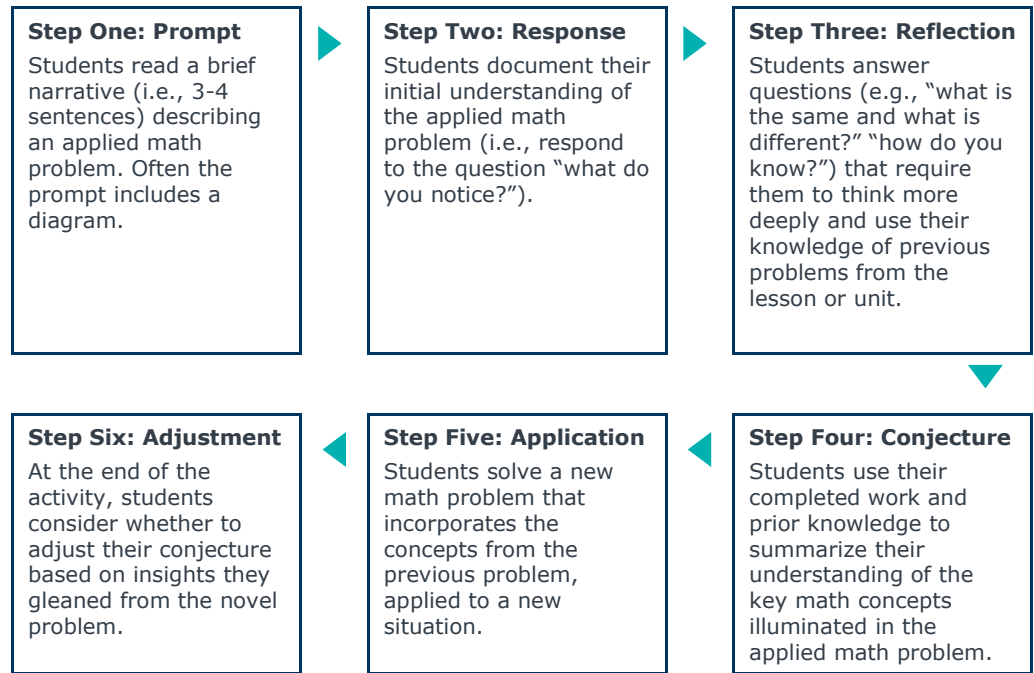
3) "The Definition of The Flipped Classroom," accessed January 23, 2020, <https://www.teachthought.com/learning/the-definition-of-the-flipped-classroom/>.

4) Article profiling District B, 2018.

Student-Centered Math Instruction Uses Discovery to Prepare Students for Standardized Tests and Beyond

Contacts at all profiled districts report that student-centered instructional tactics encourage students to discover mathematical concepts independently. Through this process of self-discovery, students ultimately develop a deeper level of understanding of course content. In addition, contacts at District C and District D stress that learning through discovery allows students to develop overarching math critical thinking skills (e.g., problem solving, flexible thinking), which transfer to all units and levels of math.

Example Student-Centered Math Activity that Guides Discovery at District D



By deepening student understanding of math concepts and improving their math critical thinking skills, contacts at District C and District D report that student-centered instruction naturally prepares students for college readiness tests such as the SAT and advanced placement (AP) exams (e.g., AP statistics). For example, contacts at District C explain that traditional math instruction focuses on students’ memorization of procedures. On AP exams, students cannot rely on procedures alone—they must flexibly apply math concepts in a variety of situations. This type of mathematical reasoning and problem-solving aligns with the type of work that students practice in student-centered math classrooms.

Overall, administrators at profiled districts do not use additional practices—beyond the student-centered instructional tactics that teachers implement—to specifically prepare students for standardized tests, including state standardized tests. Contacts at District A note that administrators plan to encourage teachers to closely integrate state standards into their lessons to ensure that student-centered instruction prepares students for state standardized tests—at this time, however, administrators have not yet begun this process.

Incorporate Instructional Tactics that Develop Critical Thinking and Growth Mindsets

Contacts at all profiled districts agree that student-centered instruction encompasses a wide array of instructional tactics.⁵ Specifically, contacts at District B, District C, and District D listed examples of tactics that teachers at these districts use in student-centered, high school math classrooms. All of these tactics encourage students to think deeply about underlying math concepts, guide students to learn from failed attempts as they work to find the solution, and prevent teacher-led lecturing from dominating the class period.

Example Student-Centered Math Instructional Tactics

Tactic	Description	District
<i>Flipped classrooms</i>	<ul style="list-style-type: none"> • Instead of practice problems, students watch a video explaining math concepts for homework. • Instead of a lecture, during class students work through problems and engage in whole-class or small-group discussions.⁶ 	District B
<i>Low-floor, high-ceiling tasks</i>	<ul style="list-style-type: none"> • Teachers design math activities (e.g., word puzzles that require analytical reasoning) that all students can understand, but more advanced students can extend to more challenging levels. These tasks help facilitate collaboration in heterogenous math classrooms. For an example task, review pages 9-12 of this resource. • These tasks may not have one right answer—students successfully complete the tasks by demonstrating proficient mathematical skills. 	District D
<i>Problem-based learning</i>	<ul style="list-style-type: none"> • Students work in groups to investigate a complex math problem, implement solutions, and evaluate their work to generate new strategies until they solve the problem. Teachers encourage students to show their thinking, monitor the groups, and ask guiding questions.⁷ • For example, teachers use the Open Middle curriculum to assign math questions with a single answer that students can reach in multiple ways (i.e., multiple permutations of the same solution). 	District C
<i>Project-based learning</i>	<ul style="list-style-type: none"> • Students work in groups to apply math skills and concepts in a real-world context (e.g., personal finance). Unlike most problem-based assignments, the outcome of the project is usually a real product or a presentation. Students may work on these projects across multiple days, weeks, or months. • For example, in the Ultimate Design Challenge, high school math students use engineering and geometry to redesign a product's packaging to increase its sustainability. 	District B

Collaboration between students represents a core characteristic of student-centered instructional tactics at all profiled districts. At District C, for example, students work through problems together on classroom whiteboards.

5) "Student-Centered Learning Definition," The Glossary of Education Reform, May 15, 2013, <https://www.edglossary.org/student-centered-learning/>.

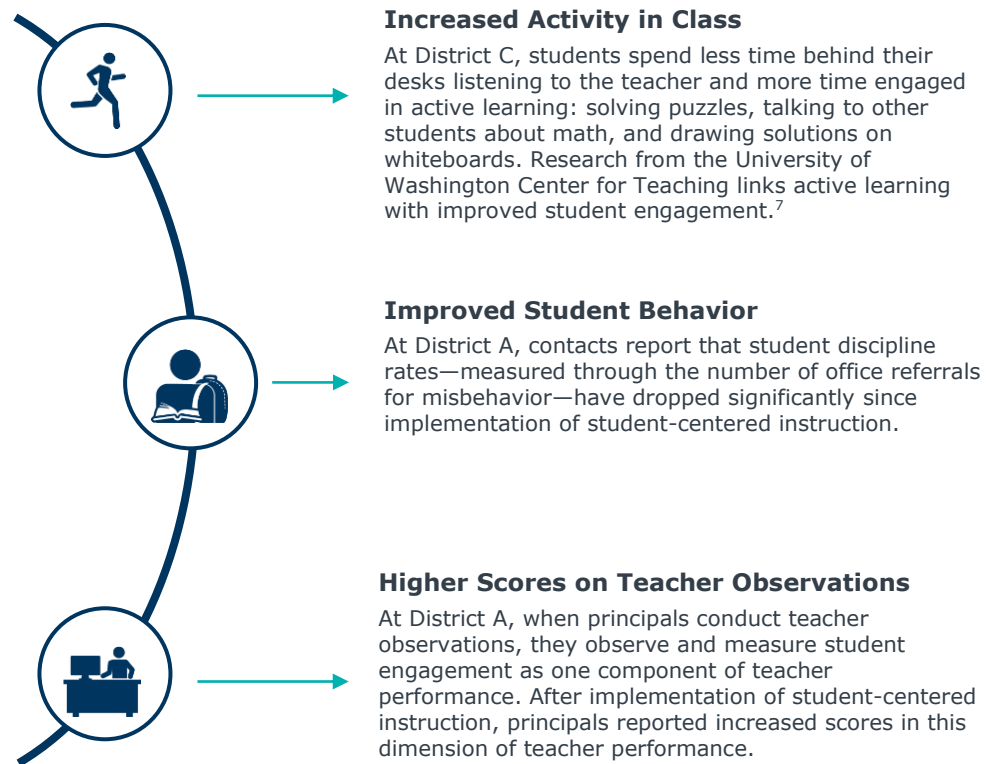
6) Stacey Roshan, "My Math Classroom, Flipped: Saving Time and Empowering Learners," Medium, September 27, 2018, <https://medium.com/inspired-ideas-prek-12/my-math-classroom-flipped-saving-time-and-empowering-learners-c76e29e0af8>.

7) "Student-Centered Math Instruction in High Schools," EAB, 2019.

Expect Effective Student-Centered Instruction to Improve School Climate

Contacts at District A, District B, and District C report that student-centered instruction has demonstrably improved student engagement and school climate. For example, at District B, administrators introduced student-centered instruction in response to the disengagement (i.e., boredom) that students often feel in lecture-based schools and classrooms. By personalizing student learning through student-centered instruction (i.e., allowing student voice to influence the topics they study, the speed at which they progress through material, and types of procedures they use to solve problems) contacts report anecdotally that students now engage more with their teachers and with the course content. Contacts also report that student-centered instruction had a transformational impact on their school climate and culture overall, particularly for low-income and English language learners. At District B, a 95 percent attendance rate suggests that students now feel excited to attend school.⁸

Indicators of Improved Student Engagement and School Climate at Profiled Districts



8) Article profiling District B, 2014.

9) "Engaging Students in Learning," Center for Teaching and Learning, accessed January 22, 2020, <https://www.washington.edu/teaching/topics/engaging-students-in-learning/>.

Student-Centered Instruction May Improve Student Learning, Particularly for Disadvantaged Students

At District B and District D, where administrators implemented student-centered instruction five or more years ago, contacts report positive student achievement outcomes. Notably, both districts serve a student population that differs from other profiled districts in two ways: a higher proportion of ELLs and families living below the federal poverty line. Therefore, contacts' observations of improved student performance align with research literature that suggests student-centered math instruction can close achievement gaps between these students and their more privileged peers.¹⁰

Statistics reflect National Center for Education Statistics (NCES) data with one exception: NCES reports 32 percent of students require English language services at District D, but contacts report that the district provides 40 percent of students with English language services.

Demographics of Profiled Districts¹¹

District	Percent of ELLs in the Student Population	Percent of Families in Poverty
District A	1	5
District B	22	18
District C	3	9
District D	40	48

Contacts at District B and District D report multiple measures that demonstrate student-centered instruction's positive impact on student achievement.

Indicators of Improved Student Achievement at Profiled Districts



Increase in Graduation Rate

At District B, contacts report that the high school graduation rate increased from 70-75 percent before implementing student-centered instruction to 95 percent or higher after implementation.



Increase in Percentage of Students Proficient in Content

At District D, before implementing student-centered instruction only 50 percent of students achieved proficiency in high school math courses (i.e., 30 percent of students failed the courses and 20 percent of students received a passing grade below a C-). Now, contacts report 80 percent of students achieve proficiency in one year's worth of math content each year. Contacts at District B also report that student-centered instruction improved math proficiency.

Profiled Districts Do Not Rely on State Standardized Test Scores to Accurately Capture the Outcome of Student-Centered Initiatives

State standardized test scores suggest mixed results of student-centered initiatives in regard to student achievement. However, contacts at District A, District B, and

¹⁰Boaler and Staples, "Creating Mathematical Futures through an Equitable Teaching Approach."

¹¹"Education Demographics and Geographic Estimates," National Center for Education Statistics, accessed January 21, 2020, <https://nces.ed.gov/programs/edge/>; EAB interviews and analysis

In **District C's** state, contacts report that students do not take state standardized tests.

District D cite inconsistencies in state assessments from year to year and changes to student body composition as factors that impede the utility of state standardized test scores as tools to measure the effectiveness of student-centered instruction. For example, during the course of student-centered instruction implementation at District D, the state shifted from testing students in eleventh grade to testing them in ninth grade. At the time of the test students have completed less than one year of the high school's student-centered math curriculum. Contacts explain that this shift prevents state standardized test scores—which show less than or equal to 10 percent of students achieving proficiency in math—from accurately reflecting the impact of the initiative.¹² State officials also changed the standardized tests during student-centered instruction implementation at District A, which contacts report prevents them from using state standardized tests to compare student performance before and after implementation.

At District B, the percentage of students achieving proficient or advanced math scores on the state standardized test improved from 66 percent to 81 percent two years after implementation of student-centered learning. In more recent years, however, an increase in the number of ELLs to the district and the adoption of the Common Core appear to have impacted student performance, which dipped in 2014. Between 2014 and 2017, the percentage of students achieving proficient or advanced math scores on the MCAS remained at or between 71 and 78 percent each year.¹³

Instead of state standardized test scores, administrators at profiled districts focus more on assessments of student learning and engagement in individual classrooms to evaluate the impact of student-centered instruction (see **pages 20-21**).

Concurrent Reforms at Profiled Districts May Have Contributed to Positive Outcomes of Student-Centered Instruction

At District B, student-centered instruction represents a school-wide priority that impacts areas beyond math classrooms. For example, administrators also adopted a schedule with longer instructional blocks and added designated teacher collaboration time to the schedule. At District D, when implementing math labs, administrators structured the curricula so that students could only progress to the next activity when they demonstrated proficiency on their current activity. These additional practices—related to student-centered instruction but not necessarily components of all student-centered reforms—may partially account for the improved student achievement at these districts.

¹²) "District D Profile," Public School Review, accessed January 27, 2020.

¹³) Article profiling District B, 2014; Article profiling District B, 2018; "State Exam Annual Comparisons -District B," District B Department of Education, accessed January 28, 2020.

3) Implementation

Pedagogy Reform and Adoption

Most Profiled Districts Incorporate Student-Centered Instructional Tactics into Traditional Curricula

At District A, District B, and District C, teachers select student-centered instructional tactics to implement in their lessons. During these lessons, teachers still cover the same concepts, standards, and topics that they would have taught in traditional, lecture-based lessons. In other words, administrators did not adjust the school's curriculum, but rather focused on adjusting the techniques through which teachers deliver that curriculum.

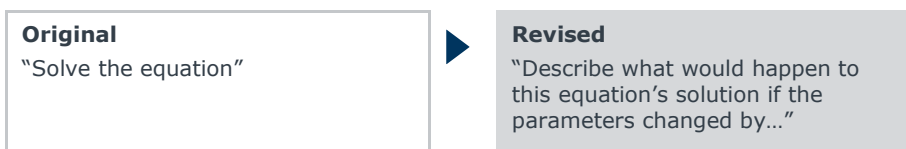
In contrast, at District D, math teachers who led instructional reform efforts developed a student-centered math curriculum comprising four units each year, with 20 student-centered activities per unit. These teachers used materials from the [Interactive Mathematics Program](#) curriculum and [Open Up](#) curriculum to create these units.

Re-Write Assessments Without Procedural Questions to Hold Teachers Accountable to Student-Centered Instruction

To ensure that teachers implemented student-centered instruction at District C, administrators required teachers to re-write their assessments. Under the revised framework, all assessments at District C ask students to think flexibly and apply math concepts. To effectively develop students' depth of understanding so that students can succeed on these revised assessments, contacts report that teachers cannot rely on the traditional, procedural math instruction inherent to lecture-based math classes. Instead, teachers must use student-centered instruction. Therefore, contacts report that revising the assessments circumvents teacher resistance to instructional reforms and ensures that they teach in a student-centered manner.

During a half-day, school-wide, professional development day at District C's high school, the math instructional coach taught teachers how to change each "procedural word" in their assessments (e.g., solve) to an "understanding word" (e.g., describe).

Example Wording Change of an Assessment Question at District C



During a monthly, hour-long department meeting, the instructional coach meets with all teachers who have upcoming summative assessments. These teachers bring a draft of their assessments, revised to the best of their ability. The instructional coach then evaluates each assessment and suggests ways to further improve them. This review process ensures that teachers properly implement lessons from initial professional development sessions. Contacts note that this process is iterative—in

subsequent years after implementation of the new assessments, the instructional coach continues to meet with teachers to improve their assessments each year.

Facilitate Gradual Adoption of Student-Centered Practices to Guide Instruction Away from Traditional Approaches

Administrators at profiled districts took different approaches to achieving the level of student-centered instruction currently occurring in their high schools' math classrooms. At District D, for example, administrators eliminated traditional instruction entirely and instantaneously through creating math labs. However, contacts report that this immediate switch created numerous issues (e.g., students had not yet learned to effectively pace themselves, teachers reported dissatisfaction with increased workload) that administrators then needed to address over the course of multiple school years.

Instead, administrators should consider asking teachers to gradually incorporate more student-centered practices into their instruction. At District A, administrators first spent a year introducing the concepts of student-centered instruction during staff trainings. In the following year, administrators mandated that all teachers implement one student-centered tactic or activity per course per quarter (i.e., a teacher leading two sections of Geometry would implement two activities each quarter—these activities can range from a short activity during one class to an activity that spans multiple class periods, depending on the teacher's preference, course content, and level of comfort with student-centered instruction). Concurrently, administrators hosted professional development sessions during which teachers shared their experiences implementing these activities and thus learned a variety of instructional tactics. Contacts note that the mandate to use one tactic per quarter in each course held teachers accountable to using student-centered instructional tactics within their classrooms, and the ongoing professional development improved teachers' confidence with tactic implementation.

In the following years, contacts suggest increased teacher confidence translated to an increase in frequency of student-centered activities. Now, the high school uses extended blocks for instructional periods. To engage students throughout the whole instructional periods, administrators mandate that teachers lecture for no more than seven minutes at a time. Teachers use the remaining time to lead four to five student-centered activities during each class period.

With Gradual Adoption, Expect Some Traditional Instructional Practices to Persist for Multiple Years

The extent to which high school math teachers continue to incorporate traditional math instruction (e.g., use lectures to demonstrate a theorem) into their classrooms varies across profiled districts.

Progress Toward Entirely Student-Centered Instruction at Profiled Districts

District

Extent of Reformed Instruction

District C

Years since implementation: 3

Somewhat Student-Centered

Teachers vary in the extent to which they have adopted student-centered instruction. For example, some teachers no longer assign homework (a central component of traditional math classes), whereas other teachers still devote time at the beginning and end of class to checking and working on homework.

District A

Years since implementation: 7

Mostly Student-Centered

Teachers sometimes lecture to demonstrate math concepts. When they do, they limit all lectures to seven minutes and incorporate four to five student-centered activities per lesson to reinforce concepts from the lecture.

District B

Years since implementation: 10

Almost Entirely Student-Centered

Administrators trained all math teachers on ways to personalize student learning (e.g., flipped classroom pedagogy) to facilitate universal implementation of student-centered instruction. In some cases, administrators identify individual teachers still using traditional, lecture-based instruction. In these instances, administrators subsequently coach the teachers to more fully implement student-centered instruction.

District D

Years since implementation: 7

Entirely Student-Centered

Administrators developed an entirely student-centered curriculum and curriculum delivery method (i.e., student-directed math labs with twice-weekly collaborative lessons).

Teacher Engagement

Engage Teachers in Self-Reflection Activities to Demonstrate the Limitations of Traditional Instruction

Administrators at District A, District B, and District D encourage teachers to reflect on students' experience of traditional math instruction to promote teachers' willingness to engage with student-centered instructional reforms. For example, at District B, administrators encouraged teachers to consider whether lecture-based instruction is compatible with students' real-world experiences in the 21st century. To accomplish this goal, administrators led reflection-based conversations with teachers on an informal basis (e.g., at staff meetings, in the hallways) in the first one to two years of student-centered implementation.

During these conversations, administrators at District B emphasize that 21st century workplaces require critical thinking, creativity, collaboration, and communication. Then, administrators articulate the way that student-centered instruction effectively prepares students for real-world success by explicitly developing these four skills. After guiding teachers' reflection on teaching and learning in the 21st century, contacts report that teachers—even those initially resistant to the idea of instructional

reforms—realized that traditional instruction does not align with 21st century student success.

At District D, contacts cite an exercise from a summer course hosted by the [Teachers Development Group](#) as highly effective for encouraging teacher self-reflection on the limitations of traditional instruction. At District D, only teachers leading the math instructional reforms attended this summer course—however, contacts suggest that administrators should consider replicating this exercise for all teachers to engage teachers initially resistant to the idea of instructional reforms.

Activity to Demonstrate the Limitations of Procedural Math



Goal

Show teachers that, as a student, you would prefer your teacher to allow you to develop understanding—rather than encouraging you to memorize a procedure.



Step One

Give teachers a prompt such as “prove the calculation for the area of a triangle is half that of a rectangle.” Ask teachers to solve the problem.



Step Two

Facilitators continuously interrupt the teachers as they work through the proof, asking them to answer the question differently or more quickly.



Impact

This exercise teaches humility, as teachers with advanced math knowledge experience uncertainty and discomfort during a math lesson. Subsequently, they realize that they prefer to learn in a student-centered environment, where they are free to explore how to solve a problem in the way most preferential to them.

Develop Teacher Committees to Promote Teachers’ Ownership Over Instructional Reforms

In addition to self-reflection, contacts at District B note that teachers’ personal investment in reforms promotes their acceptance of student-centered instruction. At District B, every teacher participates in one of a dozen student-centered learning committees. Each committee researches a different tactic or topic related to student-centered learning (e.g., competency-based education, flipped classroom pedagogy). Often, committee teachers implement their tactic in their classrooms and subsequently conduct an experiment on the impact of the tactic. The committees meet on a monthly basis to discuss their research and adjust tested tactics as necessary.

At five staff meetings throughout the year, committee teachers share their findings with all teachers at the school. These presentations provide an opportunity for committee teachers to serve as instructional leaders, which helps teachers feel ownership and pride over the work they completed as a member of their committee.

To incent initial teacher participation in student-centered committees, administrators at District B offered a 500-dollar stipend at the beginning of the year and a 300-dollar stipend at the end of the year. In subsequent years, administrators found that it was no longer necessary to provide monetary participation incentives. Instead, teachers now participate in the committees voluntarily because they view them as an essential feature of their instructional role.

Training

Focus Teacher Trainings on Multiple Student-Centered Instructional Tactics

To train teachers at District A and District C on student-centered instruction, administrators prioritize introducing teachers to a variety of student-centered instructional tactics that teachers can subsequently implement in their classrooms. Contacts at District A describe a teacher’s repertoire of instructional tactics as a toolbox—contacts explain that professional development around student-centered instruction fills teachers’ toolboxes with student-centered tools. If teachers master a variety of student-centered tactics, they can better select tactics best suited for their course content and for their students. Administrators at these districts source specific tactics from a variety of resources. For more detailed information on the tactics at the center of these trainings at profiled districts, see **page 9**.

Resources to Train Teachers at Profiled Districts



Human Resources

District A

Description

Administrators asked **teachers who already used student-centered instructional tactics** in their classrooms to present on these tactics to their peers.

Modality

Administrators devoted **all professional development time** (i.e., Professional Learning Community (PLC) time, all staff meetings, each district-wide professional development day) to exposing teachers to a variety of student-centered instructional tactics.



Digital, Print, and Social Media

District C

Description

The math instructional coach reviews accounts on **Twitter, webconferences, podcasts, and books** to identify new student-centered instructional tactics.

Modality

The instructional coach works with teachers during **monthly staff meetings** and in response to requests for assistance. In addition, the instructional coach shares many of the digital sources (e.g., podcasts) with teachers for them to access individually.



Media Sources for Instructional Tactics

Contacts at District C cite the following as key resources for training teachers on student-centered instruction:

Twitter

- [#Mtbos](#)
- [@robertkaplinsky](#)
- [@ddmeyer](#)
- [@MakeMathMoments](#)

Book

- [Visible Learning for Mathematics](#)

Webconference

- [Global Math Department – Assessing for Understanding](#)

Podcast

- [Make Math Moments](#)

Outsource Some Training Responsibilities to External Organizations and Consultants to Add Credibility

All profiled districts work with external teaching and learning organizations and/or instructional consultants to help train teachers on student-centered instruction. For example, facilitators from the [Teacher’s Development Group](#) visit District D three times each year to host two-day workshops. During these workshops, the facilitators show anecdotal evidence from other school districts of the positive impacts of student-centered instruction. Contacts report that this anecdotal evidence from instructional experts (i.e., facilitators) helps to convince teachers of the effectiveness of student-centered instruction.

At District B, administrators used a grant from the Nellie Mae Education Foundation to fund all teachers’ completion of courses on student-centered pedagogy from the organization [Research for Better Teaching](#). Teachers received a stipend to take the course, which they can count toward required professional learning credit.

Survey Teachers After Trainings to Encourage Self-Reflection and Assess Training Effectiveness

After each training session at **District A**, administrators distribute a survey that asked teachers:

- How do you feel about student-centered learning?
- Do you think you could implement today’s tactic in your classrooms?
- What other resources would you need?
- Do you think this tactic is effective?

Ongoing Supports

Offer Instructional Coaching to Help Teachers Improve Instruction

At District A, District C and District D, an instructional coach helps teachers effectively implement the tactics shared during teacher trainings. At District C, the instructional coach facilitated a book study on the text [Visible Learning for Mathematics](#). Contacts explain that this text helps teachers optimize their student-centered instruction (i.e., once teachers commit to using student-centered instructional tactics,

the book guides teachers to the next level of implementation, in which they use specific instructional tactics for specific purposes). With advice from the book, for example, teachers can decide to pick one type of activity to use at the beginning of class to inspire students' curiosity, and another type of activity to use at the end of class to summarize the day's instruction.

At District A, in addition to instructional coaches at each school site, an external consultant currently coaches teachers from one course each year. For example, last year the consultant worked with Algebra I teachers to reform the entire course (i.e., all lesson plans and assessments) in accordance with student-centered teaching. This year, the consultant is working with the Algebra II teachers to do the same with their course's curriculum.

Use Classroom Observations to Hold Teachers Accountable for Instructional Improvement

Observations from principals, math department leaders, and peers contribute to the ongoing supports available to teachers at District A, District B, and District C. At District A, a math department leader conducts observations using the Marzano teacher evaluation framework, which encourages teachers to use specific, evidence-based practices that drive student learning, engagement, and achievement.¹⁴ Contacts at District A report that the practices integrated into the framework constitute student-centered instructional practices. Thus, the framework allows the department leader to provide teachers with actionable feedback related to their student-centered instruction.

At District B administrators also encourage peer observations to help teachers observe a variety of student-centered instructional tactics.

At District B, administrators developed an observation process that holds teachers accountable to implementing student-centered instruction. Administrators created a digital teacher evaluation platform. At the beginning of the year, each teacher conducts a self-assessment and uploads a report to the platform that details their strengths and areas for growth in four areas, one of which is student-centered instruction. Then, after conducting observations, school administrators (e.g., principals or assistant principals) use these self-assessments to guide their feedback, which they also upload to the platform. If administrators' feedback notes that a teacher's instruction relies too heavily on lecturing, administrators meet with the teacher to provide instructional coaching targeted specifically at student-centered activities.

The frequency of evaluations at District B varies based on teacher tenure. Administrators evaluate teachers with under four years of teaching experience every year. Administrators evaluate teachers with more than four years of teaching once every two years.

¹⁴"Principles of Teaching Excellence Resource Guide," EAB, 2019. <https://attachment.eab.com/wp-content/uploads/2019/08/Principles-of-Teaching-Resource-Guide.pdf>.



Consider Investing in Classroom Technologies to Support Student-Centered Instruction

Administrators at District A and District B purchase technology to help teachers implement student-centered instruction. For example, administrators at District A purchased clickers for students to take quick, in-class quizzes upon the request of a teacher. Contacts also report that [Albert.io](#), a digital learning platform, supports student-centered learning at their district. The platform provides modules and practice questions for teachers and students to use to personalize student learning. At District B, where administrators implemented student-centered learning in all high school courses, the district provided each student with a Chromebook through a 1:1 initiative to facilitate blended learning (i.e., learning through both in-person instruction and digital media).

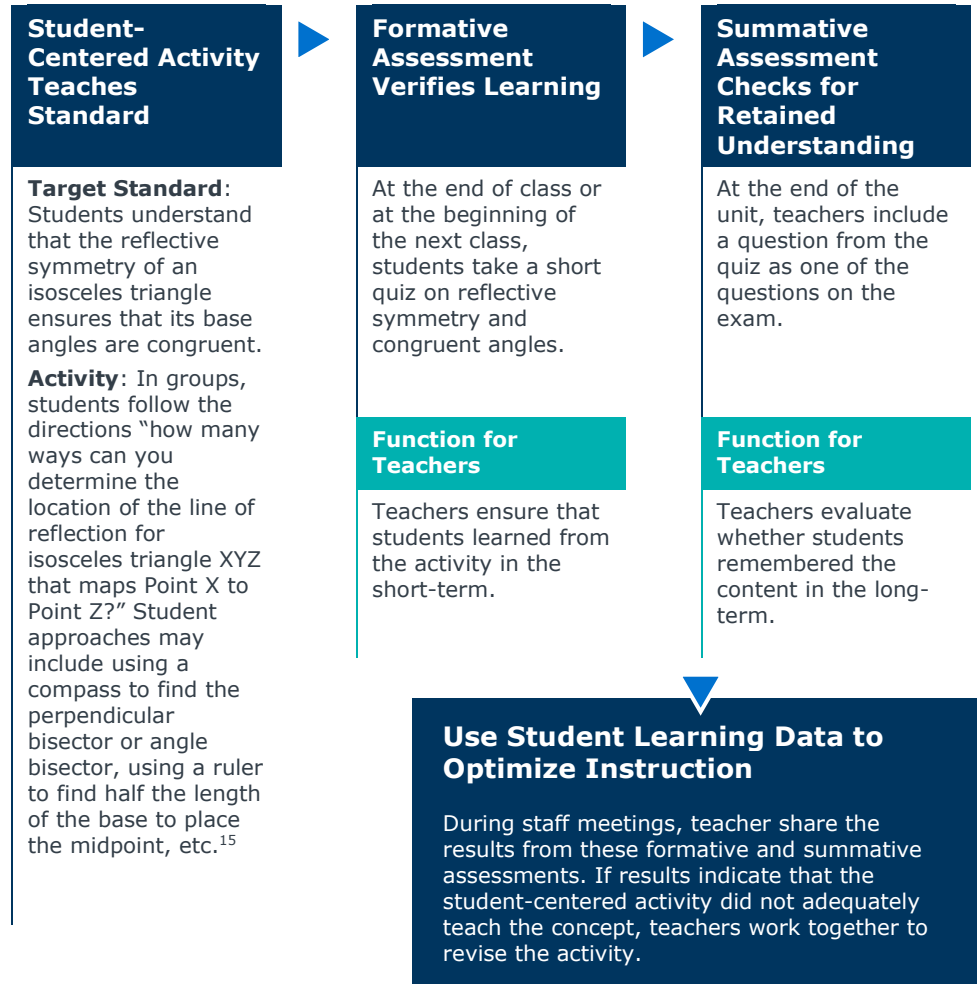
Assessing Implementation

Before Evaluating Reforms' Overall Impact, Assess Learning in Individual Student-Centered Lessons for Continuous Improvement of Instruction

At District A and District C, where administrators initiated student-centered instructional reforms two to three years ago, administrators have not yet evaluated the overall impact of student-centered instruction on student achievement (e.g., standardized test scores, grade point average). In part, contacts cite the lack of useful standardized tests (see **page 12**).

At District A, however, administrators do track student learning on a lesson-by-lesson basis (i.e., student performance on formative and summative assessments) to identify areas for growth and to continuously optimize instruction throughout student-centered learning implementation.

Student Learning Assessments at District A



Moreover, contacts at District A report that assessing the overall impact of student-centered instructional tactics on student learning will be the next step of the implementation process. As of now, however, contacts report that continuous improvement remains the key focus of their implementation efforts—contacts plan to optimize student-centered instruction prior to evaluating its impact.

Supplement Assessment Data with Qualitative Feedback to Gauge Impact of Instructional Reforms

At District D, the teachers leading student-centered math instructional reforms conduct regular check-ins with students to learn about their perspectives on the new curriculum and approach. The leaders adjust instruction in response to this feedback. For example, in the first year after implementing math labs, students reported feeling isolated during math class. In response, the leaders implemented two whole-class collaborative work sessions each week.

¹⁵Prashant Saha, “Line of Reflections on Isosceles Triangles,” *Open Middle*® (blog), accessed January 27, 2020, <https://www.openmiddle.com/line-of-reflections-on-isosceles-triangles/>.

5) Research Methodology

Project Challenge

Leadership at a member district approached the Forum with the following questions:

- What professional development opportunities do contact districts provide for math teachers to train them in reformed math instructional tactics?
- What resources do contact districts use to design teacher trainings on reformed math instructional tactics?
- On what specific instructional tactics do administrators focus professional development for math teachers at contact districts?
- What ongoing supports do contact districts provide for math teachers to encourage them to use reformed math instructional tactics?
- To what extent do high school math teachers at contact districts continue to incorporate traditional math instructional tactics?
- How do contact districts hold teachers accountable to using reformed math instructional tactics within their classrooms?
- How do contact districts engage teachers who are initially resistant to reformed math instructional tactics?
- How do contact districts ensure that reformed math instructional tactics adequately prepare students for standardized tests?
- How do contact districts assess the impact of reformed math instructional tactics, such as student-centered math instruction?
- What outcomes of reformed math instructional tactics have contact districts noticed?

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Research Parameters

The Forum interviewed administrators or teachers who oversee student-centered high school math instruction initiatives at the following districts.

District	Location	Approximate District Enrollment
District A	Mid-Atlantic	10,000
District B	Northeast	7,500
District C	Mid-Atlantic	6,000
District D	Northeast	1,000