



**School Improvement
Specialist Training Materials:
Performance Standards,
Improving Schools, and
Literature Review**

**Module 6—
Aligned and Balanced
Curriculum**

December 2005

Appalachia Educational Laboratory (AEL)
at

EDVANTIA™

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This publication is based on work sponsored wholly or in part by the Institute of Education Sciences (IES), U.S. Department of Education, under contract number ED-01-CO-0016. Its contents do not necessarily reflect the positions or policies of IES, the Department, or any other agency of the U.S. government.

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The School Improvement Specialist Project prepared seven modules. School improvement specialists, as defined by the Appalachia Educational Laboratory at Edvantia, are change agents who work with schools to help them improve in the following areas so as to increase student achievement. These modules are intended to provide training materials for educators seeking professional development to prepare them for a new level of work.

Module 1—Shared Leadership

Module 2—Learning Culture

Module 3—School-Family-Community Connections

Module 4—Effective Teaching

Module 5—Shared Goals for Learning

Module 6—Aligned and Balanced Curriculum

Module 7—Purposeful Student Assessment

Each module has three sections:

1. Standards: Each set of content standards and performance indicators helps school improvement specialists assess their skills and knowledge related to each topic. The rubric format provides both a measurement for self-assessment and goals for self-improvement.
2. Improving Schools: These briefs provide research- and practice-based information to help school improvement specialists consider how they might address strengths and weaknesses in the schools where they work. The information contained in the briefs is often appropriate for sharing with teachers and principals; each includes information about strategies and practices that can be implemented in schools, resources to be consulted for more information, tools for facilitating thinking about and working on school issues, and real-life stories from school improvement specialists who offer their advice and experiences.
3. Literature Review: The reviews of research literature summarize the best available information about the topic of each module. They can be used by school improvement specialists to expand their knowledge base and shared with school staffs as part of professional development activities.

Aligned and Balanced Curriculum
Content Standards and Performance Indicators for School Improvement Specialists
Self-Assessment Tool

Aligned and Balanced Curriculum: This matrix measures the extent to which a school improvement specialist has the knowledge and skills to assist a school in developing its capacity to create and sustain an aligned and balanced curriculum, as reflected by the following characteristics: (1) knowledge of the extent to which a school’s curriculum is aligned and balanced, (2) ability to “unpack standards” to determine embedded knowledge and skills, (3) facilitation of the ongoing planning and evaluation of curriculum, and (4) knowledge of structures that support aligned and balanced curriculum.

Knowledge or Skill	Advanced	Proficient	Basic	Novice
1. Assessing the extent to which a school’s curriculum is aligned and balanced	<p>The school improvement specialist</p> <ul style="list-style-type: none"> a. dialogues with school leaders about the importance of an aligned and balanced curriculum to the overall effectiveness of the school program and to their students’ achievement b. coaches school leaders and faculty in developing the knowledge and skills associated with the various components of the alignment process c. coaches school leaders as they assess their school’s capacity to create and sustain an aligned and balanced curriculum d. assists school leaders and faculty in assessing resources (technical and human) that can be used to create and sustain an aligned and balanced curriculum 	<p>The school improvement specialist</p> <ul style="list-style-type: none"> a. relates the importance of aligned and balanced curriculum to the ongoing work of a school faculty; helps faculty see the need for continuously addressing this function b. works with school leaders and faculty in assessing the school’s current capacity in the area of creating and sustaining an aligned and balanced curriculum c. helps school leaders and faculty determine steps to be taken to move the process of curriculum alignment forward d. recommends alternatives resources and technical assistance providers in the area of curriculum alignment as appropriate 	<p>The school improvement specialist</p> <ul style="list-style-type: none"> a. communicates to school leaders and staff the importance of external and internal alignment b. shares examples of aligned and non-aligned curricula with school leaders and faculty c. determines where a given school staff is in the process of aligning its curriculum d. shares human and technical resources that can assist school faculties in the curriculum alignment process 	<p>The school improvement specialist</p> <ul style="list-style-type: none"> a. knows the importance of both external and internal curriculum alignment b. knows the characteristics of an aligned and balanced curriculum c. is familiar with the various components of the curriculum alignment process (e.g., curriculum maps, scope and sequence documents, unpacking guides) d. understands the function of each component of an aligned curriculum e. knows how to access human and technical resources that can assist schools in the curriculum alignment process

Knowledge or Skill	Advanced	Proficient	Basic	Novice
2. “Unpacking standards” to identify embedded knowledge and skills	<p>The school improvement specialist</p> <ul style="list-style-type: none"> a. coaches faculty and staff in developing deeper understanding of national, state, and local standards related to their areas of instruction b. coaches faculty as they identify knowledge and skills embedded in standards c. provides feedback to faculty as they identify cognitive requirements of a given standard 	<p>The school improvement specialist</p> <ul style="list-style-type: none"> a. leads faculty and staff in dialogue about national, state, and local standards related to their respective areas of instruction b. leads faculty in the identification of knowledge and skills embedded in standards c. facilitates faculty understanding of the cognitive complexity associated with a given standard 	<p>The school improvement specialist</p> <ul style="list-style-type: none"> a. ensures that faculty and staff know about and have access to national, state, and local standards related to all curricular areas b. explains to faculty the importance of unpacking standards to identify embedded knowledge and skills c. knows how to analyze the level of cognitive complexity in standards and written lesson plans 	<p>The school improvement specialist</p> <ul style="list-style-type: none"> a. is knowledgeable about national, state, and local standards b. understands the importance of “unpacking standards” to identify embedded knowledge and skills c. knows the cognitive levels associated with Bloom’s Taxonomy and how to use this tool in analyzing standards
3. Supporting planning and evaluation of the curriculum	<p>The school improvement specialist</p> <ul style="list-style-type: none"> a. develops the capacity of a faculty to collaboratively plan and evaluate its curriculum b. coaches faculty as they diagnose the extent to which their instructional materials and practices are internally aligned c. coaches faculty in its use of student achievement data to make curricular and instructional decisions 	<p>The school improvement specialist</p> <ul style="list-style-type: none"> a. facilitates a faculty’s engagement in evaluation of its curriculum b. helps individuals and teams of teachers diagnose the extent to which their instructional materials and practices are internally aligned c. works with faculty in the use of student achievement data to make decisions about curriculum and instruction 	<p>The school improvement specialist</p> <ul style="list-style-type: none"> a. recognizes the extent to which a school has a viable process for curriculum planning and evaluation in place b. talks with faculty about the value of a collaborative approach to the planning and evaluation of their school’s curriculum c. diagnoses the extent to which internal alignment is present in a school’s instructional materials and practices d. instructs faculty in the use of student achievement data in curricular and instructional decision making 	<p>The school improvement specialist</p> <ul style="list-style-type: none"> a. knows the fundamentals of a sound curriculum planning cycle b. recognizes the value of a collaborative approach to the planning and evaluation of a school’s curriculum c. knows the importance of assessing the extent to which a school’s instructional materials and practices are internally aligned d. knows how to use student achievement data to facilitate curricular and instructional decision making

Knowledge or Skill	Advanced	Proficient	Basic	Novice
4. Developing organizational structures that support aligned and balanced curriculum	<p>The school improvement specialist</p> <ul style="list-style-type: none"> a. coaches school leaders as they assess the extent to which current organizational structures support alignment of curriculum b. coaches school leaders as they design new structures to support aligned and balanced curriculum 	<p>The school improvement specialist</p> <ul style="list-style-type: none"> a. works with school leaders to develop structures that support the alignment of curriculum b. facilitates the adequacy of existing organizational structures to support an aligned and balanced curriculum 	<p>The school improvement specialist</p> <ul style="list-style-type: none"> a. communicates to school leaders the importance of developing structures that will support aligned and balanced curriculum b. shares examples and prototypes of organizational structures that have been successfully used in other schools to support aligned and balanced curriculum 	<p>The school improvement specialist</p> <ul style="list-style-type: none"> a. is familiar with organizational structures that support aligned and balanced curriculum b. recognizes the benefits of developing formal structures that support aligned and balanced curriculum

What Is Curriculum Alignment?

Generally speaking, educators use two types of curriculum alignment: external and internal. External alignment means that the written, taught, and tested curricula reflect the concepts and skills (what students must know and be able to do) that appear in state and district standards. It is a way of “mapping” the curriculum onto the standards to ensure that the school is teaching the content that is expected. Most states now require school districts to have a written curriculum that shows how instruction at each grade is linked to state standards, and all schools in the district are expected to use this curriculum guide.

In states where standards are aligned with criterion-referenced tests, external alignment is fairly easy to achieve. However, when states use norm-referenced tests, teachers also must review test objectives and sample test items to achieve external alignment. In this instance, teachers may use test item analysis data to determine which concepts and skills students are mastering and where students have learning deficiencies. At this point, the instructional priority should be placed on developing and reinforcing the concepts and skills on which students have not achieved mastery. This process is sometimes called “prioritizing the curriculum.”

Internal alignment exists when classroom instruction and assessment reflect the language and complexity of the standards. Achieving this may require teachers to “unpack the standards,” or decode the performance indicators embedded in them. For example, if a science standard states, “Students will design and conduct experiments,” students must engage in these activities; reading and answering questions will not be sufficient to develop their skills. Teachers must identify the knowledge and skills students need to design and conduct experiments, provide direct instruction on vocabulary and the scientific process itself, and then guide students through an actual experiment. This process will need to be reinforced through assessment and feedback to students if they are to master the standard.

Frequently teachers have difficulty designing classroom assessments that align with state assessments. When teachers at a West Virginia middle school reviewed their classroom assessments, they found that 80% of their questions were at Bloom’s Taxonomy Level 1 (recall). However, 90% of the items on the state assessment required students to use higher levels of thinking—internal alignment had not been achieved. Teachers improved their skill in developing assessments by using the review process.

To alleviate problems with alignment, many school districts have developed quarterly benchmark assessments that help schools track student progress toward mastery of key concepts and skills. A school district might develop prioritized curricula in each discipline to assist schools with external and internal curriculum alignment. These curricula would specify the concepts and skills to be taught each nine weeks. Benchmark assessments that align with the prioritized curricula could also be developed, or a school district might develop pacing guides that correlate with quarterly benchmark assessments.

When assessments show students performing below proficiency, teachers need to review their instructional practices to identify problems with the level of instructional complexity. They also need to consider differentiated instructional practices, particularly ones that are appropriate for linguistically and culturally diverse students and students with special needs. When curriculum and assessment align, teachers can better identify and address student needs.

Curriculum alignment is often viewed as a difficult task, and it can be overwhelming to teachers. Most schools and districts look to consultants to help them undertake this task. In many low-performing schools, school improvement specialists provide leadership and/or guidance for aligning the curriculum to standards.

What Is Balanced Curriculum?

Balance in the curriculum is evident in the following areas:

- use of time
- content included
- materials and strategies that respect diversity
- attention to cognitive styles

Use of Time

Many states and school districts prioritize the use of instructional time to allow more time for core subjects or those that are tested on standardized tests. This sometimes means extending learning time for certain courses. For example, the West Virginia Department of Education recently enacted a policy that requires middle schools to provide 90 minutes per day of instructional time in mathematics and English language arts. School districts often prioritize the curriculum to ensure that key concepts and skills are introduced, developed, and reinforced in a timely manner throughout the school year.

To provide balance in the use of instructional time, one Rhode Island school district now provides curriculum units for each grading period with a specified number of days for each unit. Additionally, the district pacing guides identify which concepts and skills should be taught each nine weeks and for how long. To ensure that students master concepts and skills, the district curriculum first introduces those concepts and skills that students find most difficult, then provides time for development and reinforcement through the school year. Other schools and districts use curriculum mapping (Jacobs, 2003) that indicates what content, skills, and assessments will be included during each month of the school year.

David Squires (2005) defines a balanced curriculum as 10 to 20 time-bound units for each course. The units consist of two to five powerful activities (significant tasks) that everyone teaches and assesses. His model is based on the assumption that the teachers/curriculum developers can describe significant tasks that will raise student

achievement. These tasks are also aligned to appropriate standards and tests, ensuring that all students have equal access to an aligned curriculum. Squires' process also helps teachers align curriculum with the six pathways of development: physical, cognitive, psychological, language, social, and ethical.

Content Included

All students must participate in a challenging and common curriculum. While many states, districts, and schools may allocate additional learning time for the core courses, they also recognize the need for balanced representation of all disciplines. For example, the North Carolina Department of Education (2003) defines a balanced curriculum as one that reflects the state's full Standard Course of Study, which includes all disciplines whether they are tested or not. At the elementary and middle school levels, the balanced curriculum includes arts education (dance, music, theatre arts, and visual arts), English language arts, guidance, health and physical education, mathematics, information and computer skills, science, second languages, and social studies. This builds on the belief that a balanced curriculum challenges students in all areas of learning and allows them to demonstrate their knowledge in a variety of ways. All areas of the curriculum are considered essential to learning in school and beyond.

Materials and Strategies That Respect Diversity

Schools today are placing a high priority on closing achievement gaps. To accomplish this, schools need to use instructional strategies and materials that promote academic success for culturally and linguistically diverse students. For example, teachers must incorporate into the curriculum the principles of culturally responsive teaching—including active teaching, opportunities for student-controlled discourse, culturally relevant instructional materials, and high expectations for student learning. Furthermore, teachers must develop and extend their cultural proficiency (Burns, Keyes, & Kusimo, in press).

The National Council of Teachers of English (NCTE) recognized the need for culturally relevant materials and strategies in the report of the 1986 Task Force on Racism and Bias in the Teaching of English (www.ncte.org). For example, the Task Force wrote: "Choose materials that have more than token representation of works by nonwhite minorities and that reflect a diversity of subject matter, style, and social and cultural views. Use texts which represent nonwhite students in a nonstereotypical manner and which accurately reflect their contributions to American culture, history, and letters. . . . Include materials which provide historical commentary and interpretations on the full range of minority perspectives on social and political history."

NCTE also recognized the need for classroom strategies and materials that address the needs and interests of both boys and girls. These recommendations would seem to extend to any content area.

Attention to Cognitive Styles

Other issues of balance have to do with students' ways of knowing, or cognitive styles and developmental levels. When designing curriculum, therefore, teachers should give attention to diversity. We know that students don't learn in the same ways or at the same rate. During the primary years, developmental levels within a classroom are quite different.

Kenji Hakuta (2001), writing about the debate over bilingual education, states that a balanced curriculum incorporates both basic and higher-order skills, explicit skills instruction, opportunities for student-directed activities, use of instructional strategies that enhance understanding, opportunities for practice, systematic student assessment, staff development, and home and parent involvement (www.stanford.edu/~hakuta).

Howard Gardner's Theory of Multiple Intelligences posits that there are at least seven different ways of "being smart." Gardner and others recommend that teachers assess students' ways of learning and design curriculum that reflects their diversity. The Key School in Indianapolis, for example, has followed this recommendation and designed its entire curriculum around Gardner's theory.

How We Know That Aligning Curriculum Improves Student Learning

According to a summary of research studies completed by the Consortium of Chicago School Research, a schoolwide emphasis on alignment and coherence in the curriculum is necessary for success in improving student achievement. Test scores at schools that had no classrooms or only some classrooms with an aligned curriculum did not improve. However, those schools that had a coherent, aligned schoolwide curriculum showed a 12% increase on the Iowa Test of Basic Skills (Gordon, 2002). Underscoring this study are other research studies that indicate that by focusing on student learning, aligning what is taught with learning goals (standards), and using instructional strategies that promote learning for all students, teachers can help students improve their performance on standardized tests (see Mitchell, 1998; Schmoker & Marzano, 1999; Wishnick, 1989).

School districts that have worked with Edvantia to align curriculum have seen their students' test scores improve. For example, after one year of working with curriculum alignment, King William County, Virginia, led the state in percentage-point gains in five core areas of testing, and it ranked in the top 10 gains in six other areas. King William County continues to be near the top of all Virginia divisions for scores on the state's Standards of Learning Tests. Over a two-year period, students in Lunenburg County, Virginia, posted a 22-point gain in language arts scores, a 19-point gain in reading, a 19-point gain in math, and an 18-point composite gain on the Stanford 9 Achievement Test between fourth and sixth grades. This school district has a 60% minority enrollment and many economically disadvantaged students. The district

continues to improve and to maintain state accreditation after completing the work of aligning and balancing its curriculum.

School Story

Starting from Scratch: How to Develop Aligned and Balanced Curriculum

When the new superintendent for a New England school district arrived in July 2004, she discovered the district had no written curriculum. Faced with the accountability requirements of No Child Left Behind and a brand new set of state Grade-Level Expectations (GLEs), the superintendent knew the district must write curricula for at least mathematics and English language arts. That fall, she hired an Edvantia consultant to work with middle and high school mathematics and English language arts teachers. Their job was to develop a scope and sequence of instruction, pacing guides, and model curriculum units for Grades 6-12. The elementary supervisor and the assistant superintendent attended all meetings and applied the processes they learned to develop pacing guides for elementary school mathematics and language arts.

Prior to the consultant's first meeting with the teachers in January 2005, she sent them a simple calendar curriculum map and asked the teachers to indicate the topics and GLEs they had taught or planned to teach during each month of the 2004-2005 school year. At the first two-day workshop in January, the teachers brought these maps. The teachers then participated in a grade-level or course review of their maps, followed by a vertical view of the curriculum maps across Grades 6-12. Using these processes and the requirements of the GLEs, they determined the concepts, skills, and vocabulary that were most essential for students to master, identified any unnecessary content and skill repetitions, and noted any instructional gaps in essential concepts and skills.

The scope and sequence documents for mathematics and English language arts were developed in February and March workshops using data from the initial mapping and review process. The scope and sequence also included sample instructional activities, resources, and classroom assessments teachers might use to help students master the GLEs at each grade.

Once the scope and sequence documents were completed, reviewed by teachers across the grades, and revised, the group was ready to move forward in April with development of pacing guides for each grade. To create the pacing guides, teachers took the key concepts, skills, vocabulary, and GLEs for each grade and paced their introduction, development, and reinforcement through each quarter of the school year. Teachers wrote essential questions for each quarter to frame and focus the instruction and indicated the number of class periods that would be needed for instruction around each essential question or key curriculum component. Once the pacing guides were completed, reviewed, and revised, they were sent to another consultant who used them to develop quarterly benchmark assessments for the district.

In May, teachers began writing model curriculum units that correspond to the essential questions on the pacing guides. Working in grade-level groups by content area,

the teacher groups each completed two model curriculum units by June. Each group wrote one unit for the beginning of the 2005-2006 school year and one to be taught later in the year.

In August 2005, the Edvantia consultant presented the new curriculum to the district's principals and central office administrators. Together, they discussed how to introduce the curriculum to teachers and how to use the curriculum documents to monitor and improve instruction across the district.

The principals who participated in the alignment process praised it and the resulting curriculum materials. One said, "I can't imagine teachers being anything but overjoyed—everything they need is there and ready for them."

How Do We Create an Aligned and Balanced Curriculum?

An aligned and balanced curriculum is accomplished through development of the following components, which evolve from an initial curriculum mapping process.

- **Scope and Sequence of Instruction:** A vertical alignment of curriculum across the grades is presented.
- **Pacing Guide:** Each year's curriculum is outlined in segments (grading periods or months) that align with benchmark assessments and keep instructional pacing on track.
- **Model Curriculum Units:** One or more model curriculum units for each grade provide useful examples of how teachers can design instruction within a nine-week period. These curriculum units follow a design template outlined by Susan Drake and Rebecca Burns in their 2004 ASCD publication, *Meeting Standards Through Integrated Curriculum*.

This article explores the first component, scope and sequence. Subsequent articles explain the nature and purpose of the three curriculum components and suggest how teachers and principals may use them to improve teaching and learning for all students.

What Is Instructional Scope and Sequence?

A scope and sequence document provides a vertical view of the curriculum. It is organized around a list of concepts, skills, and key vocabulary derived from the state standards that all students should know and be able to do at each grade level from kindergarten through high school. The purposes of the scope and sequence are to build a basis for curriculum development, instructional strategies, and assessment practices, and to provide continuity of instruction from grade to grade.

Why Have a Scope and Sequence?

Without an instructional scope and sequence, or vertical alignment of curriculum, there are often unnecessary curricular repetitions. For example, the same reading selection may be used in more than one grade, or the same mathematics project/task may be repeated. Furthermore, a scope and sequence encourages spiraling of skills and concepts, which involves reinforcing and extending concepts and skills with increasing complexity within and across grades. An instructional scope and sequence may also provide sample instructional activities and classroom assessments that serve as models for increasing the complexity of the curriculum each year. Scope and sequence also helps teachers eliminate gaps or omissions of instruction in essential concepts and skills.

How Do Teachers Use a Scope and Sequence?

Teachers should read through the scope and sequence to gain knowledge about what students are learning in previous and subsequent grades as well as in their current grade. This helps them build on prior knowledge and skills and prepare students for what is expected in subsequent grades. It also helps teachers see the year's instruction as part of the whole of the middle and high school curriculum.

Using scope and sequence can help reduce teacher isolation and promote collaboration across grades. When teachers meet with their departmental teammates across grades, the scope and sequence can be the focal point for curricular and instructional planning and coordination. It can also serve as a tool for promoting important discussions about students' acquisition of skills and learning needs. Finally, scope and sequence can inform discussions about appropriate instructional activities, materials, and assessments at each grade.

How Do Administrators Use a Scope and Sequence?

Administrators should be familiar with the scope and sequence in order to have the "big picture" of curriculum in their school and to know the expectations for student learning at each grade. This knowledge will help them facilitate discussions with coaches, facilitators, and department chairs or interdisciplinary teams and departments, about appropriate instructional activities, resources, and assessments. It will also help them understand and acquire the supports, resources, or assistance teachers may need as they implement the new curriculum.

Instructional Scope and Sequence Chart

Grade _____

Content Cluster	Key Concepts, Skills, & Vocabulary	Related GLE/GSE	Classroom Assessments	Sample Instructional Activity: Materials Activity Description

Susan Drake and Rebecca Burns, *Meeting Standards Through Integrated Curriculum*. Alexandria, VA: ASCD, 2004.

Many schools under pressure to meet new standards of learning react by adopting a narrow curriculum that imposes strict boundaries on what students are taught. Drake and Burns address this issue by offering strategies for synchronizing standards across the disciplines. At the heart of the book is the KNOW/DO/BE framework, which teachers can use to ensure a curriculum that is both rigorous and relevant to K-12 students at all stages of proficiency. Among other things, this comprehensive framework helps teachers to

- map curriculum
- scan and cluster standards
- develop assessments and guiding questions
- align integrated instructional strategies and assessments

Though the authors draw on data from research, they focus on analyzing the real-life experiences of teachers who have successfully integrated their curricula in the service of accountability. The many benefits of this approach include lower absenteeism, fewer behavioral problems, and higher rates of homework completion. The case studies and research combination offers teachers a user-friendly system for meeting standards while advancing broad-based learning.

This book is available from the Association for Supervision and Curriculum Development online store at www.ascd.org. A free, companion study guide may be downloaded to assist schools as they prepare for and implement integrated curriculum.

The What, Why, and How of Pacing Guides

What Is a Pacing Guide?

Pacing guides are grade-level *curriculum maps* that prioritize teaching of state standards. They contain the content and skills outlined in the scope and sequence documents for each content area and grade and present them in sequential, or prioritized, order by grading period. Thus, pacing guides create a realistic time frame for instruction. They also indicate the appropriate amount of instructional time needed for student mastery.

Why Do We Need a Pacing Guide?

Pacing guides help teachers align the written, taught, and tested curricula. They also help teachers plan a year's curriculum in instructional segments. Furthermore, pacing guides help teachers to ensure equity so that all students across all classrooms and schools have access to the same curriculum. If students move from one school or one classroom to another, they can be assured of receiving consistent quality of curriculum and instruction without unnecessary curricular repetitions or gaps. Pacing guides help concentrate time, effort, and resources to maximize student learning.

How Do Teachers Use a Pacing Guide?

Pacing guides show how teachers across the school district might logically and effectively design instruction that is aligned with standards. Teachers should correlate the content and skills identified in the guide, as well as the essential questions that focus instruction, with available instructional resources and develop curriculum units and lesson plans. As teachers make decisions about resources and develop instructional plans, they should keep in mind the time frame for instruction indicated in the last column of the pacing guide.

Teachers should begin by reading through the entire pacing guide for their grade and content to determine how concepts and skills are introduced, developed, and reinforced throughout the year. They should compare their current pace to the pacing guide and make adjustments as needed. As teachers use the pacing guide to plan instruction for each grading period, they should remember that *they may introduce concepts and skills earlier, but they must introduce them by the time frame specified.*

A district's benchmark assessments should correlate with the pacing guides and measure student progress on the standards taught during that time frame. Results from the benchmark assessments help teachers determine each student's progress and adjust

instruction in subsequent grading periods to meet individual student learning needs. Teachers should continue to reinforce skills and concepts through the year until mastery is achieved.

How Do Administrators Use a Pacing Guide?

As instructional leaders, administrators use pacing guides to ensure that the operational curriculum is aligned with the state's standards. Administrators should review the appropriate pacing guides before making classroom visits so they know what concepts and skills they should expect to see students learning. However, the teachers who create pacing guides rely on their knowledge and experience to determine the amount of time needed for instruction in specific concepts and skills, so the pacing guides do provide realistic time frames for instruction.

If administrators observe that teachers are experiencing difficulty pacing instruction and are falling behind, they should meet with the individual teachers to discuss the problems they are having and suggest instructional modifications that may be needed. Instructional coaches, lead teachers, and department chairs can help maximize the effective use of pacing guides by providing teachers with assistance in designing and differentiating instruction.

Administrators expect that teachers will differentiate instruction within the framework of the pacing guide to support all students in their learning, including special education students and English language learners. They may provide support in the form of classroom observation, feedback, and coaching to help teachers ensure that all students achieve to high levels.

The What, Why, and How of Pacing Guides
Sample Pacing Guide Template

Grade:

Content:

Grading Period	GLE/GSE	Essential Questions	Content/Skills	Class Periods and Dates

The Sticky Dot Party

The school improvement specialist stories that appear in Improving Schools come from real life. The names have been changed or removed to preserve confidentiality.

At an elementary school where I was assigned as a school improvement specialist, teachers were beginning to understand the value of teaching state standards. It’s not that they hadn’t been focusing on standards all along. It’s just that they generally taught the chapters in their textbooks. If standards were covered in the texts, then standards were taught. But at the beginning of a new school year, we all took a second look at each standard with the goal of aligning curriculum, instruction, and assessment.

During the fall staff development days, a state math consultant made our school one of her stops. Because the district had adopted new math books, she wanted to familiarize teachers with the new texts. Fortunately, her focus was on teaching standards, not just covering the book chapter by chapter. She even had a novel idea!

“Ladies,” she said to the math teachers, “we’re going to have a Sticky Dot Party! Just bring your new texts and teachers’ manuals. I’ll bring the rest.”

“What fun!” I thought, though I knew nothing about the process she had in mind. On our first full day together, the consultant distributed pages of brightly colored dots and lists of state standards. Her instructions were simple: “Look at one standard at a time, find a lesson in your book that focuses on that standard, and stick a dot on the page where you find the lesson. Write the number of the standard on the dot.”

Teachers enthusiastically connected with the assignment. The pleasant hum of teacher talk filled the room as they leaned over tables and helped each other locate standards one by one. But after an hour or so, we heard several revealing statements: “Some of these standards are taught in more than one chapter,” and “Did you know that this standard isn’t in our new text?” One by one they discovered that if they were going to completely align instruction to standards, they would need to look for supplementary resources—workbook materials, real-life examples, the Internet, and the like.

The consultant, almost a silent partner by now, smiled the smile of someone watching “ah-ha” moments materialize. From then on, she added very little to the conversation—and she didn’t need to. What began as a simple Sticky Dot Party had morphed into a true collaboration! And curriculum alignment at that school was at long last beginning with the end in mind!

Reflection

- What were the consultant’s goals as she guided teachers through the exercise of putting sticky dots into textbooks?
- What insights do you think the teachers had as a result of this exercise?
- If the staff continues to use this exercise in the future, what additional activities might they develop to further align and support the curriculum?

Model Curriculum Units

Model curriculum units illustrate how the concepts and skills identified in a pacing guide may be incorporated into one or more selected themes during a grading period. In a pacing guide, a theme may be represented by an essential question. The essential questions are generally interdisciplinary in nature and allow for integration of concepts and skills from the clusters outlined in the content standards and from cross-curricular connections with other academic disciplines and the arts. These questions also help students see their learning as connected to a “big idea” or essential understanding that they will need to know and use in real life and in subsequent years of schooling. At the conclusion of a unit, students should be able to demonstrate their understanding of the question through both traditional and performance-based assessments.

Model curriculum units also contain a variety of learning activities and assessments compatible with student growth and achievement. Thus, the curriculum becomes more coherent and relevant to students' lives. Without such integration of knowledge and skills, instruction often becomes disconnected and student engagement and learning may be hindered.

Many educators and researchers recommend that curriculum units be developed using a backward design process (Wiggins & McTighe, 1998; Drake & Burns, 2004). Using backward design means, very simply, following three steps:

1. Identify desired results. (Identify what students will know and be able to do and focus on standards.)
2. Determine acceptable evidence of learning. (Design a culminating assessment that allows students to demonstrate what they know and can do.)
3. Plan learning experiences that lead students to desired results. (Differentiate instruction based on learning needs; provide rigorous and challenging lessons; provide support for struggling students.)

Model curriculum units are meant to be just that—models that teachers may teach as they are written, adapt to the needs and interests of their students, and use as models for developing their own curriculum units. The units may be most beneficial to new teachers, teachers who are having difficulty with pacing instruction, and teachers who may not have had prior experience in designing curriculum units.

Administrators, coaches, lead teachers, and department chairs should find the model units to be invaluable tools to support and promote teacher professional development. The units may also encourage instructionally focused discussions and development of additional curriculum units in department and interdisciplinary team planning meetings.

Book Review

Ruth Mitchell, Marilyn Willis, and the Chicago Teachers Union Quest Center, *Learning in Overdrive: Designing Curriculum, Instruction, and Assessment from Standards*. Golden, CO: North American Press, 1995.

This book was ahead of its time. It takes a “backward design” approach to standards and offers a step-by-step template to designing curriculum. Written in a conversational style, this is an excellent guide for educators wishing to design curriculum that fits accountability mandates.

The process outlined in this book begins with standards and shows teachers how to connect them into interdisciplinary clusters, how to devise real-world tasks that will embody the standards, and then how to break the unit into learning segments that will

enable students to complete the real-world tasks and attain the standards. This kind of instruction is called “standards-driven.”

According to the authors, many teachers found the process hard at first, because standards-driven instruction was totally opposite to their usual way of designing instruction. This book can help teachers understand the change and make it their own. The authors recommend that the process described in the book be used in a professional learning conversation with colleagues in a workshop setting.

Improving Alignment of High School Mathematics

A district in Tennessee employed an Edvantia consultant to work with mathematics teachers to improve the implementation of the Foundations II math course at one of its high schools. Because 40% of students in the Foundations II math classes were not reaching proficiency, administrators believed that better teaching methods were necessary. The consultant outlined a plan to work with nine teachers from the high school for the duration of the 2003-2004 school year.

Students in Foundations courses were considered to be unready for college preparatory mathematics because they had not had algebra by the eighth grade. That put these students at a disadvantage in terms of having an opportunity to attend college. In addition, they often did not receive the instruction they needed to meet state standards.

Just before school started, in August, the consultant led a group that also included teachers from another high school through a two-day kickoff institute that laid the foundation for the yearlong scope of work. Topics addressed at the institute included

- using data analysis to show areas of the Foundations II curriculum that most needed improvement
- implementing a standards-based instructional design process
- using standards-based instructional strategies in the classroom
- developing and implementing a rubric to measure the use of standards-based instructional strategies in the classroom
- establishing a professional learning community among mathematics staff at the school
- examining student work
- using techniques for individualized instruction
- implementing reading strategies in the mathematics classroom

During the school year, the consultant and teachers met each month. The consultant conducted individual classroom observations, facilitated the alignment of the curriculum to content standards, worked with the group to prepare pre and post assessments, and suggested best practices for teaching that would address gaps in instructions.

As the year passed, the consultant documented substantial changes in classroom teaching practices among participating teachers. Teachers incorporated Gardner's Multiple Intelligences into their lesson plans, instituted cooperative learning activities, and designed pre- and posttests for each unit to determine which students needed help with specific areas. Teachers created resources to support the curriculum, instruction, and assessment in the Foundations II course. Now course teachers have available to them assessments, a curriculum pacing guide that includes specific strategies for each strand of the curriculum, and recommendations for using differentiated instruction to meet student needs.

The state achievement test administered in spring 2004 showed substantial improvements over the previous year. Far fewer students scored below proficient (14% compared to 40%) and far more scored at the advanced level (42% compared to 16%). The table below shows a comparison between the two years.

**Achievement Levels for the Foundations II Mathematics Course at
the Participating High School**

Year	Advanced	Proficient	Below Proficient
2002-2003	16%	44%	40%
2003-2004	42%	44%	14%

In addition, because Foundations II teachers transferred new strategies and practices to other courses, students in other mathematics classes increased their assessment scores.

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**The Relationship Between Aligned Curriculum
and Student Achievement**

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December 2005

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Introduction

Aligning instruction to standards and assessment receives much attention from educators who are investigating ways to improve test scores and meet the mandates of the No Child Left Behind Act of 2001. Popular articles in education journals from around the world show intensive discussion about the utility of alignment (Ananda, 2003; Anderson, 2002; Evans, 2002; Ewing, 2003; Hall, 2002; La Marca, 2001; Lawson, Bordignon, & Nagy, 2002; McGehee & Griffith, 2001; Stern & Roseman, 2001). Indeed, research on aligning curriculum with standards and assessments shows a strong relationship to student achievement (Price-Baugh, 1997; Mitchell, 1998; Wishnick, 1989). The purpose of this review is to summarize the research literature on curriculum alignment.

What Is Curriculum Alignment?

English states there are three components of curriculum: the written, the taught, and the tested (1999). The written curriculum is usually the curriculum document produced by the school district. The tested curriculum is the relatively small part of the curriculum that ends up on a test. If the written curriculum provides a plan for what needs to happen during the year, the tests assess only a small amount of the knowledge and skills presented in the curriculum. The tested curriculum refers to the content addressed by questions found on state- and district-mandated standardized tests, curriculum-embedded tests, and student assignments (performance assessments). The taught curriculum consists of two parts: the lesson plans teachers use to plan what they teach and the actual classroom instruction.

Webb (1997) defines alignment as “the degree to which expectations [standards] and assessments are in agreement and serve in conjunction with one another to guide the system towards students learning what they are expected to know and do” (p. 4).

Textbook Alignment

The extent to which textbooks are aligned with standards and assessments is important due to the widespread use of textbooks to guide instruction. Early alignment studies showed a lack of alignment between textbooks and standardized tests (Freeman et al., 1980; Goodman, Shannon, Freeman, & Murphy, 1988). Textbooks covered different topics with different emphases than standardized tests. The alignment of topic coverage of textbooks and topics on various standardized tests is uneven. Freeman, Kuhs, Porter, Floden, Schmidt, and Schwille (1983) examined the degree of alignment between the topics covered by five different norm-referenced tests (MAT, Stanford, Iowa, CTBS I, and CTBS II) and the fourth-grade mathematics textbooks of four publishers (Addison-Wesley, Holt, Houghton Mifflin, and Scott Foresman). They found that the percentage of test topics covered by the texts ranged from a low of 21% to a high of 50%. Further, the Stanford test, which covered 72 topics, was the least aligned across all four texts, with an average of 22% alignment. Similarly, Floden, Porter, Schmidt, Freeman, and Schwille (1981) found little alignment between the content of district curriculum guides, which address standards, and the district’s adopted textbooks.

Recently the American Association for the Advancement of Science (AAAS) Project 2061 evaluated middle and high school math and science textbooks for alignment with a series

of benchmarks contained in most state standards (Kulm, Roseman, & Treistman, 1999). Of 12 mathematics textbooks, only 4 were rated satisfactory, and only 3 covered more than three benchmark areas. Science textbooks fared no better. Only one science text was given a satisfactory rating, and this text is not widely available (AAAS, 2005).

Reading texts exhibit a similar lack of alignment. Goodman and colleagues (1988) analyzed basal readers. The researchers found basal readers to lack alignment in several areas:

- standards of expert approaches to reading (p. 66)
- students' prerequisite skills (p. 69)
- basal comprehension instruction and student instructional needs (p. 82)
- basal curriculum and the content of the formative assessments included in the basals (pp. 92, 107, 114, 121)

Price-Baugh (1997) examined the effects of alignment between texts and student achievement on the Grade 7 Texas Assessment of Academic Skills (TAAS). The study sample included 10,233 students in 35 middle schools in Houston Independent School District. The textbook content was identified by TAAS descriptors. Price-Baugh then counted the number of skill-level and application-level word problems for each TAAS descriptor and "correlated the amount of practice and explanation in the textbook for 11 target components with the percentage of students correctly answering TAAS problems on those target components" (p. 109). Student achievement was positively correlated with all but one textbook variable. More than 55% of the variance was explained by the "number of available skill-level practice items in the textbook for each target component" (p. 111); the number of pages devoted to practice problems; and the number of application-level problems included in the text. Thus, the amount of student practice in areas that are tested is strongly related to student achievement.

Instructional Alignment

Cohen and Stover examined the alignment between instruction and assessments, labeling the process *instructional alignment* (1981). Writing of research he and his doctoral students conducted, Cohen (1987) argues, "The lack of excellence in American schools is not caused by ineffective teaching, but mostly by misaligning what teachers teach, what they intend to teach, and what they assess as having been taught" (p. 18). Cohen found that when instruction and assessment were aligned during sample lessons, low- and high-aptitude students both scored well. According to Cohen, "The critical effect size considered educationally significant had been defined as .70 sigma" (p. 17). Cohen (1987) summarized the studies of his doctoral students:

- Koczor (1984) designed six 45-minute lessons that were delivered to 25 fourth-grade students. Following each lesson, students were tested using versions of a test that represented different degrees of alignment with the lessons. Misalignment accounted for a 40% difference in posttest raw scores, and effect sizes representing differences between aligned and misaligned conditions for the lower and average students were as high as 1.10 and 2.74 sigma.

- Tallarico (1984) used instructional alignment to investigate *testwiseness* effects. Tallarico randomly divided second graders into three groups. The first group learned intent consideration, the second group learned to preread the item stem as a comprehension cue, and both groups learned these strategies under stimulus conditions and on pages simulating norm-referenced, standardized test conditions. The third group received a placebo, equal in time and in every other respect to the two experimental groups, except lacking testwise instruction. Data were analyzed using a three-treatment-by-two-aptitude-level ANOVA. For lower achievers, the stem-cue strategy group's average score exceeded the 85th percentile of the placebo group. The intent consideration treatment caused a 1.3 sigma effect.
- Fahey (1986) examined the ability of instruction to overcome initial aptitude differences. Community college students were randomly assigned to one of three directed-practice levels. Fahey found that (1) the more difficult the task, the more important was alignment; (2) alignment was more important to lower than to higher aptitude students; and (3) on the most difficult task, alignment was so effective that lower aptitude students performed better under aligned conditions than did higher aptitude students under misaligned conditions. The observed effect size was 1.2 sigma.
- Elia (1986) taught meanings of 24 low-frequency words under three contrasting conditions—phrases, sentences, and paragraphs—to low-socioeconomic level, urban, low-achieving fourth graders. The day after instruction, students were tested with various forms of assessment that reflected different degrees of alignment with instruction. Overall, Elia reported an alignment effect of .91 sigma. Alignment/misalignment accounted for 16% of the total variance.

Wishnick (1989) investigated a mastery learning curriculum to determine how much of the variance in norm-referenced, standardized achievement test scores is explained by gender; socioeconomic status (SES); teacher effect; and scores on locally developed, curriculum-embedded criterion-referenced tests (CRT) designed to measure the same skills as the norm-referenced standardized tests (NRST). Wishnick came to the following conclusions:

- Good alignment between CRT and NRST tends to reduce the variability of student scores on NRST. Poor alignment increases the variability in student scores.
- SES accounted for only 1% of the NRST performance variance. This means that the relationship between the economic status of the students and their scores on the NRST was small.
- Gender and teacher effect also accounted for little of the variance in student scores.
- Taken as a whole, the higher the degree of instructional alignment between the CRT and the NRST, the lower the effect of demographic variables—gender, SES, and teacher effect—on NRST performance. Conversely, the lower the degree of instructional alignment between the CRT and NRST item cluster, the higher the degree of influence of demographic variables on NRST performance.
- The alignment effect is more powerful for low achievers than for high achievers. Low achievers do better when the instructional outcomes are clear, and instruction is congruent with post-instructional assessment.

- The CRT was the best predictor of scores on the NRST—better than gender, SES, and teacher effect.
- The power of instruction as measured by the CRT accounted for more than 40% of NRST performance variance, and the alignment effect accounted for more than 36% of NRST performance variance. All together, the remaining variables—gender, teacher effect, and SES—accounted for 3% of NRST performance variance.

Although SES is a potent factor in school performance, when the educational model assumes that all students can demonstrate mastery and instruction is designed to ensure that students perform well on competency tests, SES loses its impact on school performance. Wishnick’s study found no evidence to support previous research that teachers interact differently with students from different socioeconomic backgrounds. Thus, the simple correlation between teacher effect and total NRST performance approached zero.

Mitchell (1998) looked at third-grade mathematics achievement in a large school district (4,000 third graders) when curriculum was aligned to the district’s test. Fifty-five percent of the students qualified for free or reduced-price lunch, an indication of poverty. The study’s purpose was “to examine the implication for educational administrators of effectiveness of the school system’s curriculum alignment after one year of implementation” (p. 8). Mitchell examined the effects of curriculum alignment, socioeconomic level, race, gender, and school size.

The district used two approaches to curriculum alignment. Four schools adopted Evans-Newton, Inc., of Scottsdale, Arizona, which focused on staff development, monitoring, and managing. Six schools aligned instruction with the ITBS (Iowa Test of Basic Skills). They first determined which test content was not covered by the math textbook and then created or selected additional curricular materials to fill in the gaps between the textbook and the test. Instructional coordinators helped faculty use the new curriculum materials.

At the end of the year, students improved six NCEs (Normal Curve Equivalent—a scale for averaging student achievement scores), from 49 to 55 on the ITBS standardized test. According to Mitchell, “There was no statistically significant difference in the effect of curriculum alignment after one year of treatment when analyzed by socioeconomic level, race, gender or school size” (p. 96).

In a college setting, Wagner and DiBiase (2001) aligned chemistry lectures that met three times a week with a chemistry laboratory course that met once a week and also incorporated some of the principles of the national science standards. They adopted an instructional model that consisted of pre-assessment, exploration, concept development, concept application, and assessment to reinforce the inquiry-based nature of the curriculum. To test the success of the changes, they assigned students to experimental and control groups, giving all students the same exam and gathering data about students’ backgrounds, including previous science and mathematics courses and SAT scores. They also administered opinion surveys halfway through the semester. Randomly selected students were interviewed to determine the effectiveness of course design on student achievement. All of the laboratory instructors also were interviewed.

Before instruction, no statistically significant differences were found between the experimental and control groups. Students in the experimental group experienced a significant increase in the final test scores for the course. Based on mid-semester lab surveys, students in the experimental group believed that the tight connection between the lecture and the lab experiments helped them understand the lecture. The students understood (rather than just memorized) the concepts and calculations, and the experiments helped them to visualize the concepts and processes from the lecture. Interviews indicated that most control group students noted the deficiencies in the curriculum, while most in the experimental group commented positively about their experiences. This study suggests that careful work on sequencing and coordinating topics around science reform themes and organizing instruction may be related to increased student achievement.

Alignment Between State Standards and the Enacted Curriculum

State standards have challenged schools to provide more and higher-level math courses for all students. To investigate the extent to which state standards have led to change at the school level, Porter, Kirst, Osthoff, Smithson, and Schneider (1994) studied six high schools, two in large urban districts and four in smaller suburban/rural districts in six states, with a range of activity in requiring curricular changes in math. The high schools generally required more students to take higher-level courses. For example, some of the high schools eliminated general math and required all students to take Algebra I. The study reported on whether the enacted (taught) curriculums in math and science courses were “watered down” as a result of increased enrollments.

Porter and colleagues found that “content of mathematics and science courses appeared not to have been compromised by increased enrollments; and the enacted curriculum in high school mathematics and science was not at all in alignment with the curriculum reform toward higher-order thinking and problem-solving for all students” (1994, p. 8). Additionally, the researchers were able to demonstrate a strong, positive, and significant correlation (.49) between the content of instruction and student achievement gains. “After controlling for prior achievement, students’ poverty level, and content of instruction (using a hierarchical linear and nonlinear approach in the analysis), practically all variation in student learning gains among types of first-year high school mathematics courses was explained” (p. 4).

To find out whether the challenge for more and better math courses was related to student achievement, Gamoran, Porter, Smithson, and White (1997) examined the content of instruction in high school math courses and related it to student test scores. They found positive correlations of .5 between end-of-semester teacher surveys of content taught and student achievement gains. Such high correlations indicate a strong alignment between the taught curriculum and the assessment.

Curriculum Alignment Through Professional Development

McGehee and Griffith (2001) designed a professional development process to use with school and district staff to develop an understanding of the content of the state and/or standardized tests and the implications for instruction, and to reach a consensus on curriculum scope and sequence that aligns with the state tests. The authors reported that after aligning the

curriculum with the tests, a small northeastern Arkansas district increased each of its Stanford Achievement Test 9 percentile rankings for fourth and eighth grades by at least 10 points. Another district in western Arkansas increased the percentage of students who scored proficient on the state tests to 72%, compared to 37% proficient as a statewide average.

The Council of Chief State School Officers was awarded a three-year National Science Foundation grant in 2000 to conduct an experimental design study. Its aim was to determine the effectiveness of a new model for professional development (PD) intended to improve the quality of instruction in math and science in five urban districts. A total of 40 middle schools made up the pool for random selection of the study groups. A professional development model (Council of Chief State School Officers, 2002) was synthesized using research on staff development. Four elements were part of the design:

- Active learning opportunities for teachers, responsive to how teachers learn and take leadership roles
- Extended duration, sustained over time
- Focus on content, high standards, and how students learn the content
- Collective participation of groups of teachers from the same school or department (Blank, 2004, p. 6)

Data collected using the Surveys of Enacted Curriculum provide comparable data that allows educators to determine the degree of consistency in the curriculum being taught and any source of variation in the enacted curriculum (Blank, 2002, 2004; Porter, 2002). Goals for school teams were as follows:

- learn to use rich, in-depth data to inform decisions about curriculum, practice, assessment, organization, and materials
- gain skills in collecting, analyzing, and displaying data; work collaboratively; and organize data-driven dialogue
- learn how to set measurable student learning goals; develop data-driven, local improvement plans; and sustain process

Teachers in the control schools received in-service professional development on using the data on the enacted curriculum. This included

- Year 1—Orientation of district and school leaders; teachers complete baseline data
- Introductory PD workshop for leader teams (two days); develop data skills and begin data inquiry
- Technical assistance in schools to introduce model to teachers
- Year 2—PD Workshop 2 (one day); Use of content data and instructional practices data
- Technical assistance in schools
- PD workshop 3 (one day); Analyzing student work and comparing instructional strategies
- Technical assistance in schools

- Re-focus efforts within schools
- Year 3—continue school team work
- Complete follow-up surveys with teachers (Blank, 2004, p. 11)

In three districts, the researchers encountered problems getting central office staff to identify schools and maintain a commitment to the study goals and processes. Teacher mobility, change in district leadership, and the subsequent change in priorities also were problematic. According to Blank (2004), “Of the 660 math and science teachers (treatment and control) in study schools in Year 1, only 49 percent were in the same school and subject assignment in Year 3” (p. 72). In addition, “Only one-fourth of the teachers in the study who completed the baseline teacher survey in Year 1 also completed the follow-up survey in Year 3” (Blank, 2004, p. 56). Therefore, conclusions reached from the study contain only a small set of teachers who were in the same assignment, participated in the staff development, and filled out the pre-post surveys. For those with complete data, there were two findings:

- The model did improve quality of instruction, as measured by increasing alignment with state standards, when comparing instruction in treatment schools to control schools; however, the effects are contingent on the level and effectiveness of implementation within the treatment schools.
- Schools with a high level of participation in the activities showed greater increases in alignment of instructional content with state standards than did other schools. (Blank, 2004, p. 56)

International Alignment Studies

The Trends in International Mathematics and Science Study (TIMSS), formerly known as Third International Mathematics and Science Study, developed a list of math and science content descriptors so that curriculum from various nations could be described, compared, and aligned. The TIMSS study found that the structure (the alignment) and content sequence of a country’s curriculum was related to its outcomes when measured by the TIMSS assessments.

Schmidt and colleagues (2001) examined the TIMSS data in middle school mathematics to see if there were relationships among the curriculum (subject-area content standards and textbook analysis), instruction (percentage of topics covered and instructional time defined as the amount of time on topics), and student achievement (the TIMSS test, which measured achievement growth resulting from one year of instruction). Generally, the researchers found a relationship between achievement gain in the subject area and content standards, textbook coverage, teacher coverage, and instructional time.

Statistically significant relationships existed between each of the curriculum aspects and learning as characterized by estimated achievement gain from seventh to eighth grade. . . . The greater coverage of a curriculum topic area—no matter whether manifested as emphasis in content standard, as proportion of textbook space, or as measured by either teacher implementation variable (coverage or instructional time)—is related to larger gains in that same topic area. . . . The curricular priorities of a

country—whether reflected by content standards, textbooks, or teacher behavior—are related to the profile of achievement gains across topics for that country. (Schmidt et al., 2001, p. 261)

Further, the researchers observed, “For both mathematics and science, the direct relationship between textbook coverage and learning was defined at the topic level” (p. 267). This means that the amount of coverage of topics in the textbook determined how well students did on the TIMSS test. If there were many pages of coverage for “perimeter, area, and volume” then student results on the items of “perimeter, area, and volume” were higher than in countries with fewer pages in the textbook. The study also found a relationship between time spent on the topic across countries and student achievement. “Higher percentages of coverage of a typical topic that involved more demanding performance expectation were associated with larger-than-average achievement gains” (p. 303). This supports previous recommendations for the United States that, in math and science, more instructional time be spent covering fewer topics.

The study also found that a country’s wealth, as measured by Gross National Product, was not strongly related to overall achievement gain in either math or science. This confirms the findings of Wishnick (1989) and Price-Baugh (1997), reported earlier, who found little relationship between SES and student outcome when alignment was controlled. The finding also suggests that curriculum and instruction are more strongly associated with learning gains than is socioeconomic status.

The study went deeper into the data, looking at achievement just in the United States, and controlled for socioeconomic status and prior achievement in mathematics. “The general conclusion is that curriculum or OTL (Opportunity to Learn) was significantly related to achievement in U.S. eighth-grade math classrooms” (Schmidt et al., 2001, p. 340). Explained another way, “Differences in learning among US eighth-grade mathematics classrooms were related to concomitant differences in the amount of instructional time that teachers allocated to supporting curriculum areas even when we adjusted for differences among classrooms due to SES and prior learning” (pp. 341-342). The more time a teacher spends on a topic, the greater achievement score for that topic. Effect sizes as measured by R^2 were between .4 and .6, thereby explaining a significant portion of the variance.

In other words, on average, for a classroom that spent about one week more on a topic than another classroom, where the two classrooms were similar in SES composition and in terms of prior achievement, the former would have a predicted achievement score some 3 to 24 percentage points higher than that of the other class. Thus, it seems unsurprising that even a small amount of additional instruction (as little as a week for each) focused on these key topics would predict large increases in learning (around 20 percentage points). (Schmidt et al., p. 344)

Schmidt and colleagues conclude that a significant relationship exists between achievement gains and curriculum. And curriculum is something that school districts have control over, even given the existence of state standards and state tests.

Summary

Curriculum alignment includes alignment between and among several education variables: state standards, state-mandated assessments, resources such as textbooks, content of instruction and instructional strategies, and so on. The studies reported in this review provide strong evidence from scientifically based research that aligning the various components can have positive and significant effects.

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