## Middle School " Go To" List: Key Articles for Getting Started with the Selection and Implementation of Mathematics Instructional Materials

American Association for the Advancement of Science (2000). *Middle grade mathematics textbooks: A benchmarks-based evaluation*. Washington, DC: American Association for the Advancement of Science.

Noting that textbook analyses are "largely cursory, impressionistic, and unreliable," the American Association for the Advancement of Science (AAAS) embarked on Project 2061 in order to provide an alternative to the traditional textbook review process. Project 2061 developed a rigorous benchmarks-based tool to assess both traditional and reform-oriented middle grades mathematics curricula. Their evaluation process 1) was rigorous and uniformly applied, 2) employed an evidence-based analysis, 3) identified key mathematical benchmarks, and 4) rated each text on 24 criteria related to instruction and learning. Twelve textbook series were analyzed and rated, with the findings presented in a comprehensive report available online. Based on Project 2061's criteria the texts that received the highest rankings were: Connected Mathematics, Mathematics in Context, MathScape, and MATH Thematics. The report includes both statistical ratings and narrative summaries for each of the twelve series so that mathematics educators and textbook adoption committees can compare and contrast a wide variety of curricula and make an informed purchasing decision. Although the AAAS only reviewed curricula for the middle grades, elementary and high school committees could make their adoption process more rigorous and research-based by utilizing Project 2061's model: determining criteria, evaluating materials in light of those criteria, and creating a quantitative score and qualitative profile for each text before making a decision.

Ball, D. L., & Cohen, D. K. (1996). Reform by the book: What Is or might be the role of curriculum materials in teacher learning and instructional reform? *Educational Researcher, 25*(9), 6–14.

In this article, Ball and Cohen discuss the central role of curriculum materials in the instructional system and examine the concept of materials as agents of improvement. The authors also analyze the relationship between textbooks, teachers, and teaching and offer suggestions regarding how curriculum materials might contribute to reform efforts.

Link: http://edr.sagepub.com/content/vol25/issue9/

Ball, D. L., Ferrini-Mundy, J., Kilpatrick, J., Milgram, R. J., Schmid, W., & Schaar, R. (2005). Reaching for common ground in K-12 mathematics education. *Notices of the American Mathematical Society, 52*(9), 1055–1058.

This article is the result of conversations between mathematicians and mathematics educators around forging areas of common agreement over several, sometimes contentious, issues in K-12 mathematics education. Three fundamental assertions (e.g., proficiency with computational procedures) are detailed and explained, followed by seven areas of agreement. These areas of agreement center around the automatic recall of basic facts, calculator use, algorithms, fractions, "real-world" contexts, instructional methods and teacher knowledge. Readers of this article may be interested in the areas of common ground sometimes overlooked in "math wars" discussions.

Bay, J. M., Reys, B. J., & Reys, R. E. (1999). The top 10 elements that must be in place to implement standards-based mathematics curricula. *Phi Delta Kappan, 80*(7), 503–506.

Several common factors contribute to the effectiveness of teachers in implementing a standards-based mathematics curriculum in their classrooms, the authors maintain. Awareness of these factors and the development of ways to address them will increase the likelihood of success. In this article they list 10 critical elements of implementation: administrative support, opportunities to study, sampling the curricula, daily planning, interaction with experts, collaboration with colleagues, incorporating new assessments, communicating with parents, helping students adjust, and planning for transition.

Link:http://www.pdkmembers.org/members_online/members/orders.asp?action=results&t=A&desc=Top+10&text=&lname_1=Reys&fname_1=&lname_2=&fname_2=&kw_1=&kw_2=&kw_3=&kw_4=&mn1=&yr1=&mn2=&yr2=&c1

Carpenter, T. P., & Lehrer, R. (1999). Teaching and learning mathematics with understanding. In E. Fennema & T. A. Romberg (Eds.), *Mathematics classrooms that promote understanding* (pp. 19–32). Mahwah, NJ: Erlbaum.

Carpenter and Lehrer describe how understanding is developed in both the learning of and the teaching of mathematics. They conjecture that understanding is built through constructing relationships, extending and applying mathematical knowledge, reflecting about experiences, articulating what one knows, and making mathematical knowledge one's own. The authors highlight how teachers can create an environment (e.g., developing norms, creating meaningful tasks to promote understanding) to foster student understanding. Additionally, they caution readers that it is not just student understanding that is important, but also teachers' understanding of mathematics and student thinking.

Goldsmith, L. T., Mark, J., & Kantrov, I. (2000). *Choosing a Standards-based mathematics curriculum*. Portsmouth, NH: Heinemann.

A publication of the K-12 Mathematics Curriculum Center at EDC, this guide focuses on the thirteen programs supported by the Center, though the ideas discussed are not specific to these programs. Its aim is to present a comprehensive view of how individual districts should go about adopting new mathematics curricula. The authors address a range of issues districts may confront, decisions committees will have to make, and strategies they may use, and describe many different procedures and processes that others have found useful. For the selection phase, the book explores how to assemble a selection committee, assess resources and needs, and create guidelines and criteria for evaluating different programs. The curriculum implementation section focuses on ways to work toward successful use of materials by planning a realistic and effective roll-out strategy, supporting teachers, and building community buy-in and assistance. Different resources are provided, including stories and examples from practitioners, suggestions for further support, and sample selection criteria from school districts and other educational organizations.

Link: www.heinemann.com/

House, J. E., & Taylor, R. T. (2003). Leverage on learning: Test scores, textbooks, and publishers. *Phi Delta Kappan, 84*(7), 537–541.

Classroom materials represent substantive discretionary dollars in all schools and districts, and often represent the unofficial curriculum in classrooms. As an often overlooked strategy for improving student achievement, aligning classroom materials with specific data-driven learning needs can be an answer for classroom teachers. Additionally, the authors provide 10 recommendations for selecting, negotiating, and implementing new classroom materials to improve instruction in a cost-efficient manner.

Link:http://www.pdkmembers.org/members_online/members/orders.asp?action=results&t=A&desc=Leverage&text=&lname_1=House&fname_1=&lname_2=&fname_2=&kw_1=&kw_2=&kw_3=&kw_4=&mn1=&yr1=&mn2=&yr2=&c1=

Mark, J., Spencer, D., Zeringue, J. K., & Schwinden, K. (in press). How do districts choose mathematics textbooks? In B. Reys & R. Reys (Eds.), *The K–12 mathematics curriculum: Issues, trends, and future directions* (Vol. 72). Reston, VA: National Council of Teachers of Mathematics.

The selection of mathematics textbooks has become a key component of district improvement plans as curriculum leaders face increasing accountability pressures to raise student achievement. In this chapter, the authors describe the selection processes districts used for choosing mathematics instructional materials and detail a view of these processes not previously described in the literature. Interviews of mathematics curriculum leaders revealed the influence state standards and tests had on the decisions they made and portrayed how these leaders use research and resources as part of the selection process. This study highlights the key role curriculum leaders play in the design of the selection process and the strategic choices they make as the process unfolds.

Phillips, E., Lappan, G., Grant, Y., & Arbaugh, F. (2008). An overview of professional development. In M. Meyer & C. Langrall (Eds.), *A decade of middle school mathematics curriculum implementation: Lessons learned from the Show-Me project* (pp. 141-150). Charlotte, NC: Information Age Publishing, Inc.

The authors identify and discuss three components of effective professional development (content knowledge, teaching and learning, and assessment). They go on to argue that professional development activities should reflect the different roles teachers play in creating powerful classrooms, including teachers as students of mathematics, teachers as teachers of mathematics, teachers as collaborators with other teachers, and teachers as facilitators working with administrators, parents and other teachers.

Reys, B. J., & Reys, R. E. (2007). An agent of change: NSF sponsored mathematics curriculum development. *NCSM Journal of Mathematics Education Leadership, 9*(1), 58-64.

This article identifies factors that make it difficult for publishers of commercial textbooks to make significant changes consistent with curricular visions put forth by the National Council of Teachers of Mathematics (NCTM). Central among these factors is the lack of consensus of state standards on what and when certain topics in mathematics should be addressed. The variability of grade placement of key mathematics learning goals across different state standards results in excessive repetition and superficial treatment of topics in school mathematics textbooks.

Reys, B. J., Reys, R. E., & Chavez, O. (2004). Why mathematics textbooks matter. *Educational Leadership, 61*(5), 61-66.

In mathematics classes, textbooks wield real power. They often dictate how teachers should sequence material, suggest the content teachers should teach, and provide activities and instructional ideas for engaging students. According to the authors, the great limitation of the traditional mathematics textbook is its presentation of mathematical ideas as facts to memorize rather than as a web of meaningful relationships. New models of mathematics textbooks, specifically those developed by the National Science Foundation, help correct this flaw. Using a common problem from a mathematics lesson—solving for the volume of a cylinder and a cone—the authors show that the new instructional approach challenges students to think and engages them in discovering the mathematical relationships that are at the heart of the discipline.

Link: www.ascd.org

Schmidt, W., Houang, R., & Cogan, L. (2002). A coherent curriculum: The case of mathematics. *American Educator, 26*(2), 10–26, 47–48.

A new analysis shows that the mathematics curricula used in the highest achieving countries are very similar--and very coherent. Through a stunning visual comparison, we can see where the U.S. comes up short. We've all heard that curricula in the U.S. are a "mile wide and an inch deep." Here's the research behind the rhetoric.

Link: www.aft.org/pubs-reports/american_educator/summer2002/curriculum.pdf

Schmidt, W. H. (2004). A vision for mathematics. *Educational Leadership, 61*(5), 6–11.

A common, coherent, and challenging curriculum can transform mathematics education in the United States. The No Child Left Behind Act's vision is to provide rigorous and demanding subject matter content for all students. As a crucial subject area, mathematics is vital to this effort. How can educators change the curriculum of mathematics to make it rigorous and accessible to all students? The author reviews the Third International Mathematics and Science Study (TIMSS) data showing significant curricular differences between the United States and other countries, especially in the degrees of standardization, coherence, and challenge. He examines briefly the role of teachers, noting that differences in subject matter background account for significantly different levels of achievement in different countries. The author argues that even the best teachers need an effective curriculum to be effective and that such a curriculum does not substantially threaten the U.S. commitment to local control of schools.

Link: www.ascd.org

Senk, S. L., & Thompson, D. R. (2003). *Standards-based school mathematics curricula: What are they? What do students learn?* Mahwah, NJ Lawrence Erlbaum Associates Publishers.

The Curriculum and Evaluation Standards for School Mathematics published by the National Council of Teachers of Mathematics in 1989 set forth a broad vision of mathematical content and pedagogy for grades K-12 in the United States. These Standards prompted the development of Standards-based mathematics curricula. What features characterize Standards-based curricula? How well do such curricula work?

To answer these questions, the editors invited researchers who had investigated the implementation of 12 different Standards-based mathematics curricula to describe the effects of these curricula on students' learning and achievement, and to provide evidence for any claims they made. In particular, authors were asked to identify content on which performance of students using Standards-based materials differed from that of students using more traditional materials, and content on which performance of these two groups of students was virtually identical. Additionally, four scholars not involved with the development of any of the materials were invited to write critical commentaries on the work reported in the other chapters.

Link: http://www.routledge.com/

Stein, M. K., Remillard, J., & Smith, M. S. (2007). How curriculum influences student learning. In F. K. Lester, Jr. (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 319–369). Charlotte, NC: Information Age Publishing, Inc.

A common goal in preparing for an adoption of mathematics instructional materials is the hope that the selected materials will improve mathematics achievement and, ultimately, students' learning of mathematics. This handbook chapter serves as an important resource for curriculum leaders seeking an understanding of research connecting curriculum and student learning. It includes reviews of both effectiveness studies about specific materials (e.g., what students using a particular curriculum learned) and more general discussions about how teachers and students use curricula (e.g., how teachers interpret written materials). The authors discuss how curriculum is often defined in multiple ways and highlight the distinction between the written, intended, and enacted curriculum. They also point to the differences in available curriculum materials (standards-based and conventional) and the importance of readers carefully interpreting research that evaluates these materials. Given that much of the research is specifically about standards-based curricula, the authors bring to light common findings detailing the challenges of successfully enacting these materials and the factors being suggested for effective implementation.

Swafford, J., & Langrall, C. (2008). When things go wrong in curriculum implementation. *A decade of middle school mathematics curriculum implementation: Lessons learned from the Show-Me Project* (pp. 115-124). Charlotte, NC: Information Age Publishing.
In this chapter, the authors present examples of implementation efforts in four districts and highlight the factors that derailed each district's plans. The district summaries are provided as illustrative examples of the four factors (plan for implementation, ongoing professional development, leadership and support, and curriculum alignment with state policies) Swafford and Langrall have identified as either supporting or impeding the implementation process. The authors conclude by posing a series of questions about the districts as a catalyst for discussion about implementation.

Tarr, J. E., Chavez, O., Reys, R. E., & Reys, B. J. (2006). From the written to the enacted curricula: The intermediary role of middle school mathematics teachers in shaping students' opportunity to learn. *School Science and Mathematics, 106*(4), 191-201.

In this paper is reported the extent of textbook use by 39 middle school mathematics teachers in six states, 17 utilizing a textbook series developed with funding from the National Science Foundation (NSF-funded) and 22 using textbooks developed by commercial publishers (publisher-generated). Results indicate that both sets of teachers placed significantly higher emphasis on Number and Operation, often at the expense of other content strands. Location of topics within a textbook represented an oversimplified explanation of what mathematics gets taught or omitted. Most teachers using an NSF-funded curriculum taught content intended for students in a different (lower) grade, and both sets of teachers supplemented with skill-building and "practice" worksheets. Implications for documenting teachers' "fidelity of implementation" (National Research Council, 2004) are offered.

Link: www.ssma.org

Wu, H. (1999). Basic skills versus conceptual understanding: A bogus dichotomy in mathematics education. *American Educator, 23*(3), 14–19, 50–52.

In mathematics, skills and understanding are completely intertwined. There is not "conceptual understanding" and "problem-solving skill" on the one hand and "basic skills" on the other. Nor can one acquire the former without the latter. This false dichotomy impedes efforts to improve math education.

Link: www.aft.org/pubs-reports/american_educator/fall99/wu.pdf