

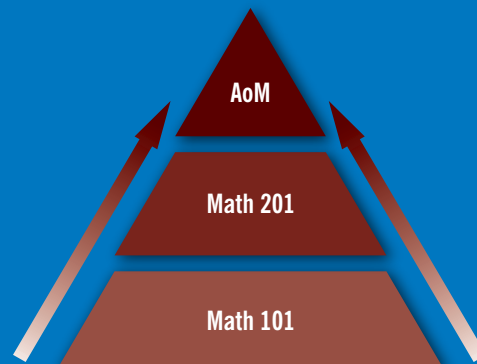
EVALUATION BRIEF

IMPACT OF REVISED STANDARDS-BASED MATHEMATICS COURSES 2006-07 AND 2007-08

Revised standards-based mathematics courses build on one another: Math 101 is foundational in nature; Math 201 is focused on deep content knowledge; the Academy of Mathematics examines subject-matter expertise in the context of classroom practice.

WHY MATHEMATICS COURSES WERE REVISED

The need to understand and use mathematics in everyday life and in the workplace has never been greater, and this realization has led to more focused and sustained efforts to improve school mathematics curricula. Restructuring of standards-based mathematics courses was influenced by research and best practices evidence from combinations of written curriculum and standards-based learning environments. In addition, lessons were learned from highly successful methods such as Japanese *lesson study* and instructional strategies such as *asset-based instruction*, developed by Boston Public Schools. Using these resources to re-design mathematics courses at the Schultz Center ensures that layers of support and interaction are part of new professional development courses. Features of asset-based mathematics instruction include recognizing students' strengths, and helping students to think about and plan for their educational growth. The same considerations govern how training is conducted with teachers, including the use of support layers and interaction provided with mathematics instructional coaches. The use of coaches is intended to help teachers implement knowledge, skills, and practices learned from professional development experiences as they are integrated into classroom instruction.



COURSE EVALUATION AND PROCEDURE

The first course in the mathematics program to be revised was Mathematics 101. It represented new understandings about the learning needs of students, and the needs of teachers to improve and enhance their teaching practice. In the spring of 2007, a survey was used to measure aspects of both content knowledge and implementation at a single point in time. Because capturing *pre-test* data individually from all participants can be problematic, a method called the *retrospective pre-test post-test design* was used to gain participant perspectives about the degree to which their learning of knowledge and skills and implementation of practices had changed prior to and following the training. The graphic at right indicates some of the survey findings:

Another group of important items on the survey measured teachers' responses to questions about using *Mathematics Workshop Model* artifacts in their classrooms. **After training, participants reported using artifacts in their classrooms at 86.5%, an increase of 21.6%. The level of reported use in classrooms of Rituals & Routines was 96.2% following the training, an increase of 23.2%.** The survey also inquired into characteristics of school-based professional development opportunities. As a whole, 64% of teachers completing Math 101 reported positive features of a professional learning environment present currently in the schools they represented.

THE ACADEMY OF MATHEMATICS (AOM) EXPERIENCE

The Academy of Mathematics (AoM) was designed to combine characteristics of *asset-based instruction*, reflective teaching and learning, and principles of Stigler's *lesson study* into a program keenly focused on how students learn. The AoM was delivered via face-to-face group participation, and the use of state-of-the-art video streaming technology that allowed teachers to "virtually" observe in their colleagues' classrooms. Reflections forms were collected from all participants attending in the spring of 2007, fall of 2007, and spring

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2007 MATHEMATICS 101 PARTICIPANT SURVEY

Four areas were addressed: Understanding of Concepts and Skills; Implementation of Concepts and Skills; Artifacts, Rituals & Routines; and Reflections of Professional Development Opportunities.

- 🌟 overall high level responses to knowledge items was 90%
- 🌟 overall high level responses to implementation items was 87%
- 🌟 percentage increase to "high" degree of knowledge was 73%
- 🌟 percentage increase to "high" degree of implementation was 67%
- 🌟 increases in implementation lagged somewhat behind increases in knowledge and understanding



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of 2008 (N=394). Narrative feedback was provided from participants, organized by the positive or negative slant on the information given, and arranged in categories according to topic. Findings from the Reflections content analysis included:

- teachers liked the neutral vehicle afforded them for observing and discussing instruction around video streamed lessons
- teachers felt more capable of identifying key characteristics associated with *Mathematics Workshop Model* lesson components after AoM
- video streaming was enthusiastically received as an opportunity to observe in actual classroom settings

Surveys of AoM participants were conducted, and some highlights of the AoM survey are provided at right:

The most difficult aspect of the AoM experience for participants to achieve was completing the *Task and Transfer* activity. This exercise documented the use of new strategies and pedagogy learned through AoM, and was instrumental in determining the extent to which teachers were implementing new skills and strategies into classroom practice.

STUDENT IMPACT OF REVISED MATHEMATICS COURSES

After two years of implementing revised standards-based mathematics courses, the extent of positive student achievement outcomes in targeted areas was assessed. Our *theory of action* at the Schultz Center holds that if we provide teachers with sustained, high quality professional learning experiences, we can expect classroom practice will be enhanced, and therefore, student achievement improved.

We analyzed student performance by identifying students of mathematics teachers in school year (2007-08), and determining the amount of standards-based mathematics training (SBMT) those teachers had completed. We then determined whether student FCAT gains differed on the basis of how much mathematics professional development teachers had completed over the past two years (2006-07 and 2007-08). Time devoted to mathematics training was categorized into three groupings: 0-1 days, 2-10 days, and 11-20 days. The graph at right illustrates our findings:

The time period included in this impact study was brief (two years), during which time teachers had opportunities to participate in revised mathematics training. The maximum number of hours of professional development taken by math teachers as of the end of 2007-08 was approximately 120. A total of 605 teachers were identified as teaching mathematics courses for students in grades 4-10 (students for whom two years' of FCAT test data would be available for comparison purposes).

Results of the student impact analysis indicated that mathematics training had an impact on all teachers, and that discernible results in student achievement could be determined for increasing days of teacher time spent in training. Although statistically significant, we acknowledge that the actual differences in these score levels are small. However, at this early stage in our work, we were interested first in confirming that the direction and pattern of increasing student scores by increasing mathematics professional development was verified. In the following years, the impact on student achievement will be expected to increase as more teachers are completing more courses in mathematics training, and are able to go deeper into the work.

AOM PARTICIPANT SURVEY DETAILS

(80%) found video streaming to be an essential part of the AoM experience. Additionally, two-thirds of participants found the Blackboard online discussion board helpful. Other highlights included:

- 85% identified modeling of effective questioning strategies
- 81% listed learning more about looking at student work, and
- 80% identified the use of higher levels of questions to guide instruction as most valuable

Teachers list the following as areas in which they most need more opportunities to view and discuss teaching practice:

- 64% want to learn more about developing and using classroom assessments
- 63% want to see more examples of differentiated instruction in lessons
- 62% request more opportunities to view student work that address standards

