Public Schools of Brookline
PK-8 Math Review

Phase I Report

June 2019

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Introduction

Purpose and Scope of Math Program Review

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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 Changes to the Massachusetts state curriculum frameworks, new Math MCAS, and outdated K-5 and middle school curricula that were not aligned with changes in the national and state standards further supported the need for the program review, and a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:

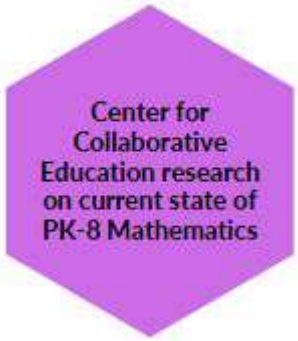
- Read and reflected on the latest research on effective mathematics teaching and learning (see Bibliography in Appendix I)
- Conducted in and out of district PK-8 mathematics classroom visits
- Reviewed vision statements of comparable districts
- Contributed to reviewing and revising multiple drafts 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

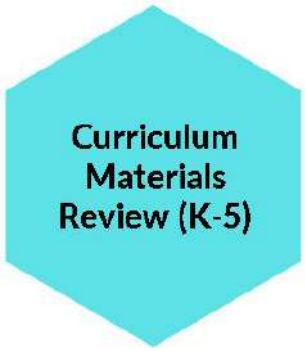
Components of Phase I

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 foridentifying 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

Bibliography (to be completed)