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Mapping the Road to Proficiency

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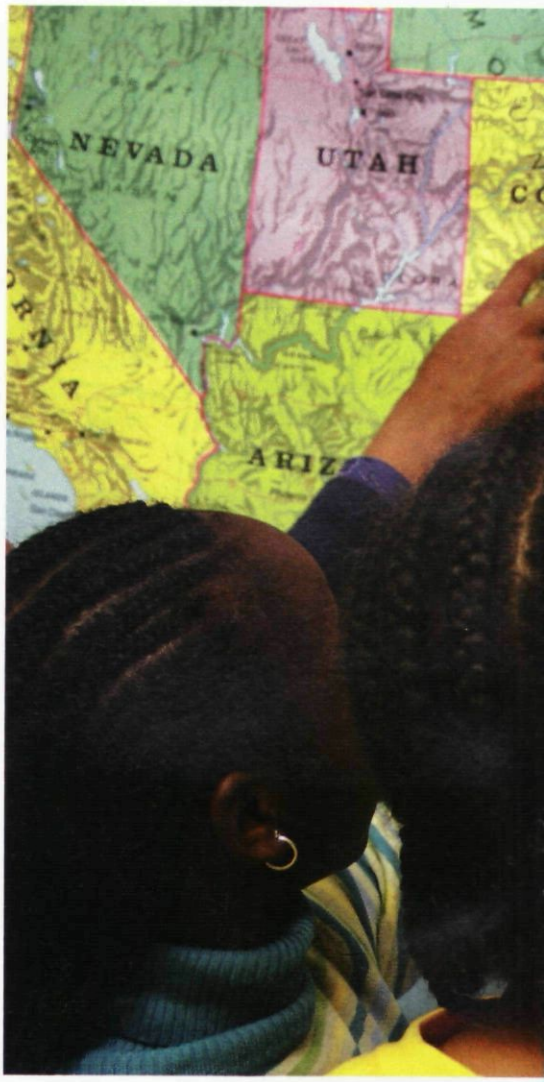


A table of specifications provides a travel guide to help teachers move students toward mastery of standards.

Thomas R. Guskey

When the standards movement began in the United States more than 15 years ago, most educators welcomed the idea. The enthusiasm that greeted the first set of clearly articulated student learning goals, published by the National Council of Teachers of Mathematics in 1989, led other professional organizations to follow suit. During the next decade, the National Council for the Social Studies, the National Academy of Sciences, and the National Council of Teachers of English all developed standards in their respective disciplines. States also took up the task, with Kentucky leading the way in 1990. Today, 49 of the 50 states have established standards for student learning.

Thoughtfully constructed standards guide education reform initiatives by providing consensus about what students should learn and what skills they should acquire. Standards also bring much-needed focus to curriculum development efforts and provide the impetus for fashioning new forms of student assessment.

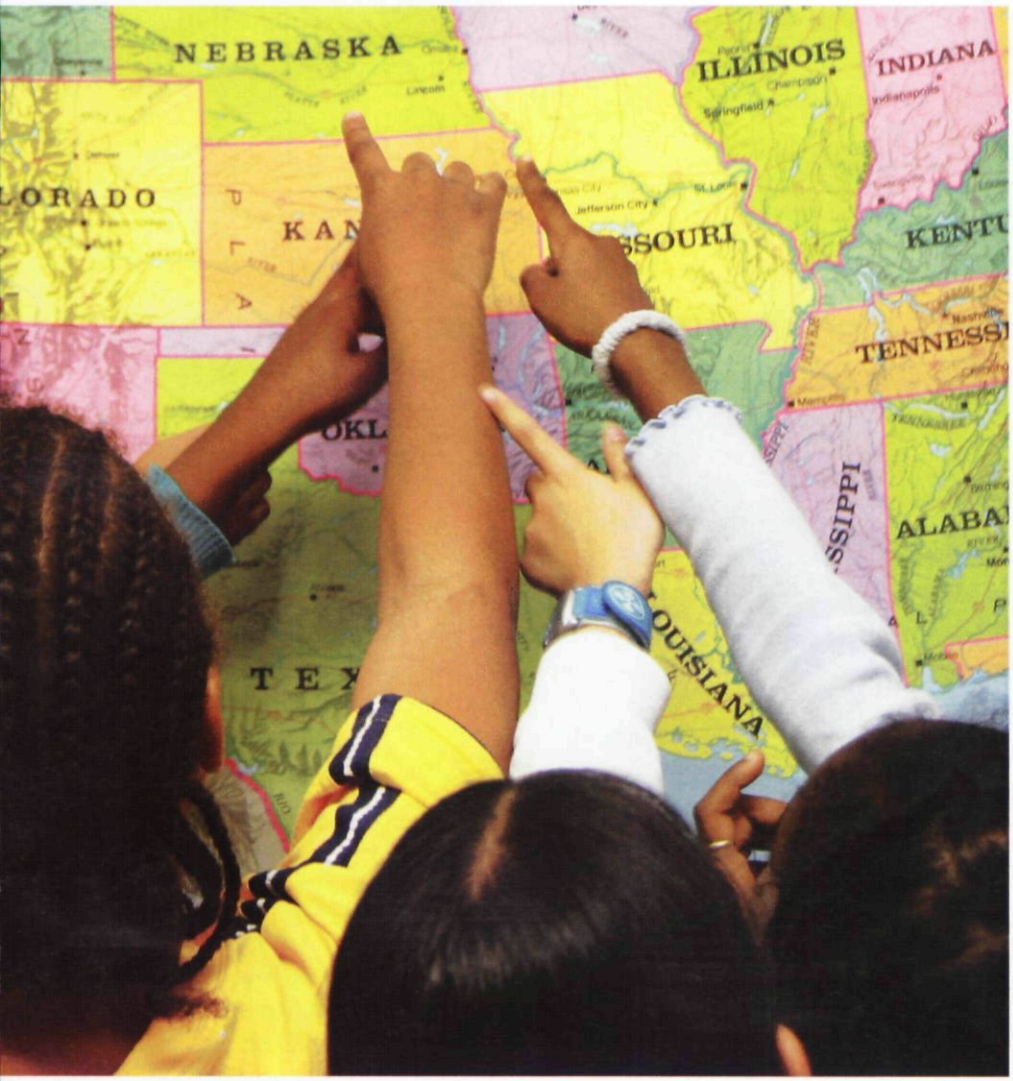
But to bring about significant improvement in education, we must link standards to what takes place in classrooms. For that to happen, teachers need to do two important things: (1) translate the standards into specific classroom experiences that facilitate student learning and (2) ensure that classroom assessments effectively measure that learning (Guskey, 1999).

Some states, school districts, and commercial publishers have developed teaching guides that identify instructional materials and classroom activities to help teachers meet the first challenge. Rarely, however, do teachers get help in meeting the second challenge—developing classroom assessments that not only address standards accurately, but also help identify instructional weaknesses and diagnose individual student learning problems.

Translating Standards into Instruction and Assessments

Large-scale assessments provide evidence of students' proficiency with regard to the standards developed by states and professional organizations. These assessments are well suited to measure the final results of instruction and, thus, to serve the purposes of summative evaluation and accountability.

But teachers cannot be concerned only with final results. Their primary concern lies in the process of helping students reach proficiency. Large-scale assessments just don't offer teachers



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Teachers need to translate standards into experiences that facilitate student learning.

much help in that respect. They tend to be too broad and are administered too infrequently. In addition, teachers often don't receive their results until several weeks or months after students take the assessment.

To understand the difference between assessing the final product and supporting progress toward that product, we might consider a youngster learning to play tennis. If you were concerned only with summative evaluation and accountability, you would need to have a clear mental picture of a "proficient" tennis player—the standard that you wanted the student to attain at the end of the learning process. Your mental picture might include approaching the ball, positioning the racket correctly, swinging smoothly, returning the ball to the other side of the court, and following the rules of the game. You would then need to identify specific criteria for judging the student's performance and finally develop a rubric describing various levels of proficiency on each of these steps.

If you were a tennis coach, however, that mental picture would be only your starting point. From there, you would go on to divide the aspects of your desired final performance into various components. You would probably think about matching the racket to the student's size and strength; adjusting the student's grip for backhand and forehand returns; explaining the importance of watching the ball; and demonstrating the backswing, return, and follow-through. You would introduce important terms, such as *service line, backcourt,* and *volley.* You would also need to explain the rules and describe how to keep score.

Building on this analysis, you would consider an appropriate sequence of learning steps, perhaps ordered in terms of difficulty or complexity. You would present basic elements, such as watching the ball, before such advanced elements as achieving appropriate follow-through and recovery. As you taught, you would check for any special problems the student may experience and correct them when they appeared. You would also need to become aware of individual differences among players and adapt your teaching to those differences. For instance, some players do well using a traditional closed stance; others do better with a more open stance. In addition, you would probably make a point of complimenting the student whenever progress was evident and providing reassurance during challenging times. And, of course, you would emphasize the enjoyable aspects of the game and give the student opportunities to experience these.

This example illustrates the complex process that takes place in effective standards-based teaching and learning. To organize instructional units and plan appropriate classroom activities, teachers must *unpack* the standards—that is, determine the various components of each standard that students must learn and then organize and arrange these components in a mean-

FIGURE 1. General Format for a Table of Specifications

TABLE OF SPECIFICATIONS

Knowledge of				Translation	Application	Analysis & Synthesis
Terms	Facts	Rules & Principles	Processes & Procedures			
New Vocabulary: Words Names Phrases Symbols	Specific Information: Persons Events Data Operations	Relations Guidelines Organizational cues	Patterns Sequences Order of events or operations Steps	Identify Describe Recognize Distinguish Compute	Use Illustrate Solve Demonstrate	Compare Contrast Explain Infer Combine Construct Integrate

ingful sequence of learning steps. Teachers must make adaptations for individual learning differences to ensure that all students understand, practice, and master each component as they progress toward the final goal. As part of this process, teachers need to develop procedures to formatively assess learning progress, identify learning problems, and determine the effectiveness of their instructional activities.

A Tool to Link Assessments to Standards

One tool to analyze standards for instruction and assessments is a *table of specifications:* a simple table that describes the various kinds of knowledge and abilities that students must master to meet a particular standard. Growing numbers of teachers are discovering how this strategy, described years ago in the work of Ralph Tyler (1949) and Benjamin Bloom (Bloom, Hastings, & Madaus, 1971), can help them align their classroom instruction and assessments with curriculum standards.

As a planning tool, a table of specifications serves two important functions.

Tables of specifications bring added validity and utility to classroom assessments.

First, it adds precision and clarity to teaching. The information in the table helps teachers break down standards into meaningful components that exactly convey the purpose of the instruction. It also clarifies for students the learning goals of a course or unit so that students understand what they are expected to learn. In fact, many teachers use tables of specifications as teaching guides, sharing their tables with students to reinforce students' understanding and learning progress.

Second, a table of specifications serves as a guide for consistency among standards, the steps needed to help students attain them, and procedures for checking on students' learning progress. Although this alignment is essential in standards-based teaching and learning, teachers often neglect it in their planning (Guskey, 1997). For example, many teachers stress that they want their students to develop higher-level cognitive skills—such as the ability to apply knowledge to new situations—but administer quizzes and classroom assessments that tap mainly the skills that are easiest to assess, particularly knowledge of facts and definitions of terms.

Developing Tables of Specifications

To develop tables of specifications, teachers must address two essential questions regarding the standard or set of standards in question. The first question is, *What must students learn to be proficient at this standard?* In other words, what new concepts, content, or material are students expected to learn? Teachers often use textbooks and other learning resources as guides in addressing this question. But textbooks should not be the only guide. Teachers should feel free to add to or delete from what the textbook and other learning materials provide to better match the

standards and better fit students' learning needs.

The second essential question is, *What must students be able to do with what they learn?* In answering this question, teachers must determine what particular skills, abilities, or capacities must pair up with the new concepts and material. For example, will students simply be required to know the steps of the scientific method of investigation, or should they be able to apply those steps in a classroom scientific experiment?

Teachers generally find it helpful to outline their answers to these two questions using some of the categories in the *Taxonomy of Educational Objectives* (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956). These categories represent a hierarchy of levels, moving from the simplest kinds of learning to more advanced cognitive skills. Figure 1 (p. 34) shows the categories that teachers in a wide variety of subject areas find most useful:

■ *Knowledge of terms.* Terms include new vocabulary, such as names, expressions, and symbols. Students may be expected to know the definitions of these terms, recognize illustrations of them, determine when they are used correctly, or recognize synonyms. Examples include the terms *factor* and *product* for a mathematics standard dealing with multiplication and *photosynthesis* for a science standard related to plant life.

■ *Knowledge of facts.* Facts include details that are important in their own right and those that are essential for other kinds of learning. Examples of facts are "The U.S. Senate has 100 members, two elected from each of the 50 states," and "Wealthy families or church officials commissioned many well-known works of art and music produced during the Renaissance."

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If you were a tennis coach, forming a clear mental picture of a "proficient" tennis player would be only your starting point.

■ *Knowledge of rules and principles.* These generally bring together or describe the relationships among a number of facts. Typically, they concern patterns or schemas used to organize major concepts. Other terms for rules and principles include *organizers, scaffolds, guidelines,* and *organizational cues.* Examples include the commutative principle related to a mathematics standard and the rules for subject/verb agreement incorporated in a language arts standard.

■ *Knowledge of processes and procedures.* To demonstrate their proficiency on some standards, students must know the steps involved in a certain process or procedure. Frequently, they must recall these steps in a specific sequence. For example, students may be expected to know the specific patterns of character development used in a novel, the appropriate order of steps in a mathematics problem, or the sequence of events necessary to enact legislation.

■ *Ability to make translations.* Translation requires students to express particular ideas or concepts in a new way or to take phenomena or events in one form and represent them in another, equivalent form. It implies the ability to identify, distinguish, describe, or compute. In general, students employ translation when they put an idea in their own words or recognize new examples of general principles they have learned. Examples include having students identify the grammatical errors

in sentences or convert temperatures from Fahrenheit to Celsius.

■ *Ability to make applications.* Making applications means using terms, facts, principles, or procedures to solve problems in new or unfamiliar situations. To make applications, students first must determine what facts, rules, and procedures are relevant and essential to the problem and then use these to solve the problem. The ability to make applications involves fairly complex behavior and often represents the highest level of learning needed to be proficient on a particular standard. For example, writing a persuasive letter using appropriate elements of argument and correct grammatical forms requires the student to make applications.

■ *Skill in analyzing and synthesizing.* Because of the complexity of analyses and syntheses, these skills typically are involved in standards for more advanced grade levels. Some teachers, however, believe that students at all levels should engage in tasks involving analysis and synthesis. Analyses typically require students to break down concepts into their constituent parts and detect the relationships among those parts by explaining, inferring, or comparing/contrasting. Examples of analyses include distinguishing facts from opinions in editorials published in the newspaper or comparing and contrasting George Washington and Ho Chi Minh, each considered the "father" of his country. Syntheses, on the other hand, involve putting together elements or concepts to develop a meaningful pattern or structure. Syntheses often call for students to develop creative solutions within the limits of a particular problem or methodological framework. They may require students to combine, construct, or integrate what they have learned. The assignment

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"Write a paragraph explaining how knowledge of mathematics and science helped Napoleon's armies improve the accuracy of their cannons" would require synthesis.

Once they become familiar with the format of a table of specifications, most teachers have little difficulty breaking down standards in terms of these categories. Those who use textbooks or other learning materials in developing tables usually find these resources to be helpful in answering the first essential question (What must students learn to show their proficiency with regard to this standard?) but less helpful in addressing the second question (What must students be able to do with what they learn?). And because tables clarify the learning structures that underlie standards, many teachers use them both as teaching guides to help plan lessons and as study guides for students.

Advantages of Tables of Specifications

Although developing tables of specifications can be challenging at first, teachers generally find that doing so offers several advantages. First, analyzing standards in this way helps teachers link instructional activities more meaningfully to standards. If faced with several narrowly prescribed standards, for example, teachers can use the table as a framework for combining those standards and developing relationships among them in effective instructional units. On the other hand, if confronted with a very broad or general standard, developing a table can help teachers clarify the individual components that students must master to demonstrate their proficiency.

Tables of specifications also bring precision to teaching. By analyzing standards according to the categories in the table, teachers identify the different subskills that students may be required to learn and bring attention to the relationships among those subskills. Students may need to know the definition of a term, for example, to understand a fact pertaining to that term. Knowing two or three facts may be

FIGURE 2. Table of Specifications for a Social Studies Unit on Maps

TABLE OF SPECIFICATIONS

Knowledge of				Translation	Application
Terms	Facts	Rules & Principles	Processes & Procedures		
Geography Geographer Map Scale Legend Topography Topographic features Longitude Latitude Coordinates	The skill of map-making is very old. Early people based maps on inaccurate information. Inaccurate maps affected early explorations. Rivers determined the location of many early settlements.	Earth features influence many human activities: ■ The routes traveled ■ The location of towns and cities ■ Occupations ■ The things eaten	Travel routes came first. Settlements, towns, and cities were established along major travel routes and intersections, especially rivers. Occupations were based on the needs of travelers.	Describe how geography affected early travel routes. Describe why accurate maps were important to early explorers. Identify lines of longitude and latitude on a map. Describe how longitude and latitude help locate points on maps.	Explain why major cities developed in their current locations. Identify specific points or locations on a new and unfamiliar map. Use a map in planning a travel route.

essential to understanding a particular procedure. Similarly, knowing a procedure will probably be a prerequisite to being able to apply that procedure in solving a complex problem. Clarifying these relationships makes instructional tasks more obvious and improves the diagnostic properties of classroom assessments.

Although this kind of analysis may guide teachers in choosing classroom activities, it does not dictate specific instructional practices. Teachers may address the "what" questions in developing a table of specifications in exactly the same way, and yet teach to that standard very differently. One teacher, for example, may use a discovery approach by introducing a complex problem or application to students and then helping students determine the facts, rules, or processes needed to solve the problem. Another teacher may use an advanced organizer approach by first explaining important rules or procedures to students and then posing complex problems to which students must apply those rules and procedures. In other words, precision does not prescribe method. Clarifying our goals does not dictate how we will reach them.

Finally, and perhaps most important, tables of specifications bring added validity and utility to classroom assessments. They help teachers ensure that their assessments provide honest evidence of students' learning progress, accurately identify learning problems, and provide useful information about the effectiveness of instructional activities.

Linking Classroom Assessments to Tables of Specifications

To serve formative evaluation and instructional purposes well, classroom assessments must include items or prompts for each important concept or subskill related to the standard being measured. By matching assessment items or prompts to the elements outlined in the table of specifications, teachers can ensure that their assessments measure all these important skills and abilities.

Consider, for example, the table of specifications shown in Figure 2, developed for an elementary school social studies standard related to the use and interpretation of maps. Although a large-scale assessment may include only one or two problems asking students to use or interpret maps, a classroom

assessment designed for formative evaluation purposes would look very different. It would include items that assess students' knowledge of relevant terms, facts, principles, and procedures related to maps, as well as other items that measure their skill in translating that information into new forms. It would also include constructed or extended-response items that require students to apply their knowledge in using or interpreting maps. (Note that this particular elementary standard does not require analysis and synthesis skills.)

Incorporating items that draw on this wide range of cognitive skills enhances an assessment's diagnostic properties and makes it more useful as a learning tool. Suppose students are unable to answer a complex, high-level assessment item that asks them to look at a map showing various geographic features (two major rivers and their intersection, mountain ranges, flat and steeply sloped areas); to identify the location on the map where a major settlement is likely to develop; and then to explain their reasons for selecting that location.

A closer look may reveal that some students correctly answered earlier items in the formative assessment demonstrating their knowledge of the necessary facts and principles, but could not apply that knowledge in this practical, problem-solving situation. Such students clearly need additional guidance and practice in making applications. Other students may answer this high-level item incorrectly because they did not know the requisite facts and principles, as evidenced by their incorrect answers to those items appearing earlier on in the assessment. These students need to return to activities that help them gain this basic knowledge. Although such a distinction in students' learning needs matters little to those concerned only with summative evaluations of students' proficiency, it matters greatly to teachers concerned with helping students attain proficiency.

To bring about significant improvement in education, we must link standards to what takes place in classrooms.

Linking classroom assessments to tables of specifications also guarantees consistency and thoroughness. In analyzing their formative classroom assessments, teachers often find items they cannot locate on the table of specifications. Such items usually tap trivial aspects of learning that are unrelated to the standard, and they can be revised or eliminated from the assessment. At other times, teachers find essential learning elements included in the table that are not tapped in their classroom assessment. In such instances, teachers must expand the assessment to include measures of these vital aspects of learning. As a result, classroom assessments become more thorough, complete, and effective at serving their formative purposes.

Destination: High Achievement for All

In developing tables of specifications, teachers identify the signposts that students must reach on the way to demonstrating their proficiency on standards. Although some teachers initially find the process challenging, most soon discover that it not only improves the quality of their classroom assessments but also enhances the quality of their teaching. Analyzing standards in this way clarifies what students need to learn and be able to do. With that focus established, teachers can concentrate more fully on how best to present new concepts and engage students in valuable learning experiences.

A table of specifications is much like a travel guide. Although it never limits the pathways available, it enhances traveling efficiency, enjoyment of the journey, and the likelihood of successfully reaching the intended destination. EL

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