GREENWICH PUBLIC SCHOOLS
Greenwich, Connecticut

Board Agenda

Date of Meeting **February 15, 2007**

Title of Item **Monitoring Report E-003 - Assessment Standards: K-12 Mathematics**

Policy **E-003** **Agenda No.** **6.b.i.**

REQUEST FOR BOARD ACTION OR PRESENTATION OF INFORMATION ITEMS

☐ **Action required**

☒ **Informational only**

Submitted By **John P. Curtin**

Position **Assistant Superintendent**

I will be present at Board Meeting to explain if called upon

☒ **Yes** ☐ **No**

Synopsis of Proposal:
Monitoring Report E-003 - Assessment Standards: K-12 Mathematics

Recommended Action (if appropriate)

GREENWICH PUBLIC SCHOOLS
MONITORING REPORT
STUDENT ACHIEVEMENT: MATHEMATICS (E-003)
FEBRUARY 2007

I hereby present my monitoring report on the District Ends Policy "Student Achievement." I certify compliance and that the information contained in this report is accurate.

Signed: _____ Date: _____
(Betty J. Sternberg, Superintendent of Schools)

BROADEST POLICY PROVISION

The District shall establish an assessment system that is aligned with the District's Mission and Vision and provides a comprehensive, consistent and integrated system of student learner objectives / outcomes, assessment, analysis and reporting.

EXECUTIVE SUMMARY

In order to ensure that all students master the objectives of the Greenwich curriculum and achieve to their highest potential, student achievement in mathematics is assessed against four broad groups of indicators: 1) aggregate performance of standardized tests such as the Connecticut Mastery Test (CMT) and the Connecticut Academic Performance Test (CAPT), 2) preparation for post secondary options including average scores on the Scholastic Assessment Test (SAT 1) and Advanced Placement Tests (AP) and enrollment in advanced classes, 3) annual growth in achievement on CMT, and 4) performance disaggregated by student subgroup on CMT and CAPT.

Accomplishments include compliance with the policy, an increase in the percentage of students scoring at the advanced level on the CMT, growth in student achievement on the CMT at the highest performance levels, an upward trend in scores on SAT 1, and an increase in student participation in advanced mathematics courses. While there were no major exceptions to any policy provision, there are a number of governance and management issues which require further attention. Governance issues include the reallocation of resources to meet the needs of all students, and instructional time as it relates to the implementation of the revised mathematics curriculum. The Board of Education may also want to consider revising the mathematics graduation requirement. Management issues focus on closing gaps in achievement among student subgroups, staff training, monitoring changes in classroom instructional practice, curriculum alignment, using formative assessment to guide instruction and report student progress to parents, increasing student access to advanced mathematics classes, ensuring that students continue to attain fluency in "math facts," and making the transition from a "linear" to a "spiraling" approach mathematics curriculum and instruction.

Note: Descriptions of the measures discussed in the next three sections and data tables describing student achievement over the last five years are attached at the end of this report.

ACCOMPLISHMENTS / HIGHLIGHTS

1. Over the last five years, student achievement on the mathematics section of the Connecticut Mastery Test (CMT) was relatively flat at the proficient and advanced levels, and trended downward at the goal level. Relative to students in similar districts, Greenwich students score lower at the proficient and goal levels and higher at the advanced level (Table 1).

2. From 2004-2005 to 2005-2006, the percentage of students performing at the advanced level on the CMT increased in nine of eleven elementary schools and all three middles schools. The percentage of students achieving at the advanced level reached a five year high in three elementary schools and all three middle schools (Tables 2 & 3).

3. Over the last five years, the achievement gap on CMT mathematics narrowed between the District average and some disaggregated subgroups: Hispanic students (proficient level), students receiving special education services (goal level), students receiving free and reduced lunch (proficient level) and English Language Learners at all three levels (Table 1).

4. The CMT mathematics achievement of the cohort of Greenwich students who were tested in both the spring of 2006 ***and*** the fall of 2003 or 2004 improved significantly: 30% of the students tested scored at a higher level, 58% at the same level and 12% at a lower level. The improvement in achievement was most notable at the advanced level (Table 8).

5. Over the last five years, student achievement on the mathematics section of the Connecticut Academic Performance Test (CAPT) increased at the proficient level, remained relatively flat at the goal level and trended downward at the advanced level. Relative to students in similar districts, Greenwich students score lower at all three levels. Over the last five years, gaps in performance among student subgroups remained relatively constant (Table 4).

6. The mean mathematics score on the Scholastic Assessment Test (SAT1) increased from 567 in 2001-2002 to 582 in 2005-2006. Over the same period of time, the percentage of graduates tested declined from 93% to 90%. Relative to students in similar districts, Greenwich students have the highest mean score on SAT1 mathematics (Table 5).

7. Over the last five years, enrollment increased in Advanced Placement mathematics courses while student achievement on AP exams remained constant or improved. Approximately, 28% of graduates in 2006 enrolled in AP mathematics (Table 6).

8. The percentage of students successfully completing Algebra 1 by the end of eighth grade increased from 38% in 2001-2002 to 40% in 2005-2006 (Table 7).

GOVERNANCE ISSUES

1. Addressing student needs by reallocating resources within budget limitations presents the District with a significant organizational and political challenge. For example, the elimination of remedial mathematics classes at Greenwich High School creates a more

complex instructional environment for classroom teachers. One means of addressing this issue is to reduce class size. However, reducing class size in some sections requires increasing class size in other sections or eliminating some courses altogether. How does the District implement the strategy of maximizing achievement for all students while closing gaps in achievement among students?

2. The revised K-8 mathematics program balances procedural fluency (computation skills) and conceptual understanding within a context that requires students to think strategically and solve complex problems. As the District implements the revised program, instructional time is emerging as a major challenge at both the elementary and middle school levels. What impact will implementing the revised mathematics program have on other areas of the District curriculum?

3. Given the knowledge and skills required to succeed in a twenty-first century global economy, should the mathematics graduation requirement be increased from three credits to four credits? Are the graduation requirements as stated in policy sufficiently rigorous to ensure a high quality education for all students? Is there sufficient latitude within these requirements to address the needs of all students?

MANAGEMENT ISSUES

1. There are significant gaps in the performance of student subgroups across measures of core mathematics skills (CMT and CAPT). Many students who lack these core skills (below proficiency) demonstrate less than expected annual growth and are falling further behind their peers. District strategies to close gaps in achievement among student subgroups include fostering a continuing community and professional dialogue around closing the achievement gap, improving curriculum and professional learning, systematically providing extended day and extended school year programs and monitored intervention plans for students performing below grade level, and exploring options for extending preschool programs to at-risk students. Based on trends in student achievement data, the extended school day program in operation at Hamilton Avenue, Julian Curtiss and New Lebanon was also implemented this year at Cos Cob, Glenville and Western Middle School. The implementation of individual student intervention plans (ISIP) continues to present challenges. The District is working to simplify the process, improve the technology for managing the plans and extend planning to students in ninth and tenth grade at Greenwich High School.

2. Implementing the revised mathematics program requires a substantial investment in staff training. During the 2005-2006 school year, all K-2 classroom teachers received extensive and ongoing training in Everyday Mathematics. During the 2006-2007 school year, this initial training is being supported through District and school grade level meetings. In June 2006, teachers in grades three through five received initial Everyday Mathematics training and teachers in grades six through eight received initial Connected Mathematics training. This initial training is being supported throughout the school year through the District Professional Learning Program and grade level meetings. We plan to provide differentiated

training in future years in order to ensure that staff new to the District receive the initial training and experienced staff continue to improve their instructional practice.

3. Training needs to be reinforced by monitoring changes in classroom practice. Focus walks and instructional walk throughs are means of supporting the improvement of classroom practice. These observation protocols are designed to guide the improvement of instruction. The purpose of these protocols is to create a safe, non-threatening environment for systematic reflection and dialogue about classroom practice. Last year, instructional walk throughs were conducted to monitor the Everyday Mathematics program in grades Kindergarten through two. The program coordinator for mathematics and building principals are currently engaged in conducting focus walks in their buildings around the implementation of Everyday Mathematics in grades three through five. The revision of the District Teacher Evaluation Plan will support these efforts by setting clearer standards for planning instruction and using formative assessment to differentiate instruction.

4. Mathematics coaches are currently funded out of the Consolidated Grant. There is a .5 coach in each of the Title 1 schools and a .4 District coach to assist teachers with the implementation of the revised mathematics program. These grant funded positions are essentially temporary. We are exploring the need to permanently assign a coaching resource to mathematics and to develop a resource to provide supplemental direct instruction to low performing students.

5. The program coordinator for mathematics is working with the teaching staff to ensure alignment between the Everyday Mathematics program and the state curriculum framework assessed by the CMT.

6. While summative assessments (CMT, CAPT, SAT1 and AP) are in place to measure student progress and program effectiveness, assessment should also be used to guide instruction. The CMT is very useful as means of identifying areas of strength or weakness in the mathematics curriculum, but much less useful as a means of making day to day instructional decisions in the classroom. The District is in the process of piloting a standards-based report card that assesses a student's progress against grade level curriculum objectives. During the summer of 2007, staff will work on developing common formative assessments across K-5 and a portfolio system for maintaining an ongoing record of student work.

7. Measures of student access to advanced mathematics curriculum at the middle and high school levels are in place in the District Success System (Improving Teaching and Learning Arena). A better system of tracking the relationship between mathematics achievement and student placement needs to be developed.

8. There have been concerns raised by some teachers and parents that the revised K-5 mathematics program sacrifices mastery of mathematics content (procedural and conceptual) and overemphasizes process (problem solving, reasoning, and communication). The intent of the program revision is to strike a better balance between these two elements. Mastery of mathematics content is embedded in the curriculum objectives, assessed at the end of each

marking period, tracked by the standards-based report card and monitored through standardized assessments such as the Connecticut Mastery Test. Any decline in mastery of mathematics content will be readily apparent and addressed through refining the implementation of the new program. Part of this concern may stem from changes in pedagogy. Everyday Mathematics uses math games, instructional techniques such as "minute math" or "mental" math, and ongoing journal exercises to reinforce the acquisition of basic math facts; programs the District has used in the past relied more heavily on repetitive practice in workbooks.

9. Everyday Mathematics relies on a "spiraling" approach to teaching mathematics objectives. The teacher introduces a concept or a procedure, the students practice and problem solve and the teacher assesses student performance across each objective as beginning, developing or secure. Instruction is differentiated by student performance level. Since the program returns or "spirals" through objectives from month to month and grade to grade, it is not necessary for a student to master one objective before moving on to the next objective. While this instructional approach is supported by extensive research, it is counter intuitive to many teachers and parents.

10. The District has made a substantial investment in reviewing and implementing a revised mathematics program. The changes in curriculum, materials and instructional practice are extensive and will take time to implement. We need to be mindful that both organizations and individuals have learning curves as we assess the impact of the changes.

EXCEPTIONS

1. None.

DESCRIPTION OF STANDARDIZED MEASURES

The **Connecticut Mastery Test** (CMT) is a state-mandated program that assesses and reports the achievement of students in grade three through grade eight in three areas: Mathematics, Reading, and Writing. Prior to the 2005-2006 school year, the CMT was administered in grades four, six and eight. The CMT assesses core academic competencies and serves as a key indicator of a student's readiness to successfully access the high school curriculum. Student scores are characterized by performance level: 5-Advanced, 4-Goal, 3-Proficient, 2-Basic and 1-Below Basic. Students scoring at the advanced level are performing at the top of all students across the state. Students scoring in the goal category possess the knowledge, ability, and skill necessary to successfully perform the tasks and assignments appropriately expected of a student with minimal teacher assistance. Students who score in the proficient category are able to successfully participate in their regular grade appropriate course work. The proficient standard is used to calculate adequate yearly progress under No Child Left Behind (NCLB). Students scoring below the proficient level require intervention to accelerate their academic progress.

The **Connecticut Academic Performance Test** (CAPT) is a state-mandated program that assesses and reports the achievement of tenth grade students in four areas: Mathematics, Science, Reading Across the Disciplines, and Writing Across the Disciplines. Student scores are characterized by performance level: 5-Advanced, 4-Goal, 3-Proficient, 2-Basic and 1-Below Basic. Students scoring at the advanced level are performing at the top of all students across the state. Students scoring in the goal category possess the knowledge, ability, and skill necessary to successfully perform the tasks and assignments appropriately expected of a student with minimal teacher assistance. Students who score in the proficient category are able to successfully participate in their regular grade appropriate course work. The proficient standard is used to calculate adequate yearly progress under No Child Left Behind (NCLB). Scoring at the proficient level or higher on the mathematics, reading and writing subtests is required for graduation from Greenwich High School. Students scoring below the proficient level require intervention to accelerate their academic progress.

The **Scholastic Assessment Test** (SAT I) is a measure of developed verbal and mathematical skills important for success in college. Scores are reported on a scale from 200 to 800. SAT1 is a college entrance examination and student participation is voluntary. Over the last five years, the percentage of graduating seniors taking SAT1 has been relatively constant in a range from 88% to 93%.

Advanced Placement (AP) is a College Board-sponsored program administered and operated by Educational Testing Service. The AP Program gives high school students an opportunity to take college-level courses and exams, and earn credit, advanced placement, or both for college. Greenwich High School offers sixteen advanced placement classes in five different disciplines. Examinations are administered in May and scored by the Educational Testing Service. AP Examination grades are reported on a 5-point scale as follows: 5-Extremely well qualified, 4-Well qualified, 3-Qualified, 2-Possibly qualified, 1-No recommendation. Greenwich High School offers two levels of AP calculus (AB and BC) and AP statistics. During the 2005-2006 school year, 28% of the graduating class was enrolled in AP mathematics.

Table 1: Connecticut Mastery Test Mathematics by Student Subgroup (%)

		01-02	02-03	03-04	04-05	05-06
District (all schools and grades)	Advanced		40	35	34	41
	Goal	80	81	77	77	77
	Proficient	93	93	91	91	92
Asian	Advanced		64	50	54	61
	Goal	92	84	81	85	91
	Proficient	98	99	95	94	97
Black	Advanced		4	5	6	7
	Goal	41	41	47	32	35
	Proficient	78	69	60	64	64
Hispanic	Advanced		17	7	13	19
	Goal	57	55	49	54	52
	Proficient	77	79	72	79	80
White	Advanced		42	38	37	44
	Goal	82	84	80	82	81
	Proficient	94	95	94	93	93
Female	Advanced		40	36	35	39
	Goal	80	81	77	78	77
	Proficient	93	93	92	92	92
Male	Advanced		39	35	34	44
	Goal	79	80	76	77	77
	Proficient	92	92	90	89	91
Special Education	Advanced		10	5	6	11
	Goal	37	39	35	26	38
	Proficient	70	66	68	53	64
English Language Learners	Advanced		8	3	9	24
	Goal	10	31	12	37	56
	Proficient	20	62	32	63	79
Free or Reduced Lunch	Advanced		10	6	6	8
	Goal	42	42	38	34	37
	Proficient	66	70	61	65	70

Table 2: Connecticut Mastery Test Mathematics by Elementary School (%)

		01-02	02-03	03-04	04-05	05-06
District (all schools and grades)	Advanced		40	35	34	41
	Goal	80	81	77	77	77
	Proficient	93	93	91	91	92
Cos Cob	Advanced		37	37	26	28
	Goal	70	81	76	74	66
	Proficient	84	91	88	92	84
Glenville	Advanced		51	40	26	30
	Goal	80	77	77	71	71
	Proficient	90	93	94	87	87
Hamilton Avenue	Advanced		23	21	11	20
	Goal	71	63	60	53	57
	Proficient	88	91	79	78	87
Dundee	Advanced		55	50	47	50
	Goal	83	93	87	78	85
	Proficient	95	100	94	93	96
Julian Curtiss	Advanced		22	30	30	25
	Goal	81	69	68	69	65
	Proficient	90	93	81	90	84
New Lebanon	Advanced		23	6	3	10
	Goal	65	73	38	47	48
	Proficient	83	82	65	66	76
North Mianus	Advanced		47	44	35	40
	Goal	88	94	81	81	80
	Proficient	98	98	97	96	94
North Street	Advanced		37	28	26	44
	Goal	87	93	79	78	81
	Proficient	99	99	96	97	96
Old Greenwich	Advanced		34	49	53	45
	Goal	89	94	89	90	83
	Proficient	95	99	98	95	93
Parkway	Advanced		48	47	32	41
	Goal	76	90	86	75	80
	Proficient	90	96	97	93	95
Riverside	Advanced		37	38	46	59
	Goal	94	97	79	96	91
	Proficient	98	98	95	100	99

Table 3: Connecticut Mastery Test Mathematics by Middle School (%)

		01-02	02-03	03-04	04-05	05-06
District (all schools and grades)	Advanced		40	35	34	41
	Goal	80	81	77	77	77
	Proficient	93	93	91	91	92
Central	Advanced		40	34	39	46
	Goal	80	81	77	81	78
	Proficient	94	93	93	93	91
Eastern	Advanced		49	47	39	57
	Goal	89	85	87	87	89
	Proficient	97	95	97	95	97
Western	Advanced		29	20	27	30
	Goal	66	66	64	64	66
	Proficient	86	84	84	83	86

Table 4: Connecticut Academic Performance Test Mathematics (%)

		01-02	02-03	03-04	04-05	05-06
GHS (all students)	Advanced		41	39	43	35
	Goal	66	72	67	69	65
	Proficient	90	92	87	88	91
Asian	Advanced		69	52	57	52
	Goal	87	83	76	86	77
	Proficient	100	94	98	92	95
Black	Advanced	The number of students in this subgroup is insufficient for reporting purposes.				
	Goal					
	Proficient					
Hispanic	Advanced		11	18	13	5
	Goal	31	44	27	37	26
	Proficient	69	77	58	62	72
White	Advanced		45	41	48	41
	Goal	71	78	72	75	74
	Proficient	94	95	93	92	95
Female	Advanced		40	36	43	33
	Goal	61	70	64	69	67
	Proficient	89	92	88	91	92
Male	Advanced		43	42	43	38
	Goal	72	75	70	70	63
	Proficient	92	92	89	85	90
Special Education	Advanced		14	11	12	6
	Goal	27	36	31	25	21
	Proficient	73	69	66	56	65
English Language Learners	Advanced	The number of students in this subgroup is insufficient for reporting purposes.				
	Goal					
	Proficient					
Free or Reduced Lunch	Advanced		4	9	6	3
	Goal	18	24	20	31	22
	Proficient	70	60	56	51	71

Table 5: Scholastic Assessment Test 1 Mathematics

	01-02	02-03	03-04	04-05	05-06
% of Graduates Tested	93%	92%	88%	91%	90%
Mean Score	567	571	576	586	582

Table 6: Advanced Placement Mathematics

		01-02	02-03	03-04	04-05	05-06
Calc AB	# Tested	54	55	60	65	95
	Mean Score	4.5	3.3	3.5	4.0	4.0
Calc BC	# Tested	19	39	26	27	40
	Mean Score	3.6	4.7	4.6	4.6	4.7
Statistics	# Tested	10	24	23	38	40
	Mean Score	3.0	4.2	3.9	3.6	3.5

Table 7: Eighth Graders Enrolled in Algebra I or Honors Geometry

	02-03	03-04	04-05	05-06	06-07
% of Eighth Graders	38%	37%	41%	36%	40%

Table 8: Change in CMT Mathematics Level Grades 5 – 8

	Fall 2003 or Fall 2004					
Spring 2006	Advanced	Goal	Proficient	Basic	Below Basic	Total
Advanced	589	399	16	2		1006
Goal	117	469	132	14	7	739
Proficient	3	91	137	51	15	297
Basic		6	35	33	19	93
Below Basic		1	4	15	40	60
Total	709	966	324	115	81	2195

Up One or More Levels	30%
Same Level	58%
Down One or More Levels	12%

Percentage of Students Tested in Spring 2006 **and** in Fall 2003 / Fall 2004	84%

	03 / 04	06
Advanced	32.3%	45.8%
Goal	44.0%	33.7%
Proficient	14.8%	13.5%
Basic	5.2%	4.2%
Below Basic	3.7%	2.7%