Duxbury Public Schools

Report of the Math Subcommittee K-9

Mathematics Curriculum Review

May 2014
## Members of the Subcommittee

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<thead>
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<th>Name</th>
<th>School</th>
<th>Position</th>
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<td>Alden</td>
<td>Curriculum Supervisor 3-5</td>
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<td>Chandler</td>
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<td>Joseph D’Andrea</td>
<td>DMS</td>
<td>Grade 6</td>
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<td>Stacy Murphy</td>
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<td>Alden</td>
<td>Grade 3</td>
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Overview

In the fall of 2014, the Duxbury Public Schools formalized its curriculum review processes. As the District Curriculum Committee began to meet actively, math was identified as the first content area to undergo a full curriculum review. As such, a math subcommittee was formed with representatives from each grade level, K-9, as well as the curriculum administrators from all four schools. As a result of current data and curriculum needs, the focus of the committee’s work was elementary and middle school while ensuring continuity and cohesion with our high school program. The committee met monthly, visited three elementary schools (Norwell, Marshfield, Abington), met with representatives of three math programs (Go Math, Envision, Everyday Math) and communicated electronically through Edmodo and Google Docs. This reports outlines the subcommittee’s activities and findings as well as its action plan going forward.

Curriculum and Instruction

Status of Common Core Frameworks

During the summer of 2012, Alden and Chandler began revising our curriculum maps, local benchmark assessments and our standards based report cards to reflect the new MA Curriculum Frameworks for Mathematics. As part of this work, a team of teachers from each grade identified which standards would be listed on the report card, and then identified how and when each standard in the frameworks would be taught. At this point, grades kindergarten through five are fully aligned with the Common Core Curriculum Standards. Looking forward, it would be wise to review maps and report cards again, now that we have lived with the standards for longer, and be sure that these documents articulate the common core changes sufficiently. Duxbury Middle School incorporated fully aligned curriculum maps and pacing guides this year across all grade levels. Discussion continues as to placement, acceleration, integration, and vertical alignment of skills.

Math Instructional Strategies

For grades kindergarten through two, teachers are using the center model of instruction for math. During the ninety-minute math block, teachers provide direct instruction to one small group at a time, specific to the needs of the group. The other students work to complete center activities either independently or in small groups. Each day, students work through each math center. Math instructional strategies at Alden reflect the practices recommended in the Everyday Math program. Teachers have, on an individual basis, adapted instruction and grouping to more
flexibly address individual student needs. Some teachers see small groups at the teaching table, some work with centers in their classroom, and others instruct partially whole class and partially in small groups and pairs. Teachers at all levels differentiate instruction for their students by selecting appropriate materials from Everyday Math and from outside sources and supplements. Teachers use formative assessments to inform instructional materials and strategies. Looking forward, teachers could benefit from professional development opportunities on current best practices for grouping, differentiation, and questioning strategies that engage students in higher order thinking. Duxbury Middle School currently utilizes whole class and small group processes. Discussion continues toward a shift from a whole class direct instruction to small group and individual work.

Research

The Math Subcommittee considered two current sources of research and recommendations. Both reports are listed below as well as their key findings quoted directly from the reports:

Final Report of the Mathematics Advisory Panel


The essence of the Panel’s message is to put first things first. There are six elements, expressed compactly here, but in greater detail later.

- The mathematics curriculum in Grades PreK–8 should be streamlined and should emphasize a well-defined set of the most critical topics in the early grades.

- Use should be made of what is clearly known from rigorous research about how children learn, especially by recognizing a) the advantages for children in having a strong start; b) the mutually reinforcing benefits of conceptual understanding, procedural fluency, and automatic (i.e., quick and effortless) recall of facts; and c) that effort, not just inherent talent, counts in mathematical achievement.

- Our citizens and their educational leadership should recognize mathematically knowledgeable classroom teachers as having a central role in mathematics education and should encourage rigorously evaluated initiatives for attracting and appropriately preparing prospective teachers, and for evaluating and retaining effective teachers.

- Instructional practice should be informed by high-quality research, when available, and by the best professional judgment and experience of accomplished classroom teachers. High-quality research does not support the contention that instruction should be either entirely “student centered” or “teacher directed.” Research indicates that some forms of
particular instructional practices can have a positive impact under specified conditions.

- NAEP and state assessments should be improved in quality and should carry increased emphasis on the most critical knowledge and skills leading to Algebra.

- The nation must continue to build capacity for more rigorous research in education so that it can inform policy and practice more effectively.

TIMSS 2011

TIMSS 2011 International Results in Mathematics Executive Summary. (2011). Boston College Lynch School of Education.

Key findings of the 2011 TIMSS International Study:

- Early Start Crucial in Developing Children’s Mathematics Achievement

- Home Resources Strongly Related to Mathematics Achievement

- Successful Schools Tend to Be Well-resourced

- Successful Schools Emphasize Academic Success and Have Safe and Orderly Environments

- Teacher Preparation and Career Satisfaction Related to Higher Mathematics Achievement

- Students with Positive Attitudes Toward Mathematics Have Higher Achievement, but Attitudes Less Positive at the Eighth Grade

- Engaging Instruction Related to Higher Mathematics Achievement

Data Analysis

MCAS

Duxbury Public School students achieve at high levels on state summative assessments (MCAS) in mathematics, particularly at the secondary level. However, in reviewing MCAS data for mathematics in grades three through eight, some concerns emerged. The 2013 MCAS results for students attaining proficient or advanced in grades three, six, and eight showed a significant
decline (7-9%) from 2012 results when compared to state averages. The greatest concern would be at grade three. In 2013, the mathematics scores for grade three students in Duxbury were only 3% greater than the state average for proficient or higher. At no other grade level was the differential above the state average that low. The next lowest mathematics scores in Duxbury were found in grades six and eight. They recorded scores at 14% above the state average in the categories of proficient and advanced. The scores at grades six and eight contributed to the middle school’s placement at Level 2.

In reviewing the annual scores of cohorts of students, beginning at grade three, and looking at that same group of students in grades four through middle school, students’ test scores and the percent of students achieving proficient or advanced makes a significant link from grade three to grade four. Consultants tracked this trend for each year assessment data was available and found similar results, when tracking different cohorts of grade three students as they moved on to successive grades.

Within grade three, the content domain of greatest concern is Measurement and Data, although scores in each domain need improvement. In reviewing the content of specific questions that students struggled with on the 2013 MCAS, across all domains, it was evident that much of the content of those questions derived from skills introduced in grade two, and built upon in grade three.

**District Assessments**

aMath

Alden and Chandler piloted aMath in 2013-2014. aMath is an adaptive broad math screening tool that assesses multiple math skills. The measure was relatively efficient to administer and students performed well overall. However, the level of data gained from this measure is insufficient to inform instructional practice, strategic grouping, or intervention. Alden and Chandler are looking forward to using a different measure with a higher quality report next year. We have investigated AimsWeb, STAR Math, and Galileo. At the elementary level, we have selected a combination of AimsWeb and STAR Math for the 2014-2015 school year.

**Local Benchmarks**

Alden and Chandler students take common local benchmark assessments three times a year. The benchmarks have been teacher created and completely aligned to the common core. They contain both past MCAS test questions and questions that came from other sources, such as Everyday Math resources and online resources. At Chandler, the benchmark questions have remained the same since the implementation of the Common Core, so teachers have been able to compare year-over-year data. This is useful to Chandler teachers, as they use this information to
group students by readiness level, which allows for better differentiation of instruction. At Alden, these have been edited over the years to improve consistency and alignment with changes in the common core questions on MCAS tests. These local benchmarks were designed to assess the state standards that are reported each term on the report card and to prepare students for high stakes testing. Teachers have developed consistency around administration procedures, as well. At both schools, the data from these assessments is given back to teachers in a spreadsheet each term, and they analyze scores as a grade level to identify areas of strength and weakness and adjust instruction accordingly. Looking forward, Alden teachers are eager to find assessment materials that are not teacher generated and therefore more reliable and valid. The middle school incorporates department created benchmark assessments as well as mid-year and end-of-year of assessments. These assessments inform instruction in conjunction with MCAS results.

Math Programs

Strengths and Weaknesses of Current Program K-5

Currently, with our core program of Everyday Math, teachers are supplementing to meet the needs of the Common Core. Grade levels frequently work together to align expectations and lessons, so that the supplementation is consistent across grade levels. This has led to some positive collaboration among grade levels and many successful lessons for our students. Everyday Math’s emphasis on developmentally appropriate strategies as students learn new material is beneficial to students. Offering a variety of algorithms improves student understanding of number sense. Attention to the spiral throughout the grades is also beneficial. There are many hands on experiences offered through the use of manipulatives and games. At the primary grade levels, teachers have had some additional training on using math centers and this has added a positive element to the implementation of the Common Core through the Everyday Math materials. To address the gaps between our current version of EM materials (2007) and the Common Core State Standards, Everyday Math released the 2012 version which added resources to supplement instruction and assessment. They did not eliminate lessons and materials for standards/skills that should no longer be taught at each grade level. One of the most beneficial additions in 2012 was the online eSuite student and teacher resources. Teachers have been working with crosswalk documents and the eSuite online tools to identify which lessons to teach and which to skip. Everyday Math 2007 needs more options for differentiation, both in class and for homework. Everyday Math benchmark and summative assessments do not meet our current needs sufficiently. 2007 lesson/unit plans are not written for our current math class time frames. As we consider new a new text, we look forward to viewing Everyday Math’s newest assessment and online support options in the fall. We understand from the sales presentation that these weaknesses have been addressed.

Strengths and Weaknesses of Current Program Grades 6-8
The middle school currently utilizes different textbooks at each of the three grade levels. Grade six adopted Go Math within the past two schools years. Grade seven began to utilize Glencoe Accelerated Math during this school year. Grade eight is currently utilized both a Glencoe text as well as a range of supplemental materials to support the recently completed common core curriculum maps. As discussion concludes about the K-5 program, the transition between grade levels will strongly be considered in order to build a cohesive, vertically aligned K-8 set of resources for instruction.

Survey of Local Districts

The committee surveyed local school systems to ascertain their current K-5 program and then compared it with their MCAS performance. The results are as follows:

### Envision

<table>
<thead>
<tr>
<th>Town</th>
<th>Implementation stage</th>
<th>% Proficient and Advanced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohasset</td>
<td></td>
<td>87%</td>
</tr>
<tr>
<td>Hopkinton</td>
<td>year 2</td>
<td>87%</td>
</tr>
<tr>
<td>Marshfield</td>
<td>year 2</td>
<td>83%</td>
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<tr>
<td>Middleboro</td>
<td>year 1</td>
<td>65%</td>
</tr>
<tr>
<td>Norwell</td>
<td>year 2</td>
<td>76%</td>
</tr>
<tr>
<td>Rockland</td>
<td>year 4</td>
<td>56%</td>
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<tr>
<td>Scituate</td>
<td>year 1</td>
<td>81%</td>
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<tr>
<td>Silver-Lake</td>
<td>K-3</td>
<td>85%</td>
</tr>
<tr>
<td>Weymouth</td>
<td></td>
<td>72%</td>
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<tr>
<td>Whitman-Hanson</td>
<td></td>
<td>74%</td>
</tr>
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### Everyday Math

<table>
<thead>
<tr>
<th>Town</th>
<th>Implementation stage</th>
<th>Proficient and Advanced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abington</td>
<td>piloting Go Math and envision</td>
<td>56%</td>
</tr>
<tr>
<td>Franklin</td>
<td>looking to switch</td>
<td>81%</td>
</tr>
<tr>
<td>Hingham</td>
<td></td>
<td>80%</td>
</tr>
<tr>
<td>Hull</td>
<td></td>
<td>84%</td>
</tr>
<tr>
<td>Plymouth</td>
<td></td>
<td>70%</td>
</tr>
<tr>
<td>West Bridgewater</td>
<td></td>
<td>91%</td>
</tr>
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### Expressions

- Somerset
Big Ideas
● Silver Lake  grades 6-8

Digits
● Middleboro  grades 6-8
● Hanover    77%
● Pembroke   71%

Looney Math Consulting Review

The district employed Looney Math Consultants to conduct a third party review of our K-8 math program. Below is an outline of the review process and findings:

Through an analysis of classroom observations, surveys, interviews, and student assessment data, consultants explored the following areas:

● How the provided texts and curriculum are utilized and aligned to the CCSS
● Modes of instruction utilized by teachers and how they provided differentiation of instruction
● The effectiveness of the co-teaching model between regular and special education teachers
● Use of personnel and physical (including technology) resources
● Allocation of time and tasks during the math class
● Level of rigor of cognitive tasks in math classrooms

Results of Teacher Surveys
Survey Participants
● All teachers Chandler, Alden
● Math department DMS

Priority Needs Emerged
● Professional Development
● Materials Aligned with Common Core

Interviews with Teachers, Leaders
● Teachers are supplementing the curriculum heavily; amount of supplementing and materials used vary widely
● Chandler teachers interested in model, resources for center-based math instruction
● Alden teachers interested in additional support for students, teachers
● MS teachers concerned with vertical alignment of math program, class size
**Classroom Observations: Chandler**
- Students were actively engaged in learning activities
- Observed mostly math learning centers
- Saw frequent use of manipulatives to facilitate learning
- Viewed a predominance of activities/lessons within the Measurement and Data domain across all grade levels
- Most activities observed required students to perform at the lower levels of cognition

**Classroom Observations: Alden**
- Positive learning environment
- Multiple materials used to support instruction
- Predominantly whole class instruction
- Few student-centered instructional approaches observed
- Lack of corrective feedback provided to incorrect responses
- Level of rigor was low to moderate across all classrooms; few opportunities to engage in higher level thinking skills

**Classroom Observations: DMS**
- Teacher-student interactions were positive
- The majority of teachers incorporated some type of technology into instruction
- Instruction primarily direct and whole class in mode
- Minimal student-centered instructional approaches were observed
- Differentiation was observed in level of support given to students through an aide or additional teacher
- The questions asked students to solve problems at the lower cognitive levels and the majority of questions were single versus multiple step or word problems.

**District Recommendations**
- 1.5 FTE Math Coach to support CCSS alignment and rigorous math instruction, provide professional development, align mathematics program across schools and grades
- Professional development opportunities
  - PK-5: content-based
  - 6-8: pedagogy and student engagement
  - All grades: differentiation of instruction and increasing higher level thinking in mathematics

**Next Steps**
- Math Subcommittee K-9
  - Integrate consultant report, discussions, school visits, textbook overviews and pilots
  - Create action plan for 2014-2015
    - Professional development
• Assessments
• Materials
• Consistent practices: content/instructional
• Staffing?
  ○ Provide report to District Curriculum Committee
  ○ Share report with school community

Recommendations of the K-9 Math Subcommittee

The K-9 Math Subcommittee met several times to determine action steps for the coming school year and beyond. As this year of curriculum review concludes, the committee feels 2014-2015 will be the first year of two years in the implementation phase of the curriculum cycle.

Action Steps 2014-2015

• Increase consistency across grade levels
• Develop and implement district math vocabulary list
• Identify key mastery skills and teach to mastery
• Teach to mastery math fact/algorithim
• Order Everyday Math 2012 student materials in lieu of the 2007 version
• Highlight Common Core Standards for Mathematical Practices across all schools
• Pilot new texts K-5: Go Math, Envision, Everyday Math 2015
• Adopt and utilize early numeracy math assessments K-5
• Replace aMath assessments K-5 with Star Math and AIMSWeb
• Consider DMS common text series purchase 6-8
• Foster ongoing development of centers/small group instruction
• Integration technology into math instruction beginning with online text access in middle school where individual student laptops will be available
• Develop RTI mathematics plan: data analysis and remediation
• Consider personnel needs (math specialist, math coach, etc.) and budget impacts
• Budget for new text series K-5, possible replacements/additions 6-8
• Consider review of DHS program
• Provide professional development focused on the following in K-5:
  ○ Entire K-5 staff: August 27 Bureau of Education Research to provide workshop on centers in mathematics instruction
  ○ Alden visit Chandler to see centers in classrooms
  ○ Instructional strategies to further integrate higher order thinking
  ○ Summer work to build vocabulary lists, practices work K-5
  ○ Summer work DMS curriculum maps
DMS focused professional development on rigor and higher order thinking through Looney Consultants

**Actions Steps 2015-2016 draft**

- Implement new textbook K-5
- Implement common text series grades 6-8?
- Implement and review of early numeracy math assessments K-5
- Identify skill needs based on assessment data
- Hire identified personnel (coach, specialists, etc.)
- Communicate center and differentiation model with DMS via visits