



RAISING MATH ACHIEVEMENT IN NEW YORK?

A REVIEW OF THE NEW YORK STATE MATH STANDARDS COMMITTEE REPORT FOR PRE-KINDERGARTEN THROUGH GRADE 8

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INTRODUCTION

The Math Standards Committee’s report currently before the Board of Regents that recommends a complete overhaul of math standards in New York is the product of a recommendations made by the Independent Math A Panel, a group formed in 2003 to investigate the high failure rate by students statewide on the Math A Regents Exam.¹ New York State Commissioner of Education, Richard P. Mills, directed the Math Standards Committee to “examine the existing Regents standards in mathematics” and to “propose modifications to the Regents mathematics standards to improve clarity, specificity, and functionality.”²

Unfortunately, it took a high failure rate by students on the state’s math exams to prompt New York to reexamine its math standards and to seemingly recognize that a complete overhaul was needed.

Math achievement for the State has remained abysmal on the National Assessment of Educational Progress (NAEP), commonly referred to as the “The Nation’s Report Card.” In the four times the 4th-grade exam has been administered since 1992 and the five times the 8th-grade exam has been administered since 1990, the percent of New York students failing (performing below proficient) the test has consistently remained above 66 percent.³ Failure rates for racial minorities evidence an alarming achievement gap: for the 4th-grade NAEP exams administered in 2003, 89 percent of African-American students failed, 85 percent of Hispanic students failed, and 55

¹ Several members of the original Panel were appointed to the Mathematics Standards Committee.

² Mathematics Standards Committee, *Report to the New York State Commissioner of Education* (November 4, 2004), p. 3, www.regents.nysed.gov/2004Meetings/November2004/1104brd4.htm.

³ National Center for Educational Statistics, *State Mathematics 2003 Snapshot Report, New York, Grade 4*, <http://nces.ed.gov/nationsreportcard/pdf/stt2003/2004457NY4.pdf> and *State Mathematics 2003 Snapshot Report, New York, Grade 8*, <http://nces.ed.gov/nationsreportcard/pdf/stt2003/2004457NY8.pdf>.

percent of White students failed. On the 8th-grade exams, failure rates were 90 percent for African-American students, 84 percent for Hispanic students, and 56 percent for White students. Students qualifying for the federal free or reduced-priced meals program failed at a rate of 81 percent in 4th grade and 85 percent in 8th grade.

New York has not fared well on national tests, and these results indicate that major problems have persisted for well more than a decade.

The recognition by the State Education Department that New York's math standards need to be improved also is bolstered by a new review of the current standards that gives New York an overall grade of "C" on its math standards and notes several weaknesses, including ambiguous standards that fail to clearly indicate what students are expected to know, a premature introduction of calculators in elementary level grades, and too much redundancy in content from year to year.⁴

On November 4, 2004, the Math Standards Committee released the *Math Standards Committee Report to the New York State Commissioner of Education* recommending sweeping reforms to mathematics instruction in New York. Following the release of the November report, the Committee received feedback from the field and released an addendum on January 5, 2005. (The page number references contained herein refer to the recommendations made in the Committee's November report.)

The recommendations generally – and in some places significantly – move the state in the right direction, but the Math Standards Committee fell short in a number of areas that are key to ensuring the mathematical competency of New York's students.

The Committee's praiseworthy recommendations include the development of detailed grade-by-grade math learning standards, realigning content among grades to promote deeper, more

⁴ More specifically, the report gave New York's math standards a "D" for clarity, "C" for content, and a "C" for mathematical reasoning, (David Klein, *The State of Math Standards 2005*, Thomas B. Fordham Foundation (January 2005), p. 87, www.edexcellence.net/doc/mathstandards05FINAL.pdf).

meaningful study, and clarifying the language of the standards to remove any ambiguity of what is expected of students. All of these are likely to improve the quality of math instruction in New York. Other recommendations by the Committee, however, are likely to weaken the current quality of math instruction in New York. These include delaying the math exams in grades 3-8 that are required under the landmark federal *No Child Left Behind* Act, overemphasizing the use of calculators in the primary grades, and weakening high school graduation requirements by shuffling the content of Regents math courses and requiring students to only pass a one-year Regents course on algebra for graduation.

On Tuesday, January 11, 2005, the Board of Regents is scheduled to vote on whether to accept the Committee's recommended reforms for math learning standards for pre-kindergarten through 8th grade. The Committee plans to finalize its recommendations for high school grades over the following few weeks, allowing the Board of Regents to review and take action on these proposed revisions at its mid-February meeting.

This report presents an analysis of strengths and weaknesses of the Math Standards Committee's report for pre-kindergarten through 8th grade.⁵

⁵ The review does not include an analysis of content of the hundreds of grade-by-grade learning standards or the strengths or weaknesses of these individual standards.

POSITIVE RECOMMENDATIONS OF THE NEW YORK STATE MATHEMATICS STANDARDS COMMITTEE

The Math Standards Committee has made a number of recommendations that, if properly implemented, will work to improve math instruction in New York. These include the following:

- ***Establishes Grade-by-Grade Curriculum:*** Instead of grade-specific requirements detailing what teachers are expected to teach and students are expected to know, New York currently uses learning standards that are grouped into three general levels – Elementary (intended for grades K-4), Intermediate (grades 5-8) and Commencement (grades 9-12) – which are then supplemented with a “core curriculum” grouped by grade-level clusters for Elementary (PK-K, 1-2, 3-4) and Intermediate (5-6, 7-8) levels and by Regents courses for Commencement level (Math A and Math B).⁶ The Committee recognized the problems of this approach, and noted a need for a grade-by-grade curriculum, in part to be used for test development (p. 4). (As part of the landmark federal *No Child Left Behind* Act, all New York students will be tested annually in mathematics in grades 3-8 beginning in the 2005-06 school year. New York’s current assessment system only tests students twice in these grades, 4 and 8.)

The Committee provided a list of grade-by-grade content and performance standards covering grades pre-kindergarten through high school. Providing detailed content for each grade in this manner will newly enable teachers to be held more accountable for student performance towards these standards and will offer parents and students clear expectations for what students should learn over the course of a school year. Now, the content tested on

⁶ State Education Department, *Mathematics Resource Guide with Core Curriculum* (Albany, NY: 1999), www.emsc.nysed.gov/ciai/mst/mrg.html.

annual state assessments in grades 3-8 should be aligned to reflect the revised standards so that the tests will reflect what students are expected to know.

- ***Realigns Content to Encourage Greater Depth of Study:*** The Committee’s report notes that the State’s current math standards “include several topics each year, causing teachers and children to jump from topic to topic, with rarely enough time to cover material in any great depth” (p. 5). The Committee claims to have revised and realigned standards that will allow teachers to go into greater depth of each topic. If the implemented math standards are appropriately realigned – and assuming most teachers will have the ability to teach math at a greater depth – this reform should provide greater focus across the State’s math curriculum and increase the depth to which students will be mathematically proficient.
- ***Clarifies Language:*** One of the Committee’s goals was to ensure that “language [is] clear for teachers, parents, and students and test developers, both in terms of the expectations, and in terms of the depth of understanding of each” (p. 5). This is encouraging, as a recent study of state accountability systems found that “[a]cross the board, [New York’s] math standards are generally vague [and] poorly written...”⁷ A brief review of the reworded standards proposed by the Committee shows that in many places these improvements have been made.

⁷ Richard W. Cross, Theodor Rebarber, and Justin Torres, *Grading the System: The Guide to State Standards, Tests, and Accountability Policies*, Thomas B. Fordham Foundation (January 2004), p. 26, www.edexcellence.net/doc/GradingtheSystems.pdf. The Fordham Foundation study also found that “New York’s math standards place greater emphasis on thinking, writing, and talking about math—so-called ‘math chat’—than on actual performance, and do not cover important topics in anything like a comprehensive manner...” The study rated New York’s standards a 2 out of a possible 5 (defined as “poor”).

WEAK OR PROBLEMATIC RECOMMENDATIONS

The Mathematics Standards Committee has made a number of recommendations that will weaken the state's approach to math instruction. These include the following:

- ***Recommends Delay in Math Exams Required by NCLB:*** Under the federal *No Child Left Behind* Act, New York is required to begin providing annual assessments in and mathematics for grades 3-8 beginning in the 2005-06 school year. But the Committee “recommends that the State Education Department consider requesting from the federal government a waiver for a one-year postponement of the NCLB math tests in grades 3-8” to allow the planned slower implementation of the new math standards to guide the content of the new state assessments (p. 10). This would move the first implementation of annual exams from the currently scheduled March 2006 to March 2007.⁸ If the State Education Department is granted a waiver to delay implementing the math standardized exams for grades 3-8, the Committee calls for the first implementation of the revised high school Math A exam in the 2007-08 school year and Math B in the 2008-09 school year. Acknowledging that the granting of such a waiver is unlikely, the Committee recommends that the state math assessment administered in grades 3-8 should not be based on the content in the new standards until March 2007.

There is no need to entertain a delay in accountability of improved instruction simply because of bureaucracy. The Board of Regents can avoid a delay by adopting the

⁸ The state mathematics exams required under NCLB for grades 3-8 are already being developed and will be field tested in 2005. According to the State Education Department, “NYS has recently awarded the contract for development of the ELA and math tests in grades 3-8 to CTB/McGraw-Hill. Work on test specifications and item preparation has begun with committees of teachers from across the state” (State Education Department, *Grade 3-8 ELA and Mathematics Testing Program* (October 2004), <http://emsc33.nysed.gov/osa/3-8testing.htm>).

Committee's recommendations now and requiring the state math assessments administered in March 2006 to be based on the new standards. There is no justification for allowing another class of students to slip by.

- ***Inappropriate Adoption of Performance Standards from National Council of Teachers of Mathematics:*** In an effort to distinguish between content standards (ideas and concepts students should know) and performance standards (processes or skills students should be able to perform), the Committee recommended the adoption of “process stands” written by the National Council of Teachers of Mathematics (NCTM) and aligned the state’s existing standards among the NCTM’s process strands. While this may seem like a worthwhile effort to some, the NCTM’s mathematical philosophies are based on “constructivist” math philosophies that emphasize process and “discovery learning” and is less concerned with competence and correct answers. Instead, students should be expected to memorize basic math facts and fundamental skills and standards should be based on actually solving math problems.

The recommendation to adopt the NCTM’s process strands is alarming, will take New York’s standards in the wrong direction, and should be scraped.

- ***Overemphasis on Use of Calculators:*** In an effort to include technology as a component of the early years of the math curriculum, the Committee recommends the use of four function calculators as an instruction tool for grades K-4 and scientific calculators for grades 5-8, including use of the calculators on extended response questions on state assessments. (The

Committee also recommends the exploratory use of graphing calculators for grades 7-8 and the regular use of them in grades 9-12, including required use on the Regents exams.)

While students obviously ought to learn to use appropriate technology, math instruction in elementary grades should remain focused on students mastering simple arithmetic. As a recent report on state math standards pointed out:

An implicit assumption of most state standards is that students need practice using calculators over a period of years, starting at an early age. Thus, very young children are exposed to these machines in order to achieve familiarity and eventual competence in their use. But anyone can rapidly learn to press the necessary buttons on a calculator. Standards addressing ‘calculator skills’ have no more place in elementary grade standards than do standards addressing skills for dialing telephone numbers.⁹

While the Committee is right to recognize that “the use of technology is an essential part of high quality math instruction,” calculators should not be used until middle-school grades and only after students have mastered arithmetic.¹⁰

The State of California – home to the Silicon Valley and one of the world’s largest technology-based workforces – is commonly recognized as having the best math standards in the country. California doesn’t include the use of calculators in its math standards until 6th grade.¹¹

The emphasis on the use of calculators is worrisome because such measures most often serve as a replacement for requiring students to memorize number facts, especially in the elementary grades, or manually using algebra and plane geometry. The issue becomes one of efficiency, not technology, at the expense of practicing traditional skills and drills,

⁹ David Klein, *The State of Math Standards 2005*, Thomas B. Fordham Foundation (January 2005), p. 15, www.edexcellence.net/doc/mathstandards05FINAL.pdf.

¹⁰ Mathematics Standards Committee, *Addendum to Report to the New York State Commissioner of Education* (January 5, 2005), p. 5, www.regents.nysed.gov/2005Meetings/January%202005/0105bra7.2.pdf.

¹¹ David Klein, *The State of Math Standards 2005*, Thomas B. Fordham Foundation (January 2005), p. 15, www.edexcellence.net/doc/mathstandards05FINAL.pdf.

hand calculations, or mental mathematics. While the Committee notes that “[t]he use of technology should not replace the learning of essential skills,” the additional time required for recommended calculator use will no doubt come at the expense of other math content.

Although the Committee recommends the use of calculators in all grade levels, its report doesn’t include these requirements until 7th grade, leaving teachers with little direction for when calculators are envisioned to be used for instruction in the primary years. In order to provide clear restrictions and guidance for when calculators should be used and in what fashion, specific standards should be developed and incorporated into the proposed middle and high school standards, and should be eliminated from elementary years.

- ***Fails to Define Math Coursework Required to Raise Standards for Teacher***

Preparation/Qualifications: In order for the proposed math standards to have the affect of increasing student achievement, teachers of all grade levels need to be well-qualified and knowledgeable in math. Recognizing that some teachers may not be adequately prepared for math instruction using the proposed new standards, the Committee endorses the recommendation of the now-defunct Independent Math A Panel, which originally recommended an increase in the number of required math courses taken by college students preparing to become teachers and to define the math coursework in these required classes.

While increasing the requirements for new math teachers is a step in the right direction, the recommendations only cite examples of what *could* be required coursework (including calculus, number theory, algebraic structures, probability and statistics) and fails to provide a specific list of coursework that *should* be required (p. 16). It is reasonable to expect that the Committee ought to be able to define what college math coursework teachers ought

to complete successfully in order to be deemed proficient in the content areas of instruction. Instead, however, the Committee calls for more bureaucracy: the creation of “a statewide Committee for the Preparation of Teachers of Mathematics” to examine issues relating to certification and coursework requirements (p. 16).

As for preparing individuals already in the teaching profession, the Committee also simply endorses a recommendation of the Independent Math A Panel to increase professional development requirements and fails to define the content of such coursework. Missing from the recommendation is a requirement that any professional development activities be required to incorporate strategies that are supported with scientifically-based research and that have been proven to increase student achievement. Without such a requirement, there is no guarantee that any professional development will adequately prepare teachers to effectively teach math.

Furthermore, the call for the formation of another committee to be established to examine these issues further leads one to reasonably question the depth of which the Committee examined such issues, the certainty to which it stands by its recommendations, and/or the usefulness of its call for reform in this area.

- ***Offers Pedagogical Guidance in Grade-by-Grade Curriculum Guides:*** The Committee recommends the development of grade-by-grade curriculum guides that include pedagogical suggestions. Differing from the proposed draft standards, these curriculum guides would include “a list of topics to be taught, sample lessons, pedagogical suggestions, and a suggested time frame for each topic” (p. 14).

While the potential exists that these guides may be useful to some teachers, if the current curriculum guides serve as any indicator of what the new advice will be, such guides are likely to be of poor quality and of little practical use. A study of the current math guides finds that “[t]he sample classroom lessons are often little more than puzzles and are poor vehicles for teaching core principles of mathematics,” for example.¹² The review further notes that the pedagogical examples offered are great time-wasters: one recommendation is that “students use the library to research kite history and learn to identify various kinds of kites. They design a particular kind of kite (of geometric shape), construct it, decorate it, and fly it in a contest.” Time spent for 6th-grade math on library research and a kite-flying contest hardly sounds like time well spent.

The Committee and Department should remain focused on what students should know, not trying to tell teachers how to instruct students according to a particular educational pedagogy.

- ***No Sequencing of Content:*** One reason cited by the Committee for the need to revise math standards is to create an appropriate sequence of content that allows for students to build knowledge on existing knowledge. The report notes that “[t]he performance indicators need to be sequenced appropriately across the grades, so that knowledge and skills grow from year to year” (p. 5). This is a good idea, and is the direction New York should take.

Unfortunately, it appears that the Committee’s proposal fails to accomplish this.

The report itself notes that the Committee has in fact *not* sequenced the proposed revised standards:

¹² David Klein, *The State of Math Standards 2005*, Thomas B. Fordham Foundation (January 2005), p. 15, www.edexcellence.net/doc/mathstandards05FINAL.pdf

The Committee wishes to make it clear that the order of presentation of the performance indicators in this draft should not necessarily be read as the order in which topics should be presented during the school year. It is our expectation that the mathematics curriculum committee will develop a curriculum that appropriately sequences each of the performance indicators during the school year. (p. 9)

There is no indication in the Committee's January addendum that this sequencing has yet been accomplished. Before the potential of the proposed new standards can be fully realized, the appropriate sequencing of the content must be completed.

- ***Decrease Math Graduation Requirements:*** The Math Standards Committee recently split its recommendations for reform into a pre-K through 8th-grade package, which is currently before the Board of Regents for action, and a package of high-school reforms due to go before the Regents in February 2005. At least one recommendation in the latter package should be rejected soundly right now, however.

The Committee made a common-sense proposal to realign the content of math courses in high school to provide concentration by discipline, specifically algebra, geometry, and trigonometry. Separating the instructional schedule by specific discipline is designed to allow for greater depth of study in each field and the elimination of redundancy among secondary years. Currently, New York's math Regents exams test student knowledge in all three of these basic high-school level subject areas of algebra, geometry, and trigonometry. To graduate, students are required to pass a tests that cover these three areas.

In its November 2004 report, however, the Math Standards Committee proposed reducing the state's math graduation requirements, eliminating the need for students to be tested in either geometry or trigonometry. Clearly, Commissioner Mills did not have in mind eliminating areas of required subject knowledge as a measure to boost the passage rate by students on state math exams. Rather, students should be required to pass Regents exams in

each of the noted math disciplines, and the Committee's recommendation to do otherwise should be rejected.

CONCLUSION

The Board of Regents should take the following steps in order to increase math achievements in New York:

- ***Adopt Select Committee Recommendations:*** The Board of Regents should adopt the following recommendations made by the Math Standards Committee:
 - Establish a grade-by-grade curriculum that provides improved content and performance standards for mathematics in PK-8 and high school;
 - Realign the content within and among grades to encourage greater depth of study of math topics;
 - Revise the language of math standards to provide teachers with clear statements about what they are expected to teach and what students are expected to learn;
 - Raise standards for teacher preparation/qualifications in order to ensure that all teachers, elementary-level and special education teachers, are highly-qualified.

- ***Extend Time Spent on Math Instruction:*** The amount of time for math instruction should be significantly increased, especially at chronically-low performing schools and for struggling students. This can be done by lengthening or doubling up learning periods for math or by extending the school day and school year.

- ***Adopt Another State's High-Quality Math Standards:*** Instead of wasting further effort, New York could instead adopt the math standards of other states that research has already shown are among the nation's best, including those of California, Massachusetts, and

Indiana. All three of these states received an “A” grade in a new study of state math standards.¹³

¹³ David Klein, *The State of Math Standards 2005*, Thomas B. Fordham Foundation (January 2005), p. 10, www.edexcellence.net/doc/mathstandards05FINAL.pdf.