



Show-Me Center Newsletter

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TEXTBOOKS MATTER!

**Barbara Reys, Director
Show-Me Project**

Textbooks are a highly visible and much-used tool in mathematics classrooms. They help teachers organize and deliver instruction, they serve as a source of problems for students to engage in and apply their knowledge, they provide assessments to monitor student learning, and they communicate to parents, often through homework assignments, what their children are studying. As an education community, we place a great deal of trust in textbooks. So it is vital that teachers and administrators regularly examine the content focus of district-adopted textbooks and the instructional strategies implicit within textbook lessons. Is the content and instructional focus of your district-adopted textbook consistent with your goals for student learning? Does the textbook help teachers engage students in learning important mathematics or does it serve as a road map for passing through a host of isolated topics and procedures that will need to be revisited, yet again, next year?

What is the content focus of middle grade mathematics textbooks used in your school? What are students expected to learn (to know, understand and be able to do)? Are students expected to learn procedures of mathematics? If so, what are these procedures? Are they expected to understand concepts, properties and relationships within mathematics? If so, what are these concepts? NCTM's *Principles and Standards for School*

Mathematics outlines a set of core learning expectations in the middle grades, organized around five content and five process strands. For example, students in the middle grades are expected to develop "computational fluency" with rational numbers. This means more than simply being able to accurately add, subtract, multiply, and divide fractions and decimals. It includes understanding the nature and properties of rational numbers, ability to judge the size of rational numbers, often utilizing benchmarks, and ability to choose and use appropriate and efficient computing techniques. Do the mathematics textbooks in your school help students develop these skills and understandings?

In addition to focusing on significant mathematical content, textbooks should also provide teachers with ideas for delivering that mathematics to students and for engaging students in mathematical thinking. Do the textbooks used in your school help teachers engage students in thinking mathematically? Do they provide problems and activities that challenge students to think, to utilize prior knowledge, to make sense of mathematical situations and then draw upon appropriate tools for solving problems? For example, examine the sequence of lessons in your textbook focused on fractions. Are the materials focused primarily on introducing and



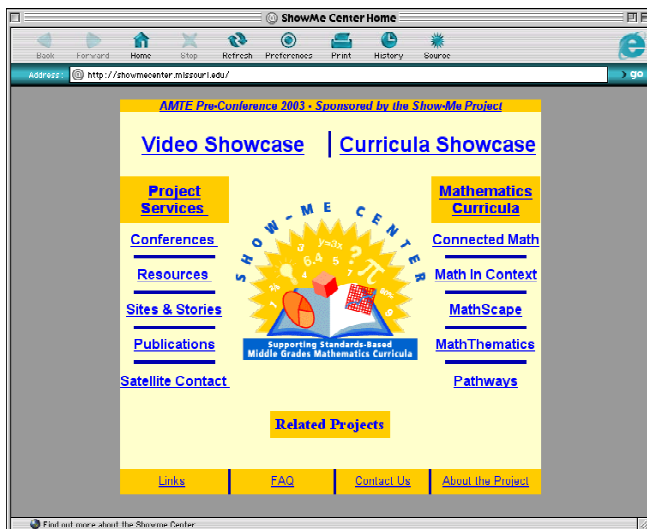
Textbooks Matter! (continued)

“...ask yourself:
What mathematics is being developed?
How engaged are the students?
What will students likely recall from this lesson a few months from now?”

developing standard computational procedures? Do students have ample opportunity to model fractions, to develop multiple methods for judging their relative size, to explore connections between various representations of fractions, to estimate with fractions, and to develop, based on their understandings, efficient and accurate methods for computing with fractions? If your textbook has too narrow a focus on skills, it isn't serving your students (or teachers).

As you begin a new school year, I encourage you to think about the role your textbook plays in providing

opportunities for students in your classroom to develop mathematically – students interested in mathematics, able to formulate and solve problems, and willingness to invest the effort into making sense of mathematical situations. As you use textbook lessons, ask yourself: What mathematics is being developed? How engaged are the students? What will students likely recall from this lesson a few months from now? Textbooks should serve to help teachers help students learn important mathematics, and learn it well. Are your textbooks helping or hindering?

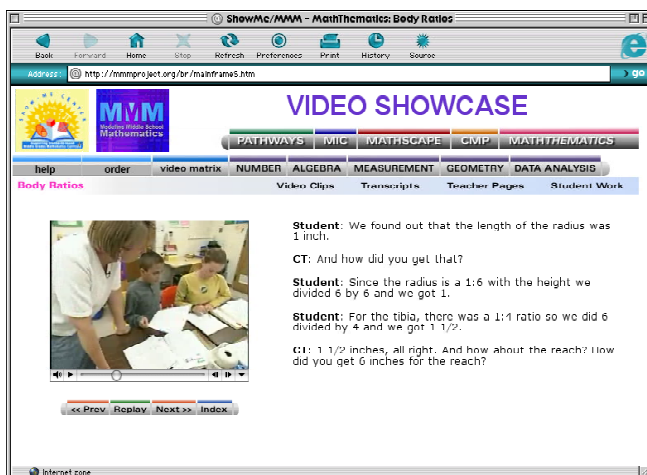


Show-Me Website

Do you wish that you could observe other teachers implementing *Standards*-based curricula? Do you wonder how students solve problems and reason in a standards-based classroom? Are you curious about what the developers of these curricula envision for the classroom? If so, you should check out the Video Showcase feature of the Show-Me website (<http://showmecenter.missouri.edu>). Here you can find videos and transcripts of ten lessons taught by classroom teachers. Each lesson is drawn directly from one of the middle grades standards-based curricula. The videos also include teacher reflections and comments from the curriculum developers.

The videos and website are tools for individual teacher reflection, group professional development, and pre-service teacher education.

These videos, developed by the “Modeling Middle School Mathematics” project can be obtained in VHS format by contacting the developer at: bolstereducation@yahoo.com



Activity Showcase

In future issues of the Newsletter, activities from other standards-based curricula will be showcased.

The following activity is part of the unit “Comparing Quantities” from the *Mathematics in Context* series. This unit introduces students to informal methods for solving systems of equations. The unit presents realistic problem situations that students solve by using strategies like guess-and-check, exchanging, making new combinations, and using notebook notation. At the end of the unit and later in the series, strategies are formalized as methods of solving equations.


The problem below is from the third lesson in the unit. In it, students are given the cost

of two combinations of items and are asked questions that engage them in using an exchanging strategy to determine the price of each item.

Try this problem with your students. Show the two price combinations on an overhead and ask students what they can determine about the cost of a pair of shorts or a pair of glasses. Pose the three questions listed on the page. Watch how students naturally develop and apply intuitive strategies based on what makes sense to them. Teachers can use these student-generated strategies to introduce notation and generalized methods.

“Watch how students naturally develop and apply intuitive strategies based on what makes sense to them.”

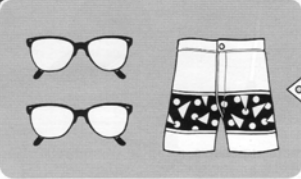
C. FINDING PRICES



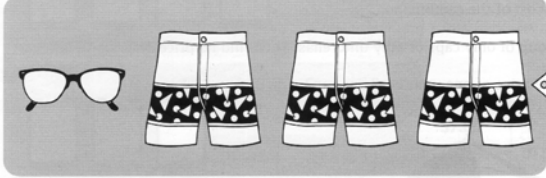
Price Combinations

So far you have used two strategies for solving problems that involve combinations of items. The first strategy, exchanging, was used in the problems about trading food at the beginning of the unit. The second strategy was to make a combination chart and use number patterns found in the chart.

In this section, you will use the strategy of exchanging to solve problems involving money.



\$50.00



\$50.00

1. Without knowing the prices of a pair of glasses or a pair of shorts, you can determine which item is more expensive. Explain how.
2. How many pairs of shorts can you buy for \$50?
3. What is the price of one pair of glasses? Explain your reasoning.

Mathematics in Context • Comparing Quantities 15

If you'd like to see more of this activity, check out the Show-Me Web site, Curriculum Showcase at <http://showmecenter.missouri.edu/showme/Lesson/main.shtml>.



Did you know....

The National Science Foundation has launched the new Math and Science Partnership (MSP) program, part of the President Bush's initiative – No Child Left Behind. The MSP program will promote the development and implementation of productive partnerships among major stakeholders with each partnership requiring commitments from one or more school

districts and one or more higher education entities. In all cases, MSP collaborations will unite the efforts of preK-12 schools with mathematics, science, and/or engineering faculty, as well as education faculty, from institutions of higher education.

For more information, see:
<http://ehr.nsf.gov/msp/mathandscienceapp.asp>.



The NCTM Academy for Professional Development is a series of high-quality professional development institutes specially designed for mathematics educators. The Institutes are two- or five-day intensive and informative educational events designed to reenergize participant's mathematics teaching skills.

For 2002-03, the NCTM Academy offers a choice of Institutes on geometry and algebra, two of the cornerstones of mathematics. Space is limited for all Institutes. A schedule of events and registration information are located at <http://www.nctm.org/academy/>.



Mathematically Sane
Promoting the rational reform of
mathematics education

The Mathematically Sane Web site, <http://MathematicallySane.com>, is dedicated to advocate – broadly and persuasively – for the rational reform of school mathematics. The site posts information to helping educators, citizens and policy-makers at all levels make a stronger case for better mathematics

programs; gathering and disseminating diverse success stories -- both anecdotal and data-based; and providing a forum for reform minded mathematics educators. A "Frequently Asked Questions" (FAQ) page provides responses and information to many questions, concerns and issues related to standards-based curriculum reform.

Send us your story

In Upcoming issues of this newsletter we'd like to share successful stories of implementation of standards-based middle grades mathematics curricula. If you'd like to share your story, send us a brief summary via our e-mail address (center@showme.missouri.edu).

News from the Show-Me Project

The Show-Me Project is five years old! Originally funded for a 5-year period (1997-2002), the project has received notification of continued funding by the National Science Foundation through September 2005. The Project will continue to provide information and assistance to school districts seeking to utilize standards-based middle grades curriculum materials. Several new initiatives are also planned including:

- Conferences and workshops for targeted groups including district curriculum leaders, researchers, and teacher educators.
- Development and dissemination of resources such as the annual summary of research related to standards-based curriculum implementation, materials for use in teacher preparation and professional development, media packets summarizing the goals of

standards-based curriculum reform.

- Identifying and networking professionals with experience successfully teaching standards-based curriculum, mentoring teacher colleagues, and/or enlisting the support of community members. Methods will be developed to allow sharing of the knowledge and experience of these key professionals.

The over-arching goal of the Show-Me Project is to ensure the opportunity for every middle school student to study important mathematics within a learning environment that challenges their intellect and engages their interest. The Show-Me Project staff are interested in hearing from you. We welcome your ideas and suggestions. Contact us via the website or by e-mail.

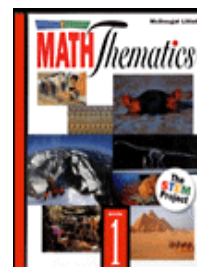


Show-Me Project Curriculum, Satellite Centers and Publishers

Curriculum	Show-Me Satellite Center	Publisher
Connected Mathematics Project Gr. 6-8	Betty Phillips A717 Wells Hall Michigan State University East Lansing, MI 48824 (517) 432-2870 cmpweb@math.msu.edu http://www.math.msu.edu/cmp	Prentice-Hall http://phschool.com/math/cmp
Mathematics in Context Gr. 5-8	Meg Meyer University of Wisconsin-Madison 575K Educational Sciences Bldg. Madison, WI 53706 (608) 263-1798 mrmeyer2@facstaff.wisc.edu	Encyclopaedia Britannica http://mic.britannica.com
MATH <i>Thematics</i> Gr. 6-8	Rick Billstein Mathematics Department University of Montana Missoula, MT 59812 rickb@selway.umt.edu http://www.math.umt.edu/~stem	McDougal Littell http://classzone.com/maththem/
MathScape Gr. 6-8	Emily Fagan Education Development Center 55 Chapel Street Newton, MA 02458 (617) 969-7100 x3519 mathscape@edc.org http://www2.edc.org/MathscapeSTM	Glencoe McGraw-Hill http://www.glencoe.com/sec/catalog/linkmath.html
Show-Me Center	303 Townsend Hall University of Missouri Columbia, MO 65211 (573) 884-2099 center@showme.missouri.edu http://showmecenter.missouri.edu	



**Connected
Mathematics
Project**





Perspectives on Curriculum Reform

A Static Mathematics Curriculum is Unhealthy!

Johnny W. Lott, President, National Council of Teachers of Mathematics

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NCTM's *Principles and Standards for School Mathematics* provides guidance for revisions to curriculum that go beyond those suggested by NCTM's 1989 *Standards*. Calls for reform and change in the school mathematics curriculum are not a new phenomenon. Throughout the past century, the message has been that a static mathematics curriculum is unhealthy.

At the beginning of the twentieth century, E. H. Moore in his 1902 valedictory address as president of the American Mathematical Society characterized both the school and the college curriculum as in need of change. His picture of mathematics included integration, manipulatives, group learning, and technology. Moore recognized the need for change because he saw a curriculum steeped in the algorithms of arithmetic as unconnected to the real world and not designed to be studied by all.

Throughout the ensuing decades, similar messages calling for change echoed the underlying premise that including theory in the curriculum would greatly increase both mathematics skills and understanding. In the last decade of the twentieth century, the NCTM *Standards* documents and reform curriculum projects have come closer to the changes proposed by Moore 100 years ago.

In all this time, mathematics curriculum has never evolved to a stage that anyone should call finished. Nonetheless, there have been segments of the mathematics community who wanted the curriculum to "go back" to an earlier era. Let us consider parts of earlier curricula.

Do we want elementary school students studying nothing but number, as in the 1907 Wentworth text entitled *New Elementary Arithmetic*, or number and measurement, as in the 1926 Knight, Studebaker, and Ruch textbook entitled *Standard Service Arithmetics, Grade Three*? Similarly, do we want high school students to study algebra from the Hawkes, Luby, and Touton book

entitled *First Course in Algebra* (1910), in which variable and function are defined on page 259 of a 334-page book, or from a college text by Allendoerfer and Oakley entitled *Fundamentals of Freshman Mathematics* (1959) that has few applications?

Although these books may have been exemplary when they were written and may have contributed to the curriculum at the time, they are not books that would enable students to succeed in today's world. Simply put, both mathematics and the world have changed. To have an educated and mathematically literate populace in the future, mathematics curriculum must continue to evolve.

Today, students are entering a world that demands geometric knowledge with some understanding of a global positioning system, an understanding of probability and odds to make sense of lotteries, and capabilities in data analysis to make sense of environmental problems, stock and money markets, and the mathematics found in the pages of *USA Today*. Even the mathematics of the 1980s did not prepare most students for today's challenges.

The reform curricula of the 1990s began addressing the perpetually changing nature of "everyday" mathematics, but are we at a place where we can finally say "We've finished" and relax? The answer is NO. We will never reach that place. As the world shrinks, the population becomes even more mobile, and worldwide communication teaches us that we do not live in isolation, we have to look beyond our borders both in a curricular sense and in a real sense if we want a mathematically literate citizenry. Trying to achieve a static curriculum or a curriculum from an earlier era is not an option.

What can we do? NCTM offered a good example for educators when it produced two sets of *Standards*—one in 1989 and

the other in 2000. At the beginning of forthcoming decades, we must provide a snapshot of what we want students to study. As we do this, we need teachers in the classroom doing what they do best—educating the youth—and we need university professors educating prospective teachers for the future. This latter group has one of the greatest challenges—preparing those who will lead and teach a curriculum that is not yet written. We also need the general populace working with us, demanding that changes and updates continually be made in the mathematics curriculum.

As we plan the curriculum for coming decades, we must tap the best minds in mathematics, cognition, and interdisciplinary thought. We must involve people who are young and old as well as from a wide diversity of backgrounds and experiences. As we work, we must strive not to produce Edsels—models potentially way ahead of their time—but we must also strive not to produce decades of Volkswagens with no changes. The vision of mathematics education must be comparable to the original SST. It must give thought to future technology. It must be workable. And it may

be ahead of its time. The production model for future decades should be of the Model T variety—useful and affordable, but never a complete vision for the future.

The possibility of reform should always be an option, whatever the model. We cannot afford to be so locked into the past that we miss the big picture of mathematics in the world around us. As the world continues to change, so must the mathematics curriculum.

Allendoerfer, Carl B., and Cletus O. Oakley. *Fundamentals of Freshman Mathematics*. New York: McGraw-Hill Book Co., 1959.

Hawkes, Herbert E., William A. Luby, and Frank C. Touton. *First Course in Algebra*. Boston: Ginn & Co., 1910.

Knight, F. B., J. W. Studebaker, and G. M. Ruch. *Standard Service Arithmetics, Grade Three*. Chicago: Scott, Foresman & Co., 1926.

Moore, Eliakim Hastings. "On the Foundations of Mathematics." *Mathematics Teacher* 60 (April 1967): 360-74. [Reprint of the 1902 address, first published in *Science*, 1903, and later included in *A General Survey of Progress in the Last Twenty-five Years, First Yearbook of the National Council of Teachers of Mathematics*, 1926.]

Wentworth, George. *New Elementary Arithmetic*. Boston: Ginn & Co., 1907.

Have you read....

"Standards-Based Mathematics Curriculum Materials: A Phrase in Search of a Definition" by Paul Trafton, Barbara Reys and Deanna Wasman in the November 2001 issue of *Phi Delta Kappan*.

The authors describe six central characteristics of "standards-based" mathematics curriculum materials including: comprehensive, coherent, develop ideas in depth, promote sense-making, engage students, and motivate learning. To view the article, see: <http://www.pdkintl.org/kappan/k0111tra.htm>

Adding It Up: Helping Children Learn Mathematics (2001) National Academy of Sciences

This book presents the results of the Mathematics Learning Study Committee commissioned by the National Research Council, concerning what needs to be done to boost the mathematical performance of America's students. The 11 chapters explore how students learn mathematics in the elementary schools and what changes could lead to

improvement during these critical years. The research identifies the five components of mathematical proficiency and provides advice for reaching targeted goals. It also emphasizes the coordination of curriculum, instructional materials, assessment, instruction, professional development, and school organization. For more information on this book, see:

<http://www.nap.edu/books/0309069955/html/>

"Making mathematics work for all children: Issues of standards, testing, and equity" by Alan Schoenfeld in the January/February 2002 issue of *Educational Researcher*

This article discusses the potential for providing high quality mathematics instruction for all students. It addresses four conditions necessary for achieving this goal: high quality curriculum; a stable, knowledgeable, and professional teaching community; high quality assessment that is aligned with curricular goals; and stability and mechanisms for the evolution of curricula, assessment, and professional development. The goal of this article is to catalyze conversations about how to achieve sustained, beneficial changes. To view the article, see: <http://www.aera.net/pubs/er/toc/er3101.htm>

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We're on the Web!

See us at:

<http://showmecenter.missouri.edu>

AMTE Pre-Conference Sponsored by Show-Me

The Show-Me Project will sponsor a pre-conference to the Annual meeting of the Association of Mathematics Teacher Educators (AMTE) focusing on middle school mathematics teacher preparation. The pre-conference is limited to 75 participants and pre-registration is required. It will be held Thursday, Jan. 30 from 11:00 – 4:30, with check in between 10:00-11:00.

Zalman Usiskin (University of Chicago), Jim Lewis (University of Nebraska), Ira Papick and Fran Arbaugh (University of Missouri) will present sessions focused on content preparation of middle school mathematics teachers and resources for working teacher candidates, including use of standards-based curriculum materials. A DRAFT conference agenda and registration form are available at <http://showmecenter.missouri.edu/AMTE>.

To inquire about the pre-conference, contact the Show-Me Center at center@showme.missouri.edu.

The Show-Me Project is a National Center for Middle Grades Mathematics Curricula supported by the National Science Foundation under grant no. ESI 9714999. See <http://showmecenter.missouri.edu> for more information about the project.

