

**Connecting Students, Standards, and Success:
Using standards-based curriculum connections to improve learning**

by

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Abstract

In many classrooms, lack of preparation and support for true standards-based curriculum, instruction, and assessments, as well as inappropriate uses of high-stakes tests, have driven standards-based reform efforts in directions that tend to fracture learning, diminish teaching, and focus curricula almost exclusively on the discrete subject areas represented in large-scale tests. The authors make a case for connecting curriculum, instruction, and assessments using standards, in order to improve student learning and understanding and to provide all students with access to a comprehensive and challenging curriculum—one of the elements identified in research as a key to closing achievement gaps. The basis for these connections include the schoolwide goals for student learning derived from analysis of the many national standards documents, and five research-based ways to make multi- and interdisciplinary connections. These five keys to standards-based connections are global skills, ways of making meaning (thinking and learning processes), common concepts, shared content, and cross-discipline instruction.

Peer review statement

This article was peer-reviewed in a slightly different format by a panel of national scholars and curriculum and standards experts affiliated with the member organizations of the Alliance for Curriculum Reform (www.acr.uc.edu for more information). This peer review was for quality of the research and content only, and does not imply any particular endorsement or recommendation by any of the Alliance member organizations.

By now, every state and school district in the United States is engaged in standards-based systemic reform initiatives. Since the 1989 publication of standards for K-12 students in mathematics (NCTM), every major content area has developed a set of national standards for “what every student should know and be able to do.” Cross-disciplinary areas concerned with quality K-12 education have done the same, and the result has been standards not only for mathematics, English, social studies, science, geography, health, dance, music, theatre, visual arts, physical education, and others, but also for early childhood and middle grades, learners of English as a second language, information literacy, and more.* Researchers at the Mid-Continent Regional Laboratory once estimated that the full set of national standards would take 22 years to learn (Marzano and Kendall, 1998). Along with national standards came state versions in similar content areas, with many state standards the same as their national counterparts but with many also different. Accountability requirements for districts and schools have evolved into high-stakes assessments and serious repercussions for schools not able to bring their students to mastery of many of these standards. Arguably, the accountability legislation that has had the greatest impact is *No Child Left Behind* and the myriad of state laws that followed.

Unfortunately, for many classroom teachers standards-based reform has come to mean two things: a seemingly endless list of expectations that their students must meet, and a series of high-stakes tests that are tied to discrete subject areas, the results of which often mean dire consequences. Both of these conditions have driven standards-based reform efforts in ways that tend to fracture learning, diminish responsive and creative teaching, and focus attention almost exclusively on the discrete subject areas represented in high-stakes, large-scale tests.

One reason for this problem is that the accountability system is only partly aligned with the goals of the standards. While accountability tests are intended to measure some foundational indicators of learning in just a few content areas, largely due to expense and the need to establish priorities, the standards present a broad and comprehensive vision for student learning, complete with some approaches to instruction and classroom and formative assessments that are new for many teachers and schools. While the tests may indeed serve some external accountability interests (i.e., whether a school is missing the mark), they tell little about the actual work going on in the school and even less about whether the comprehensive learning described in various standards documents is being pursued by teachers, leaders, and students. Discussing the weakness of external tests as a way to focus schools and educators on standards-based changes in curriculum and instruction, Marzano and Kendall (1998) noted that

The problem with an over-reliance on multiple-choice items is that they characteristically measure a narrow range of skills only. In fact, some studies have found that they do not address students’ abilities to apply knowledge or thinking critically about knowledge (see Marzano 1990; Marzano and Costa 1998). (p. 11)

Marzano and Kendall go on to note that even given a broader range of performance tasks on standardized tests, the basic problem runs deeper than the test—it is an issue of how tests are viewed within the system and process of teaching and learning. There is a traditional view that “teaching to the

* For links to easily access many of these standards documents online, go to <http://www.acr.uc.edu>.

test” is unethical, but many assessment experts (e.g., Wiggins 1993) have argued that this view is wrong for two reasons. First, it does not respect the rights of the students and teachers to know the criteria upon which their work will be judged, and more importantly for our discussion here, this view “assumes that a test can be designed in such a way that it adequately represents a student’s competence in the subject matter that is tested.... Unfortunately, current research has shown that this is rarely the case.” (Marzano and Kendall 1998, p.15). To use the standardized assessments that are intended only to provide a baseline accountability measure for schools and districts as the primary requirements for the curriculum that individual students receive is to severely limit what those students are taught. Worse, such practice tends to make the educational experience less interesting, and it limits teachers’ expectations of students’ potential. The ironic result is that focusing on assessment as a way to ensure implementation of standards-based education reforms is just as likely to result in a stratified education and continued achievement gap.

What began as a national movement to expand and enrich the learning of all students in order to ensure that our nation as a whole would become better educated, critical, and creative thinkers—and thus more globally competitive, in response to the warnings of publications such as *A Nation at Risk* (1983) and now *The World is Flat* (2005)—has become in many schools a different approach with the same results. Some students receive a very basic, disconnected, and uninteresting education; others are able to make more of their schooling, but often only due to the resources that support them outside the school arena. Consider that in spite of what is now for most standards areas a full decade of effort, results on the National Assessment of Educational Progress, the International Mathematics and Science Studies, and other measures of large-scale educational improvement have not advanced markedly, and achievement gaps remain (Education Trust, 2005).

Turning Standards into Better Practice

Why don’t we see wide-spread indications that standards-based curricula are making a pronounced impact on student achievement? There are a number of reasons behind this. First, implementation is certainly still in progress, and it has likely been incomplete and imperfect in most schools—it may well be too early to attribute much in the way of impact to either standards-based reform efforts or the related accountability legislation. Related to this is the fact that teachers have not generally been prepared to teach in this fashion. This includes preparation in a style of lesson planning and accompanying assessments, but it may also be that traditional teacher preparation is not aligned with the deeper disciplinary understanding behind the standards themselves. In her study of changes required of teachers mastering a standards-based approach, Lewis (1999) describes it this way:

To “go to scale” with standards, that is, to implement them district-wide, districts needed to entice teachers into basing their instruction on standards, not treating them as an add-on. This is like driving a taxi in New York City after learning to drive on a country road. Instead of embellishing suggested lessons from the teachers’ guides to textbooks or drawing from routines established early in their careers, teachers now needed to start their instructional planning with standards. Those most adept at it set learning outcomes, develop the rubrics (how student work will be judged), and frame performance tasks and assessments relate to the content. (p. 35)

A third common scenario is that teachers and administrators may not feel *able* to implement standards-based approaches in effective ways. The push to focus on high stakes tests often results in even less focus on the kind of connected, rich learning that is sought by the very standards that the tests are designed to measure. Teachers and administrators faced with dire consequences drop their well-intentioned, well-designed standards-based approaches in favor of familiar comfort zones. We have encountered numerous examples of this, and we are sure readers have as well. For example, one complaint shared recently with the authors was that the planned curriculum and the expert judgments of eight certified, “highly qualified teachers” of mathematics were overridden by a nervous new principal with no mathematics teaching experience. With only three days warning, teachers were instructed to drop their lesson plans to conduct three weeks of worksheet-based test practice in the hope of bumping up scores. Again, from the Lewis study of middle schools and districts struggling to successfully implement standards-based reforms:

One of the most important lessons we have learned... is that the determination of whether students are meeting standards will eventually have to be done at the classroom level. The standards are far too complex to be assessable with the amount of testing time available for district-level tests. Thus, we have shifted our work from creating more district assessments to creating district scoring guides and model tasks that would provide some standardization at the classroom level without being completely secure, standardized tests. (Lewis, 1999, p 86)

Finally, the standards themselves are no doubt in part to blame, suffering from what Wiggins and McTighe (1998) call the “Goldilocks” problem. Some standards are “too big”—that is, too broad in concept to lend themselves easily to classroom practice—and some standards are “too small”—on such a level of detail that they micromanage the teachers’ work. Pair this with the limited experience and preparation for teachers to turn standards documents into meaningful, responsive curricula, lesson plans, and assessments, and we have a problem.

Begin with the Discipline in Mind

One way to bring educators back to a focus on quality comprehensive education for all students is to show that student achievement can be enhanced and improved by connecting learning across the disciplines. There is evidence to support that when students see how their learning relates to other subjects and concepts, their achievement improves and their understanding deepens. From our work with schools and standards over the years, and in reviewing recent standards-based research, we find support for a better way to approach standards-based practice that impacts the learning of all children: making connections among the standards and the disciplines they represent. In fact, not only do we find that such approaches make the use of standards more efficient and influential on student learning (albeit fundamentally different in many ways from some past traditions of practice), we argue that a connected approach to curriculum, instruction, and assessment is *required* in effective standards-based education due to the very nature of the underlying disciplinary content.

Improving Student Understanding and Application and Transfer of Skills and Knowledge

Recent advances in cognitive science and studies of learning processes support the connection of disciplines in curriculum, instruction, and assessment. Students must not only learn knowledge and skills but also have opportunities to apply and practice these in a variety of contexts. Effective learning must also stay with students long-term and provide the foundation for future learning within the discipline and in other areas of content—as well as hold connections to life applications. Bransford et al. (1999) summarize their conclusions (emphases added):

- *Skills and knowledge must be extended beyond the narrow contexts in which they are initially learned.* For example, knowing how to solve a math problem in school may not transfer to solving math problems in other contexts.
- It is essential for a learner to develop a sense of *when* what has been learned can be used—the conditions of application. Failure to transfer is often due to learners' lack of this type of conditional knowledge.
- Learning must be guided by generalized principles in order to be widely applicable. *Knowledge learned at the level of rote memory rarely transfers; transfer most likely occurs when the learner knows and understands underlying principles that can be applied to problems in new contexts.*

(pp. xiii-xiv)

They go on to note how a broader grasp of knowledge and concepts benefits learners, helping them to guide their own learning:

Learners are helped in their independent learning attempts if they have conceptual knowledge. Studies of children's concept formation and conceptual development show the role of learners' mental representations of problems, including how one problem is similar and different from others and understanding the part-whole relationships of the components in the overall structure of a problem.

(pp. xiii-xiv)

Learners are not rote memorization machines; they must have context, structure, and application to make learning meaningful and long-lasting. Integration of many types makes content more relevant to learners. A review of the literature on curriculum integration in math and science (Czerniak, 1999) revealed that there seems to be a lack of consensus about the definition of integration. However, the majority of the empirical research studies that have been conducted were found to support curriculum integration as a way to improve student achievement in math and science. One study (Foss, 1998) examined the effectiveness of a project for K-4 in-service teachers designed to change mathematics, reading, and science teaching in elementary schools through an integrated curriculum. Results suggested that many of the in-service teachers substantially increased their knowledge of mathematics, science, and reading; better understood the implementation of an interdisciplinary curriculum; and were interested in learning new teaching approaches.

Shifting the Quality and Focus of Teachers' Work with Students

The connection of content in effective ways also requires that teachers put students' understanding at the center of their work, and it subsequently pushes teachers' work in directions that are less traditional.

For example, in a report on a five-year study focusing on characteristics of educational practice that accompany student achievement in English language arts in middle and high schools (Langer, 1999), the Excellence in English Study found that in higher-performing schools, overt connections are constantly made among knowledge, skills, and ideas across lessons, classes, and grades as well as across in-school and out-of-school applications. In contrast, in the more typically performing schools, connections are more often unspoken or implicit, if they occur at all.

The focus of this study was the special features of instruction that make a difference in student learning in high-achieving schools. The study compared high-achieving and low- to moderate-achieving schools that were otherwise similar. The study involved 19 middle and high school English programs, in Florida, New York, and California, that exhibited diversity in population, educational problems, and approaches to improvement. Langer's analysis of instruction found that the teachers overtly pointed out connections among the students' learning: connections among concepts and experiences within lessons; connections across lessons, classes, and even grades; and connections between in-school and out-of-school knowledge and experiences. Nearly 90% of the more successful teachers in the study tended to make all three types of connections with approximately equal focus. In comparison, the other teachers in the study tended to make no connections at all, and when they did, they tended to be limited to "real-world" connections between home and school (Johannessen, 2002, p. 10).

The findings of the study suggest that higher achieving schools are characterized by instructional programs in which:

- (1) skills and knowledge are taught in multiple types of lessons;
- (2) tests are deconstructed to inform curriculum and instruction;
- (3) within curriculum and instruction connections are made across content and structure to ensure coherence;
- (4) strategies for thinking and doing are emphasized;
- (5) generative learning is encouraged/ and
- (6) classrooms are organized to foster collaboration and cogitation (Langer, 1999, p. 46).

Langer also found considerable differences in the way teachers went about teaching students strategies to engage in reading and writing activities and to reflect on and monitor their performance. All of the more successful teachers overtly taught their students strategies for organizing their thoughts and completing tasks, whereas only 17% of the more typical teachers did so. The other 83% of the more typical teachers left such strategies implicit (Johannessen, 2002, p. 17).

We draw another example of ways in which teachers support students' learning through connected curriculum and instruction from a source that did not set out to address such connections

explicitly. However, a review of Ladson-Billings (1994) work related to “culturally relevant” teaching reveals that many of the strategies she identified with successful teaching of African-American children resonate strongly with our arguments in support of connected curriculum and instruction. These are chiefly in the area of how teachers think of content, the nature of knowledge, and their expectations for students’ active engagement with content, knowledge, and learning. She contrasts “culturally relevant” and “assimilationist” teaching:

Culturally Relevant

- Teacher helps students make connections between their community, national, and global identities.
- Teacher sees teaching as “pulling knowledge out”—like “mining.”
- Teacher encourages students to learn collaboratively. Students are expected to teach each other and be responsible for each other.
- Knowledge is continuously recreated, recycling and shared by teachers and students. It is not static or unchanging.
- Knowledge is viewed critically.
- Teacher is passionate about content.

Assimilationist

- Teacher homogenizes students into one “American” identity.
- Teacher sees teaching as “putting knowledge into”—like “banking.”
- Teacher encourages students to learn individually, in isolation
- Knowledge is static and is passed in one direction, from teacher to student.
- Knowledge is viewed as infallible.
- Teacher is detached, neutral about content

(pages 34, 55, 81)

Regardless of how one may view the dichotomous form of presentation, the “culturally relevant” teaching approach is consistent with the findings of Bransford and other learning scientists, as well as with the several studies we note as examples in this article. It would also seem reasonable to assume that such approaches to teaching would be effective for all children, not just African-American learners.

A final example comes from Lewis’ study of middle schools successfully implementing standards-based reforms in some challenging educational environments. Again, the best standards-based approaches placed the content at the center but helped students make explicit connections while modifying the traditional, “assimilationist” style of teaching.

[The teacher] encourages students to use a variety of ways to present science projects for a “brief” unit on the solar system. She suggests: a talk show, a roulette game, or a quiz. Learning that most of her students had already studied the planets, she asked them to conduct research that stretched them beyond what they already knew. Confessing that this was one of her least-liked units when she was in school, she tells them, “I need you to teach me. You may think teachers know it all, but we are not specialists in everything. Find something I might not know.” (Lewis 1999, p. 47)

Making quality connections within and across content standards to modify curriculum, instruction, and accompanying assessments provides a powerful anchor for improving both teacher and student work. In the remainder of this article, we discuss some ways to approach these changes.

Some Practical Ways to Begin Making Quality Connections

We describe two entry points for educators to begin thinking about how to modify curriculum, instruction, and assessment to better meet students' needs while supporting improved achievement. Both are well-grounded in analysis of the complete set of national content area standards. The first, *Schoolwide Goals for Student Learning*, is an analysis that sought to identify elements that every set of content standards included in common. The second, *Five Ways of Making Connections*, is the result of an analysis of research on connected and integrated curricula (some of which is cited in this article) in combination with a cross-discipline analysis of the many national content area standards.

Schoolwide Goals for Student Learning from the National Standards

The value of the following list is that it was derived from the many national content area standards, so that any and all of these elements can be used by a school as unifying learning themes across all curriculum areas. These recommendations were initially developed at the request of and with the support of the several regional education accrediting commissions, via the National Study of School Evaluation, to guide schools and districts in organizing their continuous improvement plans. (*NSSE is a member of the Alliance for Curriculum Reform – www.nsse.org*)

Learning-to-Learn Skills

- Students make a commitment to creating quality work and striving for excellence
- Students use a variety of learning strategies, personal skills, and time management skills to enhance learning
- Students reflect on and evaluate their learning for the purpose of improvement

Expanding and Integrating Knowledge

- Students connect knowledge and experiences from different subject areas
- Students use what they already know to acquire new knowledge, develop new skills, and expand understanding
- Students demonstrate integrated knowledge and skills in applying multidisciplinary approaches to solving problems or completing tasks

Communication Skills

- Students communicate with clarity, purpose and understanding of audience
- Students integrate the use of a variety of communication forms and use a wide range of communication skills
- Students recognize, analyze and evaluate various forms of communication

Thinking and Reasoning Skills *Critical Thinking, Problem-Solving, and Creative Thinking*

- Students gather and use information effectively to gain new information and knowledge, classify and organize information, support inferences and justify conclusions appropriate to the context and audience
- Students utilize, evaluate and refine the use of multiple strategies to solve a variety of types of problems
- Students generate new and creative ideas by taking considered risks in a variety of contexts

Interpersonal Skills

- Students work with others in a variety of situations to set and achieve goals
- Students manage and evaluate their behavior as group members
- Students deal with disagreement and conflict caused by diversity of opinions and beliefs

Personal and Social Responsibility

- Students take responsibility for personal actions and act ethically (e.g., demonstrate honesty, fairness, integrity)
- Students respect themselves and others, and understand and appreciate the diversity and interdependence of all people
- Students demonstrate an understanding of and responsibility for global and environmental issues
- Students act as responsible citizens in the community, state and nation

Five Research-based Keys to Connections Within and Across Disciplines

These five approaches to connecting the disciplines and content-area standards are closely related, and will certainly overlap. Each is followed by an example or two for further illustration. The intent is not to classify curriculum and instructional approaches, but rather to provide experienced educators with a number of starting points for thinking about refining their work in support of better student learning.

Global skills

Global skills can serve as a focus of the curriculum by tying together content in a variety of subject areas. For example, a focus on communication skills can draw on three different sets of standards (English language arts, information literacy, and health) in ways that reinforce one another:

- Students adjust their oral, written, and visual presentations to suit different audiences.
- The student who is information literate collaborates with others, both in person and through technologies, to design, develop, and evaluate information products and solutions.
- Students analyze and evaluate the effectiveness of various communication methods to accurately express health information and ideas.

The integrated curriculum can be defined as the integration of several subjects or areas of study into a common framework. The aim of integrated curriculum attempts to provide both understanding of one course (e.g., science) and its inter-relatedness with other disciplines and with life outside school (Barak & Pearlman-Avni, 1999; Raizen, 1997; and Hsiung, 2000). It is the students' discovery of inter-relatedness and its portrayal in student understandings that makes connections powerful.

Global skills provide a forum for integrated instruction as described by Langer (1999) by providing a stage for students to embark on large and purposeful study using the skills and knowledge taught and practiced in separated and simulated instruction. It is here that students assimilate and broaden skills learned, and this generates new learning and sparks curiosity for further study. Researchers (e.g., see Colombo, Sadowski, Walsh, 2000; Hsiung, Chen, and Wang, 2000) have found that purposeful integration of the curriculum results in student transfer of skills taught, deeper understanding of content,

and development and sharing of personal and academic connections. Students also demonstrate higher levels of self-confidence and purposeful study habits in the classroom.

Ways of making meaning

These approaches focus on important thinking and learning processes necessary for mastery of the various content areas including critical thinking skills. For example:

- Students' discussions of and writings on controversial issues show understanding of the need for coherently developed argumentation (*high school level English language arts standard*).
- Students can follow logical arguments and judge the validity of the arguments in solving mathematical problems (*high school level math standard*).
- Analyze, compare, and evaluate differing critiques of the same dramatic texts and performances (*high school level theatre standard*).

In 2002, Findley explored the connections that fifth-grade students made within a curriculum integrating history and literature, within each subject, across subjects, and with their own lives. Using a card sort activity to help uncover what connections students had made, she found that they constructed connections in multiple and varied ways.

One student drew on his own diverse background knowledge to make sense of new learning. For example, while reading about Cambodian immigrants, he became fascinated by the Pol Pot regime. He drew comparisons with Hitler, talked about the breakup of Yugoslavia and the Soviet Union, and even discussed ancient Greece. He pondered what being an immigrant might feel like and made connections with readings about the U. S. internment of Japanese during World War II. He also decided that everything connected to his own life.

Another student made connections across the curriculum by telling stories. She read and retold stories. She refused to dip into nonfiction texts for specific information but rather insisted on reading whole books that had narrative texts with related personal stories. She also made connections across historical eras by creating a master narrative for herself. She placed freedom at the center and then connected the Revolutionary War and U. S. Constitution with this theme, explaining that "the Civil War had to do with freedom because they were fighting for slaves' freedom and that Native Americans were moved just because of their color." Findley concluded that the connections students make across the curriculum are important ones and that integrated curriculum planning must be broad enough to allow students to interpret learning through their own processes in order for meaning to be constructed.

Problem-based learning, which uses a central major problem that students work on for a longer period of time, is another instructional technique that organizes the curriculum around meaning making skills. Medical school instructors developed problem-based learning to make students better at diagnosis and problem solving (ASCD, 1992) and has found its way into many schools and classrooms across America. Bartels (1998) studied a fourth-grade class that undertook problem-based learning; this class drew from middle- and lower-income families in a suburban population that identified 75% of its students as at-risk. Their teacher designed four units that encompassed the school year. The first was based around a single problem statement that directed study in a unit on planets. The unit integrated three

disciplines: language arts (through Greek myths and writing activities), mathematics (by relating fractions to decimals and computing with decimals), and science (through a study of the rotation of planets, the solar system, and earth as a system). Speakers made presentations to the class, and students researched applicable topics in the library and did hands-on activities. Students worked on the problems in teams that changed when the unit changed. The work was directed by changes noted in a KWL (“**K**now,” “**W**ant to learn,” “**L**earned”) chart that communicated what information was needed and was then adjusted to account for new information. (Bartels, 1998, p. 2).

The results of the study indicated that problem-based learning covered a significantly higher quantity and quality of content during the unit. Students were doing mathematics at a higher level than the curriculum required, and they completed the entire fourth-grade mathematics curriculum during the first three grading periods. Students covered higher level mathematics concepts earlier in the year because they had to know how to do complex operations like multi-digit multiplication to solve their unit problem (Bartels, 1998). Students were more successfully involved in research, retrieving information they needed to work toward a solution. They took the responsibility very seriously and acted independently of teacher direction to collect information and data. They also became more self motivated so that they could plan their work in order to be finished by deadlines. And although the teacher wrote the final problem for the year, the students organized the activities for this unit entirely on their own. The teacher had been displaced as the source of knowledge for students; she instead guided them toward constructing their own knowledge.

The teacher found it more efficient to cover the fourth-grade curriculum with problem-based learning because the unit problem motivated students to demand more content than would have been covered with traditional methods, and problem-based learning encouraged interdisciplinary teaching. The students not only learned additional content but the problem-based learning class scored 41 percent higher in mathematics and 18 percent higher in language arts than the comparable, traditional fourth-grade class in the room next door. When the achievement test scores for the past two years were compared, the fourth grade students taught with problem-based learning scored 61.5 percent higher in mathematics and 50 percent higher in language arts than the previous class taught by the same teacher using traditional instruction.

Common concepts

Common concepts are found throughout the various sets of disciplinary standards, and they can be used to improve transfer of knowledge and skills. The “comparison and contrast” of various concepts across content areas can deepen students’ understanding of each. With regard to the use of patterns as organizing concepts, for example:

- Students use patterns, relationships, and computations to analyze mathematical situations (*elementary level math standard*).
- Students recognize patterns and make connections between related scientific concepts (*elementary level science standard*).
- Students compare simple patterns of behavior or interaction in various cultural settings (*elementary level foreign language standard*).

A study of curriculum integrating the arts with other subjects in three urban elementary schools in Dallas, Texas, found that students demonstrated statistically significant levels of improvement in academic performance (as measured by Texas Assessment of Academic Skills and the Iowa Test of Basic Skills). Extensive quantitative and qualitative research over the four-year period led researchers to attribute the achievement gains to the carefully developed integrated arts curriculum and instruction. (Tunks, 1997).

Duncan-Andrade (2005) proposed a teacher inquiry group at “Power Elementary,” a three-year program whose purpose was to support the development of student-empowering social justice themes in teacher’s practice. The inquiry group shed light on two questions: “How can a focus on teaching for social justice energize teaching and learning in an urban school?” And “How can urban schools create a formal space for teachers to investigate and question their philosophies and beliefs and learn from colleagues who provide relevant, socially transformative instruction?”

The examples provided in this writing demonstrate how these highly effective teachers viewed instruction as a catapult to build student empowerment and student achievement as mutually nurturing each other. “These teachers view education as a vehicle to invest in that can improve conditions in urban areas. . . . Less successful urban teachers tend to have more modest ambitions, such as wanting their students to study for tests, behave well in class, and persist in school” (Duncan-Andrade, 2005, p. 71). In these classrooms students are involved in academic studies that are imbedded in social justice learning. For example, as Ms Grants class work with a “Mysteries of Medicine” unit she had students view the film *John Q*, discuss inequities in the health care system, and follow-up with writing assignments and poster projects examining how these issues affected their own lives and the lives of other people in the community (Duncan-Andrade). Mr. Truong’s 5th grade students (38 in all) rose from fewer than 50 percent of the students scoring at or above proficiency in spelling, vocabulary, and proofreading to 83 percent at or above proficiency. The common concepts and themes provided an anchor for students’ interest and subsequent academic success.

Shared content

Shared content is found when one set of content standards incorporates—either explicitly or implicitly—content from another subject area. For example:

- Students describe ways in which language, stories, folk tales, music, and artistic creations serve as expressions of culture and influence behavior of people living in a particular culture (*elementary level social studies standard, connects with English language arts, music, and visual arts standards content*).
- Describe how history, culture, and the visual arts can influence each other in making and studying works of art (*elementary level visual arts standard, connects with social studies standards content*).
- Students use their skills of reading, listening, and observation to interpret and evaluate mathematical ideas (*middle level math standards, connects with English language arts and communication standards content*).

In Langer's study of high performing schools, the teachers worked consciously to weave a web of connections. One teacher used "curricular improvising" to incorporate a grade wide visit to a senior citizens center to shape character studies. Using this opportunity, the teacher required students to interview residents, write a character sketch, then analyze the results of the interview to identify a certain character trait and support it with evidence from the interview. In this case he asked students to identify whether the resident was a liberal, moderate, or conservative. Character sketches were further explored when the students read *Romeo and Juliet* and students once again identified character traits and justified with evidence from the story. Civics, English language arts, and theatre worked together to improve students' achievement.

Cross-discipline instruction

Cross-discipline instruction is the idea of teaching one content area across multiple content areas. For example, reading, writing, and communication skills are often taught very effectively in the context of specific content rather than separately—one reads, writes, and communicates *about* other content.

- Students listen, read, and view scientific information to interpret and evaluate scientific ideas (*elementary level science standard*).
- Students research, write, and illustrate a geographic history of a state that focuses on how the state got its present boundaries (*sample performance indicator, middle level geography standard*).
- Students describe components of physical fitness and motor skill competence with clarity in verbal and written forms. (*high school level physical education standard*).

A study by researchers at the University of Maryland concluded that Maryland elementary students who were taught to read by teachers who combined reading lessons with other subject matter made much larger gains on reading tests than children who were drilled on skills alone. Fifth graders who were taught in integrated instruction registered an average gain of 30 percent on the Maryland State Performance Assessment Program reading-comprehension tests over other students. Students whose teachers stuck close to the basal approach had scores that were likely to stay the same or decline. (Guthrie, 2000)

Kindergarten teachers in Chicago conducted an action research project to identify and investigate students' lack of ability to retain and actively use the skills taught in language arts (Columbo, Sadowski, & Walsh, 2000). The teachers worked together to collect data from assessments, observations, and interviews to analyze the problem and then to develop and implement possible solutions. The research team concluded that engaged learning centers and an integrated curriculum developed better understanding and transfer of skills across subject areas. They implemented learning centers designed to weave instruction of language arts skills across all curriculum areas. The targeted students improved their reading skills, including word-sound associations, left-to-right progression, rhyming words, and the alphabet.

Another study of interest aimed to discover the impact of an interdisciplinary media literacy intervention curriculum on 4th-grade girls in an urban elementary school. Fuller, Damico, and Rodgers

(2004) found that when given an opportunity to view, analyze, and discuss the role of fat in growth and development the girls were more likely to consider and wrestle with the complexities of body size and media representation issues than were participants in a control group. For example, girls in the intervention group demonstrated a better understanding that computers were sometimes used to alter images of women in the media. Girls in this group were better able to identify the benefits and risks of fat.

Implications for Policy and Practice

This article has focused on the natural relationships that exist among subject areas, as well as ways to build on those to support better achievement for all students across the entire span of curriculum content. These relationships may be based on thinking and learning skills found in all content areas, or they may represent specific and logical relationships between and among subjects. We seek to identify and promote those that build student achievement in deep, meaningful, and lasting ways.

We believe that achieving high expectations for all students is the goal of education. National standards in the content areas define high-quality learning goals. In many places, national standards have been adapted at state and local levels to define what students should know and be able to do. In other cases, independent groups developed standards at those levels. Regardless of how standards were developed, we can identify natural connections among the disciplines. These natural connections represent the “big picture” of knowledge. They allow teachers to manage the perceived overwhelming list of student learning objectives. Most important, these natural connections allow students to integrate knowledge into something useful for life and learning beyond P12 schooling.

Unfortunately, while these techniques resonate with the latest cognitive science and learning research, innovation in schools has been limited. But if we are to find ways to address the persistent problem of reaching all students and bringing every child to a high level of achievement, we must find better ways to teach and assess. These ideas are supported by research from many sectors, by the content standards, and by common sense. Hopefully, our pursuit of standardized testing scores will lead us to a higher quality of education, brought about by innovative change, and not simply better measures of the same old results. We must find ways to use accountability measures to support innovation rather than to stifle it, and to use our more sophisticated data collection and analysis resources to validate, reward, and disseminate better educational methods in schools across our nation, especially if we wish to reach every student and close achievement gaps.

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