The Implementation of Singapore Mathematics

in a

Regional School District in Massachusetts
2000-2006

Remarks to
National Mathematics Advisory Panel
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by

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Introduction: Good morning. Thank you for the opportunity to speak with you, and most especially for your commitment to this extensive undertaking. This past June I retired from my position as associate superintendent for one of the largest regional school districts in Massachusetts, a position I held for over twenty years. My comments this morning address the implementation of the Singapore Mathematics program in the North Middlesex Regional School District and the resultant outcomes.

Background: In the spring of 1998 the Massachusetts Department of Education inaugurated a mandatory assessment program for all public school students in grades 4, 8 and 10. The results from the first administration of the Massachusetts Comprehensive Assessment System (MCAS) were dismal, particularly in mathematics. The statewide failure in grade 10 math was 52%. North Middlesex Regional High School's tenth graders did not fare much better with a failure rate of 39%. By the second year of testing, North Middlesex's failure rate had climbed to 46%, not far ahead of the state average of 53% for 1999. We anticipated that results would improve dramatically in 2001 when passing the test became one criterion for attainment of a high school diploma, but this did not lessen our disappointment when our students' performance in the spring of 2001 was scarcely better than the state average. We determined to find the cause of, and a remedy for, our unsatisfactory outcomes.

In the fall of 1999 we began a review of available district data in mathematics, and concluded that the promise that our fourth graders had shown on MCAS and other district assessments was in a precipitous decline by middle school. To provide more academic opportunity and rigor for middle school students, among other things, we did the following:

1. eliminated all activity block periods at the middle school level;
2. established a goal that all middle school math teachers would have majors in their field;
3. provided more time for mathematics; and
4. reviewed and revised all curricula in mathematics.

Most important of all, we responded to a Massachusetts Department of Education initiative to host a summer institute on the acceleration of middle school mathematics. The institute, open to teachers, grades 5-9, introduced participants to the *Mathematics Syllabus* issued by the Singapore Ministry of Education. Another prominent feature of the Institute was the development of three teacher-leaders who facilitated the institute with their college partner after working with district administration to identify areas of need.

Singapore Math: The Singapore Math program calls for direct instruction. Its focus is on mathematical thinking with immediate application of new skills to problem solving. There are few topics covered each year, and these topics are introduced in great detail. In addition, understanding is enhanced through visual representation utilizing a problem solving strategy termed,"model drawing." Beyond this, textbooks are lively without the distraction of many contemporary texts, paper-bound and considerably smaller than traditional textbooks. I think you will be surprised when you see the texts, some of which I have left for your perusal.

Implementation of Singapore Mathematics: In the fall of 2000, five of the institute participants implemented the curriculum and textbooks from Singapore in six classrooms, grades 5-8. The experience was successful: over the next six years the implementation extended to all grades (1-8) and from 6 classrooms in 2000 to 130 in the 2005-2006 school year. Throughout the implementation phase, faculty involvement was voluntary, the only requirement being the teacher's enrollment in a district-sponsored mathematics course. *Appendix A* depicts the expansion of Singapore Math in North Middlesex.

Outcomes: North Middlesex's trial with Singapore Math was expanded because of the many indicators of success. *Appendices B* and *C* present a longitudinal history of student outcomes on the MCAS at grade 10 (1998-2005) and the Iowa Tests of Basic Skills at grades 2, 5 and 6. As Appendix B indicates, North Middlesex grade 10 students performing at the advanced level on the MCAS math exam increased from 9% in 1998 to 57% in 2005, while the failure rate over the same period declined from 39% to 2%.

There are other indicators of success:

1. all grade 8 students now enroll in Algebra I (in contrast with 25% of the population in 1999)

2. there is a significant increase in the percentage of grade 9 students enrolled in Algebra II (from less than 25% in 1999 to 45% this year); and

3. in the 2005-2006 school year (for the first time) there were students enrolled in AP Calculus (BC);

This fall, 100% of students in grades 1-7 and 75% of students in grade 8 are in the Singapore Math program. Singapore Mathematics is no longer an initiative, but the way North Middlesex delivers mathematics instruction.

Educational Community Response: On almost a weekly basis North Middlesex is contacted by school districts from across the country seeking information on the implementation of Singapore Mathematics. In most cases, the caller seeks affirmation of a decision already made to purchase the textbooks from Singapore. The response from North Middlesex is always the same: it is as much the professional development in mathematics and the administrative support as it is the textbook and the program. There is no end to improvement, and the role of administration is critical if success is the desired outcome.

Beyond requests for information, North Middlesex's classrooms are visited with frequency by both local educators and those from afar. Last year alone brought in visitors from Ohio to Georgia. In addition, our efforts in mathematics have received considerable attention in the media from the *Boston Globe* to the *Wall Street Journal*. This month, Gene Maeroff (founder of the Hechinger Institute on Education and the Media at Teachers College, Columbia University) released his latest book, *Building Blocks: Making Children Successful in the Early Years of School.* The chapter on

mathematics in *Building Blocks* focuses on the efforts in North Middlesex to "build a foundation for mathematics the early years" through the Singapore Math program.

Conclusion: Improving outcomes for students in mathematics is dependent on a number of factors, chief among them a teacher with a strong math background, ongoing professional development, administrative support and involvement, and a mathematics program that encourages mathematical understanding. North Middlesex seems to have found the answer.

Appendix A: North Middlesex Regional School District: Implementation of Singapore Mathematics (2000 – 2006)

	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Total #Classes
2000-01						▲	▲	▲▲	▲▲	**6**
2001-02		▲▲			▲▲	▲▲▲ ▲▲	▲▲▲	▲▲▲ ▲	▲▲▲	**19**
2002-03	▲▲	▲▲▲ ▲▲▲	▲▲▲ ▲▲▲ ▲▲▲ ▲	▲▲▲	▲▲▲ ▲▲▲ ▲	▲▲▲ ▲▲▲ ▲▲▲ ▲	▲▲▲ ▲▲▲ ▲	▲▲▲ ▲▲	▲▲▲ ▲▲	**55**
2003-04	▲▲	▲▲▲ ▲▲▲ ▲▲▲	▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲	▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲▲	▲▲▲ ▲▲▲ ▲▲▲ ▲	▲▲▲ ▲▲▲ ▲▲▲ ▲▲	▲▲▲ ▲▲▲ ▲▲▲	▲▲▲ ▲▲▲ ▲	▲▲▲ ▲▲	**79**
2004-05	▲▲▲	▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲▲ 14/17	▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲ 13/16	▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲ 16/16	▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲▲ 17/17	▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲▲ 17/17	▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ 12/16	▲▲▲ ▲▲▲ ▲▲ 8/18	▲▲▲ ▲▲▲ 6/18	**106**
2005-06 **100% Implementation at grades 1-6; 75% at 7-8**	▲▲▲	▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲▲ 17/17	▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲ 16/16	▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲ 16/16	▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲▲ 17/17	▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲▲ 17/17	▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ 18/18	▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ 12/16 100% in 2006-07	▲▲▲ ▲▲▲ ▲▲▲ ▲▲▲ ▲▲ 14/18 100% in 2007-08	**130**

Number of Classes using Curriculum by School Year (▲ = 1 classroom)

Appendix B: MCAS Mathematics Results
1998-2005

Results for North Middlesex Regional High School and State

Grade 10 ***Percentages of Students at Each Performance Level*** **Comparison of North Middlesex and State Results (1998-2005)**								
	Advanced		Proficient		Needs Improvement		Failing	
	NMRSD	**State**	**NMRSD**	**State**	**NMRSD**	**State**	***NMRSD***	**State**
Math 2005	57%	35%	30%	27%	11%	24%	2%	14%
2004	40	29	34	28	22	28	4	15
2003	24	24	33	27	31	28	12	20
2002	26	20	31	24	27	31	16	25
2001	27	18	32	27	29	30	13	25
2000	13	15	21	18	29	22	37	45
1999	7	9	19	15	29	23	46	53
1998	9	7	18	17	34	24	39	52

North Middlesex Regional School District

Appendix C: Iowa Tests of Basic Skills

Grade 2 – Comparison of 2000-2003 Mathematics Results

Percentile Rank of Average Standard Score: National Student Norms

	Math Advanced Skills				Math Total			
	00	01	02	03	00	01	02	03
District	82	83	85	84	81	83	84	85
Ashby	78	74	79	73	78	72	74	76
Townsend	89	88	92	92	89	88	91	94
Pepperell	77	80	80	78	75	80	80	77

Grade 2 – Comparison of 2004-2005

Percentile Rank of Average Standard Score: National Student Norms

	Mathematics							
2005 Enrollment	**Concepts**		**Problems**		**Computation**		**Total**	
	'04	'05	'04	'05	'04	'05	'04	'05
District N=326	81	85	80	82	70	79	79	83
Ashby N=28	77	82	81	75	83	76	81	79
Townsend N=132	82	90	78	87	71	88	79	91
Pepperell N=166	81	80	80	78	66	71	79	77

Iowa Tests of Basic Skills
Grade 5 – Comparison of Mathematics Results 1999-2005

District and School Results in National Percentile Ranks

	Math Concepts							Math Problems and Data Interpretation							Math Computation						
	99	00	01	02	03	04	05	99	00	01	02	03	04	05	99	00	01	02	03	04	05
District	61	65	70	75	77	79	78	64	66	70	72	74	74	74	65	70	57	64	66	74	78
Ashby	54	67	70	76	70	77	80	63	71	68	69	68	73	77	74	80	70	73	72	76	83
Townsend	65	68	70	76	79	79	79	67	65	68	71	74	72	74	67	76	58	65	65	75	80
Pepperell	60	63	69	74	78	79	77	62	65	73	74	74	77	73	50	61	52	59	65	73	73

2000-2001: 1 Singapore Math class (in Ashby))
2001-2002: 5 SM classes
2002-2003: 10 SM
2003-2004: 11 SM classes
2004-2005: 17 SM classes (100%)
2005-2006: 17 SM classes

North Middlesex Regional School District

Iowa Tests of Basic Skills
Grade 6 – Comparison of Mathematics Results 1999-2005

District and School Results in National Percentile Ranks

	Math Concepts							Math Problems and Data Interpretation							Math Computation						
	99	00	01	02	03	04	05	99	00	01	02	03	04	05	99	00	01	02	03	04	05
District	60	67	76	74	80	79	81	60	66	72	70	75	73	74	60	63	62	63	72	71	74
Ashby	70	60	69	AES Gr. 6 Students moved to HBMS				64	64	72	AES Gr. 6 Students moved to HBMS				68	66	69	AES Gr. 6 Students moved to HBMS			
Townsend	57	71	79	75	80	80	82	56	68	71	68	73	74	73	63	66	63	60	76	74	73
Pepperell	60	65	72	73	79	78	80	63	65	73	72	76	73	74	54	60	59	64	68	68	76

2000-2001: 1 Singapore Math class (in Townsend)
2001-2002: 3 SM classes
2002-2003: 7 SM
2003-2004: 9 SM classes
2004-2005: 12 SM classes
2005-2006: 18 SM classes (100%)