McREL Compendium of Standards

The Compendium of Academic Standards was developed by McREL in the 1990s. While funding for the project ended in approximately 2015, the Compendium remained online through 2023, although the contents, links, and other resources had not been updated since 2016.

Due to the materials becoming out-of-date, the growing number of broken links to lesson plan resources, and the underlying database and servers becoming incompatible with current technology, the Compendium was taken offline in 2024.

The historical information below was taken from the Compendium website in 2024, and is published here for archival and reference purposes.

For more information about the Compendium, please contact McREL International, 4601 DTC Boulevard, Suite 500, Denver, CO 80237.

Purpose of this work

Many educators see the publication of the now-famous report *A Nation at Risk* (National Commission on Excellence in Education, 1983) as the initiating event of the modern standards movement. Few calls to action have been so often quoted as the dire pronouncements from that report: "The educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a nation and a people. . . . We have, in effect, been committing an act of unthinking, unilateral educational disarmament" (National Commission on Excellence in Education, 1983, p. 5).

Amid growing concerns about the educational preparation of the nation's youth, President Bush and the nation's governors called an Education Summit in Charlottesville in September 1989. That summit concluded with the establishment of six broad goals for education that were to be reached by the year 2000. The goals and their rationale are published under the title *The National Education Goals Report: Building a Nation of Learners (National Education Goals Panel* [NEGP], 1991). Two of the goals (3 and 4) related specifically to academic achievement:

- *Goal 3: By the year 2000, American students will leave grades 4, 8, and 12 having demonstrated competency in challenging subject matter including English, mathematics, science, history, and geography; and every school in America will ensure that all students learn to use their minds well, so they may be prepared for responsible citizenship, further learning, and productive employment in our modern economy.*
- *Goal 4: By the year 2000, U.S. students will be first in the world in science and mathematics achievement.*

The goals were outlined in the State of the Union of 1990, a year which also saw congress establish the National Education Goals Panel (NEGP); the following year, congress established the National

Council on Education Standards and Testing (NCEST). Collectively, these two groups were charged with addressing unprecedented questions regarding American education such as, What is the subject matter to be addressed? What types of assessments should be used? What standards of performance should be set?

These efforts had an impact on national subject-matter organizations, who sought to establish standards in their respective areas. Many of these groups looked for guidance from the National Council of Teachers of Mathematics (NCTM), which preempted the public mandate for standards by publishing the *Curriculum and Evaluation Standards for School Mathematics* in 1989. The National Academy of Sciences used the apparent success of the NCTM standards as the impetus for urging Secretary of Education Lamar Alexander to underwrite national standards-setting efforts in other content areas. According to Diane Ravitch, then an assistant secretary of education, "Alexander bankrolled the projects out of his office's discretionary budget" (in Diegmueller, 1995, p. 5). The National Science Teachers Association (NSTA) and the American Association for the Advancement of Science (AAAS) quickly launched independent attempts to identify standards in science. Efforts soon followed in the fields of civics, dance, theater, music, art, English language arts, history, and social studies, to name a few. (An overview of the movement to establish standards in the core subject areas is reported in Table 1.1) Since 1990 the movement has acquired considerable momentum at the state level as well. As of 1999, the District of Columbia, Puerto Rico, and every state except Iowa have set or are setting common academic standards for students. (American Federation of Teachers, 1999).

Table 1.1

1983	*A Nation at Risk* is published, calling for reform of the U.S. education system.
1983	Bill Honig, elected state superintendent of California public schools, begins a decade-long revision of the state public school system, developing content standards and curriculum frameworks.
1987	The National Council of Teachers of Mathematics (NCTM) writing teams begin to review curriculum documents and draft standards for curriculum and evaluation.
1989	Charlottesville, VA: The nation's fifty governors and President Bush adopt National Education Goals for the year 2000. One goal names five school subjects-English, mathematics, science, history, and geography-for which challenging national achievement standards should be established.
1989	The National Council of Teachers of Mathematics publishes *Curriculum and Evaluation Standards for School Mathematics*.
1989	Project 2061 of the American Association for the Advancement of Science (AAAS) publishes *Science for all Americans*, describing what "understandings and habits of mind are essential for all citizens in a scientifically literate society."
1990	In his State of the Union address, President Bush announces the National Education Goals for the year 2000; shortly thereafter, he and Congress establish a National Education Goals Panel (NEGP).

1990	The Secretary's Commission on Achieving Necessary Skills (SCANS) is appointed by the Secretary of Labor to determine the skills young people need to succeed in the world of work.
1990	The New Standards Project, a joint project of the National Center on Education and the Economy and the Learning Research and Development Center, is formed to create a system of standards for student performance in a number of areas.
1990, fall:	The Mid-continent Regional Educational Laboratory (McREL) begins the systematic collection, review, and analysis of noteworthy national and state curriculum documents in all subject areas.
1991	SCANS produces *What Work Requires of Schools*, which describes the knowledge and skills necessary for success in the workplace.
1991, June:	Secretary of Education Lamar Alexander asks Congress to establish the National Council on Education Standards and Testing (NCEST). The purpose of NCEST is to provide a vehicle for reaching bipartisan consensus on national standards and testing.
1992, Jan:	NCEST releases its report, *Raising Standards for American Education*, to Congress, proposing an oversight board, the National Education Standards and Assessment Council (NESAC), to certify content and performance standards as well as "criteria" for assessments.
1992, Jan:	The National Council for the Social Studies names a task force to develop curriculum standards.
1992, spring:	The National History Standards Project receives funding from the National Endowment for the Humanities and the U.S. Department of Education.
1992, spring:	The National Association for Sport and Physical Education begins work on Outcomes for Quality Physical Education Programs, which will form the basis of standards in Physical Education.
1992, June:	The Consortium of National Arts Education receives funding from the U.S. Department of Education, the National Endowment for the Arts, and the National Endowment for the Humanities to write standards in the arts.
1992, July:	The Center for Civic Education receives funds from the U.S. Department of Education and the Pew Charitable Trusts for standards development in civics and government.
1992, July:	The Geography Standards Education Project creates the first draft of geography standards.
1992, Oct:	The Committee for National Health Education Standards is funded by the American Cancer Society.
1992, Nov:	The Bush administration awards funds to create English standards to a consortium of three organizations: the National Council of Teachers of English, the International Reading Association, and the Center for the Study of Reading at the University of Illinois.
1993, Jan:	The National Standards in Foreign Language Project becomes the seventh and final group to receive federal funds for standards development.
1993, April:	McREL publishes its first technical report on standards, *The Systematic Identification and Articulation of Content Standards and Benchmarks: An Illustration Using Mathematics*.

1993	AAAS's Project 2061 publishes *Benchmarks for Science Literacy*.
1993, Nov:	NEGP's Technical Planning Group issues "Promises to Keep: Creating High Standards for American Students," referred to as the "Malcolm Report." The report calls for the development of a National Education Standards and Improvement Council (NESIC), which would give voluntary national standards a stamp of approval.
1993, Nov:	The National Research Council, with major funding from the U.S. Department of Education and the National Science Foundation, establishes the National Committee on Science Education Standards and Assessment (NCSESA) to oversee standards development in content, teaching, and assessment.
1994, Jan:	McREL publishes *The Systematic Identification and Articulation of Content Standards and Benchmarks: Update, January 1994*, which provides a synthesis of standards for science, mathematics, history, geography, communication and information processing, and life skills.
1994, Feb:	The Standards Project for English Language Arts, a collaborative effort of the Center for the Study of Reading, the International Reading Association, and the National Council of Teachers of English, publishes the draft *Incomplete Work of the Task Forces of the Standards Project for English Language Arts*.
1994, March:	President Clinton signs into law Goals 2000: Educate America Act. This legislation creates the National Education Standards and Improvement Council (NESIC) to certify national and state content and performance standards, opportunity-to-learn standards, and state assessments; adds two new goals to the national education goals; brings to nine the number of areas for which students should demonstrate "competency over challenging subject matters." The subject areas now covered include foreign languages, the arts, economics, and civics and government.
1994, March:	The U.S. Department of Education notifies the Standards Project for the English Language Arts that it will not continue funding for the project, citing a lack of progress.
1994, March:	The Consortium of National Arts Education Associations, funded by the U.S. Department of Education, the National Endowment for the Arts, and the National Endowment for the Humanities, publishes the arts standards (dance, music, theatre, and the visual arts).
1994, fall:	The National Council on Social Studies publishes *Curriculum Standards for the Social Studies: Expectations for Excellence*.
1994, Oct:	Lynne Cheney, past chair of the National Endowment for the Humanities (NEH), criticizes the U.S. history standards in the *Wall Street Journal* two weeks before their release. (NEH, with the U.S. Department of Education, funded development of the U.S. history standards.)
1994, Oct:	U.S. history standards are released; world history and K-4 history are released shortly thereafter.
1994, Oct:	The Geography Education Standards Project publishes *Geography for life: National Geography Standards*.

1994, Nov:	The Center for Civic Education, funded by the U.S. Department of Education and the Pew Charitable Trusts, publishes standards for civics and government education.
1995, Jan:	Gary Nash, National History Standards Project co-director, agrees to revise the history standards; the U.S. Senate denounces the history standards in a 99-1 vote.
1995, April:	The U.S. Department of Education withdraws assurance of a $500,000 grant to the National Council on Economic Education for the development of standards in economics.
1995, May:	The Joint Committee on National Health Education Standards releases *National Health Education Standards: Achieving Health Literacy*.
1995, summer:	The National Association for Sport and Physical Education publishes *Moving Into the Future: National Standards for Physical Education*.
1995, Oct:	The National Council on Economic Education, using funds from private sources, convenes a drafting committee to develop standards; projected publication is winter 1996.
1995, Nov:	The New Standards Project releases a three-volume "consultation draft" entitled *Performance Standards* for English language arts, mathematics, science, and "applied learning."
1995, Dec:	McREL publishes *Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education*, a synthesis of standards in all subject areas, including behavioral studies and life skills.
1995	The National Business Education Association publishes *National Standards for Business Education: What America's Students Should Know and be Able to Do in Business*.
1996, Jan:	The National Standards in Foreign Language Education Project publishes *Foreign Language Learning: Preparing for the 21st Century*.
1996, Jan:	The National Research Council publishes *National Science Education Standards*.
1996, March:	The National Education Summit is held. Forty state governors and more than 45 business leaders convene. They support efforts to set clear academic standards in the core subject areas at the state and local levels. Business leaders pledge to consider the existence of state standards when locating facilities.
1996, March:	The National Council of Teachers of English and the International Reading Association publish *Standards for the English Language Arts*.
1996, April:	Revised history standards are published. A review in the *Wall Street Journal* by Diane Ravitch and Arthur Schlesinger, professor emeritus at City University of New York, endorses the standards. Lynn Cheney renews her criticism of the history standards, determining that the revision does not go far enough.
1996	The International Technology Education Association, supported by a grant from the National Science Foundation and the National Aeronautics and Space Administration, releases a guiding document for the development of standards in technology.

1997, Feb:	President Clinton, in his State of the Union Address, calls for every state to adopt high national standards, and declares that "by 1999, every state should test every 4th grader in reading and every 8th grader in math to make sure these standards are met."
1997	EconomicsAmerica releases *Voluntary National Content Standards in Economics* in paper copy and on CD-ROM.
1997	Teachers of English to Speakers of Other Languages publishes *ESL Standards for Pre-K-12 Students*.
1997	The National Center on Education and the Economy publishes the New Standards' *Performance Standards: English Language Arts, Mathematics, Science, Applied Learning* - one volume each for elementary, middle, and high school.
1998	The National Communication Association publishes *Competent Communicators: K-12 Speaking, Listening, and Media Literacy Standards and Competency Statements*.
1998	The Council for Basic Education publishes *Standards For Excellence in Education*, which includes standards in science, history, geography, English language arts, mathematics, civics, foreign language, and the arts
1998	The American Library Association publishes *Information Power: Building Partnerships for Learning*, which includes nine broadly described information literacy standards.
1999, fall:	The National Education Summit is held. Governors, educators, and business leaders identifies three key challenges facing U.S. schools - improving educator quality, helping all students reach high standards, and strengthening accountability - and agrees to specify how each of their states would address these challenges
1999	The National Standards in Foreign Language Education Project republish their standards as *Standards for Foreign Language Learning in the 21st Century*, complemented by nine language-specific standards for Chinese, Classical, Languages, French, German, Italian, Japanese, Portuguese, Russian, and Spanish
2000	The International Technology Association publishes *Standards for Technological Literacy: Content for the Study of Technology*.
2000	The International Society for Technology in Education publishes *National Educational Technology Standards for Students: Connecting Curriculum and Technology*.
2000	The National Council of Teachers of Mathematics publishes *Principles and Standards for School Mathematics*.

The Case for Standards

Why are standards important? There appear to be three principal reasons advanced for the development of standards: standards serve both to clarify and to raise expectations, and standards provide a common set of expectations.

Former Assistant Secretary of Education Diane Ravitch is commonly recognized as one of the chief architects of the modern standards movement. In her book *National Standards in American Education: A Citizens Guide* (1995), Ravitch provides a common-sense rationale for standards:

> "Americans . . . expect strict standards to govern construction of buildings, bridges, highways, and tunnels; shoddy work would put lives at risk. They expect stringent standards to protect their drinking water, the food they eat, and the air they breathe. . . . Standards are created because they improve the activity of life." (pp. 8-9)

Ravitch (1995) asserts that just as standards improve the daily lives of Americans, so, too, will they improve the effectiveness of American education: "Standards can improve achievement by clearly defining what is to be taught and what kind of performance is expected" (p. 25).

Such a view is apparently shared by many. The polling firm Public Agenda conducted a number of surveys on the issue of standards over the last several years. They found that most Americans strongly support higher standards that are clear and specific (Farkas, Friedman, Boese & Shaw, 1994), believing that higher expectations produce better performance. Teachers, as well, support proposals to raise standards, which they expect to improve their students' academic performance (Johnson & Farkas, 1996). A recent finding indicates that students also see value in standards, saying that higher standards will make them work harder, and they expect to learn more as a result (Friedman & Duffet, 1997).

The Standards Project

Although much effort has been devoted to the development and implementation of standards, no consensus has emerged as to what form "standards" should take or how they should be used. The result is that the character, scope, and level of detail provided in standards often vary significantly from one subject area to another. Some subject-area groups have argued that the disciplines are so inherently different that a common approach to standards is not possible (Viadero, 1993). However, our analysis of standards from a wide range of subject areas confirms that a number of basic techniques can be successfully applied to describe content knowledge regardless of the domain. The application of this process provides content knowledge expressed in a roughly equivalent format across subject areas, which should facilitate communication of and about standards. Clear standards provide clearer expectations for students and the possibility of better communication among teachers, administrators, parents, and the larger community. Without such a common format, even the basics of a school system can break down. Reporting student progress on standards, for example, becomes quickly problematic if one subject area describes standards in terms of a performance vignette, as is the case with work done by the Standards Project for the English language arts, while another subject area describes standards in terms of specific components of information and skills, as is the case with the National Council of Teachers of Mathematics. When demands on schooling become more complex, as for example when teachers seek to design lesson plans that incorporate standards from more than one discipline, a lack of common language can overburden innovative work.

The purpose of our project is to address the major issues surrounding content standards, provide a model for their identification, and apply this model in order to identify standards and benchmarks in the subject areas. This project has been documented in a series of reports and updates (Marzano & Kendall, 1993; Kendall & Marzano, 1994, 1995, 1996, 1997). For this edition, revisions have been made to standards in mathematics, science, the English language arts, foreign language, and technology. The revisions were undertaken to incorporate newly released material in these subject areas and additionally, in the area of science, to reorganize content. The introductory sections and content for the subject areas remain unchanged except for the subject areas just listed.

History of the Standards

Before describing the model of standards and benchmarks that is the basis for this project, it is useful to briefly consider the major efforts that are completed or underway to identify standards and benchmarks. These efforts, of course, form the database from which this project draws.

Mathematics

It is certainly no exaggeration to say that the publication of Curriculum and Evaluation Standards for School Mathematics in 1989 by the National Council of Teachers of Mathematics (NCTM) ushered in a new era relative to the role of national organizations in the practice of schooling. Through the Standards document, NCTM helped to form a new perspective on how national subject-area groups can contribute to the improvement of education when it delineated, for three levels (K-4, 5-8, and 9-12), a consensus on what students should know and be able to do and how that might best be demonstrated in the classroom. Other organizations soon followed NCTM's lead. The influence of the NCTM Standards is reflected in another useful resource for the identification of mathematics content: an assessment framework for mathematics developed for the National Assessment of Educational Progress (NAEP)[1]. This document, Mathematics Framework for the 1996-2000 National Assessment of Educational Progress (n.d.), organizes the subject area into five sections, each providing up to a dozen statements presented as benchmark indicators; benchmark material is identified by the grade at which it should be introduced and when it should be assessed at both informal and formal levels.

In addition, NCTM published Professional Standards for Teaching Mathematics (1991) and Assessment Standards for School Mathematics (May 1995), the latter organized around six standards: important mathematics content, enhanced learning, equity, openness, valid inferences, and coherence. NCTM has recently revised the standards, publishing Principles and Standards for School Mathematics (2000). This new set of standards, while built upon the foundation of the original Standards documents, differs from the original in that it integrates the classroom-related

[1] NAEP ("the nation's report card"), a nationally representative assessment of student knowledge in various subject areas, is a congressionally mandated project of the National Center for Education Statistics, the U.S. Department of Education; NAEP's policy guidelines are formulated by the National Assessment Governing Board (NAGB).

portions of all three prior works and, in addition, re-organizes standards content into four grade bands: prekindergarten through grade 2, grades 3-5, grades 6-8, and grades 9-12.

Science

In science, three efforts have contributed significantly to the development of standards. The National Research Council (NRC) published the National Science Education Standards in December 1996. Material related directly to content standards fills over one-third of the work's 262 pages, while additional chapters address standards for science teaching and professional development, as well as assessment, program, and system standards. The science content standards are written for three grade levels: K-4, 5-8, and 9-12. At each grade level, seven general science topics are addressed. Standards related to these topics become increasingly comprehensive at each grade level.

The second effort within the field of science comes from the American Association for the Advancement of Science (AAAS). Working from the foundation they helped build in Science for All Americans (1992), AAAS's Project 2061 provides over 60 "literacy goals" in science as well as mathematics, technology, and the social sciences. These goals are well articulated across levels K-2, 3-5, 6-8, and 9-12. This effort, published as Benchmarks for Science Literacy (1993), includes a useful discussion and presentation of the research base available to those who worked on the project.

In addition to these efforts, the National Science Teachers Association (NSTA) has published the Scope, Sequence and Coordination of National Science Education Content Standards (Aldridge, 1995) as an addendum to The Content Core: A Guide for Curriculum Designers (Pearsall, 1993). This supplement is designed to make the Core more consistent with the recently published NRC standards. NSTA has also released A High School Framework for National Science Education Standards (Aldridge, 1995), developed under a grant from the National Science Foundation. Like the addendum to the Core, this framework builds directly from the November 1994 draft of the NRC science standards. Essential generalizations in physics, chemistry, biology, Earth and space sciences, and other areas organize the framework. Each generalization is described in some detail with a list of the relevant concepts, empirical laws, and theories or models that students will need in order to acquire a solid grounding in the topic. These subsections are presented in grade sequence (9, 10-12) and include a recommended learning sequence. Other useful sources of information come from NAEP, including their Science Objectives: 1990 Assessment, Science Assessment and Exercise Specifications for the 1994 NAEP and Science Framework for the 1996 National Assessment of Educational Progress (since republished as the Science Framework for the 1996-2000 National Assessment of Educational Progress).

History

The History Standards Project, directed by the National Center for History in the Schools (NCHS), first published three sets of standards: National Standards for History for Grades K-4, National Standards for United States History, and National Standards for World History (NCHS, 1995).

Publication of the standards drew immediate criticism, launched by Lynn Cheney who, as former head of the National Endowment for the Humanities, had approved funding for the project ("History Standards," Education Daily, January 1995). Others joined the debate, either condemning the history standards outright or making recommendations for their improvement. A group of historians, practitioners, and public figures, convened by the Council of Basic Education (CBE), reviewed the documents and concluded that the "overwhelming majority of criticisms was targeted at the teaching examples in the documents, rather than at the actual standards for student achievement" ("Review panels," CBE, October 1995). The teaching examples are absent from a new, basic edition of the standards, National Standards for History (NCHS, 1996). This edition also takes into account recommendations from the group convened by CBE, as well as recommendations from other interested individuals. In addition to addressing the traditional content of history studies, the standards documents from NCHS share a treatment on Historical Thinking, which includes such standards as Chronological Thinking and Historical Comprehension.

There are a number of other useful resources available for the articulation of standards in a history curriculum. One document is Lessons From History: Essential Understandings and Historical Perspectives Students Should Acquire (Crabtree, Nash, Gagnon, & Waugh, 1992), a comprehensive description of K-12 history education. It was on the basis of this noteworthy work that NCHS was funded to develop national standards. Another well-received guide is Building a History Curriculum: Guidelines for Teaching History in the Schools (Bradley Commission on History in the Schools, 1988). Although this document is general in scope, it does offer a useful focus on the historical perspective that students should acquire in their study of history. Recently the National Council for History Education published the first in a planned series of standards documents, Building a U.S. History Curriculum: A Guide to Using Themes and Selecting Content. Companion booklets in western civilization and world history will be published in the next two years, as well as a guide for history in the early grades. Three companion documents will be published in the next two years: booklets in western civilization and in world history and a guide for history in the early grades.

Other useful documents include two works from NAEP: Framework for the 1994 National Assessment of Educational Progress U.S. History Assessment (n.d.) and Provisional Item Specifications for U.S. History (1992). As in other recent work from NAEP, the framework organizes its subject matter into themes such as Change and Continuity in American Democracy, The Gathering and Interactions of Peoples, Cultures and Ideas, and The Changing Role of America in the World. The framework recommends some preliminary achievement levels (basic, proficient, and advanced) at 4th, 8th, and 12th grades. The descriptions of subject matter are fairly general. For example, an 8th-grade student at the basic level should, among other things, "have a beginning understanding of the fundamental political ideas and institutions of American life, and their historical origins" (p. 38). The Item Specifications, however, provide a greater level of detail in "defining questions," organized by theme, for students at the 4th, 8th, and 12th grades.

English Language Arts

In the language arts, the Standards Project for the English Language Arts (SPELA) was initially supported by the Fund for Improvement and Reform of Schools and Teaching (FIRST) of the Office

of Educational Research and Improvement. Initiated in September of 1992, SPELA was designed to be a three-year collaborative effort of the Center for the Study of Reading (CSR), the International Reading Association (IRA), and the National Council of Teachers of English (NCTE). SPELA produced one complete draft of its standards entitled Incomplete Work of the Task Forces of the Standards Project for the English Language Arts (1994). That draft contained five strands (Reading/Literature, Writing, Language, Real World Literacy, and Interconnections), each listing two or three standards described at a general level. This draft was to go through a number of iterations until a final document was produced. However, on March 18, 1994, the U.S. Department of Education notified SPELA that it would not continue funding for the project. According to NCTE, funding for the project was halted because of a number of "philosophical differences" between SPELA and the Department of Education. These differences included a disagreement over the inclusion of delivery standards, which was supported by SPELA, and the lack of attention to a specific canon of children's literature, which was not supported by SPELA. However, the primary reason for cessation of funding appears to be the federal government's assertion that SPELA was not attending to the basic task of identifying what students should know and be able to do in the English language arts. As noted by Janice Anderson, interim director of FIRST at the time funding was halted, SPELA had not made "substantial progress toward meeting the objectives" of the project. The proposed standards, she stated, "are vague and often read as opinions and platitudes," focus too much on process rather than content, and lack "a coherent conceptual framework" ("NCTE/ IRA Say Standards Effort Will Continue," The Council Chronicle, June 1994).

NCTE and IRA vowed to complete the project even without federal support and produced an incomplete draft entitled Standards for the English Language Arts (NCTE, October 1995). That draft articulated 11 very general standards but did not address benchmarks at different developmental levels. As in the case with the SPELA document, this later effort met with criticism due to its lack of specificity. According to an article in Education Daily, the eleven standards that the IRA and NCTE drafted "deliberately say little more than that students should be able to read a wide range of texts and write effectively using various strategies. . . .The document elaborates on each standard, but doesn't break down specific competencies students should show at various grade levels, as do standards in other disciplines." (Education Daily, October 25, 1995, p. 1). The final version of their work, Standards for the English Language Arts, published in 1996, contains 12, rather than 11, standards and includes other modifications. Companion works, such as the Standards in Practice series, provide information from which benchmarks for each standard can be inferred.

Although its efforts were not designed to produce standards per se, the National Assessment of Educational Progress has produced a number of documents that provide guidance as to the nature and format of English language arts standards. For example, the Writing Framework and Specifications for the 1998 National Assessment of Educational Progress (n.d.) provides explicit descriptions of basic, proficient, and advanced performance in writing. These level descriptions can quite easily be translated into expectations about what students should know and be able to do in the area of composition. In the area of reading, the Reading Framework for the National Assessment of Educational Progress: 1992-2000 (n.d.) not only provides a detailed description of

what students should know and be able to do at various grade levels but also details the types of materials students should be able to read.

The topic of media literacy has received greater emphasis recently in K-12 schooling, in part because of efforts like those of the National Communication Association's Competent Communicators: K-12 Speaking, Listening, and Media Literacy Standards and Competency Statements (1998). Useful material for the development of standards and benchmarks has also appeared from a number of international organizations, ranging from the Australian Education Council to the British Film Institute and the Ontario Ministry of Education.

The Arts

Standards for the arts, prepared under a grant from the U.S. Department of Education, the National Endowment for the Arts, and the National Endowment for the Humanities, were published in 1994 by the Consortium of National Arts Education Associations. The design of the final document, What Every Young American Should Know and Be Able to Do in the Arts, has been greatly simplified over earlier drafts. Standards for dance, music, theatre, and the visual arts are organized into K-4, 5-8, and 9-12 grade clusters. Each field contains from six to nine content standards, articulated across all grade clusters. Within each grade cluster for a given content standard, several achievement standards are provided. For example, in the visual arts section, a content standard found within each grade range, "Understanding the visual arts in relation to history and cultures," has three achievement standards associated with it for the 5-8 level. One such achievement standard states, "Students know and compare the characteristics of art works in various eras and cultures."

In addition, NAEP, working closely with the authors of the national standards for the arts, has developed an Arts Education Assessment Framework (1994). For dance, music, theatre, and the visual arts, the framework describes the learning expected of students in (1) knowledge and understanding about the arts and (2) perceptual, technical, expressive, and intellectual/reflective skills. The assessment framework is a matrix in which the knowledge and skills for each discipline form one axis and the application of this knowledge and skill forms the other. Application in the arts is defined as students creating, performing, or responding to the arts.

Civics

The Center for Civic Education (CCE) has published National Standards for Civics and Government (1994). The standards are presented for K-4, 5-8 and 9-12; major areas organize some 70-plus content standards. Each content standard has associated with it a set of key concepts that students should know in order to meet the standard. The standards are organized into five areas: civic life, politics, and government; the foundations of the U.S. political system; the values and principles of U.S. constitutional democracy; the relationship of U.S. politics to world affairs; and the role of the citizen. Each area is presented as a question, and each of the five outermost questions (e.g., What is government and what should it do?) has more specific questions that organize the content standards beneath them (e.g., What are major ideas about the purposes of government and the role of law in society?). The CCE has also produced a source book of impressive scope and

detail, Civitas: A Framework for Civic Education (Quigley & Bahmmeller, 1991), which contains more than 600 pages of information about civics.

In addition, the NAEP Civic Consensus Project, drawing heavily on the National Standards for Civics and Government, has produced the Civics Framework for the 1998 National Assessment of Educational Progress (n.d.). The framework outlines preliminary descriptions of three levels of achievement-basic, proficient, and advanced-for civic knowledge and skills that students should possess at grades 4, 8, and 12.

Economics

Economics was included as a core subject in the Goals 2000 Educate America Act. In April 1995, however, the Department of Education decided not to provide grant money to assist the National Council on Economic Education (NCEE). Nevertheless, NCEE continued work with funding from private sources and has recently published Voluntary National Content Standards in Economics (1997). As anticipated, the work closely follows A Framework for Teaching Basic Economic Concepts with Scope and Sequence Guidelines, K-12 (Saunders & Gilliard, 1995). Twenty standards are identified, each supplied with a rationale. Organized beneath the standards at 4th, 8th, and 12th grades are benchmarks; these are paired with descriptions of what students can do to demonstrate their understanding of the benchmarks. The standards are available in Virtual Economics: An Interactive Center for Economic Education /Version 2.0, a CD-ROM that includes an extensive library of activities, lessons, and other resources that are hypertext linked to the content standards.

Foreign Language

The development of standards for foreign language was undertaken by the American Council on the Teaching of Foreign Languages (ACTFL) in partnership with a number of foreign language associations. Funded by a grant from the Department of Education and the National Endowment for the Humanities, the National Standards in Foreign Language Education Project published National Standards for Foreign Language Education (1996). The standards are organized under five goal areas for students: communicate in languages other than English (Communication), gain knowledge and understanding of other cultures (Culture), connect with other disciplines and acquire information (Connections), develop insight into own language and culture (Comparisons), and participate in multilingual communities (Communities). The communication area contains three standards; other goals contain two standards each-for a total of eleven standards, which are articulated at three levels: K-4, 5-8, and 9-12. A rationale statement follows each goal and standard. Sample progress indicators are provided for each goal by level.

In 1999 the standards were republished as standards for Foreign Language Learning in the 21st Century, complemented by nine language-specific standards for Chinese, Classical Languages, French, German, Italian, Japanese, Portuguese, Russian, and Spanish. The language-specific content serves to explicate the original standards, providing language-specific examples for the learning scenarios and progress indicators that accompany the standards.

Other work that provides useful information related to foreign language learning comes from the Teachers of English to Speakers of Other Languages, Inc. (TESOL). The ESL Standards for Pre-K-12 Students (1998) describes three overall goals that address personal, social, and academic uses of English. Under each goal are organized three standards. Each standard is provided with descriptors, progress indicators, vignettes, and discussions at three grade clusters: pre-K-3, 4-8, and 9-12.

Geography

The Geography Education Standards Project has published Geography for Life: National Geography Standards (1994). The document provides 18 standards articulated for grades K-4, 5-8, and 9-12. The standards are organized under six areas: The World in Spatial Terms, Places and Regions, Physical Systems, Human Systems, Environment and Society, and The Uses of Geography. At each grade level, a standard is defined by three to six activities, each of which is exemplified by three "learning opportunities," that is, activities described at a greater level of detail than the standard. Certainly the most visually interesting of the standards documents, with numerous high-quality photographs and illustrations on glossy paper, it reflects indebtedness to one of the codevelopers on the project, the National Geographic Society.

The writing committee of the Geography Standards Project, in addition to the consensus process, relied chiefly upon two sources for their material. The first, Guidelines for Geographic Education (Joint Committee on Geographic Education, 1984), provides an instructional framework for teaching and learning geography by structuring content around five themes: Location, Place, Human-Environmental Interaction, Movement, and Regions. The second, NAEP's Geography Assessment Framework for the 1994 National Assessment of Educational Progress (1992), uses material from the five themes to develop three content areas for assessment: Space and Place, Environment and Society, and Spatial Dynamics and Connections. The assessment framework recommends the development of questions that measure students' cognitive abilities "at a basic Knowing level, a more complex Understanding level, and an Applying level that covers a broad range of thinking skills" (p. 3). This three-tiered approach, together with three content areas, forms a matrix within which essential assessment questions are developed.

Another source for detailed information on geography comes from NAEP's Item Specifications (1992) for the 1994 Assessment. This document provides some detailed descriptions as to the basic, proficient, and advanced levels of achievement in geography. For example, "Eighth grade basic" means that students should be able to, among other things, "solve fundamental locational questions using latitude and longitude; interpret simple map scales; identify continents, oceans, and selected countries and cities. . . ."(p. 54). The Item Specifications provide greater levels of detail in terms of how cells in the NAEP matrix might be developed.

Health

The Joint Committee on National Health Education Standards, funded by the American Cancer Society, has published National Health Education Standards: Achieving Health Literacy (1995). The

committee developed seven standards, each with rationale statements and "performance indicators" for students at grades K-4, 5-8, and 9-11. The material is organized both by standards and by grade levels. The work includes a set of "opportunity to learn" standards designed to provide direction for the policies, resources, and activities that should facilitate the implementation of the health education standards. In addition, a table is provided that maps the topics covered in the health standards to related adolescent risk behaviors.

Physical Education

The National Association for Sport and Physical Education (NASPE) has published *Moving into the Future: National Standards for Physical Education: A Guide to Content and Assessment* (1995). The report lists seven standards with benchmarks at grades K, 2, 4, 6, 8, 10, and 12. These grade-level descriptions of the standards include rationale statements, sample benchmarks, and assessment examples. The assessment examples are quite extensive, providing numerous ideas for student and group projects and for student portfolios, all with suggested criteria for assessment. Standards from the self-funded group were based on NASPE's 1992 publication, *Outcomes of Quality Physical Education Programs*.

Social Studies

The National Council for the Social Studies (NCSS) has published *Expectations of Excellence: Curriculum Standards for Social Studies* (1994). As the title indicates, NCSS recognizes a distinction between content and curriculum. It describes this distinction by noting that the role of the social studies is to provide "overall curriculum design and comprehensive student performance expectations, while the individual discipline standards (civics and government, economics, geography, and history) provide focused and enhanced content detail" (p. viii). The document underscores this organizing role of curriculum standards through the elaboration of 10 "thematic strands" such as Culture, Time, Continuity and Change, and Individual Development and Identity. Each theme is provided with a list of student performance expectations and classroom activities appropriate for the early grades, middle grades, and high school. Across all 10 strands, 241 performance expectations are described. A useful appendix provides "essential skills for social studies," organized under the categories of Acquiring Information, Organizing and Using Information, and Interpersonal Relationships and Social Participation. Each area is defined by goal statements and a "suggested strength of instructional effort" (i.e., minimum or none, some, major, and intense) toward reaching those goals at levels K-3, 4-6, 7-9, and 10-12.

Technology

In 1996, the International Technology Education Association (ITEA), funded by the National Science Foundation and the National Aeronautics and Space Administration, published *Technology for All Americans: A Rationale and Structure for the Study of Technology*. Following four years of a review and revision process, ITEA published *Standards for Technological Literacy: Content for the Study of Technology* (2000). As the title suggests, and the preface makes clear, these standards address "what students should know and be able to do in order to be technologically literate" (p. vii). The

twenty standards comprise five broad categories on the nature of technology, technology and society, understanding of design, abilities needed in a technological world, and understanding the designed world. Each standard is provided with an introductory narrative, as are the grade-level benchmarks, which describe content appropriate for the grade range. Benchmarks are provided for each of the standards at the K-2, 3-5, 6-8, and 9-12 grade levels.

The International Society for Technology in Education (ISTE) has published *National Educational Technology Standards for Students: Connecting Curriculum and Technology* (2000). The ISTE work provides ten performance indicators for each grade band, K-2, 3-5, 6-8, and 9-12. The indicators are assigned to one or more of the following six broad categories: basic operations and concepts; social, ethical, and human issues; technology productivity tools; technology communication tools; technology research tools; and technology problem-solving and decision-making tools. A significant portion of the report is focused on providing curriculum examples of effective use of technology in teaching and learning. An activity and list of resources is provided at each grade range for each of the five subject areas of English language arts, foreign language, mathematics, science, and social studies.

The World of Work

Progress is also being made in delineating the knowledge and skills students should have to be successful and productive in the world of work. The Secretary's Commission on Achieving Necessary Skills (SCANS) and the report the commission produced, *What Work Requires of Schools* (1991), has helped to focus attention on standards that address higher-order thinking and reasoning skills, as well as personal traits and interpersonal skills that students should acquire. This document adds a strong voice to the call from other standards groups for greater attention to the development of students' critical thinking skills, their ability to communicate, and their ability to work in groups.

A complementary effort was undertaken by the American Society for Training and Development (ASTD), representing "50,000 practitioners, managers, administrators, educators and researchers in the field of human development" (Carnevale, Gainer, & Meltzer, 1990, p. xiii). An ASTD research team, funded through a grant from the U.S. Department of Labor, reviewed the literature and polled its members to determine what skills were most desired by employers. The team identified 16 skill areas, including traditional academic areas such as reading, writing, and computation, as well as nontraditional areas such as interpersonal skills, self-esteem, and negotiation. Their findings were published in *Workplace Basics: The Essential Skills Employers Want* (Carnevale, Gainer, & Meltzer, 1990).

Finally, the National Business Education Association has published *National Standards for Business Education: What America's Students Should Know and Be Able To Do in Business* (1995). The standards cover a wide range of subjects, including marketing, management, accounting, production, and finance as well as basic skills in computation, communication, decision-making, and problem solving.

International Efforts

Organizations outside the United States have also contributed to the definition of content for the curriculum. Material from three of these organizations has been cited in this report.

The International Baccalaureate Organization, headquartered in Geneva, Switzerland, has some 1000 participating schools in over 100 countries throughout the world. Examinations for the International Baccalaureate (IB) are based upon a rigorous and comprehensive syllabus. The IB diploma is recognized and accepted by universities worldwide.

The Australian Education Council has produced a number of documents as part of an effort it describes as the most significant collaborative curriculum development project in the history of Australian education. Two documents were found to be of particular use, *English: A Curriculum Profile for Australian Schools* and *Technology: A Curriculum Profile for Australian Schools*.

The Third International Mathematics and Science Study (TIMSS), a large-scale, cross-national comparative study of math and science curricula, has made available the set of items used in their mathematics and science assessment of students. The International Association for the Evaluation of Educational Achievement (IEA) has published *TIMSS Mathematics Items: Released Set For Population 1 (Third and Fourth Grade)* (1998a); *TIMSS Mathematics Items: Released Set For Population 2 (Seventh and Eighth grade)* (1998b); *Released Mathematics and Science Literacy Items Population 3* (1998c).

State-Level Efforts

Work on the development of academic standards, undertaken by just a few states in the early 1990s, has increased dramatically. According to a recent review of state standards from the American Federation of Teachers (1999), "the District of Columbia, Puerto Rico, and every state except Iowa have set or are setting common academic standards for students" (p. 5). The quality of state standards has been under sharp scrutiny in the last few years, not only in reviews from AFT but from the Council for Basic Education (1998a) and the Fordham Foundation (Finn & Perilli, 2000). Although these organizations have awarded markedly different ratings for the same state standards (Olson, 1998), they do appear to be in agreement that state standards have improved over the last few years, but each notes that a number of state standards could still be improved.

In Summary

Efforts continue in the development and refinement of standards. For most subject areas, there is one or more set of standards published by a nationally recognized group of subject-area experts. In addition, almost all states have published standards in the subject areas. One can infer that if a school, district, or state is to design a schooling system based on standards, these many and varied efforts must be reconciled to some degree.

The Process of this Work

The section "Purpose of this work" alluded to the difficulties created by the variety of perspectives taken by various groups on the scope, purpose, and nature of standards. In order to develop an internally consistent model of standards and benchmarks, we address the significant problems that have resulted and describe our approach to their resolution. Here we consider four problems: (1) multiple documents, (2) varying definitions of standards, (3) differing types of content description, (4) differing grade ranges, and (5) varying levels of generality.

Multiple Documents

A number of subject areas have multiple documents that address the standards in that domain. For example, *Principles and Standards for School Mathematics* (2000) published by NCTM (2000), could certainly be considered the "official" description of what students should know and be able to do in the field of mathematics. However, mathematics standards and benchmarks also are explicitly and implicitly articulated in each of the following documents:

- *Benchmarks for Science Literacy* (1993), by Project 2061 of the American Association for the Advancement of Science (AAAS)
- *Mathematics Framework for the 1996 National Assessment of Educational Progress Mathematics Assessment* (n.d.), by the National Assessment of Educational Progress (NAEP)
- *Performance Standards: English Language Arts, Mathematics, Science, Applied Learning, Volume 1, Elementary School* (1997a) by the National Center on Education and the Economy
- *Performance Standards: English Language Arts, Mathematics, Science, Applied Learning, Volume 2, Middle School* (1997b) by the National Center on Education and the Economy
- *Performance Standards: English Language Arts, Mathematics, Science, Applied Learning, Volume 3, High School* (1997c) by the National Center on Education and the Economy
- *Standards for Excellence in Education*. (1998) by the Council for Basic Education

Science provides another example of multiple source documents. Three documents provide descriptions of essential student knowledge and skill in science as determined by three national organizations: the National Research Council, the American Association for the Advancement of Science, and the National Science Teacher's Association (see Section 2, Science, for a discussion). Additionally, a description of important science content also can be found in documents from NAEP, the International Baccalaureate Organization, the New Standards Project and the Council for Basic Education.

In most subject areas there exist different, and sometimes competing, views of what content is important; certainly no single document represents a comprehensive view of the content for a

particular subject. Yet a comprehensive review is important for anyone who intends to identify important information and skills at the level of a school, district, or state. To address this need, we determined to identify the significant documents for each subject area and synthesize the content they address in a useful, comprehensive set of statements concerning what students should know and be able to do. At the end of the process, we had consulted 137 documents (listed in Appendix A), across 14 areas of study.

Varying Definitions of Standards

Different documents among, and even within, subject areas define standards in various ways. To illustrate, consider the following elements taken from the NCTM document *Curriculum and Evaluation Standards for School Mathematics* (1989):

a. *Students use estimation to check the reasonableness of results*.

b. *Students recognize and appreciate geometry in their world*.

c. *Students use mathematics in other curriculum areas*.

These elements are presented as standards in the NCTM document but are very different in nature. Element a describes a skill or an ability a person might use to solve a real-life problem. For example, one might use estimation to determine whether the gas pump total generally squares with the price of a gallon of gas multiplied by the number of gallons that were required to fill the tank in the car. Conversely, element *b* does not describe a commonly used skill. It is difficult to imagine many day-to-day situations that would demand an ability to recognize and appreciate geometry in the world. This element rather describes a goal of the curriculum, that is, a perspective or disposition that students might acquire as a result of the successful completion of studies in mathematics. Thus, it should not be identified as knowledge or skill. Similarly, element *c* does not describe student knowledge or skill but might be interpreted as a recommendation as to how to design other areas of the curriculum to work in concert with mathematics instruction. Evidence for this comes from the fact that element *c* appears in NCTM's Standard 4, Mathematical Connections. The first four standards in the NCTM guide (the other three being Mathematics as Problem Solving, Mathematics as Communication, Mathematics as Reasoning) were first designated as principles, not standards. For reasons of accommodation, since regretted by the chair of the NCTM Commission on Standards, the first four principles were also given the name *standards*, and confusion has resulted ever since (T.A. Romberg, personal communication, June 24, 1997). The most recent edition of standards from NCTM (2000) categorizes standards of this type as process, as opposed to content standards.

It is our belief that curriculum goals and principles should not be part of a description of content standards. Content standards describe the knowledge and skills that students should attain. Curriculum standards, on the other hand, can describe overarching goals, or ways in which the curriculum should be orchestrated to achieve a desired result. In either case, curriculum standards do not explicitly describe student knowledge and skills as do content standards. Mixing both types of standards as if there were no significant difference creates unnecessary confusion.

Differing Types of Content Description

Closely related to the problem of differing definitions for a standard is the problem of differing formats for the description of the content of a standard. One method, alluded to above, is simply to describe the content as information and skills. For example, the National Research Council (NRC) describes the following as a fundamental concept for a life science standard in grades 5-8:

> *All organisms are composed of cells - the fundamental unit of life. Most organisms are single cells; other organisms, including humans, are multicellular.* (p. 156)

This is a fairly straightforward description of what a student should know.

A contrasting approach is to present the content in the form of an activity or performance indicator. For example, the following, identified as a performance indicator, is provided by the Joint Committee on National Health Education Standards (NCHES):

> *As a result of health instruction in Grades 5-8, students will explain how health is influenced by the interaction of body systems*. (p. 17)

In this case, information that the student should know is not directly described as in the previous example. Presumably, the student who successfully completes this activity has acquired the requisite information and/or skills for this topic within the specified grade range.

Finally, another common format for communicating the content of a standard is the performance task. A performance task, in comparison with an activity, can be thought of as providing a greater level of detail and specificity, both in terms of the context of the task and the information or skill that might be required to complete the task successfully. For example, the following task appears in the *National History Standards* (National Center for History in the Schools, 1994c):

> *Analyze pictures of hunter-gatherer sites in places such as Danube fishing villages, the Lascaux caves in France, and hunter sites in northern regions. Contrast these with agricultural sites such as those found in Jericho, Çatal Hüyük, Banpo village in North China, and the TehuacánValley in Mexico. How do hunter-gatherer sites differ from agricultural sites?* (p. 48)

This task describes a specific focus of study-the differences between hunter-gatherer sites and agricultural sites-and the context within which the student acquires and demonstrates this knowledge, that is, through the comparison and contrast of pictures or drawings of the sites. Thus, it differs from the simpler activity approach to content description.

There are, then, a number of different ways in which content has been described in the national reports. Our goal, to provide a synthesis of content from differing documents within each of the subject areas, requires a consistent description of content. We have chosen to describe content in the information and skills format. There are several reasons for this. First, the information and skills description, as opposed to the activity or task description, does not require the reader to make inferences from the activity or task to the information and skills that would be required for

successful demonstration of that task; rather, student information and skills are described in a straightforward manner. Second, the activity or task description tends to be narrowly prescriptive in that it characterizes not only what the student should know and be able to do, but how the student should demonstrate this knowledge. Thus, the content described is likewise narrowed; users might erroneously believe that the skill or information required by the activity or task is a complete description of the information or skill the student should acquire. Finally, although the added information provided in a task or activity might be useful for teachers as a guide for instruction or classroom assessment, it is not useful for teachers as a guide to what information and skills are essential for students to learn. Such activity descriptions confound the issue of how students are to demonstrate competence with the logically prior and equally significant issue of what should comprise the content of the curriculum. Once the content has been determined, of course, delineating various ways knowledge might be presented and demonstrated is appropriate. Until and unless that content is identified, however, we believe it is best to keep the two kinds of description separate.

The documents consulted for this project differ considerably in the ways in which content is described; some presented unique challenges of interpretation. The introductory pages for each subject-area section in this report provide a brief summary of the type of analysis that was required given the documents that were used.

As a consequence of the method of standards description adopted for this project, the material identified in this report has some noteworthy characteristics. Specifically, the information that comprises standards identified within this report generally falls into one of three broad categories representing three general types of knowledge. Such distinctions have proved useful in descriptions of learning (Anderson, 1990). At a basic level, knowledge within any domain can be organized into the categories exemplified in Table 3.1.

The first column contains examples of knowledge that involves processes. These processes may or may not be performed in a linear fashion. For example, performing long division is a process: you perform one step, then another, and so on. Reading a map also involves certain steps, but these steps, unlike those in long division, do not have to be performed in any set order. You might read the name of the map first, then look at the legend, or you might just as effectively perform these steps in reverse order. Knowledge of this sort is usually called *procedural knowledge*. One might think of such knowledge as composed of the *skills and processes* important to a given content area.

Table 3.1

Procedural *The Learner is able to…*	**Declarative** *The learner understands…*	**Contextual** *The learner…*
read a map	the concept of a geographic region	knows when to use a map instead of a globe
perform long division	the concept of a numerator	models numbers using number line

set up an experiment	the characteristics of an amoeba	classifies organisms
shoot a free throw	the rules of basketball	knows when to use man-to-man vs. zone coverage
edit an essay	the conventions of punctuation	uses appropriate tone and style for a selected audience

The examples in the second column do not involve a process or a set of steps. Acquiring this type of knowledge involves understanding the component parts. For example, knowledge of the concept of "a geographic region" includes understanding the characteristics of a variety of regions, knowing criteria that give a region identity and how regional boundaries can change, and so on. This type of knowledge is commonly called *declarative knowledge*. One might think of such knowledge as composed of the *information* important to a given content area.

The last column contains items that are not simply declarative or procedural but that specify knowledge acquired in a unique context. One might think of contextual knowledge as *information* acquired only during the execution of some *process*, or a kind of *process* that gains special meaning only when applied to certain kinds of *information*. Column three contains examples of information and/or skills that are in part defined by the conditions under which they are learned. For example, "to classify" is a skill or procedure; to understand the characteristics of organisms is declarative knowledge, or information; but knowledge constructed while classifying organisms is a special type of knowledge, also known as taxonomy. Students learn how structure, function, biochemistry, and behavior can be used to classify organisms; they also know how a taxonomy can describe the degree of relatedness between organisms. Another example of contextual knowledge can be found in the following example from English language arts:

Represents key ideas and supporting details in outline or graph form

This describes not simply a skill the student must acquire-using an outline or a graph-but a knowledge of key ideas and supporting details and how they can be represented in such formats.

This report, then, identifies all content as belonging to one of the three categories described above. The reader is referred to "How the Subject Area Sections Are Structured" for a description of how the category of each item can be identified. Generally speaking, however, content that is declarative in nature usually begins with the stem "understands that . . ." or "knows that . . .". Content that is procedural in nature begins with verbs, such as "uses", "solves," and "predicts." Content that is contextual in nature also begins with verbs or verb phrases but tends to look more like activities in that a particular skill is described in terms of the information or knowledge about or upon which the skill is applied.

It is of interest to note that some subject areas are more heavily declarative or procedural in nature. Contextual knowledge, which is a special case, is not common. Table 3.2 displays the distribution of the types of knowledge across the subject areas in this report:

Table 3.2

	Declarative	Procedural	Contextual
Mathematics	139	63	21
Science	253	8	-
History	1240	23	18
English language arts	86	248	6
Geography	230	4	4
Arts	147	96	26
Civics	426	-	1
Economics	159	-	-
Foreign Language	52	46	10
Health	121	13	2
Physical Education	47	42	16
Behavioral Studies	100	-	-
Technology	106	36	2
Life Skills	67	220	21
Total	3174	799	127

Differing grade ranges

Regardless of their position on standards, most groups acknowledge the need to identify expected or anticipated skill or understanding at various developmental levels. These statements of expected knowledge are referred to as *benchmarks*. To illustrate, consider the following content standard within science:

Understands basic concepts about the structure and properties of matter

At the 12th-grade level, the benchmark, or expected level of understanding, might be described in the following way:

- *Knows that the physical properties of a compound are determined by its molecular structure (e.g., constituent atoms, distances and angles between them) and the interactions among these molecules*

At the 8th-grade level, the benchmark or expected level of understanding might be:

- *Knows that atoms often combine to form a molecule (or crystal), the smallest particle of a substance that retains its properties*

Theoretically, these benchmarks, or subcomponents of a standard, could be identified at all grade levels. However, the trend seems to be to develop benchmarks at a few key levels. For example, the National Assessment of Educational Progress (NAEP) identifies benchmarks at grades 4, 8, and 12. The American Association for the Advancement of Science (Project 2061) identifies benchmarks at grades 2, 5, 8, and 12.

In this model, benchmarks identify expected understanding or skill at various grade levels, with a preference for articulating benchmarks at primary, upper elementary, middle, and high school within each standard. However, these levels of identification may be different in some content

areas, depending on the availability of source materials. The reader is referred to the introductory sections of each content area to determine what levels have been identified for that area.

Differing Levels of Generality

The benchmark is the smallest unit of analysis for this study. As described above, it can be characterized as being declarative, procedural, or contextual in the type of knowledge it describes. The "size" of a benchmark is more problematic and seems best described in practical rather than theoretical terms. A practical description begins from what appears to be common among the benchmarks that we have identified within the subject areas.

From our observations, a benchmark seems to have a lower and an upper limit. As to the lower limit, in no case does it appear to describe specifics of information or specific skills that an average student could master quickly, assuming that the benchmark has been placed at the appropriate grade level. This lower limit means that a declarative benchmark would never be equivalent to a short list of facts, for example; nor would a two-step algorithm be identified as a procedural benchmark at the 4th-grade level. This provides a rough starting point for the lower level of a benchmark.

A useful reference point for a benchmark, particularly at the lower end of the interval, is the behavioral objective. A benchmark is "larger" than a behavioral objective. Measurement expert Robert Mager (1962), described what came to be called a *behavioral objective* as consisting of three key elements: a target behavior, a description of conditions under which the behavior is demonstrated, and criteria for acceptable performance. By limiting the description of information and skill to a behavior and to the conditions under which that behavior is demonstrated, this approach necessarily required many, many thousands of behavioral objectives to describe the knowledge within a given content domain. Benchmarks, by contrast, do not describe the behavior of students who meet an objective, nor do they narrow the description of information and skills to a particular set of conditions. (A contextual benchmark, discussed above, is a special case. It describes a general context for knowledge use rather than the specific conditions under which that knowledge could or should be demonstrated).

Thus, a single behavioral objective could not address all of the content described within a benchmark, but a single benchmark could be the source of a number of instructional objectives. This characteristic of benchmarks, at least as they appear in this report, is in part explained by the fact that the articulation of standards and benchmarks is not an attempt to organize learning or learning activities within a model for instruction. Rather, this approach uses a cognitive theory of knowledge types to assist in the analysis and identification of information and skills[2]. At the lower limit, then, a benchmark does not prescribe instructional objectives. That is, as said of the NCTM standards in a report from the National Academy of Education Panel (Shepard, 1993), they "do not

[2] This process has been applied to documents, however, that have been developed by educators with understanding or belief about knowledge structures within their subject areas as well as what research says about the proper sequencing for the development of particular knowledge and skills. Clearly, then, the documents we have analyzed could well reflect the influence of certain theories of learning or theories of instruction. When this information (e.g., the sequence for learning about computation across K-12) is preserved in this study, it is better understood as a useful "side-effect" of our method, not a result of it.

delineate specific instructional activities, [but] they do set the direction for what should be taught" (p. 3).

In summary, a benchmark can be described as an "interval" of levels of generality in the description of information and skills. In this section, we have attempted to describe some of the characteristics of the lower end of that interval. Benchmarks do not describe trivial or "easy" information and skills for the developmental level at which they are found. They are not descriptions of information and skill that have been narrowed through behavioral objectives or by being translated into an instructional activity.

Where the lower bounds of a benchmark have some identifiable characteristics, the characteristics of the upper bound are much more vague. That is, within this study it became difficult to determine the point at which the component of a standard seemed too broad in scope or too generally stated to be characterized as a benchmark. In fact, at the next broader level of generality, we found that depending upon the document we analyzed, this level was either treated as a topic organizer or identified as a complete standard. The national history standards documents from NCHS were found to have at least four tiers of organization. In the design for the world history standards, for example, historical eras provided the most general structure. The level just beneath eras was identified as the standard level. Beneath the standard level there was no detailed information, but three or four more specific statements were given, under which benchmark-level information was provided.

The subject area of science offers a convenient example of the variance in approaches to levels of generality, inasmuch as two organizations have put considerable effort into the development of science standards, each using a different organizational scheme. Project 2061's *Benchmarks for Science Literacy* (1993) articulates most standards (termed *literacy goals*) across K-12. In practice, this means that a standard is described at a level that is broad enough to be articulated with benchmarks at each of four developmental levels: K-2, 3-5, 6-8, and 9-12. For example, one standard, or literacy goal, is on "the structure of matter." This idea is expressed at the earliest developmental level in terms such as the following:

> *By the end of the 2nd grade, students should know that*
>
> - *Objects can be described in terms of the materials they are made of (clay, cloth, paper, etc.) and their physical properties (color, size, shape, weight, texture, flexibility, etc.).* (p. 76)

At the upper level, 9-12, a sample benchmark under the same overarching idea is:

> *By the end of the 12th grade, students should know that*
>
> - *The configuration of atoms in a molecule determines the molecule's properties. Shapes are particularly important in how large molecules interact with others*. (p. 80)

Contrasting material comes from the National Research Council (NRC), which was funded by the Department of Education to develop standards for science. If we search for an idea similar to the

one found at the early grades in the Benchmarks, we find it in the following, which is identified as a content standard:

> *As a result of the activities in grades K-4, all students should develop an understanding of*
>
> - *Properties of objects and materials*
> - *Position and motion of objects*
> - *Light, heat, electricity, and magnetism* (p. 123)

Concepts related to these topics, or subcomponents, are elaborated under the heading "fundamental ideas that underlie this standard." At that level, the following description is found for "properties of objects and materials":

> - *Objects have many observable properties, including size, weight, shape, color, temperature, and the ability to react with other substances*. (p. 127)

This demonstrates a dramatically different way of organizing very similar information. In this document, the standard has several organizing topics, each of which is defined at a greater level of detail. These details describe information and skills at about the same level as found in the benchmarks from Project 2061's *Benchmarks*. The benchmark information differs essentially in two ways: In the NRC document, benchmarks appear in a standard that is complete at grade level, rather than articulated across grades; and these benchmarks also appear arranged under topic headings.

Although the categories in these two documents differ, the same or very similar material is covered. For example, the corollary to the 12th-grade benchmark from Project 2061 on the structure of molecules (see example above) can be found in the NRC document as part of a different standard, which has six organizing subcomponents (p. 176), under one of which ("structure and properties of matter") the following information can be found:

> - *The physical properties of compounds reflect the nature of the interactions among its molecules. These interactions are determined by the structure of the molecule, including the constituent atoms and the distances and angles between them*. (p. 179)

In short, NRC has determined that standards should be categories of information not so broad as to encompass a common set of information across K-12. This articulation does appear, however, at the next larger level of organization. That is, all the benchmark information presented in the examples above from the NRC document is organized under the category Physical Science.

In this study, wherever possible, we describe standards at a level of generality that is broad enough to allow the articulation of benchmarks across K-12. Sometimes this approach required the reorganization of material from the subject-area documents. However, this organization was considered advantageous in that it organized information and skills systematically across subject

areas without any apparent loss of critical information. In addition, as mentioned at the outset (see Purpose of this work) this consistency of format provides a clearer system-wide picture for those who wish to integrate benchmarks from different subject areas but who also need to keep track of how and what curriculum they have addressed.

Standards, as found in the documents analyzed for this study, appeared at different levels of organization and structure. Standards provide a way of organizing information, that is, the benchmarks that identify important declarative, procedural, and contextual knowledge. This organization itself may provide information on how "pieces" of knowledge can be logically sequenced for students' ease of learning. For example, a study of research findings by the authors of *Benchmarks for Science Literacy* (1993) led them to the following kinds of adjustments for writing benchmarks:

1) Stating less-sophisticated precursors of an idea. For example, research suggests that the notion of a "fair comparison" can be understood in lower grades as a preliminary form of the later concept of a controlled experiment.

2) Adding prerequisite components for learning outcomes. For example, research draws attention to the need for understanding how people see things by reflected light as a prerequisite to a benchmark for understanding the phases of the moon.

3) Changing benchmarks to different grade levels. For example, research shows that natural selection is still a difficult idea for many college students-even after special instruction. So the benchmark for natural selection was moved form 8th grade (where some teachers thought it could be taught) to 12th grade. (p. 328)

It should be noted that the approach to benchmark writing discussed here-that is, the sequencing of information based upon the idea that learning occurs in a step-by-step fashion, leading to the understanding of more complex concepts or principles-may not be an approach that works well for all types of knowledge. Science is a nomothetic discipline, that is, it has as its focus universal laws or principles. Thus, it may be possible to arrange benchmarks to serve overarching ideas, for example, benchmarks that build toward the understanding of a general principle. The discipline of history provides a counter-example. History is an idiographic discipline, that is, one that has as its primary interest the nonabstract (e.g., specific individuals and concrete events). The discipline of history does not seek to extract universal ideas or laws from the stream of people and occurrences that it studies. Thus, with respect to this discipline, benchmark writing may not involve a step-by-step approach to larger generalizations but, rather, may simply entail the description of important facts, events, and episodes. Therefore, one would expect to find benchmarks organized by historical eras, rather than by ideas or principles.

In this report, the standards we have developed reflect both the character of the materials available to us and the model we have developed for identifying knowledge. There are other ways that benchmarks can be grouped, however, and except for the caution that developmentally sequenced information, when available, should not be lost, there appears to be no compelling

reason that districts or schools should not feel free to organize benchmarks in whatever way they find most useful.

The Process Used in This Report

Although some variations exist in the manner in which standards from different domains were addressed, a general process was followed to identify the standards in this report.

Identify Significant Reports

In February of 1990, President Bush announced the national educational goals that he and state governors had established. One of those was that by the year 2000, American students would demonstrate mastery over challenging subject matter in core subject areas. Congress has since defined and expanded the goal areas to include the domains of English, mathematics, science, foreign languages, civics and government, economics, arts, history, and geography. Additionally, the educational goals state that all students should have access to physical education and health education to ensure they are healthy and fit. Given this national mandate for improved student performance in these areas, the most significant documents in the fields were identified and examined. For this report, 137 documents were consulted to construct standards and benchmarks.

In addition to these areas, documents were also reviewed for the domain of the workplace. Workplace standards, were developed to meet the growing demand for a smoother transition from school to the workplace, as made evident from recent Skills Standards efforts funded by the Departments of Education and Labor.

It is important to note that a number of documents used were in draft form. All relevant documents are discussed in the appropriate subject sections.

Select Reference Documents

Since there was more than one document within many of the domains considered, a reference report was selected for each domain. Reference documents were selected based on their completeness, perceived acceptance by the subject discipline community, and compatibility with the perspective of standards and benchmarks taken in this report.

Identify Standards and Benchmarks

Once a reference document was selected, standards and their benchmarks were identified. This was done from both "top-down" and "bottom-up" perspectives. A top-down perspective was taken when a reference document contained explicit standards that were at a level of generality consistent with the position on standards taken in this study. In such cases, the standard found in the reference document was accepted with minor modifications, or if rewritten, kept close to the original meaning. Benchmarks were then identified for each standard. Depending upon the character of the document, this process could entail the straightforward identification of explicitly stated benchmarks or an analysis of the material to find information about knowledge and skills that was implicit. This would be the case, for example, if essential knowledge and skills were presented in the form of an instructional activity rather than as a description of the important

knowledge and skills. In some cases, however, a reference document articulated standards at a different level of generality (too general or too specific) or in a different format (performance or curriculum standards as opposed to content standards). In such situations, implicit and explicit benchmark components (declarative, procedural, and contextual elements) were identified first. These were then organized into standards. In effect, such standards were designed from the bottom up.

Integrate Information from the Other Documents

When the analysis of the reference document was complete, information from the other documents was then integrated into the standards and benchmarks identified from the reference document. On some occasions, the analysis of secondary documents within a domain illustrated a need to create new standards that were not explicit or implicit in the reference document.

Organize Standards into Categories

In all, this report describes 4,100 benchmarks distributed among 256 standards. These standards have been organized into 14 major categories. In a number of cases, the organization was straightforward; for example, standards generated from and referenced to science documents were placed under the category of science. Such an approach was followed for the areas of mathematics, geography, and history. For other categories, the bottom-up approach, which characterized the formation of standards from benchmarks, also was used to organize similar standards into larger areas. The standards and benchmarks and their categories are listed in figure 5.1.

Figure 5.1 The standards and benchmarks identified in this document

	Standards	Benchmarks
Mathematics	9	223
Science	13	261
History	2	48
Historical Understanding		
K-4 History	8	108
(As Implemented*)	(±4)	(±54)
U.S. History	31	405
(As Implemented*)	(±10)	(±135)
World History	46	720
(As Implemented*)	(±15)	(±240)
English Language Arts	10	340
Geography	18	238
Connections	1	13
Dance	6	62
Music	7	80
Theatre	6	72
Visual Arts	5	42
Arts (total)	25	269
Civics	29	427
Economics	10	159
Foreign Language	5	108
Health	10	136

Physical Education	5	105
Behavioral Studies	4	100
Technology	6	144
Thinking & Reasoning	6	121
Working with Others	5	51
Self-regulation	6	59
Life Work	8	78
Life Skills (total)	25	309
Total	256	4100

* The numbers shown for history standards are not equivalent to numbers in other subject areas, inasmuch as a history standard can be achieved in any one of the three years of study recommended by NCHS. Thus, the number of applicable standards for any one year is less than the total number listed here.

Acknowledgments

This online database is the 4th edition of *Content Knowledge*, a work that first began as a series entitled *The Systematic Identification and Articulation of Content Standards and Benchmarks*, first published in April 1993. A study as ambitious as this one is always the product of the hard work and creative insight of a number of individuals. The following individuals had major responsibilities for the current online edition:

John Kendall is responsible for the conceptual design of the research underlying the development of the standards and benchmarks, topics, vocabulary, and knowledge/skill statements. He is also responsible for the technical design, quality control, and implementation of that research.

Nathalie Bleuzé shared major responsibility for the revision of standards and benchmarks in mathematics and economics, and for citations in civics.

Keri DeFrees shared major responsibility for the development of prekindergarten benchmarks in science. She shared major responsibility for the development of knowledge/skill statements in behavioral studies, civics, science, technology, and life skills.

Kathleen Flynn shared major responsibility for the synthesis of prekindergarten benchmark in the language arts.

Heather Hoak shared major responsibility for performance expectations, benchmark revisions, citation updates, and linked assessment items in language arts.

Megan Odum shared major responsibility for updating benchmarks and identifying alignments with the Common Core State Standards for mathematics.

Courtney Pollack synthesized benchmarks, knowledge/skill statements, vocabulary, and topics for college readiness content in mathematics.

Amy Richardson shared major responsibility for career education standards and updated benchmarks in technology. She shared major responsibility for the development of knowledge/skill statements in the arts, civics, foreign language, health, physical education, technology, and life skills; for the development of knowledge/skill statements and topics in health education,

agricultural education, and family/consumer sciences. She also identified performance expectations in grades 3-5 mathematics.

Susan Ryan shared major responsibility for the development of knowledge/skill statements for history and for the career education standards, and knowledge/skill statements and topics for arts and communication and business education. She also identified performance standards for grades 6–8 language arts. She has updated benchmarks and associated content for English language arts and reviewed alignments with the Common Core State Standards for ELA.

Lisa Schoch-Roberts shared major responsibility for the identification of standards and benchmarks in physical education and for the revision of standards and benchmarks in United States and world history for an earlier report.

Amitra Schwols shared major responsibility for updating benchmarks and identifying alignments with the Common Core State Standards for mathematics, for performance statements in K–2 and 6–8 mathematics, and for the development of knowledge/skill statements and topics in health education and engineering education, as well as the update of benchmarks for engineering education.

Chris Snyder shared major responsibility for the development of knowledge/skill statements for the language arts and history. She has shared responsibility for the revision of standards and benchmarks in the English language arts, foreign language, and history.

Jennifer Tuzzeo shared major responsibility for benchmarks, knowledge/skill statements, vocabulary, and topics for college readiness content in language arts. She contributed to the update of citations in language arts and to linked assessment items in economics and geography.

Shelly Wasson shared major responsibility for the identification of standards and benchmarks in science, health, the arts, and foreign language, for additions to the section on life skills, for the verification of standards and benchmarks in geography, and for document preparation.

Sandra Weeks shared major responsibility for revised benchmarks and linked assessment items in science.

Jill Williams shared major responsibility for the revision of benchmarks in mathematics, the development of prekindergarten benchmarks for mathematics, and the development of knowledge/skill statements and assessment item links for mathematics.

Contributors

Alan Alpert shared major responsibility linking NAEP released assessments in history.

Mark Noonan contributed to the citations for college readiness content in mathematics.

In addition, **Farid Khan** continues to redesign the online database program to accommodate the expansion of content and resources. For the 5th edition, he contributed to the conception and

design of the versioning system, which allows users to identify updates and revisions to benchmarks, knowledge and skill statements, and vocabulary.

Previous Editions

The following individuals contributed to the development of content in previous editions of this work:

Robert Marzano was co-author of all previous editions of *Content Knowledge*. His contributions were primarily at the level of conceptual design for the standards, benchmarks, and knowledge/skill statements.

Mary Lee Barton shared major responsibility for an earlier revision of standards and benchmarks in the English language arts.

Heidi Hoopes shared major responsibility for an earlier revision of standards and benchmarks in technology.

Bradley Kennedy shared major responsibility for the initial identification of standards and benchmarks in world history, for draft standards in foreign language, and for the verification of standards in the arts.

Laura Lloyd shared major responsibility for citation updates of standards and benchmarks in physical education, health education, behavioral studies, and the arts.

Jessica Logan shared major responsibility for the identification of standards and benchmarks in technology and for the revision of standards and benchmarks in foreign language and life skills.

Biaze Miller shared major responsibility for the performance expectations in grades K–5 language arts, and for the development of topics and knowledge/skill statements in business education.

Jennifer Norford shared major responsibility for the identification of standards and benchmarks in economics and behavioral studies, and for the revision of standards and benchmarks in mathematics.

Audrey Peralez contributed to the initial identification of standards and benchmarks in geography.

Therese Sarah shared major responsibility for the initial identification of standards and benchmarks in U.S. history and K-4 history, for draft standards in economics, and assisted in the identification of the geography benchmarks.

Michael Schintgen shared major responsibility for the revision of standards and benchmarks in mathematics.

Michael Shea shared major responsibility for the identification of standards and benchmarks in civics.

Angela Wahlquist shared major responsibility for the revision of standards and benchmarks in science.

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Professional Subject-Area Organizations

THE ARTS
Music Educators National Conference
1902 Association Drive
Reston, VA 22091
703-860-4000

COMMON CORE STATE STANDARDS INITIATIVE
National Governors Association
Hall of the States 444 N. Capitol St., Suite 267
Washington, D.C. 20001-1512
202-624-5300

COMMON CORE STATE STANDARDS INITIATIVE
Council of Chief State School Officers
One Massachusetts Avenue, NW · Suite 700
Washington, DC 20001-1431
202-336-7000

CIVICS AND GOVERNMENT
The Center for Civic Education
5146 Douglas Fir Road
Calabasas, CA 91203
818-591-9321

ECONOMICS
The National Council on Economic Education
1140 Avenue of the Americas
New York, NY 10036
212-730-7007

FOREIGN LANGUAGE
American Council on the Teaching of Foreign Languages
Six Executive Plaza
Yonkers, NY 10801-6801
914-963-8830

GEOGRAPHY
National Council for Geographic Education
1600 M Street, NW
Suite 2500
Washington, DC 20036
202-775-7832

HEALTH EDUCATION
Association for the Advancement of Health Education
1900 Association Drive
Reston, VA 22091
703-476-3437

HISTORY
National Center for History in the Schools
UCLA, 231 Noore Hall
Los Angeles, CA 90024
310-825-4702

LANGUAGE ARTS
National Standards for the English Language Arts Project
The International Reading Association Division of Research
800 Barksdale Road
P.O. Box 8139
Newark, DE 19714-8139
302-731-1600, ext. 226

MATHEMATICS
National Council of Teachers of Mathematics
1906 Association Drive
Reston, VA 22091
703-620-9840

PHYSICAL EDUCATION
National Association for Sport and Physical Education
1900 Association Drive
Reston, VA 22091
703-476-3410

PSYCHOLOGY
American Psychological Association
750 First Street NE
Washington, DC 20002-4242
800-374-2721; 202-336-5500

SCIENCE
National Science Education Standards
2101 Constitution Ave., NW
HA 486
Washington, DC 20418
202-334-1399

SOCIAL STUDIES
National Council for the Social Studies
8555 16th St. Suite 500
Silver Spring, Maryland 20910
301-588-1800
www.socialstudies.org

TECHNOLOGY EDUCATION
International Technology Education Association
1914 Association Drive
Reston, Virginia 20191-1539
703-860-2100

NATIONAL RESEARCH CENTER FOR CAREER AND TECHNICAL EDUCATION
University of Minnesota, Twin Cities
1954 Buford Ave.
St. Paul, MN 55108
800-322-9664

McREL's Contributions to K-12 Standards

- Published a database of K-12 content standards, entitled *Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education*, (Kendall & Marzano).
- Posted standards-based resources on McREL's website where anyone who has Internet access may examine and use the material.
- Developed with Achieve, Inc. the Achieve+McREL standards database, an on-line tool that enables content providers to align their content--once--with the McREL standards database and that content will be aligned automatically and instantly with 40+ states' standards in the Achieve+McREL standards database.
- Posted in 1999 Standards for Career Education for Agriculture Education, Arts & Communication, Business Education, Engineering Education, Family/Consumer Sciences, and Health Education on McREL's website.
- Helped over 150 school districts and intermediate education agencies establish and implement standards-based education.
- Developed a comprehensive standards-based vocabulary list derived from an analysis of McREL's standards database that may be used for instructional, organizational, and key word search purposes by teachers, curriculum administrators, students, parents, and content providers.
- Helped the states of California, Hawaii, Florida, Kansas, Iowa, Idaho, Illinois, Minnesota, South Dakota, North Dakota, and Washington with various aspects of standards-based education (e.g., standards drafting, reviewing, evaluating, and analyzing).
- Contracted with North Dakota to assist local teachers and staff in the design and development of assessments tied to its statewide language arts and mathematics standards.
- Developed the standards-mapped Snapshot Assessment System for elementary and middle school migrant, language minority, and mobile students.
- Published articles in the educational press concerning standards and assessment.
- Reviewed, analyzed, revised or aligned over 300 separate standards documents and subject matter content for various schools, school districts, states, and private sector clients.
- Published a standards handbook, entitled *A Comprehensive Guide to Designing Standards-Based Districts, Schools, and Classrooms* (Marzano & Kendall, 1996).
- Licensed Content Knowledge and McREL's standards-based vocabulary list to software publishers and online content providers, and performed standards-based content alignment and standards database development for Internet, software and print publishers.

- Produced in 1999 a standards-based video entitled *Standards in the Classroom* featuring Jane E. Pollock.
- Published *Essential Knowledge: The Debate Over What American Students Should Know* (Marzano & Kendall with Gaddy, 1999), a book about what knowledge should be embraced by K-12 standards-based education.
- Published *What Americans Believe Students Should Know: A Survey of U.S. Adults* (Marzano, Kendall, & Cicchinelli, 1999), a survey designed by McREL and administered by the Gallup Organization to find out what American adults believe students should know by the time they graduate from high school.
- Developed two standards-based workshops, entitled "Implementing Standards in the Classroom" and "Assessment, Grading, and Record Keeping" (1999).
- Published *Transforming Classroom Grading* (Marzano, 2000), a book concerning grading and record keeping in a standards-based classroom.