A New Approach to Math in the MIDDLE
Programs like the Connected Mathematics Project emphasize concepts and problem-solving.

Paul Lowe

I’m a former math and science teacher, now principal of a Vermont middle school. During the past six years, I have worked in three middle schools, each of which had adopted the same new math program—Connected Mathematics Project (CMP)—shortly before my arrival. Curious about this coincidence, I discovered that all three schools had made their decisions for the same reason: They were seeking a program that had documented success in teaching math concepts and problem-solving.

Over the past year, events in my school and subsequent research have drawn me into discussions with teachers, administrators, and others about the strengths and weaknesses of some of the new approaches to teaching math. I’m not writing as an expert in math instruction but as a principal whose goal is to improve learning for all students. If I refer often to Connected Math, it is only because it happened to be a catalyst for me. In most cases where I mention CMP, you could substitute any of several similar programs, such as Mathscape, Math Thematics, and Mathematics in Context. It is not my intention to fuel arguments for or against CMP or any other approach to teaching math.
What I hope to do is stimulate thinking and more discussion.

Some relevant background: CMP is one of several math curricula whose development was funded by the National Science Foundation (NSF) in the early 1990s. This effort was prompted by several studies, including data from the National Assessment of Educational Progress, which indicated that American children, while reasonably proficient in arithmetic, performed relatively poorly in mathematics problem-solving and understanding of concepts.

A team at Michigan State University developed the materials that became CMP. It and similar programs subsequently were described in a report by the University of Washington as “…representing the new thrust in American mathematical education of inquiry-based, discovery-based, and student-centered learning…” (Adams 2000).

CMP is designed as a three-year program of 24 thematic units for grades 6-8, covering the content goals of Number, Geometry, Measurement, Algebra, Statistics, and Probability. Process goals, drawn directly from standards established by the National Council of Teachers of Mathematics (1989) include Problem-Solving, Communication, Reasoning and Connections, plus nine subordinate goals (Lappan et al. 1996). Each unit addresses several goals through one or more extended problems.

There is substantial research indicating that CMP and programs like it can and do work in terms of producing measurable learning even among heterogeneously-grouped students (AAAS 1999). Given this evidence, I’m surprised that more schools haven’t adopted these programs. How could you go wrong?

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How You Might Go Wrong

After working in three schools with good teachers who have used CMP, and from conversations with others familiar with it, the consensus is that it has many strong points but that it presents challenges, especially in four areas.

1. **It presents language difficulties.** In strengthening students’ understanding of concepts and ability to solve problems, CMP relies on language—in texts, instruction, and desired student responses. This can pose problems for students with weaknesses in language reception or expression. As a principal who emphasizes literacy instruction across the curriculum, I see the impact this kind of approach has on the significant number of students whose reading levels are below where they should be.

2. **It’s very different.** For many teachers, the required pedagogy, assessment, and classroom management are poles apart from that for which most of them have trained. One of the biggest challenges to successfully teaching in any discovery-based classroom is simply managing students within groups, so that learning happens and horseplay does not. This is not a trivial matter when dealing with adolescents.

   Students who previously have had traditional instruction in math must change the way they think and talk about math, and what they must do to succeed. They must learn how to ask questions of themselves and peers, develop theories, and think independently. All of these are highly desirable but involve increased risk-taking that may not feel safe in many classrooms.

   Finally, many parents have spoken with me about their inability to help their children with math homework. The problems are far different, as are the integrated topics and concepts. This means students get less help at home, while teachers and schools get more questions from the community.

3. **It requires a lot of time.** While the program’s authors imply that conventional classes of 45 to 50 minutes are long enough to teach CMP properly...
(Lappan et al. 1996), many teachers and trainers have suggested to me that an hour per day is much more realistic. In fact, one school district in Vermont, after making significant investments in materials and staff development, is unable to complete the intended course each year despite spending more than an hour per day on math.

4. **It gives less attention to math skills.** CMP and its sister programs were designed to strengthen two wobbly legs of the mathematics stool—concepts and problem-solving. Many teachers using the program feel that this has been accomplished at the expense of the third leg—training in conventional math skills. While CMP advocates have told me that students get adequate skills work if the program is taught “right,” I have not yet worked with a teacher who didn’t supplement CMP with additional skills instruction.

**What Principals Need to Do**

Based on my own experience and numerous discussions with teachers and others, I have several suggestions for those who may be considering CMP or similar programs.

1. Be clear that these programs are designed to implement a school’s curriculum. They are not complete curricula in themselves. One colleague describes CMP as a skeleton on which to hang whatever other math instruction is needed. Teachers must be willing to adapt and data must be developed that show what is working and what changes are needed in the program and the classroom.

2. Provide the leadership needed to confront and resolve conflicts over the time requirements for math and other programs.

3. Provide resources for teachers, including manipulatives and calculators.

4. Provide qualified coaches or consultants for teachers, especially during the first years of working with the program.
5. Review program implementation and student achievement data on a yearly basis with staff.

6. Ensure that parents, school boards, and others understand the why and how of comprehensive math programs.

7. Do whatever is needed to provide adequate professional development for teachers, and see that the results are used in the classroom.

8. Don’t go back to the “good old days.” As school leaders, you must encourage effective teaching on all three legs of the mathematics stool. Don’t let reluctant teachers, skeptical parents, or enthusiastic salesmen push you in other directions before you have fully adapted and evaluated programs—CMP or any other.

9. Don’t start a math version of the phonics wars. Reading instruction was hurt by arguments over the relative merits of phonics versus whole-language instruction. Don’t take sides for different math programs. Getting results matters; getting credit does not.

10. Make sure that students can move smoothly from elementary to middle to high-school math without major gaps in knowledge or boredom caused by overlaps or different instructional approaches.

11. Don’t give up on your teachers. Some math textbooks and learning systems, perhaps despairing of finding willing or adequately-trained teachers, are designed to be “teacher-proof.” As principals, we must ensure and demonstrate that all students are learning in our schools—and that teachers are the most important factor in making that happen.

I’m asking our four math teachers to work with me this year to identify how we can modify or supplement our CMP program so that every student learns more math. One challenge we face is that, although we have many students with weak math skills and background, we also have an increasing number of very capable students coming from elementary schools that have improved their math programs. How can we teach this range of kids effectively? I’m optimistic that if we adapt, collaborate, and care about every kid’s success as a person and a learner, we can help every student learn more math.

References

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WEB RESOURCES
The Connected Mathematics Project at Michigan State University has its own Web site, providing an overview, curriculum description, implementation information, and resources.

www.math.msu.edu/cmp/

The Show-Me Center at the University of Missouri posts a 2003 project brief describing research on the impact of standards-based middle grades mathematics curricula on student learning.

http://showmecenter.missouri.edu/resources/ResearchBrief.pdf

New York University’s Department of Mathematics reviews evaluations and commentary on Connected Mathematics Project.

http://math.nyu.edu/mfdd/braams/links/cmp.html

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