I. Why Application Instruction

A Changing Nature of Society

The education system in the United States was created to develop students' intellectual capacities and to transmit the culture. After World War II, the mission expanded to include preparation for higher education. A primary purpose has never been, and still is not, to teach students skills that they can use in the workplace, at home, and in society in general.

When life was simpler and jobs for the unskilled plentiful, students could easily find a place for themselves in the world of work. Now that we live in the age of burgeoning information and technology, it is time for this nation to expand the definition of what it means to be educated to include not only literacy and cultural understandings, but also learning relevant to the adult roles that students will fill in the future.

How many times has a teacher heard a student ask, "When will I ever use what you're teaching me today?" How often do we hear of employers complaining that high school graduates may have passed all the tests, but they can't seem to use what they know. These comments should raise a warning flag about the quality of American education.

"Do not confine your children to your own learning, for they were born in another time."
Hebrew proverb

Today's students, who learned the alphabet and how to count by watching television, are growing up in a culture that is dramatically different from that of their parents. They will also function in a workplace and society that bears little resemblance to 20, 40, or 60 years ago.

The kinds of skills needed in contemporary society are different from those traditionally taught in American schools, and the level of competency required in them is higher than ever before. Moreover, the skills needed for workplace success are higher than and different from those required by universities. Yet, the curriculum in place in most American schools today is the same as in the 1950s.

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To narrow the gap between the education graduates receive and the requirements of our technological, information-based society and workplace, we must first understand the skills demanded of employees in the context of a changing work world. Employers are requiring workers at all levels to do more than ever before. Decision making has filtered down through the ranks. Workers must now manage their workstations, schedule their time, strive for quality, solve problems, and learn new technologies. To be successful in the workplace, all students, even those going on to college, need good skills in English language arts, mathematics, and science *and* the ability to apply those skills in real-life situations. In addition, students need to know how to solve problems, work cooperatively in teams, and organize and analyze the flood of information around them.

B What Students Need to Know and Be Able to Do

Application of skills and knowledge is consistent with many national studies and reports on education as well as with national standards in mathematics and science. A very brief overview of significant findings and national standards follows.

The SCANS Findings

In 1991, the U.S. Department of Labor's SCANS study, based on 12 months of field work with public and private sectors employers, identified essential workplace competencies common to all jobs. These competencies, and the foundation skills/attributes that every person needs to earn a decent living, are shown below.

What Work Requires of Schools

SCANS Workplace Know-How

Workplace Competencies

- Resources — allocating time, money, materials, and staff.
- Interpersonal skills — working on teams; teaching others, serving customers; leading, negotiating, and working well with people from culturally diverse backgrounds.
- Information — acquiring and evaluating data; organizing and maintaining files; interpreting and com-

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municating; and using computers to process information.
- Systems — understanding social, organizational, and technological systems; monitoring and correcting performance; and designing or improving systems.
- Technology — selecting equipment and tools; applying technology to specific task; and maintaining and troubleshooting equipment.

Foundation Skills

- Basic skills — reading, writing, arithmetic and mathematics, speaking, and listening.
- Thinking skills — the ability to learn, to reason, to think creatively, to make decisions, and to solve problems.
- Personal qualities-individual responsibility, self-esteem and self-management, sociability, and integrity.

What SCANS also found was that in every kind of job, employees must be able to put their knowledge to work. "We believe, after examining the findings of cognitive science, that the most effective way of learning skills is 'in context,' placing learning objectives within a real environment rather than insisting that students first learn in the abstract what they will be expected to apply."

International Center Studies

The International Center for Leadership in Education has conducted detailed research to compare what is taught and tested in other countries with the U.S. education system. In comparing the science, math, and language arts curricula of 10 highly industrialized countries (Canada, China, Denmark, England, France, Germany, Japan, Korea, Russia, and the United States), the International Center found that the U.S. led the world in the number of content requirements and objectives in these subjects.

W.R. Daggett
Defining Excellence for American Schools

When the types of knowledge taught were scrutinized, however, it became clear that the U.S. was at the bottom in teaching students to use the knowledge they are acquiring. In this country, we just pile content upon content without teaching students how to use what they are learning. Asian nations especially, and to a lesser extent European nations, cover fewer content objectives but give students experiences in applying their knowledge in real-world situations.

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W.R. Daggett

Testing and Assessment in American Schools — Committing to Rigor and Relevance

It was no surprise that when the International Center turned its attention to the kinds of assessments used around the world, it found that this country relies on standardized tests with multiple-choice questions that assess content knowledge. Essays and performance-based exams were common in the Asian and European countries.

In the global economy, U.S. workers are essentially competing with workers in other countries. Business/industry continues to find our high school graduates, and even college graduates, lacking the skills needed to function in the high-tech workplace. The prosperity of this nation and standard of living of its citizens may well depend on whether our schools can give students the education they must have to join the work force of the 21st century.

TIMSS

The Third International Mathematics and Science Study (TIMSS) is the largest and most comprehensive international comparison of education ever undertaken. During the 1995 school year, the study tested the math and science knowledge of a half-million students from 41 nations at three grade levels. The study also included a curriculum analysis, videotaped observations of mathematics classrooms, and case studies of policy issues.

TIMSS

Pursuing Excellence — A Study of U.S. Eighth-Grade Mathematics Teaching, Learning, Curriculum, and Achievement in International Context

Schmidt, McKnight, and Raizen

A Splintered Vision — An Investigation of U.S. Science and Mathematics Education

TIMSS ranked U.S. eighth-grade student achievement 28th out of 41 nations in math and 17th in science. Although U.S. student performance in math and science has improved since 1983, the current rankings represent only slightly above average performance in science and below average performance in math.

The fourth grade results, reported by Schmidt, McKnight, and Raizen, showed the U.S. ranking higher than most other nations. One conclusion that could be drawn is that the longer our students are in school, the poorer the results.

It appears we are quite far from fulfilling one of our national goals: to be first in math and science achievement by 2000.

In studying curricula, TIMSS found that current U.S. curricular standards are unfocused and aimed at the lowest common denominator. They are, in other words, “a mile

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wide and an inch deep." The analysis found that U.S. states, on average, intend students to cover more topics in mathematics and science than most other countries studied. In addition, what may be considered "basic" in eighth grade mathematics differs dramatically among TIMSS countries. In the U.S., basic content included arithmetic, fractions, and a small amount of algebra. In Germany, Japan, and most other countries, basic content for all students included intense coverage of algebra and geometry.

An independent group of American college mathematics teachers was asked to evaluate the rigor of mathematical content of sample lessons. Thirty percent of the Japanese lessons and 23 percent of the German ones received the highest rating for rigor, while none of the American did.

TIMSS also found variations in teacher methodology. In U.S. math classes, solving problems is the end goal for students. In Japan, however, understanding mathematics is the ultimate goal; problem solving is merely the context in which understanding can best grow. U.S. lessons tend to have two phases: an initial acquisition phase and a subsequent application phase. In the former, the teacher demonstrates and/or explains how to solve a sample problem. The explanation might be purely procedural or may include the development of concepts. In the application phase, students practice solving problems on their own, while the teacher helps individual students who are experiencing difficulty.

In Japanese lessons, the order of activity is generally reversed. Problem solving comes first, followed by a time in which students reflect on the problem, share the solution methods they have generated, and work jointly to develop explicit understandings of the underlying mathematical concepts. Whereas students in the U.S. classrooms must follow the teacher as he or she leads them through the solution of example problems, the Japanese student has a different job: to invent his or her own solutions, then reflect on those solutions in an attempt to increase understanding.

We teach many more topics than other nations, do little prioritizing of the subjects taught, and provide virtually no

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opportunity for students to apply the knowledge gained. We continue the practice of social promotion for our students, often regardless of their performance. These are the reasons the U.S. did not do well on TIMSS, and they are things we can address in our schools.

National Standards

Most U.S. students learn basic mathematical facts and formulas, but many of them are unable to use this knowledge to solve everyday problems. The National Council of Teachers of Mathematics (NCTM) *Curriculum and Evaluation Standards for School Mathematics* reflects a concern that students in the U. S. are not mathematically literate and often fail to see the relationship between mathematics learned in school and real-life situations. The standards recommend developing understanding by using realistic contexts and applications as well as concrete pictorial models, appealing more to students' intuitive sense. Therefore, meaning is constructed out of prior knowledge and experiences.

The national science standards of the National Research Council (NRC) do not prescribe a single curriculum for students to achieve content standards. Rather, the translation of content into curricula can and should take many forms. Regardless of organization, the NRC believes that science programs should emphasize understanding natural phenomena and science-related social issues that students encounter in everyday life.

The NRC document advises that if teachers are to teach for understanding, as described in the content standards, then coverage of great amounts of trivial, unconnected information must be eliminated from the curriculum. Integrated and thematic approaches to curriculum are favored.

Science for All Americans and *Benchmarks for Science Literacy*, publications of the American Association for the Advancement of Science's Project 2061, are intended to help guide reform in science, mathematics, and technology education.

"*Benchmarks* demands more of students than is now customary — more depth, more connectedness, more relevance. But it demands far less memorization of isolated facts and concepts than the great compendium of miscella-

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neous topics confronting them today in the required science and mathematics curriculum."

"If we want students to learn science, mathematics, and technology well, we must radically reduce the sheer amount of material now being covered. The overstuffed curriculum places a premium on the ability to commit terms, algorithms, and generalizations to short-term memory and impedes the acquisition of understanding."

C Schools Not Meeting Student Needs

The challenges of a changing economy and society have been known to us for more than a decade. How well have schools responded?

Virtually every state raised its graduation requirements and beefed up its testing program in response to the 1983 publication of *A Nation at Risk*. "Back to basics" was a frequent rallying cry. But these efforts concentrated on the same academic, theoretical, abstract teaching areas that had caused the education crisis in the first place. What is taught in schools and the way instruction is organized and delivered often do little to prepare students to assume their adult responsibilities.

The organization of American schools and the American culture itself have become the biggest obstacles to school reform and higher standards. Offering discrete courses taught in isolation, with little connection to other subjects or other learning, may be compatible with teacher training, but it bears no resemblance to the integrated way we use knowledge in life.

Furthermore, as a society we have come to view getting students ready for college as the primary goal of schooling. Yet, every year, the level of skills needed for employment climbs, while requirements for college entry stay the same or, even diminish in years when demographics produce a dip in the number of high school graduates and many colleges struggle to fill seats.

One result of a school system that focuses almost exclusively on preparing students for the next grade or level of education is a preoccupation with sorting students. The culture of American schools is to sort and compare students to identify the "brightest." Schools have paid so much attention to comparing students to the average that few

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have noticed that standards are too low. Ranking at or near the top of the class does students little good if they do not have the skills to compete in modern society.

Today, all students need high levels of skill and knowledge to succeed in adult life. Schools must develop a culture of excellence that challenges every student to achieve rigorous and relevant standards.

Teaching through application is a very effective way to engage more students in pursuit of higher standards and to ensure that graduates can use what they have learned. When students see the relevance of what they are learning, they are more motivated to learn. Research has also shown that people retain more of what they have learned by doing instead of reading or listening.

It's not just higher standards that are needed but the right standards. More emphasis needs to be placed on looking at the specific skills and knowledge that students must acquire.

Every core subject has applications to the real world, yet too often these subjects are reduced to textbook-driven memorization of facts. Science, for example, is about understanding the natural world. It seems logical that experiences in a science curriculum should give students direct opportunity to use science skills to make observations in and about the real world. Yet, memorizing tables and taxonomies and moving through the chapters in a textbook are the more typical activities in the science classroom.

Mathematics is a subject in which students develop the skills to recognize patterns, communicate relationships between quantities, and analyze data. Without real-world uses of these skills, they are solely intellectual pursuits. It's a little like learning the rules and skills of driving a car without ever actually sitting behind the wheel and going for a drive.

English language arts is about learning forms of communication and understanding a culture through works of literature. Again, the real test of communication skills is the ability to use them effectively in actual situations. Yet, neither speaking and listening skills nor technical reading and writing are emphasized in the English classroom.

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Moreover, too often little connection is made between a piece of literature and the daily lives of students in the world they are experiencing. Literature can be extremely valuable in helping students form a broad understanding of the human experience when connections are made between a book and the real world.

D Research Connections

Research in many aspects of physiology as well as education reinforces the importance of using application instruction as a means of raising student achievement.

Modern technology enables biologists, medical researchers and cognitive scientists to research and better understand how the human brain functions and how people learn. This fascinating exploration of brain neurons and synapses gives physiological documentation to many of the practices of good teaching.

W. Calvin

How Brains Think: Evolving Intelligence Then and Now

The brain is stimulated through the senses. The more that teachers can create learning experiences that embody new sights, sounds, and manipulations, the more learning that will occur. The brain records these many stimulations, but they are only retained as a result of rehearsal, practice, or connection to other knowledge and experience.

Children learn to use language and develop patterns of learning very young. Research confirms that the brains of children ages 4 to 10 are much more active than when they are older. The foundations of learning are therefore established at an early age for students. If high quality learning does not occur then, later learning will be stunted.

"Children learn best if they are immersed in complex experiences and are given the opportunity to actively process what they have learned."

Renate Nummela Caine

The old adage of learning best by experience is really true. Recent research confirms that more learning occurs when students are immersed in a rich, stimulating environment. Learning that involves a physical component, such as writing or design and construction, results in greater brain activity than simply listening or viewing. To be effective, education must create these types of stimulating learning experiences.

When a student cannot recall a new piece of information, it is because that information never made it into long-term memory. Research confirms that there is a process for converting short-term memory to long-term memory.

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R. Caine and G. Caine

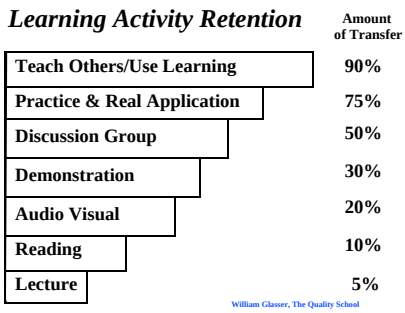
Making Connections: Teaching and the Human Brain

Research also shows that greater learning takes place when students are challenged and engaged in their learning. Too often, according to Caine and Caine, the rote teaching of facts leads to students actually becoming intellectually disengaged from the learning process, and the brain stops learning. This finding does not mean students should not be required to memorize information, just that it needs to be done in a manner that keeps students interested, which is often through real-world integrated tasks.

W. Glasser

The Quality School: Managing Students Without Coercion

Application results in better learning. The compilation of research in communication and learning by William Glasser reinforces what we all know innately — that we retain information better when we actually use it.



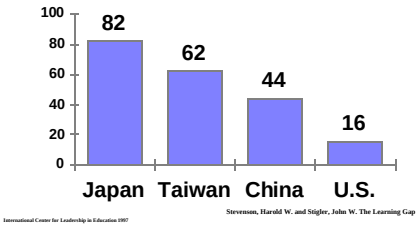
Students retain 75 percent or more of what they experience through application. Gathering new information only through lecture results in a retention rate of 5 percent. Reading can increase that rate to 10 percent. Adding audiovisual material results in a 20 percent retention rate. These are the instructional practices applied in most U.S. classrooms. Application of learning is not only a worthy learning objective but also an effective route to greater retention of knowledge and higher levels of learning.

H. Stevenson and J. Stigler

The Learning Gap

Students in American classrooms have limited exposure to application. In this country, the term "applied" is often used in conjunction with lower-level, less-demanding courses. Parents and educators in search of high-level courses avoid anything that is described as application. Likewise, teachers do not endeavor to include application in instruction.

Real World Applications



Other nations equate application with high-level learning and frequently incorporate real-world problems into instruction. Stevenson and Stigler have pointed out the significant international differences in this area. Analysis of classroom instruction revealed that only 16 percent of instruction in the sample of U.S. classrooms could be characterized as application. In contrast, instruction in Taiwan and Japan was 62 percent and 82 percent application, respectively.

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W. Schmidt, C. McKnight and S. Raizen

A Splintered Vision: An Investigation of U.S. Science and Mathematics Education

Contrary to perceptions in the U.S., application instruction does not mean a lack of rigor. In the most comprehensive study to date on a comparison of achievement of students across nations, TIMSS tested 500,000 students in 1995 and 1996. The study also compared textbooks and instructional practices. The curriculum analysis component is published in *A Splintered Vision*.

The TIMSS analysis of textbooks looked at the breadth of topics and rigor of assignments among several nations. American textbooks focused overwhelmingly on the most basic performance expectations. On average, 80 percent of the units in science textbooks for 9-year-old students focused on "understanding simple information." No other nation had as much emphasis on that. U.S. textbooks for 13-year-olds were somewhat more rigorous, but other nations clearly require more challenging work.

The analysis of teacher lessons plans showed the same low level of expectation in the United States.

The TIMSS definition of challenging work was not based solely on criteria involving high levels of cognitive activity. Challenging work was also judged by the degree to which students were expected actually to use their knowledge.

In *Characterizing Pedagogical Flow:*, the authors made this observation about U.S. classrooms:

W. Schmidt, C. McKnight and S. Raizen

Characterizing Pedagogical Flow: An Investigation of Mathematics and Science Teaching in Six Countries

> "Subject matter content in general appeared to be represented in more theoretical, abstract and procedural form rather than represented in practical situations or related to students' experiences."

Research on the tens of thousands of students who drop out of school annually in this country shows that their main reason for leaving is not that they lack the intellectual skills to do the work. It is that they see no connection between what goes on in school and their future. If we are to reach all students to help them develop the level of skills and knowledge which will provide them greater future opportunities, we must make those connections between education and the real world.

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Southern Regional Education Board

Making High Schools Work: Through Integration of Academics and Vocational Education

The experience of many schools has shown that integration of basic academic skills with applications from vocational areas results in students achieving at higher levels on tests of basic skills in reading, writing, and mathematics, according to Southern Regional Education Board. Stevenson and Stigler have pointed out that one of the obvious differences among international systems is that American education does not have a tradition of valuing learning through application. Close examination shows significantly higher levels of application in European and Asian classrooms. It is no surprise therefore that American students do not fare well on international tests that emphasize application. U.S. eighth-graders ranked 28th in math and 17th in science on the 1996 TIMSS.

Perhaps the most compelling research driving the need for application is that the majority of students learn best when instruction emphasizes application, as Conrath reported in *Our Other Youth*. To assist students in achieving high standards, teachers must create learning environments that present students with challenging problems which are aligned with their learning styles so that they can demonstrate their knowledge and use their skills.

J. Conrath

Our Other Youth

Adding to the education research on the efficacy of more application in learning are the findings from community forums and focus groups of parents and business and community leaders. The expectation of all of these groups is that high school graduates will be able to use the knowledge they acquire in school when they venture out into the world.

E Changing the Focus of Schools

In this country, education is largely a spectator sport. The people who should be the active participants — the students — are frequently relegated to the role of onlooker while the teacher "performs" in front of the class. Put another way, education in this country centers on teaching rather than learning. Practices and structures that promote learning are either weak or missing. Furthermore, the way we teach and test convinces many students that they cannot learn.

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In the U.S., with its exclusive focus on preparation for college, the word "applied" has become synonymous with "lower level." But the truth is that all students need to be taught theoretical and content knowledge *and* how to apply those theories and that content. Overwhelming evidence has established that the knowledge acquired in the typical American school curriculum fails to equip students for the increasing rigors of the workplace.

"The great waste in the school comes from the child's inability to utilize the experiences he gets outside of school in any complete and free way within the school itself; while on the other hand, the child is unable to apply in daily life what he is learning at school."
John Dewey, 1899

Children become better problem solvers in direct relation to the opportunities they have to solve problems and to reflect on what worked and what didn't. Real-world problems don't come neatly packaged in predictable, easy-to-solve formats, so we need to provide students with experience in grappling with problems that mirror the world beyond school.

The Rigor/Relevance Framework is a powerful tool for making changes in curriculum and assessment which support higher standards and improved learning for students. In the face of growing international competition and expanding information and technology, producing a well-educated work force must become a goal of schools.

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II. Rigor/ Relevance Framework

A Overview

The Rigor/Relevance Framework is a tool developed by staff of the International Center to evaluate curriculum and assessment. The Framework uses the Knowledge Taxonomy, often referred to as Bloom's Taxonomy, and the Application Model to measure the rigor and relevance of curriculum objectives, test questions, and performance tasks.

Knowledge Taxonomy

1. Awareness
2. Comprehension
3. Application
4. Analysis
5. Synthesis
6. Evaluation

Application Model

1. Knowledge in one discipline
2. Apply knowledge in discipline
3. Apply knowledge across disciplines
4. Apply knowledge to real-world predictable situations
5. Apply knowledge to real-world unpredictable situations

The Knowledge Taxonomy has been used in U.S. schools for several decades to organize curriculum by levels of cognitive knowledge. As students move up the levels in the Knowledge Taxonomy, instruction typically becomes more complex. American schools teach at the analysis, synthesis, and evaluation levels in such subjects as algebra, literature, and physics. This does not mean, however, that students are able to translate that high-level instruction into real-world applications.

The Application Model's five levels indicate whether students are required to put their knowledge to use in new contexts, such as other disciplines and real-world situations.

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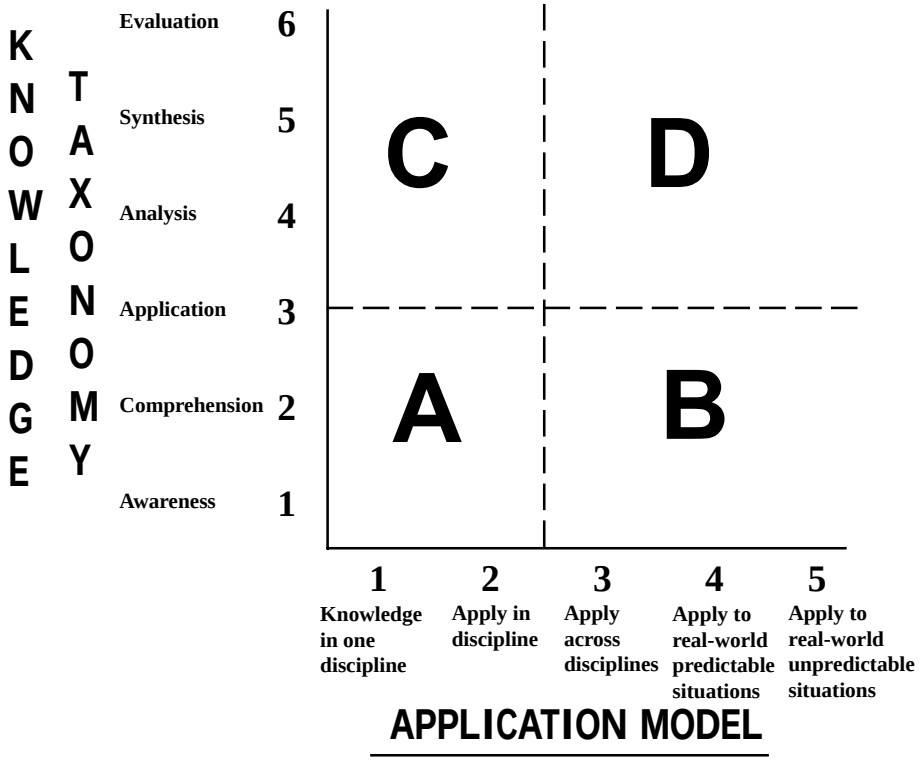
The two scales can be combined on a two-dimensional graph (see Figure 1) and used as a basic tool for analyzing curriculum and assessment.

Figure 1. Rigor/Relevance Framework



The Knowledge Taxonomy deals with one type of knowledge: knowledge for its own sake. The Application Model deals with the ability to gather and use that knowledge to solve everyday problems. In Figure 1, quadrants A and C denote knowledge for its own sake. Examples of quadrant A are knowing that the world is round and that Shakespeare wrote Hamlet. Quadrant C embraces higher levels of knowledge, such as knowing how the U.S. political system works and analyzing the benefits and challenges of the cultural diversity of this nation versus other nations.

The second type of knowledge/skills also comprises two quadrants. Quadrant B would include knowing how to use math skills to make purchases and count change. The ability to access information in wide-area network systems and to gather knowledge from a variety of sources to solve a complex

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problem in the workplace is an example of quadrant D knowledge.

Here is an example involving technical reading and writing.

Quadrant A: Recall definitions of various technical terms.
Quadrant B: Follow written directions to install new software on a computer.
Quadrant C: Compare and contrast several technical documents to evaluate purpose, audience, and clarity.
Quadrant D: Write procedures for installing and troubleshooting new software.

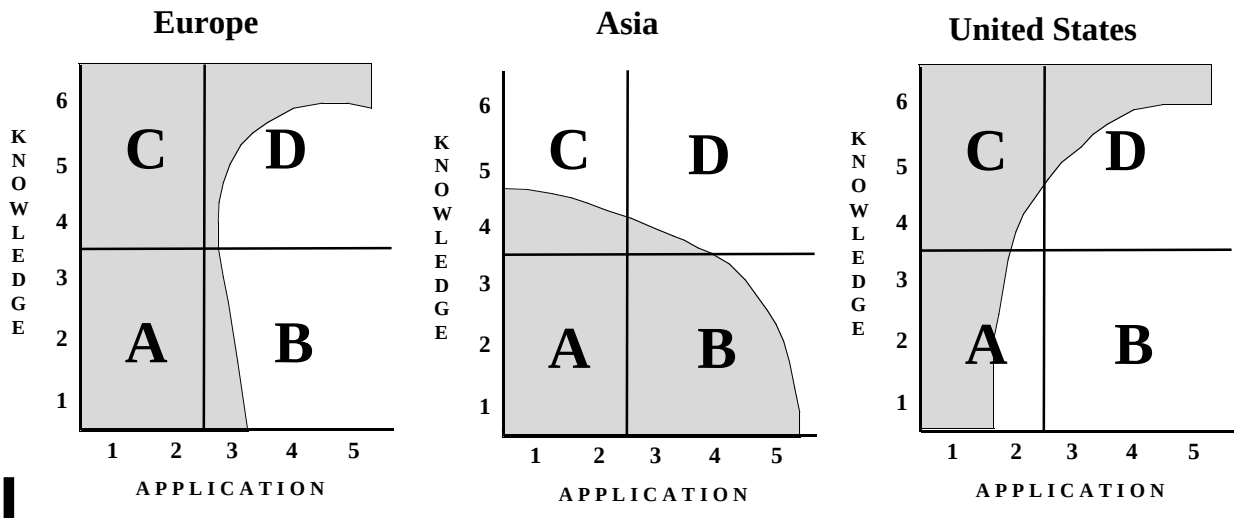
B Uses of the Rigor/ Relevance Framework

International Comparisons

The Rigor/Relevance Framework was the basis for a 1994 study by the International Center of the curriculum standards in 10 industrialized nations. Curriculum specialists analyzed the actual objectives in curricula by comparing them to both the Knowledge Taxonomy and the Application Model. The results showed significant differences in the math, science, and language arts requirements in the United States, Europe, and Asia.

The graphs in Figure 2 have the Knowledge Taxonomy along the vertical axis and the Application Model along the horizontal axis. The shaded area represents the curriculum.

Figure 2. Comparison of Curriculum Objectives



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The U. S. graph shows that curriculum standards heavily emphasize cognitive achievement and were concentrated in quadrants A and C of the Rigor/Relevance Framework. In contrast, the standards of Asian nations show a much higher concentration in quadrant B and not nearly as high a level of content knowledge. Europe falls somewhere in between.

What is obvious from Figure 2 is that America does as well as any other nation in the world in teaching the upper levels of the Knowledge Taxonomy in math, science, and language arts. However, American schools spend very little time teaching students how to apply that knowledge. The exceptions are vocational programs, where students move to applications while in secondary schools, and some types of professional or technical programs in institutions of higher education.

While Europe leans more toward teaching applications than America, the greatest emphasis on applications is found in the Asian system. In Asia, instruction moves up both the Knowledge Taxonomy and the Application Model to ensure that all students have upper-level skills in both. This emphasis on the upper levels of the Application Model is missing in the U.S. and somewhat lacking in the European nations until students enter universities.

The research also revealed that America has more content requirements than any other nation in the industrialized world. But when it comes to the ability to apply that content, U.S. students typically function at level 2 on the Application Model (the ability to apply knowledge within a discipline). Asian curricula are at a much higher level on the Application Model.

W.R. Daggett
Testing and Assessment in American Schools — Committing to Rigor and Relevance

A follow-up study by the International Center looked at differences in exams in 10 countries using the same method. The results were clear. Students in the United States were the most tested but least evaluated students in the world. Steeped in a long history of reliance on standardized objective tests, our education system uses these exams to select and sort students and to audit schools. Where our schools fall woefully short, especially by international standards, is in using assessment as a means to improve instruction.

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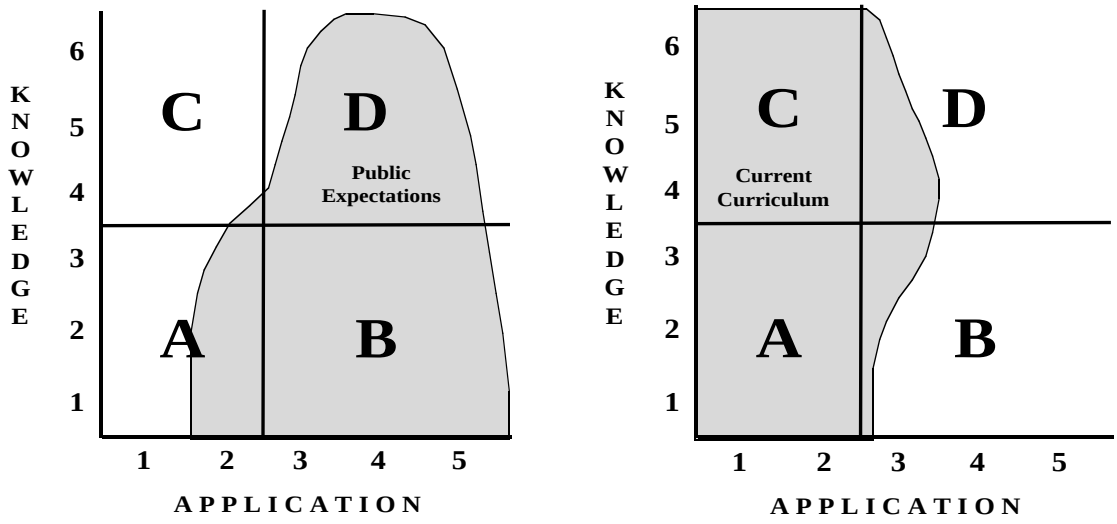
The United States does as well as any nation in the world in testing students on content knowledge, the A and C types of knowledge. However, our students are not assessed on whether they can apply their knowledge in real-world situations.

Management of Change

Another useful purpose of the Rigor/Relevance Framework is to compare community expectations of what students need to learn in school with the current school curriculum. Many communities have used the Framework as part of the International Center's management of change process, which helps districts implement systemic reform. One of the most powerful parts of that process is the discrepancy analysis between what the community expects high school graduates to know and be able to do and what students are taught in school.

In Michigan, for example, 10 school districts gathered data from the public and analyzed their present curricula. The results shown in Figure 3 were universal: the curriculum in all sites was predominantly in the A and C areas of the graph, while the community's advice on the knowledge and skills high school graduates need called for knowledge of types B and D.

Figure 3. Michigan Schools Discrepancy Analysis



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There were some differences among schools, and some subjects did have curriculum content that reached into the application area. But the overall significant discrepancy led to extensive conversations and the development of plans for change in current programs.

These comparative data do not mean that schools should abandon A and C — which constitute a rigorous, theoretical curriculum — for the purpose of adding B and D, which make for a relevant curriculum. Instead, all students need a curriculum with a strong theoretical base plus experiences which help them understand how that knowledge can and will be applied in a variety of settings in their lives.

The implication of the international study and the work of the Michigan schools and other sites is that this country needs to make a critical decision about what it means to be educated. Students will not be adequately prepared for life if they simply move up on the Knowledge Taxonomy to higher and higher levels of knowledge in a subject. We also must teach them how to apply the knowledge they have acquired.

Performance Assessment

Just as the Rigor/Relevance Framework can be used to assess the knowledge and application levels of curriculum, so too is it helpful in evaluating the levels of various types of assessments and test questions.

The U.S. relies heavily on objective tests, with their multiple-choice answers. As a result, teaching tends to emphasize memorization of facts and "covering" the curriculum rather than solving complex problems. U.S. students are assigned 50 multiplication problems, while in Europe students are given one or two involved problems that require careful thought. Moreover, objective tests tell very little about how students think, whether they can use their knowledge, or what to teach next.

Another type of testing is gaining in popularity in the U.S. — performance-based assessment, also called authentic assessment. With performance-based assessment, students must demonstrate competence to perform complex tasks rather than simply recall knowledge. Student performance is frequently compared to a set standard rather than against the performance of other

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students. Connections between disciplines and higher-level cognitive skills are easier to assess in performance tests than in objective tests.

Everyone is familiar with the concept underlying performance-based assessment. Parents assess their children's performance every day, without formal tests. From child safety to deciding whether a teenager is ready to take the car out alone, parents rely on collecting information about how well their children really understand before deciding what comes next. Similarly, employers expect their employees to understand what is expected and to perform competently, not just to know isolated bits and pieces of information. Evaluations are based on observing performance over time.

Some performance-based tasks assess application of knowledge in a discipline, while others pose real-world unpredictable problems for students to solve. A performance task can require low levels of knowledge or more complex synthesis or evaluation of knowledge.

The Rigor/Relevance Framework can help in the design and analysis of performance tasks. It can also be useful in explaining performance-based assessment to parents and other members of the community who, because they are comfortable with traditional testing and grading systems, may be hesitant about supporting something new.

C Why the Framework is Effective

The Rigor/Relevance Framework is a fresh approach to looking at curriculum standards and assessment. It is based in traditional aspects of education yet encourages a move to application of knowledge instead of focusing exclusively on acquisition of knowledge.

The Framework is easy to understand. With its simple, straightforward structure, it serves as a bridge between school and the community. It offers a common language with which to express the notion of more rigorous and relevant standards and encompasses much of what parents, business leaders, and community members want as higher standards. The Framework is versatile because it can be used in the development of instruction and assessment. Likewise, teachers can use it to measure their progress in adding rigor and relevance to classroom instruction.

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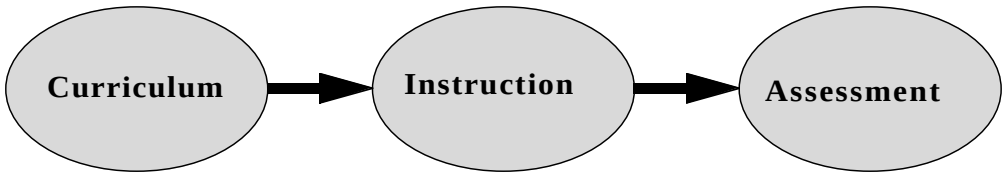
III. Planning Instruction with the Rigor/Relevance Framework

A Elements of Good Planning

Instructional planning is often divided into three components: curriculum, instruction, and assessment. Curriculum is *what* students will learn, instruction is *how* students will learn, and assessment is in what *way* and how *well* students are expected to demonstrate what they have learned as a result of the instruction.

Traditionally, these three elements have been approached as three separate steps, one following the other (see Figure 4). Many teachers learned to plan their lessons using this linear model: decide what to teach, design how to teach it, and then decide how to measure student achievement. Teaching also proceeds in a linear manner. Topics are introduced one after the other, pausing only long enough for a chapter or unit test. Particularly at the secondary level, instructional planning focuses on covering the topics at a uniform rate of speed.

Figure 4. Traditional Planning



Recent research and innovations in teaching and learning have concluded that curriculum, instruction, and assessment are not separate and linear but interrelated. Good learning takes place when there is a dynamic linkage of the three components. In a performance planning model, instruction and assessment, in particular, should have significant overlap (see Figure 5).

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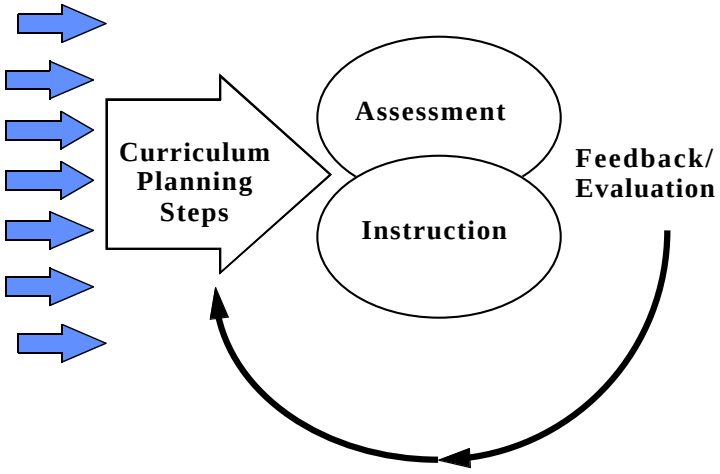
Figure 5. Performance Planning Model



Assessment should occur more naturally as part of the instructional process. The current assessment reform movement seeks to place greater emphasis on student performance rather than recall of facts. Teachers are better able to plan good instruction and assessment if they abandon the image of linear steps and of assessment following instruction.

Curriculum planning does occur prior to instruction and assessment. Much of the discussion here on improving instruction will focus on the curriculum planning process. Without effective planning, there is very little likelihood that students will achieve the expected rigor and relevance. "Failing to plan" is clearly a prescription for "planning to fail."

Factors in Planning

Curriculum planning is a complex process that must take into consideration several important factors. It is much more that simply picking out a work of literature or a textbook chapter and deciding that it would make a good instructional topic. Factors that should be considered in order to make thoughtful decisions about instruction and assessment are:

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- curriculum standards
- content knowledge
- community expectations
- student knowledge
- teacher self-knowledge
- assessment practices
- effective instructional strategies.

Curriculum Standards

Standards drive education today. The public expects more consistent achievement at high levels for all students regardless of their school or district. The success of public education depends on its ability to raise the achievement levels of all students. Teachers are expected to align instruction with district, state, or national standards. Challenging or interesting teaching and learning experiences are only appropriate if they are consistent with standards. That is why one of the primary factors to consider in good planning is curriculum standards.

Content Knowledge

Teachers teach because of their desire to help students, but they also must know their subject well. Teachers must possess both the techniques of pedagogy and content knowledge. A key aspect of good planning is applying content knowledge to a topic or theme. Teachers have many resources, such as books, videos, experts, and the Internet, to supplement content knowledge; however, their personal understanding of their subject is central to planning good instruction.

Community Values

The word “public” in public education means that schools are responsible to the communities they serve. Community values are an important consideration in curriculum planning. No aspect of the curriculum, lesson, or student activity will long exist if it strays far from community values. Across the United States, there are many stories of conflict between school and community. When these conflicts arise, whether it is a controversy over a book selection, a video shown to students, or a topic assigned, the objective of helping students to learn is often lost in the uproar. It is far

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more productive to maintain close communication between the school and community and to anticipate areas of disagreement before they turn into conflicts. Preventing a problem is far easier than trying to resolve one.

Student Knowledge

Good instruction depends on knowing the students. What are their current skill levels? What previous knowledge do they have? What are their preferred learning styles? What aspects of their current experiences relate to a particular instructional theme? Teachers should have the answers to questions like these and use this knowledge in planning and introducing a learning experience to students.

Teacher Self-knowledge

Teachers should play to their strengths in approaching instructional topics. Some teachers are better at individual coaching, some are entertaining story tellers, and some are skilled in using instructional technology. Not all content needs to be taught in the same way. When planning instruction, teachers should take into consideration their own strengths and weaknesses in order to make their teaching most effective.

Assessment Practices

The basic principles of good assessment should be followed regardless of whether traditional or innovative assessments are used. An assessment is valid only if it relates directly to what is being taught. Rewarding a student for a science project because it was artistically presented is not a valid assessment. Assessment also needs to be fair and reliable, meaning that all students with the same level of skill and knowledge will receive the same grade or rating. Beyond these basic principles, teachers are developing more and more assessments that measure actual student performance. Capturing a student's presentation on videotape, for example, is an acceptable form of documenting student work. Teachers should continue to expand their knowledge of innovative assessment practices and combine this with adherence to assessment principles in order to make decisions about assessment as part of the planning process.

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Effective Instructional Strategies

In selecting instructional strategies, teachers should consider the many forms of teaching and select those which best relate to a given topic or theme. Traditional "chalk-and-talk" and "textbook-and-worksheet" approaches still have their place in the classroom, but effective instruction must also include other strategies that more actively engage students in learning. Instructional technology, for example, when used creatively, can be a powerful instructional strategy that provides students expanded tools for communication, research, design, or presentation.

Curriculum Planning Steps

Curriculum planning involves several steps, which generally should occur in sequence. Certain elements of assessment planning, for example, should come before planning instruction. The following key steps in good curriculum planning are presented in the order in which ideal planning should occur.

Curriculum Planning Steps

1. Define instructional unit/make curriculum connections
2. List expected levels of student knowledge and performance using Rigor/Relevance Framework
3. Identify student work used for assessment
4. Define required content knowledge
5. List essential questions/concepts
6. Design assessment and instruction together

Step 1 - Instructional Unit/Curriculum Connections

The first step is to focus the curriculum plan and define its limits. What group of students is this unit for (grade level, previous experience)? What subject or subjects are included? This defines the student audience and the subject context.

Another part of this step is making connections. The first connection relates to why this unit is being

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taught. How does it relate to the curriculum standards for the grade level, school, or district? If there are state or national standards to which this topic is related, these should be identified as well. If it is an interdisciplinary or thematic unit, the multiple connections to several disciplines should be listed.

This planning step ensures that the design of student work, content, and instructional activities is not random but rather anchored in curriculum standards and in the instructional disciplines that make up the school curriculum.

Step 2 - Expected Levels of Student Knowledge and Performance

This step has two important purposes. The first is to place more emphasis on student learning. By thinking about what students need to know and be able to do, the curriculum planning process shifts its focus from the teacher to the student. The second purpose is to use the Rigor/Relevance Framework to analyze expected levels of skills and knowledge.

Statements used to identify the skills and knowledge should be as specific as possible. Include only one thought in each statement. Be sure to use verbs that indicate some action to be taken rather than the passive accumulation of knowledge. The following are examples of skill and knowledge statements.

- Read or view news reports on a community issue, interpret the information, and present a personal position on the issue.
- Use a second language to discuss current events in a country where the language is spoken.
- Follow directions in a manual to operate a piece of laboratory equipment safely.
- Write an essay about an issue of interest using references to historical precedents.
- Compare prices, interest rates, and maintenance costs of buying a major appliance.

Once the statements are written, each must be examined to determine its level on the Knowledge Taxonomy and the Application Model. Table I shows an example listing the levels for several statements.

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Table I. Levels of Sample Skill/Knowledge Statements

Competency	Application Level	Knowledge Level
Determine a mathematical model for estimating large number of actual objects	4	5
Identify common land formations (islands, deltas, mountains) on maps	2	2
Prepare written and oral arguments to support a suggested policy change at school	5	5
Predict, evaluate, and rank minerals by hardness	2	2
Compare and contrast two short stories	2	4

Many skills can be taught at several levels of complexity or difficulty. By using the Rigor/Relevance Framework in this planning step, teachers can more accurately develop appropriate levels of instruction. When a teacher sets an expectation of real-world application by designating Level 4 or 5 on the Application Model, there is a conscious commitment to work toward real-world application. Likewise, designating a high level on the Knowledge Taxonomy will require instruction that supports higher-level thinking skills.

The Rigor/Relevance Framework helps the teacher to focus on what students are learning, not on what he or she is teaching.

Step 3 - Student Work

Student work is defined as the observable effort or tangible products produced by a student. Examples of observable efforts are group discussion, student research, reading, troubleshooting, and brainstorming. Tangible products might include pieces of writing, science experiments, solutions to problems, tests, and project designs.

Student work provides the most tangible evidence of the learning process. The best way to judge the quality of

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teaching and learning is by looking at the work that students are doing in the classroom. Is it meaningful and challenging? Are all students actively engaged? Do students have a clear understanding of what constitutes outstanding work? Do students show commitment to and enthusiasm for their work? The answers to these questions provide rich evidence of the quantity and quality of learning taking place.

Teachers should spend time thinking about what significant pieces of work students will do and not limit themselves simply to defining the content and objectives of what students will learn. Taking the time to reflect on student work will lead to more application in instruction and assessment.

As part of defining student work, teachers should also have examples of exemplary work to share with students. Research shows that students perform best when they have a clear understanding of what constitutes high-quality work.

Student work is the heart of learning. Learning does not occur without effort. Too often, effort in school is measured by the hard work of the teacher rather than by the hard work of the students which results in learning. Focusing on student work is an excellent means to measure the quality of instruction. Teachers can improve learning in their classrooms by concentrating on student work as part of curriculum planning.

Step 4 - Content Knowledge

Discussion of the importance of teaching students to apply their knowledge sometimes leads teachers and parents to the false conclusion that content knowledge will be neglected. This is not the case. Without basic content knowledge, students have nothing to apply. Students still need to learn content and even at times memorize facts and formulas. Just as important, however, is knowing how to use that knowledge.

One of the strengths of the Rigor/Relevance Framework is that it creates a connection and balance between content knowledge and application. Decisions about curriculum are not a forced dichotomy between knowledge or application. Students must learn both.

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In planning instruction with the Rigor/Relevance Framework, the goal is for students to use their knowledge ultimately in real-world situations; the goal is not to prepare students for the next grade or level of education. When teachers focus on use of knowledge, they begin to see connections between subjects.

To ensure a strong, direct connection of content knowledge and real-world applications, it is best to start with the end in mind. The teacher should develop a clear idea of the real-world application and select content necessary to achieve that application goal. This is where the Performance Planning Model differs from some other instructional models. Content is not included in instruction just because the teacher knows it or the textbook covers it. Teachers must make decisions about what content to teach based upon how students will use the knowledge.

Careful judgments are necessary to include only what is necessary. Everyone is aware of the rapid expansion of information in the world. At an earlier time in our history, it was possible to convey to students most of the conventional knowledge about a subject. Today, there is too little time and too much information for students to learn all there is to know. Teachers need to select the content knowledge based on the work in which students will be engaged. This body of knowledge is the focus for an instructional unit.

For some strategies related to learning, please see **Information Sheet - How People Learn** *on page III-35.*

It can be a difficult decision for teachers to omit facts and other information that seem important, but education must abandon the effort to pour a few more bits of knowledge into students' heads. Instead, teachers must assist students in acquiring a more effective learning strategy — developing the skills to pose questions, collect observations, research topics, and analyze information. Making this change will give students the tools and motivation to continue their quest for knowledge beyond the classroom.

Step 5 - Essential Questions/Concepts

Posing an initial question is an excellent way to introduce an instructional unit. A broad, open-ended question will pique students' curiosity and focus interest on the main concept(s) to be introduced or expanded in the lesson. The question should never have a simple yes or no answer, nor

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does it necessarily need to be resolved in the lesson. If a question engages students in learning, then it has done its job.

What could we ask about _____?
This question can be used to introduce a topic. To help students liberate their curiosity, refrain from giving judgmental cues as they generate questions in response.

When a class is about to spend several days or weeks studying a particular topic or concept, traditional practice dictates that the teacher identify the key questions and the key answers. These questions are often thoughtful ones intended to stimulate students' interest through questioning.

Another approach is to try starting a new unit by asking the class to think of questions that could be asked about the topic: "What questions should we ask about the Civil War? About stars? About number relationships? About nouns?"

If students are not used to this type of experience, they are likely to echo the kinds of questions found at the end of textbook chapters or asked by teachers around memorization of facts and generalizations. Teachers find, however, that if they ask many tantalizing and divergent questions, their students are likely to model that behavior.

Students used to information questions may ask: "What were the six main causes of the Civil War? Which states joined the Confederacy? What happened at Shiloh? Who was the Union commander at Shiloh? When did the war end?" More open-ended questions can be generated by suggesting that students think along the lines of asking "What if…?" or "Why …?" Then students might ask: "What would have happened if Lincoln has been shot in the first month of the war? Why did Lincoln only free the slaves in the rebel states? How did it feel to be a woman in the path of Sherman's army?"

Identifying essential concepts is the other part of Step 5. Concepts are those "big" ideas that connect bits of instruction. While teachers hope their students will remember the details of a lesson, their greatest expectation is that students will carry away the overarching concepts that are important for future understanding.

Information Sheet — Asking Open-ended Questions *on page III-36 has examples of questions that stimulate thinking.*

Instructional plans generally include several activities, projects, readings, observations, or experiments. A good plan also makes clear the main concepts and principles that students are expected to grasp from these instructional experiences.

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Step 6 - Assessment and Instruction

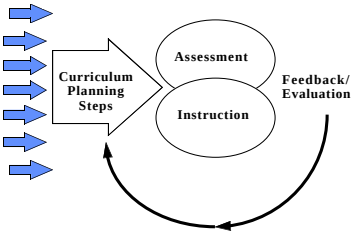
As the Performance Planning Model indicates, instruction and assessment should be planned together. Teachers should select and plan a series of varied activities for students that will enable them to develop and demonstrate the expected skills and knowledge for the instructional unit. As students engage in performance activities, their work should be evaluated using specific objective criteria.

Activities must be consistent with the levels of skills and knowledge set in Step 2 of curriculum planning. If the expectation is that students will achieve at the level of application within the discipline (Level 2 on the Application Model and Level 3 on the Knowledge Taxonomy), it is appropriate to plan activities that expose students to knowledge and then to present school-based problems and activities in which they apply and reinforce that knowledge. If the expectation is to develop more rigorous instruction, then the teacher must present more challenging activities in which students analyze information and create new solutions. If the goal is to achieve more relevant instruction, then teachers must develop activities that have the characteristics of real-world application.

Example of a real-world problem with embedded assessment
A high school geometry class made a site visit to a high-accident ramp near the school, analyzed its construction by applying newly learned geometric principles, and designed better ways to build the ramp. The students developed a professional presentation of several of their best ideas and shared it with city planners. In the end, one of their designs was the basis for reconstruction at the site, and by the time they graduated from high school, they witnessed a drastically reduced accident rate there.

Relevant instruction and assessment are characterized by using real-world rather than discipline-related problems and technical books rather than textbooks. Emphasis is placed on creating student activities which are constantly challenging rather than routine. These activities should be closely connected to the identified student work

Feedback



No teacher sets out to plan a boring or ineffective lesson, but it sometimes happens. A key aspect of good instructional planning is for the teacher to collect feedback continually so as to evaluate the effectiveness of instruction. Through this feedback, instruction can be improved over time. The difference between average and outstanding teachers is often attributable to the skill of the latter in learning from their failures and improving the planning of future instruction. That is why a feedback/evaluation loop completes the Performance Planning Model.

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B Key Questions for Planning Instruction

Certain key questions can serve as guides in thinking through the planning process. These questions, when answered in sequence with the Curriculum Planning Steps, introduce more application in teaching and learning in the classroom (see Table II). An example of an instructional unit that has been planned using the key questions is shown in Table III.

Table II. Planning Steps/Key Questions

Curriculum Planning Steps	Key Questions
1. Definition of instructional unit	What is the focus of this instructional unit (topic, area, theme, setting, concepts)? What are the important connections (standards, other disciplines)?
2. Levels of expected student knowledge and performance	What are students expected to know and be able to do (knowledge level and application level)?
3. Student work	What student work will be used to measure achievement?
4. Content knowledge	What content will students need?
5. Essential questions and concepts	What key questions will trigger student interest, and what are the "big" concepts/ideas to be learned?
6. Assessment and instruction	What assessment and instruction will be effective?

C A Closer Look at "Real World"

The Application Model is based on the premise that the highest level of application is to connect knowledge to situations and problems in the real world. This notion is easy to understand, and it gains strong support from those outside education as the correct course to follow. But how do we define "real world"? Is it as simple as stating that everything inside school is artificial and everything outside school is real world? If this were the case, and our goal is real world, we should tear down the schools and rely solely on work-based learning, community internships, and apprenticeships.

Real-world instruction is defined by the instructional activity not by the location of instruction.

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Table III. Sample Instructional Plan

1. ***What is the focus of this instructional unit (topic, area, theme, setting, concepts)? What are the important connections (standards, other disciplines)?***

- Criminal Justice System - procedures, rights and responsibilities
- Secondary Level Social Studies
- State Social Studies Standard #5 - U.S. Government

2. ***What are students expected to know and be able to do (expected application level and knowledge level)?***

Competency	Application Level	Knowledge Level
Understand the court system	1	2
Understand the role of court officials	1	2
Participate on a jury	5	6
Recognize individual rights in criminal cases	4	4
Compare U.S. judicial system to other nations	2	4

3. ***What student work will be used to measure achievement?***

- Written test on court system
- Role play on court officers
- Group project on other court systems
- Student journal following participation on youth court jury

4. ***What content will students need?***

- Criminal justice system, courts
- Levels of crimes
- Roles of judges, officers, attorneys, juries
- International systems

5. ***What are the "big" concepts/ideas to be learned, and what key questions will trigger student interest?***

- Concept - Court system designed to protect individual rights
- Question -Why is it important to have private citizens participate as jury members?

6. ***What assessment and instruction will be effective ?***

- Guest presentation - District Attorney Office
- Lecture/reading on court systems
- Group research and reports
- Group role play and skits
- Youth court experience

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Definitions of "real world" are useful in sharing ideas on what types of education meet the test of real world. One definition of a real-world application is that it occurs in the same way that it is used by adults. Moreover, standards of performance are the same as for adults roles, the most significant of which are worker, parent, citizen, and lifelong learner.

Five criteria can be used to examine the real-world nature of instruction as it relates to the use of skills and knowledge in adult roles. These criteria are:

- setting
- tools/resources
- standards
- relationships
- use of time.

Setting refers to the environment surrounding the use of skills. In the workplace and home, skills and knowledge are seldom used in isolation, and the problems to be solved are rarely clearly defined. Moreover, workplaces often have challenging working conditions, such as noise, distractions, or extreme weather, which can greatly affect the adequate performance of skills. In many learning situations, a workplace setting can be simulated by replicating the physical environment or providing access to the actual information or people available on the job.

Tools/resources refers to the materials, equipment, and resources with which people do work and communicate with one another. In the area of information technology, this includes telephones, fax machines, computers, and, equally important, the same software that is used in the workplace. When students use the same design software that is used by engineers, for example, they are equipped to engage in real-world design tasks. Doing a research project in school using the Internet and libraries all over the world is an example of using real-world resources.

Standards are used to measure the quality of work. In the real world, standards are often set based on the products or services consumers are willing to purchase. A competitive marketplace drives businesses to reach for higher standards of products and service in order to stay in business. These standards are set by external customers.

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In education, standards are often combinations of standardized tests and curriculum standards set by the state, school, or teacher. In nearly every case, the level of performance is determined by the judgment of teachers. For example, the standards of acceptable fifth grade writing or what score is required to pass high school level algebra is set by individual teachers or schools. That is, these standards are set by educators within the system.

One way to bring the real world into the school setting is to use adults from outside school to set the standards. For example, when a state develops reading comprehension tests, instead of arbitrarily picking 65 as the passing grade, the state would ask employers, parents, or elected officials to designate acceptable or exemplary performance. Likewise, community or business groups can be valuable in reviewing the scoring guides for performance-based assessments. This adds an aspect of external-driven standards in education.

Relationships are an important defining characteristic of the real-world use of skills. Most people work with other people. Our democracy is based on participation. When teachers attempt to plan real-world activities, they should make an effort to create group learning and performance situations in which students must work together.

Time is the final defining characteristic. In the real world, there are often clear time lines that must be met. Usually there is no delay in getting feedback as to whether something worked or didn't work. In school, however, a student may get feedback on the quality of an assignment several days later, when the teacher returns it with a grade. Employees tend to have their work evaluated almost instantly. If teachers want real-world instruction, they need to set real-world deadlines and provide more immediate feedback to students.

Teachers can move toward real-world instruction by focusing on the setting, tools/resources, standards, relationships, and use of time. While not all instruction needs to be real world, community expectations are clear that students must be better able to use the knowledge they acquire in school. Limited resources will inhibit all school instruction from meeting the test of real world, but working toward these five criteria will move instruction toward that goal.

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D Approaches to Instruction

Working with Students

Effective instruction requires sound curriculum planning, but it also requires attention to the needs of students. Three areas of student needs are especially important for teachers to consider:

- providing an optimal physical setting
- paying attention to the physical and emotional needs of students
- facilitating and modeling characteristics of student-centered learning.

Physical Setting

Learning is hard work, and students must understand that they are expected to expend significant effort to achieve their learning goals. At the same time, it is the teacher's responsibility to ensure that the school provides an optimal physical setting for students to engage in their work of learning. Everyone works better in comfortable surroundings. By attending to the physical classroom, teachers can reduce one barrier to students learning well.

The following list can be used to measure the extent to which students have an appropriate physical learning environment.

- Extensive learning materials are available.
- There are distinct areas for individual, small group, and large group activities, or they can be easily created.
- The classroom is continually modified to meet the needs of students and the work being undertaken.
- The classroom is orderly; materials are organized and easy to locate.
- Provision is made for students to work in quiet areas.
- Space is organized to encourage independence for students to find materials on their own and take responsibility for equipment.
- Space is provided to display student work.

Physical and Emotional Needs of Students

Learning is a physiological brain activity that records various stimuli received by the senses. The brain then stores and process this information. Certain conditions

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contribute to high levels of brain functioning while others interfere with the normal functioning of the brain in learning. Research has shown that the neurological activity of the brain actually shuts down when these inhibitors occur. It is the teacher's role to maximize good learning conditions and remove learning inhibitors. There are several excellent references on brain research in the Annotated Bibliography which can expand teachers' knowledge of the classroom conditions that contribute to or inhibit learning.

Some of the negative conditions that inhibit learning are fear, confusion, inconsistency, and frustration. Students need a learning environment that is free of fear. They should feel safe physically and emotionally. A school that has a climate of violence or tolerates verbal abuse and unruly students cannot produce high levels of learning in students.

Confusion leads to a shutdown of brain activity. Students are most comfortable when there is a normal routine and expectations. Frequent changes to these patterns interfere with learning. Teachers should establish consistent procedures for students and then follow them. This does not mean that instruction should always be routine; it means that changes should be announced in advance so that students are prepared for them.

Another factor that can lead to confusion is a lack of clarity regarding expectations. Students do not learn well when they are unsure about what they are supposed to be doing. Teachers should set clear expectations and get frequent feedback from students to ensure that students are "on track" about the expectations for their work.

Inconsistent judgment or evaluation also inhibits learning. Students should see consistency from a teacher as to what constitutes high-quality work or good behavior. If a teacher is inconsistent in student evaluation or gives the perception of being inconsistent, it will inhibit learning.

Frustration in students also comes from the perceived wasting of time. When students lack the necessary materials or resources to engage in a learning activity, they may disengage themselves mentally from the process.

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A condition that improves brain functioning is stimulation. One of the best methods of stimulating students is by creating visually attractive and interesting classroom displays. In addition to being varied and colorful, these displays should spark interest and curiosity. By exploring ways to connect their teaching to other experiences of students, teachers can also stimulate learning.

Teachers need to set conditions that trigger thinking in students, first by explaining the expectations for learning and then by giving students the opportunity to think and make connections in their own minds. Teachers typically ask questions in the classroom, but often don't give students adequate time to think and respond. Teachers can improve student learning by posing thoughtful questions and extending their "wait time" to allow student to think rather than jumping to supply an answer and moving on to the next point.

Students need to feel a part of the learning in a classroom. Teachers should plan activities that include participation by students. Even with large classes, it is important to maintain eye contact with students and make them feel special and involved.

The respect and support of peers can greatly enhance student learning. Likewise, "put-downs" are strong inhibitors to learning. By establishing a culture of peer support, teachers can promote greater learning.

Teachers must be knowledgeable about ideal learning conditions and constantly alert to feedback from students regarding new inhibitors that appear. Sometimes these conditions are beyond the teacher's direct control. In these instances, the teacher must be an advocate for the students and ask that the issues be addressed through administrative decisions, funding, or policy.

Sometimes problems relating to the school environment can seem overwhelming, but focusing directly on the problem can lead to solutions. For example, in an urban middle school, poor student climate was a significant problem. One of the ways the school addressed it was to

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appoint one of the assistant principals to oversee the school climate and culture full time. Rather than being assigned to a group of students, it was his charge to work across the school to develop a positive climate, and over time, through a number of initiatives, school climate did improve significantly.

Student-centered Learning

Student-centered learning means that classroom activities are conducive to maximum student engagement. There are several key characteristics of student-centered learning experiences:

- self-direction
- working with others
- flexible time
- intrinsic rewards
- application.

Self-direction. Students devote more energy to learning when they feel they have some self-determination in what they are doing. The more that students are able to select their own path of learning, the greater the level of engagement and interest. Obviously, it is not appropriate to switch to the extreme and give students complete freedom to choose what they want to learn at all levels. Often the student's choice will not involve the learning objective, since it is required of all students, but some self-determination in selection of learning activity is an excellent way to engage students. This is where learning styles come into play. The more that teachers are able to create conditions of self-determination and let students take initiative, the greater will be the students' level of involvement and ultimately their achievement.

Working with Others. While students are expected to develop individual competence in school, one of the characteristics of student-centered learning is to learn together. Working with others allows for sharing of creative ideas, testing of solutions, and feedback as to performance and achievement. The more that teachers are able to structure joint learning activities, the more they will be able to increase the engagement of students. The application of cooperative learning techniques is very useful in increasing the scope of learning in groups.

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Flexible Time. One of the most difficult student-centered characteristics to achieve is the flexible use of time. Allowing more time is not simply extending tasks for students. Some students need more time; others need less. The challenge for teachers is to find creative ways to allow each student to move at an individual pace. This is difficult in classroom settings, but many teachers have found ways to do this by structuring varied instructional activities, with time devoted to large group work, small group work, and individual work. During individual time, some students can review difficult material while others accelerate to more challenging tasks.

U.S. Department of Education
Prisoners of Time

Once students become actively engaged in an interesting activity, it is counterproductive to "ring the bell" arbitrarily and tell them to move on to the next activity. Again, high levels of learning require more flexible use of time.

Intrinsic Rewards. Schools have long relied on external recognition systems, primarily the use of grades, to quantify student achievement. However, grades are not sufficient to motivate high levels of student learning. Teachers should also work to help students develop the ability to derive satisfaction from doing high-quality work. It is this sense of personal goal setting, commitment, and satisfaction which will drive individuals to continual learning.

Application. The last aspect of student-centered learning is application and practice. Application of knowledge is an objective of student achievement, but it is also a way to practice and reinforce learning. Research consistently supports that practice and actually using knowledge lead to the greatest retention and learning. In addition, many individuals have a preferred style of learning that involves concrete, practical applications. Instruction that includes a high degree of practice will result in higher levels of achievement. It is no surprise that "If you don't use it, you lose it." Application needs to play an important role in developing student-centered learning.

Just as teachers should take an inventory of the physical classroom setting, so too should they take a self-inventory of the way they teach to be sure they are not contributing

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inhibitors to learning. Doing a self-assessment is difficult. It is far more comfortable to rationalize a behavior than to confront a weakness and develop a strategy for change. The assistance of peers can help with this, but unfortunately, the culture of most schools is that teachers "go it alone." They are expected to work independently. Little time is provided for collaboration.

An example of an exception to this culture of isolation was a school that had set an instructional goal to increase the amount of individualized help that the poorest performing students received. One teacher was assigned as part of her instructional duties to work with other teachers, coaching them in the classroom and giving them feedback on the degree to which the selected students were getting the help they needed. This was a major change that required the cooperation of the staff in working toward a goal of raising student achievement.

Effective Instructional Strategies

Oldies But Goodies

The instructional strategies described below are not innovative; they have been around for a long time. The reason that they persist is that they are effective.

Developing more rigorous and relevant instruction does not mean throwing out all current practices. When used at the right time, these strategies can help students to achieve rigorous and relevant standards.

Lecture. There still is an important role for providing information directly through a presentation or lecture. Teachers have knowledge they can and should present to students. Lectures are most effective when they are well organized, accompanied by audiovisual materials, and backed up with references to other sources of information. A variation on providing direct instruction through lecture is to invite guest presenters or to use lectures via video or distance learning system. While lectures are efficient in use of time and inexpensive, the disadvantage is that they are one of the least engaging methods of instruction.

Demonstration. Demonstrations are opportunities for students to gain new information through direct observation. Frequently, tasks or the manipulation of materials and

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objects are best explained to students through physical demonstrations by the teacher or through the use of video materials.

Reading. Vast amounts of information can be conveyed through the written word. By reading, students not only acquire information, but also develop emotional response through reading about people, cultures, and society.

Writing. Writing is an effective way for students to organize their knowledge and to reinforce concepts. In writing, students are required to review material and express it in their own words. This means that writing is also an effective way to measure student understanding. Writing can vary in length from short paragraph responses to test questions to research reports reflecting analysis of a considerable amount of information.

Guided Practice. Guided practice is a general term for the work that most often goes on in the classroom. In mathematics, for example, the teacher may introduce a new math operation, demonstrate its use through one or two examples, and then give students additional problems on which to practice the operation. Typically, the teacher provides individual guidance to students in making sure they follow the steps. Working in the classroom is an effective way for students to review and practice new information under the guidance of an instructor.

Independent Practice. For students, a natural extension of reviewing new material under teacher direction is engaging in practice at an independent time and location. Most homework is in this category. Students respond to questions or solve routine problems to reinforce basic concepts or skills.

Discussions. Discussions are an excellent means for students to clarify concepts in their own minds. Just as writing forces students to organize their thoughts, presenting information verbally produces the same type of reinforcement. Students must combine previous knowledge with their understanding of new information into logical points of information, questions, or opinions. Teachers can stimulate discussion through asking thoughtful questions and challenging students to think and form their own opinions. Discussions can also be conducted in more formal structures, such as student forums, panel discussions, and debates.

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Notetaking. In traditional practice, the complement to teacher lectures is student notetaking. A benefit of notetaking is that the writing process reinforces students' understanding of information. Students who develop the skill of organizing logical notes have created a useful reference for more advanced work or to prepare for examinations. A variation on notetaking in outline form is to record information in free-form diagrams to show connections between items and to use graphics and symbols to represent information. Depending upon students' individual learning styles, using these graphical organizers can be very helpful for recording and reinforcing information.

Research. Research activities do not lend themselves to short, simple solutions. They require students to locate and retrieve information from several sources, including library references, text, other individuals, and electronic databases via the Internet. The end product of the research is often a written report that summarizes information gained through research.

Journals. A technique that is used to encourage students to reflect upon an experience is to require a written journal. Students often engage in out-of-school activities, such as field trips or career exploration opportunities, that have a direct connection to learning, yet there is no opportunity for the teacher to observe what the student has learned. Journals can also be used for evaluation.

Brainstorming. Brainstorming when introducing new material is a good way to involve students. Generating vast amounts of information which may or may not have some connection to topics and then sorting that information is an engaging learning process. Brainstorming stimulates thinking and allows students to participate without the anxiety of coming up with the right answer. Brainstorming is an effective technique to begin a discussion at any time on any topic; the ideas can then be further refined.

Analyze, Compare, and Contrast. One way to start students thinking about new information is to ask them to analyze large amounts of information to see patterns or connections between ideas. In science, students can observe a phenomenon and make comparison to previous experiences. In literature, student might compare and contrast themes, characters, or plots. As students look for these

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types of connections and shared characteristics, they gain basic understandings of the new information.

Cooperative Learning. One technique that is gaining popularity is collaborative classrooms, where students typically work cooperatively in groups. Cooperative groups are very effective for problem solving and inquiry, but working well in a cooperative group requires preparation and practice. Students who are used to traditional teacher-centered instruction are often uncomfortable and lack the skills to work successfully in a group. Teachers should review the literature and suggestions of other teachers on how to use cooperative groups effectively for high-level learning.

Memorization. Memorization still has a place in school. Students should understand that some information is most efficiently used by direct recall rather than by looking it up in a reference source. There are many techniques for remembering information, and students should be guided in developing techniques to memorize information. Some students learn information by using mnemonic devices in which they connect key information, such as making the first letter in a series of words into a new word that is easy to remember. Students can also use visual images to memorize information.

Rigor and Relevance

The following instructional strategies are more complex and significantly more effective in increasing the rigor and relevance of instruction.

Inquiry. Inquiry is a technique that engages students in posing their own questions around an instructional topic. Teachers often stimulate this by creating a unique observation or demonstration or by posing questions to students. Then students are encouraged, usually in cooperative teams, to make additional observations and pose questions. With the teacher's guidance, students are led to a significant understanding of the instructional topic.

Project Design. Project design activities require students to integrate their skills and knowledge to create their own work, as individuals or in a group. The project might be literary or artistic. Students might also engage in engineer-

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ing design, where they are required to create a product or device to meet a particular need or specification. Technology projects are excellent vehicles for integrating and applying mathematics and science knowledge as well as English language arts skills to explain their design.

Problem Solving. Problem solving denotes instructional activities that are more complex than the simple problems given to students in guided practice. The problems may be tackled individually or in small groups. In social studies, for example, students might be asked to analyze a significant social problem or community issue and to prepare a logical solution.

Questioning. Effective use of questions can stimulate significant thinking by students. Rather than simply conveying factual information and expecting students to remember it, teachers can greatly reinforce students' connections with new information by asking them to think about that information in a different context. To introduce ecosystems, for example, teachers can pose "what if" questions, such as: What if there were no plants? What if certain animal species did not exist? What if all the ice at the North Pole melted? This type of question stimulates thinking and allows students to approach fundamental concepts, ideas, or information from a new perspective.

Simulation. Simulation is a teaching strategy that is by definition real world. In this type of activity, the teacher replicates the way skills or knowledge are used outside of school. Simulations may be used to initiate student interest, for skill building, or as a culminating activity following extensive student research. Simulations require a great deal of time and effort to create, although there are many commercial simulation games and activities related to a variety of instructional topics. Computer-based simulations also offer excellent learning opportunities.

Work-based Learning. Recently there is great interest in using the work place as an opportunity for learning. By engaging in work related tasks which may require communication or design or producing some other product, students have a direct opportunity to use language skills, creativity, higher order thinking skills and previous knowledge of math and science. Work-based learning activities are very engaging for students and can be opportunities for

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students to become excited about learning for the first time. They require extensive planning to make sure the students are not simply doing routine work but engaged in activities that relate to the learning objectives.

Interactive Instructional Technology. Recent advances in instructional technology, including multimedia and three-dimensional images, are creating a new form of instructional technique. Complex branching programs provide a choice of learning paths and enable tailoring of programs to student questions or interests. This high degree of visual reality and interactivity offers students an opportunity to develop a depth of understanding of complex concepts in a much shorter time than would be possible through traditional instruction. A virtual reality science simulator, for example, can allow students to explore the structures and cells of plant life in three dimensions instead of studying diagrams in a textbook. Interactive instructional technology provides a unique way to motivate students to high levels of skills and knowledge.

Interdisciplinary Instruction

Often, it is difficult to comprehend how interrelated the world around us is. A small change in a law or policy, the invention of a new tool, or the extinction of some insignificant-seeming plant or animal can have far-reaching consequences of an unexpected nature and magnitude.

Education should increase students' understanding of the interconnectedness of the world. Unfortunately, the traditional subjects and courses taught in U.S. schools are separate and disconnected. As students move from class to class and grade to grade, they are exposed to bits and pieces of knowledge, but they are not taught how what they learn in one class is related to another.

"It should come as no surprise that the unhealthiness of our world today is in direct proportion to our inability to see it as a whole."

Peter M. Senge
The Fifth Discipline

Although the real world uses knowledge in an integrated form, the U.S. education system has broken it apart into specialized studies. This fragmented approach is not an effective way to prepare students for the world. The current structure of separate subjects:

- ignores some extremely important knowledge
- fails to show students the integrated nature of the world

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- disregards basic principles of learning
- has no built-in mechanism to adapt to change
- emphasizes information absorption rather than construction
- lacks criteria for determining relative significance of content.

Integrating subjects costs little — no new textbooks, no additional equipment, no bureaucratic reorganization or retraining of teachers. Often, all that is required is a change of attitude and the willingness to restructure education so that it prepares students for life, not just for more school. With a little vision of how skills are used outside the educational establishment, a vastly superior interdisciplinary curriculum can be put in place.

The ultimate objective of education must be to provide students with (a) foundation knowledge for dealing with the real world, (b) skills to succeed in their various adult roles, and (c) the ability to continue to learn. An interdisciplinary curriculum is more natural than the present curriculum. Unfortunately, that does not mean that it is easily understood, especially by those whose perceptions of the world have been structured by traditional schooling.

The problem is not that an interdisciplinary curriculum requires more effort to plan, but that it is different. It demands a paradigm shift in thinking. Consider how long it took to gain acceptance for the idea that sunrise was a consequence of the Earth's rotation rather than the sun's movement, or how long it took to "discover" gravity. When change in the familiar is threatened, people often resist. They are greatly attached to their perceptions of reality.

While the development of interdisciplinary learning experiences is important, teachers often find it difficult to plan such experiences, because they have neither the information nor the planning time. Textbooks and teachers' guides rarely show relationships between the subject areas. Although teachers cannot change the content of textbooks rapidly or directly, they can use a planning process that encourages the incorporation of cross-disciplinary ideas and activities in instructional strategies.

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Most teachers have a particular subject-matter expertise, but they have also accumulated knowledge and developed interests in other areas. What's more, they have access to other teachers with different subject-matter concentrations. With these resources at hand, teachers can construct lessons that help students understand important and interesting relationships between the disciplines.

Giving students opportunities to explore interconnections among the subjects they are studying has many advantages. Interdisciplinary instruction adds meaning and relevancy to learning as students discover applications between disciplines. New perspectives are developed which help students construct a more integrated web of knowledge. This integrated knowledge structure not only facilitates learning new information, but also helps students appreciate the wealth of information and ideas they already possess.

For more suggestions, see **Information Sheet — Guidelines for Creating Interdisciplinary Instruction** *on page III-37.*

Using Community Resources

One of the best strategies for bringing relevance to the classroom is to think beyond the walls of the school to the resources in the community. Communities offer a wealth of opportunities for learning through application. Manufacturing plants, retail and wholesale businesses, hospitals, local government, and not-for-profit organizations offer a gold mine of technical reading materials, communication situations, scientific phenomena, and problems in search of solutions. Teachers can make direct visits or convene meetings of community leaders to brainstorm ideas.

Some business leaders are willing to spend time in school working with students to explain the application of skills or to pose real-world problems for them to solve. Elected officials, service organization leaders, recent graduates, and senior citizens can help to identify learning opportunities in the community.

Schools can greatly enhance teaching and learning by creating partnerships with the community. Examples of partnership activities include mentorships, experiential learning opportunities, and co-investigations, whereby students and community members solve community problems together.

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E Designing Assessment

Performance-based assessments are an effective way for teachers to learn whether students can understand concepts and apply their knowledge. It is not unusual for students to know all the facts but be unable to understand the connections between those facts or how to use them. Many students learn by rote, with little understanding of *why*, or they draw erroneous conclusions about *why*. Well-constructed performance tasks help the teacher and the students know if they really understand or if they are merely following a pattern they have learned or parroting information they have memorized.

Traditional norm-referenced tests tell very little about *how* students think, whether they can use knowledge, or what to teach next. Students become better problem solvers in direct relation to the opportunities they have to find solutions to problems and to reflect on what worked and what didn't. Real-world problems don't come neatly packaged in predictable, easy-to-solve formats, so teachers need to provide students with experience in grappling with problems that mirror the world beyond school.

Good performance-based assessments ask students to explain and justify their work, not just do a task. As the students begin to justify their answers, they themselves start to reflect more on their own learning and take more responsibility for ensuring that they really understand *why*, not just *what*. Learning makes sense to them; it becomes more than just filling in the blanks on a test on Friday afternoon.

Performance-based assessment involves gathering evidence about how students think, what connections they are making, what strategies they use to solve problems. Teachers use this type of assessment so that they know better how and what to teach, not just to give students a grade. Performance-based assessments help make instruction more effective, because they are rich with clues about how students learn.

Performance-based assessments differ from traditional multiple-choice or fill-in-the-blank tests in several ways. With performance-based assessments, student performance is compared to a set standard rather than against

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the performance of other students. Connections and higher-level cognitive skills are easier to assess than with objective tests.

Traditional tests have an element of surprise. Students, and even the teacher in the case of standardized state and national tests, never know what questions will be asked. With performance-based assessment, students know exactly what is expected of them.

Criteria

In a performance task, the specific descriptions of the knowledge and skills that define what is required are called "criteria." These describe precisely what that student is expected to know and be able to do.

A standard is a general statement of an end goal. Criteria provide specific details that can be used to create tasks to teach and assess each student's ability to meet that standard. The criteria form the basis of the scoring guide.

Defining criteria for complex tasks is not easy. It involves analyzing what is essential in the task as performed by the real-world expert, not merely what a student must do to complete the task. There are typically *qualitative* differences in performances as one becomes more proficient. Experts don't just do more, faster; they see connections a novice doesn't notice and find creative solutions to problems that others may not envision.

Criteria also help students formulate a working definition of what is considered "expert performance" and why. Using the criteria, teachers can work with students to develop a scoring guide for a task that describes what is "competent," "highly proficient," etc. Such discussions help students understand how to become "expert" themselves.

Parents are equally interested in criteria. One fifth-grade teacher discovered a side benefit of sharing with parents and students the criteria she wrote for a critical writing task. Parents reported back that they could really support what their children were doing and talk with them about their progress without worrying about whether what they were saying was "right" or not.

Criteria remove the mystery from assessment. Everyone knows, from the beginning, exactly what students must do

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to excel. Involving parents and other community members in the process of establishing criteria may be beneficial to all.

Reliability

In order for an assessment to be considered reliable, it should be able to predict reasonably well how a student will perform on another, comparable task. If, for example, students are able to analyze a mathematics task involving ratio in one instance, they should be expected to solve similar problems on other tests.

Reliability depends in part upon the *comparability* of tasks. It is fairly simple to create comparable tests for the recall of information. It is far more difficult to predict a student's performance on real-life, multifaceted tasks; there are too many variables. At the same time, performance-based assessments are a more solid measure of what students know and can do.

A second aspect of reliability that is extremely important in performance-based assessments is *inter-rater reliability*, or the ability of different teachers to score a performance task in the same way. If several teachers are using the same task, it shouldn't matter which one scores the students' work. Everyone should be in close agreement on what "competent" or "highly proficient" means. Developing inter-rater reliability takes much discussion about what "competent" looks like. It also takes well-written scoring guides.

Validity

Validity is a measure of how closely a task mirrors the knowledge and behaviors that are required to perform comparable real-life tasks. Good performance tasks require hands-on learning, but they go beyond just "doing" and require children to think deeply and make important decisions. A valid task provides the information necessary for students to perform successfully, but it also requires considerable thought and decision making by the student, as well as the organizing of relevant data, problem solving, and thoughtful habits of mind.

Valid scoring guides reflect the relative importance of each aspect of that thinking and decision making. Yes, it is important that a final report is neat, that it is carefully checked, with grammatical and spelling errors corrected. It is also important that students be able to organize ideas

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logically and select appropriate evidence to argue their point. However, a scoring guide that weighs each of these skills equally is not valid, because these skills are not equally important. Validity is determined, in part, by whether a task actually measures what it says it measures and also by whether the scoring of that task is comparable to real-life standards.

Performance-based assessments are only as good as their designer. Labeling an assessment "performance-based" or "real-life" doesn't automatically guarantee that it is a valid measure of student performance.

In order for a task to be valid, students must understand that task. Traditional testing programs view teachers as proctors who must not explain the meaning of a word or coach a child who does not understand the directions. With performance-based assessments, teachers are *expected* to interact with students and to provide whatever assistance a youngster requires to understand the task. The teacher may make a notation that a certain student needs additional help reading directions or organizing ideas, but the teacher also provides the needed support so that the student can complete the task.

Teachers need to be sure that other factors are not affecting student performance. A reading disability may create problems for some youngsters; language and cultural differences may cause difficulty for others. Teachers must know their students and ensure that *differences not related to the criteria being measured* are noted. Providing support to students as needed gives them a fair shot at demonstrating their understanding of the knowledge and skills being assessed.

The teacher controls many aspects of the performance task which determine whether the assessment is valid. Assessment tasks should be done in the classroom to be sure that each student's actual performance is being assessed. Once work leaves the room, it could be someone else's work. For learning activities that may be appropriate, but for assessment tasks it is not, because the purpose is to gain information that helps the teacher provide feedback to students and plan the next steps in instruction.

The teacher also decides whether to permit students to collaborate or have them work independently. Either option may be valid, depending on the goal in assessing. If students

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are to work collaboratively, the criteria should include specific descriptions of expected behavior, and the teacher should be clear about what aspects of the project can be done together and what must be done independently. Students might, for example, collect data or perform an experiment together, but then write their own conclusions individually.

Scoring Guides

Scoring guides should reflect *qualitative* differences in students' development. At their best, a scoring guide describes student performance at a given level of development clearly and precisely. Moreover, while the scoring guide is used to assess each student's performance on the assessment task, students often refer to the scoring guide as they work through a task.

Scoring guides can be designed in many formats, although there are three basic types: holistic, checklist, and analytic.

Holistic is the simplest of the three forms. It is often used when the person judging the performance is extremely knowledgeable of quality performance. Usually, there are a few broad categories. Each category is given a maximum point value, and the evaluator assigns a specific number of points to each measure. A total score is then given to the performance. This is similar to the judging of athletic or musical performances.

The **checklist** generally has a longer list of items than the holistic categories. The evaluators check off the items that were completed satisfactorily. Typically, no qualitative values are given to a performance, only a record of which items were completed. This type of scoring guide is best suited to performances in which the process is critical or there are specific steps or safety procedures that must be followed.

The **analytic** scoring guide is the most popular for performance tasks. The analytic scoring guide uses several broad categories. For each category, specific criteria describe the highest and lowest levels of performance and several levels in between. Analytic scoring guides can be developed and refined to evaluate student performance on a consistent and accurate basis.

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Scoring guides are probably best reviewed by several teachers together, with each one bringing samples of student work to share. If the teachers can agree that a few of the samples are "expert" (or "4," or however the top level is designated), then they can discuss what specific evidence of student knowledge and skills makes those papers "expert." Next, they look through the work that represents "competent" performance and describe the specific evidence accepted for that level. Typically, continuing on down through the levels brings the teachers back to the descriptions already written to modify them.

The International Center has resources to assist schools in adding performance-based assessment to their testing programs (see Chapter VII).

Teachers in schools where scoring guides have been used for more than a few years report that they revisit their scoring guides at least annually. They also create new scoring guides with their students and have lively conversations about standards. Students who have been using scoring guides for several years tend to be far more reflective about their work, with the result that their teachers find that a "4" for a class a year ago is a "3" or even a "2" now.

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Information Sheet

How People Learn

Understanding the human brain and how people learn is useful for teachers in making decisions about what activities will help students learn best.

In the brain, billions of cells combine with chemical processes to record in memory or recall from memory symbols, images, and physical responses. Over millions of years, the brain has developed the process that makes patterns and links out of all this information. Without links between bits of information, we could not learn anything new or recall earlier information. Everything would be a separate experience. So, in order for any piece of information to be stored in the brain, it must have a link or connection.

By taking this notion of information links into consideration, teachers can plan instructional activities that will be effective in promoting student learning. There are three major strategies for helping students make links for the content they are learning: practice, name content, and construction.

Practice, the most natural strategy, is the way we learn to survive as humans. Those things we repeat and rehearse we remember. Application reinforces learning. New information will soon be forgotten unless the student has an opportunity to use that information. A good example is learning how to use complex computer software. The knowledge gained in a training course is soon forgotten unless the person has an opportunity to practice using the skills. In planning any instruction, practice is an excellent way for a student to remember content.

The second major strategy is to **name content**. Practice is not always efficient, because there may not be a chance to use new skills or knowledge immediately. In formal education, there are names and categories for content knowledge. The whole manner in which people use words and mathematical symbols is an efficient way to receive, process, and remember information. Naming includes memorization techniques, such as the use of mnemonics or visualization, which enable students to process and remember vast amounts of knowledge in short amounts of time. There are also notetaking techniques that help students to record and store new information. These naming conventions and study skills are part of a process for helping students to store and recall knowledge for future use.

The third type of strategy is **construction**. Practice can be impractical at times, and naming is not effective with all students. In learning by construction, students are given the opportunity to develop their own links to the knowledge by "discovering" that knowledge. Just as our ancestors explored the world and learned what items were edible and where danger existed, so too can students explore their world through carefully designed instruction. Not every student will make the same links of information, as occurs in standard naming techniques, but when those links are made, they will be more lasting in the memory, because each set of links that students use is based upon their previous knowledge, so they will remember these much better.

As an example, a teacher using the naming strategy to teach about the commutative process in mathematics typically gives students the term, defines it, and gives examples in symbols — x=a(bc) is equivalent to x=(ab)c. In contrast, a construction approach might start with students solving a two-digit multiplication problem in their heads. After the students explain how they arrived at the answer, the teacher would note that not all students followed the same sequence of steps, yet each arrived at the correct answer. After students "discover" that numbers can be multiplied in any sequence, the teacher can label this the commutative process. Students will retain the links to this new knowledge because it has been largely constructed from their own knowledge.

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Information Sheet

Asking Open-ended Questions

Several types of questions can stimulate students' thinking. These open-ended questions require students to think about related pieces of information. There should not be a single or simple answer. Ambiguity is fine, but the questions should be clear and have some relation to experiences students have had or can imagine.

What if ... ?

Hypothetical questions pose new situations to students and require them to look at events or processes in different ways. Rather than just recalling facts, students must link them to other pieces of information.

Examples:
- What if the climate warmed up by 10 degrees?
- What if you reversed two numbers in a math equation?

What are ... ?

Classification questions cause students to analyze the characteristics of a group of items. By creatively trying to design new classification systems, students make more careful observations and develop the analytical thinking skills to compare and contrast items.

Examples:
- What are similarities among different insects?
- What are differences among types of triangles?

What is ... ?

Discovery questions require students to locate an answer or figure something out. These questions should present interesting problems that do not have obvious solutions. They should be questions that students have not seen before and that require them to design observations or link previous information.

Examples:
- What is in soil?
- What is the largest pair of numbers you can multiply in your head?

How do ... ?

Explanation questions encourage students to think about the way something works. They force students to analyze systems and to think about complicated processes in terms of steps which the students can understand. After struggling to think about things in their own terms, students are often better able to understand the standard description of the process.

Examples:
- How do plants grow?
- How do you measure the flow of a river?

Why ... ?

Causation questions require students to think about possible reasons why something occurred. They encourage students to think about the relationship of events and various pieces of information. These questions are ideal for observing phenomena and proposing possible causes in the process of scientific inquiry.

Examples:
- Why do only some things float in water?
- Why does the wind blow?

How would you ... ?

Creative questions require students to design new solutions to problems. Students apply their knowledge of a topic to create a new process or product.

Examples:
- How would you write without any verbs?
- How would you write sentences to create different emotions?

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Information Sheet

Guidelines for Creating Interdisciplinary Instruction

Formulate a goal statement that indicates the principle(s) or concept(s) to be understood at the completion of the lesson. What are the primary pieces of information or the concepts that you want students to understand? Often, interdisciplinary lessons do not concentrate on the mastery of specific skills. By their very nature, these lessons usually focus on the application of skills and knowledge in new contexts. For this reason, goals of interdisciplinary lessons will usually involve helping students understand how the skills and knowledge they possess can be combined to accomplish a task, discover a solution, or explain a situation.

Select the content that will serve as the basis for instruction. Often, the content base is determined by the text. There are times, however, when your goal necessitates the use of ancillary materials. In either case, determine the primary vehicle that will drive the instruction (e.g., a work of art or literature, a scientific or mathematical principle, an event or era in history).

Identify events, discoveries, and writings within other disciplines that relate to the primary content base in a meaningful way. Through talking with colleagues and brainstorming on your own, consider information in other disciplines that seems to relate to the primary content. At this point, you may find it helpful to look at the table of contents in any textbooks you may be using. However, don't discount your own expertise, films or plays you've seen, books or magazine articles you've read, and your life experience.

Determine the key points of intersection between disciplines which correspond to the established terminal goal of instruction. As you investigate each cross-disciplinary idea in more depth, keep your goal well in mind. It is easy to become enthralled in the idea itself and lose sight of the major instructional intent. Some ideas will probably need to be discarded, either because they are too complex or because they do not fully address the goal. Other ideas may be so compelling and enlightening that you may want to revise the terminal goal to reflect new insights you have gained.

Identify the prerequisite skills and knowledge that students must possess in each discipline area. Interdisciplinary instruction can fail if students lack knowledge of key concepts within each discipline. Carefully consider the skills students must have before they can successfully accomplish the objectives you have set forth. Sometimes, missing skills or pieces of information can be taught rather quickly. However, when this is not the case, it will be necessary to revise the interdisciplinary content.

Formulate instructional strategies that will compel students to combine their knowledge from several disciplines. Students are not used to activating their knowledge in one discipline while studying another. For this reason, it is important to develop activities that cross the boundaries of traditional disciplines in a purposeful way. Conceptual mapping, in-class debates, group projects, and a variety of discovery techniques are examples of ways to accomplish this goal. As in all instruction, the critical component of interdisciplinary lessons is active and invested participation by students.

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What could we ask about _____?

This question can be used to introduce a topic. To help students liberate their curiosity, refrain from giving judgmental cues as they generate questions in response.

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IV. Relationship to Other Curriculum Reform Approaches

The Rigor/Relevance Framework has some features in common with other popular curriculum reform efforts. These similarities reinforce the importance of application instruction. What's more, schools pursuing any of these other models will find the Framework a nice complement to current work and an additional tool for reform.

A Dimensions of Learning

Dimensions of Learning is an instructional framework designed by Robert Marzano that shares assumptions about learning and the art of teaching with the Rigor/Relevance Framework. The premise of Dimensions of Learning, which incorporates significant research and several important theories of learning, is that all successful learning is based upon five dimensions of thinking:

R.J. Marzano
A Different Kind of Classroom

1. Attitudes and Perceptions about Learning
2. Acquisition and Integration of Knowledge
3. Extension and Refinement of Knowledge
4. Meaningful Use of Knowledge
5. Productive Habits of the Mind

This model helps teachers plan curriculum and instruction by examining the different aspects of how students learn. It links performance instruction to performance assessment.

Dimension 1 Attitudes and Perceptions about Learning

In Dimension 1, teachers address many of the factors that affect thinking and learning. We know how influential the classroom environment can be in either promoting or distracting from learning. Research in early childhood education points out the stimulating effect of a colorful classroom loaded with "stuff" to excite the senses and thinking.

Students must also feel comfortable and safe in their environment, or even the most dynamic lesson plan will be ineffective. Teachers need to give attention to setting the proper

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emotional climate for students. Learning cannot take place if students are worried or focused on other issues.

Teachers should be aware of signals that a student is experiencing emotions that will interfere with his or her learning and offer an understanding word or other support.

The school and classroom climate must focus on learning, and students, teachers, and parents must actively support this common expectation. There do need to be clear rules and procedures, while bearing in mind that a school run only by rules takes on an "institution culture." Teachers displaying a positive attitude toward learning will do much to promote an excellent school environment.

Dimension 2
Acquisition and Integration of Knowledge

Taken together, Dimensions 2, 3, and 4 sequentially address acquiring knowledge, refining knowledge, and using knowledge. This is a useful hierarchy.

Dimension 2 is about the basics of learning and thinking. In this dimension, Marzano makes a distinction between types of knowledge: declarative and procedural. This distinction is important when planning instructional activities. Declarative knowledge can be described as discrete facts or concepts. They can be small bits of information, such as the date of a peace treaty, or large concepts, such as the movement of the planets in the solar system. Procedural knowledge, on the other hand, involves a process. It may involve physical skills or thinking processes which are part of a sequence of steps.

Each type of knowledge requires students to think somewhat differently in acquiring the knowledge. Students learn declarative knowledge by constructing meaning, organizing, and storing. Instructional techniques that are effective with declarative knowledge give students opportunities and tools for discovering meaning and ways to organize and store the knowledge for future use. Procedural knowledge, in contrast, requires students to construct a model of how a process is done and then to shape it through practice to internalize the procedure. Troubleshooting an electric circuit is a good example. Students are exposed to the steps in the process and then use practice and additional situations to shape and internalize the acquisition of the knowledge in setting up electrical circuits.

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Dimension 3
Extension and Refinement of Knowledge

Dimension 3 is where students demonstrate their ability to understand knowledge. By creating instruction that asks students to connect previous knowledge or to define knowledge in their owns terms, teachers help students extend and refine their knowledge.

Dimensions of Learning identifies several types of learning activities that can be used to extend and refine knowledge. Comparing and contrasting pieces of literature, characters, plots, or literary styles is a typical example in English. Drawing logical conclusions or constructing opinions from various pieces of knowledge is another way students extend and refine their knowledge.

In this dimension, the use of questions is very powerful. By facilitating students to pose questions around an observation or issue, a teacher can stimulate students to extend their knowledge. Likewise, a properly timed question from a teacher can refine a student's understanding.

Dimension 4
Meaningful Use of Knowledge

The next sequential level of thinking is to use knowledge in meaningful ways. Dimension 4 is about application and has great similarity to the Application Model. Experimental inquiry and investigation are instructional strategies for developing skills in using knowledge. By setting up opportunities for students to design or invent solutions to problems, teachers can help students develop their thinking in applying previously learned knowledge. It is clear that the natural extension of acquiring and refining knowledge is to apply it in meaningful ways.

Dimension 5
Productive Habits of Mind

Developing productive habits of mind is the highest level of the Dimensions of Learning. In this dimension are all of the skills and characteristics associated with higher levels of thinking, such as:

- critical thinking
- being accurate and seeking accuracy
- being clear and seeking clarity
- being open-minded

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- restraining impulsivity
- taking a position when the information warrants it
- being sensitive to the feelings and level of knowledge of others
- creative thinking
- engaging intensely in tasks even when answers/solutions are not immediately apparent
- pushing the limits of one's knowledge and abilities
- generating, trusting, and maintaining one's own standards of evaluation
- generating new ways of viewing a situation outside the boundaries of standard convention
- self-regulation
- being aware of one's own thinking
- planning
- being aware of necessary resources
- being responsive to feedback
- evaluating the effectiveness of one's own actions.

Dimension 5 skills are developed more by how we teach than what we teach. No lesson plan can transfer to a student the steps in being a creative thinker. The way in which a teacher facilitates learning, how tests are constructed, and the manner in which student achievement is recognized have a significant impact on developing creative thinking skills.

B Brain-based Learning

R. Caine and G. Caine
Making Connections: Teaching and the Human Brain

The brain's natural function is to learn. Brain-based learning is teaching based on the unique structure and function of the brain. Learning occurs if the brain is not prohibited from using its normal processes. Every person is born with a brain that is an immensely powerful processor. The brain can and does remember, make connections, and recall information. Schooling sometimes inhibits learning by discouraging, ignoring, or even punishing the natural learning processes of the brain.

Leading researchers in the field of brain-based learning are Renate and Geoffrey Caine and Leslie Hart. Some of the core principles of brain-based learning are:

- Learning engages the whole physiology.
- The search for meaning comes through patterning.
- Emotions are critical to patterning.

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L. Hart
Human Brain, Human Learning

- The brain processes wholes and parts simultaneously.
- Learning involves both focused attention and peripheral perception.
- Learning involves both conscious and unconscious processes.
- We have two types of memory: spatial and rote.
- Facts are best understood when embedded in natural, spatial memory.
- Learning is enhanced by challenge and inhibited by threat.
- Each brain is unique.

The three instructional techniques associated with brain-based learning are: immersion, where learning environments are created that fully immerse students in a learning experience; relaxed alertness, where an effort is made to eliminate fear while maintaining a highly challenging environment; and active processing, where the learner consolidates and internalizes information. The implication for instruction is that learning should be designed around student interests. Other implications are for students to learn in teams, structuring learning around real problems and allowing learning settings outside the classroom and school building.

People learn best when solving realistic problems. Brain-based learning suggests that the way the brain works has a significant impact on the kinds of learning activities that are most effective. Teachers need to help students have appropriate experiences and capitalize on those experience. The best way to learn is not through lecture but by participation in realistic situations that let learners try new things in safe environments.

One implication for individual learning is an emphasis on "active learning," so that learners make connections that tap both hemispheres of their brains. Three interactive elements are essential to this process:

1. Teachers need to **immerse** learners in complex, interactive experiences that are both rich and real. A good example is the use of immersion in the teaching of a second language. Teachers need to take advantage of the brain's

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ability to process in parallel.

2. There must be a personally meaningful challenge. This is the intrinsic motivation that is part of the state of mind identified as **relaxed alertness**.

3. There must be intensive analysis, so that the learner gains insight about the problem, about the ways in which it could be approached, and about learning generally. This is called the **active processing** of experience.

C Thematic Instruction

Thematic instruction is the organization of curriculum around major themes that integrate basic disciplines, such as English language arts, math, and science, with the exploration of a broad topic, such as communities, rain forests, river basins, use of energy, etc. A leading educator and author in thematic instruction is Susan Kovalik.

S. Kovalik
ITI: The Model — Integrated Thematic Instruction

Thematic instruction is a strategy that promotes the belief that we learn best when we are learning in the context of a coherent "whole" and when we can connect what we are learning to the real world in a practical way. Thematic instruction seeks to put the learning of such cognitive skills as reading, mathematics, scientific method, and writing in the context of a real-world topic that is both specific enough to be practical and broad enough to allow creative exploration.

Thematic instruction most frequently occurs at the individual grade level. It involves teachers of that grade working as a team to design instruction and assessment around a theme. Typical steps include:

1. **Choosing a theme**. Themes often involve a large, integrated system (e.g., river basins, a city, rain forests) or a broad concept (community, democracy, transportation). Efforts are often made to connect the theme to the students' everyday lives. In some cases, students participate in the choosing of the theme.

2. **Designing the integrated curriculum**. Teachers organize the learning objectives of their core curriculum (both process skills and content knowledge) around the theme. In the study of a river basin, for instance, math might involve calculation of water flow and volume; social

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studies would look at the nature of river communities; science could study phenomena like weather and floods; literature might study books and novels that are river-focused, such as the works of Mark Twain. The initial design requires considerable work on the part of teachers. Again, sometimes students are involved in helping design the curriculum.

3. **Designing instruction**. This usually involves changes in the class schedule, combining of hours, field trips, team teaching, bringing in outside experts, etc.

4. **Presentation and celebration**. Because thematic instruction is often project-oriented, it may involve class presentations to the school or community. Extensive visual displays are also common.

Thematic instruction can be a very useful tool for integrating the curriculum and eliminating the isolated, reductionist nature of teaching around disciplines rather than experience. Initially, it requires some creative design work and substantial restructuring of teacher relationships and class schedules.

D Integrating Academic and Vocational Education

The integration of academic and vocational education is an education reform strategy conceptualized by vocational educators, supported by the business community, and articulated in federal legislation. It is vocational education's attempt to improve the educational and employment opportunities of students, all of whom will face new technologies and a workplace that demands high-level skills.

W. N. Grubb, et al.
The Cunning Hand, the Cultured Mind: Models for Integrating Vocational and Academic Education

One motivation for this reform is the dropout and illiteracy rates, along with employers' criticisms that schools are delivering workers who lack problem-solving abilities, higher-order thinking skills, and communication/employability skills — all crucial for work in a global economy. Vocational educators recognize that developing overly specific training and encouraging a dual structure segregates vocational and academic education. At the same time, academic education has been criticized for a curriculum that lacks opportunities for students to connect learning to "real world" events. The integration of vocational and academic education is a natural solution: modify two existing parts of the education system to form a new alliance that better prepares students for the future.

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High Schools That Work

G. Bottoms and A. Presson
Improving General and Vocational Education in the High Schools

A regional effort to integrate and improve high school education has been underway for more than a decade by the Southern Regional Education Board (SREB). SREB is a consortium of states that was formed to "develop, apply, evaluate, and advance approaches to strengthen students' basic competencies in communications, mathematics, and science, and their critical thinking and problem-solving abilities." SREB worked with vocational, government, and business leaders, high school graduates and teachers to analyze ways in which academic skills are used in the workplace. *Improving General and Vocational Education in the High Schools* presented two major recommendations for raising the academic and technological literacy of high school graduates:

- Students pursuing a vocational major should be required to complete a vigorous and coherent program combining academic and vocational study.

- Students in the general curriculum for whom the pursuit of a vocational major is inappropriate should be expected to complete an upgraded program requiring them to study one or more of the academic areas in depth.

The benefits of such integration efforts are that they can establish relationships among teachers from academic and vocational areas, enable schools to prepare students for clusters of related occupations with varied skill levels, initiate the alignment and sequencing of academic and vocational course content, and encourage the restructuring of curriculum and course sequences along the lines of clusters or career paths. Today, more than 475 schools in 21 states are involved in SREB's High Schools That Work effort.

Models of Integration

Various innovations and practices to integrate academic and vocational education have been initiated in schools across the United States . Several education researchers, including Grubb, et al., have identified different integration models. These models, in their many variations, suggest new ways for educators to think about integration and about practices that can best help them meet the challenges of reform. A brief description of the models, along with their respective benefits and limitations, is provided here.

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Fragmented multiple disciplines: the status quo. Many teachers have always made the appropriate connections between academic and vocational disciplines within their own classrooms. The problem with this model is that it is too fragmented to be effective; students who are not assigned to these teachers do not get the benefit.

Connected multiple disciplines: incorporating academics. This approach involves modifying vocational courses to include more academic content. Benefits include the potential to increase the academic capacities of students to meet the technical requirements of business; ease of adoption; limited additional expense; and less remediation. The presence of academic teachers within a vocational program highlights the importance of academic material. However, this model does not eliminate the segregation of vocational and academic courses, teachers, or students, nor does it affect academic or general tracks.

Nested multiple disciplines: occupational high schools and magnet schools. Occupational high schools have been relatively successful at integrating vocational and academic education, particularly where teachers keep in mind the goals of the school and the ambitions of the students. The benefits of having occupational high schools include the potential alignment of all courses with emphasis on specific occupational areas and opportunity for academic and vocational teachers to collaborate. Magnet schools are another example. They embrace an overall theme or career cluster around which all instruction is based. Although they involve students interested in specific occupational or subject areas, magnet schools do not always go far enough to fully integrate the curriculum.

Transposed multiples disciplines: applied academic courses. Potentially all students are targeted in this approach, which involves academic teachers in modifying courses or adopting new courses to include more vocational content (for example, adopting applied academics). Benefits of this model are that off-the-shelf curriculum materials are available and a coherent sequencing of courses is possible. Limitations are that the model changes academic courses but does not touch vocational programs, nor does it encourage cooperation between vocational and academic teachers.

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Interdisciplinary sequences: curricular alignment. This approach is designed to change the content of both vocational and academic courses and to consider the sequence of courses rather than viewing courses as individual and independent offerings. It requires cooperation between academic and vocational teachers and fosters team efforts. Benefits of this model are flexibility, low cost, and potential for coordinating existing teachers and courses rather than requiring new configurations. It is an attempt to create a coherent sequence of courses for students rather than modifying existing individual courses, which are independent of each other. Limitations are that it does not change the content of courses and is fragmented because of a lack of regular contact between vocational and academic teachers.

Interdisciplinary teaming: team teaching. This approach is similar to curricular alignment, with both vocational and academic instructors sequencing their courses. In contrast to providing separate courses, the teachers teach the combined curriculum as a team. This model is very flexible, low cost, and results in a well-connected curriculum. Limitations are that not all courses fit neatly together and that it requires close collaboration between vocational and academic teachers, which moves teachers out of their comfort zones.

Interdisciplinary webs: career clusters. Occupational clusters can be used by both comprehensive high schools and specialized vocational schools. Teachers usually belong to occupational clusters rather than conventional academic or vocational departments, thus facilitating collaboration. Benefits include the creation of coherent sequences of courses that encourage students to think about occupations early in their high school careers and the bringing together of students from different backgrounds and with varied ambitions. The paths to these career clusters offer opportunities for contact with potential employers and with educators at postsecondary institutions. A limitation of this model is that it requires a school with a well-developed vocational program which provides substantial offerings in each of the occupational clusters.

Interdisciplinary threads: career academies. In this school-within-a-school model, four teachers typically collaborate to team teach in math, English, science, and the vocational subject that is the core of the academy. Each

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group of students studies these subjects with the same team of teachers for two or three years in the academy and takes all other subjects in the regular high school. Benefits are sustained contact between teachers and students, smaller class size, teacher commitment to the academy model, and connections with businesses that are linked with the program. This model offers substantial opportunity for both horizontal and vertical alignment as teachers can coordinate the topics they teach and adjust the sequence of topics over time. Limitations are that students are frequently segregated in the same way evidenced through tracking, the process is costly, and it requires restructuring.

Interdisciplinary integration: courses and projects. This approach involves both academic and vocational teachers in organizing curriculum around student projects. Getting teachers to collaborate in developing new courses or modifying content is the primary benefit. Limitations are that the effects on integration may be small and the vocational content, nil.

Transdisciplinary immersion: work-based learning. In this model, the distinction between disciplines disappears. Learning through work-based experiences is a good example of learning in a discipline-free setting. The limitations of this model are the difficulties of locating good learning settings for all students and of planning experiences that will cover the curriculum. The benefits are that students see the direct application of skills and the purpose for learning.

E Multiple Intelligences

H. Gardner

Frames of Mind — The Theory of Multiple Intelligences

A theory of human intelligence developed by psychologist Howard Gardner suggests that there are at least seven distinct ways that different people have of "knowing" and understanding the world. Each of these is a distinct "intelligence" — a set of skills that allows the individual to find and resolve genuine problems facing him or her.

Gardner defines an intelligence as a set of competencies that:

- is somewhat autonomous from other human capacities
- has a core set of information-processing operations
- has a distinct developmental history (stages of development that everyone passes through)
- has plausible roots in evolutionary history
- can be encoded in a symbol system.

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The seven intelligences identified by Gardner (and he suggests the list may not be exhaustive) include:

1. **verbal-linguistic** — the ability to use words and language
2. **logical-mathematical** — the capacity for inductive and deductive thinking/reasoning, the use of numbers, and the recognition of abstract patterns
3. **visual-spatial** — the ability to visualize objects and spatial dimensions and to create internal images and pictures
4. **body-kinesthetic** — wisdom of the body; ability to control bodily motion
5. **musical-rhythmic** — the ability to recognize tonal patterns and sounds and a sensitivity to rhythms and beats
6. **interpersonal** — capacity for person-to-person communication and relationships
7. **intrapersonal** — inner states of being, self-reflection, metacognition, and awareness of spiritual realities.

Traditional instruction is heavily weighted in favor of verbal-linguistic and logical-mathematical intelligences. This theory would suggest a more balanced curriculum that incorporates the arts, self-awareness, communication, and physical education. Instructional methods should be expanded to appeal to all of the intelligences. Methods include role playing, music performance, cooperative learning, reflection, visualization, story telling, and hands-on learning. Assessment methods should take into account the diversity of intelligences, and self-assessment tools should be available to help students understand their intelligences.

Application instruction supports diverse learning styles. It is likely that many students will be more successful in understanding concepts when teaching methods are more compatible with the way they learn.

F Summary

There is a great deal of similarity between these various education initiatives and the Rigor/Relevance Framework (see Table IV). The initiatives consistently encourage instruction to be created within a rich context in which students can apply their knowledge and skills. Teachers are urged to seek out real-world applications to help students develop an understanding of the relevance of what they are

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learning. In addition, the focus is on planning instruction that centers on student learning rather than on teaching and disciplines.

Schools that are pursuing one of these initiatives will find the Rigor/Relevance Framework a good complement to the efforts underway. It is not necessary to scrap current work and staff development activities in favor of this new model. The Framework offers an additional tool to help teachers improve instruction and assessment and to help everyone better understand the direction in which this country must move its schools.

Table IV. Comparison of Rigor/Relevance Framework and Other Reform Models

	Rigor/ Relevance Framework	Dimensions of Learning	Brain-based Learning	Thematic Instruction	Integrate Vocational and Academic	Multiple Intelligences
Promotes student application	Yes	Yes	Yes	Yes	Yes	Often
Encourages real-world context	Yes	Often	Often	Often	Yes	Often
Emphasizes student learning over teaching disciplines	Yes	Yes	Yes	Yes	Sometimes	Yes

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V. Professional Development Workshops

A Introduction

Professional development is the key to achieving rigorous and relevant learning in the classroom. This **Resource Kit** contains everything needed to conduct staff development workshops of various lengths.

Workshop 1 – 90 minutes
Defining Rigorous and Relevant Curriculum
explains the need to change what and how we teach and introduces the Rigor/Relevance Framework and the Performance Planning Model.

Workshop 2 – 3 hours
Using the Rigor/Relevance Framework
includes all the content of Workshop 1 plus activities for teachers that give them experiences in using the Rigor/Relevance Framework.

Workshop 3 – 3 hours
Planning Rigorous and Relevant Instruction
offers presentations and activities that help teachers plan instruction using the Rigor/Relevance Framework; Workshop 2 is a prerequisite.

Workshop 4 – 3 days
Planning Rigorous and Relevant Instruction and Assessment
contains all the content of the first three workshops plus additional experiences in planning instruction and designing assessment.

This chapter contains:

- agendas for workshops
- speaking points based on the content of other chapters
- thumbnail versions of the visuals
- activities for teachers
- handouts

The workshop agendas are suggestions only; content and activities can be modified to create experiences of varying lengths.

Visuals
Hard copies of the overheads are in the plastic sleeve at the end of the binder. A PC-formatted computer disk (under the videotape) contains five Microsoft Powerpoint 4.0 files, which were prepared on a Macintosh computer. The files should open in either Windows or MacOS. **R_R_Print.ppt** includes black and white masters corresponding to the hard copies, which can easily be reprinted from this file. The other four files are color format visuals from which to print color transparencies or to display directly in a computer-based slide show. **R_Rwksp1.ppt, R_Rwksp2.ppt,** and **R_Rwksp3.ppt** are the recommended visuals for Workshops 1, 2, and 3, respectively. **R_Rsup.ppt** contains visuals unique to Workshop 4 and additional visuals.

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B Workshop Agendas

Workshop 1
90 Minutes

Defining Rigorous and Relevant Curriculum

Agenda

This orientation session introduces the Application Model and describes how the Rigor/Relevance Framework can be used to improve student achievement.

Presentation
10 minutes

Introduction
- Overview of agenda
- Distribute Handout 1

Presentation/Video
40 minutes

Vision of Instructional Changes
- Why the need to change - **Video #1**
- What's different about education reform in the 1990s
- Characteristics of successful schools
- Rigorous and relevant learning

Presentation
40 minutes

Rigor/Relevance Framework
- Introducing the Application Model and Knowledge Taxonomy
- Rigor/Relevance Framework as a tool for improving education
- Unique characteristics of the Rigor/Relevance Framework
- Research on international standards
- Research on testing and assessment
- Using the Knowledge Taxonomy, Application Model, and Rigor/Relevance Framework

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Workshop 2
3 Hours

Using the Rigor/Relevance Framework

Agenda

This workshop introduces the Application Model and the Rigor/Relevance Framework. Participants practice using the Application Model, Knowledge Taxonomy, and Rigor/ Relevance Framework. The workshop covers the content of Workshop 1 and is the prerequisite for Workshop 3.

Presentation
10 minutes

Introduction
- Overview of agenda
- Distribute Handouts 1 and 2

Presentation/Video
50 minutes

Vision of Instructional Change
- Why the need to change - **Video #1**
- What's different about education reform in the 1990s
- How Do You Learn ?- **Activity 2**
- What we mean by learner-centered instruction
- Application initiatives
- Characteristics of successful schools
- Rigorous and relevant learning

Presentation/Video
30 minutes

Rigor/Relevance Framework
- Introducing the Rigor/Relevance Framework - **Video #2**
- Rigor/Relevance Framework as a tool for improving education
- Research on international standards
- Research on testing and assessment
- Unique characteristics of the Rigor/Relevance Framework
- Uses of the Rigor/Relevance Framework

Presentation/Activities
90 minutes

Using the Rigor/Relevance Framework
- Application Model and Knowledge Taxonomy
- Determining Levels of Rigor and Relevance- **Activity 3**
- Setting the Level of Knowledge - **Activity 4**
- Setting the Level of Application - **Activity 5**
- Defining Real World - **Activity 6**

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Workshop 3
3 Hours

Planning Rigorous and Relevant Instruction

Agenda

This workshop introduces the concept of planning instruction based upon the Rigor/Relevance Framework. Participants practice several of the key elements of the performance planning process. Workshop 2 is a prerequisite for this workshop.

Presentation 10 minutes	**Introduction** • Overview of agenda • Distribute Handout 3
Presentation 10 minutes	**Why Application Instruction** • What the research shows
Presentation 30 minutes	**Performance Planning** • Curriculum planning process • Planning Steps and Key Questions • Developing instructional plans
Activities 70 minutes	**Performance Planning Activities** • Setting Levels of Student Skills and Performance - **Activity 8** • Knowledge Challenge - **Activity 12** • Application Challenge - **Activity 13**
Presentation/Group Sharing 30 minutes	**Assessment** • Performance assessment • Sharing ideas
Presentation 20 minutes	**Changing the Paradigm of Instruction** • What we can learn from other schools • Management of change process • Things that will drive changes in instruction

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Workshop 4
3 Days

Planning Rigorous and Relevant Instruction and Assessment

Agenda

This intensive workshop includes all topics on performance planning using the Rigor/Relevance Framework and covers performance assessment as well. Participants practice the key elements of performance planning and assessment.

— Day 1 —

Presentation/Activity
30 minutes

Introduction
- Overview of agenda
- Distribute Handouts 1, 2, and 3
- How Does It Feel To Be Learning? - **Activity 1**

Presentation/Videos/Activity
90 minutes

Vision of Instructional Change
- Why the need to change - **Videos #1** and **#3**
- What's different about education change in the 1990s
- How Do You Learn? - **Activity 2**
- What we mean by learner-centered instruction
- Application initiatives
- Characteristics of successful schools
- Rigorous and relevant education

Presentation/Video
30 minutes

Rigor/Relevance Framework
- Rigor/Relevance Framework as a tool for improving education - **Video #2**
- Unique characteristics of the Rigor/Relevance Framework
- Research on international standards
- Research on testing and assessment
- Using the Knowledge Taxonomy, Application Model, and Rigor/Relevance Framework

Presentation/Activities
150 minutes

Using the Rigor/Relevance Framework
- Knowledge Taxonomy verb list
- Application Model decision tree
- Determining Levels of Rigor and Relevance - **Activity 3**
- Setting the Level of Knowledge - **Activity 4**
- Setting the Level of Application - **Activity 5**
- Determining Levels of Test Questions - **Activity 11**
- Defining Real World - **Activity 6**

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— Day 2 —

Presentation
10 minutes

Why Application Instruction
- What the research shows
- Connections to other initiatives

Presentation
30 minutes

Performance Planning
- Curriculum planning process
- Planning steps and key questions
- Developing instructional plan

Presentation/Activities
90 minutes

Performance Planning Activities
- Suggestions for developing instructional plans
- Setting Levels of Student Knowledge and Performance - **Activity 8**
- Knowledge Challenge - **Activity 12**
- Application Challenge - **Activity 13**
- Identifying Community Resources - **Activity 7**

Activity/Group Sharing
150 minutes

Individual and/or Small Group Work
- Developing Instructional Plans - **Activity 10**
- Individuals share instructional plans

— Day 3 —

Presentation/Activity
60 minutes

Changing the Paradigm of Instruction
- What we can learn from other schools
- Management of change process
- Things that will drive changes in instruction
- Put It In Writing! - **Activity 15**

Presentation/Activity/Sharing
120 minutes

Assessment
- Fundamentals of good assessment
- Setting Clear Expectations: What Do You Want? - **Activity 9**
- Performance assessment
- Sharing ideas

Activity/Sharing
120 minutes

Individual and/or Small Group Work
- Developing Analytical Scoring Guides - **Activity 14**
- Individuals share performance assessment

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C Speaking Points

Workshop 1 90 minutes	Defining Rigorous and Relevant Curriculum

Introduction
10 minutes - Presentation

- **Overview of agenda**

  Review agenda for presentation

- **Distribute Handout 1** (3 pages)

  Inform participants that these are the key visuals that go with the presentation.

Note: *Viewing Video* #3, Education Reform — Defining the Problem*, is good preparation for conducting this session.*

Vision of Instructional Changes
40 minutes - Presentation/Video

- **Why the need to change**

  Show **Video #1** - Introducing Rigorous and Relevant Instruction - *6 minutes*

Why ??????

- **Accelerating technological change**
- **Global economic competition**
- **Mismatch of education expectations and reality**
- **Curriculum that doesn't meet student needs**

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Accelerating technological change
- One of the most powerful influences in society today is rapidly changing technology. Among other things, it is displacing jobs and changing skill requirements.
- We cannot predict all the new technologies that will be part of our daily lives in the future.
- In order to adapt to and use these technologies, students will need higher levels of problem-solving skills.

Share with the audience or have them brainstorm new technologies and their effects on skills and jobs. Some examples: computer dictation systems, virtual reality, the Internet, distance learning, genetic engineering/cloning.

Suggested trainer videotape resource: Technology — Its Next Move and the Implications*, available from the International Center*

Global economic competition
- Fueled by new technologies, many nations around the world are producing products and services in competition with the United States.
- We can maintain our standard of living only if we have the skills in our work force to produce goods and services that have high value on the world market.

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- We cannot compete with other nations by lowering wages or working longer hours. We must work smarter in a rapidly changing world.

Mismatch of educational expectations/underemployed college graduates
- Most people recognize the value of an education, however, too often we express that value in terms of degrees and diplomas. These pieces of paper do not always equal the skills and knowledge necessary for success.
- There has been a tremendous increase in the number of college graduates. This rapidly growing population of graduates accepted the premise that a college degree would guarantee success. Yet, we all know a recent college graduate who is unemployed or underemployed, even while unemployment is at a record low nationwide.
- This phenomenon points out that it is not the college degree itself but the specific skills and knowledge that make a person more employable.
- The general perception that college preparation alone will lead to success does not match the current reality. The goal should be for students to accumulate the skills and knowledge they need for life, not just diplomas and degrees.

Curriculum that doesn't meet student needs
- Most students, particularly at the high school level, endure instruction that is mind numbing rather than mind expanding.
- Surveys of students who drop out of school consistently show that the reason for their departure is not a lack of intellectual capacity; rather it is that they see no connection between what they are learning in school and their world.
- The traditional curriculum includes too many academic exercises and not enough real-world problems to which students must apply their knowledge.
- Another way that the curriculum isn't meeting the needs of students is in the lack of connection between courses and grade levels. In high school especially, rarely is there any connection between what a student does first period and second period. This lack of coordination interferes with students applying skills across the curriculum and allows few opportunities for them to integrate their use of knowledge.
- Since the curriculum is so content-laden, the objective of most instruction is to cover the material. As long as a

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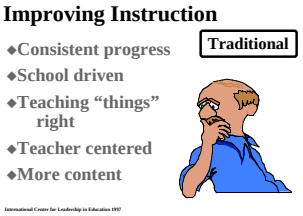
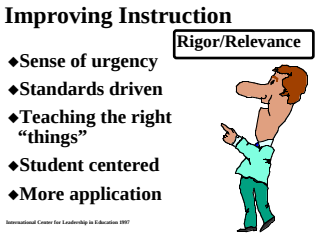
student passes a test, which typically emphasizes recall of knowledge, we assume that learning has occurred.
- This curriculum, with its lack of coordination and absence of application, could be called the "teach it, test it, lose it" curriculum.
- Real learning is measured by being able to use knowledge, not just accumulate it.

- **What's different about education reform in the 1990s**

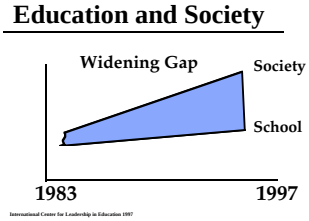
Different problems, higher stakes
- We have always tried to improve schools, however the problems are different today, and the stakes are higher.
- Traditionally, we were satisfied if our schools were making consistent progress.
- Changes were school driven, and we relied on teachers to use their expertise to set the expectations for what students should learn.
- Much of our school improvement effort was focused on the teacher. If teachers taught better, better learning would result.
- There was great emphasis on teaching things correctly, on doing things the right way in the classroom.
- To raise standards, we increased the amount of content that students were expected to learn.



Sense of urgency
- Today there is a greater sense of urgency in school reform. We can no longer be content with the consistent progress of the past. Initiatives to move to a curriculum that is more rigorous and relevant have different characteristics from traditional efforts to improve instruction.



The gap
- One reason for the sense of urgency is the widening gap between schools and society.
- Despite public perceptions to the contrary, schools are better today than at any other point in our history.
- What's more, this progress has been made even though there are a greater number of families in crisis. Widespread poverty and family disruptions interfere with children's learning and erode support of schools.
- So schools do continue to make progress, but it is much slower than the pace of technological change in the rest of society.



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- Unless we adopt a sense of urgency, schools will continue to prepare students for a world that existed decades ago.

How should we measure success in learning????

- **Comparing to expectations not other students**
- **Using external not internal standards**
- **Challenging not sorting students**

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A focus on standards
- Another hallmark of the current school improvement effort is the focus on standards.
- Standards set by individual teachers can no longer be the measure of student achievement.
- Instead, student success will be measured by a consistent set of high standards that are external to the school.
- All students should have the opportunity to engage in challenging learning and to have their achievement judged against these standards.

Skills of the Future

New Basics
- **Creative Thinking**
- **Technical Reading/Writing, Speaking & Listening**
- **Analysis, Problem Solving**
- **Inquiry, Technology**
- **Computer Applications**
- **Adaptation, Improvement**

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Teaching the right skills
- While there are clearly defined good practices that result in good instruction, more of the discussion needs to shift to determining what are the right skills to be teaching in school.
- Some of the skills we emphasized in the past are less important today. Powerful and inexpensive calculators have changed essential math skills. Working in teams means speaking and listening skills have become more important than ever.
- The rapid changes in information technology make skills like knowing how to use the card catalogue in the library obsolete.
- Teachers and other members of the community need to engage in thoughtful discussion of what are the most important skills of the future.
- For example, as technology takes over organizational skills and logical thinking for us, perhaps a more important skill to emphasize in learning is creative thinking as a way to solve problems. This is something humans can do much better than even the most powerful computers. However, most of our current instruction emphasizes sequential thinking over creative problem solving.

Learner-Centered Characteristics

- **Students actively engaged**
- **Clear expectations**
- **Thinking curriculum**
- **Constructing knowledge based on experience**
- **Learning at different rates and in different ways**
- **Assessment a natural event**

Focusing on learning rather than teaching
- These are some of the characteristics that we need to seek in developing challenging instruction that focuses more on how well students are learning than on how well teachers are teaching.

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students actively engaged
clear expectations
thinking curriculum
constructing knowledge based on experience
learning at different rates and in different ways
assessment as a natural event

Application Initiatives

- **School-to-work**
- **Contextual-based mathematics and science**
- **Reading in content areas**
- **Performance assessment**
- **Alternative schools**

Application initiatives
- A growing number of education initiatives are emphasizing raising standards by adding more application rather than by increasing content.
- The United States already has the highest content standards in the world. However, a frequent criticism is that our students cannot apply what they have learned.
- Some of the most common application initiatives are the following:

School-to-work. The interest in school-to-work or school-to-career signals the importance of developing skills and knowledge for future employment. This is not about the technical skills needed for the workplace but about how academic skills can be taught so that they can be applied effectively in the workplace.

Contextual-based math and science. New national standards and curriculum initiatives call for teaching math and science in context for better results — application by another name.

Reading in content areas. English literacy is fundamentally important. Success in getting all students to read effectively requires exposure to nonfiction works, using reading material that is real world and of direct use in other instruction.

Performance assessment. Student assessments that are more performance based and real world are being developed because they are a more accurate way to measure student learning. This is another form of application learning.

Alternative schools. A number of students are achieving success through alternative schools. These schools follow many of the characteristics of learner-centered instruction and use application of subject matter and work-based learning to enable students to achieve higher standards. Districts are reducing dropout rates and serving more students with alternative schools.

Characteristics of Successful Schools

- ✔**Rigorous and relevant curriculum**
- ✔**Assess knowledge and application**
- ✔**Address student behavior**
- ✔**Willing to change organization**

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- **Characteristics of successful schools**

- Many schools have made significant progress in developing rigorous and relevant learning by paying attention

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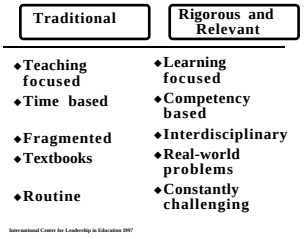
to these four characteristics: a rigorous and relevant curriculum, assessment of knowledge and application, a focus on student behavior, and a willingness to change the way schools are structured.

1. Rigorous and relevant curriculum
- These schools emphasize high level, academically challenging work for all students.
- They give students opportunities to use their knowledge and skills in real-world applications.
2. Assessment of knowledge and applications
- Successful schools have a comprehensive evaluation system that assesses both the acquisition of knowledge and the ability to use that knowledge. Teachers use performance tasks to see how well students can apply what they have learned.
3. Address issues of student behavior
- These schools have a climate that promotes learning. Distractions are kept to a minimum and students are free of threats of violence or verbal abuse.
- The school works with parents to develop guiding principles by which the school operates, so that students develop the personal qualities needed for success.
4. Willing to change the organization
- Although schools are deeply entrenched institutions, governed by laws, regulations, and contracts, successful schools have staffs that are willing to change. The reason why many reform efforts have failed in the past is because the adults in the system were unwilling to change.
- We cannot maintain the status quo and make significant change at the same time.
- Individuals need to make a personal commitment to change, or none of the good ideas for improving school will get very far.



- **Rigorous and relevant learning**

- Rigorous and relevant instruction differs from traditional instruction in several ways.

Learner focused. Attention is concentrated on the degree to which students are learning rather than on whether the teacher is covering the material or presenting it well.

Competency based. The focus is on standards and the flexibility to give students time to achieve those standards. The traditional perspective holds time fixed, resulting in students achieving at different levels.

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Interdisciplinary. Instruction and activities use knowledge and skills from more than one discipline, which mirrors the way we do things in life. The traditional curriculum separates the disciplines and therefore fragments instruction.

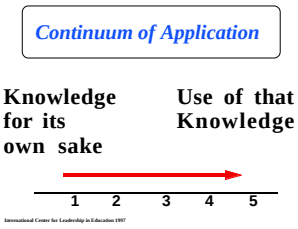
Real-world problems. Students use real-world problems as the focus of their learning rather than textbooks.

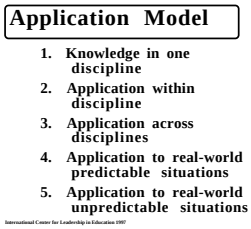
Constantly challenging. Learning is varied and engaging to the student instead of a routine format of lectures.

Note: *For more in-depth coverage of the Rigor/ Relevance Framework, see Chapter II.*

Rigor/Relevance Framework
40 minutes - Presentation

- **Introducing the Application Model and the Knowledge Taxonomy**

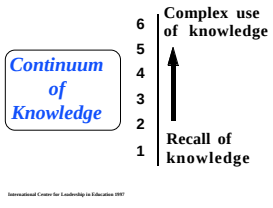




- The Application Model is based on the premise that there is a continuum from knowledge for its own sake to using knowledge to solve real-world unpredictable problems.

The Application Model has five levels.
Level 1 - Knowledge in a discipline.
Students understand and recall knowledge related to a school subject.
Level 2 - Application in a discipline.
Students can solve problems and use skills and knowledge in activities directly related to a discipline.
Level 3 - Application across disciplines.
Students can solve problems and use skills and knowledge in activities that include more than one discipline.
Level 4 -Application in real-world predictable situations.
Students make practical application of their knowledge and skills in situations where the results can be anticipated.
Level 5 -Application in real-world unpredictable situations.
Students make practical application of their knowledge and skills in situations where the likely result is not known and cannot be anticipated.

Note: *If time permits, review several examples of skill statements at each level of the Application Model from Handout 9.*



- The Knowledge Taxonomy, often called Bloom's Taxonomy, has been used in the United States for decades and is familiar to many teachers. This taxonomy can be shown on a continuum as well, from the lowest level of recall of knowledge to the highest level of complex use of knowledge.

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Knowledge Taxonomy

1. Awareness
2. Comprehension
3. Application
4. Analysis
5. Synthesis
6. Evaluation

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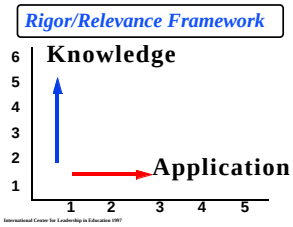
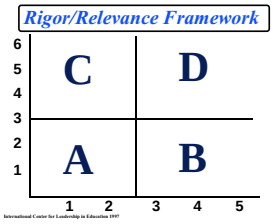
The Knowledge Taxonomy has six levels.

Level 1 - Awareness
Level 2 - Comprehension
Level 3 - Application
Level 4 - Analysis
Level 5 - Synthesis
Level 6 - Evaluation

- **Rigor/Relevance Framework as a tool for improving education**

- The Application Model is combined with the Knowledge Taxonomy to form the Rigor/Relevance Framework.
- This Framework was developed by the International Center for Leadership in Education to help districts in their school reform efforts





The Framework can be divided into four quadrants.
Quadrant A is low-level application and low-level knowledge.
Quadrant B is high-level application and low-level knowledge.
Quadrant C is low-level application and high-level knowledge.
Quadrant A is high-level application and high-level knowledge.

- **Unique characteristics of the Rigor/Relevance Framework**

Unique Characteristics

- Fresh approach to setting higher standards
- Bridge between public and schools
- Simple and easy to understand
- Explains differences in international performance
- Framework for curriculum, instruction and assessment

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- The Rigor/Relevance Framework can be used for developing curriculum, instruction, and assessment.
- It's a fresh approach to setting higher standards.
- The Framework is a bridge between educators and the public because it's easy for parents and business to understand.
- It can be used to explain differences in performance of students from the United States and other countries on international tests.

- **Research on international standards**

Note: *For more information on the international studies, see Chapter II.*

- One of the first uses of the Rigor/Relevance Framework was in a research study that compared curriculum objectives in 10 countries.
- Each curriculum objective was evaluated as to its

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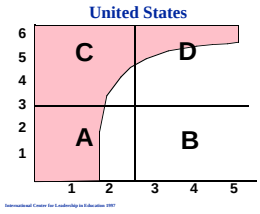
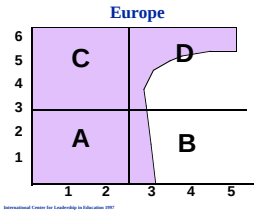
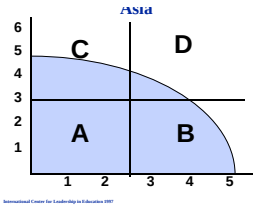
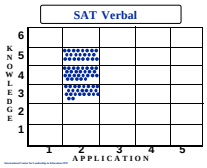


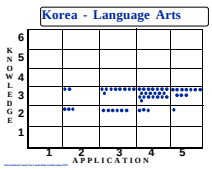


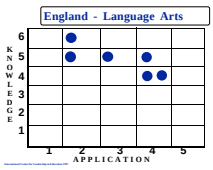


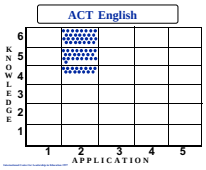
level of application and knowledge, and a point was plotted on the Framework. After hundreds of points were plotted, the area was shaded in.
- The analysis for the United States was based on the curriculum from a sampling of large and small states, because we have no national curriculum.
- The concentration of objectives shows many requiring complex cognitive use of knowledge, but very little application.
- Only a few advanced courses had real-world application, and these also required high levels of cognitive knowledge.
- European curricula showed a similar pattern to the U.S. but with some more application.
- The Asian curricula showed the greatest contrast. There was a great deal more application but not the emphasis on the upper levels of the Knowledge Taxonomy.
- The study made no judgment on which curricular approach was better, but the information helps us understand differences among nations.

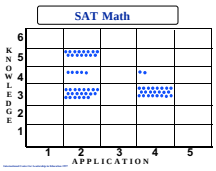
- **Research on testing and assessment**











- A second major research study conducted by the International Center using the Rigor/Relevance Framework looked at assessments in this country and abroad. The same procedure was used to plot test questions. Each dot on the Framework represents a test question.
- The SAT Verbal showed a concentration of high-level knowledge questions with no real-world application.
- The ACT English showed a higher level of knowledge than the SAT but still no application.
- The Korean test of language skills is consistent with the Asian model for standards. It has much more real-world application than the other tests.
- The language arts test from England was one of the best from the standpoints of both rigor and relevance. The test had very few questions, but they all required complex thinking, and several had high degrees of real-world application.
- The SAT math also had some real-world applications.

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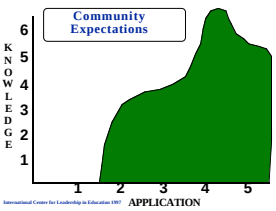
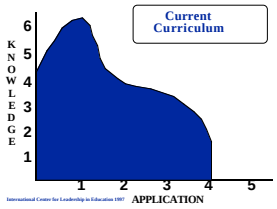




- **Using the Knowledge Taxonomy, Application Model, and Rigor/Relevance Framework**

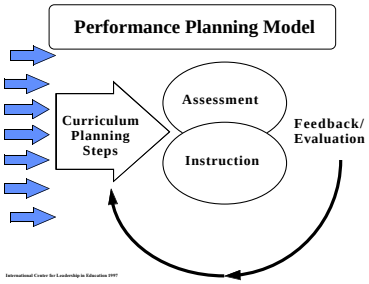
Management of change process
- Moving beyond research, the International Center has put the Rigor/Relevance Framework to work as part of its management of change process for schools. One step in this change process is to collect detailed information from the community as to what they expect a high school graduate to know and be able to do. This information is then compared to the current curriculum. The Rigor/ Relevance Framework is perfect for this analysis.
- Here are the results of a community survey, which shows that the public expects students to know how to use their knowledge in real-world situations.
- The current curriculum stood in sharp contrast to the community expectations. This gap led to considerable discussion among community and education leaders and resulted in an ambitious plan for significant change in the school districts involved.

Planning Instruction
- The other use of the Framework is the focus of this presentation. The Framework can be used in planning instruction and assessment in order to achieve the level of rigor and relevance we desire for our students.
- To achieve rigorous and relevant instruction, teachers need to refocus the way they plan instruction and design assessment.
- Traditional instructional planning implies a linear process.

First, there is curriculum — What will be taught
Second, there is instruction — How will it be taught
Third comes assessment — How well was it learned

- The Performance Planning Model is a different approach which can assist you in focusing on what students are learning and on developing more rigorous and relevant instruction.
- The Performance Planning Model is based on the assumption that instruction and assessment overlap. As we develop more assessments in a performance mode, it is appropriate, if not essential, to make our assessment of students at the same time that they are engaged in the instructional activity. This integrated vision of instruction and assessment is the core of the model.

Traditional Planning



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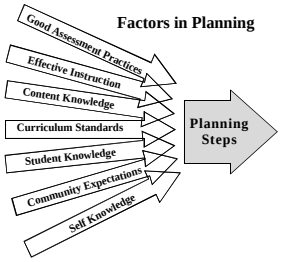
- Preparing for instruction and assessment involves a process of curriculum planning, which consists of several steps that must occur in a specified order.
- The arrows leading into the curriculum planning steps represent the several factors that must be taken into consideration in order to plan high-quality instruction.
- The final part of the model is feedback and evaluation. Instruction and assessment are never perfect, particularly when you are taking risks to move to higher levels of rigor and relevance. Continual feedback and evaluation are essential for continuous improvement.



Curricular Planning Factors
- Several factors are involved in making thoughtful decisions about instruction and assessment.
  - Curriculum standards
  - Content knowledge
  - Community expectations
  - Student knowledge
  - Teacher self-knowledge
  - Assessment practices
  - Effective instructional strategies

Curriculum standards. Standards drive education today. Teachers must align instruction with district, state, and sometimes national standards. Even the most challenging or interesting instruction is not appropriate unless it is consistent with standards. So one of the primary factors to consider in good planning is curriculum standards.

Content knowledge. Teachers must know their subjects well. A key component of good planning is applying content knowledge to the topic or theme. Although there are many resources to supplement content knowledge, teachers must rely on their personal knowledge, particularly when instruction involves real-world observations and problems.

Community expectations. Community expectations are an important consideration. No aspect of the curriculum activity will long exist if it strays far from community values and expectations. Across the country there have been many stories of conflict between school and community. When these conflicts arise, the objective of helping students to learn is often lost in the shuffle. It is far more productive to maintain close communication between the school and community in order to anticipate topics of disagreement before they turn into conflicts. Preventing a problem is far better than trying to correct one.

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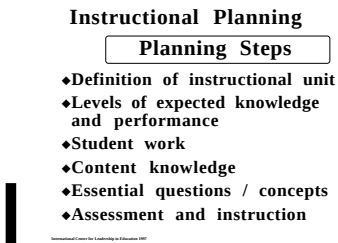
Student knowledge. Good instruction depends on knowing the students. What's their current skill level? What previous knowledge do they have? What are their preferred learning styles? What aspect of their current experience relates to this instructional theme? The answers to these questions help teachers to plan connections when introducing a learning experience to students.

Teacher self-knowledge. Teachers should use their strengths in tackling an instructional topic. Some teachers are better at individual coaching, some are entertaining storytellers, some are skilled in the use of instructional technology. Not all instruction needs to be taught in the same way. Take into consideration your own strengths and weaknesses in planning instruction.

Assessment practices. While there are some innovations taking place in assessment today, the basic principles of good assessment must still be followed. Assessment must be valid and related directly to what's being taught. Rewarding a student for an outstanding science project because it was artistically presented is not a valid assessment. Assessments also need to be fair and reliable, meaning that all students with the same level of skill or knowledge will receive the same rating. Beyond these basic principles, teachers should feel free to expand their knowledge of innovative assessment practices and to develop tests that measure student performance, not just recall.

Effective instructional strategies. Just as there is innovation in assessment practices, so too is there innovation in instructional strategies. Teachers should consider the many forms of teaching and select those which best relate to a given topic or theme. The traditional "chalk and talk" and "textbook and worksheet" still have their place, but effective instruction includes many diverse strategies that engage students more actively in learning. Use of instructional technology is an example. It provides students with expanded tools for communication, research, design, and presentation.



Planning Steps

- There are six planning steps that set the stage for moving to rigorous and relevant instruction. They should be followed in order.

1. Define instructional unit/curriculum connections
2. Levels of expected knowledge and performance

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3. Student work
4. Content knowledge
5. Essential questions/concepts
6. Assessment and instruction

Definition of instructional unit. This step requires a definition of the instructional course, age of students, length of time, themes, and connections to other learning and to district or state standards.

Levels of expected knowledge and performance. This is the step that uses the Rigor/Relevance Framework. It focuses attention on what the students will be learning. In answer to the question, "What are the students expected to know and be able to do?, this step should delineate 6 to 12 clear performance statements. Each of these statements is then applied to the Rigor/Relevance Framework to determine the level at which students must demonstrate their performance, both in terms of rigor — that is, knowledge — and relevance — or application. These expectations set the goals that must be followed later in planning.

Student work. This is an essential step that comes prior to identifying content. The question to ask is: What will be the major observable pieces of work in which students will engage? Thinking carefully about this should lead to better and clearer performance tasks and other activities that will engage students actively in learning.

Content knowledge. Content should be delineated after deciding on the student work and the expected skills and knowledge that students will gain. Content should be defined by what is required to achieve the objectives and not just by what happens to be in a textbook.

Essential questions/concepts. This step involves listing important questions that will lead students into a particular lesson. Questions are a powerful way to stimulate thinking, and the right questions at the beginning of a lesson can be very engaging. Also part of this step is to define any overarching concepts or "big ideas" that are to be developed as part of this instruction.

Assessment and instruction. This is the heart of the instructional plan, the instructional activities and assessments in which students will engage. The selection of these two central components will be much better if the other planning steps are completed prior to this one.

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Summary
- We need to make changes in schools to better prepare all students for the complex and ever-changing future that lies ahead of them.
- We must examine our curriculum to ensure that we are teaching the skills that will be important.
- Our goal for all students must be high levels of rigor as well as relevance.
- The best way to ensure that student have high levels of skills is through greater application.
- The Rigor/Relevance Framework provides a tool for reflecting on curriculum.
- The Performance Planning Model is a way of looking at instruction and assessment that places greater emphasis on what students are learning.

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Workshop 2
3 hours

Using the Rigor/Relevance Framework

Introduction
10 minutes - Presentation

- **Overview of agenda**

  Review agenda for presentation

- **Distribute Handouts 1 and 2** (5 pages)

  Inform participants that these are some of the visuals that go with the presentation.

Note: *Viewing Video* #3, Education Reform — Defining the Problem*, is good preparation for conducting this session.*

Vision of Instructional Change
50 minutes - Presentation/Video/Activity

Why ??????

- **Accelerating technological change**
- **Global economic competition**
- **Mismatch of education expectations and reality**
- **Curriculum that doesn't meet student needs**

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- **Why the need to change**

  Show **Video #1** - Introducing Rigorous and Relevant Instruction - *6 minutes*

Suggested trainer videotape resource: Technology — Its Next Move and the Implications*, available from the International Center.*

Accelerating technological change
- One of the most powerful influences in society today is rapidly changing technology. Among other things, it is displacing jobs and changing skill requirements.
- We cannot predict all the new technologies that will be part of our daily lives in the future.
- In order to adapt to and use these technologies, students will need higher levels of problem-solving skills.

Share with the audience or have them brainstorm new technologies and their effects on skills and jobs. Some examples: computer dictation systems, virtual reality, the Internet, distance learning, genetic engineering/cloning.

Global economic competition
- Fueled by new technologies, many nations around the world are producing products and services in competition with the United States.
- We can maintain our standard of living only if we have the skills in our work force to produce goods and services that have high value on the world market.
- We cannot compete with other nations by lowering wages or working longer hours. We must work smarter in a rapidly changing world.

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Mismatch of educational expectations/underemployed college graduates

- Most people recognize the value of an education, however, too often we express that value in terms of degrees and diplomas. These pieces of paper do not always equal the skills and knowledge necessary for success.
- There has been a tremendous increase in the number of college graduates. This rapidly growing population of graduates accepted the premise that a college degree would guarantee success. Yet, we all know a recent college graduate who is unemployed or underemployed, even while unemployment is at a record low nationwide.
- This phenomenon points out that it is not the college degree itself but the specific skills and knowledge that make a person more employable.
- The general perception that college preparation alone will lead to success does not match the current reality. The goal should be for students to accumulate the skills and knowledge they need for life, not just diplomas and degrees.

Curriculum that doesn't meet student needs

- Most students, particularly at the high school level, endure instruction that is mind numbing rather than mind expanding.
- Surveys of students who drop out of school consistently show that the reason for their departure is not a lack of intellectual capacity; rather it is that they see no connection between what they are learning in school and their world.
- The traditional curriculum includes too many academic exercises and not enough real-world problems to which students must apply their knowledge.
- Another way that the curriculum isn't meeting the needs of students is in the lack of connection between courses and grade levels. In high school especially, rarely is there any connection between what a student does first period and second period. This lack of coordination interferes with students applying skills across the curriculum and allows few opportunities for them to integrate their use of knowledge.
- Since the curriculum is so content-laden, the objective of most instruction is to cover the material. As long as a student passes a test, which typically emphasizes recall of knowledge, we assume that learning has occurred.
- This curriculum, with its lack of coordination and

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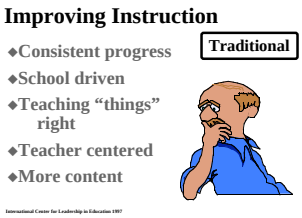
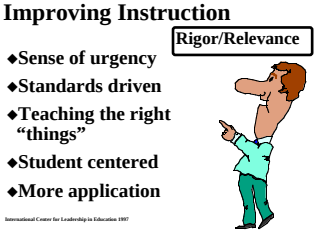
absence of application, could be called the "teach it, test it, lose it" curriculum.
- Real learning is measured by being able to use knowledge, not just accumulate it.

- **What's different about education reform in the 1990s**

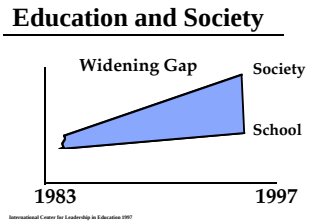
Different problems, higher stakes
- We have always tried to improve schools; however, the problems are different today, and the stakes are higher.
- Traditionally, we were satisfied if our schools were making consistent progress.
- Changes were school driven, and we relied on teachers to use their expertise to set the expectations for what students should learn.
- Much of our school improvement effort was focused on the teacher. If teachers taught better, better learning would result.
- There was great emphasis on teaching things correctly, on doing things the right way in the classroom.
- To raise standards, we increased the amount of content that students were expected to learn.



Sense of urgency
- Today there is a greater sense of urgency in school reform. We can no longer be content with the consistent progress of the past. Efforts to move to a curriculum that is more rigorous and relevant have different characteristics from traditional efforts to improve instruction.



The gap
- One reason for the sense of urgency is the widening gap between schools and society.
- Despite public perceptions to the contrary, schools are better today than at any other point in our history.
- What's more, this progress has been made even though there are a greater number of families in crisis. Widespread poverty and family disruptions interfere with children's learning and erode support of schools.
- So schools do continue to make progress, but it is much slower than the pace of technological change in the rest of society.
- Unless we adopt a sense of urgency, schools will continue to prepare students for a world that existed decades ago.



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How should we measure success in learning????

- **Comparing to <u>expectations</u> not other students**
- **Using <u>external</u> not internal standards**
- **<u>Challenging</u> not sorting students**

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A focus on standards
- Another hallmark of the current school improvement effort is the focus on standards.
- Standards set by individual teachers can no longer be the measure of student achievement.
- Instead, student success will be measured by a consistent set of high standards that are external to the school.
- All students should have the opportunity to engage in challenging learning and to have their achievement judged against these standards.

Skills of the Future

New Basics

- **Creative Thinking**
- **Technical Reading/Writing, Speaking & Listening**
- **Analysis, Problem Solving**
- **Inquiry, Technology**
- **Computer Applications**
- **Adaptation, Improvement**

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Teaching the right skills
- While there are clearly defined good practices that result in good instruction, more of the discussion needs to shift to determining what are the right skills to be teaching in school.
- Some of the skills we emphasized in the past are less important today. Powerful and inexpensive calculators have changed essential math skills. Working in teams means speaking and listening skills have become more important than ever.
- The rapid changes in information technology make skills like knowing how to use the card catalogue in the library obsolete.
- Teachers and other members of the community need to engage in thoughtful discussion of what are the most important skills of the future.
- For example, as technology takes over organizational skills and logical thinking for us, perhaps a more important skill to emphasize in learning is creative thinking as a way to solve problems. This is something humans can do much better than even the most powerful computers. However, much of our current instruction emphasizes sequential thinking over creative problem solving.

Focusing on learning rather than teaching
- The time has come for schools to focus more on how well students are learning than on how well teachers are teaching, which is a change from the traditional approach to education in this country.

- **How Do You Learn? - Activity 2**
  5-8 minutes

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Learner-Centered Characteristics

- Students actively engaged
- Clear expectations
- Thinking curriculum
- Constructing knowledge based on experience
- Learning at different rates and in different ways
- Assessment a natural event

- **What we mean by learner-centered instruction**

Students are actively engaged
- Students sitting passively in a classroom may or may not be learning. The best way to gauge whether students are learning is by the degree to which they are engaged in a task.
- If students can describe the activity and show interest in it and commitment to it, they are likely to be learning in a lasting and meaningful way.

Expectations are clear
- In addition to being engaged in their work, students need to be focused on the goal. Better learning takes place and students are more motivated when they understand what is expected.
- Expectations can take many forms, such as performance standards at an outstanding level for a piece of work, a list of facts to memorize, or the list of criteria on which they will be assessed.

The curriculum is a thinking curriculum
- Learning activities should not only engage students, but also challenge them to think. They should be required to make connections between information and to use previous knowledge.
- Asking students to express information in their own terms or to write responses to questions forces them to think more deeply and clearly, thus leading to more learning.

Knowledge is constructed based on experience
- The research on how the brain learns reinforces the notion that students will retain ideas longer when they construct them from their own observations, discovery, or conclusions. Learning should create as many opportunities as possible for students to construct their knowledge so they will retain it better.

Activities accommodate the differences in the way students learn
- Students learn at different rates and in different ways. Learning activities are more effective when they give students opportunities to learn at their pace and through the types of activities they are more comfortable with.

Assessment is a natural event
- Assessment should not be an anxiety-laden event which attempts to rank or sort students based on how well they have memorized the material. Assessment

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should be an opportunity for students to demonstrate naturally what they have learned at the time they have learned it.
- If the curriculum builds on previous knowledge and has appropriate connections, there will always be some built-in assessment of knowledge gained over time.

- **Application initiatives**

Application Initiatives

- **School-to-work**
- **Contextual-based mathematics and science**
- **Reading in content areas**
- **Performance assessment**
- **Alternative schools**

- A growing number of education initiatives are emphasizing raising standards by adding more application rather than by increasing content.
- The United States already has the highest content standards in the world. However, a frequent criticism is that our students cannot apply what they have learned. Some of the most common application initiatives are:

School-to-work. The interest in school-to-work or school-to-career signals the importance of developing skills and knowledge for future employment. This is not about the technical skills needed for the workplace but about how academic skills can be taught so that they can be applied effectively in the workplace.

Contextual-based math and science. New national standards and curriculum initiatives call for teaching math and science in context for better results — application by another name.

Reading in content areas. English literacy is fundamentally important. Success in getting all students to read effectively requires exposure to nonfiction works, using reading material that is real world and of direct use in other instruction.

Performance assessment. Student assessments that are more performance based and real world are being developed because they are a more accurate way to measure student learning. This is another form of application learning.

Alternative schools. A number of students are achieving success through alternative schools. These schools follow many of the characteristics of learner-centered instruction and use application of subject matter and work-based learning to enable students to achieve higher standards. Districts are reducing dropout rates and serving more students with alternative schools.

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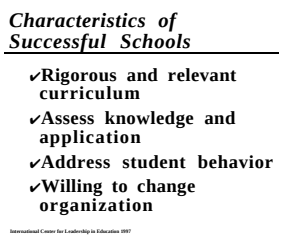
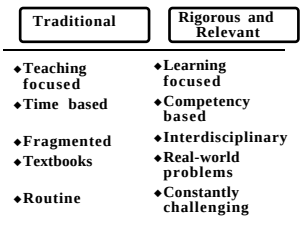


- **Characteristics of successful schools**

- Many schools have made significant progress in developing rigorous and relevant learning by paying attention to these four characteristics *(on overhead)*.
1. Rigorous and relevant curriculum
- These schools emphasize high level, academically challenging work for all students.
- They give students opportunities to use their knowledge and sills in real-world applications.
2. Assessment of knowledge and applications
- Successful schools have a comprehensive evaluation system that assesses both the acquisition of knowledge and the ability to use that knowledge.
- Teachers use performance tasks to see how well students can apply what they have learned.
3. Address issues of student behavior
- These schools have a climate that promotes learning. Distractions are kept to a minimum and students are free of threats of violence or verbal abuse.
- The school works with parents to develop guiding principles by which the school operates, so that students develop the personal qualities needed for success.
4. Willing to change the organization
- Although schools are deeply entrenched institutions, governed by laws, regulations, and contracts, successful schools have staffs that are willing to change. The reason why many reform efforts of the past have failed is because the adults in the system were unwilling to change.
- We cannot maintain the status quo and make significant change at the same time.
- Individuals need to make a personal commitment to change, or none of the good ideas for improving school will get very far.



- **Rigorous and relevant learning**

- Rigorous and relevant instruction differs from traditional instruction in several ways.

Learner focused. Attention is concentrated on the degree to which students are learning rather than on whether the teacher is covering the material or presenting it well.

Competency based. The focus is on standards and the flexibility to give students time to achieve those

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standards. The traditional perspective holds time fixed, resulting in students achieving at different levels.

Interdisciplinary. Instruction and activities use knowledge and skills from more than one discipline, which mirrors the way we do things in life. The traditional curriculum separates the disciplines and thereby fragments learning.

Real-world problems. Students use real-world problems as the focus of their learning rather than textbooks.

Constantly challenging. Learning is varied and engaging to the student instead of a routine format of lectures.

Note: *For more in-depth coverage of the Rigor/ Relevance Framework, see Chapter II.*

Rigor/Relevance Framework

30 minutes — Presentation/Video

- **Introducing the Rigor/Relevant Framework**

Show **Video #2 –** Rigor/Relevance Framework *(27 minutes) to provide an introduction to the Application Model, Knowledge Taxonomy, and Framework. It will cover the following points:*
- explanation of the Application Model and Knowledge Taxonomy
- Rigor / Relevance Framework as a tool for improving education
- research on international standards
- research on testing and assessment

- **Unique characteristics of the Rigor/Relevance Framework**

Unique Characteristics

- **Fresh approach to setting higher standards**
- **Bridge between public and schools**
- **Simple and easy to understand**
- **Explains differences in international performance**
- **Framework for curriculum, instruction and assessment**

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- The Rigor/Relevance Framework can be used for developing curriculum, instruction, and assessment.
- It's a fresh approach to setting higher standards.
- The Framework is a bridge between educators and the public because it's easy for parents and business to understand.
- It can be used to explain differences in performance of students from the United States and other countries on international tests.

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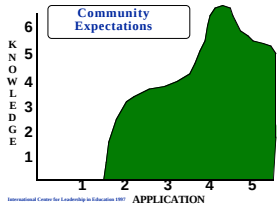
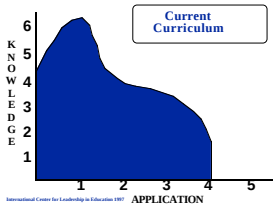




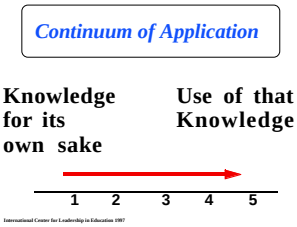
- **Other Uses of the Rigor/Relevance Framework**

Management of change process
- Moving beyond research, the International Center has put the Rigor/Relevance Framework to work as part of its management of change process for schools. One step in this change process is to collect detailed information from the community as to what they expect a high school graduate to know and be able to do. This information is then compared to the current curriculum. The Rigor/ Relevance Framework is perfect for this analysis.
- Let's look again at the results of the community survey, which shows that the public expects students to know how to use their knowledge in real-world situations.
- The current curriculum stood in sharp contrast to the community expectations. This gap led to considerable discussion among community and education leaders and resulted in an ambitious plan for significant change in the school districts involved.

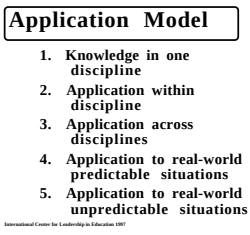
Using the Rigor/Relevance Framework

90 minutes — Presentation/Activities

- **Application Model and Knowledge Taxonomy**



- The Application Model is based on the premise that there is a continuum from knowledge for its own sake to using knowledge to solve real-world unpredictable problems.



The Application Model has five levels.
Level 1 - Knowledge in a discipline.
Students understand and recall knowledge related to a school subject.
Level 2 - Application in a discipline.
Students can solve problems and use skills and knowledge in activities directly related to a discipline.
Level 3 - Application across disciplines.
Students can solve problems and use skills and knowledge in activities that include more than one discipline.
Level 4 -Application in real-world predictable situations.
Students make practical application of their knowledge and skills in situations where the results can be anticipated.
Level 5 -Application in real-world unpredictable situations.

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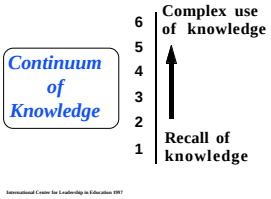

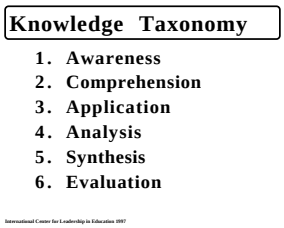

Students make practical application of their knowledge and skills in situations where the likely result is not known and cannot be anticipated.

- The Knowledge Taxonomy, often called Bloom's Taxonomy, has been used in the United States for decades and is familiar to many teachers. This taxonomy can be shown on a continuum as well, from the lowest level of recall of knowledge to the highest level of complex use of knowledge.

The Knowledge Taxonomy has six levels.
Level 1 - Awareness
Level 2 - Comprehension
Level 3 - Application
Level 4 - Analysis
Level 5 - Synthesis
Level 6 - Evaluation

- **Determining Levels of Rigor and Relevance - Activity 3**
  20-30 minutes

- **Setting the Level of Knowledge - Activity 4**
  15-20 minutes

- **Setting the Level of Application - Activity 5**
  15-20 minutes

- **Defining Real World - Activity 6**
  15-20 minutes

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Workshop 3
3 hours
Planning Rigorous and Relevant Instruction

Introduction
10 minutes — Presentation

- **Overview of agenda**
- **Distribute Handout 3**

Why Application Instruction
10 minutes — Presentation

- **What the research shows**

For research that supports application instruction to help students achieve at higher levels, see Chapter II.

A review of education research shows:
- Application results in better learning.
- Schools in the U.S. have limited application.
- Students engaged in application learn better and stay in school longer.
- Contextual learning is more lasting.
- Students learn at different speeds and in different ways.

Education Research

What have we learned?

- Application results in better learning
- Schools have limited application
- Students engaged in application, learn better and stay in school
- Contextual learning more lasting
- Students learn at different speeds and in different ways

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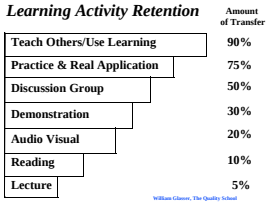
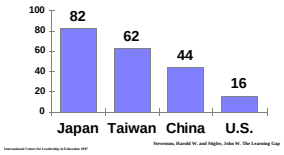
Learning Activity Retention visual
- This shows the results of the work of William Glasser. It is also similar to early work referred to as Edgar Dales Cone of Learning.



Real World Applications



Real World Application visual
- This is the result of observations of U.S. and Asian classrooms which involved a detailed time analysis to determine percent of time students were actually engaged in applying knowledge rather than listening to the teacher.
- These results were reinforced recently by the Third International Mathematics and Science Study, known as TIMSS, which pointed out how heavily content-laden and superficial the U.S. curriculum is, while many other nations require their students to solve complex problems.

Learning Styles of American Youth

• Linguist	10%
• Personal experiences	22%
• Practical utility	51%
• Imaginative	17%

International Center for Leadership in Education 1997
Jerry Conrath, Our Other Youth, 1988

Learning Styles visual
- Many research studies reinforce the notion that students have different learning styles. This study, by Jerry Conrath, points out how most students learn through practical utility while most teachers teach with a focus on linguistic style.

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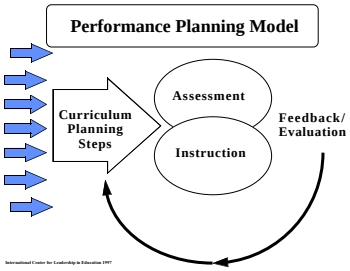
Performance Planning

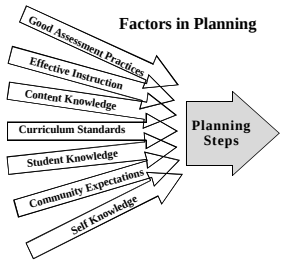
30 minutes — Presentation

- **Curriculum planning process**

Planning Instruction
- The Rigor/Relevance Framework can be used in planning instruction and assessment in order to achieve the level of rigor and relevance we desire for our students.
- To achieve rigorous and relevant instruction, teachers need to refocus the way they plan instruction and design assessment.
- Traditional instructional planning implies a linear process.
  First, there is curriculum — What will be taught
  Second, there is instruction — How it will be taught
  Third comes assessment — How well was it learned
- The Performance Planning Model is a different approach which can assist you in focusing on what students are learning and on developing more rigorous and relevant instruction.
- The Performance Planning Model is based on the assumption that instruction and assessment overlap. As we develop more assessments in a performance mode, it is appropriate, if not essential, to make our assessment of students at the same time that they are engaged in the instructional activity. This integrated vision of instruction and assessment is the core of the model.
- Preparing for instruction and assessment involves a process of curriculum planning, which consists of several steps that must occur in a specified order. The arrows leading into the curriculum planning steps represent the several factors that must be taken into consideration to plan high-quality instruction.
- The final part of the model is feedback and evaluation. Instruction and assessment are never perfect, particularly when you are taking risks to move to higher levels of rigor and relevance. Continual feedback and evaluation are essential for continuous improvement.

Traditional Planning





Curricular Planning Factors
- Several factors are involved in making thoughtful decisions about instruction and assessment.
  Curriculum standards
  Content knowledge
  Community expectations
  Student knowledge
  Teacher self-knowledge
  Assessment practices
  Effective instructional strategies

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Curriculum standards. Standards drive education today. Teachers must align instruction with district, state, and sometimes national standards. Even the most challenging or interesting instruction is not appropriate unless it is consistent with standards. So one of the primary factors to consider in good planning is curriculum standards.

Content knowledge. Teachers must know their subjects well. A key component of good planning is applying content knowledge to the topic or theme. Although there are many resources to supplement content knowledge, teachers must rely on their personal knowledge, particularly when instruction involves real-world observations and problems.

Community expectations. Community expectations are an important consideration. No aspect of the curriculum will long exist if it strays far from community values and expectations. Across the country there have been many stories of conflict between school and community. When these conflicts arise, the objective of helping students to learn is often lost in the shuffle. It is far more productive to maintain close communication between the school and community in order to anticipate areas of disagreement before they turn into conflicts. Preventing a problem is far better than trying to correct one.

Student knowledge. Good instruction depends on knowing the students. What's their current skill level? What previous knowledge do they have? What are their preferred learning styles? What aspect of their current experience relates to this instructional theme? The answers to these questions help teachers to plan connections when introducing a learning experience to students.

Teacher self-knowledge. Teachers should use their strengths in tackling an instructional topic. Some teachers are better at individual coaching, some are entertaining storytellers, some are skilled in the use of instructional technology. Not all instruction needs to be taught in the same way. Take into consideration your own strengths and weaknesses in planning instruction.

Assessment practices. While there are some innovations in assessment today, the basic principles of good assessment must still be followed. Assessments must be valid and related directly to what's being taught. Rewarding a student for an outstanding science project because it was artistically presented is not a

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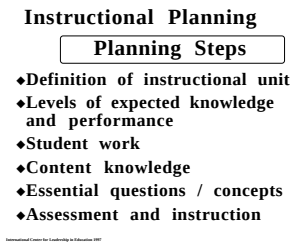
valid assessment. Assessments also need to be fair and reliable, meaning that all students with the same level of skill or knowledge will receive the same rating. Beyond these basic principles, teachers should feel free to expand their knowledge of innovative assessment practices and to develop tests that measure student performance, not just recall.

Effective instructional strategies. Just as there is innovation in assessment practices, so too is there innovation in instructional strategies. Teachers should consider the many forms of teaching and select those which best relate to a given topic or theme. The traditional "chalk and talk" and "textbook and worksheet" still have their place, but effective instruction includes many diverse strategies that engage students more actively in learning. Use of instructional technology is an example. It provides students with expanded tools for communication, research, design, and presentation.

- **Planning Steps and Key Questions**



Planning Steps
- There are six Planning Steps that set the stage for moving to rigorous and relevant instruction. The steps should be followed in order.

1. Definition of instructional unit/curriculum connections
2. Levels of expected knowledge and performance
3. Student work
4. Content knowledge
5. Essential questions/concepts
6. Assessment and instruction

Definition of instructional unit. This step requires a definition of the instructional course, age of students, length of time, themes, and connections to other learning and to district or state standards.

Levels of expected knowledge and performance. This is the step that uses the Rigor/Relevance Framework. It focuses attention on what the students will be learning. In answer to the question, "What are the students expected to know and be able to do?, this step should delineate 6 to 12 clear performance statements. Each of these statements is then applied to the Rigor/Relevance Framework to determine the level at which students must demonstrate their performance, both in terms of rigor — that is, knowledge — and relevance — or application. These expectations set the goals that must be followed later in planning.

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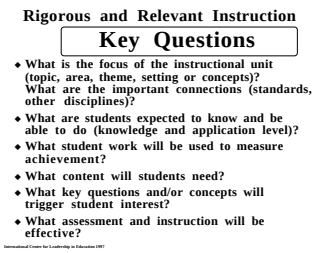
Student work. This is an essential step that comes prior to identifying content. The question to ask is: What will be the major observable pieces of work in which students will engage? Thinking carefully about this should lead to better and clearer performance tasks and other activities that will engage students actively in learning.

Content knowledge. Content should be delineated after deciding on the student work and the expected skills and knowledge that students will gain. Content should be defined by what is required to achieve the objectives and not just by what happens to be in a textbook.

Essential questions/concepts. This step involves listing important questions that will lead students into a particular lesson. Questions are a powerful way to stimulate thinking, and the right questions at the beginning of a lesson can be very engaging. Also part of this step is to define any overarching concepts or "big ideas" that are to be developed as part of this instruction.

Assessment and instruction. This is the heart of the instructional plan, the instructional activities and assessments in which students will engage. The selection of these two central components will be much better if the other planning steps are completed prior to this one.



Key Questions
- These key questions are useful to guide you through each of the steps of the Performance Planning Process.

1. What is the focus of this instructional unit (topic, area, theme, setting, concepts)? What are the important connections (standards, other disciplines)?
2. What are students expected to know and be able to do (expected application level and knowledge level)?
3. What student work will be used to measure achievement?
4. What content will students need?
5. What are the "big" concepts/ideas to be learned, and what key questions will trigger student interest?
6. What assessment and instruction will be effective ?

- **Developing instructional plans**

Review the Sample Instructional Plan (Handout 11)
Review Handout 12 (3 pages), which could be used in planning instruction

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Performance Planning Activities

70 minutes — Review/Activities

Review tools for using the Rigor/Relevance Framework: Knowledge Taxonomy Verb List (Handout 6) and Application Model Decision Tree (Handout 7).

- **Setting Levels of Student Skills and Performance - Activity 8**
  30 minutes

- **Knowledge Challenge - Activity 12**
  10-15 minutes

- **Application Challenge - Activity 13**
  10-15 minutes

Assessment

30 minutes — Presentation/Group Sharing

Performance Assessment

- "Real World" situations
- Part of ongoing instruction
- Apply knowledge and skill
- Result in product or performance
- Demonstration
- Criterion referenced
- Standards of excellence
- Judged by trained teacher/others

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- **Performance assessment**

  About performance assessment
  - Thinking about performance assessment and real world is often the same thing. Drawing from real world problems, teachers can design appropriate performance assessments.
  - Performance assessment often works best if it occurs at the same time as instruction. Assessment contrived as a follow-up activity is often artificial and expensive to construct.
  - Performance assessment should require the application of skills and knowledge that relate directly to the instruction. Care should be taken to make sure the evaluation of the performance is not overly influenced by the skills and knowledge students have gained through other instruction. A successful performance should relate to the instruction at hand.
  - A good means of designing performance assessment is to think about the product or behavior that the student will create. Often this involves some type of demonstration by the student.
  - The evaluation should be done using a scoring guide designed for the assessment. The scoring guide should include specific objective criteria against which to compare the performance. Students should be familiar with

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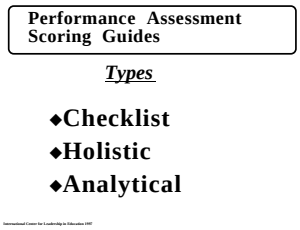
the scoring guide so they will know what the expectations are. If possible students should also be able to see in advance examples of excellent performance to which they can compare their work.
- When possible, use outside evaluators. If the criteria in the scoring guide are prepared well, they can be used by adults other than the teacher to evaluate performance. Using outside evaluators tends to increase the importance of the evaluation in the minds of students. It also adds a greater degree of real-world perspective.



Types of Scoring Guides
- Scoring guides can be designed in many formats, although there are three basic types: checklist, holistic, and analytical.
- The **checklist** generally has a list of items, and the evaluators check off the items that were completed satisfactorily. Typically, no qualitative values are given to a performance, only a record of items completed. This type of scoring guide is best suited to performances in which the process is critical or there are specific steps or safety procedures that must be followed.
-The **holistic** scoring guide is the simplest of the three forms. It is often used when the person judging the performance is extremely knowledgeable of quality performance. Usually, there are a few broad categories. Each category is given a maximum point value, and the evaluator assigns a specific number of points to each measure. A total score is then given to the performance. This is similar to the judging of athletic or musical performances.
- The **analytical** scoring guide is the most popular for performance tasks. It uses several broad categories with specific criteria for each which describe the highest and lowest levels of performance and several levels in between. Analytical scoring guides can be developed and refined to evaluate student performance on a consistent and accurate basis

- **Sharing ideas**

Have workshop participants work in small groups to identify and then share examples of performance assessments that they have been able to add to their instruc-

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tion.

Changing the Paradigm of Instruction

20 minutes - Presentation

- **What we can learn from other schools**

  Review characteristics of successful schools from Workshop 2.

Management of Change

- Create awareness
- Identify community expectations
- Examine curriculum
- Analyze discrepancy
- Define negotiables/non-negotiables
- Develop and communicate plan
- Evaluate and revise plan

- **Management of change process**

  - Many schools and districts that have been successful in creating higher standards of rigor and relevance have followed a management of change process devised by the International Center for Leadership in Education. Here are the steps in the process:

  1. Create Awareness
  - Although Americans as a group seem convinced that schools must change, most parents and taxpayers think that the schools in their individual districts are just fine.
  - The driving force to improve schools must come from a recognition that they are not preparing students adequately for the future society in which they will live and work.
  - The skills, knowledge, and behaviors needed for entry-level employment today outstrip those needed for entry into higher education.
  - This nation's fixation on preparing young people for college, while still a worthy goal, has become an impediment to achieving world-class education standards.
  - Parents and others must recognize that we must also add a third important purpose to education — the ability to apply academic skills in the increasingly sophisticated workplace.
  - School districts that have been successful in creating an environment to support change have used a variety of techniques to create awareness, including:
    - Providing information at back-to-school nights or open houses for parents
    - Including ongoing information in newsletters to parents and the community
    - Making awareness of the changing work world part of the ongoing curriculum for students
    - Encouraging community groups to include in their meetings information about the need to upgrade

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and expand the curriculum in American schools

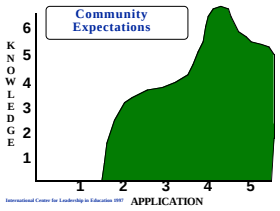
Creating partnerships with business leaders and the local media to coordinate an ongoing awareness program through the media.

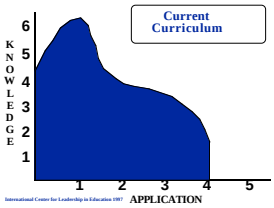
2. Define Community Expectations

- To break the exclusive focus on courses, grades, and test scores, many schools have refocused attention on the specific skills and knowledge graduates need to be prepared for the world in which they will live and work. This is done by focusing on the adult roles that students will assume, such as citizen, worker, lifelong learner, consumer, and family member.
- School staff, parents, and the community must discover for themselves what they want for their children. Through community forums or other means, they identify the skills and knowledge they believe a high school graduate should possess.
- The process of coming to agreement through the power of discovery creates a sense of ownership which can help sustain the entire effort. Without it, the strong tendency is for everyone to drift back to the old paradigm of courses and tests.

3. Examine Curriculum

- After defining community expectations, the next step is to analyze the current curriculum with respect to the level of skills and knowledge in the various subjects. In the process, school personnel begin to discover how well the schools are doing in developing the skills related to the adult roles identified by the community.





4. Discrepancy Analysis

- The next step is the discrepancy analysis, which compares the skills and knowledge identified by the community to the current curriculum. This is done using the Rigor /Relevance Framework.
- Throughout the nation schools have found a very wide gap between what parents, educators, and the community perceived as needed and what is being taught in the schools.

5. Identify the Negotiables and Non-negotiables

- In every community, there are some things — the school calendar, the athletic program, the organizational structure, staffing patterns, tax base, etc. — which the community or school district is unwilling to

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change.
- In Step 5 of this process, schools begin to discover what is indeed non-negotiable. Equally as important, they identify what the community and school personnel are willing to change — or negotiate.
- Typically, schools have found that it is very difficult to change things that will have an impact on any of the adults — taxpayers, parents, administrators, or teachers.

6. Develop, Communicate, and Implement Plan
- After the other steps are completed, the development of a plan becomes a relatively simple but critical task.
- If a district does not go through the other steps to change the attitudes and beliefs of the community and the educational staff, the plan often amounts to little more than cosmetic alterations to existing programs.
- In districts that have gone through this process, the plan has led to fundamental changes in organizational structure, staffing patterns, use of technology, curriculum, assessment, and overall definition of what it means to be an educated person in the community.

7. Evaluate and Revise Plan
- No plan, no matter how well developed, works perfectly. The most successful schools are those which have instituted a process of continuous improvement.

Changing the Paradigm of Instruction

- **Student work**
- **Interdisciplinary**
- **Lengthen time**
- **Multi-level**
- **Instructional technology**
- **Embed assessment**

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- **Things that will drive changes in instruction**

- Many professional development activities attempt to help teachers change their instructional practices. These efforts have varying degrees of success, sometimes resulting in change but more often ending up with teachers reverting to their old practices.
- Experience in many schools shows that certain system changes can result in sustained change. These systemwide "paradigm shifters" can also be a trigger to get some of the more reluctant teachers to change. Here are some of the most effective paradigm shifters.

Focus on student work. The change to rigorous and relevant achievement can be described as a shift from focusing on what is taught to focusing on what is learned. One powerful technique is to focus instructional planning and evaluation of the quality of instruction on the work in which students are en-

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gaged. Is it challenging? Is it meaningful?

Interdisciplinary instruction. Having teachers work collaboratively can result in significant changes in instruction. Teachers approach a task more professionally when working together, Collaboration can also create a synergy of new ideas. Creating interdisciplinary projects can bring about significant change in instruction.

Lengthen time. Block scheduling is a popular trend, and many schools are using it with great success. It is not however a magic solution. A change in schedule is appropriate if it is a strategy to provide additional time for in-depth instruction and application.

Instructional technology. There is great interest and investment in instructional technology, and there is no question that we need to incorporate it more, but we also need to make good decisions on how to use technology effectively so that it can have a significant impact on instruction.

Embed assessment. What gets tested gets taught. When evaluation is traditional and follows the completion of instruction, then teaching is often focused on the content that must be recalled on the test. The move to performance assessment helps to place greater emphasis on the application of skills. This is a move in the right direction. Moreover, when that performance assessment is embedded into instruction rather than following it, it has a more significant impact on improving instruction.

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Workshop 4 3 days	Planning Rigorous and Relevant Instruction and Assessment

Day 1

Introduction
30 minutes - Presentation

- **Overview of agenda**

  Review agenda for presentation

- **Distribute Handouts 1, 2, and 3** (6 pages)

  Inform participants that these are some of the visuals that go with the presentation.

- **How Does It Feel To Be Learning? - Activity 1**
  10-15 minutes

Vision of Instructional Change
90 minutes - Presentation/Videos/Activity

- **Why the need to change**

Why ??????

- Accelerating technological change
- Global economic competition
- Mismatch of education expectations and reality
- Curriculum that doesn't meet student needs

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- *Show* **Video #1** - Introducing Rigorous and Relevant Instruction - *6 minutes*
- *Review the points below briefly, then show* **Video #3 -** School Reform—Defining the Problem - *50 minutes*

Accelerating technological change
- One of the most powerful influences in society today is rapidly changing technology. Among other things, it is displacing jobs and changing skill requirements.
- We cannot predict all the new technologies that will be part of our daily lives in the future.
- In order to adapt to and use these technologies, students will need higher levels of problem-solving skills.

Global economic competition
- Fueled by new technologies, many nations around the world are producing products and services in competition with the United States.
- We can maintain our standard of living only if we have the skills in our work force to produce goods and services that have high value on the world market.

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- We cannot compete with other nations by lowering wages or working longer hours. We must work smarter in a rapidly changing world.

Mismatch of educational expectations/underemployed college graduates

- Most people recognize the value of an education, however, too often we express that value in terms of degrees and diplomas. These pieces of paper do not always equal the skills and knowledge necessary for success.
- There has been a tremendous increase in the number of college graduates. This rapidly growing population of graduates accepted the premise that a college degree would guarantee success. Yet, we all know a recent college graduate who is unemployed or underemployed, even while unemployment is at a record low nationwide.
- This phenomenon points out that it is not the college degree itself but the specific skills and knowledge that make a person more employable.
- The general perception that college preparation alone will lead to success does not match the current reality. The goal should be for students to accumulate the skills and knowledge they need for life, not just diplomas and degrees.

Curriculum that doesn't meet student needs

- Most students, particularly at the high school level, endure instruction that is mind numbing rather than mind expanding.
- Surveys of students who drop out of school consistently show that the reason for their departure is not a lack of intellectual capacity; rather it is that they see no connection between what they are learning in school and their world.
- The traditional curriculum includes too many academic exercises and not enough real-world problems to which students must apply their knowledge.
- Another way that the curriculum isn't meeting the needs of students is in the lack of connection between courses and grade levels. In high school especially, rarely is there any connection between what a student does first period and second period. This lack of coordination interferes with students applying skills across the curriculum and allows few opportunities for them to integrate their use of knowledge.
- Since the curriculum is so content-laden, the objective of most instruction is to cover the material. As long as a

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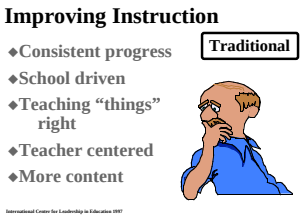
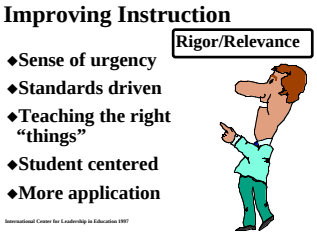
student passes a test, which typically emphasizes recall of knowledge, we assume that learning has occurred.
- This curriculum, with its lack of coordination and absence of application, could be called the "teach it, test it, lose it" curriculum.
- Real learning is measured by being able to use knowledge, not just accumulate it.

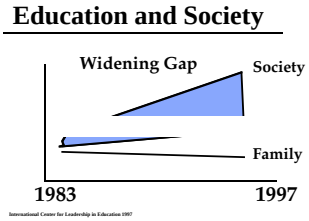
- **What's different about education reform in the 1990s**

Different problems, higher stakes
- We have always tried to improve schools; however, the problems are different today, and the stakes are higher.
- Traditionally, we were satisfied if our schools were making consistent progress.
- Changes were school driven, and we relied on teachers to use their expertise to set the expectations for what students should learn.
- Much of our school improvement effort was focused on the teacher. If teachers taught better, better learning would result.
- There was great emphasis on teaching things correctly, on doing things the right way in the classroom.
- To raise standards, we increased the amount of content that students were expected to learn.





Sense of urgency
- Today there is a greater sense of urgency in school reform. We can no longer be content with the consistent progress of the past. Efforts to move to a curriculum that is more rigorous and relevant have different characteristics from traditional efforts to improve instruction.



The gap
- One reason for the sense of urgency is the widening gap between schools and society.
- Despite public perceptions to the contrary, schools are better today than at any other point in our history.
- What's more, this progress has been made even though there are a greater number of families in crisis. Widespread poverty and family disruptions interfere with children's learning and erode support of schools.
- So schools do continue to make progress, but it is much slower than the pace of technological change in the rest of society.

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How should we measure success in learning????

- **Comparing to <u>expectations</u> not other students**
- **Using <u>external</u> not internal standards**
- **<u>Challenging</u> not sorting students**

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- Unless we adopt a sense of urgency, schools will continue to prepare students for a world that existed decades ago.

A focus on standards
- Another hallmark of the current school improvement effort is the focus on standards.
- Standards set by individual teachers can no longer be the measure of student achievement.
- Instead, student success will be measured by a consistent set of high standards that are external to the school.
- All students should have the opportunity to engage in challenging learning and to have their achievement judged against these standards.

Skills of the Future

New Basics

- **Creative Thinking**
- **Technical Reading/Writing, Speaking & Listening**
- **Analysis, Problem Solving**
- **Inquiry, Technology**
- **Computer Applications**
- **Adaptation, Improvement**

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Teaching the right skills
- While there are clearly defined good practices that result in good instruction, more of the discussion needs to shift to determining what are the right skills to be teaching in school.
- Some of the skills we emphasized in the past are less important today. Powerful and inexpensive calculators have changed essential math skills. Working in teams means speaking and listening skills have become more important than ever.
- The rapid changes in information technology make skills like knowing how to use the card catalogue in the library obsolete.
- Teachers and other members of the community need to engage in thoughtful discussion of what are the most important skills of the future.
- For example, as technology takes over organizational skills and logical thinking for us, perhaps a more important skill to emphasize in learning is creative thinking as a way to solve problems. This is something humans can do much better than even the most powerful computers. However, much of our current instruction emphasizes sequential thinking over creative problem solving.

Focusing on learning rather than teaching
- The time has come for schools to focus more on how well students are learning than on how well teachers are teaching, which is a change from the traditional approach to education in this country.

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- **How Do You Learn? - Activity 2**
  5-8 minutes

- **What we mean by learner-centered instruction**

Learner-Centered Characteristics

- Students actively engaged
- Clear expectations
- Thinking curriculum
- Constructing knowledge based on experience
- Learning at different rates and in different ways
- Assessment a natural event

Students are actively engaged
- Students sitting passively in a classroom may or may not be learning. The best way to gauge whether students are learning is by the degree to which they are engaged in a task.
- If students can describe the activity and show interest in it and commitment to it, they are likely to be learning in a lasting and meaningful way.

Expectations are clear
- In addition to being engaged in their work, students need to be focused on the goal. Better learning takes place and students are more motivated when they understand what is expected.
- Expectations can take many forms, such as performance standards at an outstanding level for a piece of work, a list of facts to memorize, or the list of criteria on which they will be assessed.

The curriculum is a thinking curriculum
- Learning activities should not only engage students, but also challenge them to think. They should be required to make connections between information and to use previous knowledge.
- Asking students to express information in their own terms or to write responses to questions forces them to think more deeply and clearly, thus leading to more learning.

Knowledge is constructed based on experience
- The research on how the brain learns reinforces the notion that students will retain ideas longer when they construct them from their own observations, discovery, or conclusions. Learning should create as many opportunities as possible for students to construct their knowledge so they will retain it better.

Activities accommodate the differences in the way students learn
- Students learn at different rates and in different ways. Learning activities are more effective when they give students opportunities to learn at their pace and through the types of activities they are more comfortable with.

Assessment is a natural event
- Assessment should not be an anxiety-laden event which attempts to rank or sort students based on how

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well they have memorized the material. Assessment should be an opportunity for students to demonstrate naturally what they have learned at the time they have learned it.
- If the curriculum builds on previous knowledge and has appropriate connections, there will always be some built-in assessment of knowledge gained over time.

- **Application initiatives**

Application Initiatives

- **School-to-work**
- **Contextual-based mathematics and science**
- **Reading in content areas**
- **Performance assessment**
- **Alternative schools**

- A growing number of education initiatives are emphasizing raising standards by adding more application rather than by increasing content.
- The United States already has the highest content standards in the world. However, a frequent criticism is that our students cannot apply what they have learned. Some of the most common application initiatives are:

School-to-work. The interest in school-to-work or school-to-career signals the importance of developing skills and knowledge for future employment. This is not about the technical skills needed for the workplace but about how academic skills can be taught so that they can be applied effectively in the workplace.

Contextual-based math and science. New national standards and curriculum initiatives call for teaching math and science in context for better results — application by another name.

Reading in content areas. English literacy is fundamentally important. Success in getting all students to read effectively requires exposure to nonfiction works, using reading material that is real world and of direct use in other instruction.

Performance assessment. Student assessments that are more performance based and real world are being developed because they are a more accurate way to measure student learning. This is another form of application learning.

Alternative schools. A number of students are achieving success through alternative schools. These schools follow many of the characteristics of learner-centered instruction and use application of subject matter and work-based learning to enable students to achieve higher standards. Districts are reducing dropout rates and serving more students with alternative schools.

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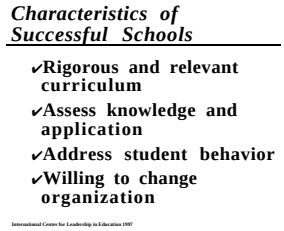


- **Characteristics of successful schools**

- Many schools have made significant progress in developing rigorous and relevant learning by paying attention to these four characteristics *(on overhead)*.

1. Rigorous and relevant curriculum

- These schools emphasize high level, academically challenging work for all students.
- They give students opportunities to use their knowledge and skills in real-world applications.

2. Assessment of knowledge and applications

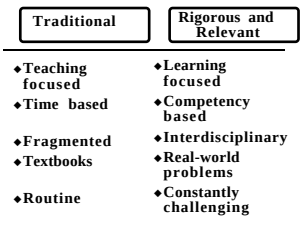
- Successful schools have a comprehensive evaluation system that assesses both the acquisition of knowledge and the ability to use that knowledge.
- Teachers use performance tasks to see how well students can apply what they have learned.

3. Address issues of student behavior

- These schools have a climate that promotes learning. Distractions are kept to a minimum and students are free of threats of violence or verbal abuse.
- The school works with parents to develop guiding principles by which the school operates, so that students develop the personal qualities needed for success.

4. Willing to change the organization

- Although schools are deeply entrenched institutions, governed by laws, regulations, and contracts, successful schools have staffs that are willing to change. The reason why many reform efforts of the past have failed is because the adults in the system were unwilling to change.
- We cannot maintain the status quo and make significant change at the same time.
- Individuals need to make a personal commitment to change, or none of the good ideas for improving school will get very far.



- **Rigorous and relevant learning**

- Rigorous and relevant instruction differs from traditional instruction in several ways.

Learner focused. Attention is concentrated on the degree to which students are learning rather than on whether the teacher is covering the material or presenting it well.

Competency based. The focus is on standards and the flexibility to give students time to achieve those standards. The traditional perspective holds time fixed, resulting in students achieving at different levels.

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Interdisciplinary Instruction. Instruction and activities use knowledge and skills from more than one discipline, which mirrors the way we do things in life. The traditional curriculum separates the disciplines and thereby fragments learning.

Real-world problems. Students use real-world problems as the focus of their learning rather than textbooks.

Constantly challenging. Learning is varied and engaging to the student instead of a routine format of lectures.

Note: *For more in-depth coverage of the Rigor/ Relevance Framework, see Chapter II.*

Rigor/Relevance Framework

30 minutes — Presentation/Video

- **Introducing the Rigor/Relevant Framework**

Show **Video #2 –** Rigor/Relevance Framework *(20 minutes) to provide an introduction to the Application Model, Knowledge Taxonomy, and Framework. It will cover the following points:*
- explanation of the Application Model and Knowledge Taxonomy
- Rigor / Relevance Framework as a tool for improving education
- research on international standards
- research on testing and assessment

- **Unique characteristics of the Rigor/Relevance Framework**

Unique Characteristics

- **Fresh approach to setting higher standards**
- **Bridge between public and schools**
- **Simple and easy to understand**
- **Explains differences in international performance**
- **Framework for curriculum, instruction and assessment**

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- The Rigor/Relevance Framework can be used for developing curriculum, instruction, and assessment.
- It's a fresh approach to setting higher standards.
- The Framework is a bridge between educators and the public because it's easy for parents and business to understand.
- It can be used to explain differences in performance of students from the United States and other countries on international tests.

- **Other Uses of the Rigor/Relevance Framework**

Management of change process
- Moving beyond research, the International Center has put the Rigor/Relevance Framework to work as part of its management of change process for schools. One step

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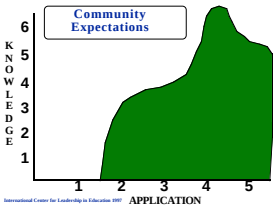
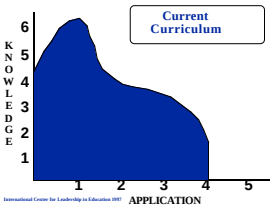


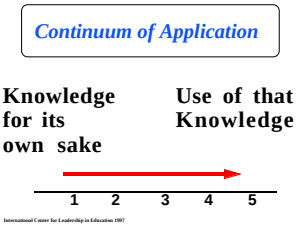


in this change process is to collect detailed information from the community as to what they expect a high school graduate to know and be able to do. This information is then compared to the current curriculum. The Rigor/Relevance Framework is perfect for this analysis.
- Let's look again at the results of the community survey, which shows that the public expects students to know how to use their knowledge in real-world situations.
- The current curriculum stood in sharp contrast to the community expectations. This gap led to considerable discussion among community and education leaders and resulted in an ambitious plan for significant change in the school districts involved.

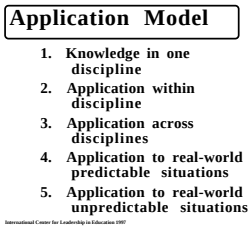
Using the Rigor/Relevance Framework

150 minutes — Presentation/Activities

- **Application Model and Knowledge Taxonomy**



- The Application Model is based on the premise that there is a continuum from knowledge for its own sake to using knowledge to solve real-world unpredictable problems.



The Application Model has five levels.
Level 1 - Knowledge in a discipline.
Students understand and recall knowledge related to a school subject.
Level 2 - Application in a discipline.
Students can solve problems and use skills and knowledge in activities directly related to a discipline.
Level 3 - Application across disciplines.
Students can solve problems and use skills and knowledge in activities that include more than one discipline.
Level 4 -Application in real-world predictable situations.
Students make practical application of their knowledge and skills in situations where the results can be anticipated.
Level 5 -Application in real-world unpredictable situations.
Students make practical application of their knowledge and skills in situations where the likely result is not known and cannot be anticipated.

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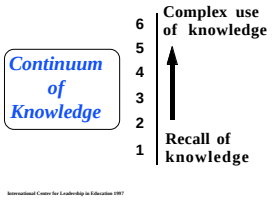

Knowledge Taxonomy

1. **Awareness**
2. **Comprehension**
3. **Application**
4. **Analysis**
5. **Synthesis**
6. **Evaluation**

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- The Knowledge Taxonomy, often called Bloom's Taxonomy, has been used in the United States for decades and is familiar to many teachers. This taxonomy can be shown on a continuum as well, from the lowest level of recall of knowledge to the highest level of complex use of knowledge.

The Knowledge Taxonomy has six levels.
Level 1 - Awareness
Level 2 - Comprehension
Level 3 - Application
Level 4 - Analysis
Level 5 - Synthesis
Level 6 - Evaluation

- **Determining Levels of Rigor and Relevance - Activity 3**
  20-30 minutes

- **Setting the Level of Knowledge - Activity 4**
  15-20 minutes

- **Setting the Level of Application - Activity 5**
  15-20 minutes

- **Determining Levels of Test Questions - Activity 11**
  50-60 minutes

- **Defining Real World - Activity 6**
  15-20 minutes

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Day 2

For research that supports application instruction to help students achieve at higher levels, see Chapter II.

Education Research

What have we learned?

- Application results in better learning
- Schools have limited application
- Students engaged in application, learn better and stay in school
- Contextual learning more lasting
- Students learn at different speeds and in different ways

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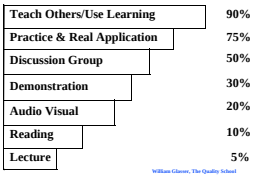
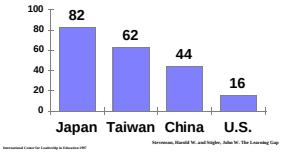
Learning Activity Retention



William Glasser, The Quality School

Real World Applications



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Stevenson, Harold W. and Stigler, John W. The Learning Gap

Learning Styles of American Youth

• Linguist	**10%**
• Personal experiences	**22%**
• Practical utility	**51%**
• Imaginative	**17%**

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Jerry Conrath, One Other Youth, 1989

Note: *Review discussion in Chapter IV.*

Why Application Instruction

10 minutes — Presentation

- **What the research shows**

A review of education research shows:
- Application results in better learning.
- Schools in the U.S. have limited application.
- Students engaged in application learn better and stay in school longer.
- Contextual learning is more lasting.
- Students learn at different speeds and in different ways.

Learning Activity Retention visual
- This shows the results of the work of William Glasser. It is also similar to early work referred to as Edgar Dales Cone of Learning.

Real World Application visual
- This is the result of observations of U.S. and Asian classrooms which involved a detailed time analysis to determine percent of time students were actually engaged in applying knowledge rather than listening to the teacher.
- These results were reinforced recently by the Third International Mathematics and Science Study, known as TIMSS, which pointed out how heavily content-laden and superficial the U.S. curriculum is, while many other nations require their students to solve complex problems.

Learning Styles visual
- Many research studies reinforce the notion that students have different learning styles. This study, by Jerry Conrath, points out how most students learn through practical utility while most teachers teach with a focus on linguistic style.

- **Connections to other initiatives**

- The Rigor/Relevance Framework has some features in common with other popular curriculum reform efforts.

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Connections with School Improvement Efforts

- **Dimensions of Learning**
- **Brain-Based Learning**
- **Thematic Instruction**
- **Integration of Academic and Vocational**
- **Multiple Intelligences**

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Dimensions of Learning

- Dimensions of Learning is an instructional framework designed by Robert Marzano that shares assumptions about learning and the art of teaching with the Rigor/ Relevance Framework. The premise of Dimensions of Learning is that all successful learning is based upon five dimensions of thinking.
- This model helps teachers plan curriculum and instruction by examining the different aspects of how students learn. It links performance instruction to performance assessment.

Brain-based Learning

- The brain's natural function is to learn. Brain-based learning is teaching based on the unique structure and function of the brain. Schooling sometimes inhibits learning by discouraging, ignoring, or even punishing the natural learning processes of the brain.
- Some of the principles of brain-based learning are:
  - The brain processes wholes and parts simultaneously.
  - Learning involves both focused attention and peripheral perception.
  - Learning involves both conscious and unconscious processes.
  - We have two types of memory: spatial and rote.
  - Facts are best understood when embedded in natural, spatial memory.
  - Learning is enhanced by challenge and inhibited by threat.
- The three instructional techniques associated with brain-based learning are: immersion, where learning environments are created that fully immerse students in a learning experience; relaxed alertness, where an effort is made to eliminate fear while maintaining a highly challenging environment; and active processing, where the learner consolidates and internalizes information.

Thematic Instruction

- Thematic instruction is the organization of curriculum around major themes that integrate basic disciplines, such as English language arts, math, and science, with the exploration of a broad topic, such as communities, rain forests, river basins, use of energy, etc.
- Thematic instruction promotes the belief that we learn best when we are learning in the context of a coherent "whole" and when we can connect what we are learning to the real world in a practical way.

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- Thematic instruction seeks to put the learning of such cognitive skills as reading, mathematics, scientific method, and writing in the context of a real-world topic that is both specific enough to be practical and broad enough to allow creative exploration.

Integration of academic and vocational education
- The integration of academic and vocational education is an education reform strategy conceptualized by vocational educators, supported by the business community, and articulated in federal legislation.
- One motivation for this reform is the dropout and illiteracy rates, along with employers' criticisms that schools are delivering workers who lack problem-solving abilities, higher-order thinking skills, and communication/employability skills — all crucial for work in a global economy.
- Vocational educators recognize that developing overly specific training and encouraging a dual structure segregates vocational and academic education.
- At the same time, academic education has been criticized for a curriculum that lacks opportunities for students to connect learning to "real world" events.
- The integration of vocational and academic education is a natural solution: modify two existing parts of the education system to form a new alliance that better prepares students for the future.

Multiple intelligences
- A theory of human intelligence developed by psychologist Howard Gardner suggests that there are at least seven distinct ways that different people have of "knowing" and understanding the world. Each of these is a distinct "intelligence."
- The seven intelligences are: verbal-linguistic, logical-mathematical, visual-spatial, body-kinesthetic, musical-rhythmic, interpersonal, and intrapersonal.
- Traditional instruction is heavily weighted in favor of verbal-linguistic and logical-mathematical intelligences. This theory would suggest a more balanced curriculum that incorporates the arts, self-awareness, communication, and physical education. Instructional methods should be expanded to appeal to all of the intelligences.

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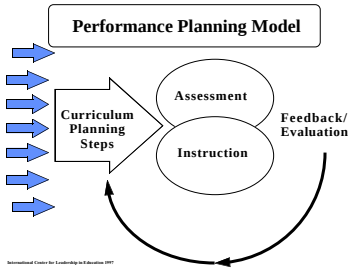
Performance Planning
30 minutes — Presentation

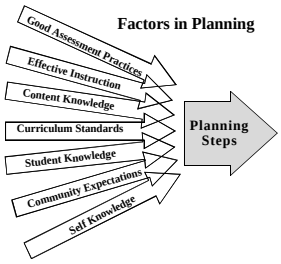
- **Curriculum planning process**

Planning Instruction
- The Rigor/Relevance Framework can be used in planning instruction and assessment in order to achieve the level of rigor and relevance we desire for our students.
- To achieve rigorous and relevant instruction, teachers need to refocus the way they plan instruction and design assessment.
- Traditional instructional planning implies a linear process:
  First, there is curriculum — What will be taught
  Second, there is instruction — How it will be taught
  Third comes assessment — How well was it learned
- The Performance Planning Model is a different approach which can assist you in focusing on what students are learning and on developing more rigorous and relevant instruction.
- The Performance Planning Model is based on the assumption that instruction and assessment overlap. As we develop more assessments in a performance mode, it is appropriate, if not essential, to make our assessment of students at the same time that they are engaged in the instructional activity. This integrated vision of instruction and assessment is the core of the model.
- Preparing for instruction and assessment involves a process of curriculum planning, which consists of several steps that must occur in a specified order. The arrows leading into the curriculum planning steps represent the several factors that must be taken into consideration to plan high-quality instruction.
- The final part of the model is feedback and evaluation. Instruction and assessment are never perfect, particularly when you are taking risks to move to higher levels of rigor and relevance. Continual feedback and evaluation are essential for continuous improvement.

Traditional Planning



Curricular Planning Factors
- Several factors are involved in making thoughtful decisions about instruction and assessment.
  Curriculum standards
  Content knowledge
  Community expectations
  Student knowledge
  Teacher self-knowledge
  Assessment practices
  Effective instructional strategies



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Curriculum standards. Standards drive education today. Teachers must align instruction with district, state, and sometimes national standards. Even the most challenging or interesting instruction is not appropriate unless it is consistent with standards. So one of the primary factors to consider in good planning is curriculum standards.

Content knowledge. Teachers must know their subjects well. A key component of good planning is applying content knowledge to the topic or theme. Although there are many resources to supplement content knowledge, teachers must rely on their personal knowledge, particularly when instruction involves real-world observations and problems.

Community expectations. Community expectations are an important consideration. No aspect of the curriculum will long exist if it strays far from community values and expectations. Across the country there have been many stories of conflict between school and community. When these conflicts arise, the objective of helping students to learn is often lost in the shuffle. It is far more productive to maintain close communication between the school and community in order to anticipate areas of disagreement before they turn into conflicts. Preventing a problem is far better than trying to correct one.

Student knowledge. Good instruction depends on knowing the students. What's their current skill level? What previous knowledge do they have? What are their preferred learning styles? What aspect of their current experience relates to this instructional theme? The answers to these questions help teachers to plan connections when introducing a learning experience to students.

Teacher self-knowledge. Teachers should use their strengths in tackling an instructional topic. Some teachers are better at individual coaching, some are entertaining storytellers, some are skilled in the use of instructional technology. Not all instruction needs to be taught in the same way. Take into consideration your own strengths and weaknesses in planning instruction.

Assessment practices. While there are some innovations in assessment today, the basic principles of good assessment must still be followed. Assessments must be valid and related directly to what's being taught. Rewarding a student for an outstanding science project because it was artistically presented is not a

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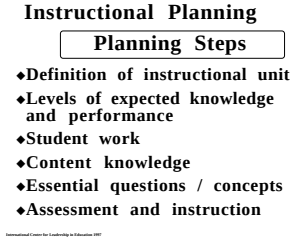
valid assessment. Assessments also need to be fair and reliable, meaning that all students with the same level of skill or knowledge will receive the same rating. Beyond these basic principles, teachers should feel free to expand their knowledge of innovative assessment practices and to develop tests that measure student performance, not just recall.

Effective instructional strategies. Just as there is innovation in assessment practices, so too is there innovation in instructional strategies. Teachers should consider the many forms of teaching and select those which best relate to a given topic or theme. The traditional "chalk and talk" and "textbook and worksheet" still have their place, but effective instruction includes many diverse strategies that engage students more actively in learning. Use of instructional technology is an example. It provides students with expanded tools for communication, research, design, and presentation.

- **Planning Steps and Key Questions**



Planning Steps
- There are six Planning Steps that set the stage for moving to rigorous and relevant instruction. The steps should be followed in order.

1. Definition of instructional unit/curriculum connections
2. Levels of expected knowledge and performance
3. Student work
4. Content knowledge
5. Essential questions/concepts
6. Assessment and instruction

Definition of instructional unit. This step requires a definition of the instructional course, age of students, length of time, themes, and connections to other learning and to district or state standards.

Levels of expected knowledge and performance. This is the step that uses the Rigor/Relevance Framework. It focuses attention on what the students will be learning. In answer to the question, "What are the students expected to know and be able to do?, this step should delineate 6 to 12 clear performance statements. Each of these statements is then applied to the Rigor/Relevance Framework to determine the level at which students must demonstrate their performance, both in terms of rigor —

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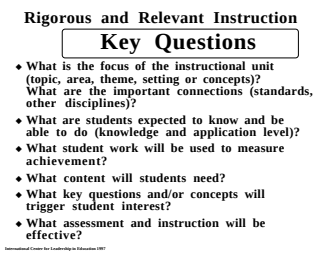
that is, knowledge — and relevance — or application. These expectations set the goals that must be followed later in planning.

Student work. This is an essential step that comes prior to identifying content. The question to ask is: What will be the major observable pieces of work in which students will engage? Thinking carefully about this should lead to better and clearer performance tasks and other activities that will engage students actively in learning.

Content knowledge. Content should be delineated after deciding on the student work and the expected skills and knowledge that students will gain. Content should be defined by what is required to achieve the objectives and not just by what happens to be in a textbook.

Essential questions/concepts. This step involves listing important questions that will lead students into a particular lesson. Questions are a powerful way to stimulate thinking, and the right questions at the beginning of a lesson can be very engaging. Also part of this step is to define any overarching concepts or "big ideas" that are to be developed as part of this instruction.

Assessment and instruction. This is the heart of the instructional plan, the instructional activities and assessments in which students will engage. The selection of these two central components will be much better if the other planning steps are completed prior to this one.



Key Questions
- These key questions are useful to guide you through each of the steps of the Performance Planning Process.

1. What is the focus of this instructional unit (topic, area, theme, setting, concepts)? What are the important connections (standards, other disciplines)?
2. What are students expected to know and be able to do (expected application level and knowledge level)?
3. What student work will be used to measure achievement?
4. What content will students need?
5. What are the "big" concepts/ideas to be learned, and what key questions will trigger student interest?
6. What assessment and instruction will be effective ?

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- **Developing instructional plans**

  Review the Sample Instructional Plan (Handout 11)
  Review Handout 12 (3 pages), which could be used in planning instruction

Performance Planning Activities

70 minutes — Presentation/Activities

Review tools for using the Rigor/Relevance Framework: Knowledge Taxonomy Verb List (Handout 6) and Application Model Decision Tree (Handout 7).

- **Setting Levels of Student Skills and Performance - Activity 8**
  30 minutes

- **Knowledge Challenge - Activity 12**
  10-15 minutes

- **Application Challenge - Activity 13**
  10-15 minutes

- **Identifying Community Resources - Activity 7**
  10-15 minutes

Individual and/or Small Group Work

150 minutes — Activity/Group Sharing

- **Developing Instructional Plans - Activity 10**
  45 minutes

  Work with individuals or groups to develop lesson plans following the Performance Planning Model

- **Individuals share instructional plans**

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Day 3

Changing the Paradigm of Instruction
60 minutes - Presentation

Characteristics of Successful Schools

- ✔Rigorous and relevant curriculum
- ✔Assess knowledge and application
- ✔Address student behavior
- ✔Willing to change organization

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- **What we can learn from other schools**

Review characteristics of successful schools

- Rigorous and relevant curriculum
- Assessment of knowledge and applications
- Address issues of student behavior
- Willing to change the organization

- **Management of change process**

- Many schools and districts that have been successful in creating higher standards of rigor and relevance have followed a management of change process devised by the International Center for Leadership in Education. The steps in the process are:

Management of Change

- ◆Create awareness
- ◆Identify community expectations
- ◆Examine curriculum
- ◆Analyze discrepancy
- ◆Define negotiables/non-negotiables
- ◆Develop and communicate plan
- ◆Evaluate and revise plan

1. Create Awareness
- Although Americans as a group seem convinced that schools must change, most parents and taxpayers think that the schools in their individual districts are just fine.
- The driving force to improve schools must come from a recognition that they are not preparing students adequately for the future society in which they will live and work.
- The skills, knowledge, and behaviors needed for entry-level employment today outstrip those needed for entry into higher education.
- This nation's fixation on preparing young people for college, while still a worthy goal, has become an impediment to achieving world-class education standards.
- Parents and others must recognize that we must also add a third important purpose to education — the ability to apply academic skills in the increasingly sophisticated workplace.
- School districts that have been successful in creating an environment to support change have used a variety of techniques to create awareness, including:
  - Providing information at back-to-school nights or open houses for parents.
  - Including ongoing information in newsletters to parents and the community.
  - Making awareness of the changing work world part of the ongoing curriculum for students.

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Encouraging community groups to include in their meetings information about the need to upgrade and expand the curriculum in American schools.

Creating partnerships with business leaders and the local media to coordinate an ongoing awareness program through the media.

2. Define Community Expectations

- To break the exclusive focus on courses, grades, and test scores, many schools have refocused attention on the specific skills and knowledge graduates need to be prepared for the world in which they will live and work. This is done by focusing on the adult roles that students will assume, such as citizen, worker, lifelong learner, consumer, and family member.
- School staff, parents, and the community must discover for themselves what they want for their children. Through community forums or other means, they identify the skills and knowledge they believe a high school graduate should possess.
- The process of coming to agreement through the power of discovery creates a sense of ownership which can help sustain the entire effort. Without it, the strong tendency is for everyone to drift back to the old paradigm of courses and tests.

3. Examine Curriculum

- After defining community expectations, the next step is to analyze the current curriculum with respect to the level of skills and knowledge in the various subjects. In the process, school personnel begin to discover how well the schools are doing in developing the skills related to the adult roles identified by the community.

4. Discrepancy Analysis

- The next step is the discrepancy analysis, which compares the skills and knowledge identified by the community to the current curriculum. This is done using the Rigor /Relevance Framework.
- Throughout the nation schools have found a very wide gap between what parents, educators, and the community perceived as needed and what is being taught in the schools.

5. Identify the Negotiables and Non-negotiables

- In every community, there are some things — the school calendar, the athletic program, the organizational structure, staffing patterns, tax base, etc. — which the community or school district is unwilling to change.

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- In Step 5 of this process, schools begin to discover what is indeed non-negotiable. Equally as important, they identify what the community and school personnel are willing to change — or negotiate.
- Typically, schools have found that it is very difficult to change things that will have an impact on any of the adults — taxpayers, parents, administrators, or teachers.

6. Develop, Communicate and Implement Plan
- After the other steps are completed, the development of a plan becomes a relatively simple but critical task.
- If a district does not go through the other steps to change the attitudes and beliefs of the community and the educational staff, the plan often amounts to little more than cosmetic alterations to existing programs.
- In districts that have gone through this process, the plan has led to fundamental changes in organizational structure, staffing patterns, use of technology, curriculum, assessment, and overall definition of what it means to be an educated person in the community.

7. Evaluate and Revise Plan
- No plan, no matter how well developed, works perfectly. The most successful schools are those which have instituted a process of continuous improvement.

- **Things that will drive changes in instruction**

- Many professional development activities attempt to help teachers change their instructional practices. These efforts have varying degrees of success, sometimes resulting in change but more often ending up with teachers reverting to their old practices.
- Experience in many schools shows that certain system changes can result in sustained change. These systemwide "paradigm shifters" can also be a trigger to get some of the more reluctant teachers to change. Here are some of the most effective paradigm shifters.

Focus on student work. The change to rigorous and relevant achievement can be described as a shift from focusing on what is taught to focusing on what is learned. One powerful technique is to focus instructional planning and evaluation of the quality of instruction on the work in which students are engaged. Is it challenging? Is it meaningful?

Interdisciplinary instruction. Having teachers work collaboratively can result in significant changes in instruction. Teachers approach a task more profes-

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sionally when working together, Collaboration can also create a synergy of new ideas. Creating interdisciplinary projects can bring about significant change in instruction.

Lengthen time. Block scheduling is a popular trend, and many schools are using it with great success. It is not however a magic solution. A change in schedule is appropriate if it is a strategy to provide additional time for in-depth instruction and application.

Instructional technology. There is great interest and investment in instructional technology, and there is no question that we need to incorporate it more, but we also need to make good decisions on how to use technology effectively so that it can have a significant impact on instruction.

Embed assessment. What gets tested gets taught. When evaluation is traditional and follows the completion of instruction, then teaching is often focused on the content that must be recalled on the test. The move to performance assessment helps to place greater emphasis on the application of skills. This is a move in the right direction. Moreover, when that performance assessment is embedded into instruction rather than following it, it has a more significant impact on improving instruction.

Changing the Paradigm of Instruction

- **Student work**
- **Interdisciplinary**
- **Lengthen time**
- **Multi-level**
- **Instructional technology**
- **Embed assessment**

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- **Put It In Writing! - Activity 15**
  20-30 minutes

Assessment

120 minutes — Presentation/Activity/ Group Sharing

- **Fundamentals of good assessment**

- Performance-based assessments are an effective way for teachers to learn whether students can understand concepts and apply their knowledge.
-Traditional norm-referenced tests tell very little about how students think, whether they can use knowledge, or what to teach next.
- Real-world problems don't come neatly packaged in predictable, easy-to-solve formats, so teachers need to provide students with experience in grappling with problems that mirror the world beyond school.
- Good performance-based assessments ask students to explain and justify their work, not just do a task. As the students begin to justify their answers, they themselves

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start to reflect more on their own learning and take more responsibility for ensuring that they really understand why, not just what.
- Performance-based assessments help make instruction more effective, because they are rich with clues about how students learn.
- With performance-based assessments, student performance is compared to a set standard rather than against the performance of other students. Connections and higher-level cognitive skills are easier to assess than with objective tests.
- Traditional tests have an element of surprise. Students never know what questions will be asked.
- With performance-based assessment, students know exactly what is expected of them.

Criteria
- In a performance task, the specific descriptions of the knowledge and skills that define what is required are called "criteria." These describe precisely what that student is expected to know and be able to do.
- The criteria form the basis of the scoring guide.
- Defining criteria for complex tasks is not easy. It involves analyzing what is essential in the task as performed by the real-world expert, not merely what a student must do to complete the task. There are typically qualitative differences in performances as one becomes more proficient.
- Criteria also help students formulate a working definition of what is considered "expert performance" and why.
- Criteria remove the mystery from assessment. Everyone knows, from the beginning, exactly what students must do to excel.

Reliability
- Reliability depends in part upon the comparability of tasks. It is fairly simple to create comparable tests for the recall of information. It is far more difficult to predict a student's performance on real-life, multifaceted tasks; there are too many variables.
- At the same time, performance-based assessments are a more solid measure of what students know and can do.
- A second aspect of reliability is inter-rater reliability, or the ability of different teachers to score a performance task in the same way.
- If several teachers are using the same task, it shouldn't matter which one scores the students' work. Everyone

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should be in close agreement on what "competent" or "highly proficient" means.

Validity
- Validity is a measure of how closely a task mirrors the knowledge and behaviors that are required to perform comparable real-life tasks.
- Good performance tasks require hands-on learning, but they go beyond just "doing" and require children to think deeply and make important decisions.
- A valid task provides the information necessary for students to perform successfully, but it also requires considerable thought and decision making by the student, as well as the organizing of relevant data, problem solving, and thoughtful habits of mind.
- Validity is determined, in part, by whether a task actually measures what it says it measures and also by whether the scoring of that task is comparable to real-life standards.
- In order for a task to be valid, students must understand that task. Traditional testing programs view teachers as proctors who must not explain the meaning of a word or coach a child who does not understand the directions.
- With performance-based assessments, teachers are expected to interact with students and to provide whatever assistance a youngster requires to understand the task.

- **Setting Clear Expectations: What Do You Want? - Activity 9**
  30-40 minutes

- **Performance assessment**

Performance Assessment

- "Real World" situations
- Part of ongoing instruction
- Apply knowledge and skill
- Result in product or performance
- Demonstration
- Criterion referenced
- Standards of excellence
- Judged by trained teacher/others

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About performance assessment
- Thinking about performance assessment and real world is often the same thing. Drawing from real world problems, teachers can design appropriate performance assessments.
- Performance assessment often works best if it occurs at the same time as instruction. Assessment contrived as a follow-up activity is often artificial and expensive to construct.
- Performance assessment should require the application of skills and knowledge that relate directly to the instruction. Care should be taken to make sure the evaluation of

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the performance is not overly influenced by the skills and knowledge students have gained through other instruction.
- A good means of designing performance assessment is to think about the product or behavior that the student will create. Often this involves some type of demonstration by the student.
- The evaluation should be done using a scoring guide designed for the assessment. The scoring guide should include specific objective criteria against which to compare the performance. Students should be familiar with the scoring guide so they will know what the expectations are. If possible students should also be able to see in advance examples of excellent performance to which they can compare their work.
- When possible, use outside evaluators. If the criteria in the scoring guide are prepared well, they can be used by adults other than the teacher to evaluate performance.
- Using outside evaluators tends to increase the importance of the evaluation in the minds of students. It also adds a greater degree of real-world perspective.

Performance Assessment Scoring Guides

Types

- **Checklist**
- **Holistic**
- **Analytical**

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Types of Scoring Guides
- Scoring guides can be designed in many formats, although there are three basic types: checklist, holistic, and analytical.
- The **checklist** generally has a list of items, and the evaluator checks off the items that were completed satisfactorily. Typically, no qualitative values are given to a performance, only a record of items completed. This type of scoring guide is best suited to performances in which the process is critical or there are specific steps or safety procedures that must be followed.
-The **holistic** scoring guide is the simplest of the three forms. It is often used when the person judging the performance is extremely knowledgeable of quality performance. Usually, there are a few broad categories. Each category is given a maximum point value, and the evaluator assigns a specific number of points to each measure. A total score is then given to the performance. This is similar to the judging of athletic or musical performances.
- The **analytical** scoring guide is the most popular for performance tasks. It uses several broad categories with specific criteria for each which describe the highest and lowest levels of performance and several levels in be-

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tween. Analytical scoring guides can be developed and refined to evaluate student performance on a consistent and accurate basis

- **Sharing ideas**

  Have participants work in small groups to identify and share performance assessments that they could add to their instruction.

Individual and/or Small Group Work
2 hours — Activity and Sharing

- **Developing Analytical Scoring Guides - Activity 14**
  50-60 minutes

- **Individuals develop and share performance assessments**

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D Activities for Teachers

1 How Does It Feel To Be Learning?
2 How Do You Learn?
3 Determining Levels of Rigor and Relevance
4 Setting the Level of Knowledge
5 Setting the Level of Application
6 Defining Real World
7 Identifying Community Resources
8 Setting Levels of Student Knowledge and Performance
9 Setting Clear Expectations: What Do You Want?
10 Developing Instructional Plans
11 Determining Levels of Test Questions
12 Knowledge Challenge
13 Application Challenge
14 Developing Analytical Scoring Guides
15 Put It In Writing!

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Activity 1

How Does It Feel To Be Learning?

Time	10-15 minutes

Purpose

This activity helps participants to reflect on the emotional needs of learners — students and themselves.

Materials

Chart paper to record sharing of ideas

Procedure

- Ask participants to think about something they recently learned how to do. It can be work related or in their personal lives. As facilitator, it is helpful if you share a personal example.
- After giving the group time to think, ask participants to share in pairs the emotions they felt.
- Have the group share as a whole and record the responses, which should cover a range (e.g., frustration of learning how to do something new, exhilaration of achievement).

Suggestions

Discuss that learning is a highly emotional activity. Teachers need to be aware of the emotional swings of learners so that they can support students in their learning and colleagues in learning new instructional techniques.

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Activity 2

How Do You Learn?

Time 5-8 minutes

Purpose

This activity gives participants insight into the characteristics of student-centered learning that produce a high level of student engagement in learning.

Materials

None

Procedure

- Give participants a few minutes to think about a learning experience in their background that they would describe as "changing their lives." It might have led to a new job, a rewarding hobby, a better relationship with someone, or a formal award. Examples can be personal; they will not be shared with the group.

- Ask participants the following questions, in order, about their life-changing experience. Read each question once through and then go back and ask participants to raise their hands when you read the part [in **bold** type] that best describes their learning experience.

  Was your learning **started by yourself** or **required of you**? [initiation]

  In your learning, did you work **primarily alone** or **mostly with others**? [dependence]

  Was the structure **formal** (in a school or program) or **informal** (not an organized program)? [structure]

  Did you have **time limits** on learning or **flexibility** in time to learn? [time]

  Were the rewards for learning **intrinsic** (self-fulfillment) or **extrinsic** (diploma, certificate, award)? [rewards]

  Was what you learned primarily **theory** or **application**? [type of learning]

Suggestions

The majority of participants will select: **self-started** / **worked with others** / **informal structure** / **flexible time** / **intrinsic rewards** / **application**. These are the characteristics of student-centered learning. Moreover, they are in direct contrast to the way most schools operate.

Although this activity is a forced choice, it does point out the characteristics teachers need to strive for if we expect to make school meaningful and life-changing for students.

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Activity 3

Determining Levels of Rigor and Relevance

Time 20-30 minutes

Purpose

This activity reinforces understanding of the Knowledge Taxonomy and the Application Model by having participants examine skill and knowledge statements and determine their levels on both scales.

Materials

Handouts

4. Determining Levels of Rigor and Relevance - Worksheet/Answer Sheet
5. Rigor/Relevance Framework
6. Knowledge Taxonomy Verb List
7. Application Model Decision Tree (2 pages)

Procedure

- Have participants sit in groups of three or four.
- Ask them to work individually to rate the Application Model level of each statement on the worksheet. Encourage them to use the Application Model Decision Tree. Have them then discuss their responses in their group and reach a consensus.
- Review the results with the entire group.
- Repeat the procedure with the Knowledge Taxonomy. This time they will rate the same skill statements for knowledge level. Encourage them to use the Knowledge Taxonomy Verb List.
- Distribute Answer Sheet and emphasize to participants that getting the same answer is less important than becoming familiar with using the scales.

Suggestions

Discuss with entire group any difficulties they had and the usefulness of the tools.

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Activity 4

Setting the Level of Knowledge

Time 15-20 minutes

Purpose

This activity gives teachers practice in using the Knowledge Taxonomy to set different levels of student objectives. By listing student skills and knowledge at each level, teachers gain understanding of how to use the Knowledge Taxonomy and distinguish between the different levels.

Materials

Handouts

5. Rigor/Relevance Framework
6. Knowledge Taxonomy Verb List
10. Examples of Student Performance by Knowledge Level

Index cards with instructional topics (Handout 8 lists topics for your information only. A master sheet formatted for duplication on standard 1 x 3 inch labels is located in the plastic sleeve with the overhead masters. The labels can then be put on index cards.)

Procedure

- Ask participants to work in groups of two or three.
- Pass out the topics on index cards, one per group.
- Review the Knowledge Taxonomy Verb List and examples of skill statements at each level.
- Ask the small groups to write statements of skill and knowledge that are indicative of each of the six levels.
- When all groups have finished, have them share their lists with the entire group.

Suggestions

Observe groups working and make sure that each of the knowledge statements is at a higher level than the last. One common mistake is to develop steps in a complicated process. Be sure each statement is independent and relates to the appropriate level.

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Activity 5

Setting the Level of Application

Time	15-20 minutes

Purpose

This activity gives teachers practice in using the Application Model to set different levels of student objectives. By listing student skills and knowledge at each level, teachers gain understanding of how to use the Application Model and distinguish between the different levels.

Materials

Handouts

5. Rigor/Relevance Framework
7. Application Model Decision Tree (2 pages)
9. Examples of Student Performance by Application Level

Index cards with instructional topics (Handout 8 lists topics. A master sheet formatted for duplication on standard 1 x 3 labels is located in the plastic sleeve. The labels can then be put on index cards.)

Procedure

- Ask participants to work in groups of two or three.
- Pass out the topics on index cards or have groups use their topics from the Knowledge Level activity.
- Review the Application Model Decision Tree and the examples of skill statements at each level on the overheads.
- Ask the small groups to write statements of skill and knowledge that are indicative of each of the five levels.
- When all groups have finished, ask them to share their lists with the entire group.

Suggestions

Remind groups not to list the steps in a process.

Tell groups that not all topics lend themselves to an objective at each

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Activity 6

Defining Real World

Time 15-20 minutes

Purpose

This activity helps participants identify examples of real-world instructional activities, both in and out of school.

Materials

Chart paper

Procedure

- Have participants work in groups of 4-6 to develop a list of real-world applications of academic skills. List the skill and then its application (e.g., reading for information — read an instruction manual).
- Have groups report out to share lists. Ask for feedback on whether they are real world.
- Now repeat the exercise and have groups identify real-world activities that could occur in school which would be an application of knowledge.

Suggestions

Help participants to recognize that some real-world exercises can take place in the school setting if they create the right conditions.

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Activity 7

Identifying Community Resources

Time 10-15 minutes

Purpose

This brainstorming activity generates ideas on community resources that might cooperate in helping teachers develop real-world instruction.

Materials

Chart paper

Procedure

- Have participants work in groups of 4-6 to list 10 community resources (people, businesses, organizations, facilities, groups) that might be willing to work with the school.
- Have groups report out to share lists.

Suggestions

As an added twist, if time allows, ask groups if they can develop a list of 10 more. To counteract the groans, offer a reward (e.g., box of candy) to the first group that gets 10 new items.

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Activity 8

Settings Levels of Student Knowledge and Performance

Time 30 minutes

Purpose

This activity gives participants practice in analyzing skill and knowledge statements to set the levels of knowledge and application. This is a critical step in the planning process for rigorous and relevant education, so it is important to focus attention on it.

Materials

Handouts

5. Rigor/Relevance Framework
6. Knowledge Taxonomy Verb List
7. Application Model Decision Tree
14. Setting Levels of Expected Skills and Knowledge - Worksheet

Procedure

- Distribute worksheet and review directions.
- Using a transparency, write out a sample skill and knowledge statement. Here are several examples (with answer key):

	Application Level	Knowledge Level
Draw pie charts	2	3
Graph data from a student survey	4	3
Interpret results of charts and graphs from a research report	4	4

- Using input from the group, specify the level of application and knowledge.
- Ask participants to select an instructional topic and list five skill and knowledge statements related to the topic.
- After all have completed the task, ask them to rate each statement with respect to level.
- Have selected participants share statements and levels. If the group is small, share with the entire group. If large, share in smaller groups.

Suggestions

Be sure participants keep skill and knowledge statements simple; they should represent one idea.

The statements should call for some student action.

Be sure participants rate the levels independently. A high application level does not necessarily indicate a high cognitive level, and vice versa.

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Activity 9

Setting Clear Expectations: What Do You Want?

Time 30-40 minutes

Purpose

This is an entertaining activity that illustrates the importance of making sure students clearly understand expectations and the criteria on which their work will be judged.

Materials

For each group
30 small balloons of various colors
10-20 yards of yarn
scissors
one push pin

Handouts - one per group
15. Assessor's Directions
16. Observer's Directions

Procedure

- Divide the participants into groups of 6-8 and appoint an assessor and an observer in each group.
- Ask the groups to assemble around the room and meet with the assessors separately. Give them the Assessor's Directions and ask them to review their role. They must keep the evaluation criteria confidential from **all** others.
- Explain to all participants that each group will be completing a task. The assessor will judge the quality of the work. The observer will observe how well the group completes the task and lead a group discussion afterwards. Give each observer the Observer's Directions.
- The task: Blow up balloons one at a time. Tie the balloon. Cut a length of yarn and attach it to the balloon. Hand the balloon to the assessor for evaluation. Any balloon not done correctly will be rejected by the assessor by popping it with the push pin. Each group must try to figure out the evaluation criteria for "acceptable" work.
- Give groups 10 minutes to do the task. All members of the group must participate. The group with the most "acceptable" balloons wins.
- When time is up, tell assessors to share the evaluation criteria. Ask each group to discuss the process. Have observers share their reactions.
- Reconvene the entire group and ask for observations on the importance of stating clear expectations up front. Draw parallels from this activity to the way teachers should evaluate students.

Suggestions

If possible, meet ahead of time with a selected group of assessors to brief them on their role.

Listen to comments from the participants as they are doing the task and share these with the entire group. Ask participants to brainstorm several ways in which they can make expectations clear to students.

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Activity 10

Developing Instructional Plans

Time	45 minutes minimum

Purpose

This activity enables participants to work through a simple lesson using the rigor/relevance performance planning steps.

Materials

Handouts

11. Sample Instructional Plan
12. Performance Planning - Worksheet
13. Performance Planning Questions

Procedure

- Have participants work individually, unless there are natural small groups, such as teachers in the same grade or same subject.
- Following the Sample Instructional Plan, have each participant develop an instructional plan for a familiar topic using the worksheet.

Suggestions

A common pitfall in writing plans is to develop too large a unit. It is better to focus on a single narrow topic for which it is natural to develop 4-6 expected skill statements.

Be sure participants rate both the Application and Knowledge levels for the expected skills and knowledge.

Check levels of skills and knowledge to be sure they are appropriate for the level of students.

Look for consistency between degree of application and instruction activities (i.e., if the expected application is for real world, then the activities should reflect real world.

After participants have developed some materials through the first few steps, have them share their work with other participants and provide each other with feedback.

Allocate as much time as possible; teachers could easily spend 1-2 hours working on a typical lesson.

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Activity 11

Determining Levels of Test Questions

Time 50-60 minutes

Purpose

This activity gives participants practice in evaluating and developing test questions at various levels of the Knowledge Taxonomy and the Application Model.

Materials

Handouts

6. Knowledge Taxonomy Verb List
7. Application Model Decision Tree
17. Test Question Evaluation - Worksheet/Answer Sheet
18. Test Question Development - Worksheet

Procedure

- Divide participants into groups of 3-4. Have them locate the Rigor/ Relevance Framework (Handout 5), the Knowledge Taxonomy Verb List, and the Application Model Decision Tree.
- Have groups evaluate each of the test questions on the Test Question Evaluation Worksheet and assign them levels on the Knowledge Taxonomy and Application Model.
- After groups have completed this task (20-25 minutes), have them share their ratings. Review and discuss them with all participants.
- Distribute the Answer Sheet for their information only and remind them that getting the same rating is not as important as understanding the Rigor/Relevance Framework.
- Next ask the groups to complete the Test Question Development Worksheet, where they must first evaluate a test question and then write a new question at the designated level.

Suggestions

Don't let participants disagree too long or too strongly over a particular level on either taxonomy. It is more important to get a general sense of levels than to reach unanimous agreement on the exact level.

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Activity 12

Knowledge Challenge

Time 10-15 minutes

Purpose

This activity reinforces the Knowledge Taxonomy and encourages teachers to think about creative instructional activities that will raise the knowledge level of instruction.

Materials

Index cards (one per group)

Procedure

- Working in groups of 5-6, have participants brainstorm instructional topics in any subject which are generally taught at low levels on the Knowledge Taxonomy — level 1 or 2. Encourage participants to think of a low-level memorization assignment that they or their children suffered through. Some examples are: defining vocabulary words, identifying mechanical devices in physics, math operations (addition, etc.).
- Have the groups select one of their topics that is a good candidate for improvement and write it on an index card.
- Collect the cards and redistribute them, making sure no group gets its card back.
- Have the groups write a skill and knowledge statement for the topic which is at level 5 or 6 of the Knowledge Taxonomy. They should then suggest at least one instructional activity that would raise student performance to the stated level.
- Have groups report out: (1) their assigned skill, (2) the higher level that is their target on the Knowledge Taxonomy, and (3) their instructional activities.

Suggestions

A motivational twist can be added by appointing a couple of judges and giving a prize to the group that is most creative.

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Activity 13

Application Challenge

Time 10-15 minutes

Purpose

This activity reinforces the Application Model and encourages teachers to think about creative instructional activities that will raise the level of application in instruction.

Materials

Index cards (one per group)

Procedure

- Working in groups of 5-6, have participants brainstorm instructional topics in any subject which are generally taught at low levels (1 or 2) on the Application Model. Some examples: math word problems, multiplication tables, diagramming sentences.
- Have the groups select one of their topics that is a good candidate for improvement and write it on an index card.
- Collect the cards and redistribute them, making sure no group gets its card back.
- Have the groups write a skill and knowledge statement for the topic which is at level 4 or 5 of the Application Model. They should then suggest at least one instructional activity that would raise student performance to the stated level.
- Have groups report out: (1) their assigned skill, (2) the higher level that is their target on the Application Model, and (3) their instructional activities.

Suggestions

For the brainstorming, encourage participants to think of a low-level memorization assignment that they or their children suffered through.

A motivational twist can be added by appointing a couple of judges and giving a prize to the group that is most creative.

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Activity 14

Developing Analytical Scoring Guides

Time 50-60 minutes

Purpose

This entertaining activity develops understanding of how to create detailed scoring guides for performance-based assessments.

Materials

For each group: a plastic bag containing 4-5 different kinds, shapes, and sizes of chocolate cookies

Handouts

19. Scoring Guide - Worksheet (4 pages)
20. Chocolate Cookie Scoring Guide Example
21. Scoring Guide Samples (5 pages)

Procedure

- Review information on performance assessment and the three types of scoring guides. Distribute Scoring Guide Samples.
- Divide participants into groups of 2-3, and give each group a bag of cookies with instructions not to open the bag.
- Explain the task: To select the world's best chocolate cookie. Because there is so much prestige and money at stake, they must develop a specific scoring guide to judge the best cookie.
- Review the four steps in developing analytical scoring guides:

    1. Brainstorm characteristics
    2. Organize in 4-5 categories and label each
    3. Develop 4 different levels for one characteristics
    4. Develop a description at each level for all characteristics.

- Ask groups to work through each step of the process using the Scoring Guide Worksheet.
- Have the groups share their categories and a few of the levels of achievement for select criteria.
- Have the groups touch, smell, and taste the cookies to apply their scoring guides. Discuss the results and how well the scoring guide worked.
- Distribute Chocolate Cookie Scoring Guide Example. Have groups reflect on how well the process worked.

Suggestions

Work with individual groups to assist them in accomplishing each step.

Have participants discuss the value of working in small groups versus individually. Also discuss how the scoring guide could be improved over time.

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Activity 15

Put It In Writing!

Time 30-40 minutes

Purpose

This is an individual brainstorming activity that generates dozens of suggestions of ways to put real-world applications in instruction. Some may be frivolous, but others will stimulate creative thinking and lead to new applications of knowledge.

Materials

standard business envelope for each participant
15 3x5 inch sheets of paper (or index cards) for each participant
watch with second hand

Procedure

- Ask each participant to place an identifying mark on the upper left corner of the envelope. This keeps the envelopes anonymous but enables participants to find their own later.
- Pose a general topic to the group, such as more rigorous and relevant instruction. Ask participants to write a question on the envelope that identifies a personal need related to the topic. Examples: How do I develop more real-world applications for elementary mathematics? How do I get science and math to collaborate?
- Collect and redistribute the envelopes, instructing participants to ask for another if given theirs back.
- Give each person one minute to write a suggestion on a piece of paper and put it in the envelope. Every 60 seconds the envelopes get passed to the next person. Have participants make a quick trade with someone if their envelope gets passed back to them.
- After 15 minutes, collect all the envelopes and leave them on a table for pickup.

Suggestions

If time allows, have participants retrieve their envelopes and read the responses to themselves. Then have them share with the group the question and several of the best responses.

Point out how this brainstorming activity contributes to participants/students learning from each other without all information going through the facilitator/teacher.

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Handout 1

Defining Rigorous and Relevant Curriculum Visuals

Why ??????

- Accelerating technological change
- Global economic competition
- Mismatch of education expectations and reality
- Curriculum that doesn't meet student needs

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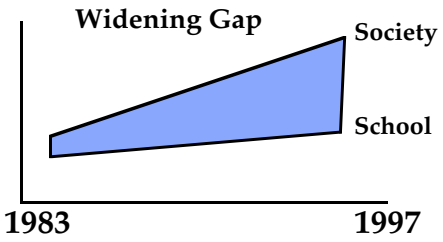
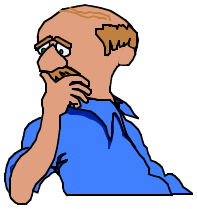
Education and Society



Improving Instruction

Traditional

- Consistent progress
- School driven
- Teaching "things" right
- Teacher centered
- More content



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Improving Instruction

Rigor/Relevance

- Sense of urgency
- Standards driven
- Teaching the right "things"
- Student centered
- More application

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Skills of the Future

New Basics

- Creative Thinking
- Technical Reading/Writing, Speaking & Listening
- Analysis, Problem Solving
- Inquiry, Technology
- Computer Applications
- Adaptation, Improvement

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Learner-Centered Characteristics

- Students actively engaged
- Clear expectations
- Thinking curriculum
- Constructing knowledge based on experience
- Learning at different rates and in different ways
- Assessment a natural event

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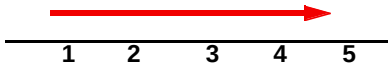
Handout 1

Defining Rigorous and Relevant Curriculum Visuals

Continuum of Application

Knowledge for its own sake — **Use of that Knowledge**



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Application Model

1. Knowledge in one discipline
2. Application within discipline
3. Application across disciplines
4. Application to real-world predictable situations
5. Application to real-world unpredictable situations

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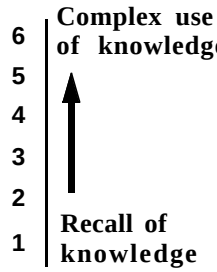
Continuum of Knowledge



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Knowledge Taxonomy

1. Awareness
2. Comprehension
3. Application
4. Analysis
5. Synthesis
6. Evaluation

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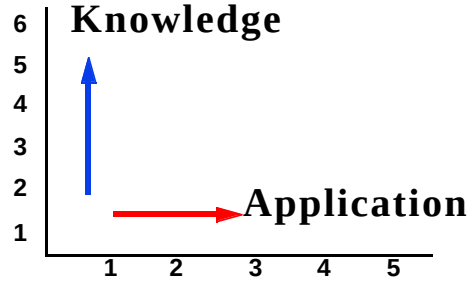
Rigor/Relevance Framework



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Traditional	Rigorous and Relevant
◆Teaching focused	◆Learning focused
◆Time based	◆Competency based
◆Fragmented	◆Interdisciplinary
◆Textbooks	◆Real-world problems
◆Routine	◆Constantly challenging

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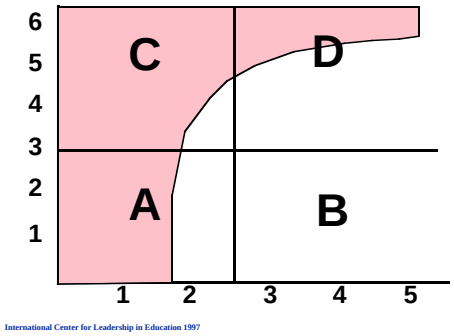
Defining Rigorous and Relevant Curriculum Visuals

United States



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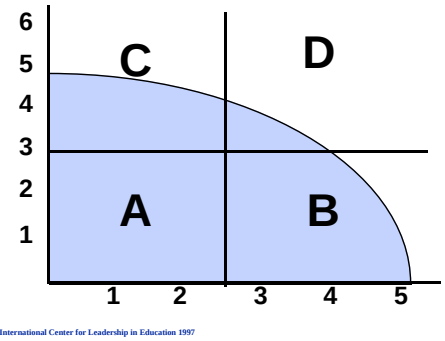
Asia



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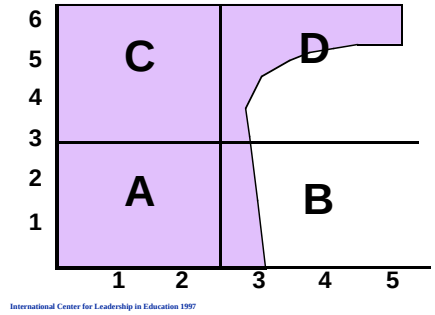
Europe



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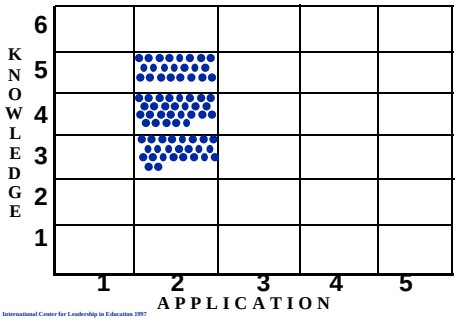
SAT Verbal



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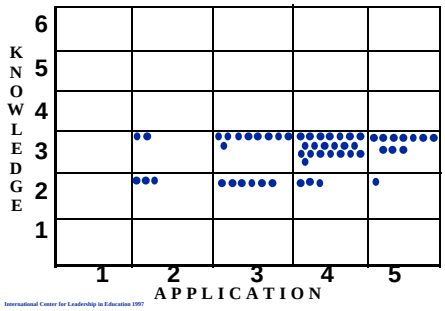
Korea - Language Arts



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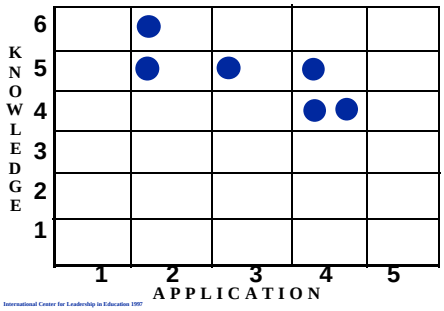
England - Language Arts



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Handout 2

Using the Rigor/ Relevance Framework Visuals

Education Research

What have we learned?

- **Application results in better learning**
- **Schools have limited application**
- **Students engaged in application, learn better and stay in school**
- **Contextual learning more lasting**
- **Students learn at different speeds and in different ways**

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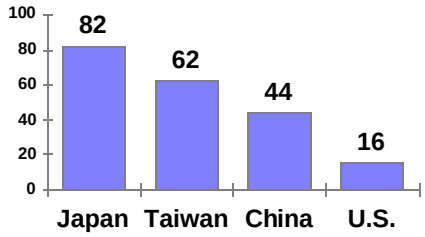
Learning Activity Retention

	Amount of Transfer
Teach Others/Use Learning	90%
Practice & Real Application	75%
Discussion Group	50%
Demonstration	30%
Audio Visual	20%
Reading	10%
Lecture	5%

William Glasser, The Quality School

Real World Applications



Stevenson, Harold W. and Stigler, John W. The Learning Gap

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Learning Styles of American Youth

- Linguist **10%**
- Personal experiences **22%**
- Practical utility **51%**
- Imaginative **17%**

Jerry Conrath, Our Other Youth, 1989

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Connections with School Improvement Efforts

- **Dimensions of Learning**
- **Brain-Based Learning**
- **Thematic Instruction**
- **Integration of Academic and Vocational**
- **Multiple Intelligences**

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Application Initiatives

- **School-to-work**
- **Contextual-based mathematics and science**
- **Reading in content areas**
- **Performance assessment**
- **Alternative schools**

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Handout 2

Using the Rigor/ Relevance Framework Visuals

How should we measure success in learning????

- Comparing to expectations not other students
- Using external not internal standards
- Challenging not sorting students

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Management of Change

- Create awareness
- Identify community expectations
- Examine curriculum
- Analyze discrepancy
- Define negotiables/non-negotiables
- Develop and communicate plan
- Evaluate and revise plan

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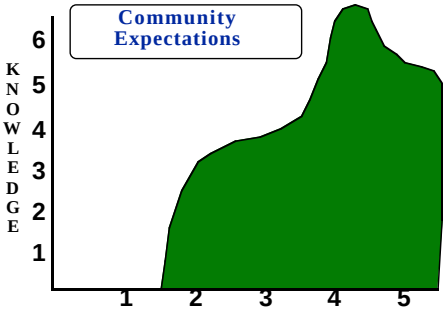

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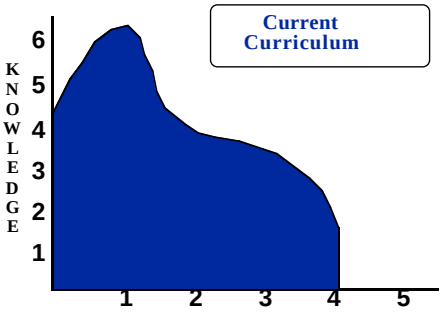

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Changing the Paradigm of Instruction

- Student work
- Interdisciplinary
- Lengthen time
- Multi-level
- Instructional technology
- Embed assessment

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Characteristics of Successful Schools

- ✔Rigorous and relevant curriculum
- ✔Assess knowledge and application
- ✔Address student behavior
- ✔Willing to change organization

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Handout 3

Planning Rigorous and Relevant Instruction Visuals

Traditional Planning Model

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Performance Assessment

- "Real World" situations
- Part of ongoing instruction
- Apply knowledge and skill
- Result in product or performance
- Demonstration
- Criterion referenced
- Standards of excellence
- Judged by trained teacher/others

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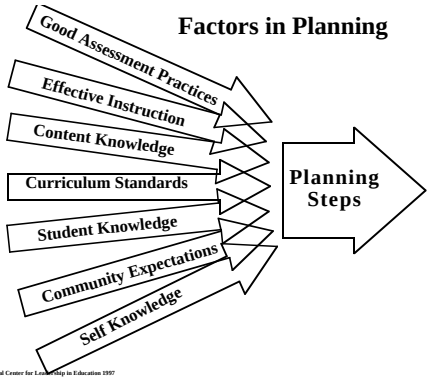
Factors in Planning



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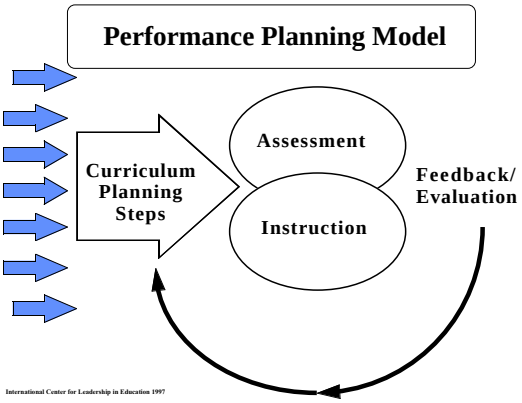
Performance Planning Model



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Rigorous and Relevant Instruction

Key Questions

- What is the focus of the instructional unit (topic, area, theme, setting or concepts)? What are the important connections (standards, other disciplines)?
- What are students expected to know and be able to do (knowledge and application level)?
- What student work will be used to measure achievement?
- What content will students need?
- What key questions and/or concepts will trigger student interest?
- What assessment and instruction will be effective?

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Instructional Planning

Planning Steps

- Definition of instructional unit
- Levels of expected knowledge and performance
- Student work
- Content knowledge
- Essential questions / concepts
- Assessment and instruction

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Handout 4

Worksheet

Determining Levels of Rigor and Relevance

Directions: For each of the following skill and knowledge statements, indicate the appropriate level on the Application Model and Knowledge Taxonomy.

	Application Level	Knowledge Level
1. Calculate rate of change in a population.		
2. Identify common land formations (islands, deltas, mountains) on a map.		
3. Prepare written and oral arguments to support a change in a school policy.		
4. Predict, evaluate, and rank minerals by hardness.		
5. Compare and contrast two short stories.		
6. Describe in your own terms the meaning of one of the amendments in the Bill of Rights.		
7. Read a bus schedule to determine the length of time for an across-city trip and which buses to take.		
8. Determine all factors of a whole number.		
9. Multiply in your head pairs of numbers less than 12.		
10. Write directions on how to determine if the batteries are dead in a portable electronic device.		
11. Edit a letter for correct grammar and spelling.		
12. Develop a mathematical model for estimating a large number of objects.		
13. Research a topic and give an oral report to the class.		
14. Convert English measurement to decimal equivalents.		
15. Determine information from a graph or statistics.		

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Handout 4

Answer Sheet

Determining Levels of Rigor and Relevance

	Application Level	Knowledge Level
1. Calculate rate of change in a population.	4	3
2. Identify common land formations (islands, deltas, mountains) on a map.	2	2
3. Prepare written and oral arguments to support a change in a school policy.	5	5
4. Predict, evaluate, and rank minerals by hardness.	2	2
5. Compare and contrast two short stories.	2	4
6. Describe in your own terms the meaning of one of the amendments in the Bill of Rights.	4	2
7. Read a bus schedule to determine the length of time for an across-city trip and which buses to take.	4	4
8. Determine all factors of a whole number.	2	4
9. Multiply in your head pairs of numbers less than 12.	1	1
10. Write directions on how to determine if the batteries are dead in a portable electronic device.	4	5
11. Edit a letter for correct grammar and spelling.	4	3
12. Develop a mathematical model for estimating a large number of objects.	4	5
13. Research a topic and give an oral report to the class.	2	5
14. Convert English measurement to decimal equivalents.	2	2
15. Determine information from a graph or statistics.	4	4

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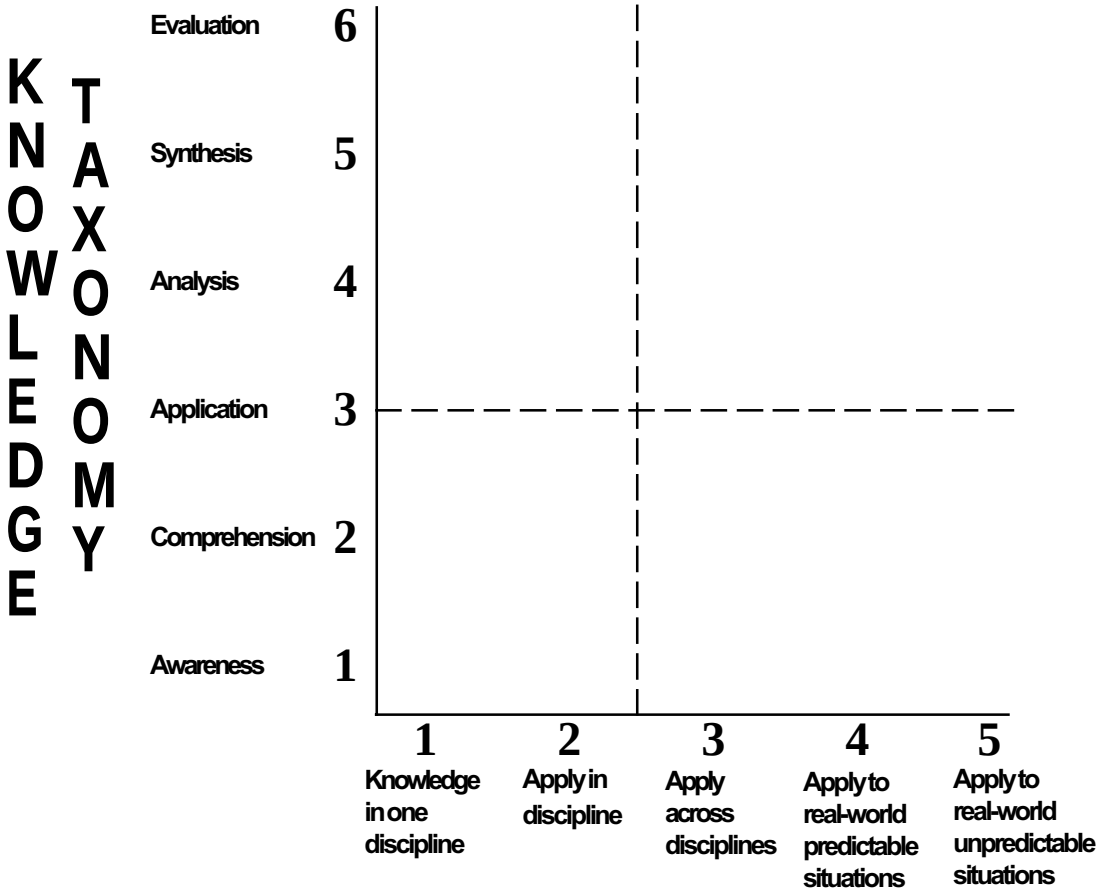
Handout 5

Rigor/Relevance Framework



APPLICATION MODEL

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Handout 6

Knowledge Taxonomy Verb List

Listed below are some of the verbs that can be used for constructing and analyzing levels of expected student knowledge.

1 Knowledge

arrange
check
choose
find
group
identify
label
list
locate
match
name
point to
recall
recite
repeat
say
select
write

2 Comprehension

advance
calculate
change
convert
contemplate
define
explain
extrapolate
infer
interpret
outline
project
propose
reword
submit
transform
translate
vary

3 Application

adopt
consume
capitalize on
devote
employ
exercise
handle
maintain
make use of
manipulate
mobilize
operate
put to use
relate
solve
start
take up
utilize

4 Analysis

assay
audit
breakdown
canvass
check out
dissect
deduce
divide
examine
include
inspect
look at
scrutinize
sift
survey
study
test for
uncover

5 Synthesis

blend
build
cause
combine
compile
compose
conceive
construct
create
develop
evolve
form
generate
make up
originate
produce
reorder
structure

6 Evaluation

accept
appraise
arbitrate
assess
award
classify
criticize
decide
determine
grade
judge
prioritize
rank
rate
reject
rule on
settle
weigh

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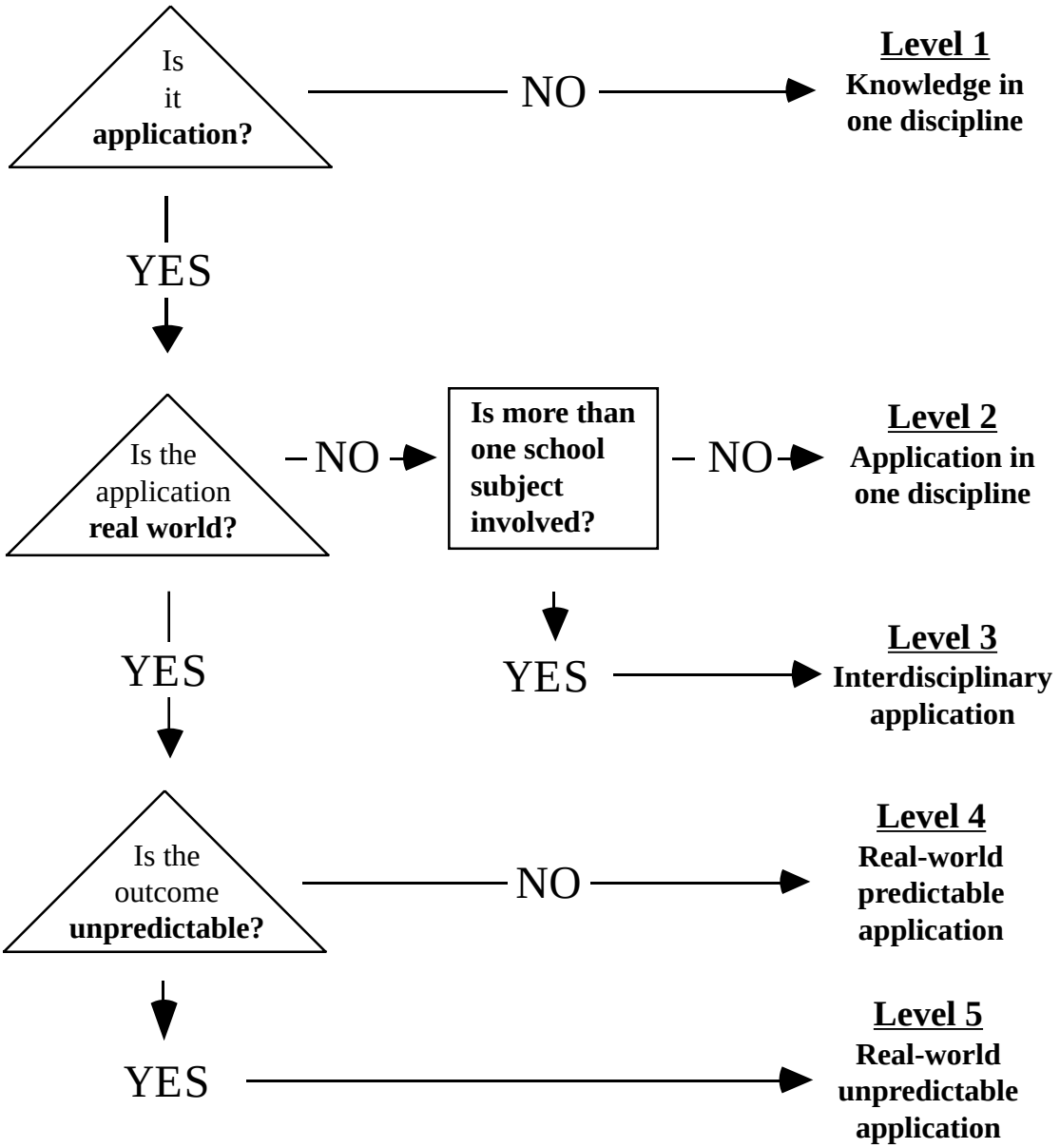
Handout 7

Application Model Decision Tree

Directions: Select a task, application, or activity and then answer the following questions. See page 2 for clarification of the questions.



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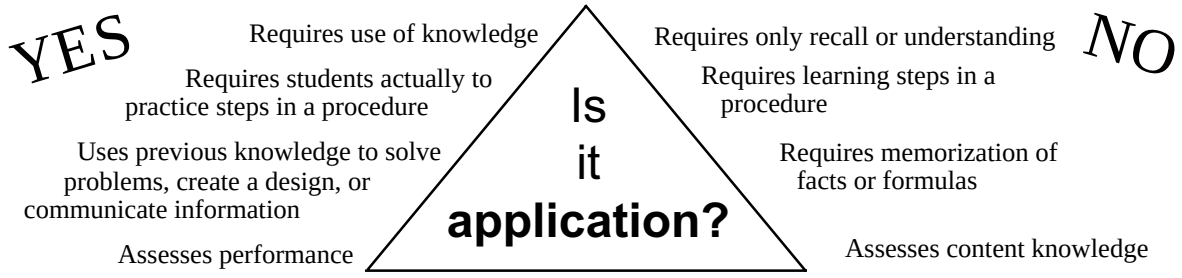
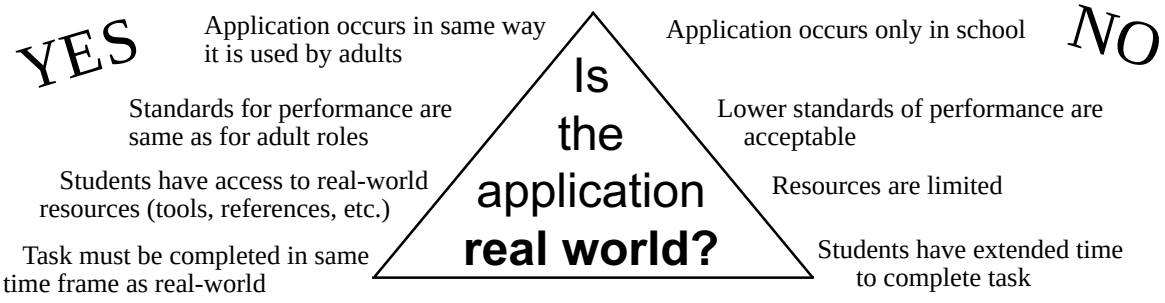
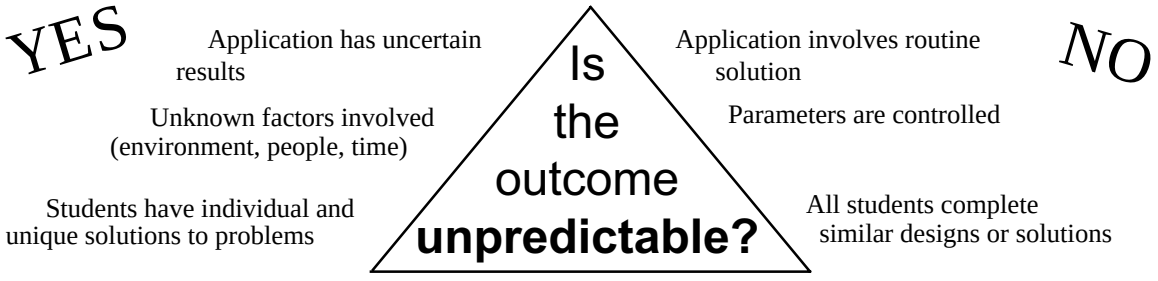
Handout 7

Application Model Decision Tree

Directions: Use the following statements to clarify where a task, application, or activity belongs on the Application Model.







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Handout 9

Examples of Student Performance by Application Level

Interviewing Skills

Application Level	
1	List steps in preparing for interview
2	Participate in a mock interview
3	Conduct interview for school-based business
4	Select appropriate apparel and grooming for an interview
5	Interview for a job

Public Speaking

Application Level	
1	List characteristics of a good speech
2	Give a presentation to a class
3	Make an oral defense of a senior exhibition or project
4	Present a point of view on an issue at a public meeting
5	Respond to questions as a student representative at a boardof education meeting

Application Model

1. Knowledge in one discipline
2. Apply knowledge in discipline
3. Apply knowledge across disciplines
4. Apply knowledge to real-world predictable situations
5. Apply knowledge to real-world unpredictable situations

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Handout 10

Examples of Student Performance by Knowledge Level

Roller Skating

Knowledge Level	
1	Identify equipment
2	Explain safety precautions
3	Roller skate on level ground and hills
4	Examine skills and weaknesses
5	Develop a plan for improvement
6	Assess someone else's skills

Nutrition

Knowledge Level	
1	Label foods by group
2	Explain nutritional values of foods
3	Eat balanced meals
4	Study success in achieving nutrition goals
5	Generate revised nutrition goals
6	Appraise results of nutrition habits

Knowledge Taxonomy

1. Awareness
2. Comprehension
3. Application
4. Analysis
5. Synthesis
6. Evaluation

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Handout 11

Sample Instructional Plan

1. ***What is the focus of this instructional unit (topic, area, theme, setting, concepts)? What are the important connections (standards, other disciplines)?***

- Criminal Justice System - procedures, rights and responsibilities
- Secondary Level Social Studies
- State Social Studies Standard #5 - U.S. Government

2. ***What are students expected to know and be able to do (expected application level and knowledge level)?***

Competency	Application Level	Knowledge Level
Understand the court system	1	2
Understand the role of court officials	1	2
Participate on a jury	5	6
Recognize individual rights in criminal cases	4	4
Compare U.S. judicial system to other nations	2	4

3. ***What student work will be used to measure achievement?***

- Written test on court system
- Role play on court officers
- Group project on other court systems
- Student journal following participation on youth court jury

4. ***What content will students need?***

- Criminal justice system, courts
- Levels of crimes
- Roles of judges, officers, attorneys, juries
- International systems

5. ***What are the "big" concepts/ideas to be learned, and what key questions will trigger student interest?***

- Concept - Court system designed to protect individual rights
- Question -Why is it important to have private citizens participate as jury members?

6. ***What assessment and instruction will be effective ?***

- Guest presentation - District Attorney Office
- Lecture/reading on court systems
- Group research and reports
- Group role play and skits
- Youth court experience

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Handout 12

Worksheet

Performance Planning

1. ***What is the focus of this instructional unit (topic, area, theme, setting, concepts)? What are the important connections (standards, other disciplines)?***

2. ***What are students expected to know and be able to do (expected application level and knowledge level)?***

Competency	Application Level	Knowledge Level

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Handout 12

Worksheet

Performance Planning

3. ***What student work will be used to measure achievement?***

4. ***What content will students need?***

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Handout 12

Worksheet

Performance Planning

5. ***What are the "big" concepts/ideas to be learned, and what key questions will trigger student interest?***

6. ***What assessment and instruction will be effective?***

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Handout 13

Performance Planning Questions

1. ***What is the focus of this instructional unit (topic, area, theme, setting, concepts)?***
   What are the important connections (standards, other disciplines)?

2. ***What are students expected to know and be able to do (expected application level and knowledge level)?***

Competency	Application Level	Knowledge Level

3. ***What student work will be used to measure achievement?***

4. ***What content will students need?***

5. ***What are the "big" concepts/ideas to be learned, and what key questions will trigger student interest?***

6. ***What assessment and instruction will be effective ?***

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Handout 14

Worksheet

Setting Levels of Expected Skills and Knowledge

Directions: Use this form to draft skills and knowledge expected for the instructional topic. Answer the question: **What do I expect students to know and be able to do?**

1. List skill and knowledge statements.
2. For each statement designate the level of application you expect students to achieve.
3. For each statement designate the level of knowledge you expect students to achieve.

Application Level	Knowledge Level	Skills and Knowledge

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Handout 15

Assessor's Directions

The Task

The group will do the following task:

- Blow up a balloon.
- Tie the balloon closed.
- Attach a piece of yarn.
- Hand the balloon to you for evaluation.
- Following acceptance or rejection, start the process over.

Evaluation Criteria

You accept or reject each balloon. Balloons are **rejected** if they do **not** meet the following criteria:

1. The balloon is blown up and has yarn tied to the knot.
2. The person who hands it to you is holding onto the yarn.
3. The balloon is a different color from the previous one accepted.

You may use a variety of facial expressions but do not give any verbal cues as to why you accept or reject a balloon.

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Handout 16

Observer's Directions

Your task is to make observations about the group and how the task is carried out. You do not participate in the activity.

The following questions should guide your observations and the discussion that follows completion of the task.

1. What were participants' reactions to:

   - rejection of the balloon?

   - acceptance of the balloon?

2. What factors influence group participation?

3. How important was feedback from the assessor?

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Handout 17

Worksheet

Test Question Evaluation

Directions: For each of the following test questions/activities, indicate the appropriate level on the Application Model and the Knowledge Taxonomy.

	Application Level	Knowledge Level
1. What is the value of n in the following equation? $6.5 = 0.48 + n$ A. 0.17 B. 3.12 C. 6.02 D. 6.98		
2. The phrase "x to the fifth power" is represented by which mathematical expression? A. x^5 B. 5^x C. $5x$ D. $5+x$		
3. The pressure (voltage) of a battery for a bus or truck employing a diesel engine is usually 24V connecting two 12V batteries in series. When a starter was switched on for starting the engine, 180A of electric current flowed. How much power (W) was consumed by this starter?		
4. If books bought at prices ranging from \$2.00 to \$3.50 are sold at prices ranging from \$3.00 to \$4.25, what is the greatest possible profit that may be made selling 8 books?		
5. A 10-foot ladder is placed against the side of a building. The bottom measures 8 feet from the building. The ladder doesn't reach the desired height, so it is moved closer to the building and now the base is only 4 feet from the building. How much higher does the ladder now reach?		
6. A 1,500 watt electric water heater can heat 2 kg of water from 15° C to 30° C in 140 seconds. Find the efficiency of the heater. Assume that 4,200 joules of heat energy are needed to increase the temperature of 1 kg of water by 1° C. A. 20% B. 40% C. 80% D. 100% E. 125%		
7. The distance between two parts of a cell, measured using a microscope that enlarges 5.7 million times, was 2.43 cm. Calculate the true distance separating these two parts in micrometers.		
8. Your boss tells you to find the best deal in cellular phone service. Economy service is \$19.95 a month plus 31¢ per minute of airtime. Silver service is \$40.95 a month plus 16¢ per minute. Gold service is \$80.95 a month with unlimited airtime. Define variables. Write equations. Make tables and graphs. Find slopes and points of intersection. For each plan, how much airtime will \$100 buy? For what range of airtime is each plan cheapest?		

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Handout 17

Worksheet

Test Question Evaluation

	Application Level	Knowledge Level

9. Read the sentences and choose the one word that correctly completes both sentences.
Richard has _____in several companies.
Politics _____him.

A. interests B. bores C. stock D. discuss

10. In a population of 1,000 fruit flies, the percentages of gene pairs are:
TT = 15% Tt = 51% tt = 34%

If the fruit flies were free to breed normally, and if nothing happened to disturb the "gene pool," what would be the approximate percentage of tt two generations later?

A. 15% B. 34% C. 51% D. 68% E. 75%

11. On a trip through Europe, Karen and Alicia saw these gas prices.

Country	Cost per Liter
France	4 francs
England	0.4 pounds
Denmark	2.8 kroner

Karen said, "Wow! Gas is so much cheaper here than in the U.S. Alicia replied, "You're wrong! It's way more expensive here." Who was correct? Show the work that supports your answer and explain why you are right. Assume the cost of a gallon of gas in the U.S. is $1.30, and use the tables below to make your comparison.

Currency Conversion Table
$1.00 = 4.5 francs
$1.00 = 0.67 pounds
$1.00 = 2.2 kroner

Liquid Measure Conversion Table
1 quart = 0.946 liters
1 gallon = 4 quarts

12. Which of these substances is found in every living cell?

A. protein B. chlorophyll C. cellulose D. starch E. hemoglobin

13. Choose the word that means the same, or about the same, as the underlined word. all facets

A. corners B. aspects C. feelings D. forms

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Handout 17
Worksheet

Test Question Evaluation

English Performance Tasks	Application Level	Knowledge Level
14. Select a local issue or controversy of interest to you. Gather data from a variety of sources and form a hypothesis on aspects of the topic based on your data. Relate its importance to your community.		
15. After getting an explanation and examples of World Wide Web homepages, students will collaborate to design a World Wide Web homepage for the school, determining as a group which aspects of the school will be represented to the world through the Internet.		
16. After reading a novel, imagine the publisher has sent you an advance copy and asked you to write a literary review. Include your opinions and feelings about the story and its characters with support statements for each. Create a book jacket or poster to draw attention to the book.		
17. As a technical writer, it is your job to make sure next year's students understand the classroom jobs. You will need to experience, reflect on, and summarize a classroom job. After investigating the tasks of a technical writer, you will write a manual that includes: a. an explanation of how to perform all components of the job b. interview questions to ask an applicant c. an application form d. a job performance rating scale e. a help-wanted ad to advertise the job		
18. Students will read, discuss, and interpret Chaucer's "Prologue" to *The Canterbury Tales*. Students will then select two characters they find intriguing, gain a thorough knowledge of these two characters from the "Prologue," and create a written dialog between them. Students should stress both the differences and commonalties so that the dialog reveals two distinct personalities.		
19. After examining and comprehending the Bill of Rights, each group of students will rewrite an amendment or create a new one for the 21st century. Groups will present their "right," and the class will debate it and then vote on its inclusion in a "new Bill of Rights." Each student will complete a portfolio containing research, summaries of and reactions to proposals by other groups, and notecards for oral presentation.		
20. Structure a business plan based on a hypothetical enterprise executed on a computer. This plan must exhibit stages from the earliest planning, researching, and designing to staff managing, record-keeping, and sales promotion. A major requisite for this task is to demonstrate well-thought-out steps that complement each other and a finished product that is both consistent and progressive.		

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Handout 17

Answer Sheet

Test Question Evaluation

		Application Level	Knowledge Level
1.	What is the value of n in the following equation? $6.5 = 0.48 + n$ A. 0.17 B. 3.12 C. 6.02 D. 6.98	2	2
2.	The phrase "x to the fifth power" is represented by which mathematical expression? A. x^5 B. 5^x C. 5x D. 5+x	1	1
3.	The pressure (voltage) of a battery for a bus or truck employing a diesel engine is usually 24V connecting two 12V batteries in series. When a starter was switched on for starting the engine, 180A of electric current flowed. How much power (W) was consumed by this starter?	4	3
4.	If books bought at prices ranging from $2.00 to $3.50 are sold at prices ranging from $3.00 to $4.25, what is the greatest possible profit that may be made selling 8 books?	4	3
5.	A 10-foot ladder is placed against the side of a building. The bottom measures 8 feet from the building. The ladder doesn't reach the desired height, so it is moved closer to the building and now the base is only 4 feet from the building. How much higher does the ladder now reach?	4	3
6.	A 1,500 watt electric water heater can heat 2 kg of water from 15° C to 30° C in 140 seconds. Find the efficiency of the heater. Assume that 4,200 joules of heat energy are needed to increase the temperature of 1 kg of water by 1° C. A. 20% B. 40% C. 80% D. 100% E. 125%	4	3
7.	The distance between two parts of a cell, measured using a microscope that enlarges 5.7 million times, was 2.43 cm. Calculate the true distance separating these two parts in micrometers.	3	3
8.	Your boss tells you to find the best deal in cellular phone service. Economy service is $19.95 a month plus 31¢ per minute of airtime. Silver service is $40.95 a month plus 16¢ per minute. Gold service is $80.95 a month with unlimited airtime. Define variables. Write equations. Make tables and graphs. Find slopes and points of intersection. For each plan, how much airtime will $100 buy? For what range of airtime is each plan cheapest?	4	5

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Handout 17
Answer Sheet

Test Question Evaluation

		Application Level	Knowledge Level
9.	Read the sentences and choose the one word that correctly completes both sentences. Richard has _____in several companies. Politics _____him. A. interests B. bores C. stock D. discuss	2	2
10.	In a population of 1,000 fruit flies, the percentages of gene pairs are: TT = 15% Tt = 51% tt = 34% If the fruit flies were free to breed normally, and if nothing happened to disturb the "gene pool," what would be the approximate percentage of tt two generations later? A. 15% B. 34% C. 51% D. 68% E. 75%	4	2
11.	On a trip through Europe, Karen and Alicia saw these gas prices. Country — Cost per Liter France — 4 francs England — 0.4 pounds Denmark — 2.8 kroner Karen said, "Wow! Gas is so much cheaper here than in the U.S. Alicia replied, "You're wrong! It's way more expensive here." Who was correct? Show the work that supports your answer and explain why you are right. Assume the cost of a gallon of gas in the U.S. is $1.30, and use the tables below to make your comparison. Currency Conversion Table $1.00 = 4.5 francs $1.00 = 0.67 pounds $1.00 = 2.2 kroner Liquid Measure Conversion Table 1 quart = 0.946 liters 1 gallon = 4 quarts	4	5
12.	Which of these substances is found in every living cell? A. protein B. chlorophyll C. cellulose D. starch E. hemoglobin	1	1
13.	Choose the word that means the same, or about the same, as the underlined word. all facets A. corners B. aspects C. feelings D. forms	2	2

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Handout 17

Answer Sheet

Test Question Evaluation

	English Performance Tasks	Application Level	Knowledge Level
14.	Select a local issue or controversy of interest to you. Gather data from a variety of sources and form a hypothesis on aspects of the topic based on your data. Relate its importance to your community.	4	5
15.	After getting an explanation and examples of World Wide Web homepages, students will collaborate to design a World Wide Web homepage for the school, determining as a group which aspects of the school will be represented to the world through the Internet.	4	3
16.	After reading a novel, imagine the publisher has sent you an advance copy and asked you to write a literary review. Include your opinions and feelings about the story and its characters with support statements for each. Create a book jacket or poster to draw attention to the book.	4	5
17.	As a technical writer, it is your job to make sure next year's students understand the classroom jobs. You will need to experience, reflect on, and summarize a classroom job. After investigating the tasks of a technical writer, you will write a manual that includes: a. an explanation of how to perform all components of the job b. interview questions to ask an applicant c. an application form d. a job performance rating scale e. a help-wanted ad to advertise the job	4	4
18.	Students will read, discuss, and interpret Chaucer's "Prologue" to *The Canterbury Tales*. Students will then select two characters they find intriguing, gain a thorough knowledge of these two characters from the "Prologue" and create a written dialog between them. Students should stress both the differences and commonalties so that the dialog reveals two distinct personalities.	2	4
19.	After examining and comprehending the Bill of Rights, each group of students will rewrite an amendment or create a new one for the 21st century. Groups will present their "right," and the class will debate it and then vote on its inclusion in a "new Bill of Rights." Each student will complete a portfolio containing research, summaries of and reactions to proposals by other groups, and notecards for oral presentation.	4	5
20.	Structure a business plan based on a hypothetical enterprise executed on a computer. This plan must exhibit stages from the earliest planning, researching, and designing to staff managing, record-keeping, and sales promotion. A major requisite for this task is to demonstrate well-thought-out steps that complement each other and a finished product that is both consistent and progressive.	4	5

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Handout 18

Worksheet

Test Question Development

Directions: In the first box, develop a test question. Use the second box to revise the question at a higher level of knowledge and/or application.

Test Question

Level of Application _____ Level of Knowledge _____

Revised Question

Level of Application _____ Level of Knowledge _____

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Handout 19

Worksheet

Scoring Guide

Step 1. Brainstorming

Directions: Develop a list of characteristics of the world's finest chocolate cookie.

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Handout 19

Worksheet

Scoring Guide

Step 2. Organize criteria

Directions: Organize similar characteristics from brainstorming into categories, and give each category a name. The categories become the criteria for evaluation.

Similar characteristics

Similar characteristics

Name_____

Name_____

Similar characteristics

Similar characteristics

Name_____

Name_____

Similar characteristics

Similar characteristics

Name_____

Name_____

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Handout 19

Worksheet

Scoring Guide

Step 3. Develop levels of one criterion

Directions: Choose one criterion and describe four levels of quality to judge it.

Product: World's Finest Chocolate Cookie

Criterion: _____

Level 4 (highest)	**Level 3**
Level 2	**Level 1** (lowest)

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Handout 19

Worksheet

Scoring Guide

Step 4. Develop scoring guide for four levels of all criteria

Directions: Copy the criteria from Step 2 and enter the set of levels from Step 3. Complete the chart with descriptions of levels for each criterion.

	Level			
Criterion	**4**	**3**	**2**	**1**

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Handout 20

Chocolate Cookie Scoring Guide Example

Characteristic	Level 4	Level 3	Level 2	Level 1
Texture	The cookie is crispy on the outside, chewy on the inside, moist but not greasy.	The cookie is somewhat crispy on the outside, chewy on the inside.	The cookie is fully cooked but too hard or too chewy.	The cookie is overcooked or undercooked.
Appearance	The cookie is dark brown, at least 3 inches in diameter, with a rich appearance.	The cookie is moist, medium to dark brown, and almost 3 inches.	The cookie is pale brown, looks dry, and is 2 inches or less.	The cookie is burnt, raw, or crumbly.
Taste	The cookie is oven fresh with a sweet, full, chocolatey flavor in every bite.	The cookie is fresh with a strong chocolate flavor.	The cookie is somewhat fresh with a mild chocolate flavor.	The cookie is stale, salty, or dry.
Contents	The cookie is 25% chocolate pieces and/or nuts.	The cookie has some nuts and/or chocolate pieces.	The cookie has no chips or nuts.	The cookie has nuts that are rancid or chips that are bitter.
Smell	The cookie emits a rich chocolatey smell from 4 feet away.	The cookie smells chocolatey when held at arm's length.	The cookie has a chocolate odor if held near nose.	The cookie smells burnt, rancid, or has no odor at all.

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VI. Suggestions for Administrators

A Instructional Leadership

Rigorous and relevant instruction is achieved by teachers who make changes in the way that they plan and conduct instruction and assessment. They cannot, however, accomplish it alone. All school staff, but particularly administrators, must play an important role as well. The philosophy, culture, policies, and procedures of the school can provide an incentive to change, or they can be significant barriers.

The research consistently shows that the principal is key to any instructional change in schools. In fact, the principal should be the instructional leader of a school, helping to guide, encourage, and support teachers in making a change.

W. Smith and R. Andrews

Instructional Leadership: How Principals Make a Difference

Wilma Smith and Richard Andrews define nine characteristics of the instructional leader.

The instructional leader:

1. Places priority on curriculum issues.
2. Is dedicated to the goals of the school and the school district.
3. Is able to rally and mobilize resources to accomplish the goals of the district and the school.
4. Creates a climate of high expectations in the school, characterized by a tone of respect for teachers, students, parents, and community.
5. Functions as a leader with direct involvement in instructional policy.
6. Continually monitors student progress toward school achievement and teacher effectiveness in meeting those goals.
7. Is able to develop and articulate a clear vision of long-term goals for the school.
8. Consults effectively with others in school decisions.
9. Recognizes time as a scarce resource and creates order and discipline by minimizing factors that may disrupt the learning process.

The Council of Chief School Officers has developed "Standards for School Leaders," which articulates the knowledge,

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Council of Chief School Officers
"Standards for School Leaders"

dispositions, and performances that school leaders must have to be effective in their role in school. The standards defined for a school administrator call for an education leader who promotes the success of all students by:

- facilitating the development, articulation, implementation, and stewardship of a vision of learning that is shared and supported by the school community
- advocating, nurturing, and sustaining a school culture and instructional program conducive to student learning and staff professional growth
- ensuring management of the organization, operations, and resources for a safe, efficient, and effective learning environment
- collaborating with families and community members, responding to diverse community interests and needs, and mobilizing community resources
- acting with integrity, fairness, and in an ethical manner
- understanding, responding to, and influencing the larger political, social, economic, legal, and cultural context.

It is the responsibility of the principal to show leadership by focusing educational planning, reinforcing changes, working for outside support, and modeling the characteristics of learner-centered instruction. Several key responsibilities of principals are following through consistently in classroom observations, creating public awareness and support, changing the paradigm of instruction, and facilitating effective professional development. These areas are discussed below.

B Classroom Observation

Classroom observation is a vital link among the student, teacher, and principal. It brings the principal closer to the real action — instruction and learning. It places the principal in a resource role in which his or her ideas can really affect teachers, students, and learning.

The following questions are helpful in classroom observation. Principals may also want to conduct brief interviews with the teachers in order to answer each question fully.

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Questions for Classroom Observations

- Does the teacher support high student achievement by high expectations, challenging work, respect for students, and assistance for students?

- Does the teacher use open-ended questions during presentations or on tests/quizzes?

- Are questions directed at individual students during presentations? Is the wait time provided by the teacher sufficient for students to respond to questions? Are students asked to justify/explain their responses?

- Is student discourse/discussion encouraged during class? Does the teacher invite extended student explanations and stimulate student discourse?

- Does the teacher have a "system" for making sure that each student is called on during the class and there is full participation by all students?

- Does the teacher make frequent connections and references between what is being learned in the classroom and the real world and/or student experiences?

The National Association of Secondary Principals (NASSP) recommends the following procedures for classroom observations by principals. The procedures were compiled by Dustin A. Peters, principal at Elizabethtown (Pa.) Area High School.

- Give every staff member the option of a pre-observation conference, although new staff members might be the only ones who show interest. The conference provides new staff with insight into the complex process and thus relieves tension. It also enables you to lay a groundwork of expectations for the teachers.

- Use the pre-observation conference to set the stage for the teacher and you to share ideas about teaching and learning. Make it a positive and supportive experience. From these planned and focused beginnings can spring a tremendous opportunity for teacher growth and improvement.

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- Include the assistant principals in the process by assigning them to make observations and asking them to provide intensive assistance to teachers in need of extra help.

- Spend a day observing a particular department, rotating each period. In some cases, you might observe a teacher twice. By the end of the day you will have completed several observations, improved your knowledge of that department, and formulated specific ideas for improvement in the department as a whole.

- Provide each teacher with your usual observation report and write a one- or two-page draft of your total day, describing what happened period by period and including general comments particular to the department staff members. Offer four or five suggestions, ideas, questions, or considerations for the department as a whole.

- You have now established a better link with this instructional area and can offer yourself as a well-informed resource. Keep in touch with the staff to get their reactions to your observations/comments. Schedule a day or half-day every week for this kind of observation.

- Make your post-observation report count. Take some time to prepare your suggestions for improvement. It is better not to write down any suggestions than to come up with ones that are not meaningful and helpful.

- In your post-observation conference with teachers, keep the atmosphere positive. Avoid distractions during the meeting and keep open the lines of communication. Remind teachers to invite you into the classroom when they think you would find a particular lesson interesting. When you do receive an invitation, be there.

- Observation need not be limited to the classroom. Effective observation involves everyone in every school setting.

- Follow a student around the building for an entire day and interview him or her at the end of the day. In addition to observing the student, you will have the opportunity to observe six or seven teachers. Write teacher observation reports and one- or two-page report about the student, the student interview, and what happened in each class.

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- Spend the first 30 to 40 minutes each morning wandering around the building. Meet the substitutes, visit teachers, check out the library, lobby, or other areas where students congregate. By being out and about, you can take care of problems that might have otherwise been brought to your attention later in the day when someone "just dropped in" to discuss a situation with you.

- This "walking around" concept is good at any time. Visit a few classrooms during the day, and don't forget art, technology, physical education, library, and family and consumer science classes.

- Find other ways and times to make observation reports. Write one about the play rehearsal, concert, math convention, career day, or the special effort by the counselor on parent night. Use any meaningful situation to observe, record, reinforce, and give feedback. Use your time effectively and generate a positive response and some new ideas.

- Observation can be one of the more pleasant aspects of the principal's role. It allows you to spend more time with students — which should be a priority — and to have positive, constructive contact with teachers. Observation also improves classroom activity and instruction. And, for those occasions when you need to be critical, your new observation approach will provide you with more background information, time-on-task, and, ultimately, better documentation.

- Instructional leadership is an important responsibility. Accept it. Enjoy it. Your time will be better spent, and you will soon be far more knowledgeable about what's going on in the building and in the classroom. As you spend more time with your teachers and students, you will gain a new perspective on your school — one beyond your office walls.

The following principles are useful to remind principals of their educational leadership role in implementing rigorous and relevant instruction.

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Principles for Principals

- The primary purpose of school is to teach students to use their minds well.
- There is a strong sense of a common learning community among staff and students.
- The school atmosphere is safe, trusting, concerned and caring.
- Students are the workers in school, teachers and administrators facilitate and support that work.
- There are clearly defined outcomes for students to achieve.
- Expectations are high, and there is a commitment to high quality work.
- All staff model the self-discipline, self-motivation, and commitment that they hope to develop in students.
- Everyone is treated with dignity and respect.
- The focus is on the learner, decisions are based on sound knowledge of learning research and effective organizations.
- The school celebrates life and learning.
- The school is a happy place where humor is a positive force.

C Public Awareness and Support

Creating awareness of the need to change is a critical first step that should not be ignored. The responsibility for initiating public awareness falls to the administration. Parents, students, educators, and the community must be made aware of the pressing need to restructure U.S. schools. It is no longer enough to prepare our young people for good citizenship and higher education. Schools must also help all students develop the basic skills needed for an increasingly sophisticated workplace. Only when parents and community leaders are convinced that schools need to change can administrators generate the political and community pressure necessary to support moving the curriculum to a more relevant base.

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Creating awareness is a long-term, ongoing process. School districts that have successfully created a culture and environment to support change have used a variety of awareness techniques. Here are some suggestion that can get parents, students, educators, and the community thinking of the need for change in school.

- Provide information on the changing nature of work and the new skills all students need for the workplace as part of back-to-school nights and open houses conducted for parents in the fall.

- Use the school newsletter to provide parents and the community with ongoing information about the inability of American children to compete against international standards, the changing nature of the American workplace, etc.

- Encourage students to challenge the relevancy of curriculum by writing statements in the front of classrooms that ask, "Where will I use what you are teaching me today?"

- Make awareness of the changing work world part of students' ongoing curriculum.

- Ask community employers to bring lunch in for their employees and use the time to discuss the importance of restructuring schools and the need for higher-level skills.

- Request that community groups and community leaders expand their regular meeting structure to include information about the need to upgrade and expand the curriculum in American schools.

- Create partnerships with business leaders, other education leaders, and the local media to help coordinate an ongoing awareness program on the need for change in schools.

While awareness efforts must emphasize areas in which U.S. students are not competitive internationally, they should also note areas in which we are truly world-class. When it comes to developing creativity and self-esteem in students, American schools do extremely well. In the area

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of equity — including sex equity, race equity, and equity for students with disabilities — the United States is a world leader.

International comparisons are useful for reflecting on current standards. The U.S. does not need to duplicate other countries' education systems, but this country must ensure that its students can compete internationally.

Focus on Adult Roles

Once an ongoing awareness program on the need for change in the schools is underway, it is time to engage the public actively in the process. The International Center has found that an excellent way to do that is to approach a broad cross-section of the community and seek advice on what high school graduates should know and be able to do when they leave school. The key to this process is shifting thinking away from what students do in school to what people expect them to be able to do after they graduate.

To break the traditional preoccupation with courses, grades, and test scores, it is important to refocus the attention of educators, parents, and the general public on the adult roles for which graduates must prepare. Adult roles identified independently by various school districts and states include citizen, worker, lifelong learner, consumer, family member, and good user of personal health care and leisure time. It is interesting to note that these seven adult roles were first identified in 1917 as part of the Cardinal Principles of Education, which governed the first wave of school reform in America.

Many communities have succeeded in reaching agreement on adult roles. Districts could simply provide everyone with a list of adult roles, but that is not recommended. To restructure our schools so that they focus on what we should expect graduates to be able to do instead of on courses and tests, experience has shown that school staff, parents, and the community must discover for themselves what they want for the current generation of children. The process of coming to agreement through the power of discovery creates a sense of ownership that can help sustain the entire effort. Without it, the strong tendency is for everyone to drift back to the old paradigm of courses and tests.

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Public forums are a good way to seek the public's advice both on the adult roles for which graduates should be prepared and on the skills they will need to fulfill those roles. These forums offer another excellent opportunity to get out the message about the need to restructure curriculum for the sake of the students and the country.

D Changing the Paradigm of Instruction

It is relatively easy to set new standards and institute different assessments, even to say teaching will change. It is much more difficult for a teacher actually to break out of the "comfort zone" of current habits. Habits are strong forces to overcome. Initial attempts to change even the simplest of habits make us uncomfortable and cause us to doubt our own competence. By recognizing that change is difficult and may not "feel right" initially, principals can encourage teachers to keep focused on the goal and to support one another, so that the change can be a lasting one.

Recommendations

There are several areas of instructional change that can be very effective in altering the paradigm of instruction in schools.

Student Work. Focusing on student work is a powerful way to change the paradigm of instruction. Too often in school the focus is on the quality of the teacher's performance in the classroom. But the real test of the effectiveness of an education program is what students are able to produce that demonstrates their fundamental skills in communication and problem solving as well as the quality of their thinking. Significant changes have occurred in classrooms where the emphasis is on critically evaluating the quality of the work in which students are engaged. Is it challenging? Is it interesting and meaningful? Do students understand the measure of high quality?

Interdisciplinary Curriculum Work. Creating interdisciplinary teaching teams or designing interdisciplinary projects for students has a significant impact on instruction. The dynamics of teachers working together creates new ideas and new perspectives on teaching. Interdisciplinary work also fosters a climate where teachers can support and encourage one another as they attempt to make changes in teaching and learning.

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Lengthen Time. A recent trend in secondary schools is to change the master schedule in order to lengthen class periods. Schools are rapidly moving away from 45-minute periods to time blocks of 60, 90, or even 120 minutes. These longer blocks provide opportunity for more in-depth instruction and group projects. Although it may be possible to get by with a weak lesson plan and keep students entertained for 45 minutes, longer classes require much better planning to include a variety of instructional activity. Student work is definitely a focus when more time is available in class.

Multilevel. On the elementary level, interdisciplinary instruction is often not a problem because teachers typically teach more than one subject. But the barriers at the elementary level can be the connections between grades. Creating multigrade teams in elementary school has changed instruction. It also creates the dynamic of two or more teachers collaborating, who can then support one another. Multilevel teams improve the ability of teachers to reinforce and continue skill development over time.

Technology Applications. Schools that rely heavily on instructional technology for student work and problem solving have had remarkable success in engaging students in challenging instruction. Accomplishments are even greater in schools that have all students using laptop computers. These students do not use educational software but rather business, design, and communication software to solve real problems.

Embed Assessment. Another way to make significant changes in instruction is to change to timing of assessment. Traditionally, testing comes after instruction, often in the form of a chapter test on a Friday or an end-of-year test on a hot day in June. As teachers seek to design more performance-based assessment, the assessment becomes part of instruction. As students do the work, they receive direct feedback in the form of self-evaluation and peer, teacher, or external evaluation. Seeking ways to embed assessment within the instructional time results in a significant change in the way instruction and assessment are provided.

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Pitfalls

In addition to considering recommendations for creating change, it is also helpful to pay attention to pitfalls to avoid. The following problem areas must be addressed in any schoolwide change.

Lack of Consensus. The area where school leaders are most likely to fall short in bringing about change is in building consensus on the beliefs and values that should guide teaching and learning. Educators need to communicate their goals clearly to others. Any proposed educational change should include from the start a broad-based group of individuals, in order to attain a critical mass of people committed to reform. Once involved in the process, these individuals can become important advocates for the reform, especially when the going gets tough; and it will get tough.

Lack of Commitment. Another area of difficulty is in the implementation of the change. Most administrators have seen too many innovative education reform plans that end up going nowhere. This happens because everyone underestimates the complexity of changes required, the length of time it will take, the intensity and frequency of professional development required, and the necessity to significantly reform the school culture. If we accept this reality, we can better commit the patience, energy, and time that is required to bring about a genuine and lasting transformation of learning and teaching. One way to maintain the commitment is to create a detailed plan for implementation and to revisit, evaluate, and revise it periodically.

Lack of Trust. Change requires taking risks. Competent professionals do not want to fail, particularly with the education of someone else's children. There is a feeling of safety in staying with the status quo. In order to risk attempting something new, people need the support and encouragement of others. A key ingredient of a climate of risk-taking is trust. Any school attempting change needs to do a self-analysis of the level of trust in the school and in the community. If trust is low, then efforts must be made to open communications and build common expectations in order to establish a higher level of confidence in the school administration.

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Testing Mismatch. Testing and assessment programs that are not aligned with the curricular goals can become significant barriers to change. For example, mathematics tests may focus more on computational skills than on the reasoning and problem-solving skill that might be part of the new curriculum. Still, teachers and administrators will feel significant pressure for their students to perform well on these tests. When a mismatch like this occurs, teachers are teaching to a test that differs from the stated goals of the curriculum. Changes in assessment practices must therefore be a key part of any curriculum reform effort.

E Facilitating Effective Professional Development

Moving instruction to more rigor and relevance requires that staff learn new skills and habits. This learning must be provided through professional development activities. The principal's leadership is critical in facilitating professional development.

Professional development is most effective when it is done on a school rather than district basis. Professional development activities should be planned in a way that strengthens the sense of a united community within a school.

Professional development should focus on those areas which are likely to improve student achievement. Teachers and other staff may find a variety of topics of great personal interest, but professional development time provided by a school must focus on building skills directly related to increasing student achievement. These professional development requirements can be spelled out in a coherent plan that includes a needs analysis, skills to be developed, activities, follow up, and time line.

One area which is frequently overlooked is including all staff. Teachers are key to developing rigor and relevance in instruction, but all adults in school play a supporting role. A professional development plan should incorporate, as appropriate, all staff and parents as well.

D. Sparks and S. Hirsch
A New Vision for Staff Development

Professional development days are often seen as an opportunity to offer workshops or presentations conducted by outside experts. While there are times when this is useful to introduce new information or to motivate staff, the most powerful professional development occurs through a collaborative and coaching model. After establishing clear goals within a

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school, staff can work together to develop the necessary skills. Through reflective observation and coaching in one-to-one situations, teachers can make significant and lasting changes in instruction. It is not easy to establish this type of collaborative culture, and it is more expensive in the use of time, but it works.

Professional development is typically looked upon as a frill. Schools do it if they have time and spend money on it if they have money. When time or money becomes tight, it is often the first to go. Schools need to build professional development into their everyday operations as an ongoing, indispensable component. The level of rigor and relevance in the curriculum will not increase if teachers continue to teach and schools continue to operate in the same way.

Characteristics of Effective Professional Development

Professional development programs that are most successful in changing instruction and learning:

- focus on teachers as central to school reform yet includes all members of the school community
- respect and nurture the intellectual capacity of teachers and others in the school community
- reflect the best available research and practice in teaching, learning, and leadership
- are planned principally by those who will participate in them
- enable teachers to develop expertise in content, teaching methods, and other strategies to reach high standards
- enhance leadership capacity among teachers, principal, and others
- have ample time and other resources to enable educators to develop their individual capacities in learning to work together
- promote commitment to continuous inquiry and improvement of the culture and daily life of school
- are driven by a coherent long-term professional development plan built on needs assessment
- are evaluated on the basis of student learning and guide subsequent professional development efforts.

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VII. Additional Resources

A International Center Materials and Services

The International Center for Leadership in Education offers a wide variety of services, publications, videotapes, and other resources to assist schools and districts in their school reform efforts. All of these services and materials are designed to enable schools to provide all students with a rigorous and relevant curriculum that prepares them to succeed in life.

The following is a brief overview of some of the services. Additional information can be found in the back pocket of the binder.

Model Schools Conference

This annual international conference is held for three days at the end of June in a different city each year. It features 40 of the most innovative schools in the United States, sessions conducted by nationally recognized experts, and presentations by education leaders from countries with the most progressive education systems in the world. The Conference has gained a reputation as the country's premier conference on school reform.

Master Teacher Network

Expert technical support from experienced practitioners is provided by the Master Teacher Network, which gives practical, hands-on assistance to teachers and administrators so that they can broaden the learning experiences of students.

Master teachers conduct workshops designed to meet the specific needs of the school and its staff. These workshops engage teachers very actively in the process of acquiring the essential knowledge, tools, and techniques they need to effect change in the classroom.

Every master teacher in the Network is a subject specialist with great depth and breadth of knowledge in his or her area. All were selected for their outstanding ability to

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deliver rigorous and relevant education programs and to motivate students to high levels of performance. The teachers come from model schools across the United States and have completed a comprehensive training program with the International Center, including use of the Rigor/Relevance Framework.

Model Schools Assessment Network

The Model Schools Assessment Network offers a collection of performance-based assessment activities designed by teachers for teachers. The tasks help students attain high standards of learning because the tasks focus on both the acquisition and the application of knowledge.

Schools or districts pay a membership fee to join the Network. They contribute performance-based tasks and periodically receive computerized and hard copy collections of all the tasks, which have been edited and correlated to the Rigor/Relevance Framework by International Center staff. Membership includes five free registrations at the annual Model Schools Assessment Workshop.

Tapes and Publications

The International Center's videotapes and audiotapes on school reform are updated annually to keep pace with the latest research and the rapid changes occurring in the workplace and society. Publications include reports on the international research conducted by the International Center, compilations of case studies of schools and districts that have been successful in restructuring their education systems, and Leadership Press's latest books.

Forums on Schools
This resource provides a step-by-step process for involving a community in efforts to prepare today's students for tomorrow's workplace as well as for advanced education and training. The package includes instructions for conducting community forums, public awareness materials, audiovisual aids, and evaluation forms.

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Organizational Change

The International Center can assist schools in making systemic changes to support a rigorous and relevant curriculum. Among the services offered:

- Long-term Contracts for Management of Change
- Block Scheduling and Year-round School
- Collaborative School Review
- Total Quality Management
- Cost-benefit Analysis of School Programs
- Developing Guiding Principles in Students

Keynote Speakers/Senior Consultants

The International Center's keynote speakers and senior consultants are available to explain the fundamental changes occurring in society and their impact on schools. Keynote presentations focus on changes in technology, the workplace and our lives, as well as on changing demographics. Education practitioners describe proven techniques to manage change in schools and share results using case studies from around the world.

For additional information on any of the International Center's services or resources, please contact:

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B Annotated Bibliography

Print Resources

Beane, James A. *A Middle School Curriculum: From Rhetoric to Reality*. Columbus, OH: National Middle School Association, 1993.

The author reviews and critiques numerous curriculum models and concludes that general education based on young people's "personal and social concerns" is the most appropriate for middle school.

Bottoms, G., and Presson, A. *Improving General and Vocational Education in the High Schools*. Atlanta, GA: Southern Regional Education Board, 1989.

This report details the SREB-State Vocational Education Consortium's approaches for achieving gains in the mathematics, science, and communications competencies of students in general and vocational programs.

Brady, Marion. *What's Worth Teaching: Selecting, Organizing and Integrating Knowledge*. Kent, WA: Books for Educators, 1989.

Marion Brady is a strong advocate of integrated, real-world instruction. This book provides several concrete examples of ways to integrate instruction around real-world phenomena. His common-sense approach challenges several of the existing structures in education.

Caine, Renate Nummela, and Caine, Geoffrey. *Education on the Edge of Possibility*. Alexandria, VA: Association for Supervision and Curriculum Development (ASCD), 1997.

This is an excellent addition to the discussion on the application of brain research to instruction. These experts go beyond research and theory to apply their work in two schools to change classroom instruction.

Caine, Renate Nummela, and Caine, Geoffrey. *Making Connections: Teaching and the Human Brain*. Addison-Wesley, 1991.

Two experts on neuropsychology and education explain how the human brain functions during learning experiences and suggest classroom implications. The authors believe that unleashing genuine student potential requires educators to alter education so that students guide their own learning. They suggest that educators transform themselves and their perceptual orientation.

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Calvin, W. *How Brains Think: Evolving Intelligence Then and Now*. New York: Basic Books, 1996.

William Calvin is a scientist who can translate jargon into lay language. This is a practical tool for educators interested in helping students to see the connections between the things they learn. The book helps teachers diminish the barriers between subjects and offers a variety of approaches to curriculum integration. It explains how educators can integrate social skills, problem-solving skills, and thinking skills with any content area.

Conrath, Jerry. *Our Other Youth*. Gig Harbor, WA: Jerry Conrath, 1988.

Jerry Conrath is a long-time advocate for educating all students well. He reports on his research on the learning styles of youth and proposes that teachers modify instructional practice to better meet the needs of students.

The Council of Chief School Officers. "Standards for School Leaders."

Gleaned from research on educational leadership and the wisdom of colleagues, these standards were drafted by personnel from 24 state education agencies and representatives from various professional associations. The standards present a common core of knowledge, dispositions, and performances that will help link leadership more forcefully to productive schools and enhanced educational outcomes.

Educational Leadership, Vol. 49, no. 2, October 1991.

Special issue on curriculum integration includes articles by Beane, Fogarty, Jacobs, Vars, and other experts. Interdisciplinary, multidisciplinary, integrated, and thematic approaches, including science-centered curriculum and mathematics across the curriculum, are explored. Of particular interest to secondary school educators is an article by Aschbacher about Humanitas, a highly successful program in 29 Los Angeles public high schools.

Educational Leadership, Vol. 50, no. 7, April 1993.

Special issue on authentic learning includes articles on teaching for understanding, characteristics of authentic learning, authentic assessment, and research.

Educational Leadership, Vol. 54, no. 6, March 1997.

Special issue on how children learn includes articles on applying brain research to instruction, developing constructivist classrooms, and the use of questions.

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Fogarty, Robin. *The Mindful School: How to Integrate Curricula*. Palatine, IL: IRI Skylight Publishing, 1991.

Robin Fogarty is known as one of the leading consultants on curriculum integration. In this book, she explains several models and provides practical suggestions to teachers on how to integrate instruction.

Fried, Robert L. *The Passionate Teacher: A Practical Guide*. Boston: Beacon Press, 1995.

This is a powerful book that instills positive attitudes and beliefs about good teaching.

Gardner, Howard. *Frames of Mind — The Theory of Multiple Intelligences*. New York: Basic Books, 1983.

This is Howard Gardner's often-cited work that accelerated the conversation and research around the multiple ways students exhibit intelligence. He offers seven human intelligences: linguistic, logical-mathematical, spatial, musical, kinesthetic, intrapersonal, and interpersonal.

Glasser, W. *The Quality School: Managing Students Without Coercion*, 2d ed. New York: Harper Collins, 1992.

Glasser presents a persuasive argument for moving away from coercive management models, which promote adversarial relationships between administrators, teachers, and students, to more collaborative approaches. He offers practical ideas concerning discipline, tutoring, motivation, homework, counseling and organization. This book is an important work on school reform and can be a useful resource for improving school cultures and learning experiences for youngsters.

Gonser, Connie. *Integrating the Elementary School Curriculum*. Alexandria, VA: ASCD.

This is an ASCD Professional Development Institute on six tapes, with presenters' notebook of handouts, overheads, and other training materials. It explains why an integrated curriculum is the most natural approach to learning. It covers the process of curriculum integration and explores a curriculum planning framework that helps organize thematic units.

Grubb, W. N., Davis, G., Lum, J., Plihal, J., and Morgaine, C. *The Cunning Hand, the Cultured Mind: Models for Integrating Vocational and Academic Education*. Berkeley, CA: National Center for Research in Vocational Education (ED 334 421), 1991.

The NCRVE, principally Norton Grubb, has taken a lead in identifying ways in which schools have effectively integrated vocational and academic education. This early publication describes various models and examples of how schools have organized instruction to integrate the two.

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Hands-On Elementary Science. Developed by TERC, Cambridge, MA: 1994.
This series of workshops introduces teachers to the basic principles of hands-on science enhanced by technology and project-based learning. The *Leader's Manual* has outlines, activities, and handouts for workshops on project-based science, computer-based science learning, using telecommunications for enhancing students' access to data, and guiding teachers in transforming curriculum.

Harmin, Merrill. *Inspiring Active Learning.* Alexandria, VA: ASCD, 1994.
This handbook includes a wealth of practical ideas for more effective instruction in any classroom. It also includes a self-evaluation scale for evaluating progress.

Hart, Leslie. *Human Brain, Human Learning.*
This was one of the first publications to use the term "brain-compatible." Hart's observations about the brain indicate that the traditional approach to teaching and learning is, in fact, "brain-antagonistic" and that changes need to occur to the teaching/learning paradigm before education is truly brain-compatible.

Jacobs, Heidi Hayes (ed.). *Interdisciplinary Curriculum: Design and Implementation*. Alexandria, VA: ASCD, 1989.
The continuum of options for interdisciplinary curricula — from a discipline-based to a fully integrated program — is described. The books includes David Perkins's suggestions for "selecting fertile themes for integrated learning."

Kohn, Alfie. *Beyond Discipline: From Compliance to Community*. Alexandria, VA: ASCD, 1996.
The author provides excellent insight into learner-centered classrooms and developing a sense of a learning community, as well as useful suggestions for moving toward learner-centered instruction. He contrasts many of the changes needed in classrooms as "working with" rather than "doing to" students.

Kovalik, Susan. "An Integrated Curriculum is the Foundation for Brain-Compatible Learning." ASCD Presentation. Alexandria, VA.
The author explores what is known about learning and the brain and why students are more apt to store and retrieve knowledge when teachers use an integrated thematic approach that presents knowledge in patterns, relates it to something useful, and connects it to powerful emotions.

Kovalik, Susan. *ITI: The Model —Integrated Thematic Instruction*, 3d ed. Kent, WA: Books for Educators, 1994.
This book describes a "brain-compatible" integrated curriculum, with sample materials.

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Marzano, Robert J. *A Different Kind of Classroom*. Alexandria, VA: ASCD, 1992.
The Dimensions of Learning described by Marzano provides an excellent detailed framework for improving classroom instruction and increasing the quality of student learning.

Marzano, Robert J., Picking, Debra, and McTighe, Jay. *Assessing Student Outcomes: Performance Assessment Using the Dimensions of Learning Model*. Alexandria, VA: ASCD, 1994.
This work uses the Dimensions of Learning to provide a rationale for performance-based assessment and suggests several tools for developing performance assessment in the classroom.

Maurer, Richard E. *Designing Interdisciplinary Curriculum in Middle, Junior High, and High Schools*. Needham Heights, MA: Allyn & Bacon, 1994.
This book offers advice on unit design and team organization, with 23 sample middle grades units, 19 high school units, and lists of contacts.

Penn, Alexandra, and Williams, Dennis. *Integrating Academic and Vocational Education: A Model for Secondary Schools*. Alexandria, VA: ASCD, 1996.
This short, easy-to-read publication provides an excellent overview of the advantages of integration of academic and vocational education. The authors provide specific practical changes that can be made using as an example the experiences at Cocoa Academy for Aerospace Technology in Brevard County, Florida.

Schmidt, William H., McKnight, Curtis C., and Raizen, Senta A. *A Splintered Vision: An Investigation of U.S. Science and Mathematics Education*. Boston: Kluwer Academic Press, 1997.
This is one of the key publications that describes the results of the curriculum analysis conducted by the Third International Mathematics and Science Study (TIMSS). It points out that the U.S. curriculum covers too many topics and has limited in-depth instruction. In other words, the curriculum is a mile wide and an inch deep.

Schmidt, William H., et. al. *Characterizing Pedagogical Flow: An Investigation of Mathematics and Science Teaching in Six Countries*. The Netherlands: Kluwer Academic Publishers, 1996.

Smith, Wilma, and Andrews, Richard. *Instructional Leadership: How Principals Make a Difference*. Alexandria, VA: ASCD, 1989.
This is an excellent practical reference for principals on their role as instructional leader. It is organized around the way principals should carry out this role through being a resource provider, instructional resource, communicator, and visible presence. It also includes several self-review checklists.

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Southern Regional Education Board. *The 1996 High Schools That Work Assessment: Good News, Bad News and Hope*. Atlanta, GA: Southern Regional Education Board, 1996.

High Schools that Work is the largest national project promoting integration of vocational and academic skills. This report shows that school, district and state efforts to implement the High Schools That Work key practices to improve student achievement are paying off for schools willing to sustain their improvement efforts.

Sparks, Dennis, and Hirsch, Stephanie. *A New Vision for Staff Development*. Alexandia, VA: ASCD.

The authors tell how "three powerful ideas" — results-driven education, systems thinking, and constructivism — are shaping staff development. The focus has shifted from the district to the school, from fragmented efforts to comprehensive plans, from adult needs to student needs, from off-site training to job-embedded learning, and from generic skills to a combination that includes content-specific skills as well.

Stevenson, Harold W., and Stigler, John W. *The Learning Gap: Why Our Schools Are Failing and What We Can Learn from Japanese and Chinese Education*. New York: Simon & Schuster, 1992.

The authors based this book on their in-depth surveys conducted during the 1970s and 1980s in Japan, China, Taiwan, and the U.S. They point out the differences between Asian and American education environments and suggest solutions to improve American schooling.

U.S. Department of Education. "Prisoners of Time." Report of the National Education Commission on Time and Learning, May 1994.

The final report of the Commission, released to widespread public and editorial approval, this contains several messages: Learning in America is a prisoner of time. The reform movement of the last decade is destined to founder unless it is harnessed to more time for learning. Time is the unacknowledged design flaw in American schools.

U.S. Department of Education, National Center for Education Statistics. *Pursuing Excellence.* Washington, DC: U.S. Government Printing Office, 1996.

This work, subtitled "A Study of U.S. Eighth-Grade Mathematics Teaching, Learning, Curriculum, and Achievement in International Context" presents the initial findings for this age group from the Third International Mathematics and Science Study (TIMSS). It explores achievement, curriculum, and teaching.

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Internet Resources

Instructional Planning

International Center for Leadership in Education
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The website of the International Center for Leadership in Education provides an overview of initiatives in which the Center is involved as well as links to model schools. The website also has a section that includes updates to this Resource Kit — Planning Rigorous and Relevant Instruction. The address is http://www.daggett.com/instruct.

The Effective Schools Home Page
<http://www.voyager.net/effectiveschools/index.html>

This is the website for Effective Schools and the work of the well-known education reformer Larry Lezotte. The site includes articles by Lezotte and Effective Schools publications.

Explorations in Learning and Instruction

Pathways to School Improvement
<http://www.ncrel.org/sdrs/pathways.htm>

Pathways to School Improvement is an online road map for enhancing America's educational system. It was designed primarily to help school improvement teams as they progress through the phases of school improvement. A product of the North Central Regional Educational Laboratory, Pathways is ranked among the top 5 percent of websites on K-12 education and educational issues.

Ask ERIC Lesson Plans
<http://ericir.syr.edu/Virtual/Lessons/>

The Educational Resources Information Center (ERIC) is a federally funded national information system that provides, among its vast resources, a database of sample lesson plans organized by subject.

The Theory Into Practice Database
<http://www.gwu.edu/~tip/>

The Theory Into Practice (TIP) Database is a website intended to make learning and instructional theory more accessible to educators. The database contains brief summaries of 50 major learning and instructional theories. These theories can also be accessed by learning domains and concepts.

U.S. Department of Education
<http://www.ed.gov/index.html>

This comprehensive site describes various funding programs and federal education initiatives.

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Developing Educational Standards <http://putwest.boces.org/standards.html>	This is an excellent annotated list of Internet sites with K-12 educational standards and curriculum frameworks documents, maintained by the Putnam Valley Schools, New York.
Integrated Thematic Instruction <http://www.kovalik.com/>	Recognized as a pioneer in thematic instruction, Susan Kovalik has provided training for thousands of teachers in the U.S. and around the world on ways to "orchestrate learning" better by using teaching strategies and developing curriculum that incorporates how the brain learns best.
TIMSS <http://ustimss.msu.edu/>	With data on half a million students from 41 countries, the Third International Mathematics and Science Study (TIMSS) is the largest, most comprehensive, and most rigorous international study of schools and students ever. This is one of the sites for information on TIMSS.
The Project Approach <http://www.ualberta.ca/~schard/projects.htm#story>	This website features stories of projects that teachers have carried out in their classrooms and gives a nice structure for planning lessons using the Project Approach.
Eisenhower National Clearinghouse for Mathematics and Science Education <http://www.enc.org/>	The Eisenhower National Clearinghouse for Mathematics and Science Education (ENC) is funded through a contract with the U. S. Department of Education to provide K-12 teachers with a central source of information on mathematics and science curriculum materials.
AASA Publications <http://www.aasa.org/pubs/aasapubs.htm>	The website of the American Association of School Administrators (AASA) provides an excellent discussion of current education reform topics including key articles from its *School Administrator Magazine.*
RMC Research Corporation <http://www.rmcres.com/improve/timeptrs.html>	This website includes references to resources and suggestions on creating additional time for teachers to engage in implementing systemic change.
Prisoners of Time <http://www.ed.gov/pubs/PrisonersOfTime/index.html>	Report of the National Education Commission on Time and Learning (May 1994) which gives recommendations on using instructional time effectively.
School to Work <http://www.stw.ed.gov/>	This is a comprehensive website on School-to-Work initiatives across the nation.

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