

Mathematics Program Review Phase II Report

February 1, 2007

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Mathematics Program Review Phase II Report

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Executive Summary

Based on the Public Schools of Brookline Mission and Core Values, the Massachusetts State Curriculum Frameworks, and the National Council of Teachers of Mathematics (NCTM) *Principles and Standards for School Mathematics*, the Mathematics Program Review Committee created a vision to help us guide our work. This vision statement articulates our beliefs about teaching and learning mathematics in Brookline. It consists of six principles: equity, curriculum, teaching, learning, assessment and technology. During Phase I of our study, we used these six principles to organize the committee's findings and to analyze the areas of strengths and areas of improvement, to frame areas of inquiry, and to initiate ideas about the next steps. This Phase II Report identifies specific actions supported by rationale, timelines, and budget implications.

Equity Vision: *We believe that equity requires high expectations with rich meaningful learning opportunities for all students...*

Areas for Improvement (Phase I):

- ✓ K-8 grouping patterns (e.g. why are students grouped? how are they grouped? and who decides the groups? and what criteria is used for determining groups?) vary widely by school and by student background and achievement level.
- ✓ Better communication between school and parents as well as home-school connections.
- ✓ Many students (Black and Latino students, SPED students, and economically disadvantaged students) who fall within sub-populations within our schools do not perform well in mathematics on standardized test measures.

Actions include:

- Identify grouping patterns in mathematics K-12.
- Define and implement consistent parent communication practices.
- Improve documentation of student progress and parent communication for students who receive extra support in mathematics.
- Determine if schools require additional support or resources in order to narrow the achievement gap.

Rationale includes:

- Common grouping patterns in mathematics should be affirmed by research and implemented consistently throughout the district.
- Active parent involvement and cooperation yields increased student achievement.
- Appropriate, timely, and informative documentation of progress will facilitate greater success for under-performing students.
- Achievement of identified sub-populations can be improved by targeting resources and personnel.

Curriculum Vision: *Our curriculum reflects and is consistent with the Massachusetts Curriculum Frameworks and the National Council of Teachers of Mathematics (NCTM) (2000) Principles and Standards for School Mathematics and (NCTM (2006) Focal Points. It is highly coherent with an emphasis on the big mathematical ideas....*

Areas for Improvement (Phase I):

- ✓ Brookline's Learning Expectations (BLEs) need to be better aligned with the state Curriculum Frameworks.
- ✓ The current curriculum as implemented does not always reflect an integrated approach to content, where conceptual understanding and efficient computational strategies are interwoven.
- ✓ Materials and teacher training are needed to address the learning gaps in our current curriculum (e.g. specific topics, support for underperforming students, and extensions for high performing students).

Actions include:

- Align the K-8 BLEs and 9-12 course syllabi and competencies with the Massachusetts Curriculum Frameworks.
- Review current and available K-5 curricula and then 6-8 curricula to determine the best program to be used as a primary source for mathematics instructional materials.
- Support K-5/6 classroom teachers to transition from current learning expectations to the revised BLEs.
- Identify and develop curriculum resources for differentiating instruction and to support the learning gaps.

Rationale includes:

- The Massachusetts Curriculum Frameworks contain reasonable standards that are rigorous and should be used as a guide for mapping and revising the BLEs.
- The BLEs are not currently fully aligned. To fully realize our vision, we need a closer alignment with all grade levels, specifically grades K-8.
- We need to select a program and supplementary materials that support our Learning Expectations and deepen student understanding of both mathematical concepts and skills.
- Given that no single program will meet the needs of all students, teachers will need additional support materials to extend our curriculum for underperforming and higher performing students.

Teaching Vision: *Our teachers have strong mathematical knowledge... are reflective practitioners who use assessments to refine our instruction, and they use a repertoire of pedagogical strategies to accommodate the learning differences among students... engage in professional development opportunities.*

Areas for improvement (Phase I):

- ✓ Professional development opportunities in content and pedagogy are needed.
- ✓ Teachers need additional support to use and extend the curriculum, particularly for underperforming and higher performing students.
- ✓ K-8 mathematics teachers need more opportunities to collaborate.

Actions include:

- Plan and deliver a series of courses in math content knowledge and pursue opportunities for teachers to demonstrate mathematics competencies (e.g. 1-6 licenses or a series of courses).
- Increase the collaboration between Math Specialists, Enrichment and Challenge Support Program (ECS) teachers, and Special Education teachers.
- Create a plan to evolve the role and responsibilities of the Mathematics Specialists to move toward a mathematics coaching model.
- Create a plan for supporting new teachers by fully developing the Math Grade Level Facilitators' (GLF) role.

Rationale includes:

- The professional development needs that teachers self-identify are important in planning and organizing workshops, summer institutes, and graduate courses.
- To help teachers begin to think about how to better differentiate within the classroom, the building leaders in math, SPED and ECS need to collaborate to identify effective instructional strategies that would support both higher performing and lower performing students.
- To provide high quality mathematics instruction, schools and teachers need support from Mathematics Specialist/Mathematics Coaches who have expertise in both content and pedagogy knowledge.
- The GLF are the K-5/6 teachers who meet throughout the year (6 sessions) with new teachers at each grade level. There is one GLF at each grade level across the district. During these training sessions, the GLF work with new teachers to plan upcoming curriculum units.

Learning Vision: *Our students use mathematics effectively and understand it deeply. They engage in rich provocative mathematical tasks in which they analyze, create, interpret, reason, and make conjectures...and become proficient in their skills.*

Areas for Improvement (Phase I):

- ✓ K-8 students need to demonstrate more computation and algorithmic fluency.
- ✓ Students need more concepts and skills development in measurement (e.g. area, perimeter, measurement conversion) and opportunity for application in both science and mathematics.

Actions include:

- Perform a data analysis on computation and algorithmic fluency items on the 2003, 2004, 2005 and 2006 MCAS (grades 4, 6, 8, and 10) to establish baseline data on student performance on these items.

- Develop a correlation chart that correlates the BLEs, Massachusetts Curriculum Frameworks, and the adopted curriculum program lessons/units at each grade level.
- Collaborate with the Science Department on creating interdisciplinary curriculum and assessment for measurement.

Rationale includes:

- The qualitative data from Phase I study indicates that computation and algorithmic fluency are areas for improvement. An MCAS analysis on these types of items will help validate the data reported in the study.
- A correlation chart will give teachers greater access to all aspects of the curriculum at a glance. It will facilitate teachers' planning of instruction and understanding the coherence of the curriculum across the grades.
- Students understanding of measurement concepts across the grades (K-8) has been identified as an area for improvement. The current curriculum programs provide limited opportunities for students to explore measurement concepts.

Assessment Vision: *...Our assessments are on going and worthy as they support the learning of important mathematics for both teachers and students...*

Areas for Improvement (Phase I):

- ✓ Common grade level assessments should be developed to complement state and classroom assessments to inform instruction and monitor student progress.
- ✓ Course placement practices and procedures for incoming grade 9 students need to be examined and re-established across the system.

Actions include:

- Establish a timeline to work with vertical and horizontal teams to continue the development of common grade level assessments (e.g. formative and summative assessments) based on essential standards.
- Establish course placement guidelines for incoming 9th Grade students and for sequential courses offered at BHS.

Rationale includes:

- Frequent data will allow teachers and administrators to better differentiate instruction and determine progress for all learners.
- Written course placement criteria and guidelines will help inform teachers at all schools in the district.

Technology Vision: *We believe that technology is an essential tool for the optimal teaching and learning of mathematics...*

Areas for Improvement (Phase I):

- ✓ Establish an inventory and baseline of technology integration skills in mathematics classes.

- ✓ Identify exemplary computer software programs by grade level that support improved student learning.
- ✓ Examine new K-8 curricula materials for the use of technology.
- ✓ Develop essential standards for the use of technology in mathematics for K-12 students.
- ✓ Offer professional development activities that target the use of technology.

Actions include:

- Establish an inventory and baseline of technology integration skills in mathematics classes.
- Identify exemplary computer software programs by grade level that support improved student learning.
- Examine new K-8 curricula materials for the use of technology.
- Develop essential standards for the use of technology in mathematics for all students K-12.
- Offer professional development activities that target the use of technology.

Rationale includes:

- Technology use varies greatly from school to school and from course to course.
- Outdated and incompatible software programs need to be replaced and aligned with new curriculum expectations.
- Technology applications should not be viewed as add-ons rather as an integral part of how concepts are presented, developed, and practiced.
- There should be agreement on what students need to know and be able to do in order to effectively utilize technology in their lives.
- Teachers need to be confident in their technology abilities in the mathematics classroom.

Introduction to Phase II

The goal of Phase II of the Mathematics Program Review is to create a plan that will address the areas for program improvement identified through Phase I of the review process. The Phase I report described a vision for an exemplary Mathematics Program in six categories: Equity, Teaching, Learning, Curriculum, Assessment and Technology. During Phase II, the Mathematics Program Review Committee examined the areas for improvement for each of these categories and investigated strategies for strengthening the program. The resulting plan for overall program improvement follows. The plan addresses each vision category separately, although there is natural overlap among them.

Phase II Process

Committee

The committee met regularly from January- December 2006. The members of the Phase II Mathematics Program Review are:

Angela Allen, K-8 Mathematics Curriculum Coordinator (co-chair)
Tracy Bare, 7/8 Math teacher at Pierce School
Jim Bosman, 9-12 Mathematics Curriculum Coordinator (co-chair)
Sarah Crane, Academic Data Analyst
Ellen Davidson, parent and .2 Math specialist at Driscoll School
Deb Gallagher, Lincoln School vice-principal
Nancy Knott, parent
Amy Martin, Director of Program Review and Grants (co-chair)
Karin Olson, classroom teacher at Lincoln School
Danielle Rabina, BHS Mathematics teacher
Pipier Smith-Mumford, Pierce School principal
Christine Thompson, Special Education teacher at Lawrence School
Grace Wang, BHS Mathematics teacher
Rhonda Weinstein, Math specialist at Baker School

Committee Data Gathering

The Mathematics Program Review Committee met regularly from January 2005 to January 2006 to develop the plan for program improvement. Early on it became apparent that some additional data gathering and analyses would be useful in order to better understand the program needs described by teachers, parents and administrators during Phase I. The additional data gathered and used by the committee during Phase II is described below and is available for review upon request.

- Discussion group with 7/8 Mathematics classroom teachers to discuss middle school concerns, including grouping practices, Algebra, and transition to Grade 9. (March 2005)

- Discussion group on minority student achievement gap in Mathematics, using the following text: *Urban Success: a Multidimensional Mathematics Approach with Equitable Outcomes*, by Jo Boaler. Phi Delta Kappan, January 2006. (April 2006)
- E-mail survey of classroom teachers on their professional development needs and preferences with regard to Mathematics. (May-June 2005)
- 2006 MCAS update, including disaggregated data for sub-populations (race, ethnicity, SPED) (November 2006)
- BHS class enrollment update – comparison of previous data. (November 2006)
- Survey of Grade 9 students. (December 2006)
- Updates from the Elementary Instructional Materials Review Committee. (May & September 2006)
- Survey of BHS teacher technology use in Mathematics. (November 2006)
- Information on Mathematics instruction for Special Education students. (November 2006)

Community Updates

Two evening events for parents were held in 2006 in order to afford parents the opportunity to hear more detailed information and ask questions about the Program Review process, the Phase I findings and the Phase II committee work: February 13, 2006 at the Lawrence School and May 1, 2006 at the Heath School. These presentations were given by the Mathematics coordinators, Jim Bosman and Angela Allen, and the Deputy Superintendent for Teaching and Learning, Dr. Jennifer Fischer-Mueller. In order to provide community access to the work of the Mathematics Program Review committee, the PSB website contains information on the Program Review process, the complete Mathematics Phase I reports and the Mathematics parent forum presentation. The Phase II report will be available in February 2007.

The Elementary Mathematics Instructional Materials Review

In order to address the areas for improvement with respect to Curriculum, in December 2006, the Program Review Committee identified a subcommittee to implement the School Committee's newly revised policy on the process for recommending instructional materials. The Math Curriculum Program Advisory Committee consists of the K-8 Curriculum Coordinator and Town-wide Math Specialist, in addition to teacher representatives from every Brookline school, all grades K – 8, and parent representatives.

According to the new guidelines, the process for the review of instructional materials has two (2) steps, described as Round 1 and Round 2. The first Round begins when programs/texts are identified as candidates for review. These programs are identified by the Program Review Committee through their research on available programs; the programs' use nationally and locally; measures of satisfaction and effectiveness as described by current users; and/or contemporary research identifying the program as an effective tool supporting teaching and learning. In addition, the programs identified for review are chosen based on their potential alignment to state frameworks and the K-8 Learning Expectations.

During Round 1, we conducted the first review of seven curriculum programs. The committee analyzed and evaluated the following programs: Investigations 2009 (*revised*), Everyday Mathematics (*revised*), Math Trailblazers, Scott Foresman-Addison Wesley and Singapore Mathematics, ThinkMath and Math Expressions using a detailed criteria rubric. These evaluations involved: presentations on each of these programs; conversations with other districts that have used each program; a review of the research on the program's effectiveness; and each program's alignment to the MA State Frameworks. Round 1 will end with a report that states why some programs are being considered for advancement to the next round and why the other programs did not make the advancement to Round 2. A summary of this report will be presented to our school community.

We anticipate moving on to Round 2 in the Mid-Winter 2007. Round 2 is a more rigorous examination of the materials that were advanced, that will include identifying the programs' alignment to the State Frameworks and our Learning Expectations, continuing discourse and visiting with other districts as well as reviewing research and seeking feedback on the programs' strengths and weaknesses from various stakeholders. Administrators, teachers and students will have opportunities to give feedback through a piloting process, and parents will have opportunities to provide feedback through a public forum as well as other forms of communication (email and letters). Round 2 ends with a detailed report on each program submitted to the Superintendent and Deputy Superintendent for Teaching and Learning. A Round 2 summary report will be presented to the school community.

The Superintendent and Deputy Superintendent for Teaching and Learning will carefully review information presented in the report and continue the research as needed. When satisfied with the level of scrutiny and review, the Superintendent will make a recommendation to the School Committee. The School Committee has the final word. Once the program materials are approved by the School Committee, we expect to begin a pilot for program(s) in the fall of 2007.

Plans for Program Improvement

EQUITY

***Equity Vision:** We believe that equity requires high expectations with rich meaningful learning opportunities for all students. We believe that all students should participate in a strong instructional program with solid support for the teaching and learning of mathematics. At every grade level, all constituents within the Public Schools of Brookline community should act on the belief that every child is entitled to learn challenging and relevant mathematics taught by competent and well-supported teachers.*

Addressing areas for improvement: Phase I findings indicate the need to address the academic achievement gaps in mathematics for specific sub-populations (African American, Hispanic, Title 1, and SPED students) as well as the inconsistency in grouping practices across schools that may contribute to inequitable learning opportunities for our students. To further assure equity, parent access to information about the mathematics program and how they can support their students must be strengthened so that all parents feel they are well informed. Mathematics specialists must be effectively utilized in order to provide consistent support to teachers and students at all elementary schools.

Actions:

1. Research and identify grouping patterns (e.g. why are students grouped? how are they grouped? and who decides the groups? and what criteria is used for determining groups?) in mathematics across the system. Provide input into the development of district (School Committee) policies for grouping. Determine steps to align the grouping patterns with district guidelines.
 - Rationale.** Brookline's district policies must be affirmed before our mathematics program can re-organize and recommend grouping practices for implementation at all schools. The Math Program can contribute to the district discussion by providing information on current practices in the various schools (K-12), and by identifying research-based practices that may be relevant to Brookline classes.
 - Timeframe.** Data on grouping in Brookline classrooms is currently being gathered. Research on successful grouping or non-grouping is available.
 - Budget Implications.** Research and planning – no cost. If it is determined that grouping practices need to be significantly changed, there will likely be costs, especially for eliminating the practice of grouping that leads to tracking.
2. Consistent parent communication procedures will be defined and implemented across the system. Math specialists along with grade 7-8 teachers will work with the coordinator to plan specific events each year. Examples may include parent forums or math breakfasts (nights). It is our goal to have spring and fall events each year. The coordinator will develop a series of print materials (e.g. summer math calendar) for distribution to parents each year – originating at the system level to ensure consistency of information. Parents will be involved in

reviewing/previewing these materials as they are developed. The PSB Mathematics website will be updated to include a K-12 parent section. We will also increase efforts to improve communication with underrepresented parents and families by offering Math presentations at METCO and STS parent meetings.

Rationale. Current research indicates that parent involvement, and home/school cooperation yield increased student achievement. Currently information that is provided or available to parents is not consistent across schools. Our goal is to make information equally available to all parents. Some parent events already take place; the plan would ensure that high quality, comparable events are offered at each K-8 building. Some of the information/events would target math awareness/math skills for parents in order to address concerns that some parents would like to become more familiar with the mathematics content and pedagogy used by teachers.

Timeframe. A plan for implementation will be developed for the 2007-2008 school year. Print materials will be revised during the summer of 2007 and a website component will be added during the 2007-2008 school year.

Budget Implications. Teacher stipends for this work.

3. Provide improved documentation of student progress and parent communication for students who receive Title I support services in math. Title I math specialists will write and send reports to parents twice a year, and will be available to attend parent/teacher conferences. There will be a home/school math component at each Title I parent meeting.

Rationale. Title I serves under-performing students. Better documentation will help facilitate the sharing of information with parents. Specifically, this documentation will help teachers better support these students within the classroom.

Timeframe. Implementation of these improvements began with the 2006-2007 school year.

Budget Implications. None

4. Gather data from METCO teachers, BHS tutorial teachers, BHS Math Center teachers, and K-12 Learning Center teachers on the time they spend supporting their students in Math. Determine the appropriate mathematics content background necessary for teachers in these roles.

Rationale. This will help determine what professional development is needed to build the capacity of these teachers to work with students in mathematics. It will also help to determine if staffing levels are adequate.

Timeframe. Data collection began during the 2006-2007 school year, and is continuing. The data will be analyzed during the summer of 2007.

Recommendations and plans for targeted professional development will be proposed for implementation beginning with the 2007-2008 school year.

Budget Implications. Stipends for teachers for summer work will be needed. Long-term budget implications if the findings indicate the need for additional staff.

5. K-8 METCO, SPED, and ELL teachers will be strongly encouraged to participate in grade level facilitators' training workshops. Outreach to these teachers will be through the math specialists, the K-8 coordinator, building principals and other curriculum coordinators.

Rationale. These support teachers are not necessarily trained or equipped to work with students around math or the curriculum. Grade level facilitators offer 2-hour workshops every 6 weeks to familiarize teachers with the math concepts and the curriculum.

Timeframe. Begin during the 2007-2008 school year.

Budget Implications. None

6. Gather data on attendance and grades of students who participate in the Math Center as implemented at BHS in the fall of 2006. Data will be gathered on rates of voluntary participation, success of assigned students, and increased enrollment and success in Algebra II classes. Grade 8 teachers will provide BHS with information on students who are being recommended for honors level math with support.

Rationale. To determine if the additional support yields greater enrollment and success of minority students in Honors and AP courses.

Timeframe. Data will be gathered beginning with the 2006-2007 school year. Coordinator analysis and recommendations for modifying the program will take place 2007-2008.

Budget Implications. None

7. Examine the distribution of sub-populations of students across elementary schools to determine if certain schools will require more support or resources in order to narrow the achievement gap. Follow-up questions for each school will pertain to reviewing the supports and structures that are in place for these students and who accesses them.

Rationale. Research on the achievement gap indicates that certain strategies or programs require more personnel and resources. Students affiliated with programs (METCO, STS) may have access to additional support, but questions remain about how the support is utilized for mathematics. In addition, we need better information on what is available for those who are under-performing but not SPED, METCO, or STS students.

Timeframe. Work with Academic Data Analyst and curriculum/program coordinators during the spring of 2007 and over the course of the 2007-2008 school year.

Budget Implications. Long-term. Re-organization of our resources and/or support systems may require funding.

8. Examine the practices around student participation in Math League and Math Counts across the elementary schools. These practices should be consistent so that there is equity of access. A meeting will be held with all schools to debrief the Math League/Math Counts experience this year in order to determine

commonalities and create guidelines for access/participation. Access to practices and meets for all students will be addressed.

Rationale. We have high expectations for all students. Students need to be encouraged and able to participate in enrichment opportunities.

Timeframe. Spring of 2007; recommend practices for implementation in 2007-2008.

Budget Implications. None

Measures of Effectiveness:

- Improvement in standardized test measures for identified sub-populations. A steady increase in MCAS Advanced and Proficient categories will be documented for all students in Grades 3-10, both in the aggregate and in the sub-populations.
- Enrollment in honors and AP classes reflects the overall diversity at BHS. Using 2005-2006 enrollment data as baseline, the number of students of color enrolled in high level mathematics courses will steadily increase over the next 5 years.
- Grouping guidelines are developed and in place at each elementary school, based on the School Committee policy. There is consistency in how grouping in mathematics occurs at all levels across schools.
- Positive feedback on evaluation forms (completed by parents about specific events, written materials and website information)

Plans for Program Improvement

CURRICULUM

***Curriculum Vision:** Our curriculum reflects and is consistent with the Massachusetts Curriculum Frameworks and the National Council of Teachers of Mathematics (NCTM) (2000) Principles and Standards for School Mathematics and NCTM (2006) Focal Points. It is highly coherent with an emphasis on the big mathematical ideas that are interconnected to other disciplines and related to real-life experiences. We clearly articulate our curriculum across the grades so students deepen their understanding of mathematical ideas and see the relationship between concrete and abstract ideas while they develop both conceptual and procedural-based knowledge.*

Addressing areas for improvement: Curriculum can be defined as the content or “what” we teach across the grades. The curriculum must be common, coherent, and challenging, but more significantly, it should be closely aligned with the Massachusetts Curriculum Frameworks, which are grounded in the National Council of Teachers of Mathematics (NCTM) Principles and Standards for School Mathematics (Schmidt, 2004). In order for the program to move toward the vision we will identify a curriculum with appropriate supplementary materials, provide on-going professional development, and encourage multi-grade collaboration and discourse to help us align the Brookline Learning Expectations and Course Syllabi with the Massachusetts Curriculum Frameworks.

Actions:

1. Align the K-12 Brookline’s Learning Expectations (BLEs) with the Massachusetts Curriculum Frameworks. These standards are rigorous yet reasonable and should be used as a guide for mapping and revising the BLEs. Therefore, our charge is to either meet or exceed Massachusetts Curriculum Frameworks.

Rationale. The BLEs are not currently fully aligned. To fully realize our vision, we need a closer alignment with all grade levels, specifically grades K-8.

Timeframe. The revision of the K-6 BLEs is in progress and will be completed by March 2007. Grades 7 and 8 will begin the revisions in January 2007 and with goal of completion by June 2007. BHS Course Syllabi are aligned to the Massachusetts State Curriculum Frameworks.

Budget Implications. None

2. Review current and available K-5 curricula and then 6-8 curricula to determine the best program to be used as a primary source for mathematics instructional materials. The Curriculum Program Advisory Committee (sub committee of program review) began the review and evaluation process last February. The final report that summarizes the committee findings will be submitted to the Deputy

Superintendent of Teaching and Learning in December 2006. Subsequently, the Superintendent, Deputy Superintendent along with School Committee will make the final decision for the curriculum program(s) to be piloted and implemented in Phase III. It should be noted that the Curriculum Program Advisory Committee will identify any area in the program(s) for consideration needing supplementary materials for differentiated instruction.

Rationale. As we align to Massachusetts Curriculum Frameworks we need to select a curriculum program and supplementary materials that support our Learning Expectations and deepen student understanding of both mathematical concepts and skills. Given that no single program will meet the needs of all students, teachers will need additional support materials to extend our curriculum for underperforming and higher performing students.

Timeframe. The K-5 curriculum program review process is well underway and nearly complete. The committee reviewed five programs last spring in 2006 and two programs in fall 2007. The final report that recommends finalists will be completed in mid-winter 2007. In either spring 2007 or fall 2007, we will begin to pilot programs that were approved and recommended by the deputy superintendent and superintendent. Final selections will be made for phased implementation beginning in September 2008. Sixth through eighth grade curriculum program advisory committee will convene after the core K-5 curriculum program has been selected.

Budget Implications. Prior to implementation of the “new” curriculum program, support will be needed for K-5 classroom teachers to transition from current learning expectations to the revised learning expectations. The curriculum coordinator along with math specialists will identify supplementary materials to better differentiate instruction with the revised BLEs. Math specialists and grade level facilitators will be responsible for coaching teachers using these transition materials. Implementation of new curriculum will cost approximately \$150K. There will also be cost incurred for supplementary materials identified to address gaps in selected curriculum program. Further, summer workshops for developing and organizing differentiation materials to supplement the curriculum will be needed. Outside consultants are needed to better help teachers understand how to differentiate instruction.

3. Support K-5/6 classroom teachers to transition from current learning expectations to the revised BLEs. Identify and develop curriculum resources for differentiating instruction. Furthermore, supplementary curriculum will be identified and distributed, with recommendations for instruction. Mathematics specialists and Grade Level Facilitators will be help provide support for teachers in using these transitional curriculum resources.

Rationale. Bridge the gap identified in the learning expectations so that the curriculum is fully supported during a possible staggered implementation (e.g. fall 2008, K-2; fall 2009, 3-5) of a new curriculum program.

Timeframe. Summer workshop 2007

Budget Implications. Stipends for teachers work.

4. Identify specific BHS courses in need of curriculum work. Establish a timeline for reviewing these courses. Follow an already established process for systematically reviewing 9-12 curriculum materials/textbooks.

Rationale. High school teachers have identified specific courses for review and modification to support our vision.

Timeframe. Two courses (Math 2 H and Math 3 H) were completed during 05-06. Math 2 and Math 4 H are being examined during 06-07. Algebra 2 & Trig and PreCalculus will be examined during 07-08.

Budget Implications. New course texts cost about \$70 apiece. Estimate per course: \$12,000-\$15,000.

5. Create a comprehensive plan for professional development specifically linked to the implementation of new curriculum materials. Professional development will be on-going and sustained through the duration of implementation, and is considered integral to its success.

Rationale. Well-trained teachers are critical to the successful implementation of a program that supports students' learning as they progress through the curriculum.

Timeframe. On-going professional development will be necessary for new and experienced teachers beginning with the implementation of the curriculum program. Professional development will commence the summer '08 prior to implementation. It will continue throughout the first year of implementation.

Budget. First year PD costs should be embedded into the curriculum implementation. After the first year, Grade Level Facilitators will help sustain professional development. Cost incurred will be the workshop rate (\$31/HR) for 2-hour sessions.

6. Create a scope and sequence plan to orient teachers to the span of the mathematics curriculum across grades K-12. Ex: BHS teachers need to be familiar with the scope and sequence of our courses and how they build on each other. Some elements of the plan will include multi-grade meetings will be scheduled annually to enhance teachers' understanding of curricular goals and expectations for the grades preceding and following a given grade level (include SPED). Create a chart that describes K-12 scope and sequence as well as common vocabulary.

Rationale. On-going for 6-12. Should be planned for K-6 in conjunction with curriculum program selection.

Timeframe. Begin in June 2008 and on-going thereafter.

Budget. None

Measures of effectiveness:

- The reports from the Curriculum Program Advisory committees and 9-12 curriculum review committees will indicate their process and success at completing their tasks, and will lead to the selection of a new curriculum program.

- A published revision of Brookline’s K-8 Learning Expectations and Course Syllabi that show alignment to Massachusetts Curriculum Frameworks.
- Comprehensive professional development is factored into the implementation plan as new curricula are adopted and supported by appropriate time and funding. Data will show that all teachers participate.
- Materials for differentiating instruction to address the needs of the range of students are available and their use is evident in teachers’ lessons.
- Development of an updated list of supplementary materials for each grade level that addresses the identified gaps in the selected curriculum program.

Phase II Plans for Program Improvement

Teaching

Teaching: *Our teachers have strong mathematical knowledge and use it to assess what students know and what they need to learn. Understanding what students already know, they design meaningful learning experiences. They are reflective practitioners who use assessments to refine their instruction, and they use a repertoire of pedagogical strategies to accommodate the learning differences among students. They engage in professional development opportunities and collaborate with their colleagues to further develop and deepen their content and pedagogical knowledge.*

Addressing areas for improvement: Plans for improvement need to address how teachers use curriculum program(s) and supplementary materials to teach Brookline's Learning Expectations (BLEs). Teachers need access to quality resources and support in implementing strategies to teach the growing range of learners in their classrooms. These resources are important but not nearly as important as the teachers who use them. Teachers also need opportunities to further develop and deepen their mathematical content knowledge. "How well teachers know mathematics is central to their capacity to use instructional materials wisely, to assess students' progress and to make sound judgments about presentation, emphasis, and sequencing" (Ball, D., Hill, H, and Bass, H. 2005)

Actions:

1. Examine new curricula (part of the task of the Curriculum Program Advisory Committee) for quality differentiated instruction materials and support for teachers and students. Five curricula programs (*Singapore*, *Scotts Foresman-Addison Wesley*, *Revised Investigations*, *Everyday Mathematics* and *Trailblazers*) were reviewed in the spring 2006. Two additional curriculum programs (*Math Expressions* and *Think Math*) were reviewed in fall 2006. In the January 2007, the committee will submit a summary of their findings of these curricula programs to the DSTL for review. The DSTL and the Superintendent will review these findings and determine programs to be moved forth in round 2 (deeper analysis of alignment, review of related research, and pilot). More specifically, the committee will assess the alignment of the programs the move forth in round 2 with BLEs for the quality of differentiation and extension activities that better support the range of learners in our classrooms. In addition, the committee will visit schools and classrooms as well as conduct interviews where these programs are being piloted.

Rationale. A curriculum program that provides teachers with the resources to better differentiate within the classroom will help improve instructional strategies for *all* learners.

Timeframe. Submit reports with committee a summary of committee finding to the Deputy Superintendent for Teaching and Learning and the Superintendent to consider for further examination by January 31, 2007. Visit pilot schools for three recommended curriculum programs in January 2007. Begin the second round of evaluation for the programs to be moved forth in January or February 2007.

Budget Implications. None

2. Plan and deliver a series of 18-hour graduate courses in mathematics content knowledge and pursue opportunities for teachers to demonstrate mathematics competencies (e.g. 1-6 licenses or a series of courses). In May of 2006, Math specialists at each school conducted individual and small group interviews to gather data about teachers' professional development preferences. Slightly over 100 teachers were surveyed. The results were analyzed to determine teachers greatest priority needs for professional development. Using survey results, graduate courses on *Developing Mathematical Idea (DMI)*, through the Educational Development Center (EDC) in Newton will be offered in Brookline.

Rationale. The professional development needs that teachers self-identify are important in planning and organizing workshops, summer institutes, and graduate courses. The TIMSS (*Third International Study of Mathematics and Science Study*), an unprecedented study of teachers of mathematics, found a direct correlation to improved teaching and improved students' learning mathematics. Moreover, teachers' professional development in content knowledge is the cornerstone to building maximum student learning in mathematics. The Rand Research Brief on *Developing a Strategic Research and Development Program in Education* (2003) plainly states, that "The quality of mathematics teaching and learning depends on what teachers do with their students, and what teachers can do with their students depends on their knowledge of mathematics". Therefore, it is crucial for PSB to provide professional development opportunities for teachers so that they might deepen their mathematics knowledge. The K-8 mathematics program has received at grant from Brookline Education Foundation (BEF) to support teachers' professional development in mathematics content knowledge.

Timeframe. Fall 2006 through spring 2008. Ideally, one course will be offered each fall and spring semester.

Budget Implications. Funding from the BEF to the extent possible; system funding to supplement. Cost per course: \$7000.

3. Increase the collaboration between Math Specialists, Enrichment and Challenge Support Program (ECS) teachers, and Special Education teachers. Schedule a release day during the winter 2007 school year for this collaborative work. The K-8 mathematics coordinator will work with the ECS and SPED coordinators to plan this professional development experience, which will focus partly on differentiation in the mathematics classroom and partly on collaborative coaching, that is, how to work with the teachers within the classroom.

Rationale. To help teachers think about how to better differentiate within the classroom, the building leaders in math, SPED and ECS need to collaborate and identify effective instructional strategies that would support both higher performing and lower performing students. Effective instructional strategies for differentiation will include extensions and interventions. Based on the teacher survey data (see Appendix survey and results) gathered in May 2006, differentiation of instruction is a top priority for professional development for many teachers. Nearly 80% of teachers indicated that differentiating instruction for struggling students while 60% identified differentiating instruction for high ability students as a priority need for professional development.

Timeframe. February 7, 2007

Budget Implications. \$500 - \$1000 for a guest speaker (TBD). This expense will be paid from the budget of the three departments.

4. Create opportunities for mathematics professional development during the school day in each elementary school. Develop a building-based plan with K-8 principals that might mirror the opportunities available at BHS. For example, principals might include time in the school schedule for grade level teachers to meet routinely in order to review units, look at student work, discuss curriculum and meet with the building math specialist or curriculum coordinator.

Rationale. Based on the teacher survey data gathered in May 2006, 54% of teachers indicated sharing and planning should be a priority for professional development.

Timeframe. On-going. Meet with each principal spring 2007 to discuss building schedule for common grade level meetings.

Budget Implications. None

5. Create a plan to evolve the role and responsibilities of the Mathematics specialists (MS) to a building-based coaching model. For 2006-2007, three overarching goals for MS were clearly articulated and will be phased in and fully realized over the next three years. The first goal requires MS to spend 50% or more of their time in classrooms supporting teachers with instructional practices (e.g. differentiated instruction). Next year the plan will require more time (75%) spent in classrooms. In addition, MS should hold at least one parent event to help facilitate the development of a mathematically literate school community where the lines of communication are open between parents and MS within the school and across the district. Additionally, MS should actually select and coach one teacher whereby the MS meets with the teacher prior to instruction to plan the lesson, participates in instruction, debriefs lesson with teacher.

Rationale. To provide high quality mathematics instruction, schools and teachers need support from Mathematics Specialist/Coaches who have expertise in both content and pedagogy knowledge. With their expertise, they model best practices for teachers that support student understanding, reasoning, and problem solving; use assessments to assess what students know and understand about mathematics and use the data to help teachers refine

their instruction. MS/Mathematics Coaches support would be needed for the successful implementation of a “new” program. Their knowledge should extend beyond the classroom and be shared within the school community among administrators and parents and across the district with other Mathematics Specialists.

Timeframe. None.

Budget Implications. None. The K-8 mathematics program has received a 2-year (for the school year 2006-2007 and 2007-2008) grant from the Brookline Education Foundation Grant (BEF) to provide professional development for grade level facilitators (GLF) and MS. More specifically, this professional development will focus on collaborative coaching that support teaches development of both content and pedagogical knowledge within and outside the classroom.

6. Create a plan for supporting new teachers by fully developing the Math Grade Level Facilitators’ (GLF) role. Organize and plan a professional development opportunity for GLF teachers to meet and share best practices and determine key elements for training sessions that are consistent across the district. Develop a grade level facilitator’s guide.

Rationale. The GLF are the K-5/6 teachers who meet throughout the year (6 sessions) with new teachers at each grade level. There is one GLF at each grade level across the district. During these training sessions, the GLF work with new teachers to plan upcoming curriculum units. They help new teachers to identify the big mathematical ideas, point out related Massachusetts Curriculum Frameworks or BLEs, explain pacing, determine key questions, identify essential activities, model assessments, and review strategies for differentiation.

Timeframe. During the 2006-2007, the following professional development has been scheduled: GLF Release Day September 29, 2006 and GLF Release Day. November 15, 2006. NCTM Conference March 2006. Continue similar opportunities and experiences in 2007 -2008 and 2008-2009 school years.

Budget Implications. NCTM Conference \$7200 (*funded by BEF*). Teacher Stipend-Leader Workshop Rate (\$31.41/hr)

7. Work with the Director of Professional Development and Special Initiatives and the Professional Development Council to examine the possibility of creating a 5-year professional development plan for mathematics educators in the system K-12.

Rationale. A 5-year professional development plan would strategically address PD needs in curriculum, instruction, and assessment for the whole school community that ranges from paraprofessionals to principals. With a 5-year plan, the budget implications can be considered more carefully and grants can be applied for in a timely manner.

Timeframe. Begin in spring 2007.

Budget Implications. None.

Measures of effectiveness:

- Math Specialists increase time spent supporting teachers and students within classrooms. They would document the time spent supporting, planning, teaching, and debriefing with teachers.
- Documentation from school mathematics forum/meetings that indicate communication between home and school.
- Teacher evaluation forms for professional development opportunities (e.g. Developing Mathematical Ideas, DMI), indicating better outcomes/relevance/applicability
- New teacher feedback from Grade Level Facilitator training sessions.
- Documentation (e.g. observation notes, teacher surveys, formative assessments) that supports full implementation and consistent use of recommended/SC adopted instructional materials to teach the BLEs.
- Sampling of home communications (e.g. information about the curriculum: website, letters, brochures, student work) – shows that we have expanded and improved upon the information for parents. Feedback from parents indicates that parents feel better informed about the curriculum and the BLEs.

Phase II Plans for Program Improvement

Learning

Learning: *Our students use mathematics effectively and understand it deeply. They engage in rich provocative mathematical tasks in which they analyze, create, interpret, reason, and make conjectures and generalizations as well as connections to real-life experience in a variety of contexts. They also share and clarify their mathematics ideas as they engage in discourse about their learning with peers, teachers, and parents. Students build upon prior knowledge and experiences to construct new knowledge as they reflect on their learning and recognize mistakes as opportunities for learning. Our program encourages all students to become proficient in their skills, stimulates curiosity, creates enjoyment, and develops greater depth of understanding.*

Addressing areas for improvement: Plans for improvement need to address how students use the curriculum program and supplementary materials to achieve the Brookline's Learning Expectations (BLEs). Students need access to a program that actively engages them in the content standards (Number Sense and Operations, Patterns, Relations, and Algebra, Data Analysis, Statistics and Probability, Geometry, and Measurement) as well as in the process standards (Problem Solving, Communications, Reasoning and Proof, Making Connections, Multiple Representations).

Actions:

1. Examine new curricula (part of the task of the curriculum program advisory committee) for quality differentiated instruction materials and support for students along the learning continuum. Five curricula programs (*Singapore*, *Scotts Foresman-Addison Wesley*, *Revised Investigations*, *Everyday Mathematics* and *Trailblazers*) were reviewed in the spring 2006. Two additional curriculum programs (*Math Expressions* and *Think Math*) were reviewed in fall 2006. The committee will examine the curricula programs more closely and specifically assess their alignment to our BLEs. We will evaluate the level of emphasis for each content strand to make sure that the content strands are covered with the appropriate level of depth within and across the grades. In addition, the committee will visit schools and classrooms and conduct interviews with administrators, teachers, students and parents where these programs are being implemented and/or piloted.

Rationale. A curriculum program that provides students greater access to all content strands with the appropriate level of depth across the grades is important. A curriculum program with evidence of each of the five process standards (e.g. communications, connections, multiple representation, and problem solving, and reasoning and proof) helps to create learning experiences that allow students to be active and engaged mathematical thinkers and problem solvers. Teachers need opportunities to access resources to better differentiate within the classroom and help improve their instructional strategies for *all* learners.

Timeline. Submit committee findings of curricula reviewed to DSTL and Superintendent by January 31, 2007. Visit pilot schools for curriculum programs that are moved forth from January through March 2007. Begin to in depth evaluation of programs February 2007 and March 2007.

Budget Implications. None

2. Align the K-8 Brookline Learning Expectations (BLEs) with the Massachusetts State Curriculum Frameworks so that they either meet or exceed state expectations. The BLEs will also identify essential standards for each grade level. These standards will help teachers better determine what curriculum should be emphasized and mastered by each student. The newly released NCTM focal points will be used as a guide to frame the essential standards within the BLEs. Work with K-6 Mathematics Specialists (MS) and teachers to revise the (BLEs). Work with 7/8 teachers to revise the BLEs giving consideration to Algebra being taught at the 8th grade. Present revised BLEs for feedback to various groups of teachers through school-based and district grade level meetings.

Rationale. The Massachusetts State Curriculum Frameworks for Mathematics are reasonable and should be used as a foundation for BLEs. Aligning the BLEs to the Massachusetts State Curriculum Framework will identify current gaps in the curriculum. Students' performance on many MCAS items can be improved when *all* of the standards are represented in the BLEs and supplementary materials have been identified to support these standards.

Timeline. Winter 2006 through spring 2007.

Budget Implications. None.

3. Collaborate with the Science Department on a measurement curriculum and assessment. The curriculum coordinator will meet with the science coordinator to plan a release day in 2007-2008 so that teachers in grades 3-5 can collaborate to create interdisciplinary science units. The Mathematics and Science Coordinators will also work together along with vertical teams in developing common grade level assessments that assess measurement concepts in both curricula.

Rationale. Students' understanding of measurement concepts (e.g. area, perimeter, and conversions) across the grades (K-8) needs improvement. The current curriculum programs provide limited opportunities for students to explore measurement concepts. Furthermore, measurement concepts should be situated in real-life contexts to help students make sense of them. Through interdisciplinary units, particularly in science, concepts across the disciplines can be woven together to provide greater depth.

Timeline. Fall 2008

Budget Implications. None

4. Perform data analysis on computation and algorithmic fluency items on the 2003, 2004, 2005 and 2006 MCAS (grades 4, 8 and 10) to establish baseline data on student performance on these items.

Rationale. The qualitative data from Phase I: Study indicate that computation and algorithm fluency are areas needing improvement. An MCAS analysis on these types of items will help validate the data reported in the study. More specifically, it would give some quantitative measures that show how the students actually perform on these items. It will also suggest whether or not computation and algorithm fluency are adequately assessed via MCAS and help to determine what other assessments would need to be developed.

Timeline. April 2007.

Budget Implications. None.

5. Develop a correlation chart that correlates the BLEs, Massachusetts Curriculum Frameworks, and “adopted” curriculum program lessons/units at each grade level.

Rationale. A correlation chart will give teachers greater access to all aspects of the curriculum at a glance. It will facilitate teachers’ planning of instruction and their understanding of the coherence of the curriculum across the grades. The revised BLEs have been correlated to the Massachusetts Curriculum Frameworks. After a curriculum program and supplementary resources have been selected, this chart will be expanded to explicitly correlate the lessons/units to the BLEs.

Timeline. January 2009 (after the adoption of a curriculum program).

Budget Implications. None.

Measures of effectiveness:

- Disaggregated scores on tests items related to Number Sense and Operations, and Measurement strands on MCAS tests will show a gradual increase in student performance from the baseline data.
- Overall increased performance in student achievement as measured by MCAS and SAT.
- Increase in numbers of student taking AP and Honors level courses.
- Students’ reflection on learning such as the 9th grade survey will be administered regularly. These reflections might show changes in students’ learning patterns and attitudes towards learning mathematics.

Phase II Plans for Program Improvement

Assessment

Assessment Vision: *Assessment is an integral part of the mathematics program. Our assessments are ongoing and worthy as they support the learning of important mathematics for both teachers and students. We use them as valuable tools to help students become reflective and independent learners while helping teachers make informed instructional decisions. We use varied assessments that reflect both students' understanding of content and proficiency of skills along the continuum of learning.*

Addressing areas for improvement: Assessments provide teachers with data that show what students know and what they need to know. This information helps teachers make informed decisions about their instructional practices. Currently in the K-8 mathematics program, MCAS is the primary indicator of students' performance. Common grade level assessments (CGLA) will provide administrators, teachers, students and parents with indicators of students' knowledge and skills as well as their understanding of mathematics. With additional assessments throughout the year, teachers can differentiate more effectively which may help to narrow the achievement gap. Grade 8 or grade 9 common assessments can be used as criteria for course placement at BHS. A portfolio is another way students may demonstrate what they know about mathematics and could be used to inform placement decisions for entering grade 9.

Actions:

1. Establish a timeline to work with vertical and horizontal teams to continue the development of common grade level assessments (e.g. formative and summative assessments) based on essential standards. This includes a plan for training teachers in using these tools. Developing common grade level assessments is a district initiative. The K-8 Curriculum Coordinator will meet with the Deputy Superintendent of Teaching and Learning and outside consultants to plan vertical and horizontal teams and to develop a process for implementing common grade level assessments.

Rationale. Teachers and administrators will be able to collect and examine data that will determine progress for all learners and inform instruction. Ongoing assessments help teachers better differentiate instruction for all students.

Timeframe. Spring 2007. On-going in conjunction with district initiative assessment system.

Budget Implications. None.

2. Develop a plan for a math portfolio that moves with students through the grades. These portfolios should include demonstrations of essential standards. The curriculum coordinators will work with grade 8 teachers to determine what an appropriate summative entry should include and what it might look like.

Rationale. Helps students become reflective and independent learners. Provides an opportunity to demonstrate the level of understanding of content and proficiency of skills. A portfolio is also an alternative assessment to MCAS that allows students to demonstrate both more broadly and more deeply their mathematical understanding.

Timeframe. Summer 2008; 2008-2009 school year

Budget Implications. None

3. Establish written course placement guidelines for students entering BHS. This will involve increased communication and collaboration between grade 8 and BHS teachers. The K-8 curriculum coordinator and BHS curriculum coordinator will collaborate and plan a spring 2007 release day for grade 8 and grade 9 teachers to continue conversations that began in spring 2006 about placement criteria. A formative and/or summative assessment as well as a sample from a portfolio might be a part of the criteria for placement.

Rationale. Course placement criteria and written guidelines will improve consistency across the district.

Timeframe. Spring 2007

Budget Implications. None

Measures of effectiveness:

- K-8 Common Grade Level Assessments in Mathematics become an integral part of Brookline's assessment system and teachers use them to inform instruction.
- Students are appropriately placed in grade 9 courses, as evidenced by a decrease in the number of students changing levels/courses because of underperformance.
- Few students drop out of courses because of their under performance in inappropriate courses.

Phase II Plans for Program Improvement

Technology

Technology Vision: *We believe that technology is an essential tool for the optimal teaching and learning of mathematics. Dynamic technology expands the boundaries of students' explorations of mathematical ideas and easily helps teachers to bridge procedural and conceptual understanding.*

Addressing areas for improvement: Teachers need to gain a better understanding of the role of technology in mathematics and recognize the potential opportunities for use. Areas where technology can support student learning in mathematics across the grades need to be identified, and materials and professional development must be provided.

Actions:

1. Inventory the places where technology is currently integrated into the Mathematics curriculum K-12. This will be considered a baseline from which to expand.

Rationale. Technology use varies greatly from school to school depending on hardware and teacher familiarity with various programs. For example, the current K-5 curriculum comes with software that is now out-dated and used inconsistently. In order to move forward we need updated information on what is available K-12, who uses it, and whether it is the most effective product for the purpose.

Timeframe. Survey of BHS technology use in mathematics was completed in December 2006. Information from the K-8 schools will be gathered in the spring of 2007.

Budget Implications. None.

2. A group (comprised of math specialists, classroom teachers and educational technology specialists) will meet to determine the optimal purposes/uses of technology in mathematics at all grade level. The recommendations of this group will be correlated to the opportunities currently available by grade level. A plan that articulates where technology should be increased will be developed.

Rationale. The role and importance of technology in mathematics should be explicitly communicated to teachers. Identifying where technology will enhance the understanding of mathematical concepts or improve understanding through application at each grade level will provide a starting point for professional development.

Timeframe. Begin fall 2007 and work into the 2007-2008 school year as needed.

Budget Implications. Workshop stipends (estimated \$2520)

3. Identify and recommend exemplary software for particular grade levels and specific purposes to support student learning. Hardware requirements,

suggestions for classroom use, and plans for teacher training will be included in the plan. The support of the Educational Technology program will be required.

Rationale. Teachers report that software is outdated and often doesn't work on newer computers. New programs are available, although teachers must be aware that this is only one type of technology integration and must be directly linked to student need.

Timeframe. Begin spring of 2007 and complete during the 2007-2008 school year. Needs to dovetail with the selection of curriculum materials.

Budget Implications. No cost to review. Software licensing costs can be significant. Target one program per grade span or level, beginning with the FY09 budget.

4. Examine new K-8 curricula (part of the task of the curriculum materials advisory committee) for the use of technology in support of student learning. Selection criteria will favor programs that make effective use of technology. Piloting of any programs will include piloting the technology components.

Rationale. Teachers need to see technology embedded into the materials they will be using with students. Rather than an add-on, technology should be an integral part of how concepts are presented and developed.

Timeframe. Materials review will be completed during the 2006-2007 school year. Materials review for grades 6-8 will begin upon completion of the K-5 review.

Budget Implications. No cost for the review. There will be costs for implementing a new program with all available technology supports. This will be addressed in the FY09 budget.

5. Develop minimum learning expectations for the use of technology in mathematics by students before graduating from BHS. A group of K-12 mathematics teachers will meet with ET specialists and coordinators to develop a list that details the technology competencies students need in order to be successful in post-secondary work or schooling. BHS teachers will look at mathematics curriculum paths to determine whether completion of these paths will lead to students acquiring these minimum competencies. Plans to address gaps in these competencies will follow.

Rationale. There should be agreement on what students need to know and be able to do in order to effectively use technology. We need to make sure their math experiences provide them with these competences.

Timeframe. 2007-2008 school year

Budget Implications. Teacher stipends (estimated \$2016)

6. In conjunction with the Educational Technology program, opportunities for teacher professional development will be offered that specifically target the use of technology in mathematics. This work will follow the identification of minimum technology learning expectations for students and the identification of related components in the curriculum. The professional development may be provided

by the math specialists, the grade level facilitators, educational technology specialists or outside providers.

Rationale. Teachers need to be secure in their technology abilities in the math classroom.

Timeframe. Begin during the 2007-2008 school year. Plan with Ed Tech coordinator to coincide with ET program review recommendations for professional development activities.

Budget Implications. Teacher stipends (estimated \$2240)

Measures of effectiveness:

- Basic technology skills will be assessed for inclusion in the student's math portfolio.
- Student technology benchmarks in mathematics at BHS.

IMPLEMENTATION TIMELINES**EQUITY**

ACTIONS	2006-2007	2007-2008	2008-2009	Budget Implications
1. Research best grouping practices in Math for input into system grouping policy decisions	X			0
2. Parent communication (math events, new print materials and website presence)	Spring	Summer & school year	Summer & school year	Teacher stipends for summer work
3. Improve documentation and parent communication for Title I Math	X			0
4. Gather data from specialists on time spent supporting students in Math	X	Summer		Teacher stipends for summer work
5. Include METCO, SPED, and ELL teachers in Math Grade Level Facilitator curriculum meetings		X		0
6. Gather data on BHS Math Center participation to assess effectiveness	X			0
7. Examine distribution of sub-populations across schools to help determine support needs	Spring	X		0
8. Examine Math League and Math Counts student participation practices for equity of access; develop consistent guidelines	Spring	X		0

CURRICULUM

ACTIONS	2006-2007	2007-2008	2008-2009	Budget Implications
1. Align the Learning Expectations with the Mass Curriculum Frameworks	X			0
2. Review & select new K-5 curriculum materials; Review & select new 6-8 curriculum materials; Implementation of new K-5 curricula	Complete review of K-5 materials	Review 6-8 materials	Implement new K-5 curricula	Cost of new materials K-5 = 150K-200K
3. Support transition to revised LEs: identify & develop curriculum resources for K-5		Summer		Teacher stipends @ \$6,000
4. Review/revise BHS courses; replace texts for 1 course each year	X	X	X	@ \$8,000-\$12,000 per course
5. Create a PD plan to support new curriculum implementation			X	First year covered by publisher
6. Develop Scope & Sequence Plan for K-12 teachers	X	X		0

TEACHING

ACTIONS	2006-2007	2007-2008	2009-2010	Budget Implications
1. Examine new K-5 curriculum materials for differentiation and extension activities; criteria for selection	X			0
2. Provide graduate seminar series in Mathematics content for teachers	Fall	Summer & school year	Summer & school year	Cost per course - \$7000 (BEF grant support)
3. Build collaboration between Math, SPED and ECS specialist teachers (07 workshop; plans to continue)	X	X		Speaker - \$500
4. Create building-based plans for Math PD during the school day, K-8	X	X		0
5. Create plan to transition Math specialists to building-based coaching role.		X		BEF grant support for coaching training
6. Fully develop Math Grade Level Facilitator role to better support new teachers	X	X		BEF grant support
7. Explore development of 5-year Math PD plan for Brookline teachers	Spring	X		0

LEARNING

ACTIONS	2006-2007	2007-2008	2008-2009	Budget Implications
1. Examine new K-5 curriculum materials for differentiation and extension activities; criteria for selection. (also in Teaching)	X			0
2. Align the Learning Expectations with the Mass Curriculum Frameworks. (also in Curriculum)	X			0
3. Develop a measurement assessment for Grades 3-5 in collaboration Science		X	X	0
4. Analyze student MCAS performance on computation and algorithmic fluency to establish baseline data.	X			0
5. Develop correlation chart linking BLEs, MA Curriculum Frameworks and curriculum program lessons at each grade level.			X	0

ASSESSMENT

ACTIONS	2006-2007	2007-2008	2008-2009	Budget Implications
1. Establish a plan/timeline for creating common grade level assessments K-8.	X			0
2. Develop a plan for creating student math portfolios.			X	Teacher stipends for summer work
3. Establish written course placement guidelines for students entering BHS.	X			0

TECHNOLOGY

ACTIONS	2006-2007	2007-2008	2008-2009	Budget Implications
1. Inventory how & where technology is currently integrated into the Math Curriculum K-12	X			0
2. Math specialists, Ed Tech specialists and classroom teachers identify technology opportunities at each grade level.		X		Teacher stipends (@ \$2520)
3. Identify/recommend exemplary software programs for grade levels.		X		No cost to review; software licensing costs
4. Examine new K-5 curriculum materials technology integration; criteria for selection.	X			Part of program costs
5. Develop expectations for student use of technology in Math		X		Teacher stipends (@ \$2020)
6. Develop & offer educator PD choices that target the use of technology in Math.		X		Teacher stipends (@ \$2240)

Appendix B

Math Specialists Historically	Math Specialists Today
<p><i>As an Instructional Leaders:</i></p> <ul style="list-style-type: none"> • Provide small group instruction and pull-out support (primarily) • Support students in the whole class, in small groups and individually • Teach whole class lessons • Help prepare students for MCAS • Assess what individual and groups of students need. • Give assessments to individual students. 	<p><i>As a Instructional Leaders:</i></p> <ul style="list-style-type: none"> • Provide resources and strategies • Co-plan and co-teach/model whole class lessons with classroom teacher • Debrief and reflect on math lessons with classroom teacher. • Support students within the classroom in the whole group, in small groups and individually. • Provide additional math instruction outside classroom time in small groups for students who are not a grade level.
<p><i>As a Coach to Teacher:</i></p> <ul style="list-style-type: none"> • Collaborate with teachers to provide classroom support and support for struggling students. 	<p><i>As a Coach for Teachers:</i></p> <ul style="list-style-type: none"> • Offer professional development to math teachers and grade-level teams. • Support teachers with their content and pedagogical knowledge. • Support teachers using curriculum and assessments.
<p><i>As Building Community Leader:</i></p>	<p><i>As Building Community Leader:</i></p> <ul style="list-style-type: none"> • Collaborate and meet with math specialists at local school. • Act as a math resource for the school. • Communicate with parents (conferences, letters, and parent meetings).

Grade Level Facilitators Description

Who are the facilitators?

One per grade level

K Mary McConnell - Driscoll

1 Kim Williams - Devotion

2 Jesse Kramer - Baker

3 Martha MacDonald - Baker

4 Susan Harvey - Pierce

5 Alyssa Rubenstein - Runkle

Who attends?

New teachers, teachers new to a grade level, SPED, interested interns and METCO aides

What?

Grade Level Facilitators are master teachers, at every grade level (K-5) across the district, who meet with teachers (including SPED, METCO aides, and interested interns) new to a grade level or new to the system to preview the upcoming mathematics curriculum unit, as well as to debrief and reflect upon previous units. The primary goal is to highlight the big mathematical ideas as well as correlate the essential standards in each unit. This PD also involves looking at assessments, learning how to effectively use manipulatives and/or play games, reviewing resources and discussing strategies for differentiation instruction.

Where ?

In master teacher's room, but sometimes groups rotate to participants' rooms

How often?

Two-hour meetings, 6 times a year