

Classroom Success with a Standards-based Mathematics Curriculum

**Sherleen McKinney and Michelle Blasdel
Bartholomew Consolidated School Corporation**

Monthly teacher training on Saturdays, required e-mail conversations with the instructors and monthly grade-level meetings. Would teachers volunteer to add these activities to their busy schedules? BCSC elementary teachers answered “Absolutely.”

Participation in the Math-Science Partnership Grant

Bartholomew Consolidated School Corporation (BCSC) is one of the nine districts involved in the Indiana University/NSF Math Science Partnership grant. Beginning in 2002, teachers of grades 2 and 5 were invited to participate in workshops focused on standards-based math programs, content knowledge, and leadership skills. The second year the opportunity was offered to teachers of grades 3 and 4. Volunteers were selected on a basis of 15% of teachers at each grade level in each district.

Teachers in BCSC were quick to volunteer. Many teachers felt that the traditional math program that was being used in the elementary schools of the district was not providing instruction consistent with the standards epitomized in the *Principles and Standards for School Mathematics* (2000) prepared by the National Council of Teachers of Mathematics. This document presents a vision of mathematics classrooms in which:

the curriculum is mathematically rich, offering students opportunities to learn important mathematical concepts and procedures with understanding. . . . Teachers help students make, refine, and explore conjectures on the basis of evidence and use a variety of reasoning and proof techniques to confirm or disprove those conjectures. Students are flexible and reasonable problem solvers. (p.3, italics in original)

Through the establishment by the Indiana Mathematics Initiative (IMI) of the select cadre, consisting of one or two teachers from each grade level K–6 from each participating district, the training was focused on developing and demonstrating leadership. Participation in project-wide meetings several times a year provided opportunities for select cadre members to grow as teachers and to network with others throughout the state. Afterwards, cadre members were expected to share the knowledge gained with other teachers in their districts. This allowed more teachers to benefit from the experiences and for the select cadre members to reinforce what they had learned. Thus, leadership skills have been developed. Teachers usually are comfortable presenting a lesson to a group of children. However, standing before a group of adults will send shivers down their spines. Members of the cadre became teacher-leaders within their own districts and beyond, providing workshops, working as mentors to teachers who had not received the IMI training, and providing assistance as needed.

A Partial Implementation of a Standards-based Math Program

In 2004, the views of teachers and administrators in BCSC who had received professional development in the standards-based curriculum from IMI did not prevail in textbook adoption. Most of the teachers voted to adopt the traditional Houghton-Mifflin math textbook, although IMI-trained teachers were given the opportunity to use an alternative standards-based program, *Math Expressions*.

So again, we queried the IMI-trained cohort. Monthly teacher training on Saturdays required e-mail conversations with the instructors and would involve monthly grade-level meetings. Would teachers volunteer to add these activities to their busy schedules?

Teachers in the Bartholomew Consolidated School Cooperation who chose to teach with *Math Expressions* did agree to participate in these activities. During the first year that teachers used the *Math Expressions* program, they benefited from in-depth coaching by experts that allowed them to understand the program and why the components were important to children developing the ability to succeed in learning math. With the implementation of the *Math Expressions* program, make up sessions were scheduled for teachers unable to attend the Saturday sessions. Leading these sessions was another chance for teachers in the district to develop leadership skills.

When lessons were not successful, teachers were able to contact their Chicago-based trainers, teachers who were experienced in the classroom use of *Math Expressions*. It was possible, as well, to talk with other teachers in the district to compare notes and receive advice. During the training, many teachers, the authors included, commented that although they/we had taught math for many years, for the first time math concepts that had been obscure now made sense. We learned that teaching for understanding benefits both teachers and students.

Monthly grade-level meetings were held, and they provided a forum for teachers to support each other. These meetings also provided an opportunity to discuss aspects of the program that worked, as well as those that failed to meet expectations and needed attention. Teachers looked forward to the sharing of ideas to enrich and reinforce what was being taught. The camaraderie and support of the grade-level meetings were valued by those participating, and the meetings continued after funding expired.

In BCSC the standards-based math program is not used by all elementary teachers in the school corporation. In order to reach more teachers and bring them on board, a voluntary series of “Theory into Practice” workshops was initiated. Led by Dale Nowlin, IMI District Coordinator and Math Supervisor, teachers met monthly during the 2007–2008 school year to read and discuss articles related to the NCTM Process Standards (2000). (See “Building a Professional Learning Community through Text Protocols” by Dale Nowlin, (<http://www.indiana.edu/~iucme/perspectives/14nowlin.pdf>) included in this volume.)

The teachers participating in these workshops were provided the option of meeting after school or during release time. There was very good enrollment and attendance, and many more teachers became aware of the process standards—problem solving, reasoning and proof, connections, communication, and representation—and how they are emphasized in standards-based math programs.

In May 2008, interested teachers were invited to visit a standards-based classroom. Teachers who chose to visit were impressed with the level of participation of the students, that is, surprised that indeed all students were engaged and participating in activities and discussions throughout the math lessons.

Articulation of the Standards-based Curriculum with State Tests

State testing often appears to be the guiding force behind education today. Funding from the Indiana Math Initiative made it possible for teachers using the standards-based curriculum to participate in four after-school sessions of an “ISTEP Academy.” Topics included areas of math covered on the yearly Indiana state tests (the Indiana Statewide Testing for Educational Progress, or ISTEP) in grades 3–6: Algebra and Functions, Computation, Number Sense, and Geometry/Measurement. Led by IMI consultant Donna McLeish, teachers from grades 1 through 6 attended, as well as special education teachers who often worked with multiple-grade-level students. The focus was on helping students understand the concepts on which they would be tested, and teachers worked sample problems and discussed rubrics appropriate to the grade levels they taught. Shorter versions of the “ISTEP Academy” were provided for individual schools who wanted their entire staff to learn these concepts. IMI-trained teacher leaders were instrumental in presenting these sessions.

Release time for articulation work was provided through IMI funds. Two teachers from each grade level spent two days analyzing the *Math Expressions* textbook to determine when standards were expected to be mastered, providing an ISTEP-type problem for each standard. We believe that articulation materials of this sort are extremely valuable in enabling teachers and administrators to be confident that the classroom experiences are in fact preparing students to succeed on the ISTEP tests. Copies of this work were distributed to teachers throughout the corporation.

Classroom Opportunities Offered by the *Math Expressions* Program

Teaching mathematics using the *Math Expressions* program allows students and teachers to use inquiry, problem solving, and communication skills throughout the school day. This transfers to real-life situations that students will encounter in their daily living. The “Building Concepts”¹ section helps meet those needs. One student’s family was building a house, and he had many “Ah Ha” moments in which he could see the relevance of what we were doing in mathematics class with the building of his house.

“Quick Practice”² is always a great way to begin math class. Students become more engaged when beginning with a routine that they are comfortable with, understand, and enjoy.

“Math Talk”³ started out in the beginning of the year and consisted of small group discussions of mathematical concepts and methods. The activity is based on the premise that students learn by articulating their thoughts and by listening to others. The small group setting helped students become comfortable sharing their strategies and answering questions. It was great watching and listening to the students share with one another.

Using the white boards and journals helped strengthen students’ ability to explain their reasoning process, which they will need to do when taking the ISTEP. For their journal entries, students were given the individual writing prompt appropriate for their learning from the “Differentiated Instruction”⁴ page.

¹ Building Concepts: encourages children to relate mathematical concepts to real-life situations

² Quick Practice: provides daily a few math problems reviewing previous concepts

³ Math Talk: allows children to develop and share their own mathematical thinking, listen carefully to the mathematical ideas of others and state them in their own terms, and ask questions about and provide insights into the mathematical ideas of others

⁴ Differentiated Instruction: provides activities at different ability levels that reinforce the concept being taught

Every Friday was “Show What You Know.” Students would be grouped by ability, then given problems to solve from the “Differentiated Instruction” page. They would solve the problem together within their group. During the last part of the hour, students would move to a mixed ability group and show how they solved their math problems.

We became better teachers by allowing students to be actively involved and to lead during math class. The students became teachers for one another by putting what they knew into vocabulary that they understood. It helped us to better understand how they worked through the process of learning math.

Parental Response to the *Math Expressions* Program

The language used in a classroom where a standards-based mathematics program has been adopted is different than the language used in a classroom with a traditional mathematics program. In the former, the focus is on the mathematical processes that the students use, along with their explanations and justifications, rather than solely on the end result. These concepts may be unexpected and perhaps even confusing to parents who are unfamiliar with a standards-based program. Many teachers in our corporation invited parents to attend after-school meetings to learn about math classes where process is emphasized. Parents who were unfamiliar with the program flocked to school to find out more. Their children came too and went through model lessons to show their parents how they were learning math. The parents were amazed that this was not the math they remembered, but that it certainly was working. Their children understood the mathematics that they were learning. The math anxiety that many adults suffer from is non-existent with these students.

A Lasting Impact

The Indiana Mathematics Initiative has provided in-depth training and support to a group of Indiana teachers who teach standards-based math. However, the biggest beneficiaries are the children of Indiana in their classes. They are being taught by teachers who encourage them to analyze their work, value alternative algorithms, and take ownership of their learning. These children are taught in classrooms in which all levels of children are valued as learners with important contributions to make. They, in turn, respond by being engaged in the task at hand, supporting each other and viewing themselves as budding mathematicians with a great deal to say about their work.

References

- National Council of Teachers of Mathematics. (2000) *Principles and Standards for School Mathematics*. <http://standards.nctm.org/document/chapter1/index.htm>
- NCTM. (2000) *Principles and Standards for School Mathematics*. For process standards, see Appendix, Table of Standards and Expectations: <http://standards.nctm.org/document/appendix/process.htm>

Contact info.: Sherleen McKinney and Michelle Blasdel
Bartholomew Consolidated School Corporation
Southside Elementary School
1320 W. 200 S.
Columbus, IN 47201
mckinneys@bcsc.k12.in.us
mblasdel@bcsc.k12.in.us