



January 19, 2007

To: Board of Education
From: Art Rainwater
Subject: Implementation of Superintendent's Goal for Mathematics - REVISION

Background

The Board of Education established four goals for me for the 2006-07 school year. The first goal addresses mathematics and is as follows:

1. **Initiate and complete a comprehensive, independent and neutral review and assessment of the District's K-12 math curriculum.**
 - The review and assessment shall be undertaken by a task force whose members are appointed by the Superintendent and approved by the BOE. Members of the task force shall have math and math education expertise and represent a variety of perspectives regarding math education.
 - The task force shall prepare and present to the BOE a preliminary outline of the review and assessment to be undertaken by the task force. The outline shall, at a minimum, include: (1) analysis of math achievement data for MMSD K-12 students, including analysis of all math sub-tests scores disaggregated by student characteristics and schools; (2) analysis of performance expectations for MMSD K-12 students; (3) an overview of math curricula, including MMSD's math curriculum; (4) a discussion of how to improve MMSD student achievement; and (5) recommendations on measures to evaluate the effectiveness of MMSD's math curriculum. The task force is to present the preliminary outline and a timeline to the BOE for comment and approval.
 - The task force is to prepare a written draft of the review and assessment, consistent with the approved preliminary outline. The draft is to be presented to the BOE for review and comment.
 - The task force is to prepare the final report on the review and assessment.

Spec 1/22/07

I analyzed the methodology required to meet this goal and determined that it could be accomplished best through a partnership with the University of Wisconsin-Madison, utilizing nationally recognized experts from both the University and other venues. The results of the review and assessment have national implications for the continuing search for the best mathematics instruction to meet the needs of all students, including those who need mathematics beyond the normal scope of the high school curriculum, and also those who struggle to master the mathematics content that is increasingly needed for future economic success.

The District has been a partner with the University of Wisconsin-Madison and three other school districts and two other universities in the National Science Foundation's (NSF) comprehensive Math and Science Partnership award SCALE – System Wide Change for All Learners and Educators. SCALE's primary goal is to improve math and science education and professional development for the approximately one million students and forty thousands teachers that it serves. I contacted Dr. Terry Millar, Principal Investigator of the SCALE grant, to determine if there might be interest by the University and the National Science Foundation to fund a partnership to invite nationally recognized experts, including individuals from mathematics, mathematics education and other related disciplines, to participate in the study envisioned by my goal. Dr. Millar, after discussing the issue with the University officials and NSF indicated that there was interest in such a study (although a grant to NSF will have to be submitted and competitively reviewed by the agency).

Subsequently, I met with Dr. Peter Farrell, Provost, Dr. Gary Sandefur, Dean of the College of Letters and Science, Dr. Julie Underwood, Dean of the School of Education, Dr. Adam Gamaron, Director of the Wisconsin Center for Educational Research, Dr. Terry Millar, , Lisa Wachtel, Executive Director of Teaching and Learning (MMSD), and Brian Sniff, Coordinator of Mathematics (MMSD). The purpose of the meeting was to determine the extent of interest of the University in this endeavor and to develop the structure for applying to NSF for the grant, and assuring its oversight if it is awarded. The final decision of the group was to be a leadership team for this process and to develop a working task force.

Current Status

Attached is the early working draft of the charge to the Task Force which will do the actual work of the study. The charge sets forth the expectations for the Task Force in some detail. When a final draft is completed it will be used to prepare the grant request to the National Science Foundation.

It will be necessary for the Board of Education to extend the timeline for this goal beyond the end of the current school year. The current estimate is that the study will take one year from its inception.

Next Steps

The principal investigator for the grant will be identified and possible Task Force members solicited. The nomination of potential members of the Task Force will be submitted to the Leadership Team and the Board of Education for approval based on my recommendation.

The possible types of Task Force members may include but not be limited to:

- Mathematician
- Math Education researcher
- Math education researcher whose research interest is district level mathematics education:
- Math cognitive scientist
- Psychometrician
- K-12 Teacher
- Math Professional Developer
- University teacher education representative
- Education policy expert
- ELL expert
- Individual with Math curriculum implementation experience
- Parent
- MMSD Math Coordinator

The final proposal will be submitted to the National Science Foundation for approval.

Actions needed by the Board of Education

I move that the Board of Education extend the Superintendent's First Goal for the 2006-07 school year relating to a study of the District's mathematics program to include the 2007-08 school year.

DRAFT

Charge to the Task Force on reviewing the District Mathematics Instructional System,
Formation of a Madison Metropolitan School District/ University Partnership
To Advise the Superintendent, and a proposal to NSF for research support

1/17/07

The Madison Metropolitan School District Board of Education has directed the Superintendent to:

Initiate and complete a comprehensive, independent and neutral review and assessment of the District's K-12 math curriculum.

- The review and assessment shall be undertaken by a task force whose members are appointed by the Superintendent and approved by the BOE. Members of the task force shall have math and math education expertise and represent a variety of perspectives regarding math education.
- The task force shall prepare and present to the BOE a preliminary outline of the review and assessment to be undertaken by the task force. The outline shall, at a minimum, include: (1) analysis of math achievement data for MMSD K-12 students, including analysis of all math sub-tests scores disaggregated by student characteristics and schools; (2) analysis of performance expectations for MMSD K-12 students; (3) an overview of math curricula, including MMSD's math curriculum; (4) a discussion of how to improve MMSD student achievement; and (5) recommendations on measures to evaluate the effectiveness of MMSD's math curriculum. The task force is to present the preliminary outline and a timeline to the BOE for comment and approval.
- The task force is to prepare a written draft of the review and assessment, consistent with the approved preliminary outline. The draft is to be presented to the BOE for review and comment.
- The task force is to prepare the final report on the review and assessment.

Mission of the Task Force

The Task Force will address the minimum requirements specified in the second bullet above. The Task Force also will review and assess the entire mathematics instructional system of the district, with particular emphasis on features of that system that are key to the learning and advancement of all students. The Task Force will gather evidence and make recommendations in ways that are both objective and responsive to the wishes of the BOE and the community. The goal is to fulfill the charge of the BOE while promoting inclusiveness in the process.

Charge to the Task Force

Following are details of the charge to the Task Force under the second bullet of the Board's directive, above. The detailed tasks are listed under the four topics that the Board specified as the minimum outline of "the review and assessment to be undertaken by the task force." The four Board topics (in effect, task requirements) are reproduced below in italics, followed by a listing and discussion of the detailed tasks recommended to implement these requirements.

(1) "analysis of math achievement data for MMSD K-12 students, including analysis of all math sub-tests scores disaggregated by student characteristics and schools"

Presumably the purpose of the "analysis of math achievement data for MMSD K-12 students" is to examine the relative success of Madison students. Kurt Kiefer of the MMSD research department and others in the district should advise on how best to accomplish this task. A good start would be a basic indicator report, e.g., average scale scores on the WKCE by grade over time compared with the state average and performance benchmarks (proficient, etc.). Similar longitudinal trend lines could then be built for sub-groups of students (e.g., percentile groups on the state test, African American, Latino, poor). The basic analysis should then be extended by some form of value added analysis (simple gain scores or otherwise) for the same groups and sub-groups. One purpose of the value-added analysis should be controlling for changes over time in the demographic characteristics of Madison students. For example, it is conceptually possible that value-added per student improved while average scores remained flat because the average pre-test scores of students have declined from year to year.

The study should look at the distribution of student achievement within the district, paying attention to the tails of the distribution in comparison with the nation and achievement in other countries.

It is not clear what purpose is intended for the "analysis of math sub-test scores disaggregated by student characteristics and schools." A literal response would be to create tables by district, school, sub-group (demographic?), of overall scores and sub-tests on the WKCE. The challenge is how to make sense and interpret such a mass of raw data. Causal or evaluative conclusions drawn from the association of scores on sub-items with schools or sub-groups could be frustrated by several factors, such as covariation (e.g., with demographic characteristics of students), small cell sizes, and lack of standards for evaluation. The Task Force should consider developing more specific research questions. Perhaps the BOE can provide guidance.

(2) "analysis of performance expectations for MMSD K-12 students"

The Task Force will need to decide how to define "performance expectations." Possibilities include:

1. the Board policy of all students completing Algebra by 9th grade and Geometry by 10th grade
2. the Board policy of 94% attendance as it affects expectations for mathematics
3. the Educational Framework as a statement of mission and strategy, including how the three elements of learning, engagement, and relationships affect expectations for mathematics
4. the District policy of differentiated instruction and how it affects expectations for mathematics
5. the mathematics courses required by the State and District for high school graduation
6. the opportunities for students in the district to go beyond minimum requirements (and the ease and frequency of doing so)

7. the expectations for students contained in state standards, district instructional guides, state performance standards, state assessments (the WKCE), and other forms of district instructional guidance (for example, the standards-based report card)
8. the expectations of various groups within the community
9. official or consensus policies in the district such as that all mathematics instruction should aim for a balance of computational fluency and depth of understanding

(3) "an overview of math curricula, including MMSD's math curriculum"

The overview should include:

1. a concise description and overview of standards-based and other mathematics curricula nationally, outlining similarities and differences
2. a description of the mathematics curricula being taught in MMSD, noting similarities and differences with national models;
3. a summary of the best and most objective national studies on mathematics curricula, including a summary of the research methodologies used in those studies and any limitations associated with those methodologies
4. a summary of studies of the impact of various mathematics curricula on student qualifications and competitiveness in higher education
5. information on successful efforts nationally to supplement and strengthen mathematics curricula, meet the concerns of communities and critics, and meet the needs of any sub-groups of students who are underserved by all or specific curricula.

(4) "a discussion of how to improve MMSD student achievement"

This task should include but go beyond curricula to include other important influences on student achievement, such as professional development, monitoring (e.g., classroom assessments), and accountability:

1. a review of the current instructional system in mathematics in MMSD, including curriculum, pedagogy, professional development, monitoring, and accountability, together with an assessment of the Madison approach, its strengths and weaknesses, in light of broader research findings on more and less effective instructional policies and practices
2. steps already taken and planned by the district to strengthen the quality of the mathematics curricula
3. steps already taken by the district to strengthen the quality of other components of the mathematics instructional system
4. additional options that could be adopted for improving student achievement, meeting the concerns of the BOE and the community, and meeting the needs of sub-groups of students

(5) "recommendations on measures to evaluate the effectiveness of MMSD's math curriculum and math instructional system"

These should include:

1. descriptions and analysis of any evaluations of mathematics curricula in Madison that are in progress or have already been completed

2. options for evaluating the impact of mathematics curricula in Madison, including "value-added" and the "gold standard" of randomized controlled experiments
3. data and information on the quality and of mathematics instruction in MMSD (the "enacted curriculum"), and the equity of the distribution of instructional quality, preferably from a reliable measurement of instructional quality such as the Survey of Enacted Curriculum (SEC)
4. descriptions and analysis of any evaluations of other components of the math instructional system that are in progress or have already been completed
5. options for evaluating the impact of the other components of the math instructional system in Madison, including some version of "value-added"

Partnership Committee and Proposal to the NSF

A Partnership Committee of the university and the school district shall be formed to provide the Superintendent with advice on the composition of the Task Force, and to help the Superintendent review preliminary findings and the final report. The Committee shall be chaired by an expert in mathematics curriculum and instruction and shall include from the university the Provost, Dean of Arts and Science, Dean of Education, and a former chair of the Mathematics Department and, from the district, the Executive Director of Teaching and Learning, and the district Mathematics Coordinator.

The Partnership Committee will develop and submit a proposal to the National Science Foundation to support the Task Force in developing the evidence base addressing the questions outlined above and other questions within the mission. In addition, the proposal will seek support for a case study of the committee and task force processes and related developments in the district and community. The case study will be published as a research report of SCALE, a national Math-Science partnership funded by NSF headquartered at UW, and will be conducted by the SCALE research and evaluation team.