Public Schools of Brookline
PK-8 Math Review

Phase I Report

June 2019

Table of Contents

Introduction

Purpose and Scope of Math Program Review

Four Phase Program Review Process

Current Context PK-8 Mathematics

Community Context

Curriculum Materials Review

Purpose and Scope of PK-8 Math Program Review

The purpose of the PK-8 Mathematics Program Review is to provide a systematic and public review of mathematics programming for Brookine's PK-8 students with the goal of continuously improving the educational outcomes for all PK-8 students. The last formal district review of the mathematics program took place in 2005. Changes to the Massachusetts state curriculum frameworks, new Math MCAS, and outdated K-5 and middle school curricula that were not aligned with changes in the national and state standards further supported the need for the program review, and a simultaneous curriculum materials review of both the K-5 and 6-8 mathematics curricula.

Starting in January 2018, the PK-8 Mathematics Program Review Committee met to engage in the first phase of the formal PK-8 mathematics review, which is the Study and Vision phase. This report represents the work of the committee and the concurrent and related work of other stakeholders involved in reviewing and improving the PK-8 mathematics programming for Brookline's students.

The following groups have contributed to the PK-8 Mathematics Program Review and Curriculum Materials review work:

- PK-8 Mathematics Department
- Math Specialists
- PSB Office of Teaching and Learning
- PK-8 Mathematics Program Review Committee
- Teams of teachers who served on the K-5 and 6-8 Curriculum Materials Review Committees
- Curriculum Subcommittee of PSB's School Committee
- PSB School Committee
- All PSB 6th, 7th and 8th grade students
- K-8 Principals
- PSB teachers and Special Educators
- PSB parents
- The Center for Collaborative Education (CCE) *

*Organization that coordinated and conducted independent research of the current state of mathematics education in the district. Their Phase I report and findings are attached as an appendix to this report.

Four Phase Program Review Process

Phase I: Study and Vision

(January 2018-April 2019)

The committee acquires an understanding of the current state of the program (structure and function) with the assistance of an outside evaluator. Using stakeholder input, they develop a shared vision for the program. They determine areas of strength and areas for improvement, and provide recommendations to address the areas for improvement.

Phase II: Plan

(April 2019-June 2019)

The committee gives input for the creation of a plan to address areas for growth and improvement. This involves the scope of work, the priorities and identifying resources and fundings. The plan includes indicators of success.

Phase III: Implement

The coordinator is charged with putting the Phase II plans into action and monitoring and reporting on progress.

Phase IV: Analyze

The committee convenes while implementation is underway to determine whether things are proceeding as planned. They reflect back on the review process to evaluate how it worked as a vehicle for examining the program, identifying and addressing areas for improvement. Any data on the indicators of success is examined as a check on the effectiveness of program improvements.

Current Context of PK-8 Mathematics

The last PSB PK-12 Mathematics Program Review took place in 2005. Since that time, there has been a significant shift in district leadership including a new PK-8 Mathematics Coordinator.

In 2005, the Curriculum Review Committee recommended a new curriculum for adoption. The curriculum that was initially recommended however, was not adopted by the district. Instead, *Think Math* and *Impact Math* were purchased and implemented.

With the revisions to the National Mathematical Standards of Practice, the 2017 revision to the MA Curriculum Frameworks, and the fact that our current curricula are no longer being updated by the publishers, there was an opportunity and clear need to adopt new curricula for grade levels K-5 and 6-8.

For these reasons, both the Math Program Review process and a Curriculum Materials Review are occurring simultaneously. We outline that work later in this document.

Community Context

As our community concludes the first phase of the PK-8 Mathematics Review, it is important to consider the context of Mathematics education in the Public Schools of Brookline. Mathematics education in Brookline is a complex partnership that includes the home, the classroom, pull-out groups and supplemental in-school activities as well as a significant ecosystem of private programs, tutors and online experiences.

As a district, we recognize that parents will always have choices to provide enrichment experiences to their children, and the district has a responsibility to incorporate the experiences and perspectives of all children into their public school education. Some families enter with or develop the perception that public school math education is insufficient and therefore requires additional support for students outside of school. The push and pull between the instruction and enrichment that is provided within the school day and that which is provided by some, but not all families, outside of the school day is an important piece of the context for teachers, students, and families.

It is also important to acknowledge that, as a public school district responsible for the learning of all children, the PSB must choose a curriculum that best supports the individual differentiation needed by many of our students.

Community Context (Continued)

While Brookline is a well-resourced and high performing district that clearly values education, there are documented and persistent achievement and opportunity gaps that exist in mathematics among groups of our students.

- 38% of Economically Disadvantaged students in grades 3-8 reached a performance level of "Meeting" or "Exceeding" expectations on the Spring 2018 MCAS Math assessment compared to 77% of their Non-Economically Disadvantaged peers.*
- From Spring 2011 to Spring 2018, the percentage of African American students in grades 3-8 who reached proficiency on the Math MCAS ranged from 36-49%. During this same time period, 86-89% of Asian students reached proficiency.*
- In Spring 2017, only 19% of 8th grade African American/Black students were recommended for a 9th grade honors Math course compared to 51% of 8th grade students who were White.**

There are larger societal and systemic problems that contribute to these persistent achievement gaps, including institutional racism and implicit bias. The data provided above illustrates similar troubling structural aspects of society are real and present in Brookline's schools. As a public school district, we are committed to addressing the problems over which we have control including the teaching and learning that takes place in our classrooms and the supports that all children receive to achieve their best.

It is within this complex landscape that our committee has undertaken the Program Review for PK-8 Mathematics for the Public Schools of Brookline.

*Massachusetts Department of Elementary and Secondary Education Public Profiles
**PSB Internal 9th Grade Recommendation Analysis; Spring 2017

Limitations of the Phase I Report

There are some limitations of the Phase I study and report that merit mention.

Scope of Program Review

- Program Review usually entails examining departments and programs through a PK-12 lens. The current Math Program Review includes the PK-8 Mathematics program. Because of this limitation, a plan will need to be developed to engage Brookline High School's Mathematics Department in this important review process to ensure consistency and continuity.
- Limited Comparable Assessment Data: The committee had limited formal quantitative data available to make comparisons across years because of the 2017 change in the Massachusetts Comprehensive Assessment System Math examination. The committee chose not to make longitudinal comparisons across two different assessments.

Visits to PK-8 classrooms

- Due to time limitations, the committee was not able to see mathematics instruction across a variety of PK-8 classrooms.

There is great interest on the part of the PK-8 Math Program Review Committee in Phase II of the PK-8 Mathematics Program Review to continue to visit classrooms in Brookline and comparable districts to better understand strong, effective Mathematics instruction.

Engaging Parents and Community Members in Participating in Focus Groups and Online Survey

- The following efforts were made to engage parents: communication through district and school newsletters, PSB website, communication with PTOs, flyers posted in all schools, social media, and individual school efforts
- Only a limited number of parents/caregivers attended the five public focus groups.
- The participation rate of the online parent survey was about 10%. At the time of the release of the PK-8 parent survey, parents were also asked to participate in two other surveys.

Components of Phase I

Forming the Review Committee

Committee Members

Calendar of Meetings

Overview of Committee Work

Curriculum Materials Review

Forming the Review Committee

During the fall of 2018, the PSB Office of Teaching and Learning recruited parents, educators and administrators to join the PreK-8 Math Program Review Committee. A general announcement and simple application was emailed to all teachers and parents (translated into eight languages) across the district. The PreK-8 Mathematics Coordinator, the Senior Director of Programs, and the Deputy Superintendent of Teaching and Learning reviewed all applications.

Careful attention was paid to balancing the Committee in terms representation of grade level experience, school, demographics, and answers provided on the application. Once the Deputy Superintendent finalized the Committee, members were contacted and the meeting calendar was established.

<u>In Phase 1, the Committee was charged with:</u>

- Understanding the current state of the PK-8 math program;
- Developing a shared vision for the PK-8 Math Program
- Determining areas of strength and areas for improvement in the PK-8 Math Program

Committee Members

Administrators

Dr. Nicole Gittens, EdD - Deputy Superintendent of Teaching and Learning

Vicki Milstein, Principal - Brookline Early Education Program*

Dr. Mary Brown, EdD - Principal*; Senior Director of Teaching and Learning**

Nadine Ekstrom, Senior Director of Teaching and Learning*

Margaret Eberhardt, Early Childhood Program Coordinator**

Dr. Kalise Wornum, EdD, Senior Director of Educational Equity**

Josh Paris, 9-12 Mathematics Coordinator

Educators

Valia Bourmpoula, 6th grade Math Teacher

Emily Redburn, First Grade Teacher*

Karen Shashoua, Second Grade Teacher

Natalie Dean, New Teacher Mentor**; Coordinator, Lesley Internship Program*

Alison Hansel, Math Specialist

Hilory Paster, Math Specialist

Katy O'Reilly McGraw, Math Specialist

Parent Members

Cherita Cloy

Alissa Greenwood

Aaron Hoffman

Faiza Khan

Wadner Oge

Co-Chairs

Kathleen Hubbard, PreK-8 Mathematics Coordinator (Co-chair, Content Facilitator)

Meg Maccini, Senior Director of Programs, Office of Teaching and Learning (Co-chair, Process Facilitator)

*Denotes membership 2017-18
**Denotes membership 2018-19

Calendar of Meetings

Calendar of Meetings

Time	Description of Meeting
Fall 2017	Pre-Committee Preparation
January 23, 2018	History and overview of current PSB Math Program: Overview of the Program Review Process
February 28, 2018	Begin to draft a renewed vision for the PSB Math Program
March 28, 2018	Review draft vision statement and provide feedback, examine MCAS data and generate questions using a protocol
April 25, 2018	Review and refine draft vision statement: create teacher, student and parent survey questions
May 30, 2018	Review results from teacher/staff survey, identify areas of strength and areas for improvement
June 7, 2018	Presentation and discussion of parent focus group results with Andresse St Rose from CCE
September 26, 2018	Updates on K-8 math Program Review: previewing our upcoming work
October 24, 2018	Revisit vision; planning for learning walkthroughs
November 14, 2018	Process information gathered from learning walkthoughs; work on refining vision statement
December 12, 2018	Presentation and discussion of preliminary findings with Andresse St. Rose from CCE
January 23, 2019	Discussion of Chapter. 6&7 of Mathematics Mindsets; vision revision work
February 27, 2019	Work session: vision statement
March 20, 2019	Review discuss and revise Phase I report
April 5, 2019	Work on Phase I report Recommendations for PK-8 Mathematics program
May 23, 2019	Work on Phase I report Strengths and Challenges of PK-8 Mathematics program
June 13, 2019	Final Review of Phase I report

Overview of Committee Work During Phase I

The PK-8 Mathematics Program Review Committee engaged in Phase I "Study and Vision" of the review process from January 2018 through March 2019. During Phase I, the following key activities took place, which informed the writing of this report. The Committee:

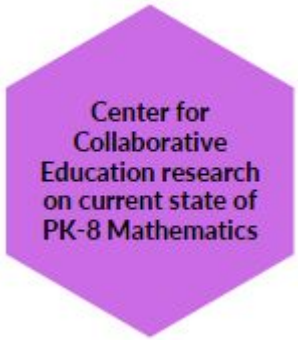
- Read and reflected on the latest research on effective mathematics teaching and learning (see Bibliography in Appendix I)
- Conducted in and out of district PK-8 mathematics classroom visits
- Reviewed vision statements of comparable districts
- Contributed to reviewing and revising multiple drafts of the vision statement for the PreK-8 Mathematics Program
- Contributed to the development of student, teacher and parent surveys
- Reviewed the preliminary findings and recommendations of the research study by outside consultants
- Made recommendations based on their own experience and work

Components of Phase 1

A diverse 19-member team composed of parents, teachers, math specialists, and administrators met on a monthly basis. Over 13 meetings the committee participated in revision and revitalization of PK-8 Mathematics vision, studied data gathered on the current state of mathematics in-district, visited classrooms both within Brookline and in neighboring districts, read current research supporting effective mathematics practices, and made recommendations for further department and district work based on the study of *Effective Math Teaching Practices,*

Math Specialists play in integral role in carrying out the work of the math department in each building. During the Phase I process, they reviewed curricular materials, contributed to the development of the vision for PK-8 Mathematics, supported the implementation of *Effective Math Teaching Practices* with teachers and students, supported the pilot process, and provided a feedback loop between teachers and the math department.

Components of Phase 1



CCE gathered feedback from 5 parent focus groups
Co-created, administered and analyzed online parent survey
Co-created, administered and analyzed online 7th grade student survey
Analyzed 2017 district Mathematics MCAS data
Gathered feedback from Principal focus group
Communicated regularly with Math Program Review Committee Co-Chairs and reported to Math Program Review Committee twice over Phase I

PSB Data team and PK-8 MPR Committee created, administered and analyzed district-wide staff survey

PK-8 Math Program Review Committee hosted Open House where the community was invited to meet with committee, ask questions of process, provide input

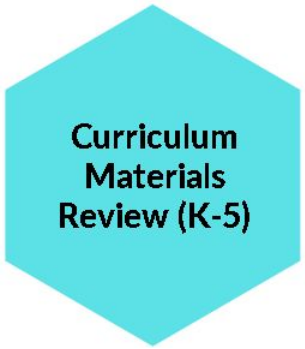
Components of Phase 1

PK-8 Mathematics Coordinator and Senior Director of Programs met with Deputy Superintendent and Superintendent regularly to communicate process, progress and to elicit feedback

PK-8 Mathematics Coordinator and Senior Director of Programs met with Curriculum subcommittee four times over Phase I to communicate process, progress and to elicit feedback

PK-8 Mathematics Coordinator and Senior Director of Programs met with School Committee four times over Phase I to communicate process, progress and to elicit feedback.

Grades K-5 Curriculum Materials Review and Pilot



Because of the urgent need to replace the primary curricular resources for grades K-5, which were written prior to the new math standards in the 2011 and 2017 MA Frameworks and are not being updated by the publishers, a Mathematics Curriculum Materials Review occurred simultaneously to the Math Program Review.

The K-5 Curriculum Materials Review Committee consisted of 15 teachers, specialists and coaches who met throughout the Spring of 2019 to review three finalist programs. This process resulted in the decision to pilot *Investigations 3*, as well as to participate in the alpha pilot of the *Illustrative Mathematics* K-5 curriculum that is currently in development.

Summary of K-5 Curriculum Materials Review Process

Criteria for K-5 Curriculum Materials Review

Grades 6-8 Curriculum Review and Pilot

Because the primary curricular resources for grades 6-8 were written prior to the new math standards in the 2011 and 2017 MA Frameworks, and are not being updated by the publishers, a Mathematics Curriculum Materials Review occurred simultaneously to the math program review.

The grade 6-8 Mathematics Curriculum Materials Review took place in Spring 2018, resulting in the recommendation of a pilot of *Illustrative Mathematics* - *Open Up Resources* during the 2018-19 school year. In grades 6-8, 16 out of 20 teachers are piloting the entire curriculum. The other four teachers were asked to pilot at least one unit from the curriculum. Teachers provided feedback throughout the year through surveys, department meetings, and ongoing communication with Math Specialists, Coaches and the Curriculum Coordinator. Information gathered through this process was used to identify areas of success and challenge, and to inform planning for implementation. Summer workshops will continue to prepare teachers for the curriculum launch in the fall.

Summary of Grades 6-8 Curriculum Materials Review Process

Criteria for 6-8 Curriculum Materials Review


Ongoing work of Math Specialists
Curriculum Materials Review (K-5)
PK-8 Math Program Review Committee
Piloting of new 6-8 curriculum and materials
Community Open House (May 2018)
Vision, Beliefs, Strengths, Challenges, and Strategies
Curriculum Subcommittee Input
Center for Collaborative Education research on current state of PK-8 Mathematics
Staff Survey on current Math Program
District Leadership Input
School Committee Input

Vision, Beliefs, & Commitments

Creating the Vision Statement

Vision Statement

Beliefs

Commitments

Creating the Vision Statement

The Math Program Review Committee thoughtfully developed the PK-8 Mathematics Vision Statement building upon all of the work done by the Committee, teachers, specialists, parents, administrators, and community members involved in the Phase I work described above. The vision statement takes into account recent published research* as well as visits to and research of comparable districts. Using the Public Schools of Brookline's mission and core values as a guide, the Committee developed a number of drafts and revisions that were reviewed by math specialists and grade 6-8 math teachers.

*Resources informing the vision include the latest research on effective mathematics teaching and learning, such as: The National Council of Teachers of Mathematics' (NCTM) *Principles and Standards for School Mathematics*, NCTM's *Principles to Actions: Ensuring Mathematical Success for All,* Jo Boaler's *Mathematical Mindsets: Unleashing Students' Potential Through Creative Math, Inspiring Messages and Innovative Teaching* and the Massachusetts Curriculum Frameworks.

PSB PK-8 Math Vision Statement

The vision for PK-8 mathematics education in the Public Schools of Brookline is to nurture a comprehensive mathematical identity in all of our students, helping them to see themselves as capable mathematicians. Students learn challenging and relevant mathematics through the development of conceptual understanding, procedural fluency, and application. Our heterogeneously grouped classrooms are set up as creative, collaborative, joyful, student-centered learning spaces. Students are active team members who engage in mathematical discussions, solve real life and theoretical problems, and use mathematics effectively in a diverse and evolving global society.

PSB PreK-8 Math Vision - Beliefs

The Public Schools of Brookline believe that...

- Our PK-8 students' academic success in mathematics must not be predicated on race, ethnicity, gender, socioeconomic status, language, religion, sexual orientation, cultural affiliation, or disability status.
- All students can benefit when working collaboratively on mathematics in heterogeneously grouped classrooms.
- At every grade level, all constituents within the Public Schools of Brookline community must act on the belief that each child can and will learn challenging and relevant mathematics.
- Families, educators and community members are partners in our students' mathematical development.
- Math competency requires the development of conceptual understanding, procedural fluency, and application, and we recognize the importance of all three areas.

PSB PreK-8 Math Vision - Commitments

Our commitment to our students, teachers, families and community is…

- To clearly communicate Math curriculum content expectations to educators, students, and families.
- To use curricula that consists of coherent units of instruction, emphasizing understanding of major mathematical ideas that deepen over multiple grade levels using consistent language, models, and tools throughout.
- To recognize our students demonstrate understanding in a variety of ways, and to, use a variety of both formal and informal methods to assess understanding and growth in both content and mathematical practices.
- To value students' varied identities and strengths.
- To provide a clear framework for support and extension in mathematics.
- To develop and support a community of educators who hold themselves accountable and support one another in effective teaching and learning to advance the mathematical growth of each student

PSB PreK-8 Math Vision - Commitments (Continued)

Our students will regularly engage with content through the standards of mathematical practice as described in the Massachusetts Curriculum Frameworks...

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Areas of Strength and Improvement

Six Areas of Focus

Areas of Strength

Areas for Improvement

Six Areas of Focus

There are six areas of focus for the PK-8 Math Program review. These areas were informed by the *Essential Elements* as described by the National Council of Mathematics' 2016 edition of *Principles to Actions: Ensuring Mathematical Success for All*:

- Teaching and Learning
- Curriculum
- Assessment
- Professional Development
- Access and Equity
- Family and Community Engagement

For each focus area, the Math Program Review Committee has identified Areas of Strength and Areas for Improvement for the Public Schools of Brookline.

Areas of Strength

Teaching and Learning

"An excellent mathematics program requires effective teaching that engages students in meaningful learning through individual and collaborative experiences that promote their ability to make sense of mathematical ideas and reason mathematically." (NCTM, 2014. p.7)

- Teachers are very excited and enthusiastic about teaching
- Math Specialists positively impact student learning as well as instructional practice
- Teachers have flexibility for pacing of the lessons and learning
- There is evidence of progress with:
    - Continued focus on *Effective Math Teaching Practices*
    - Student-centered approaches to content delivery
    - Using open-ended tasks that convey messages about high expectations for all students in heterogeneously grouped settings
    - Collaboration between colleagues including cross-site visits, sharing of instructional practices, learning labs
    - Intervention practices
    - Increased collaboration between Special Education teachers and general education teachers
    - Using a collaborative approach to planning for and fulfilling student needs (i.e. through the Challenge Framework, Child Study Team intervention, Common Planning Time)
    - Deep work within the math department to address the development of math identity and mindset, and as a result having a positive impact on some students' beliefs about who can/can't do math

Areas for Improvement

Teaching and Learning

- Not all students have access to high-cognitive demand tasks
- Need to build understanding about how PSB defines rigor in math - conceptual understanding, procedural fluency, and application and what that looks like
- Need for clarity about how PSB defines differentiation
- Lack of consistent plan and structures to address the needs of students who continue to struggle with mathematics over time
- Current schedule does not adequately support consistent time for instruction, intervention, and enrichment across schools
- There is not a consistent homework policy/expectations across schools
- Due to school schedule, limited opportunities for staff to collaborate around effective math instructional practices in action
- Current staffing does not adequately support both coaching and intervention, and and as a result there is a lack of consistency and clarity around the role of specialists; coaching vs. intervention, and the balance between working with students and supporting teachers
- Need for consistent focus and professional development on building a growth mindset within heterogeneous grouped classrooms

Areas of Strength

Curriculum

"An excellent mathematics program includes a curriculum that develops important mathematics along coherent learning progressions and develops connections among areas of mathematical study and between mathematics and the real world." (NCTM, p. 70)

- Culture of innovation and autonomy - teachers are entrepreneurial and create engaging lessons and curriculum based on individual teacher and student interests
- Many materials and resources available for classrooms, teachers and specialists
- There is evidence of progress with:
  - Increased access to rich problems that develop foundational skills
  - Curriculum resources that connect to build on developmental milestones for young learners (Kathy Richardson's "Critical Learning Phases")
  - Increased student interest in math anchored by a range of engaging activities like math games and challenges
- Flexibility within pacing guidelines to allow for adjustment based on student needs

Areas for Improvement

Curriculum

- Culture of innovation and autonomy - balancing teacher autonomy with what is essential and guaranteed for each student
- Inconsistency in instruction, access, expectations, and content coverage
- Understanding the implications of students participating in private math programs outside of PSB on curriculum and instruction
- Current curriculum does not have consistent or clear pedagogical approach
- The adopted curricula (grades K-5 *Think Math* and grades 6-8 *Impact Math*) are outdated and do not meet the current standards for content and practice

Areas of Strength

Assessment

"An excellent mathematics program ensures that assessment is an integral part of instruction, provides evidence of proficiency with important mathematics content and practices, includes a variety of strategies and data sources, and informs feedback to students instructional decisions and program improvement." (NCTM, p. 89)

- *Assessing Math Concepts* program used across the district in grades K-2 is helpful in monitoring student progress, making instructional decisions, and communicating with families about student progress

- Probe assessments are available for teachers to use and are aligned with major content in each grade to uncover prior learning and misconceptions

- Feedback provided through the staff survey indicates progress in:
  - Regularly assessing students in math and providing descriptive, timely feedback to students including strengths, weaknesses and next steps
  - Developing assessment practices that include student reflection
  - Using assessment practices such as self-assessment, retakes, and diagnostic comments that promote growth mindset "[Where] students believe their abilities can be developed." (Dweck, 2014; Boaler, 2016)

Areas for Improvement

Assessment

- Inconsistent understanding and use of assessment practices that promote a *growth mindset*
  - As examples, according to the PSB teacher survey, only 22% of teachers surveyed provide retakes of assessments, 57% give time-limited assessments

- Lack of consistency across grades/schools/classrooms with the use of probe assessments used to uncover prior learning and misconceptions

- Lack of structures and time for teachers to reflect on assessment data and plan for instruction.

- There are no district-wide common benchmarks to measure effectiveness of curriculum, instruction, and student learning

- Given the limitations of the MCAS, there is a need for benchmark assessments that teachers can use to define success and provide more timely and useful data on student math learning

Areas of Strength

Professional Development

In an excellent mathematics program, educators are supported through robust, well-planned, and ongoing professional development to help every student achieve mathematical success and achieve personal and collective professional growth toward effective teaching and learning of mathematics. (NCTM, p.99)

- Developing Mathematical Ideas seminars started in 2018-2019 that are designed to help teachers learn the major concepts of elementary and middle-school mathematics and examine how students develop understanding of these concepts
- Many opportunities for optional after-school professional development offered by PSB colleagues
- Strong leadership and support from coordinator, coaches and specialists
- Feedback provided through the staff survey and PK-8 Math Coordinator indicate progress in:
  - Teachers and specialists working together to look at student work and reflect on unit planning for all students
  - Teachers feeling supported by specialists in teaching practices
  - Increasing peer collaboration through math learning labs, cross-site visits, and peer observations

Areas for Improvement

Professional Development

- Lack of consistent plan, structure and time for math professional development
- Expectations for the role of math specialists/coaches is not clear and varies by school
- Clarity is needed on whether specialists should do student intervention, instructional coaching, or both. Schools are not currently staffed to support both of these roles
- Some teachers surveyed report a lack of clear understanding and comfort with the progression of mathematical content across grade levels to reach the range of learners in K-5 math. (32% of teachers responding are familiar with progression of math across grades and 33% are confident teaching above and below their grade level)
- A lack of opportunities within contractual time for teachers to deepen understanding of math content beyond the grade level they teach
- Many English Learner teachers and Special Education teachers have not been included in PD in content and pedagogical strategies in math
- Principals and Vice Principals need additional support so they can ensure their staff is being supported through coaching, supervision, and evaluation.
- Inconsistent opportunities for cross-grade and cross-school collaboration

Areas of Strength

Access & Equity

"An excellent mathematics program requires that all students have access to a high quality mathematics curriculum, effective teaching and learning, high expectations and the support and resources needed to maximize their learning potential." (NCTM, p.59)

- Development of programs such as Young Scholars, Young Scholars Calculus Project, Math Counts and Math League support increasing the number of all students attaining high level math achievement
- Schools across the district are instituting equity teams through which teachers are examining issues of equity and access
- District-wide professional development on race, equity and achievement for all educators
- Some progress in rethinking "labeling" and shifting from deficit to asset-based thinking and examining assumptions around ability
- District leadership has a clearer goal and focus about addressing race and equity as a district
- Taken as a whole, PSB students perform better than their peers statewide (13 points above the state average)
- Steps to Success homework centers support economically disadvantaged students
- Hired a Senior Director of Equity and Inclusion who is working with school and district leadership on equitable practices and developing an understanding of cultural proficiency in order to eliminate structural and systemic barriers to achievement. This work will extend to school staff in the upcoming school year

Areas for Improvement

Access and Equity

- Lack of district-wide systematic approach to address persistent achievement gaps that exist among some of our most vulnerable students, including those who are economically disadvantaged, English Learners, student with disabilities, or students of color
- Teachers report that they are not entirely equipped with materials, resources and teaching strategies to meet the needs of culturally diverse, English Learners and students with disabilities
- Lack of structures that allow for collaboration between special educators and general educators so they have shared and common goals for students' learning
- There are structures in our system that reinforce historical biases either favoring or discriminating against certain populations of students (such as the process for identifying students for intervention, recommendations for honors or standard level high school classes, and course acceleration)
- Need district-wide work and commitment to shift from deficit to asset-based thinking and examining assumptions around ability

Areas of Strength

Family and Community Engagement

An excellent mathematics program recognizes parents, community members, teachers and schools as essential partners in the work of nurturing and educating students in order to maximize their learning.

- Teachers are using many different structures (school-based or teacher based) to communicate with families (newsletters, math mornings, family events, open house: specialists present overview)
- Some teachers send home materials for students guidance for how school learning can be supported at home
- Teacher and specialists who are passionate about math communicate that passion to families
- Online family resources component of the 6-8 pilot curriculum has provided access to curriculum and increased parent knowledge
- Opportunities exist to build positive relationships with teachers by being involved in school/classroom activities

Areas for Improvement

Family and Community Engagement

- Amount and consistency of parent/teacher and parent/school communication varies by teacher/classroom/school
- Some parents feel that the communication and feedback about student progress should occur sooner than November conferences
- Opportunities for parent education about math teaching and learning vary across the district. Need to build on current successes at individual buildings to make them accessible to all families
- Curricula should have an online component to allow parents to support children at home and/or help to educate parents about what is being taught
- Need for transparent and clear communication to parents about resources available and options parents have to provide additional support
- In grades 6-8 there is not a natural point of contact (homeroom teacher or advisor) for parents
- Disconnect between public school expectations and experiences in outside supplemental math programs can create tension and consequences in terms of how to best serve students
- Some parents report parent/teacher communication about math can sometimes create opposition or defensiveness
- Families sense a disconnect in philosophy/transition between K-8 and high school

Recommended Strategies

Recommended Strategies for each Area of Focus

Recommended Strategies

The following recommended strategies emerged with input from the stakeholders involved in the PK-8 Mathematics Review at different points in the process of study. This was an iterative process that we continued to come back to throughout our committee meetings. The PK-8 Mathematics Program Review Committee took the feedback from various constituents and did a first pass at organizing the feedback into the six focus areas for the review. The PK-8 Mathematics Program Coordinator and Senior Director of Programs then refined the recommendations.

An important part of implementing the recommended strategies will be to ensure accountability through regularly assessing the effectiveness of the implementation plan developed from these recommendations and revising the plan as needed.

Teaching and Learning

- Strengthen Tier I math instruction. Tier I instruction is the type of instruction that every student gets every day
- Ensure that consistent and adequate time for Tier I Math instruction is provided across all PK-8 schools in Brookline
- Clarify and communicate expectations and create structures for Tier II and Tier III interventions and enrichment
- Provide additional support to advanced mathematical learners and to those learners who are struggling to access grade level mathematics within their elementary and middle school program
- Build understanding of Effective Mathematical Teaching Practices for teachers, administrators and evaluators

Curriculum

- Select curriculum aligned with stated PSB Math Criteria
- Implement K-8 curricula that include clear benchmarks aligned with state content and practice standards
- Ensure that teachers and Math Specialists have resources and materials in place to provide tiered supports

Assessment

- Develop district-wide approach to meaningful assessment so teachers can use that information to inform instructional planning and support of students
- Assess student learning regularly to monitor progress relative to benchmarks and learning expectations
- Establish a culture of and build in time for collaborative data inquiry using qualitative and quantitative information about student learning in math to identify, monitor, and work to eliminate achievement gaps over time

Professional Development

- Create and implement district-wide plan for Math professional development that prepares teachers for implementation of any newly adopted curriculum
- Create and implement district-wide plan for Math professional development that supports teachers in developing understanding of mathematical concepts that are the foundation of elementary and middle grade mathematics instruction
- Create and implement district-wide plan for Math professional development that supports teachers and schools in meeting the different learning needs of students within classrooms, grades and schools
- Create a culture of and commitment to ongoing job-embedded professional growth through coaching, collaboration and shared practice
- Solicit input from teachers on what they need to best support the math learning of their students

Access and Equity

- Define what is meant by equity and access in mathematics as a district.
- Ensure that all students get high quality core math instruction every day, and teachers provide additional support and instruction based on the needs of individual students
- Provide educators with time for conversations focused on student learning and informed by data that allow them to strategize ways to improve student learning.
- Ensure that struggling students have access to effective mathematics teaching that incorporates the NCTM Effective Mathematics Teaching Practices
- Increase the number of students from all racial, ethnic, gender and socioeconomic groups who attain high levels of mathematics achievement
- Provide students with an appropriate amount of mathematics instructional time to maximize their learning

Family and Community Engagement

Communication
Consistent written, oral and web-based messaging from teachers, principals and other administrators about:

- Student progress toward developmental milestones in understanding math concepts
- Student affect and behavioral development related to learning math (e.g. productive struggle, self assessment, self advocacy, growth mindset)
- Content standards and curriculum materials
    - For example, "In third grade the goals are…"; and "These are some of the ways students are developing an understanding of multiplication,"and "Here are ways that families can support the learning of their child(ren)"

Engagement
Create additional Math family engagement activities and enrichments that include families and utilize community expertise.

Partnerships
Continue to develop and deepen outside partnerships with interested universities and organizations for the purpose of enriching mathematical experiences for students and families

Next Steps

- Develop an action plan for Phase 2 of the PK-8 Mathematics Program Review based on recommended strategies as outlined in Phase I
- Prepare for and launch full implementation of grade 6-8 curriculum in Fall 2019
- During pilot year of K-5 curriculum, identify primary curriculum for implementation in 2020-21

Appendices

Appendix A

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Appendix B

Summary of K-5 Curriculum Materials Review

Criteria for K-5 Curriculum Review

PreK-5 Math Materials Review Process 2018-2019

Breakdown of steps in the Materials Review Process Guidelines

Sept. 2018-Jan. 2019
Part I – Identification of K-5 Materials for Review

- Identify materials used nationally and locally
  - Preliminary List:
    - *Bridges*
    - *Eureka*
    - *Everyday Math*
    - *Investigations*
    - *Jump Math*
    - *Math Expressions*
    - *Math in Focus*
    - *Ready Math*
    - *SFUSD ELementary Core Curriculum*
    - *Zearn*

Part 1 - continued

- Review current research on the effectiveness of the materials

- Review alignment to state standards and Brookline Learning Expectations

- Document the reasons for pursuing some materials for deeper review by a materials review committee - Initial review of all 10 by members of Math Specialist team
  - List Narrowed to :
  - *Investigations 3*
  - *SFUSD*
  - *Eureka*

- Create a template for review of materials with the committee

Jan. 2019-June 2018
Part II - Review of K-5 Math Materials

- **Create a K-5 Materials Review Committee**
  - **Kathleen Hubbard - K-8 Math Coordinator**
  - **Julie Boss - District-wide Math Specialist**
  - **Norma Gordon - District-wide Coach**
  - **Alison Hansel - Math Specialist, Pierce**
  - **Kerrilyn McCarthy - ETF Pierce**
  - **Liz Exton - Kindergarten, Lawrence**
  - **Laura Richardson - Grade 1, Baker**
  - **Karen Shashoua - Grade 2, Pierce**
  - **Marian Voros - Grade 2, Runkle**
  - **Dave Carter - Grade 3, Pierce**
  - **Bianca Medina - Grade 4, Driscoll**
  - **Jen Keeler - Grade 4, Baker**
  - **Kelly Gartside - Grade 4, Baker**
  - **Viri Hawkins - Grade 5 Driscoll**
  - **Noorjehan Kahn - Grade 5, Heath**
  - **Jenny Yee - Grade 1, Pierce**

Part II - continued

- **Present the template for review and the process**

  Criteria were developed in conjunction with focus areas from Program Review:

  - Assessment
  - Access and Equity
  - Teaching and Learning (Effective Math Teaching Practices)
  - Implementation and Ease of Use
  - Mathematical Practice Standards
  - Curriculum
  - Tools and Technology
  - Professional Development

Link to Criteria Document

Part II - continued

- **Facilitation of meetings for material review with the template of criteria and deliberations among the Materials Review Committee about the different options and the degree to which each option meets stated criteria**

  The committee met on the following dates, as well as completing review work independently between meetings: Monday 1/14/19, Thursday 1/31/19, Monday 2/25/19, Monday 3/18/19, Thursday 4/11/19, Monday 5/6/19

Addition of Illustrative Math

****Illustrative Mathematics -** Over the course of the initial review process we learned that the K-5 Illustrative Math Curriculum is currently being written, and there will be an opportunity for us to participate in the alpha pilot during the 2019-2020 school year. As a result, we have added this curriculum to the review list. This is the counterpart to the program being implemented in PSB grades 6-8.

Selected programs for pilot

Illustrative Math (IM) - Rationale: This program is written by one of the writers of the Common Core Standards, and has instructional routines embedded that align with the work we have been doing around research based NCTM Effective Math Teaching Practices. The design principles include “three overarching and interconnected principles—learning, teaching, and equity” and the materials address student development “in all three aspects of rigor as driven by the standards themselves: conceptual understanding, procedural fluency, and application.” We are implementing IM in grades 6-8, and If this program were selected we would have a common program and approach K-8 in PSB.

Investigations 3 - Rationale: The philosophy and instructional approach in *Investigations 3* aligns with the approach of the curriculum being piloted in grades 6-8. “Fully aligned to the content and practice standards of the Common Core State Standards (CCSS), deep and careful attention is paid to mathematics content and to student thinking and understanding. Making sense of mathematics is the heart of the work, for students and teachers.” Of the 3 programs reviewed with the PSB K-5 Math criteria developed in alignment with program Review visioning work, this curriculum had the highest average total points in all categories.

Next Steps

May/June 2019	**Recruitment of Pilot Teachers**	• Identify teachers teams from grade K-5 to pilot the selected programs • 3 hour meeting in June for piloting teachers and specialists; during June Math Specialist meeting additional information/planning/support with math specialists
Summer 2019	**PD**	• Kathleen Hubbard and Julie Boss attend training on selected programs and plan for August PD day with piloting teachers and specialists • 2 Days in August - Training for Pilot teachers (1 day per program)
School Year 2019-2020	**Pilot Adoption of Materials**	• Pilot the selected materials with ongoing support and gathering of feedback throughout the school year

Next Steps - Continued

January 2020	**Report to Superintendent**	Part II ends with a report to the Superintendent and/or designee outlining the rationale for a final recommendation and a preliminary plan, if approved, which includes the following: ❖ Alignment to the Learning Expectations ❖ Strengths of the materials ❖ Weaknesses and areas in need of supplementary material ❖ Budget for implementation, including purchasing the core materials, supplementary materials, and professional development for teachers ❖ Plan for professional development, both in content and pedagogy
School Year 2020-2021	**Begin implementation rollout**	

Appendix C

Summary of 6-8 Curriculum Materials Review

Criteria for 6-8 Curriculum Review

6-8 Math Materials Review Process 2018

Breakdown of steps in the Materials Review Process Guidelines

Sept. 2017-Jan. 2018
Part I – Identification of 6-8 Materials for Review

- Identify materials used nationally and locally
  - Narrowed to six:
    - *CMP*
    - *CPM*
    - *Engage NY*
    - *Envision*
    - *Math in Focus*
    - *Open Up/Illustrative Mathematics*

Part 1 - continued

- Review current research on the effectiveness of the materials
- Review alignment to state standards and Brookline Learning Expectations
- Document the reasons for pursuing some materials for deeper review by a materials review committee
  - Narrowed to 3:
  - *CPM*
  - *Engage NY*
  - *Open Up/Illustrative Mathematics*
- Create a template for review of materials with the committee

Jan. 2017-June 2018
Part II - Review of 6-8 Math Materials

- **Create a 6-8 Materials Review Committee**
  - Jeremy Bloch* - Grade 8
  - Mies Boet - ECS Specialist, Math Specialist
  - Valia Bourmpoula - Grades 6 and 7
  - Victoria Cavanaugh - Grade 7
  - Shephali Chokshi - Math Coach
  - Charles Deily* - Grades 7 and 8
  - Norma Gordon - District-wide Coach
  - Alison Hansel - Math Specialist
  - Kathleen Hubbard - Math Curriculum Coordinator
  - Sheila Jaung* - Grade 8
  - Julieta Roz - Math Specialist
  - Lora Smid - Grade 6

* partial participation to ensure 8th grade teacher representation

Part II - continued

- **Present the template for review and the process**

  Criteria were developed in conjunction with focus areas from Program Review:

  - Assessment
  - Access and Equity
  - Teaching and Learning (Effective Math Teaching Practices)
  - Implementation and Ease of Use
  - Mathematical Practice Standards
  - Curriculum
  - Tools and Technology
  - Professional Development

Part II - continued

- Facilitate meetings for material review with the template of criteria
- Facilitate deliberations among the Materials Review Committee about the different options and the degree to which each option meets stated criteria
- Synthesize all review data and finalize recommendations

Part II - continued

Additional Sources of Information

- Interviews and feedback from teacher experience with all 3 programs, both inside and outside of PSB
  - Local districts: Newton, Carlisle, Waltham, Groton-Dunstable
  - Brookline - Middle School and High School Teachers

CURRENTLY COMPARING K-8 MATH REVIEWS FOR FOCUS & COHERENCE

Click buttons below to compare K-8 math reviews for our gateways: 1) Focus & Coherence, 2) Rigor & Mathematical Practices, and 3) Usability.

FOCUS & COHERENCE | RIGOR & MATHEMATICAL PRACTICES | USABILITY

Update Custom Comparisons (x)

Title (3)	Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade	7th Grade	8th Grade
Core Connections (Grades 6-8) (2013) CPM Educational Program (CPM) Show Reports							8/14	8/14	13/14
Eureka Math (2013-2014) Great Minds Show Reports	14/14	14/14	14/14	14/14	14/14	14/14	13/14	14/14	14/14
Open Up Resources 6-8 Math (2017) Open Up Resources Show Reports							14/14	14/14	14/14

Consolidated Criteria Summary

	CPM	Engage NY	Open Up/ Illustrative Mathematics
Assessment	5.33	7.43	8.14
Access and Equity	4.33	4.20	9.57
Teaching and Learning	10.50	9.29	11.43

Next Steps

June 2018	**Recruitment of "First Adopters"**	• Identify at least 2 teachers from grades 6, 7, and 8 to be "First Adopters" of the selected Program • Plan for 2 days in August to provide professional development for launch.
Summer 2018	**PD**	● Send District-wide coach to training for selected Program ● 2 Days in August - PD for First Adopters
School Year 2018-2019	**Pilot Adoption of new 6-8 Materials**	• "First Adopters" implement the selected materials with ongoing PD throughout the school year • All other teachers of grades 6-8 pilot 1 identified unit. Release day for each grade level scheduled prior to this unit to provide PD for implementation of the selected unit.

Next Steps - Continued

January 2019	**Report to Superintendent**	Part II ends with a report to the Superintendent and/or designee outlining the rationale for the recommendations and a preliminary plan, if approved, which includes the following: ❖ Alignment to the Learning Expectations ❖ Strengths of the materials ❖ Weaknesses and areas in need of supplementary material ❖ Budget for implementation, including purchasing the core materials, supplementary materials, and professional development for teachers ❖ Plan for professional development, both in content and pedagogy
School Year 2019-2020	**Full adoption of new 6-8 Materials**	• 2 Days during summer 2019 - PD for all 6-8 teachers, special educators and specialists • Ongoing PD throughout the year (details of plan for this dependent on selected program)

Appendix D

PSB PreK-8 Math Review
Phase 1 Report

PSB PreK-8 Math Review

Phase I Report

Andresse St. Rose, Senior Director
Research, Evaluation and Policy

Michael Berardino, Senior Research Associate
Research, Evaluation and Policy

Center for Collaborative Education
Transforming schools for student success

Table of Contents

Introduction

In 2018, the PreK-8 Math Review Committee of the Public Schools of Brookline (PSB) retained researchers from the Center of Collaborative Education (CCE) to support Phase 1 of the math review process. In conjunction with district staff, CCE researchers developed a plan to gather data from a variety of stakeholders, including parents, teachers, administrators and students. The purpose of the data collection and analysis was to:

- **Get input on the current state of math teaching and learning in PSB from various stakeholder groups to help inform the work of the pre-K-8 Mathematics Program Review Committee;**
- **Identify areas of program strength and areas for improvement based on the perception and experiences of various stakeholder groups;**
- **Suggest priorities for the committee to address as part of the review.**

Beginning in March 2018 and continuing this current school year, CCE gathered data from K-8 principals, almost **200 math teachers and specialists**, nearly **500 parents**, and **500 7th graders** in the form of focus groups, interviews and surveys. CCE also analyzed student **MCAS math performance data from SY 2017-18** to provide some insight into student math achievement in the district.

The following section describes in greater detail the data collection process and its participants.

Data Collection Process

How was Information Collected?

- **Focus Groups**
  - Parent groups (5)
  - PreK-8 Principal Group (1)
- **Survey**
  - Parents
  - Teachers/Staff
  - 7th Grade Students*
- **In-Person Interviews**
  - Parent
  - PSB School Committee Member
- **Performance Data**
  - 2017 PSB MCAS Math Results
- **Document Review**

This report highlights the key findings and takeaways based on the analysis of the data gathered and includes selected quotations from focus groups and surveys to illustrate key themes that emerged from the data.

Additionally, it focuses on common themes raised by various stakeholder groups, including areas of agreement as well as differences in perspectives within those themes.

In some cases, only one stakeholder group was asked about a topic—for example, only the parent group were asked about their overall satisfaction with the math program and explicitly asked about supplemental math activities (although both parents and teachers often referred to supplemental math in their open-ended responses), so when relevant we include the perspectives of just one group based on the available data.

*Given certain constraints, CCE was only able to survey Grade 7 students and acknowledge that as a limitation to this study.

Focus Groups

Focus Group Logistics

CCE held five parent focus groups, including groups with parents with children in the METCO and Steps to Success (STS) programs and conducted a focus group with all K-8 principals in May 2018.

The district identified dates, times and locations for the focus groups and recruited participants. All focus group discussions were conducted by the same CCE researcher and audio-recorded after getting verbal consent from the study participants. Recordings were transcribed, coded and analyzed to identify overarching themes.

A total of **35 parents** participated in the five focus groups. Participants had children in a range of grade spans and ages enrolled across all eight K-8 schools as well as the Brookline Early Education Program (BEEP).

Focus Groups

Sample of Parent Focus Group Questions

- If you were talking to parents who were thinking about moving to Brookline and enrolling in the district: What are the things you like most about the math program that you would tell them about? And what is your opinion based on?
- When you talk to your kids about math - what are some of the things they say to you about what they are doing in school. How they feel about math?
- What could the district do to help parents be more involved in their student's math education?
- What are some questions you have about the math program or math teaching and learning that [this Math Program Review] might help to answer?

Research Report

Parent Survey

Parent Survey Logistics

The parent survey was designed to probe more deeply into issues and questions raised by the focus groups and centered on four main topics: Math Teaching and Learning, Curriculum, Parent/School Communication and Parent Involvement in Math. The survey included both Likert scale and open-ended questions so participants could provide more detailed responses and better express their views.

CCE designed the survey with feedback from several district representatives. The district notified and encouraged parents to complete the survey (which was also translated into multiple languages) through multiple means.

*Parent survey participation was not evenly distributed among the eight K-8 schools nor representative of the demographics of parents in PSB; therefore, the survey findings should not be assumed to be representative of the entire PSB parent community.

Research Report

Parent Survey Respondents

There were 474 completed parent surveys*. A majority of parent respondents indicated they were female (78%) and White (73%). While 18% of respondents indicated they were Asian/Asian American, only very tiny share of respondents indicated they were either African American/Black (1%), Latino/Hispanic (2%) or Multirace (4%); therefore, we did not disaggregate responses by race/ethnicity.

A majority (84%) of respondents also indicated that most of the time they speak English at home. The remaining respondents indicated that they primarily speak one of several other languages at home, including Hebrew, Italian, Japanese, Korean, French, Chinese, Spanish, and/or Russian.

Parent survey respondents are highly educated with all respondents indicating that they had completed at least some college. 80% also indicated they had a Master's degree, a Doctorate, and/or other professional degrees (e.g. MD, JD or equivalent). 36% indicated they either have or have had a math-related career.

Parents were asked to identify a "focus child" when answering the survey questions. Parents with more than one child enrolled in PreK-8 could complete the survey multiple times for all or as many children as they wanted to. The "focus children" were fairly evenly split by gender – 52% were female and 48% were male. We did not ask parents to indicate their child's race/ethnicity.

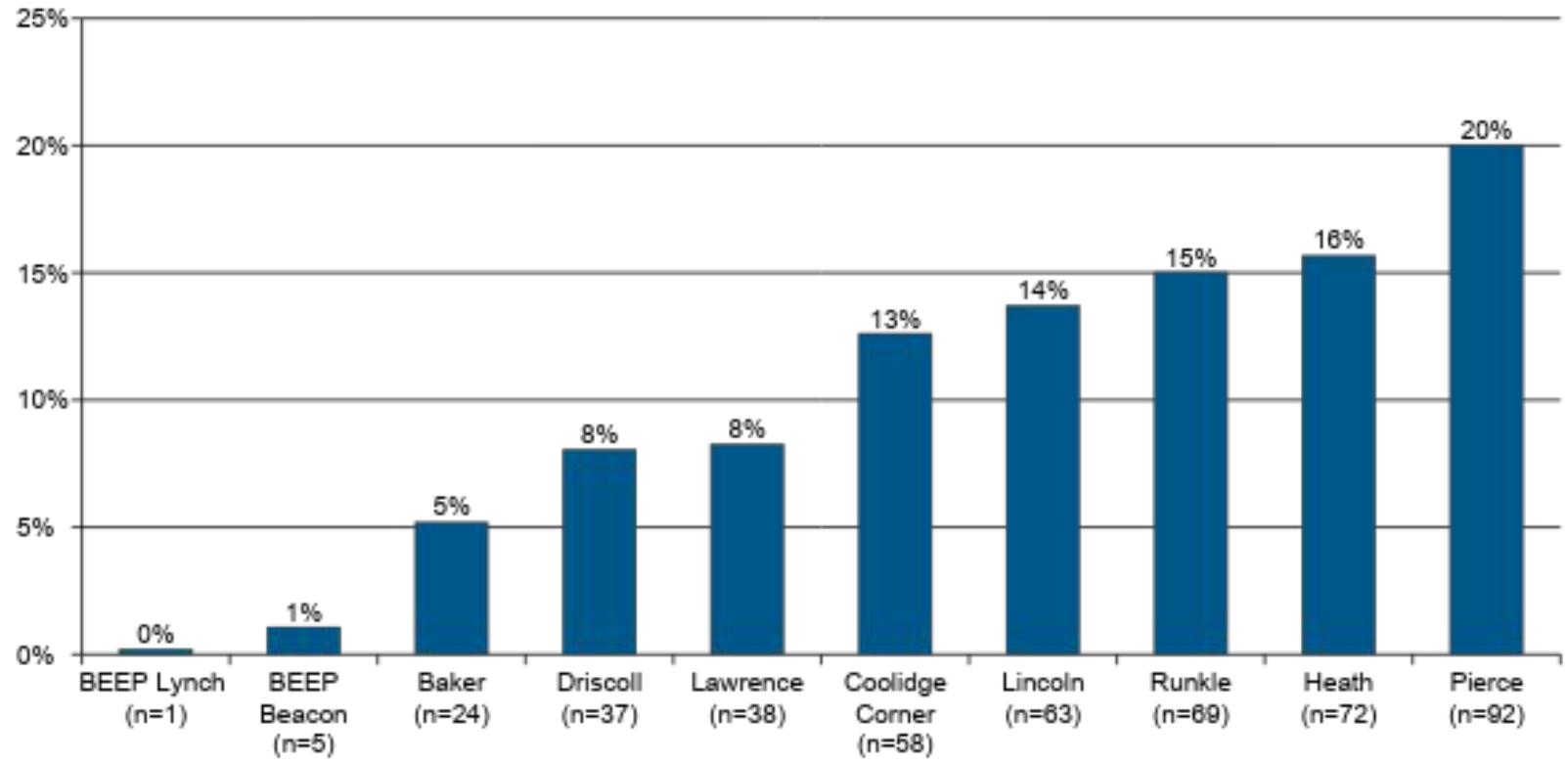
Focus children were enrolled in every school and grade level. However, due to the small number of respondents with children enrolled in BEEP programs we do not report results for this group as per data agreement.

Furthermore, 46% of respondents indicated that they either currently or have in the past utilized supplemental math programs (e.g. Russian math, School of Engaging Math, Kumon, tutors etc.) to support their children. Parents who utilize these supplements and parents who don't were equally likely to say that their student performs well in math.

*Please note that not all respondents completed every question so response rate varied by question.

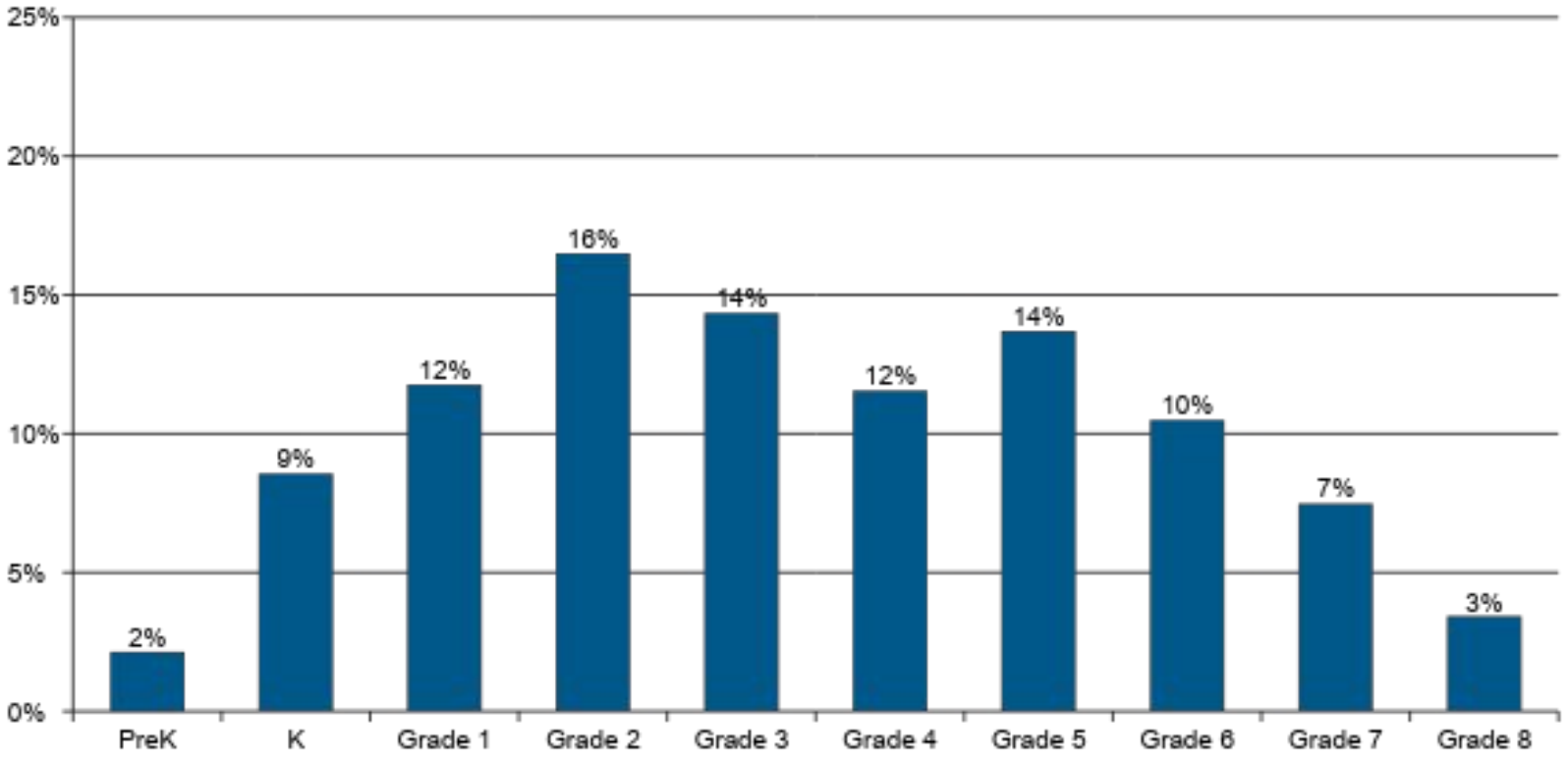
Research Report

Parent Survey Response Rate, by School



Note: Not all respondents identified the school their focus child attended, so total does not add up to 474.

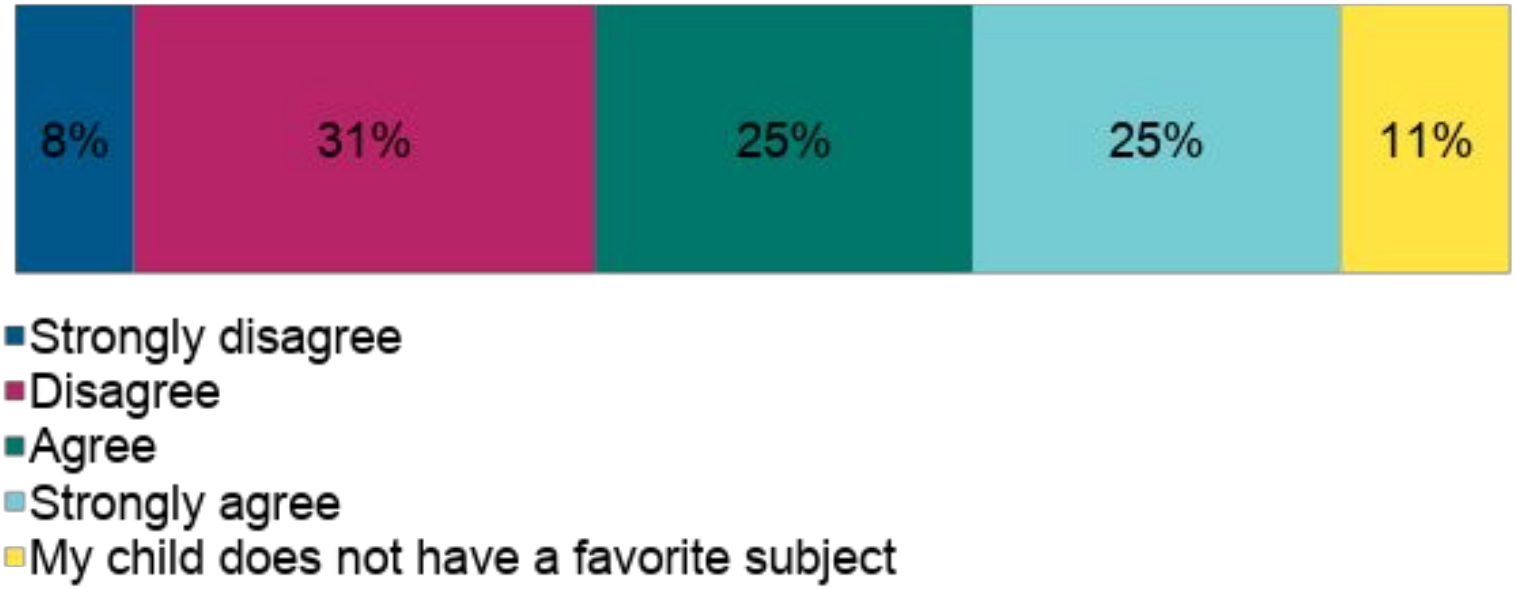
Parent Survey Response Rate, by Grade Level



Research Report

"Math is my student's favorite subject"

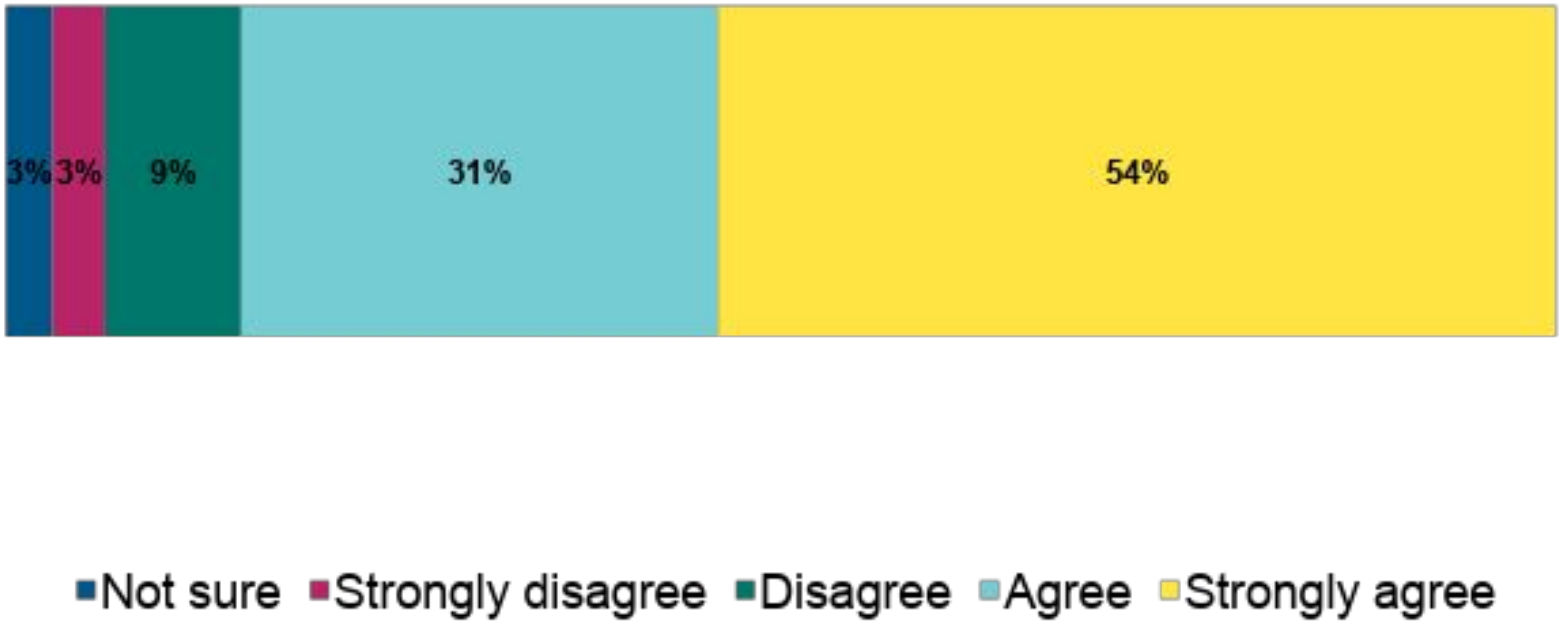
Half of respondents to the Parent Survey either "Agreed" or "Strongly Agreed" that math is their child's favorite subject.



Research Report

“My student performs well in math”

A majority of parents (85%) either “Agreed” or “Strongly Agreed” that their child performs well in math.



Research Report

Survey of 7th Grade Students

A brief paper survey was administered to all students in the 7th grade in all K-8 schools in October 2018 (budget and logistic restrictions limited the student survey to just 7th graders). The survey, created by CCE with input and feedback from PSB staff, asked students about their experience in their 6th grade math class, as well as their current 7th grade math class experience. The survey also asked about how much they enjoyed math, their math performance/grades, how challenging or easy they found math, their parent/guardian involvement in math, and both what they liked most about math and what could be better.

The survey included a question to assess how frequently students had assignments or tasks that were cognitively challenging, had real-world relevance, and required them to communicate their mathematical understanding (included writing and discussion) as aligned to current standards.

.

Student Survey Respondents

- **516 students completed the survey.**
- **Half (50%) of respondents identified as male, 46% as female and 3% preferred not to say.**
- **The Race/Ethnicity of student respondents relatively matched district demographics: Asian (23%), Black (6%), Latinx (12%), Multi-Race (8%), White (44%) and Other (7%).**
- **Responses across schools were even based on school enrollment for all eight K-8 schools, and the vast majority of 7th graders completed the survey.**

Research Report

Teacher Survey

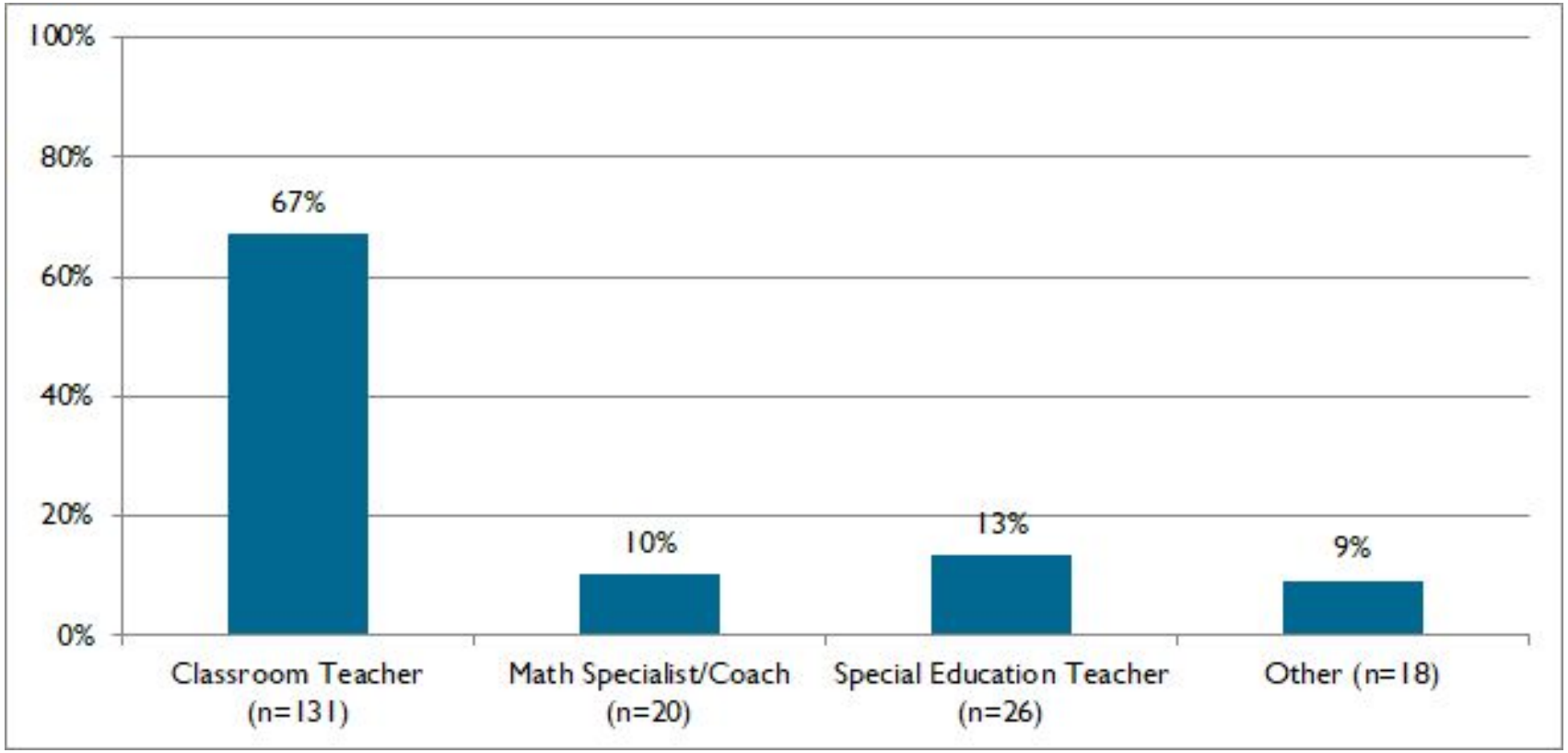
An online survey was administered to all PreK-8 Math Teachers in the Public Schools of Brookline during the Spring of 2018. The survey was created by the K-8 Math Coordinator with input from the Office of Teaching and Learning, CCE, and the Math Program Review Committee. The survey was a combination of multiple choice and open responses questions that centered around the follow topic areas:

- Professionalism/Professional Development
- Math Curriculum
- Access and Equity
- Math Assessment
- Teaching and Learning
- Technology
- Parent-Families

Teacher Survey Respondents

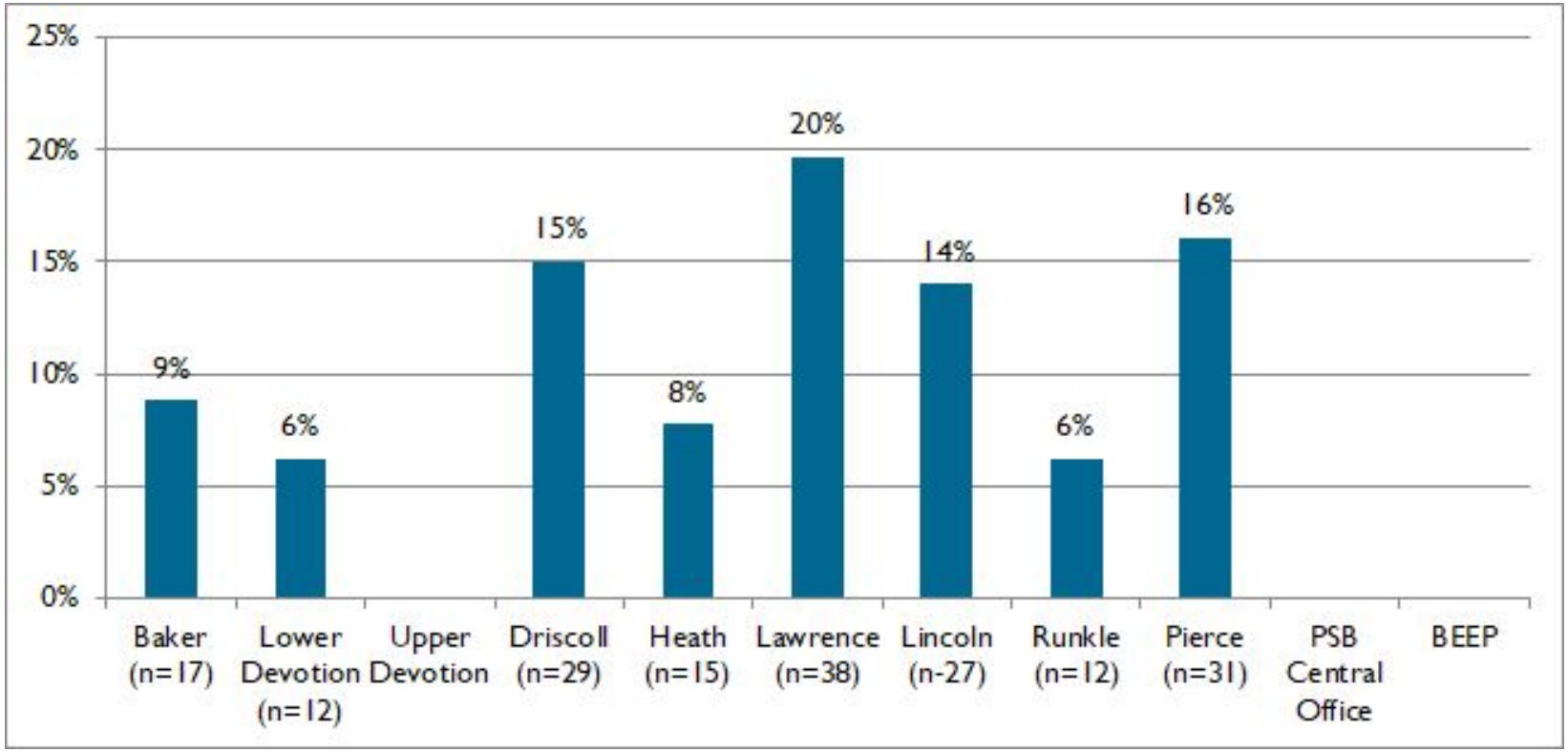
- **195 Staff completed the survey.**
- **67% of respondents identified themselves as a classroom teacher while the other 33% were primarily made up of Special Education Teachers and Math Specialists.**
- **The majority of respondents (74%) indicated they worked primarily with elementary students (Grades K-5).**
- **Responses across schools were varied and there were limited responses from teachers at BEEP.**

Teacher Survey Responses by Role



Research Report

Teacher Survey Response Rate, by School



*Schools/locations with less than 10 responses were masked for the purpose of this graphic

What We Learned from Focus Groups, Interviews, & Surveys

Parents, educators and students all had positive feedback. Many shared positive comments or experiences with and about various aspects of the math program* as well as feedback and strong opinions about areas for improvement. There was variation both within and across the different stakeholder groups (e.g. not all parents agreed on what could be improved or how to improve shortcomings and there were differences in perceptions between parents and educator/teachers on different topics).

Although a long list of topics were raised in the data, there was general agreement that the **main strengths of the current PreK-8** program are: **math educators (both teachers and specialists)**; and an approach to **"making math fun"** anchored by a range of engaging activities like math games, challenges and Math Club.

There was also overall agreement among stakeholders that **parent communication and outreach around math could be better,** including **engaging and educating parents about the current approach to math instruction**, and the **curriculum.**

Parents and teachers universally agreed that there is urgent need for a **high-quality curriculum and accompanying materials along with resources to help teachers differentiate instruction**.

Issues of equity or disadvantage were also raised by teachers and parents revealing a range of perspectives on which student groups were being underserved by the math program. The analysis of MCAS student data provided additional evidence that we describe and discuss later in this report.

*The "math program" or "program" refers to the PreK-8 math program.

Research Report: Key Findings- Strengths

- **Math Educators: Teachers & Specialists**
- **"Math is fun" approach**

Key Findings: Strengths

Math Educators - Teachers & Specialists

Brookline's teachers and math specialists are the greatest asset of the current PreK-8 math program.

Parents and students both identified teachers and math specialists as one of the main strengths of the PreK-8 math program. When asked what is the best thing about math in school, 7th graders referred to teachers most frequently noting that "***Teachers are helpful", "Caring and supportive", "Explain things well", and help them when they are "Stuck or struggling with a topic"***. Several students also noted that their ***teacher actively "Promotes a growth mindset"*** in math saying how beneficial that was to their learning.

Parents too had praise for teachers overall and several mentioned individual teachers and math specialists who stand out for them.

In both the focus groups and parent survey, parents highlighted that "***Teachers are very excited and enthusiastic about teaching***." Noting teachers' attitudes, parents said "***It's very positive and I think that they're really trying. . .it's good that they're really ... try[ing] to get to know the students.***" And, "***We had a great year with math last year because we had a teacher who was really excited about math, and [our child] felt good about math. . .and I think that made all the difference.***"

Parents also acknowledged the math specialists and several described how the classroom teacher and math specialists worked together to effectively support students, saying ***"They would bring the math specialists in, and it felt like it was really a team, a team effort and that math was definitely being made a, sort of a priority."***

"My child's teacher was exceptional in identifying where my child needed support and created a special packet of tools for her to use at home. The teacher provided concrete guidance for how we as parents could support the process. This worked really well. . .the instruction has been excellent [and I] really commend the teachers for creativity and seeing the whole student."

Parent Survey

"I appreciate that our Math Specialists are focused on providing several ways for kids to learn how to tackle math problems -- as opposed to only teaching them one way and that they are encouraging kids to understand that everyone has the ability to be great at math. Growth Mindset makes a ton of sense for math and all subjects, really."

Parent Survey

"I feel like my staff is the asset and their innovation and willingness to find the resources and think outside the box."

"I think the most positive aspect of the math team [at my school] and their work has been a series of three PD sessions that they led on high-quality instruction and high-level teacher moves and then shared them. . .[along with] family caregiver workshops to actually demonstrate some of the math that was happening in the classrooms."

PSB K-8 Principal Focus Group

Key Findings: Strengths

Math Educators - Teachers & Specialists

Teachers value collaboration and the opportunities they have to learn with their fellow teachers and Math Specialists.

For their part, math teachers overwhelmingly agree that they enjoy teaching math (90%) and also noted how valuable their professional collaboration is with a ***majority of teachers (61%) saying they collaborate with other teachers or Math Specialist to plan instruction at least monthly***.

In their open-ended responses to the survey, teachers frequently said they needed "***More time for professional learning and collaboration"*** (grade-level, cross-grade and cross-school), including "***more time with Math Specialists"*** and also suggested "***Increasing the number of math specialists in the district/their school"*** to better meet the needs of teachers and students.

Additionally, to build on what is an already effective model/system, teachers offered the following ideas:

- Changes in the schedule to allow for more time for collaboration;
- Revisiting the Math Specialist model to focus more on push in or co-teaching

"Our Math Specialists have been extremely supportive, providing materials, extensions/challenges and extra support when it is possible in their schedule. There is not enough physical support from math specialists or time in the schedule to meet teacher and struggling students' needs. Everyone is stretched. I think we need more manpower."

Teacher Survey

"My Math Specialist is wonderful, but I don't have the opportunity to work with her as often as I would like because she is supporting new teachers and/or working with other grade levels. In order for math specialists to be able to support teachers, there needs to be regular meeting times (during the school day) over the course of the school year to work together."

Teacher Survey

"So in my ... one of my grades, one teacher's still doing the Think Math workbook. . .one teacher is like, 'Oh, tell me more. I'm working very closely. I'm doing co-teaching and then exemplar lessons and modeling with the Math Specialist and trying these new kinds of things.' And then the third one is somewhere in the middle. So each class is getting a completely different experience."

PSB K-8 Principal Focus Group

"I feel that there is now a shift - less math support within the classroom and RTI (Response to Intervention) is using different materials and resources which makes it hard for a classroom teacher to be updated on how to conduct these measures within the classroom. I understand why students are benefiting from RTI however, I do miss having a balance of push-in support where strategies are then applied and integrated."

Teacher Survey

Key Findings: Strengths

Math Educators - Teachers & Specialists

To continue to build on the program's greatest asset, an investment in professional development is a must.

And while a majority of teachers (69%) indicated that they participate in math professional development a few times a year on both content (61%) and pedagogy (60%) again, in their open-ended responses to the survey, teachers repeatedly said that they need more professional development –specifically more cross-grade and cross-school opportunities. Many calling for a return to district-wide, grade-level release days.

Special education teachers also consistently commented that they are interested in more opportunities to have professional development opportunities similar to what classroom teachers receive.

"As a special education teacher I wish we had more readily available resources of modified versions of the math curriculum that my students could access. I would love to have an opportunity to sift through this with general education teachers during professional development in the summer."

Teacher Survey

"It would be great to have training in particular programs/pedagogies/strategies, etc. I am excited that we are being allowed to have a1/2 day training with our Math Specialists this spring. Compared to other gen. ed. staff, it always strikes me as strange that the district doesn't prioritize PD for special ed staff. The only way that I have been able to access formal training in Brookline is through grants. I appreciate the time and dedication of my math specialists to share resources and suggest strategies that support my students. It would be awesome if the district also made math specialists available to train Special Ed. staff."

Teacher Survey

"I would like to see more professional development around math specialized interventions for struggling learners. Not just introductory workshops but opportunities to experience what the interventions are in a hands on way and then time to work with colleagues on developing lessons around them. I would also like the opportunity to collaborate with my math specialist. I would love the opportunity to have a consistent CPT with them within which we can discuss students, math instructional needs, my support needs etc.."

Teacher Survey

Key Findings: Strengths

"Math is fun" approach

Both students and parents identified several activities that are part of the current math program that are fun and engaging.

Parents and students also noted the fun approach or aspect of math as a strength of the current math program. Students expressed engagement when math is fun and challenging, commenting "***I like math in my school because somehow the problems can be fun"*** pointing out that ***"It's fun and challenging in a good way"***. Having math be fun and engaging (as well as challenging) for students was one of parents' main goals or expectations. Parents want their students to enjoy and "have fun" while learning math to help nurture their interest and love of math. Some parents also focused on increasing the enjoyment of math for kids who struggle to engage with math, saying ***"We talk about math at home, try to integrate math in everyday activities, we have a "Math is fun" attitude";*** and ***"My primary goal is for my child to learn math that is applicable to the world around him, and therefore engaging and interesting. I want him to understand and enjoy math, not memorize [it]"***.

"The best thing about math in my school is the games that help us to realize the math and help it make sense. Some games from previous years have helped with my math learning and memory with math because it helps to remember something when it's fun."

7th grader on Student Survey

Key Findings: Strengths

"Math is fun" approach

Project-Based Learning

Students linked fun aspects to the use of math games (e.g. Sudoku, Kahoot), puzzles, riddles and the problem of the week (POW) challenge. Students and parents also listed other math activities (some may be school specific and others district-wide) that contributed to making math fun, including Math League, Math Night, and math activity stations in classrooms.

Parents and students also mentioned **project-based learning**, which allows students to engage in real-world challenges and learn skills like critical thinking and problem-solving, as a fun aspect of math. The 7th graders mentioned how much they enjoyed the "***fun***" and "***cool***" hands-on projects from 6th grade. While parents focused in on the interdisciplinary approach of projects.

"The best thing about math in our school is that we don't do a lot of worksheets, but instead we work on creative projects and problems that allow us to really think about math."

7th Grade Student Survey

"The math curriculum in PSB makes students feel FUN to learn math! This is the most important strength, in my view. Coloring, crafts, using various materials (such as buttons, blocks, etc.) help it. Connected curriculum across different subjects keeps and fosters students' interests in math. They learned math using pumpkins during the Halloween season, gingerbread men near Christmas etc."

Parent Survey

Research Report: Key Findings-

Areas for Improvement

- **Parent/School Communication**
- **Pedagogy and Instruction**
- **Curriculum**
- **Equity and access**

Key Findings: Areas for Improvement

Parent/School Communication

While some parents shared very positive examples of parent/school communication, overall, parent satisfaction was mixed with almost half (47%) indicating that they were dissatisfied to some extent.*

Some parents reported feeling:

- Unheard
- Schools are not receptive to parent involvement or feedback
- Parent feedback or input is ignored
- School thinks they are a nuisance

These feelings were especially prevalent among parents who say they contacted the school about their child needing to receive more challenging work in math.

*About half (45%) of parent survey respondents said they had contacted their child's school (e.g. Principal, teacher, Math Specialist) to discuss a math-related issue at least once last school year.

Key Findings: Areas for Improvement

Parent/School Communication

More specifically, parents indicated ***that communication around math is inconsistent –often varying by teacher, within school and by grade***. This inconsistency is perhaps supported by the fact that **teachers listed almost 30 different ways they share information with parents about students' math learning**, including social media, websites and blogs, online platforms like Canvas, calls home and parent meetings.

According to teachers, ***the most commonly used methods of communicating with parents are: emails, sending home work from math class, newsletters, bulletin boards and school math events for families and events for parents***. The many disparate ways and formats used by teachers to communicate with parents supports parent feedback that communication is inconsistent and varies.

Teacher feedback also suggests that there isn't district-wide or school-level coordination of parent/school communication.

Some of the many ways parents reported getting information on students in math:

- **Parent-teacher conferences**
- **Progress reports/quarterly grades**
- **Individual communication with teacher/math specialists**
- **Group meetings (several parents) with school**
- **Weekly email newsletter from classroom teacher**
- **Canvas (online platform)**
- **Parent portal (online platform)**
- **Homework (in grades where homework is assigned)**
- **MCAS scores (in relevant grades)**
- **Packets/folders (containing completed assignments sent home weekly)**

"I felt comfortable reaching out to the teacher to provide feedback about how my child felt about math but I don't think there was much response to my feedback -lack of response to parent feedback discourages parents to provide feedback since "nothing" appears to be done about the feedback. . . feedback at parent conference was only about their assessed level. . .which is not enough. More useful feedback would be on where my child was struggling or how to complement class work at home. I did not receive information about what the class was doing in math, so [I was] unable to try to build on math at home or to assist with activities at home."

Parent Survey

"No one told us there were any issues with our child's performance at any time throughout the year. The teacher saw us every morning but never ever indicated there she might be struggling. At the end of the year at the parent teacher conference . . .we were told that she is still not fluent in additions and subtractions with numbers up to 10. If she had been struggling with that, why weren't we told earlier in the year? We had no indication that was an issue. And we were never told what exactly the teacher did to remediate that. . . Overall, communication was poor and it impacted the child's math skills and knowledge in a negative way."

Parent Survey

Key Findings: Areas for Improvement

Parent/School Communication

Parents want better feedback on student performance and growth in math.

Beyond the quality of interactions, parents also shared that the ***information they receive around math is limited, not useful or timely***. Parents noted that ***progress reports often lack detail or specificity*** about how the student is doing in math beyond a letter grade or as indicated on a rubric, which is not enough detail for them to understand their child's progress or growth over the school year or when and how the child might be struggling.

The practice/policy around homework seems to exacerbate this issue. In the early grades where there is no math homework, parents find it even harder to keep track of student learning. And in grades where homework is assigned, parents felt that the poor quality of the homework was the main issue.

So while there was not necessarily a push to change the homework policy, parents want to see artifacts of student learning regularly.

At the same time, teachers said they regularly (if not frequently) assess students in math and ***just over half (55%) said they provide descriptive, timely feedback to students including strengths, weaknesses and next steps.*** Therefore, it appears that this information/feedback is not being communicated to parents regularly, in a timely manner or in a way parents understand or find useful.

- **86% teachers informally assess students daily (57%) or weekly (29%)**
- **40% teachers formally assess students weekly (7%) or monthly (33%)**
- **45% teachers formally assess students every few months**

Key Findings: Areas for Improvement

Pedagogy and Instruction

"Given how the teaching of math has changed, the district may consider even more communication regarding how math is taught and, as importantly, why it is taught the way it is taught now."

In focus groups, parents repeatedly alluded to ***being confused about the way math is taught***. First, noting that that it is very different from the way they learned math; and second that they found significant variation across teacher practice, by classroom, from year-to-year, and between schools.

This was supported by parent survey responses where ***75% of respondents agreed to varying degrees (more than a third (35%) strongly agreed) that the way math is taught in their child's school is very different from how they were taught.***

In some ways, parents see this too as a communication issue as primarily ***they want to better understand the approach to math and understand why the district advocates that approach.***

Key Findings: Areas for Improvement

Pedagogy and Instruction

Parents are undecided about whether the "new" math is better or worse. . . mostly, it's just different.

As parents describe it the current approach emphasizes conceptual understanding with less emphasis on procedural skills, memorization and automaticity. And while most parents said they understood the approach, opinions were mixed as to whether they like the way math is taught. Parents were also ambivalent about whether the current approach is better than how they were taught math. It seems parents are either struggling to make an assessment due to their confusion about the benefits of the approach or reserving judgement until they see the benefits of the approach.

Some parents admitted that they are confused about the current approach to teaching math and also admitted to seeing the benefits with their child(ren). However, other parents expressed frustration that their children have not yet or have taken a longer time to learn what they consider to be basic or foundational math skills/tools like multiplication.

> Theoretically, the math instruction today should be an improvement than when I was young—today having more of a goal of conceptual understanding and less focus on just procedures, but in reality I'm not sure how math was really taught in my son's classroom."
>
> Parent Survey

"From the years that my child did have homework, initially I was very confused about how math was being taught. However, after doing the work with him, I was soon able to figure it out and was very impressed with how this curriculum helped him gain a better understanding of numbers and math concepts. I feel that I sort of "memorized" how to do math without a deep foundation of understanding many of the concepts."

Parent Survey

"I think that the focus on concepts and problem solving is good in some respects. However, I believe my child would benefit from more explicit and systematic teaching. I am a former special education teacher (background in both regular and special ed) and I think there needs to be more skills directly taught and more extended practice of a particular skill so a child can actually achieve a sense of mastery."

Parent Survey

Key Findings: Areas for Improvement

Pedagogy and Instruction

Overall, parents want to better understand the current approach to math, the benefits it provides and how it is implemented.

When asked about their expectations for their children's math learning, conceptual understanding was one of parents top goals (second only to rigor/challenge and conceptual understanding, which was followed by enjoyment/fun and procedural skills). Survey results indicate that parents think that the focus on conceptual understanding is good, ***"I am so impressed that kids are learning to think in the language of math and share their thinking instead of mere mastery of calculation methods",*** and they also see strong procedural skills as an important outcome. Arguably, most parents want a balance of conceptual understanding and procedural fluency for their students. And though the current approach to math (as described by parents) is in keeping with those goals their concern seems to be around implementation or execution. It should also be noted that a small portion of parents clearly put a premium on procedural skills over conceptual understanding at least at "this age level".

"I do like the way of teaching which emphasize[s] conceptualization. But I feel insufficiency of developing calculation skills. That's the reason why I let my child do extra math activities at home (and also to give mathematical challenges to my child, based on his ability). I hope both of two ways of learning math make balance."

Parent survey

"If it is executed effectively, much of the current teaching is superior to "old math" because it helps kids understand concepts by manipulating numbers, groupings, patterns, etc. In theory, this should lead to deeper and more thorough understanding of mathematical concepts, but in my experience that is not the real world outcome. Too much time seems to be spent on fiddling around and not enough time spent helping the students connect their fiddling with the larger picture mathematical concept. And not enough time is spent practicing the use of that concept in a wide range of applications. And certainly, advanced math learners are bored to death."

Parent Survey

Key Findings: Areas for Improvement

Pedagogy and Instruction

Parents also perceive that there is a lack of differentiated instruction in math—especially for more "advanced" students.

Whatever the particular approach though more than anything parents want a more rigorous approach to math. Parents do not feel that kids are being exposed to challenging material, which leaves them bored and disengaged from math. They see this primarily as the result of ***a lack of differentiation or differentiated instruction.***

Some parents acknowledged how difficult it is to effectively differentiate instruction, "***It's really challenging to track all those different levels of math ability. And it feels a little like, and I think . . .that the thing that often seems to get dropped a little bit, is that extra push for the challenging thing."*** but see it as necessary nonetheless, and pushed back on what they see as the current version of differentiation i.e., extra worksheets pointing out that there is effective differentiated instruction in reading/literacy.

Admittedly, some parents' definition or understanding of "differentiation" may be more akin to tracking, ***"There's no differentiation now. Not in terms of who is smart and who isn't."*** but these were not in the majority

Teachers also acknowledged challenges with differentiating instruction. Overwhelmingly, teachers said that they are familiar with (95%) and confident (87%) in teaching the content standards for their grade level(s); but are far less familiar with (48%) or confident in teaching content (38%) that spans two grade levels below or two grade levels above.

"They grouped the kids but they only did that a couple times. I just wish that there could be more, and I know this is like against the Brookline philosophy and all children are gifted and I get that. . .but there seems that there could be more differentiation among the math, so that the kids who are more advanced can be challenged or the kids who are working on one thing can continue working on that and another kid can work on something else."

Parent Focus Group

"From speaking with many parents, I get the sense many parents are dissatisfied. Math seems much less effectively taught than reading, for example, and I notice less differentiation in math. Many parents complain the math is too simple, and I see that the teachers aren't really stretching the kids or challenging them. My child who had already mastered the skill being taught didn't seem to learn anything additional."

Parent Focus Group

Key Findings: Areas for Improvement

Curriculum

"Do we have a math curriculum?"

While nearly 7 out of 10 respondents to the parent survey (69%) agreed (to varying degrees) that they had a good understanding of the math content their child was taught last school year, for many parents ***the actual math curriculum is a "mystery"***. This was an especially prevalent theme in focus groups where parents consistently said that ***"[There] is a lack of communication around curriculum. . .we don't really know. . .what they're learning."***

More than half of teachers (56%) also said that there are not adequate resources to orient parents and families to the math curriculum, and they (teachers) themselves also asked, "***Do we have a math curriculum***?" And though some teachers specifically named Think Math as the current curriculum, none of the feedback on Think Math was positive.

"I know there are math standards and are familiar with them because of the MCAS and a scope and sequence that was shared years ago. My math instruction is a collection of problems, games, lessons and online work that come from many different resources that my colleagues and I have largely found on our own."

Teacher Survey

Key Findings: Areas for Improvement

Curriculum

"Our current math program (Think Math) is outdated and does not meet the expected content standards. In addition, the approach was extremely dry and teacher-centered. Our next program needs to fully embrace the math practices found in the Common Core Standards and ensure that there are many opportunities engaging, rich problem solving."

Teacher Survey

"I use Think Math for a few chapters, but beyond that, it is so outdated that most of it is not aligned with the current 4th grade standards. The fraction unit is something I have been building for years-- receiving multiple 2 inch binders with various worksheets was helpful as a resource but not a supplementary unit guide. For the majority of the year, I am creating my own units and all of the work/assessments that go with it."

Teacher Survey

"Think Math is technically our curriculum, however, I use almost none of it because it does not meet the needs of differentiation, hands-on, problem-solving, engagement, and variety. I have pieced together my activities to use in a small group, station-based setting, but it has been a lot of work to do so."

Teacher Survey

Key Findings: Areas for Improvement

Curriculum

Parents say students are bored and aren't being appropriately challenged and parents want a more rigorous math curriculum.

In describing the curriculum as a "mystery" parents first concern was about (the lack of) communication about the current math curriculum; but a deeper concern was what they perceived to be a lack of rigor or challenge with the current curriculum (again, if there is one).

About half of parent survey respondents consistently disagreed that the curriculum was academically rigorous (56%), that their child was challenged by the curriculum (52%) and were dissatisfied with the math curriculum (53%). Additionally, of the nearly 200 open-ended survey responses on curriculum, more than half (54%) focused on this theme of rigor or challenge or lack thereof.

Many parents feel that the curriculum is primarily designed or aimed at the median/average student or primarily designed for struggling students. These parents feel and that it ***disadvantages "advanced" or strong students who become bored or disengaged*** because the curriculum is too basic and/or the pace is too slow and does not provide the opportunity for advanced classwork for the students that have mastered the content.

Some parents acknowledge that students' high participation rates in supplemental math programs (e.g. "Russian math") may be part of the problem with students who know the material feeling bored in class, while others say that lack of rigor in the curriculum has led them to pursue external/supplemental math.

Parents also believe that because the curriculum lacks rigor, students are falling behind, especially when compared to math curricula in other countries. As a result of these concerns, many parents advocating outright for tracking in elementary school or for differentiated instruction (see earlier discussion).

Curriculum

Parents would also like to have a math textbook and/or more engaging, high-quality materials.

Curriculum materials are also lacking and ***parents are very frustrated that there aren't math textbooks and/or workbooks and other easily accessible reference materials***. This makes it difficult for them to know what their student should be learning (communication issue) it also limits parents' ability to help students with their homework or to be involved in their math learning in general.

Ideally, parents want access to a math textbook, workbooks, and other coherent set of materials so they know what their student is expected to learn, know and do and so they can support what's happening in school at home. They also take issue with the poor quality of some of the worksheets and other reference materials that students do bring home.

"...How are parents expected to be able to help at home when there is no textbook or workbook or binder with information about what is being taught. There is NOTHING for parents to look over to try to help their child learn concepts by looking at examples or reading information. They have ZERO notes from class because the teacher does not provide traditional teaching (writing on the board to explain concepts!). It is very, very frustrating."

Parent Survey

"Math should have a textbook or workbook so it is clear what the concepts are and why students are learning them and how things fit together. A textbook or workbook will provide context and examples for students to refer back to again and again."

Parent Focus Group

Key Findings: Areas for Improvement

Curriculum

Teachers also say the current curriculum materials are "piecemeal" and they would also appreciate having a textbook and/or coherent, curated set of curriculum materials.

Teachers spend a lot of time looking for, creating and pulling together materials from a variety of sources to meet their student and classroom needs in math. This is ***a time consuming process*** and no doubt ***leads to duplication of efforts*** and an ***incredible amount of variation in the source and quality of materials***. While a few teachers pointed out that the new Grades K-5 resource website was useful, overall teachers say in some ways ***"there are far to many resources"*** and ***what is urgently needed is a clear and coherent curriculum, with high-quality materials*** distributed to everyone who is expected to teach math content and district-provided professional development to support implementation.

"Classroom teachers are in need of strong curriculum resources that engage students in problem solving and the development of associated skills. Teachers are spending TONS of time seeking out and creating their own materials to match the standards and the engaging types of math instruction they want to provide."

Teacher Survey

"[We] need for a unified approach to teaching math that emphasizes conceptual understanding alongside procedural understanding. A singular, shared, high-level curriculum that provides all learners access to math concepts and rich mathematical experiences. Providing sufficient professional development to all teachers of math so that the quality of the math experiences children receive will not vary from room to room in the same grade or between schools or from the regular classroom to a learning center."

Parent Survey

"I look forward to the selection of a new math curriculum that will support us with our scope and sequence and provide daily resources for student practice with differentiation. We have been offered many resources, but it is hard to manage them and pull from them when we don't have a clear direction. . . we also need daily practice sheets so that the students have something to "pass in" so that we are able to review their work. In a classroom with one adult, it is not possible to teach small groups while also monitoring students' practice if there is not a physical paper to hand in on some days (compared to game sheets with dry erasing which are not saved for teacher review)."

Teacher Survey

"We desperately, urgently need a curriculum in the form of one book. We need one basic, straightforward textbook with content that aligns with our standards, and a table of contents that we can agree will be the order in which we teach units. The book will serve as a base from which I can plan and extend/modify/enrich on my own. Without that base, it is very difficult to do my job well. It is difficult to plan, to communicate with families, and to orchestrate math instruction among all of the specialists who rely on the classroom teacher for direction. I could do a much better job for students and families if we had one fourth grade math textbook.

Teacher Survey

"Not that there's one math program that fits all but, you know, [but] when you have a program, you have a pacing guide, you have common assessment etc. there's things that as a building leader, you can monitor where you can see who's making effective progress. But I find it really hard [to] say whether someone's making effective progress in math because the measures are not maybe as clear of where someone should be because we don't have common assessments."

PSB K-8 Principal Focus Group

Key Findings: Areas for Improvement

Equity and Access

The final area for improvement is equity and access. The various data collected and examined to support Phase I, revealed numerous and perhaps somewhat competing views about which student groups needs are being well-served and which are not.

In focus groups and surveys, many (though not all) ***parents expressed that "advanced" students (or students who perform above grade-level expectations in math) are not well-supported*** and that the focus is more on "average" or struggling students.

On the other hand, ***when teachers were asked about issues of equity and access, though not widespread, the more common concerns were for culturally diverse students, ELs and students with disabilities***.

The analysis of MCAS math results from SY 2017 for grades 3-8 provided another source of evidence, showing ***large gaps in performance by Race, income, disability status, and English Learner status.***

This section includes:

- Detail on student demographics for the grades 3-8 MCAS test takers student population
- Teachers' feedback from the survey

*Note: All data reported on the following slides are for PSB students who took the 2017 Spring MCAS assessment in grades 3-8.

Key Findings: Areas for Improvement

Equity and Access

Demographics of MCAS Test Takers Spring 2017 (Grades 3-8)

Student Group	% in grades 3-8	% Economically Disadvantaged
District	--	11%
Asian	18%	14%
Black	6%	40%
Latinx	11%	27%
Multirace	9%	6%
White	55%	4%

Overall, 11% of Grades 3-8 students in this population were Economically Disadvantaged*

A larger share of Black and Latinx students are Economically Disadvantaged compared to their Asian and White peers.

*Economically disadvantaged students" are students who are participating in one or more of the following state-administered programs: the Supplemental Nutrition Assistance Program (SNAP); the Transitional Assistance for Families with Dependent Children (TAFDC); the Department of Children and Families' (DCF) foster care program; and eligible MassHealth programs (Medicaid).Source: Public Schools of Brookline.

Key Findings: Areas for Improvement

Equity and Access

Demographics of MCAS Test Takers Spring 2017 (Grades 3-8)

Student Group	% in grades 3-8	% IEP
District	--	17%
Asian	18%	8%
Black	6%	39%
Latinx	11%	28%
Multirace	9%	13%
White	55%	15%

Black and Latinx students are disproportionately represented among students with an IEP -- Far above the district average of 17%

Key Findings: Areas for Improvement

Equity and Access

Demographics of MCAS Test Takers Spring 2017 (Grades 3-8)

Student Group	% in grades 3-8	% EL
District	--	9%
Asian	18%	22%
Black	6%	3%
Latinx	11%	8%
Multirace	9%	2%
White	55%	6%

The largest portion of English Learners is among Asian students.

Key Findings: Areas for Improvement

Equity and Access

CCE analyzed the Spring 2017 student MCAS math performance data for grades 3-8. Spring 2017 was the baseline year for the Next-Generation MCAS (an updated version of the nearly 20-year old MCAS assessment) and scores from this assessment should not be compared to previous years. Because of this, longitudinal analysis was not possible and the analysis instead provides **a snapshot of student performance in math**. The ***Next-Generation MCAS Achievement Levels are:***

Exceeding Expectations 530-560: A student who performed at this level exceeded grade-level expectations by demonstrating mastery of the subject matter.

Meeting Expectations 500-529: A student who performed at this level met grade-level expectations and is academically on track to succeed in the current grade in this subject.

Partially Meeting Expectations 470-499: A student who performed at this level partially met grade-level expectations in this subject. The school, in consultation with the student's parent/guardian, should consider whether the student needs additional academic assistance to succeed in this subject.

Not Meeting Expectations 440-469: A student who performed at this level did not meet grade-level expectations in this subject. The school, in consultation with the student's parent/guardian, should determine the coordinated academic assistance and/or additional instruction the student needs to succeed in this subject.

Key Findings: Areas for Improvement

Equity and Access

Overall PSB Performance on the 2017 MCAS Math was high; however, gaps between subgroups are clear

Overall performance for PSB students in grades 3-8 on the MCAS math was high –13 points above the state average of 499. PSB students of all races performed better, on average, than their peers statewide. Within PSB there were significant differences in results by race, income level, and student disability status.

On average, among PSB students, Black students scored 30 points lower than Asian students and 23 points lower than White students, with an average score in the "Partially Meeting Expectations" level on the 2017 MCAS Math Assessment. Latinx students in PSB scored 19 points lower than Asian students and 12 points lower than White students, on average for the same assessment.

Student Group	State	PSB
All students	499	512
Asian	514	520
Black	487	490
Latinx	488	501
White	502	513

Key Findings: Areas for Improvement

Equity and Access

There are large disparities in performance by Race, income, and disability status on the 2017 MCAS Math assessment for Grades 3-8 PSB students:

Students with an IEP had the lowest mean scale score of any PSB student group in Spring 2017

Only 1% of Black students in grades 3-8 scored "Exceeding Expectations" on the assessment as compared to 34% of Asian students and 21% of White students

Economically Disadvantaged students had a mean score that was 20 points lower than their Non-Economically Disadvantaged peers (494 to 514)

Grades 3-8 MCAS Math Results by Student Population, Spring 2017

PSB student MCAS Math Performance

		N	Average Scaled Score	% Exceeding Expectations	% Meeting Expectations or Higher
Gender	Female	1721	512	22%	73%
	Male	1765	512	21%	72%
Race	Asian	630	520	34%	82%
	Black	196	490	1%	33%
	Latinx	400	501	11%	51%
	Multirace	323	516	26%	80%
	Pacific Islander	3	---	---	---
	White	1935	513	21%	77%
Economically Disadvantaged	Not Econ Dis	3111	514	23%	77%
	Econ Dis	376	494	9%	39%
English Learners	Not EL	3186	513	22%	74%
	EL	301	504	10%	60%
Students with Disabilities	No IEP	2905	517	25%	82%
	IEP	582	488	3%	28%
METCO	Not METCO	3358	513	22%	74%
	METCO	129	493	5%	40%
Total	Total	3487	512	21%	73%

Key Findings: Areas for Improvement

Equity and Access

Is race a proxy for income?

Often when looking at data that shows wide gaps by Race/Ethnicity and/or income in performance, a common question is whether Race is a proxy for income—in other words ***are the differences in performance related to student income background rather than Race?*** CCE's analysis included an examination of the data by Race and income to answer that question.

Race is not a proxy for income in Brookline.* Black students had the lowest mean score among Economically Disadvantaged students and among students not designated as Economically Disadvantaged.

On average, Economically Disadvantaged students had lower mean score than their Non-Economically Disadvantaged peers across all Race/Ethnic groups. ***Among Economically Disadvantaged students, Black and Latinx students had significantly lower mean scores than Asian and White students.***

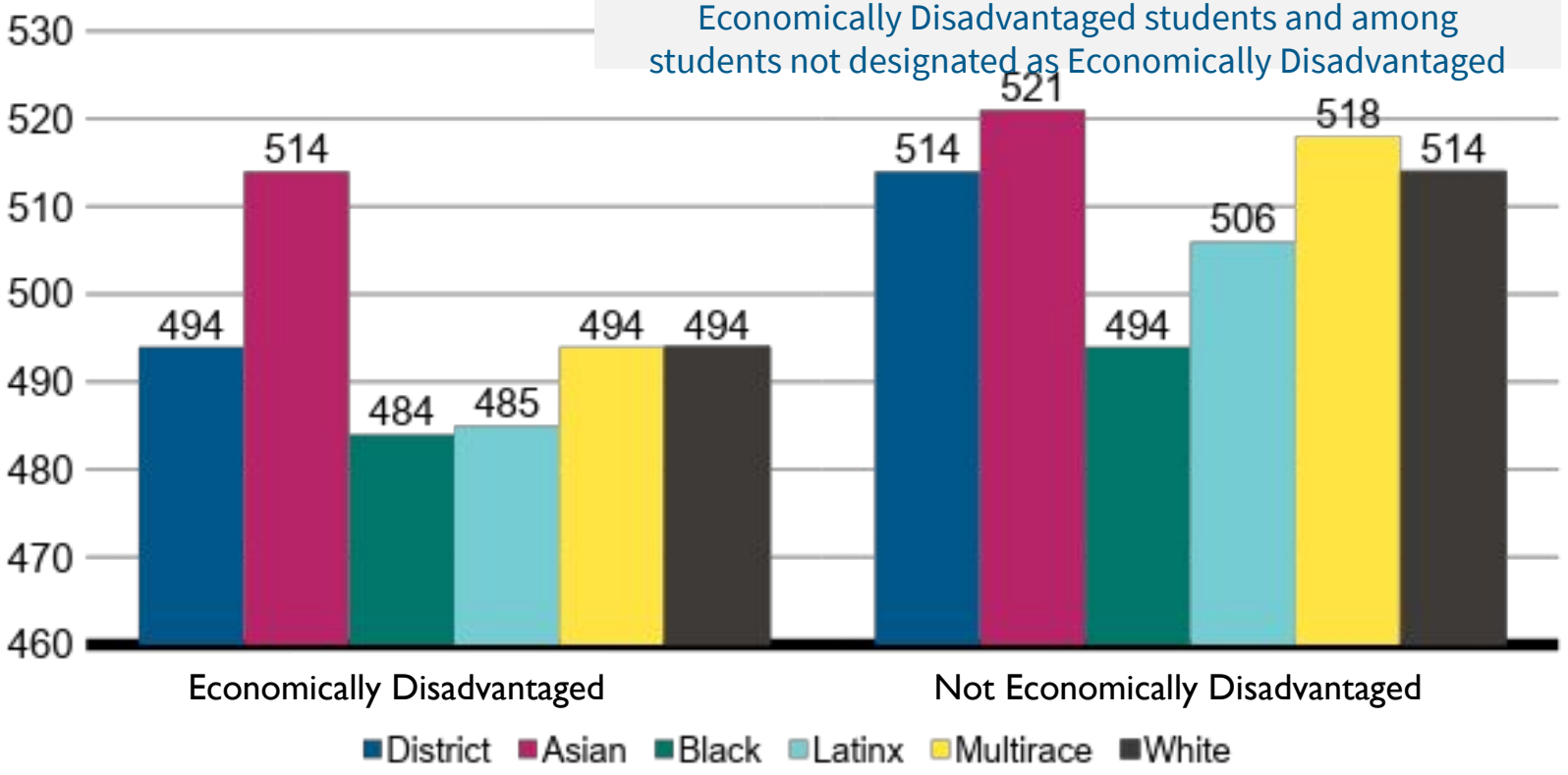
Higher income Black students had the same mean MCAS math score as lower income White students and scored far below the mean score of Economically Disadvantaged Asian students, on average.

*As shown on the Spring 2017 Math MCAS assessment

Grade 3-8 MCAS Math Results by Student Population, Spring 2017

Mean MCAS Math Score by Income and Race

Black students had the lowest mean score both among Economically Disadvantaged students and among students not designated as Economically Disadvantaged



Source: Public Schools of Brookline

Key Findings: Areas for Improvement

Equity and Access

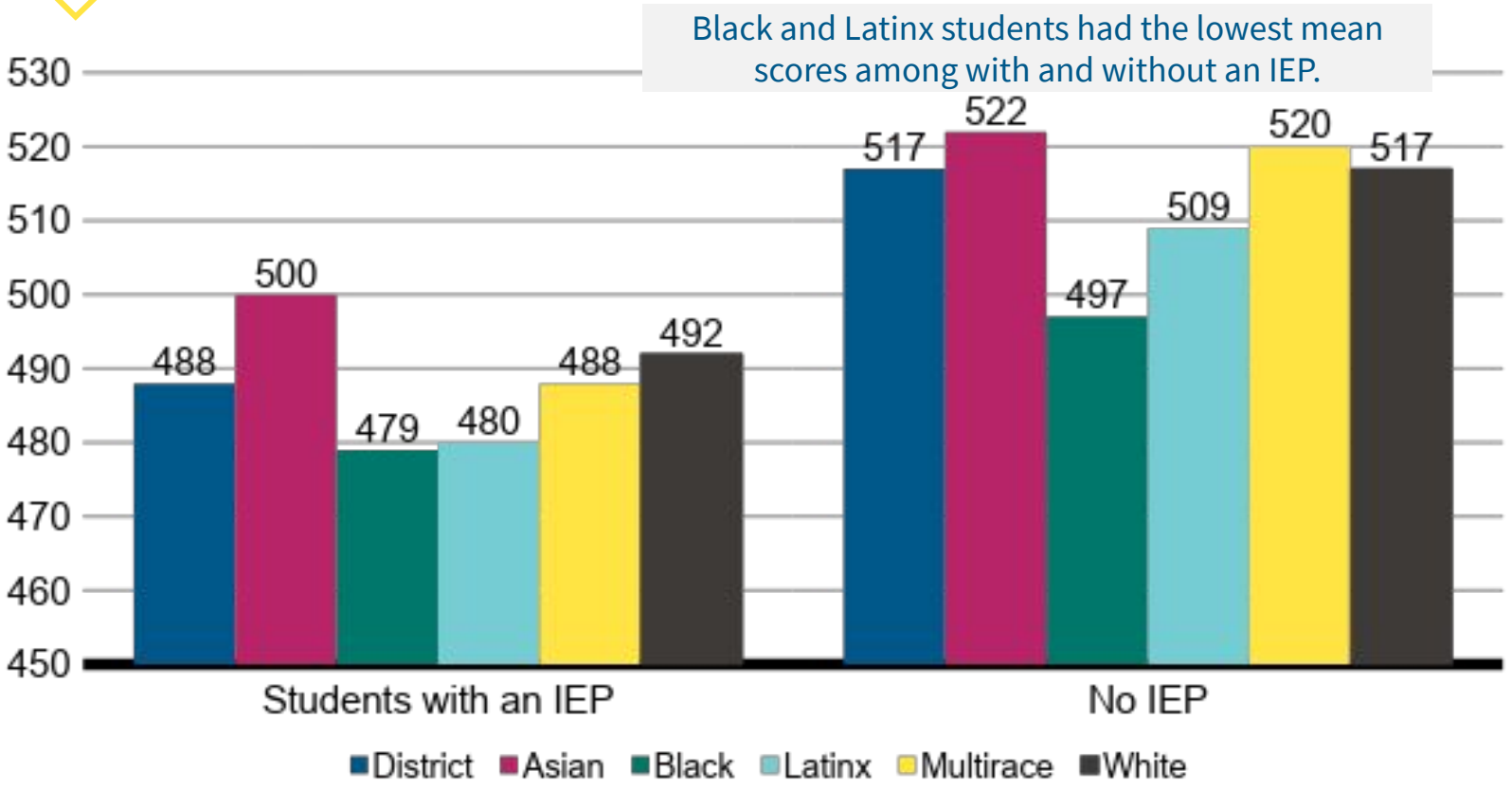
Disparities by Race are also evident among students with an IEP and those without. Black students without an IEP had lower Spring 2017 mean MCAS Math scores than Asian students with a disability

Similar to national trends, on average students with disabilities or who have an IEP had lower mean scores than students without an IEP across Race/Ethnic groups. Here again there were large gaps in performance by Race among students with an IEP (see chart next page—Mean MCAS math score by IEP status and race).

For example, there was a 20 point gap between mean scores of Latinx (480) and Asian students (500) who were on an IEP. And again, noting how patterns vary by Race--Black students without an IEP (497) had lower mean MCAS Math score, on average, than Asian students with an IEP (500).

Grade 3-8 MCAS Math Results by Student Population, Spring 2017

Mean MCAS Math Score by IEP Status



Source: Public Schools of Brookline

Key Findings: Areas for Improvement

Equity and Access

"There is a wide range of student needs in any given classroom."

When asked if they have the materials, resources and/or teaching strategies to meet the needs of various student groups (see sidebar) teachers responses were mixed. Most either "Agreed or Strongly Agreed" that they were well-equipped for the most part –except for ELs. However, a substantial share of teachers (18%-25%) selected "neutral" making interpretation difficult for this question item.

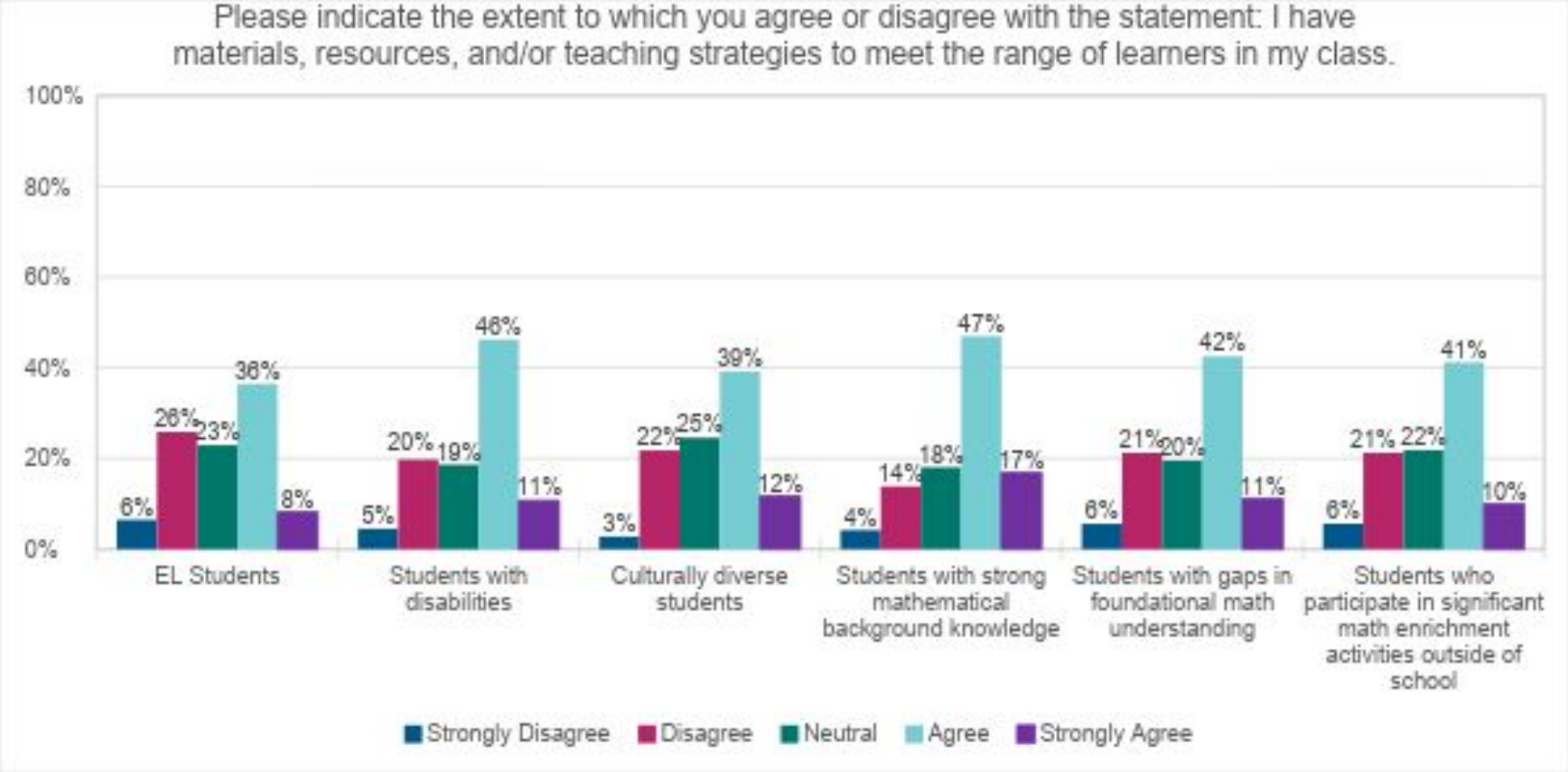
When asked to elaborate if they selected either "Disagree" or "Strongly Disagree" in response to this question, teachers most frequently provided comments on culturally diverse students, ELs, and Students with Disabilities.

Teachers were asked about working with different student groups, including:

- **Culturally diverse students**
- **English Learners (ELs) Students**
- **Students with gaps in their foundational math understanding**
- **Students with Disabilities (SWD)**
- **Students with strong mathematical background knowledge**
- **Students who participate in significant math enrichment or supplemental math activities outside of school**

Key Findings: Areas for Improvement

Meeting the Needs of a Range of Learners



Key Findings: Areas for Improvement

Equity and Access

"I'm not even sure what materials for "culturally diverse students" would look like compared to the things I already have."

"We have an achievement gap between our white students and our culturally diverse students. Therefore, we must be lacking materials, resources, and/or teaching strategies to meet their needs."

"The materials that I teach with often use animals instead of students. When students are used, their pictures/names aren't diverse (race, disability, language, gender)."

Teacher Survey

"I wish we had more information about how to adjust mathematics lessons for ELL students. I feel like most PD about ELL students connects to literacy."

"We need good quality, kid-friendly math language dictionaries for EL students. It would also help to have a list of Read Aloud picture books that correlate to units and represent various cultures."

Teacher Survey

"In the general education setting, many students on IEPs are not accessing the curriculum as the structure of the class is not universally designed and is only being taught to one type of learner. The content is incredibly fast-paced and language-heavy. Some students make comments about "feeling frustrated" and may shut down because the instruction is not accessible."

Teacher Survey

Research Report: Conclusion

- **Priorities for committee to consider in future phases of the review.**

Research Report: Conclusion

Priorities for PreK-8 Math Program

Based on the findings of this report, we identify some priorities for the committee to consider in its plan.

Identify, pilot and adopt a rigorous curriculum (or curricula for particular PreK-8 grade spans) that supports a balance of conceptual understanding and procedural fluency and that builds on the fun and engaging activities that are already established aspects of the math program.

This curriculum should also **provide/include high-quality instructional materials** (e.g. textbooks, workbooks etc.) that are used district-wide with supplemental materials that teachers can use to provide appropriate enrichment for students who need it and support for struggling students, reducing the inordinate amount of time teachers currently spend searching for and/or developing their own materials.

Teachers should also have a**ccess to instructional materials to support students' cultural, linguistic and racial backgrounds.** High-quality, culturally -relevant instructional materials can help to address disparities revealed by the data (over time) and address teachers' needs for resources to better serve culturally diverse students, ELs, and students with disabilities.

Consistency in scope and sequence of the curriculum within grades and across PreK-8 schools will help to reduce the wide variation and fluctuation in parents' (and students') experience, which is currently a significant source of dissatisfaction.

Research Report: Conclusion

Priorities for PreK-8 Math Program

Provide professional development for teachers to support implementation of new curriculum.

Ensure that math specialists and teachers, including special education and EL teachers receive training and ongoing support to effectively implement any new curriculum (and relevant instructional strategies) that is adopted. Provide teachers with more time and opportunities for job-embedded support working with math specialists within their schools as well as cross-grade and cross-school professional collaboration and learning, including by having districtwide grade-level release days. Teachers and Math Specialists are the greatest asset of the PreK-8 math program and they value and benefit from these opportunities but report that they are limited. Having release days provides more time for common planning, developing common assessments, sharing ideas and seeking feedback to support particular groups of students or individual students.

Establish a culture of data-driven decision-making and use disaggregated data on student performance in math to identify, address and monitor achievement gaps over time.

MCAS data revealed significant disparities in performance by Race, income and disability status and teachers also indicated concerns in supporting particular student groups, including ELs. This study only includes baseline data (SY 2017) from the Next Generation MCAS. The district should continue to track data over time and continue (as they have been) to disaggregate by student characteristics, by school, and by grade-level so educators can use these data to inform decision-making and instruction. Given the limitations of the MCAS (and standardized tests in general) consider having a district benchmark assessment in math that can provide more timely and useful data on student math performance. Also, teachers want an established intervention model for math to better support students who are struggling in math to help close achievement gaps.

Research Report: Conclusion

Priorities for PreK-8 Math Program

Streamline communication and outreach between schools/educators and parents and families about preK-8 math teaching and learning approaches, curriculum and student performance and progress in math. Teachers reported using many, many avenues to communicate with parents but the inconsistency in communication concerning math is a major source of frustration for many parents, who want more targeted and timely communication.

Some schools/educators are already doing outreach and parent communication that is welcome and seemingly effective (e.g. Math night, weekly reports with conversation starters etc.) so further explore and evaluate the many current methods schools/educators use to communicate with parents to identify the most effective methods and platforms, that meet the needs of parents and families but do not overburden individual teachers/schools, to create a districtwide and/or school-level communication plan and coordination.

In several places in the data collection, parents and educators were careful to point out that their criticisms on the shortcomings around communication, curriculum, intervention and instructional approach etc. that were shared in the feedback collected to support Phase I of this review were not for the district per se but specific to math—to PreK-8 math, often making the point that the literacy program seemingly does a better job in these areas compared to math. As one parent put it, ***". . . math has taken a backseat in the district . . .at least preK-8 math."*** As the committee continues this work thinking about how to **create a culture where numeracy is treated similarly to literacy** can provide a framework for the next phases of this work.

The Center for Collaborative Education

CCE's mission is to transform schools to ensure that all students succeed. We partner with educators and leaders to develop strategies, processes and tools that support our vision of schools that prepare every student to achieve academically and make a positive contribution to a democratic society. We fulfill this mission in three primary ways:

-Creating, supporting and sustaining learning environments that are collaborative, democratic and equitable

-Building capacity within districts and schools to adopt effective practices that promote collaborative, democratic and equitable learning for students and educators

-Catalyzing systemic change at the state, district and school levels through policy, research and advocacy work