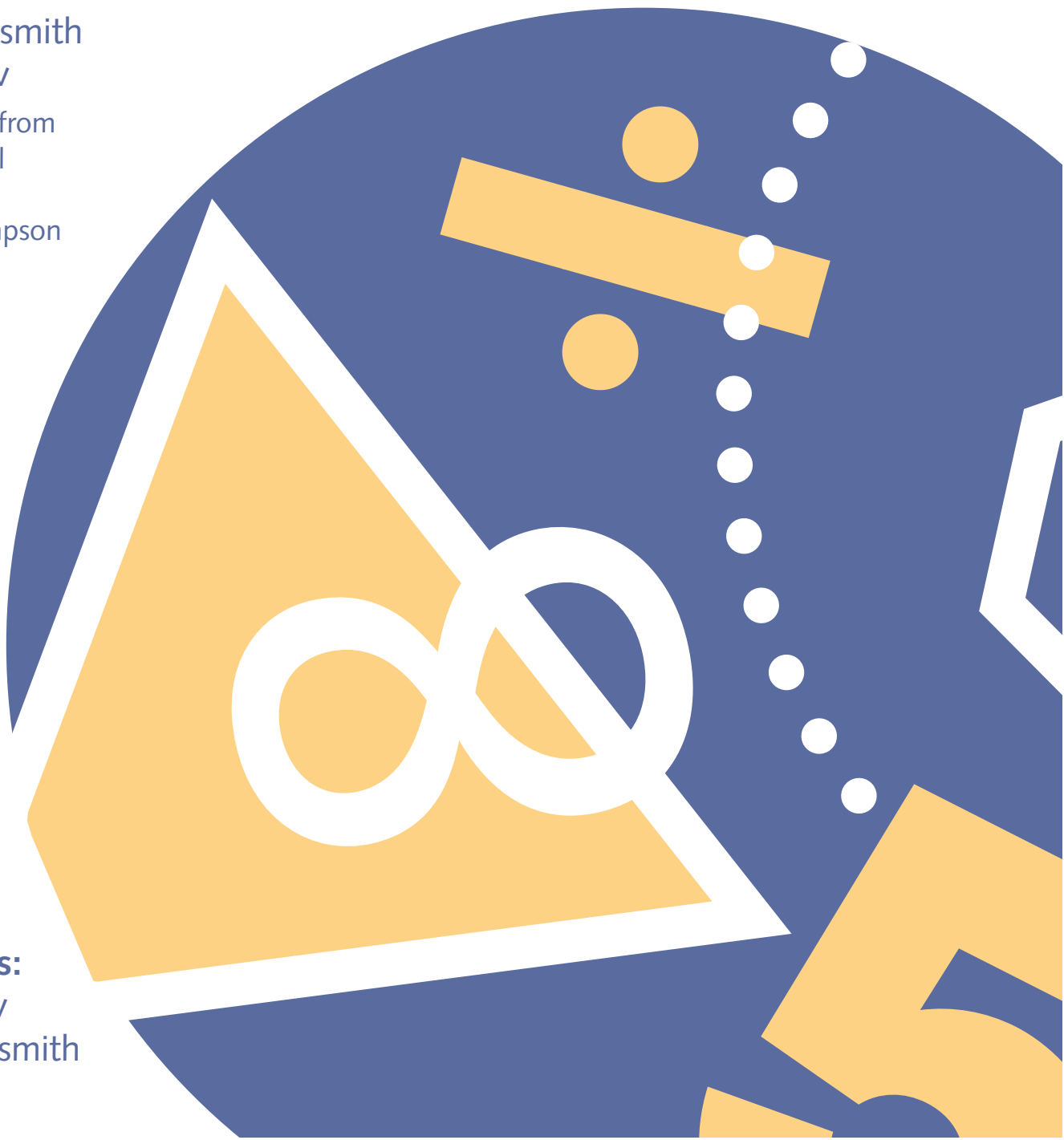


# Guiding Curriculum Decisions for Middle-Grades Mathematics

Lynn T. Goldsmith  
Ilene Kantrov  
with assistance from  
Cynthia J. Orrell  
Anne Shure  
Marianne Thompson

**Series Editors:**  
Ilene Kantrov  
Lynn T. Goldsmith



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Education Development Center, Inc.

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Cover Design: Dorothy Geiser

Education Development Center, Inc.

55 Chapel Street

Newton, MA 02458-1060

(617) 969-7100

[www.edc.org](http://www.edc.org)



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Nancy Ames, our colleague at Education Development Center, Inc. (EDC), who guides the National Forum and shares its members' commitment to middle-grades reform, had the initial vision for this project. Her work provided a solid foundation from which to build, and she supported our efforts throughout.

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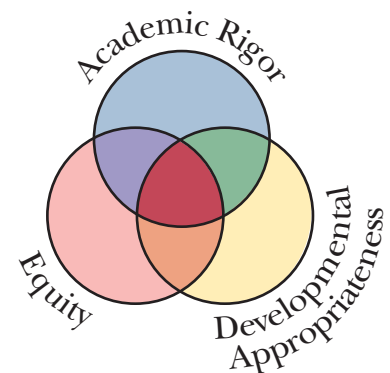


# Aiming for Academic Excellence in Middle-Grades Curricula

*Third period ends with a few, hurried instructions about homework from the teacher as students pack up their pens, pencils, and notebooks. They pour into the halls, moving in small packs to their next classes. Some scurry and others adopt a leisurely stroll, using the time to catch up with friends. The energy bounces off the lockers lining the corridors. Waves of students surge through open classroom doors—they plop books onto desks and slide into their seats. A soft sigh slips into the emptying hallways as students unpack those pens, pencils, and notebooks and prepare to think and work hard.*

When classroom doors close and lessons begin, we want our children to be intellectually challenged and engaged by their work. And indeed, good things are happening in many middle-grades classrooms throughout the country. Students are learning to think deeply about the subjects they are studying and are enthusiastic about their coursework. Their work requires them to think hard, explain and support their ideas, and apply their understanding to new situations.

How can we extend these conditions to more students in more schools? The answer involves making a number of interconnected changes: establishing district policies that promote and support quality instruction, adopting clearly articulated standards for student learning and performance, using high-quality curricula, improving teacher education, providing ongoing professional development for teachers already in the classroom, and developing community support. This guide will help educators address one of these areas of change—identifying and using high-quality curriculum to promote high standards of student achievement.



**Good things are happening in many middle-grades classrooms throughout the country. Students are learning to think deeply about the subjects they are studying and are enthusiastic about their coursework. Their work requires them to think hard, explain and support their ideas, and apply their understanding to new situations.**



**In order to meet these standards, teachers face new academic and pedagogical challenges. They must teach more demanding and extensive subject area content, they must develop different instructional strategies, and they must reach a wider range of students. Having a high-quality curriculum to guide instruction is a key to meeting these challenges.**

*Guiding Curriculum Decisions for Middle-Grades Mathematics* is part of a series of curriculum guides for middle-grades mathematics, science, language arts, and social studies.<sup>1</sup> This guide offers a set of principles for making curriculum decisions and illustrates these principles with practitioners' descriptions of their experiences in implementing standards-based curricula.

This guide series was developed at Education Development Center, Inc. with the support of the Edna McConnell Clark and W.K. Kellogg Foundations. It is based on interviews with more than 100 middle-grades educators who are using standards-based curriculum approaches and materials in their districts, schools, and classrooms. This introductory chapter sets the scene for the scope of the guide series, focusing on mathematics, but drawing examples more broadly from all of the major middle-grades subject areas.

The need for new approaches to curriculum and instruction is clear. Over the past fifteen years educators have been taking a hard look at American students' academic performance. In the realms of mathematics and science, we have learned that American students are outperformed by peers in many other countries.<sup>2</sup> Educators and employers alike express concerns about the literacy skills of America's youth. Within the last decade each major subject area has developed academic standards that raise the bar for student achievement and performance.<sup>3</sup> In order to meet these standards, teachers face new academic and pedagogical challenges. They must teach more

<sup>1</sup> The anticipated publication date for the social studies guide is in the fall of 2001.

<sup>2</sup> In an internationally administered proficiency test for mathematics and science, for example, U.S. eighth and tenth graders performed at significantly lower levels than grade-mates from a large number of other countries. For a report of this study, see Third International Mathematics and Science Study, *Attaining Excellence: A TIMSS Resource Kit* (Washington, DC: U.S. Department of Education, 1996).

<sup>3</sup> In 1989 the National Council of Teachers of Mathematics (NCTM) was the first national organization to produce a set of K-12 curriculum standards for a major subject area (revised Standards were published in April 2000). Since then, the National Council of Teachers of English (NCTE) and the International Reading Association (IRA) have collaborated on language arts standards; the National Research Council (NRC) and Project 2061 of the American Association for the Advancement of Science (AAAS) have each published science standards (the AAAS uses the term "benchmarks" instead of "standards"), and the National Council for the Social Studies (NCSS) has authored social studies standards. In addition, the National Center on Education and the Economy has published New Standards™ Student Performance Standards for language arts, mathematics, science, and applied learning. Information about subject area standards can be found on the websites of all of these organizations.



demanding and extensive subject area content, they must develop different instructional strategies, and they must reach a wider range of students. Having a high-quality curriculum to guide instruction is a key to meeting these challenges.

Until relatively recently few curriculum materials were commercially available to help mathematics teachers provide an intellectually rigorous education for all the students in their classes. Frequently, teachers committed to *Standards*-based<sup>4</sup> instruction found themselves at odds with district-mandated curricula and testing programs that emphasize learning isolated skills, and with textbooks that promote skill mastery through memorization and practice. They would spend enormous amounts of time searching for resources, planning engaging units to address important concepts, and developing lessons and activities to carry out their goals. This is no easy task. It requires a sophisticated understanding of the subject area and knowledge of the ways that students learn it. Many teachers are only reluctant curriculum developers and are aching for good materials. Others take satisfaction from creating their own curriculum, but still find it a labor-intensive process that reduces their time for classroom planning and for focusing on individual students' academic needs. And, too, the effectiveness of home-grown curricula varies considerably.

Happily, there are now high-quality published materials for middle-grades educators which can relieve teachers of the burden of inventing their own. Some of these materials have been designed from the outset around the principles of standards-based reform. Their development has included review by content area experts and a significant amount of pilot



Not all teachers are curriculum developers. We find that while they may create fun activities, their lessons don't necessarily lead to solid student learning. It's really difficult because many teachers think that to be a good teacher you have to be creative and develop your own materials. There's a prejudice that you're not a creative, innovative teacher if you rely on a piece of commercial material. I have to dispel that idea. You can still be creative and innovative, but published materials give you a structure, a sequence, and they guide you in the right direction. But there is a misconception among some teachers that just developing their own materials automatically means their lessons are better, or that the kids will be more engaged."

—State-level curriculum specialist

<sup>4</sup>Because the NCTM *Standards* have been such a singular force in mathematics education reform, when we refer to mathematics specifically, we will use "*Standards*" rather than the more generic designation.



**Because quality curriculum materials are now available, teachers can invest their time in adapting fundamentally sound materials to the particulars of their own students and situations rather than trying to invent a mathematics program out of whole cloth.**

and field testing in a range of schools to ensure that they are effective in varied classroom settings. Such carefully constructed and tested materials offer teachers an effective alternative to constructing an entire curriculum from scratch.

### **What do we mean by “curriculum”?**

In a broad sense, curriculum refers to the ideas, skills, and dispositions that educators and content specialists identify as the important ones for students to learn. Many states and districts have developed curriculum frameworks that articulate these learning goals. (Districts may further refine this articulation by indicating the concepts and skills to be learned at each grade level.) Curriculum materials—the written lessons, activities, exercises, and supporting materials—provide the means through which teachers engage student learning, articulating the important content to teach and offering teachers a structure and organization for instruction. Districts build their mathematics programs by selecting curriculum materials that will help them meet their curricular goals.

In practical terms, when you look to mathematics materials designed to address the NCTM *Standards*, the distinctions among “curriculum,” “materials,” and “program” become very subtle. These materials were developed to be comprehensive programs of study that meet the goals of a *Standards*-based curriculum. Because of this close match, we use the terms curriculum, curriculum materials, and program interchangeably in this guide.

Adapted from Lynn T. Goldsmith, June Mark, and Ilene Kantrov, *Choosing a Standards-Based Mathematics Curriculum* (Portsmouth, NH: Heinemann, 2000), 2. Copyright © 1998 by Education Development Center, Inc., K-12 Mathematics Curriculum Center. Published by Heinemann, a division of Reed Elsevier, Inc., Portsmouth, NH.

Because quality curriculum materials are now available, teachers can invest their time in adapting fundamentally sound materials to the particulars of their own students and situations rather than trying to invent a mathematics program out of whole cloth. The challenge now is to help educators choose wisely among the available materials.

Publishing curriculum materials is a big business, and with the national spotlight on standards, many programs describe themselves as “standards-based.” Some of these have been newly developed, designed from the very beginning to promote the kinds of deep and flexible understanding that standards support. Others,



however, have undergone a kind of curricular cosmetic surgery, repackaging established approaches to familiar content with some additional activities and problems, for example, open-response exercises or journal writing assignments. Reform-minded teachers, school principals, and district administrators can wade through a vast number of choices—some very good and others rather poor—trying to find programs and materials that will help their students develop the skills, knowledge, and understanding they need to reason and communicate about the subjects they are studying. Educators seeking curricula that will move students to high standards of learning and performance need help determining their criteria for evaluating materials, winnowing the options, and identifying the important implementation issues.

Within the past few years two widely publicized evaluations of middle-grades mathematics materials have been published.<sup>5</sup> These reports are valuable resources, but there are several reasons why they cannot stand alone as guides for curriculum decisions. For one, the evaluations have used different strategies for identifying materials to evaluate and different criteria for their actual evaluations. Taken together, they offer a good sense of the kinds of materials promoting academic excellence that are currently available, but neither evaluation offers a definitive list from which to choose.

For another, curriculum decisions must include a consideration of the match between prospective materials and the particular circumstances of a district, school, or classroom. Such a very specific analysis is, of course, beyond the scope of the general evaluation these reports provide. Moreover, the reports' recommendations about specific materials will become outdated as new programs are developed and old ones modified. Potentially more useful over the long run are the evaluation criteria themselves, which



I was delighted when my district adopted a new, *Standards-based* math program. It's provided the anchor for my teaching that had been missing. Before, I had to come up with all new activities for my classes all the time. It takes an enormous amount of time to construct your own curriculum from scratch. It's too scary to have to invent the whole thing. It felt like a monumental task that was just too hard to take on."

—Mathematics teacher

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<sup>5</sup> Recent analyses of mathematics curricula have been done by the U.S. Department of Education and Project 2061 of the American Association for the Advancement of Science. See Chapter 4 for information about these reports.



educators can use on their own to review materials they are considering. As you might expect, however, the most rigorous criteria are also extensive and detailed, making their use quite labor-intensive.

There are also some guides that lay out the general process of curriculum design and selection.<sup>6</sup> The kind of resource that currently seems to be missing is a practical guide that combines a view of the decision-making process and descriptions of quality *Standards*-based curricula, and that frames these within the experiences of practitioners who have been at the forefront of classroom reform. It is this niche that *Guiding Curriculum Decisions* seeks to fill.

This guide includes:

- Critical questions that embody a set of principles to guide curriculum decision making.
- Vignettes about curriculum selection and implementation that use practitioners' own voices to illustrate how the principles are addressed in practice.
- An overview of the curriculum decision-making process.
- Profiles of selected, exemplary curriculum programs.
- An annotated list of other resources that may be useful to curriculum decision making.

The principles we propose to guide decision making are general ones that pertain to any subject area. They articulate three essential components of any academically excellent curriculum. These three components provide the foundation on which the guides are based. The next section introduces these components, and is followed by some additional information about this guide: a brief tour of the remaining chapters of the guide, suggestions of different ways to use the guide, a description of our process for identifying and interviewing practitioners about their experiences with *Standards*-based curricula, and our methods for identifying materials to profile.

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<sup>6</sup> See, for example, Lynn T. Goldsmith, June Mark, and Ilene Kantrov, *Choosing a Standards-Based Mathematics Curriculum* (Portsmouth, NH: Heinemann, 2000); National Research Council, *Designing Mathematics or Science Curriculum Programs* (Washington, DC: National Academy Press, 1999); and National Research Council, *Selecting Instructional Materials* (Washington, DC: National Academy Press, 1999).



# Principles to Guide Curriculum Decisions: Three Components of Academically Excellent Curricula

Before you can judge a curriculum’s potential for promoting academic excellence, you need to know what to base your judgments *on*. The framework we describe below specifies three key components of academically excellent curricula—academic rigor, equity, and developmental appropriateness. These components, which are illustrated by the diagram of interlocking circles pictured throughout this introduction, were first proposed by members of the National Forum to Accelerate Middle-Grades Reform, a coalition of funders, educators, researchers, state and local leaders, and representatives of national associations that promotes a vision of effective schools for young adolescents.<sup>7</sup> This section describes each of the components and discusses how each pertains to middle-grades students.

## A view of middle-grades students

“Teaching middle school is like being inside a kaleidoscope—the view of the kids is always changing, and it’s always interesting. I’ve heard middle-grades kids described in a lot of ways—mostly contradictory. For example, they’re really learning how to take responsibility for themselves; they’re really wild. They’re vigilantly watching everyone and everything around them so they can figure out who they are; they’re completely oblivious to the rest of the world. They’re kind and thoughtful; they’re rude and obnoxious. You can get someone in this school to agree to every one of these descriptions, and most of us would say that, at one time or another, they’re *all* true.

“I think about middle-grades students like kernels of popcorn. They pretty much all enter sixth grade as young kids, and during the three years we have them, they start popping at different rates, transforming into these new adolescent creatures. The most obvious part of the transformation is the physical one. There are always a few kids who enter the sixth grade looking 16 instead of 11 or 12 (or who are older to begin with because they’ve repeated grades somewhere along the way), but mostly the sixth graders still have the bodies of children.

<sup>7</sup> Joan Lipsitz, Hayes Mizell, Anthony Jackson, and Leah Meyer Austin, “Speaking With One Voice,” *Phi Delta Kappan*, 78, no. 7 (1997): 553.



And then, they start popping. By the end of the first year, there are a handful of boys who are shooting up and have feet the size of canal boats, and a bunch of girls who are beginning to look like young women. When everyone comes back to school the next fall, there are more kids who are making the change, and during seventh grade, even more. It's fun to watch friends catch up with each other—one month, two boys will walk down the hall looking like Mutt and Jeff, and two or three months later, they're standing shoulder to shoulder. By the time they leave for the high school, better than half of the girls are taller than I am—and let's not even talk about the boys!

"These kids are such a funny mix of becoming more grown up emotionally and intellectually and still remaining quite young. I really enjoy their class discussions, because you can see the kids revving up their mental engines. They're thinking deeply and figuring out some really sophisticated stuff. Kids will argue for their ideas and make pretty convincing cases, too. Even though they're beginning to become really passionate about some of their ideas and beliefs, they're also learning to listen to other people. Lots of times they can understand why someone else might see things differently. Sometimes they can even convince others to change their minds.

"But this growing intellectual power is only part of the story. Kids can be having this really intense and interesting discussion in class, say about how to control variables in an experimental design. Then, as soon as class ends the girls may shift seamlessly into a debate about the 'hottest' TV star on their way out the door and the boys may start to talk up the latest basketball game or exchange tips for avoiding skateboard wipe-outs."

— Middle-grades educator



## **Academic rigor: Meeting high standards**

The current efforts to set standards for student performance at national, state, and district levels are, in essence, efforts to define academic rigor. At the heart of the standards movement is the question, "What is the essential knowledge of the discipline?" Or, as one Massachusetts teacher has put it, the fundamental question is, "What do I want my students to know ten years after they've been in my class?" For reform-minded educators, the answer to these questions includes understanding the major concepts of a subject area (the "big ideas"), acquiring characteristic ways of thinking within the discipline ("habits of mind"), and learning its particular methods of investigation and argumentation. The answer also includes mastering skills, facts, and useful procedures,



but it reframes these as part of a larger intellectual enterprise rather than as the primary goal of curriculum and instruction.

Standards are more than a list of expectations for student accomplishment—they're not simply a scope and sequence for the topics to be covered over the course of a year, a grade level, or an entire K–12 career. Standards are guideposts to help keep students on track for mastering the fundamental ideas of subject areas, reasoning according to the methods and conventions of the disciplines, and presenting (and, if necessary, defending) their thinking to others.

This view of standards is pushing curriculum and instruction in new directions. Drawing on models of apprenticeship-style learning and on the theory that students construct their knowledge and understanding by actively engaging with the central ideas of a discipline, the current educational reform movement focuses on creating opportunities for students to build and use their understanding in rich and complex learning contexts.

An academically rigorous curriculum articulates a clear set of goals for learning. It gives teachers and students a reasonable picture of the nature of the discipline and connects them with the same kinds of work that engage professional practitioners. For example, students make and test mathematical conjectures, design science experiments to test hypotheses, or research and write persuasive essays. A rigorous curriculum helps students exercise general reasoning processes, develop ways of thinking that are particular to the subject area, and acquire an understanding of the methods for establishing and evaluating knowledge in the discipline. For example, the mathematics curriculum should help students develop an appreciation for the characteristics of a convincing mathematical argument, while language arts classes should help students understand the criteria by which we judge a well-reasoned essay.

In addition, a rigorous curriculum offers students (and teachers) a coherent view of the subject area by making connections among important ideas within the discipline. These connections have an effect similar to that of viewing an Impressionist painting from across a room. From up close, the painting looks like little more than individual patches of color floating on the surface of the canvas. From a distance, these colors coalesce into the rendering of a three-dimensional scene. A rigorous curriculum

**Standards are guideposts to help keep students on track for mastering the fundamental ideas of subject areas, reasoning according to the methods and conventions of the disciplines, and presenting (and, if necessary, defending) their thinking to others.**



**An academically rigorous curriculum for the middle grades acknowledges students' growing cognitive capacities and provides them with intellectual challenges to help them shape and sharpen their growing interests.**

offers connections that help students recognize and appreciate the recurring themes, ideas, and methodologies of the discipline instead of only small, isolated pieces of the picture. In addition, it emphasizes connections between classroom study and real-world applications, helping students to recognize the practical utility of their developing knowledge. Finally, a rigorous curriculum uses a variety of strategies for assessing students' understanding and ability to apply their knowledge to new problems or in different contexts.

In the particular case of the middle grades, it is important that curricula not underestimate students' intellectual capabilities. Early adolescence is a time of significant growth in reasoning capacity, and students' coursework should reflect their increasing ability to think hypothetically and systematically. Jean Piaget, the grand master of cognitive developmental psychology, characterized the young adolescent as navigating the final major stage of intellectual growth.<sup>8</sup> Young adolescents become increasingly adept at considering a variety of perspectives, examining situations from different angles, assessing contingencies, and acknowledging possible outcomes. They can think about what might happen (or what might have happened if conditions had been different). Their reasoning becomes more complex and systematic as they develop the capacity to coordinate their thinking about several ideas at once. A classic example is the young adolescent's developing ability to understand that a balance beam's balance point is affected by the coordination of several factors: the amount of weight on each arm, the placement of the weights, and the location of the fulcrum.

The typical middle-grades curriculum is often criticized as a rehash of previous material, a time for review to ensure that students are prepared for their work in high school. Students are often seen as marking time instead of encountering new ideas and challenging work. An academically rigorous curriculum for the middle grades acknowledges students' growing cognitive capacities and provides them with intellectual challenges to help them shape and sharpen their growing interests. It helps students develop their reasoning abilities and their capabilities for inquiry.

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<sup>8</sup> For an introduction to Piaget's theories, see Herbert Ginsburg and Sylvia Opper, *Piaget's Theory of Intellectual Development* (Englewood Cliffs, NJ: Prentice-Hall, 1969), or Jean Piaget, "Piaget's Theory," in *Carmichael's Handbook of Child Development*, ed. P. H. Mussen (New York: Wiley, 1970), 702–732.



It also helps them learn to monitor and critique their work by tapping their growing “metacognitive” ability—the capacity to guide their learning by reflecting critically on their own thinking.

Many schools have looked to using interdisciplinary approaches as a way to create more overall curricular coherence and enriching experiences for students. The team structures common in many middle schools can

facilitate this effort by providing opportunities for teachers to work more closely together to establish and coordinate lesson plans. In some schools, the same teacher may even be responsible for instruction in more than one subject area. In addition to emphasizing con-

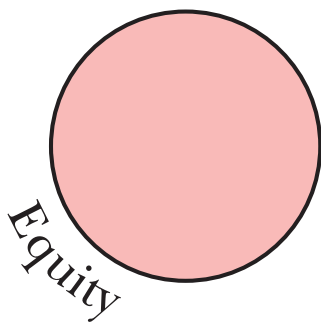
nections among different disciplines, interdisciplinary studies have the potential to explore subject area content in richer and more realistic contexts. After all, the activities and studies that comprise adult work rarely require the skills and ideas of only a single discipline.

It is important, however, to beware of a potential pitfall to interdisciplinary studies. In practice, it is less common to create a truly interdisciplinary curriculum than it is to integrate some of the themes, skills, and tools of one discipline into the study of another. For example, it is becoming increasingly common to ask students in mathematics class to write about their solution strategies, or even to write and present reports. This is a valuable addition to mathematics classes, as it provides opportunities for students to articulate their thinking and develop communication skills. However, teachers rarely respond to this written work as they would to writing assignments in language arts class. It would be unusual for teachers to require several drafts of writing done in mathematics class in order to help students clarify their ideas, shape their reasoning, and produce effective and grammatically correct prose. Writing assignments may integrate language arts skills into mathematics class, but they generally are not treated with equal weight. Similarly, having students read a novel about the Revolutionary War in language arts class while they study the



In reviewing curricula, we found some books had hardly anything new from year to year. Those books presented the same activities, the same concepts, year after year. There was just no depth. If you looked at only one year in isolation you might say, ‘Oh, this is really good,’ but then when you looked across the three years of the program, you found that it was the same stuff. Kids would go through those books each year and they wouldn’t learn anything new. We need a curriculum that will make sure we’re not teaching the same material over and over again.”

— District curriculum supervisor



**An equitable curriculum promotes high levels of achievement among a wide range of students by having more than one way to convey ideas and help students master skills.**

colonial period in social studies does not, in itself, constitute an interdisciplinary approach. Making such links may offer students the chance to practice skills and reinforce knowledge gained in another subject area, which is well worth doing. But a truly interdisciplinary curriculum addresses the full set of academic standards for each subject area involved, and requires more time than is allotted for study of a single subject.

## **Equity: Holding all students to high standards**

Our public education system is built on the commitment to prepare all of the country's children for productive lives as adult members of our society. Unfortunately, the realization of this commitment has been imperfect, and it is often those students at most risk for being marginalized—those with the fewest resources and poorest prospects—who receive the least adequate education.<sup>9</sup> By articulating high standards for all students, the current education reform movement raises expectations for student performance, with particular attention to students who have traditionally not excelled in school. Hand in hand with these higher expectations comes the assumption that all students can learn important concepts and skills when instruction builds from their current understanding, focuses on making learning meaningful, and engages students' intellectual strengths to drive the learning process.

Educators who embrace this assumption commit themselves to finding a wide range of instructional approaches and classroom activities in order to meet the specific learning needs of individual students. In the past, the most common approach for working with students at risk of falling behind has been to “re-teach,” going over material students have previously failed to master by using similar (if not identical) explanations and exercises in the hopes that more exposure will eventually lead to greater understanding. This “more of the same” approach is the educational equivalent of trying to communicate with someone who doesn't speak a word of English by repeating yourself, taking extra care to enunciate clearly and to speak more slowly and more loudly. If

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<sup>9</sup> Some also make the case that our educational system fails to meet the needs of very academically oriented students, who would benefit from more accelerated and in-depth learning.



enunciate clearly and to speak more slowly and more loudly. If the listener has no way to make sense of your speech in the first place, you won't accomplish much by saying it again. You might, however, make some progress if you try something different, like supplementary gestures or even pantomime.

An equitable curriculum promotes high levels of achievement among a wide range of students by having more than one way to convey ideas and help students master skills. It includes approaches and activities that accommodate a variety of learning styles and provides different kinds of opportunities for students to gain understanding of the subject area content and demonstrate their mastery. For example, students might model the mathematics of a problem in a variety of ways—with concrete objects (“manipulatives”), diagrams, charts, and numerical or algebraic expressions. By offering a variety of approaches, equitable curricula make it possible for students with different cognitive strengths and preferred ways of accessing information to grapple with the important ideas of the subject area. When a teacher allows a student who struggles with computation to use a calculator to figure out the areas and perimeters of differently shaped gardens, she makes it possible for the student to explore the relation between these two kinds of measurement. But offering the calculator does not substitute for also helping the student to become more competent and fluent with computation and the number sense that underlies it. This work also needs to be done.

An equitable curriculum offers content that is rich and deep enough that students with different levels of understanding can all extend their learning. Both the kinds of topics addressed and the kinds of work students are asked to do must be sufficiently broad to allow everyone room to learn. In mathematics, learning activities can offer all students the chance to investigate mathematical relationships, develop solution strategies, and discuss their reasoning. More sophisticated students can extend the activity by posing additional questions, looking for more efficient or elegant solutions, or seeking to describe the particular mathematics of the problem in terms of the general case. An equitable curriculum creates opportunities for all students, not just the most successful, to do work that challenges them to take charge, reason, organize their thoughts, and communicate them to others. As educator

**An equitable curriculum creates opportunities for all students, not just the most successful, to do work that challenges them to take charge, reason, organize their thoughts, and communicate them to others.**



and author Anne Wheelock has observed, “All students can benefit from the thinking skills and enrichment activities often offered only to those labeled ‘gifted’ and ‘talented.’”<sup>10</sup>

Student diversity takes a number of forms: different approaches to learning; gender-related differences; a variety of home cultures, languages, and life experiences; different forms of physical challenge. Curricula should be sensitive to such differences. The contexts (and, where appropriate, content) should represent a variety of perspectives and experiences. The work and lives of those “dead, white, European males” are only part of the picture. An equitable curriculum makes sure that other parts of the picture are developed as well.

How do issues of equity apply to middle-grades curricula in particular? Curricula for young adolescents need to be particularly sensitive to providing all students with opportunities to exercise their newly developing logical and critical thinking skills. Because early adolescence is a time of intellectual growth spurts as well as physical ones, middle-grades students are developing their new cognitive resources and capacities at different rates and times. A typical middle-grades classroom, therefore, is likely to contain students with an especially wide range of cognitive resources and capabilities. This intensifies the challenge of finding curricula that can promote learning for students who bring a range of skills, prior knowledge, and reasoning abilities into the classroom.

### **Developmental appropriateness: Attending to characteristics of young adolescents**

Effective curricula are geared to the students they are designed to reach. Their subject area content is developed at a level of complexity that builds on students’ current knowledge and encourages them to push toward deeper and more extensive understanding. If the ideas developed in the curriculum are too far removed from students’ experience or current ways of understanding, they will be too difficult to grasp; if the ideas are too simplistic, students will be bored by work they already understand.

Developmentally appropriate curricula are based on knowledge of how students’ thinking develops. This ensures that the curricula

<sup>10</sup> Anne Wheelock, *Crossing the Tracks* (New York: The New Press, 1992), 13.





deal with central ideas and skills in ways that address students' typical questions, confusions, and evolving understandings. Curriculum developers use their own experiences with students, educational and psychological research regarding children's acquisition of subject area concepts and skills, and pilot-test results to ensure that their materials are effective learning tools for students in the target grades.

Curricula must not only engage students at an appropriate intellectual level; they must engage students' interest and attention as well. Unless students are motivated to connect to the ideas in the curriculum, they will just mark time with studies that they don't "own." Developmentally appropriate curricula must therefore set students' academic work in contexts that are suited to their age and interests.

In the middle grades, a developmentally appropriate curriculum takes into account the young adolescent's growing cognitive capacities, helping students move from their informal and intuitive ways of understanding toward more formal and systematic approaches to the subjects they are studying. It is also particularly important that curricula motivate and engage middle-grades students, since young adolescents begin to question the purpose and value of adult-initiated assignments. As many students move to the middle grades, they leave their tractability behind as a souvenir for their elementary school teachers. Many students become less willing to work hard simply because a teacher requests it, asking, "What's the use of learning about this?" Students are more likely to put effort into their schoolwork when they perceive the contexts for lessons and activities to be interesting, important, and relevant to their lives. A developmentally appropriate middle-grades curriculum capitalizes on students' growing interest in their own communities, other cultures, and other eras to motivate their studies.

On the social front, the young adolescent's more flexible and far-reaching ways of thinking lead to a seeming paradox: an increasing attention to others which is paired with a growing self-consciousness. Students in the middle grades begin to think more deeply about the consequences of people's thoughts and actions, and are willing to consider complex and important questions like, "What makes a good friend?" "What does it mean to be a slave, or a slaveholder?" "What do the statistics on driving age

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on the environment?” Middle-grades students also think a lot about their own character and role in the world. Their questions about identity aren’t idle ones. With bodies that often look and feel alien, and with newly emerging observational and analytic skills, young adolescents are often genuinely in a state of flux. As middle-grades students grapple with questions about themselves and their world, they turn to their compatriots in struggle—their peers—for self-definition and validation.

Developmentally appropriate curricula for the middle grades capitalize on this attention to self and peers by offering students opportunities to develop social skills and to use their classmates as resources for learning. Because middle-grades students are particularly oriented toward their peer group, providing them opportunities to work together offers a way to harness their keen interest in one another toward productive educational ends. Students can develop their collaborative skills as well as engage their capacity to compare and critique ideas from different perspectives.

**A caution.** A common misinterpretation of standards-based reform is that it is first and foremost about offering students motivating and engaging activities. But an effort directed only at making lessons appealing and engaging may lead to trivial intellectual work—in an effort to hook students on learning, students may be let off the hook of mastering content.

Choosing fun classroom activities, using concrete, “hands-on” lessons, and having students work in cooperative groups do not by themselves guarantee student learning. Without clear academic goals and an understanding of how to reach them, efforts to provide engaging and interesting activities are simply form without substance. Yet, because subject area standards all stress the importance of student involvement, it’s not unusual for educators to assume that active and engaged students provide adequate evidence that substantial learning is taking place.

There is no question that it is better for students to find their work engaging and interesting than to be bored and unconvinced of the value of their efforts. However, activities may prove engaging without stretching students’ understanding. When this is the case, neither the criterion for academic rigor nor that for developmental appropriateness is being met. Quality education isn’t simply about having students busy and happy in the classroom. It’s about having them engaged in work that has intellectual teeth.



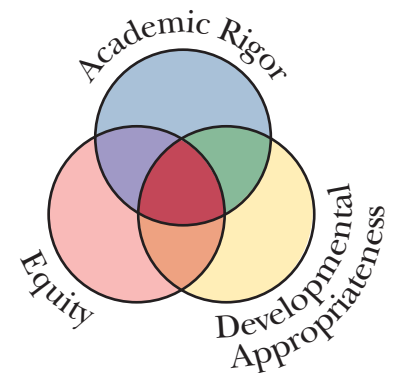
## Integrating the three components

Only when all three components described above are present can a curriculum offer the intellectual depth and pedagogical perspectives that create powerful learning opportunities for a wide range of students. Academic excellence lies at the intersection of academic rigor, equity, and developmental appropriateness.

Because the three components work in concert to support learning, when one or another is missing or weak, the curriculum will not promote academic excellence. Without academic rigor, the curriculum will have no edge as a tool for intellectual growth and students will be denied important resources for building knowledge and understanding. However, if an academically rigorous curriculum is inequitable (by being successful at promoting learning for only a narrow segment of the student population), its effectiveness is also compromised. It runs the risk of shortchanging students who have interesting minds and the potential to make significant contributions, but whose modes of learning or whose academic or social experiences are inconsistent with the limited approaches taken by the curriculum. And even an admirably rigorous curriculum will fail to promote learning if it does not address students' typical patterns of developing concepts and skills, or if it fails to capture students' interest or attention. In curriculum, as in other aspects of life, a balance among important components is the key.

## About This Guide

This guide, like the others in the series, uses the framework described above to examine *Standards*-based curricula and their implementation. It also relies on the insights of a number of teachers and advisors, who shared with us their thoughts and observations about using *Standards*-based programs. In addition to providing information about the implementation of particular materials, they talked about the “big picture”—how curriculum related to their standards for student performance, the instructional approaches they saw as most effective for student learning in diverse populations, and their commitment to professional





**We want this guide to speak to educators . . . from the place where, ultimately, the work of the curriculum is carried out—the classroom.**

development. Below is a summary of the contents of *Guiding Curriculum Decisions for Middle-Grades Mathematics*.

## **A brief tour of the guide**

*Guiding Curriculum Decisions for Middle-Grades Mathematics* looks at curriculum from several different perspectives. The introduction has offered a set of principles—the three components of academically excellent curricula—as an overarching guide to curriculum decision making. Subsequent chapters use these principles as a framework for considering curriculum decision making and implementation.

**Chapter 1.** In this chapter, we look at practitioners’ experiences with exemplary curriculum materials to help us draw explicit connections between these principles and the ways teachers actually use exemplary materials to promote students’ learning. We want this guide to speak to educators (teachers, curriculum specialists, staff developers, principals, and central office administrators) from the place where, ultimately, the work of the curriculum is carried out—the classroom. By grounding the guide in practitioners’ own descriptions of their experiences, we aim to give readers a fuller and more vibrant picture of what makes an excellent curriculum excellent.

The chapter is organized around “critical questions” to ask when making curriculum decisions. These questions are tied to the three critical components of academically excellent curricula we have described above: academic rigor, equity, and developmental appropriateness. Each of the critical questions is then illustrated by vignettes with practitioners’ observations of ways they (or their districts) have addressed the question.

**Chapter 2.** This chapter offers a practical guide to the curriculum selection process, sketching important steps to take and issues to consider. It may outline a process that is more complex and time-consuming than you have used in the past; remember that the kinds of curriculum materials that will help promote academic excellence are themselves more complex and require more study. The “flip test” that worked when materials were all more or less the same—flip through a few pages or a chapter, check for layout, readability, and coverage of topics in the district’s scope and sequence—is no longer sufficient. Because concepts and skills are developed in the context of sequenced problems and



activities, the materials generally require more thorough study in order to identify the ways content is developed in lessons and units. And because *Standards*-based curricula also rely on a considerable range of instructional approaches, close examination of materials will also help to identify those approaches that teachers will need to master.

**Chapter 3.** Chapter 3 presents profiles of examples of academically excellent mathematics curricula. These profiles do not represent a definitive list of high-quality materials, but they do represent those comprehensive, grades 6–8 mathematics curricula that were available commercially when this guide was written and meet the criteria for rigor, equity, and developmental appropriateness. The profiles are designed to give you a sense of the distinctive characteristics of individual materials. They may whet your appetite for a closer look at the curricula, but should never substitute for a more careful review of the materials themselves.

**Chapter 4.** This final chapter provides an annotated list of additional resources to assist you in making curriculum decisions. These resources include professional organizations, books about implementing curricula, professional development programs, and additional curriculum materials.

## **Some suggestions for using the guide**

For some who are looking for guidance in making decisions about new curriculum the only real question they may have is, “What should we buy?” and the only part of this guide that may seem relevant is the chapter that includes the curriculum profiles. While we certainly cannot argue about the importance of this question, we do not see it as the only one to ask, and we encourage you to use this guide (and the others in the series) for more than a quick pointer to the publishers you will contact for sales presentations.

In fact, we think that the temptation to look at the profiles and nothing more is kind of like eating dessert before your main course—it may satisfy your immediate craving, but it’s not very nutritious by itself. The profiles are intended to give you a sense of how different exemplary programs approach important issues, but this information alone isn’t enough to help you make good curricular decisions for your particular circumstances. The other parts of the guide are constructed to help you put the profiles in some broader contexts: the context of general characteristics of



academically excellent materials and the context of other practitioners' experiences, which you can then compare to the particulars of your own district, school, and/or classroom.

We strongly suggest that you read Chapter 1 before you go on to the rest of the guide. This chapter grounds the conceptual framework outlined above within the actual experiences of teachers. More than any other part of this guide, and more than most other resources we have seen, this chapter offers the voices of fellow educators reflecting on the challenges and rewards of using *Standards*-based curriculum materials.

You may want to read the guide front to back, but you may also choose to use it more as a resource book, choosing chapters to read as the need arises. However you use it, we hope that one idea shines through: that the movement toward standards for learning and performance that focus on conceptual as well as skill-based achievement has required a serious reconsideration of what makes an academically excellent curriculum. And this reconsideration, in turn, has led to the need to conceptualize both the decision-making process for curriculum selection and plans for implementation in different terms.

## **Interviews with mathematics educators**

In preparing this guide, we spoke to a number of mathematics educators throughout the country about their mathematics curricula. We were interested in learning from them about district-level curriculum choices and decisions, their thoughts about different curriculum materials, some of the challenges they had encountered in implementing *Standards*-based curricula, and ways they had resolved those challenges. All told, we interviewed 24 mathematics teachers and curriculum coordinators who work in different community settings (urban, suburban, and rural) and in different geographical regions of the country. Their districts range in size from large urban systems serving tens of thousands of students to one K–12 school with a total enrollment of just around 300.

We identified educators to interview in several ways. Colleagues and members of the advisory board for this guide recommended practitioners they knew and respected. Sometimes these practitioners, in turn, recommended that we speak with colleagues of theirs. Curriculum developers also recommended teachers who were familiar with *Standards*-based instruction and articulate about



meeting the challenges of implementing a *Standards*-based curriculum. We also contacted several of the curriculum supervisors and coordinators whose districts are associated with our granting agencies, the Edna McConnell Clark and W.K. Kellogg Foundations. The practitioners in this last group were not necessarily using *Standards*-based curricula, but were quite helpful in assisting us to develop a fuller picture of the kinds of challenges that teachers face as they work to meet standards in their classrooms.

The interviews themselves consisted of conversations of approximately an hour in length, which followed a flexible interview protocol. The interviews included discussion of curriculum selection decisions, overall experiences with *Standards*-based curricula, experiences with particular mathematics lessons, ways the curriculum affected students who were succeeding or struggling in class, and specific challenges of the curriculum for teaching and learning. We have used these interviews in creating the vignettes in Chapter 1 and in developing the curriculum profiles that comprise Chapter 3.

## **Identifying examples of Standards-based curricula**

Because the NCTM *Standards* documents have served as such a central (and unifying) force in mathematics education since the late 1980's, curriculum developers have had the advantage of designing curriculum materials around a well-articulated and largely consensual view of the important mathematical and pedagogical characteristics of an academically excellent curriculum. In addition, the National Science Foundation (NSF) has invested a considerable amount of funding to support the development of new curriculum materials based on the *Standards*. It is with these NSF-funded materials that we began to look for exemplary, comprehensive middle-grades mathematics programs. We also reviewed other materials that were identified by colleagues, our advisory board for this project, and the practitioners we interviewed (although, as it turned out, they mentioned very few additional materials). Finally, we looked to recently published evaluations of middle-grades mathematics materials for further recommendations (see Chapter 4 for a description of these reviews by Project 2061 and the U.S. Department of Education Expert



Panel). Generally, the same curriculum programs emerged from all of these sources.

Each of the programs we have profiled in Chapter 3 offers a comprehensive mathematics curriculum for at least three years of middle-grades instruction, and illustrates how curriculum materials can promote student learning that is consistent with the NCTM *Standards* and the three components of academically excellent curricula we have outlined in this introduction. Examples of other curriculum materials that are consistent with the *Standards* are described briefly in Chapter 4.

## **A final word**

As we have worked on this guide, we have spoken with many teachers who have come to believe that a Standards-based curriculum has helped them to teach better because it has helped them focus on providing rigorous, equitable, and developmentally appropriate instruction for their students. For many, learning to use these curricula effectively has been a challenge, but ultimately a rewarding one. As one seventh- and eighth- grade teacher noted,

“After the pilot testing of the curriculum there was some controversy in the district about whether it was going to be approved for adoption or not. But all the middle school teachers just looked at each other and someone said, ‘The school board can do what they want. I’ll never teach like I did before.’ So this curriculum really had a big impact on how we taught and how we saw students learning. I think it has been very powerful.”

We hope that you, too, will find that *Standards*-based mathematics curricula can be a powerful force in your district, school, or classroom. And we hope that this guide will help you to make thoughtful decisions about choosing and using your next mathematics program.