I. Overview

Why This Kit?

This kit is for the teacher who desires to do a better job of facilitating all students' learning.

This resource kit is for teachers who care about giving each student an education for the future. Teachers become teachers, for the most part, because they know the personal joy that comes from learning and facilitating learning for others. Teachers want to give students those same feelings and opportunities. However, teaching is not easy; and teaching students with diverse backgrounds, learning styles, and ability levels is particularly difficult and challenging.

Most teachers teach from their own experience, replicating the models of good teachers they have had. Increasingly, teachers are finding that this approach doesn't work for all students. To respond to the public outcry for increased accountability and higher achievement for all students, teachers must seek different solutions. This kit is for the teacher who desires to do a better job of facilitating all students' learning.

This kit provides a comprehensive resource on seventeen instructional strategies. For most teachers, the kit will serve to refresh them on strategies that they were once introduced to and they can now include more variety in their repertoire or strengthen their current use of those teaching strategies. For some teachers, this will introduce new teaching strategies which many teachers have found to be exciting ways to lead students to higher levels of achievement.

This kit provides an overview of each strategy. Additional resources are referenced for those who wish to pursue more extensive study.

This kit will not create better teachers, but it will expose teachers to ideas that can help them become better teachers and their students become better learners. One of the most valuable parts of this kit are the self-evaluation checklists. These tools will be helpful to teachers as they try out and improve the use of these strategies. The com-

panion Teacher Handbook is a reference that teachers can refer to continually for strategy ideas and the evaluation checklists.

In addition to being a useful resource for each teacher, this kit can also be used to set up professional development programs. Professional developers will find excellent resources for designing professional development activities. These might be intensive workshops or ongoing mentoring/coaching programs over a longer period of time. School district staff can use this kit to plan district-wide professional development initiatives.

New teachers are an eager audience as they begin to learn instructional strategies. Thus, teacher preparation programs will benefit greatly from using this resource. New teachers will become familiar with instructional variety in facilitating learning opportunities that are sensitive to the needs of all learners and sustain student interest and motivation.

This kit will be a useful resource for district-wide professional development initiatives and teacher preparation programs.

Most teachers have this experience: They planned a lesson and thought they taught it very well. Each activity was executed flawlessly. In the end, however, the students didn't get it. They didn't understand the concepts, they failed the tests, or they remained confused. What went wrong? Was it the students' fault? Do they need to take more responsibility for their own learning?

Teaching is Only as Good as the Learning that Takes Place

These challenging questions face teachers as they reflect on the success of their teaching. Teachers tend to judge the quality of their work on the perfect delivery of a lesson, but the real measure of success is student learning. A lesson may be successful for some students in a particular setting and not for others in a different setting. You might give a powerful presentation that inspires an audience of teachers. If you were to give that same speech to a group of parents who did not understand your language, it would fall flat.

Successful teaching is measured by learning gains. A lesson is only as effective as its reflection in student achievement. In some cases, teaching occurs in a manner which students do not understand. Teachers must search for strategies that work. This kit includes ideas, that when

coupled with the expertise of teachers, will lead to greater student learning and achievement.

Research Confirms the Need for Effective Strategies

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.

Regardless of how information is presented, students use their individual senses to incorporate new information into an ever growing body of knowledge. All five senses —hearing, sight, touch, smell and taste—can play a role in the learning process.

Hearing. Students convert sounds such as the spoken word into meaningful information. The most common application of hearing to acquire knowledge is the teacher lecture. In addition, conversations and discussions among students and teachers provide sources of knowledge through listening.

Sight. Visual stimuli generate information on their own and, when combined with spoken messages, add to student learning. Visual images contribute a great deal to the information students store as a part of their learning.

Touch or Feel. Certain skills and some types of work and recreation require the act of physically doing something to acquire knowledge. A musician or athlete acquires skills by actually playing and replaying. The physical task of writing, for example, reinforces many cognitive skills.

Smell and Taste. The senses of smell and taste also lead to acquisition of knowledge. However, these senses are less important to learning in the school environment.

A skill that is critical to learning and is related to but not a direct part of the senses, is speech. Speech is related to hearing in that it often represents a reaction or reply to

something heard. Speaking is an active type of skill similar to writing, playing an instrument or engaging in a sport. Speaking applies knowledge and in doing so, requires references to the students' mental memory and reinforces existing knowledge. Thus, there are really four natural functions involved in the process of learning: hearing, sight, touch, and speech.

Four natural functions of learning:
- *hearing*
- *sight*
- *touch*
- *speech*

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 new 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 at a very young age. 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.

The old adage that we learn 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.

Experience is the best teacher.

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. 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 students to actually become intellectually disengaged from the learning process, and the "brain" stops learning. This finding does not mean that we should cease requiring students 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.
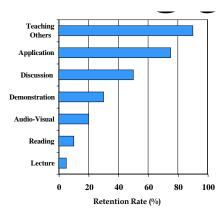
Caine and Caine

Education on the Edge of Possibility

Glasser, W.

*The Quality School:
Managing Students
Without Coercion*

Learning Retention

Retention Rate (%)

Application of knowledge 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 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 used 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.

The International Center for Leadership in Education has conducted 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.

When the types of knowledge taught were scrutinized, however, it became clear that the U.S. was at the bottom in teaching students how to use the knowledge they are acquiring. In this country, we just pile content upon content without teaching students how to apply 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.

A follow-up study by the International Center confirmed a similar pattern for assessment. The study 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.

The Third International Mathematics and Science Study (TIMSS) 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, video-

taped observations of instruction, and case studies of policy issues.

U.S. fourth-grade students ranked near the top of international comparisons. U.S. eighth-grade student achievement fell to 28 out of 41 nations in math and 17 in science. Nearly all nations' twelfth-grade students performed better than the U.S. on general mathematics and science knowledge. One conclusion that could be drawn is that the longer our students are in school, the poorer the results.

Schmidt, McKnight, and Raizen

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

TIMSS also found variations in teaching. 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 occur. 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, the students practice solving problems on their own, while the teacher helps individual students who are experiencing difficulty.

TIMSS also found variations in teaching.

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 a U.S. classroom must follow the teacher as he or she leads them through the solution of example problems, Japanese students have a different task – to invent their own solutions and then reflect on those solutions in an attempt to increase understanding.

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

Most U.S. students learn basic mathematical facts and formulas, but many of them are unable to use this knowledge to solve everyday problems.

concern that U.S. students 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 which are more appealing to students' intuitive sense. Meaning should be constructed out of prior knowledge and experiences. To do this requires different strategies than demonstration and repetitive practice.

Curriculum identified by the public as essential are those used most frequently in everyday, real-world situations.

The International Center for Leadership in Education found in its national Curriculum Survey of Essential Skills that the skills identified as essential were those used most frequently in everyday, real-world situations. To develop these skills, a learner needs opportunities to go beyond the knowledge level. Strategies must engage the learner in application. The application of knowledge and skills is a necessary component of teaching.

The National Research Council (NRC) science standards encourage integrated and thematic approaches to curriculum. *Science for All Americans* and *Benchmarks for Science Literacy*, publications of the American Association for the Advancement of Science's Project 2061, states: "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." Integration requires more than lecture and memorization. Within the context of "learning for life," students need a variety of approaches which include demonstration of knowledge beyond mere acquisition.

Successful Approaches to Teaching

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 motivated to learn more. Research has also shown that people retain more when they learn by doing instead of reading or listening. Yet, so often we require students to read or listen. These strategies are appropriate for some learning but surely not for all learning.

Every core subject has applications to the real world. Too often, however, these subjects are reduced to text-book-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. Science is understanding the natural world. Books are convenient, but students must observe the natural world to fully learn science.

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 means and forms of communication and understanding our 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 typically emphasized in the English classroom. Moreover, too often, little connection is made between a piece of literature and the era in which it is set or daily life experiences of students. 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.

Perhaps the most compelling research driving the need for varying instructional strategies 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.

Every core subject has applications to the real world.

The majority of students learn best when instruction emphasizes application.

Adding to the education research on the efficacy of 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.

"In this country, education is largely a spectator sport," points out Dr. Willard R. Daggett. 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.
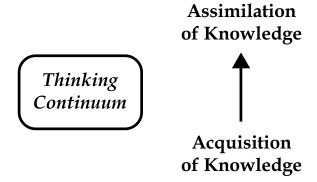
Children become better problem solvers in direct relation to the opportunities they have to solve problems and to reflect on what worked and what didn't. Real-world problems don't come neatly packaged in predictable, easy-to-solve formats, so we need to provide students with experience in grappling with problems that mirror the world beyond school.

"In this country, education is largely a spectator sport."

- Willard Daggett -

Rigor/Relevance Framework

The Rigor/Relevance Framework is a tool developed by staff of the International Center to examine curriculum, instruction, and assessment. The Framework is based on two dimensions of higher standards and student achievement. First there is a continuum of knowledge that describes the increasingly complex ways in which we think. The knowledge continuum is based on Bloom's Taxonomy

**Assimilation
of Knowledge**

*Thinking
Continuum*

**Acquisition
of Knowledge**
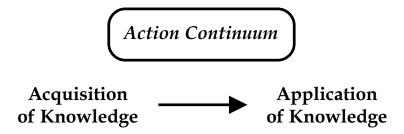
The low end of this continuum is simply acquiring knowledge and being able to recall or locate that knowledge in a simple manner (acquisition level). Just as a computer completes a word search in a word processing program, a competent person at this level can scan through thousands of bits of information in the brain to locate that desired knowledge.
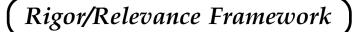
The high end of the continuum labels more complex ways in which individuals use knowledge. At this level, knowledge is fully integrated into one's mind, and individuals can do much more than locate knowledge. They can take several pieces of knowledge and combine them in both logical and creative ways. Assimilation of knowledge is a good way to describe this high level of the thinking continuum. Assimilation is often referred to as higher-order thinking skills: at the assimilation level, the student can solve multistep complex problems and create unique work and effective solutions.
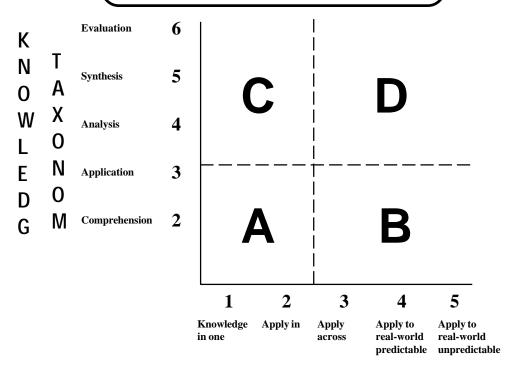
The second continuum is one of action. While, the thinking continuum can be very passive, the action continuum describes putting knowledge to use. At the low end (acquisition level) you have knowledge acquired for it own sake. At the high end is action—the use of that knowledge to solve complex problems, particularly from the real world, and to create projects, designs, and other works.

Action Continuum

Acquisition   **Application**
of Knowledge ⟶ **of Knowledge**

The thinking continuum can be expressed through a six-point knowledge taxonomy. A five-point application model describes the levels of the action continuum.

A more extensive discussion of the Rigor/Relevance Framework can be found in *Planning Rigorous and Relevant Instruction: A Resource Kit*. This also includes activities for understanding how to use the Framework in planning instruction and assessment.

Rigor/Relevance Framework

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K                Evaluation    6
N    T
O    A           Synthesis     5        C           D
W    X
L    O           Analysis      4
E    N           Application   3
D    O
G    M           Comprehension 2        A           B

                               1    2    3    4    5
                          Knowledge  Apply in  Apply   Apply to   Apply to
                          in one              across  real-world real-world
                                                      predictable unpredictable
```

APPLICATION MODEL

Four Quadrants

Teachers can use the Framework to select appropriate instructional strategies to meet learner needs and higher achievement goals.

The Rigor/Relevance Framework has four quadrants. Quadrant A represents simple recall and basic understanding of knowledge for its own sake. Quadrant C represents more complex thinking but still 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. Quadrants B and D represent action or high degrees of application. 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 problem in the workplace are types 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.

Each of these four quadrants can also be labeled with a term that characterizes the learning or student performance.

Quadrant A

Acquisition: Students gather and store bits of knowledge and information. Students are primarily expected to remember or understand this acquired knowledge.

Quadrant B

Application: Students use acquired knowledge to solve problems, design solutions, and complete work. The highest level of application is to apply appropriate knowledge to new and unpredictable situations.

Quadrant C

Assimilation: Students extend and refine their acquired knowledge to be able to use that knowledge automatically and routinely to analyze and solve problems and create unique solutions.

Quadrant D

Adaptation: Students have the competence to think in complex ways and also apply knowledge and skills they have acquired. Even when confronted with perplexing unknowns, students are able to use extensive knowledge and skill to create solutions and take action that further develops their skills and knowledge.

Rigor/Relevance Framework

K N O W L E D G E	**Assimilation** **C**	**Adaptation** **D**
	Acquisition **A**	**Application** **B**

A P P L I C A T I O N →

The Rigor/Relevance Framework is a fresh approach to looking at curriculum standards and assessment.

The Rigor/Relevance Framework is a fresh approach to looking at curriculum standards and assessment. It is based on 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 can serve 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 students to learn. The Framework is versatile; 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 instruction and to select appropriate instructional strategies to meet learner needs and higher achievement goals.
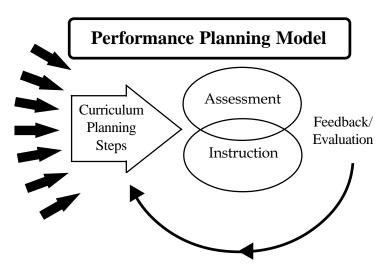
II. Focus on Learning

Planning Instruction

Curriculum, instruction, and assessment are interrelated components of learning. In a performance planning model, instruction and assessment, in particular, should have significant overlap.

Performance Planning

Performance Planning Model

Curriculum planning occurs prior to instruction and assessment. Without effective planning, there is very little likelihood that students will achieve the expected rigor and relevance. A more extensive discussion of the performance planning model is included in *Planning Rigorous and Relevant Instruction,* published by the International Center for Leadership in Education.

Curriculum planning is a complex process that must take into consideration certain important factors. In order to make thoughtful decisions about instruction and assessment, these factors should be considered:

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

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.

Step 1 - Define Instructional Unit/Curriculum Connections

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 - List 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.

Step 3 - Identify Student Work

Student work is at 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. Identify student work for students to meet expected skills and knowledge. 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 - Define Content Knowledge

Performance planning emphasizes application of knowledge; however, without basic content knowledge, students have nothing to apply. One of the strengths of the

Curriculum Planning Steps

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

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.

Step 5 - List 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 does it necessarily need to be resolved in the lesson. If a question engages students in learning, then it has done its job.

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.

Step 6 - Design 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.

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. That is why a feedback/evaluation loop completes the Performance Planning Model.

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 aspects of the 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 these areas 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 processes this information. Certain conditions 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 Bibliography in Chapter VII which can expand teachers' knowledge of the classroom conditions that contribute to or inhibit learning.

By attending to the physical aspects of the classroom, teachers can reduce one barrier to students learning well.

Some of the negative conditions that inhibit learning are fear, confusion, inconsistency, and frustration.

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 unrest 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 consistency in daily learning interactions and directions. 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 find consistency in teacher judgement as to what constitutes high-quality work or good behavior. If a teacher is inconsistent in student evaluation or gives the impression of being inconsistent, it will inhibit learning.

Frustration in students comes from many of the factors mentioned above and also 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.

Stimulation improves brain function.

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, 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 students 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, remember to maintain eye contact with students and make them feel special and involved.

Students need to feel a part of the learning.

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 arise. Sometimes these conditions are beyond the teacher's direct control. In these instances, the teacher must be an advocate for the students and seek to have the issues addressed through administrative decisions, funding, or policy.

Sometimes problems relating to the school environment 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 appoint an assistant principal 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. Over time, through a number of initiatives, school climate did improve significantly.

Student-Centered Learning

The more that teachers are able to create conditions of self-determination and let students take initiatives, the greater will be the students' level of involvement and ultimately their achievement.

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. 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. Certain learning objectives are required of all students. But some self-determination in selection of a 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 initiatives, 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.

Flexible Time

One of the most difficult characteristics of student-centered learning to achieve is the flexible use of time. Allowing more time does not mean simply extending time on 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.

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.

One of the most difficult characteristics of student-centered learning to achieve is the 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

Application and practice are necessary aspects of student-centered learning. 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 actual use of knowledge leads 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. Application needs to play an important role in developing student-centered learning.

Application and practice are necessary aspects of student-centered learning.

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"If you don't use it, you lose it."

- Education Truism -

Interdisciplinary Instruction

Teachers should take a self-inventory of the way they teach to be sure they are not contributing 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." There needs to be a greater expectation to work collaboratively.

It is important to keep in mind 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 seemingly insignificant 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.

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 life beyond school. The current structure of separate subjects:

- ignores some extremely important knowledge
- fails to show students the integrated nature of the world
- 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, an interdisciplinary curriculum can be put in place that is vastly superior to the current regimen of separate curricula for subjects.

The ultimate objectives 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 a more natural way to achieve these objectives than the present curriculum. Unfortunately, the efficacy of the interdisciplinary curriculum is not easily understood, especially by those whose perceptions of education have been structured by traditional schooling.

An interdisciplinary curriculum is a more natural way to achieve these objectives than the present curriculum.

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" genetic information and DNA. When change in the familiar is threatened, people often resist. They are greatly attached to their perceptions of how things are "supposed to be."

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 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. 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.

Interdisciplinary instruction adds meaning and relevancy to learning as students discover applications between 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.

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 are 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.

Designing Interdisciplinary Instruction

To design an interdisciplinary lesson, begin by asking yourself, "What are the primary pieces of information or the concepts that I want my 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).

Through talking with colleagues and brainstorming on your own, identify events, discoveries, and writings within other disciplines that relate to the primary content base in a meaningful way. 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 by 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. Consider carefully the skills students must have before they can accomplish the objectives you have set forth. Sometimes, needed 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

The goals of interdisciplinary lessons 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.

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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.

Applying Brain Research

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.

There are three major strategies for helping students make links for the content they are learning: practice, name content, and construction.

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.

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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 note-taking 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 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 their 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 associative properties 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.

Keys to Effective Learning

Instructional strategies are only one part of the equation for effective learning. Instructional strategies chosen well and executed well are necessary for student learning, but strategies alone are not sufficient to yield student achievement. There are three key elements that serve as the foundation to student learning:

- Instructional Strategies
- Curriculum Standards
- Teacher Behaviors

A metaphor for these key elements is the three-legged stool. A stool with one or two legs is unstable. A stool with four or more legs must have the legs be of equal length or the stool will rock and be unstable. However, the three-legged stool creates a solid support even if the legs are not perfectly equal or if you try to use it on an uneven surface.

Instructional strategies are the process of teaching and *curriculum standards* are the product of teaching. Exciting and interesting strategies are of little use unless they lead to something. Strategies are meaningful only if there are clear expectations for student standards to which students and teachers are committed.

The third leg of the stool is *teacher behavior*. Learning is a human process, greatly influenced by human characteristics. Personal predilections and emotions can play an important part in enhancing the quality of learning or creating insurmountable obstacles.

Curriculum Standards

Schools are charged with the responsibility to support students in some minimum measure of learning. Schools should not be places that children just attend with no real goals for accomplishment. The public expects students to benefit from the school experience. In order to fulfill this responsibility, schools need to make explicit what students should learn. This leads to the need for learning standards.

When each teacher sets his or her own standards, those standards are idiosyncratic and therefore seem negotiable to students. Students may regard more demanding teachers as mean-spirited. After all, the teachers don't have to require so much, so why else would they? Students then try to negotiate with these teachers to bring standards down—by failing to do the homework, for example. Teachers with high expectations must then expend valuable time and energy swimming against the cultural tide of low expectations, trying to cajole students to meet high standards.

Common standards enable all teachers to provide consistent, coordinated instruction that builds on what students have learned in previous years. A single set of expectations for what students should learn also helps to reduce some of the pressures that work against academic rigor. Students can't complain that their schoolmates get to study easier material or have to do less work.

Common standards enable all teachers to provide consistent, coordinated instruction that builds on what students have learned in previous years.

For standards to support high achievement, they should:

- Be specific about what students are expected to learn, so that teachers will interpret them consistently.

- Be coordinated at all grade levels and across all educational programs in order to stretch students to reach their maximum potential.

- Offer an appropriate balance of academic rigor and "real world" relevance. Education standards should not be an arbitrary list of intellectual obstacles for students to overcome. Standards can and should be connected to the application of skills and knowledge. There is, however, a body of foundation knowledge that students need to know.

Education standards should be clear about what is to be learned by students and how well it is to be learned. Standards should not seek to prescribe teaching methods, strategies, or lesson plans. Standards are about the end goal, not the means or process to get there.

The standards movement was born in the early 1990s in an attempt to narrow the curriculum. Funding became available for subject-matter professional organizations to identify the most important skills in their content areas. By 1996, standards documents had been developed and published in no fewer than 12 subject areas.

These national standards provide schools and teachers a reference point for standards. However, these documents, taken as a group, create a number of problems for educators who attempt to use them as the cornerstone of their system redesign or curriculum reform initiatives. They take differing approaches to standards development; they offer multiple

perspectives on standards within a subject area; and there is too much content within and across content areas.

Schools and teachers need standards in order to set clear expectations for students and the community. State and national standards are helpful, but they should not replace the need to develop and agree upon standards within schools and districts.

Curriculum Survey of Essential Skills

Curriculum standards must come not only from groups of national and state experts, but also from the local community. Public schools need the support of the community if they are to be successful. One way to build that support is to listen to the community in regard to suggestions about what students need to learn. One resource developed by the International Center to seek broad-based input from educators and the community is a Curriculum Survey of Essential Skills. The purpose of the Curriculum Survey is to enable school districts to identify the most important content in English language arts, mathematics and science in terms of the rigor and relevance needed to prepare students for post-school, real-world situations.

The typical U.S. curriculum contains an extensive number of topics to be covered and leaves little time to teach students the process skills required to apply their knowledge to practical, real-world situations and to succeed in today's workplace. The Curriculum Survey asks participants to select the 35 most important topics for students to learn in the three content areas.

The lists of topics compiled for the survey were taken from professional exit standards determined by the National Council of Teachers of Mathematics (NCTM), the National Science Teachers Association (NSTA), and the National Council of Teachers of English (NCTE) as well as from various state standards.

A key aspect of this survey is the participation of educators and community members in identifying the content that is essential. Reaching out to various constituents creates awareness of the need for rigor and relevance throughout the community and promotes a sense of ownership of curriculum reform initiatives.

Survey findings are not intended to be used to eliminate low-rated topics from the curriculum. Rather, the results are intended to be a point of departure in discussing which English language arts, mathematics, and science topics are priorities and to make the district aware of what the community as a whole views as the most essential skills and knowledge for high school graduates to have.

Key findings of the Curriculum Survey, whether using district or national data, show that the top ranked topics are consistently content-based or skill-based. The lower-ranked topics are typically instructional strategies or techniques that teachers have historically used to develop students' skills. For example, the ability to "apply in writing the rules and conventions of grammar, usage, punctuation, paragraphing, and spelling" is universally rated a high priority as is "the ability to gather, analyze, and synthesize information while reading." On the other hand, the ability to "contrast the reading of a Shakespearean or other play with a live or filmed performance," "assess several works by the same author," and "use response journals to jot down ideas from reading literary texts" consistently rank as low priorities. These lower-ranked topics should be viewed as methodology or instructional techniques that can be used to teach skills such as the ability to gather, analyze, and synthesize information while reading or to use appropriate grammar, etc., in writing. Instead, instructional strategies (i.e., response journals, comparing novels, and reading Shakespeare) have become ends in and of themselves rather than a means to an end. While teachers can still use many of these strategies, they must have a clear focus on the skills and knowledge students must acquire. This survey points out the confusion between the curriculum destination and the instructional strategy used to reach that goal. Teachers need to select appropriate strategies and activities that will enable students to achieve clear curriculum goals.

...top ranked topics are consistently content-based or skill-based.

While the results of the Curriculum Survey are interesting in themselves, they also have the potential to open a discussion on curriculum content, which can lead to higher student achievement through curriculum reform. Using a community outreach vehicle such as the Curriculum Survey as a starting point, the International Center has assisted schools to raise standards and ensure that their students get the education they need for our technological, information-based

society. The International Center does this by working with district leadership to set the agenda for future staff development work and to map out strategies for improvements in curriculum and assessment.

Teacher Behaviors

Standards and instructional strategies alone are not sufficient to achieve high levels of learning. The behaviors of the adults and peers who are part of the student's world influence the learning process. We need only to think about two different students to realize the importance of human behavior. One student experiences constant support and encouragement from parents and teachers. The other is loaded with self-doubt and uncertainty from overly critical parents and uncaring teachers. These two students could be working toward the same education goal. They could both experience the same well-planned and stimulating instruction; however, the learning that takes place is likely to be different.

Teachers can do little to influence the behaviors of parents and peers outside of the school. But they can control their own behavior and the behavior of students in the classroom. Dealing with this behavior is part of what teachers must do to create the third leg of a solid foundation for effective learning.

It is not the purpose of this kit to delve into human psychology and the nature of the human needs which are satisfied or thwarted by the actions of others. However, three behaviors cover much of what is involved in creating a supportive culture for learning: set clear expectations, provide encouragement, and give constructive criticism.

Setting Clear Expectations - One of the characteristics that distinguishes humans as learners is our ability to communicate expectations for learning and not just explore new experiences randomly. Students reach higher levels of achievement when teachers constantly remind them of the expectations. More important is setting those expectations high for all students. Students and teachers frequently fall into the trap of translating initial uneven levels of student achievement into the assumption that students initially are destined to stay in the back of the pack. Keeping students focused on the goals and exhibiting high expectations for all students is an important teacher behavior.

Providing Encouragement - Learning new things naturally gives rise to fear and doubt. Encouragement from others helps students to overcome doubts and to take the risk to try new things. There is real value in the learning process to have a cheerleader constantly saying, "You can do it." Teachers need to exhibit confidence that their students are able to accomplish the learning goals.

Giving Constructive Criticism - No matter how well instruction is planned, understanding doesn't occur instantly. Mastery comes gradually and mistakes are made along the way. These mistakes can be stepping stones to higher levels of learning if they are pointed out in a positive way. Students need feedback. This feedback steps beyond the encouragement and provides an accurate and honest assessment of progress. This can be positive if it includes not only a judgment of whether learning has been achieved but also suggestions for improvement.

Feedback, or instructional reinforcement, is an essential part of instructional technique. A student needs to know that she or he is successful in order to feel successful. Teachers develop routines for devising ways to provide constant feedback to students. Effective use of feedback can increase productive behavior, minimize behavior problems, and increase focus on the learning task.

| **Providing Student Feedback** |

Feedback provides students with verbal, symbolic, tangible or other rewards for desirable academic performance or effort at the classroom level. This definition includes:

- Praise (and other verbal reinforcement) for correct answers during discussions; improved test scores; and accurate projects, worksheets, homework.
- Symbolic rewards such as gold stars, stickers, work posted on bulletin boards, names in public relations documents.
- Token rewards such as points or chips which contain value only in reference to their redemption capabilities.
- Activity rewards such as participating in a special class outing, going on field trips, having free time, being able to spend more time on a computer.

"Successful experiences in school are likely to result in a positive academic self-concept. The individual strives desperately to secure some assurance of his self-worth…"

        - Bloom -

Importance of Feedback

Learner feedback should be maximized. Feedback reduces uncertainty and increases coping abilities while lowering adrenaline stress responses. Even in the absence of control, feedback has value (Hennessy, King, McClure, and Levine 1977). The brain is designed to operate on feedback, both internal and external. What is received at any one brain level depends on things that have already happened. The brain decides what to do based on what has just been done. Without this feedback system, learning would not be possible.

Types

Intrinsic Feedback—When the feedback comes from inside the task or job, it is intrinsic. It is inherent in the task and obtained immediately through the senses. A person's inability to balance an account would be an example of intrinsic feedback.

Extrinsic Feedback—This feedback is outside the task or job. It does not originate in the task and sometimes it is immediate; however, often it is delayed. An example of this would be quarterly sales figures and bonuses.

In instructional settings, learners need to know how to identify and use intrinsic feedback. Students need opportunities to reflect upon their work; part of this process involves self-recognition of the accuracy and quality of their performance. Facilitating this type of student reflection encourages intrinsic feedback.

Extrinsic feedback should be given as quickly as possible. Learners require more extrinsic feedback than individuals who have gained competency or mastery. Extrinsic feedback is required to learn knowledge, skills or attitudes. An example of this is the instructor's response to a learner: "That's correct; you are doing a fine job."

Learners aim toward mastery. However, to reach mastery, a learner needs to be able to demonstrate mastery level performance without extrinsic feedback. This mirrors real-world performances, where all too often individuals have to learn how to obtain and use extrinsic feedback themselves. Skilled performance includes the ability to anticipate the requirements

of a task or situation and to use intrinsic and extrinsic feedback to personal advantage.

Effects on Academic Achievement

Research findings indicate a direct correlation between reinforcement and academic achievement. Findings include:

- Acknowledging correct responses is positively related to achievement.
- Feedback is most effective when related to students' goals.
- Instructional reinforcement alone produces achievement benefits equal to those produced by a combination of instructional and behavioral feedback.

Verbal Reinforcement

Verbal reinforcement is a common part of teachers' vocabulary that could be used to better advantage. Many classroom opportunities pass without using this powerful stimulus to learning. To be effective, verbal reinforcement should be precise; appropriate; and shift from frequent to intermittent as the learner becomes more skilled at the task.

To be effective, verbal reinforcement should be precise and appropriate.

Precise—The verbal reinforcement should specify exactly what the learner has done well. Video games and computers give specific feedback, as does peer editing of a student's written report. Teachers need to be as specific in their feedback. "Good work," "Nice start" are too vague. For a learner to respond to feedback, it needs to specify exactly what the learner has done that merits praise. For example, "Your use of adjectives to describe the fear and anxiety of the characters, particularly in the first three paragraphs, is excellent. Through your use of language, the reader is experiencing the same fear and anxiety of the characters."

Appropriate—Only *appropriate* use of reinforcement works. If a student doesn't want feedback, it's not reinforcing. Sometimes students may find praise in front of others embarrassing. A middle school athlete who is praised for his fine penmanship may take painful kidding by his friends. More appropriate feedback for this student might be to correlate the skillful motor coordination found in fine handwriting to coordination demonstrated by the student in sports.

Knowledge of Results

Knowledge of results should be specific and timely. A teacher who gives prompt, complete feedback is showing students that he/she respects their efforts and values their work. Explicit feedback should be given to students as rapidly as possible after student work is completed. Feedback has optimum corrective impact when it is given immediately or very soon thereafter. It has maximum communicative effect when it is both specific and complete. A good example of the speedy delivery of knowledge of results is when students finish a worksheet or written exercise and they receive the answers displayed on an overhead or in printed form. Students can correct their own work immediately and ask the teacher clarifying questions. Another example would be providing students with answer books or keys to exercises.

Just telling students how they are doing at some later time is not sufficient reinforcement. What becomes powerful in learning is feedback that is rapid, specific, and complete. Computer games are a good example of this; they give instantaneous knowledge of results. Teachers who give students feedback soon after they perform and build in opportunities for students to self-correct or discover what needs to be done to improve are providing effective knowledge of results. Students get powerful messages from teachers' responses and messages that can easily influence the quantity and quality of the student's participation in learning.

The Effects of Praise

Several researchers have found a correlation between teacher praise and increased student achievement. Brophy and Evertson conclude:

> …a student who is accustomed to success, expects success, and is capable of achieving success with reasonable effort tends to respond well, at least in terms of improved achievement, to chiding criticism for failure that results from lack of effort or persistent application of skills. In contrast, the student who is accustomed to failure, expects failure, and has difficulty mastering something even if he/she persists long and hard is much more likely to be positively affected by encouragement and praise, and more likely to be negatively affected by criticism. (pp. 91-92).

Explicit feedback should be given to students as rapidly as possible after student work is completed.

Students get powerful messages from teachers' responses ...

Brophy and Evertson

Learning from Teaching: A Developmental Perspective

Elaborate teacher praise is not effective in promoting greater student achievement. Simple praise is effective. This is especially true if the praise is directly related to the task at hand. Superficial attempts at praise are ineffective while genuine praise enhances achievement. Teacher praise is more effective than peer praise. Also, research findings indicate that giving praise brings greater gains for students from low socioeconomic families and for students with low academic ability.

Superficial attempts at praise are ineffective while genuine praise enhances achievement.

The Effects of Criticism

Corrective feedback to an answer that is wrong contributes to the learner's ability to stay focused on the learning. Dealing with unsatisfactory responses is not easy. However, it is better to tell a student that he/she is wrong than to ignore the answer. It is even better to provide students with the correct response rather than just simply indicate a wrong answer. A teacher needs to use criticism cautiously. Strong words of disapproval and criticism are not effective in promoting academic achievement. Mild criticism does correlate with achievement. However, its effectiveness depends upon the nature of the learning task. There appears to be no evidence that a teacher should avoid telling students that they are wrong; however, teachers who use a great deal of criticism appear consistently to have classes where students achieve less.

Use of Student Ideas

Another type of feedback is the teacher's acceptance and use of student ideas. This type of feedback takes various forms:

- acknowledging the student's ideas by repeating what has been expressed
- modifying the student's ideas by rephrasing them
- applying the student's ideas by using them to draw an inference or take students to the next step
- comparing the student's ideas by drawing relationships between the student's thoughts and those of another student or the teacher
- summarizing the student's ideas for clarification.

Too few research studies have focused on the effectiveness of the use of student ideas on subsequent learning to draw firm conclusions. Those studies that have been done indicate this instructional strategy is beneficial to learning. Thus, we can conclude that the strategy of using student ideas may be effective in encouraging academic achievement.

Guidelines for Effective Instructional Feedback

The following guidelines are beneficial for classroom feedback:

Feedback is essential to the acquisition of intellectual and motor skills.

- Feedback is essential to the acquisition of intellectual and motor skills. It is also essential for developing positive attitudes.
- Feedback should be brief. It should be specific, factual, and direct.
- Feedback should be given within an appropriate time period. It does not have to be immediate but feedback should occur before the same behavior is repeated.
- Avoid giving feedback to a learner when he/she is in the middle of performing a task. This may interfere with learning.
- Learners need to observe and use feedback that is intrinsic in the task or situation. This will help to maintain mastery.

Some Teachers' Thoughts on Feedback

Teachers indicate that many positive reinforcers have worked. Some of these are: a wink, a smile, saying, "I'm proud of you." Others include writing "Great job" on test papers or putting stars and stickers on papers. Another tried-and-true method is to give a treat to students who perform well or behave appropriately. Many teachers exempt students from quizzes or assignments as a means of reinforcing completion of satisfactory work.

Another approach involves teachers rewarding students for doing things they might not want to do with activities they do like. An example of this would be promising to let the student play computer games or do a special art project when work is finished.

How Important Is Feedback?

Research findings clearly indicate that instructional reinforcement has a positive effect on students' academic achievement. Findings show that on-task behavior increases when students are given feedback for learning; feedback is also related to positive attitudes toward learning, toward particular subjects, and toward teachers. The correlation between feedback and learning is too great to be ignored. Feedback has a definite, influencing place in instruction.

The correlation between feedback and learning is too great to be ignored.

III. Using Instructional Strategies

Definitions

The instructional strategies described below can be effective in developing more rigorous and relevant instruction. These strategies can help motivate students to achieve at higher levels.

Brainstorming

When introducing new material, brainstorming is a good way to involve students. It is also a way for students to suggest solutions to problems. Generating vast amounts of information which may or may not have some connection to the topic and then sorting out 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.

Cooperative Learning

One organizational technique that has proved its success is collaborative classrooms, where students 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. Cooperative learning is a great deal more than "group work."

Demonstration

Demonstrations are opportunities for students to gain new information through direct observation. Frequently, tasks or the manipulation of materials and objects are best explained to students through physical demonstrations by the teacher, another student, or a recognized expert in the area or through the use of video materials, graphic and pictorial representations, etc. Demonstrations are usually followed by student replication and 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 during class time is an effective way for students to review and practice new information under the guidance of an instructor. For students, a natural extension of reviewing new material under teacher direction is engaging in practice at an independent time and location. Most homework falls in this category. Students respond to questions or solve routine problems to reinforce concepts or skills.

Guided Practice

Inquiry is a technique that engages students in posing their own questions around an instructional topic. Teachers often stimulate this by creating an intriguing investigation, which can be a unique observation, a demonstration, or questions posed 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 topic. Teachers can stimulate discussion through asking thoughtful questions and challenging students to think and form their own opinions.

Inquiry

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 simulation, 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.

Instructional Technology

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 a distance learning system. While lectures are efficient in use of time and inexpensive, they are one of the least engaging methods of instruction.

Memorization

Memorization still has a place in school. Students should understand that some information is most efficiently accessed through 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.

Note-taking / Graphic Organizers

In traditional practice, the complement to teacher lectures is student note-taking. A benefit of note-taking 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 note-taking 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. When compatible with students' individual learning styles, graphic organizers can be very helpful for recording and reinforcing information.

Presentations/ Exhibitions

Oral presentations by students are an effective way to reinforce concepts. Students are required to organize ideas and express them in their own words. Oral presentations or exhibitions combined with other student work help to develop this important language arts skill and become good culminating activities for students to demonstrate learning.

Problem-based learning allows students to develop and exercise problem-solving skills during a real problem or investigation. The teacher's role is to guide students as they search for solutions. Students work individually and in groups to make observations, conduct interviews, review reports, and make recommendations. Problem-based learning activities allow students to assume the roles of real-world professionals. The problems also help students see the connections between various content areas. Problem-based learning allows students to study interdisciplinary material that is organized around a common goal.

Problem-based Learning

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 engineering 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.

Project Design

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.

Research

Simulation/Role-playing 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 range from simple role playing to complex computer programs software. Simulations that require a great deal of time and effort to create are often available as commercial simulation games and activities. Computer-based simulations offer excellent learning opportunities.

Simulation/ Role-playing

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Socratic Seminar

A Socratic seminar is a strategy that combines the elements of teacher questions, inquiry and discussion. It is named for the Greek philosopher Socrates, who taught only through questions. Students work in small groups arranged in a circle to aid discussion. All students have completed the same prior reading. The teacher acts as the facilitator by asking a provocative question. The seminar proceeds as a discussion around key issues, with the teacher asking probing questions as needed.

Teacher Questions

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.

Work-based Learning

Recently there has been great interest in using the workplace for learning. By engaging in real-world tasks that may require communication or designing a product, students have an 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 excite them about learning for the first time. Work-based learning requires extensive planning to make sure students are not doing simple routine work but rather are engaged in activities that relate to the learning objectives.

Additional Strategies

There are many other strategies that teachers use to create learning opportunities for students. The 17 strategies selected as primary techniques are used frequently, but they are not the entire universe of instructional strategies. Teachers will use other means to create learning situations. Several of these strategies deserve acknowledgment and are described below.

Literature. Literature is closely aligned with English language arts instruction. Many English teachers would identify literature as the content of what they teach. One purpose of teaching literature is to develop in students the satisfaction of reading for personal pleasure. Furthermore, through literature, students acquire information about people, history, cultures, and society. Through literature, students develop thinking skills of analysis, inquiry, logic, and recall. By reading great literary works, students are exposed to the effective use of language and techniques such as metaphor, alliteration, and symbolism.

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. The length of writing can vary from a one-paragraph response to a test question to multi-page research reports incorporating a considerable amount of information. A writing technique that is used to encourage students to reflect upon an experience is a journal. Journals can also be used for evaluation. When students engage in out-of-school activities, such as field trips or career explorations that have a direct connection to learning, the journal offers a way for the teacher to observe what the student has learned.

Creative Arts. In schools, the creative arts are generally viewed as a separate discipline in which students can develop skills related to artistic productions or performances. There are skills and knowledge unique to the creative arts, however, the arts can also be an instructional strategy for developing skills in other areas of the curriculum. Music helps to reinforce mathematics concepts. Different types of music cannot be appreciated unless a student understands the historical and cultural origins of the music. Dramatic plays and musicals improve language use. Many areas of the visuals arts and working with materials require students to learn aspects of materials science, chemistry or physics. Arts are a wonderful integrating strategy that nurtures students' individual talents but also help students learn through application.

Changing Roles

Effective use of many of the strategies require changes in the traditional roles of the teacher and the student. One way to help understand the strategies is to consider the roles the teacher and student play. The following chart illustrates the role of teacher and student for each strategy.

Changing Roles

Strategy	Role of the Teacher	Role of the Student
Brainstorming	Cheerleader • Encourages participation • Is creative, has fun	Idea Generator • Thinks creatively • Makes new connections
Cooperative Learning	Parent • Prepares students in advance • Give students responsibility • Provides for equal participation	Peer Participant • Collaborates in learning process • Gives supportive feedback
Demonstration	Salesperson • Gives organized presentations • Has students replicate	Interested Observer • Watches carefully • Asks questions • Rehearses in his/her mind
Guided Practice	Coach • Sets practice rules • Ties learning goals to practice	Athlete at Practice • Remembers basic techniques • Repeats, repeats, repeats • Focuses on achievement
Inquiry	Mystery Writer • Leads to "discovery" • Provides clues • Foreshadows events	Scientist • Asks questions • Makes observations • Tests hypotheses
Instructional Technology	Pilot • Integrates technology • Is knowledgeable about systems • Monitors learning systems	Explorer • Follows new paths to learning • Uses technology • Shares with others
Lecture	Expert • Directs thinking • Shares knowledge • Evaluates students	Listener • Pays attention • Relates to previous knowledge • Organizes knowledge
Memorization	Magician • Teaches "tricks of the trade" • Creates new tricks	Sorcerer's Apprentice • Copies traditional techniques • Experiments with new tricks
Note-taking/ Graphic Organizers	Master Mechanic • Knows right tool for the job • Provides important information • Teaches how to use the tools	Artisan • Captures ideas • Uses fundamental tools • Expresses personal creativity

Changing Roles, continued

Strategy	Role of the Teacher	Role of the Student
Presentations/ Exhibitions	Olympic Judge • Establishes ideal performance • Evaluates students	Speaker • Shows well researched preparation • Has good platform skills • Informs the audience
Problem-based Learning	Coach • Presents problem situation • Encourages skill development • Supports students in the process	Detective • Analyzes the situation • Makes detailed observations • Seeks solutions
Project Design	Consultant • Provides background on project • Sets design specifications • Advises on process	Engineer • Examines the design specifications • Designs solutions • Tests solutions
Research	Resource Person • Teaches problem-solving • Poses problems • Translates into students' world	Scientist • Poses problems • Collects evidence • Organizes information
Simulation/ Role-playing	Stager • Manages the situation • Sets simulation/game in motion • Watches from the wings	Player • Focuses on the goal • Plays role with enthusiasm • Strives to improve
Socratic Seminar	Travel Agent • Enables learning from group • Guides group's journey	Journalist • Gathers and analyzes information • Organizes thoughts and ideas • Expresses ideas clearly
Teacher Questions	Conductor • Orchestrates learning • Guides performance	Expert • Responds to questions • Seeks new information
Work-based Learning	Navigator • Guides students • Shows students "destination" • Connects school and work	Apprentice • Models the master worker • Develops habits of the jobs • Seeks to improve constantly

The appropriateness of a strategy in individual situations depends matching characteristics of the strategy, the learner, and what needs to be learned. Teachers should be familiar with all strategies so they can confidently select the best strategy for the right situations.

While each strategy is described independently, the strategies are rarely used independently. When creating instructional units, teachers will select several strategies. For example a lecture may precede a demonstration and ultimately lead to a problem-based exercise. Keeping in mind the strengths of each strategy will help to create effective instructional experiences.

The instructional strategies can be related to the quadrants of the Rigor/Relevance Framework. In the following chart, each strategy is rated as to its appropriateness for each of the four quadrants.

Selecting Strategies

Rigor/Relevance Framework

Rigor/Relevance Framework

Following this introduction, each of the 17 strategies is discussed in a separate section. On the first page of each strategy is an icon depicting the Rigor/Relevant Framework. In each quadrant is a star. The size of the star indicates the relative appropriateness of that strategy for each level of learning. The larger the star, the more appropriate the strategy. The largest star corresponds to three stars on the chart.

Instructional Strategies and the Rigor/Relevance Framework

Strategy	Acquisition Quadrant A	Assimilation Quadrant C	Application Quadrant B	Adaptation Quadrant D
Brainstorming	★★	★★★	★	★★★
Cooperative Learning	★★	★★	★★★	★★★
Demonstration	★	★	★★★	★★
Guided Practice	★★★	★★	★★	★
Inquiry	★	★★★	★★	★★★
Instructional Technology	★★	★★★	★★★	★★★
Lecture	★★★	★★	★	★
Memorization	★★★	★★	★★	★
Note-taking/Graphic Organizers	★★	★★	★★	★★
Presentations/Exhibitions	★	★★	★★	★★★
Problem-based Learning	★★	★★	★★★	★★★
Project Design	★	★	★★★	★★★
Research	★★	★★★	★	★★★
Simulation/Role-playing	★★	★★	★★★	★★★
Socratic Seminar	★	★★★	★	★★★
Teacher Questions	★★	★★★	★	★★★
Work-based Learning	★★	★★	★★★	★★★

Key   ★★★ Ideal Strategy   ★★ Appropriate Strategy   ★ Least Appropriate Strategy

One of the factors to consider in selecting strategies is student learning styles. Certain instructional strategies are more effective with particular learning styles. When matched with student's learning style, these strategies can help the student achieve expected standards. Four broad categories of learning styles are listed below.

Learning Styles

Concrete-Sequential learners respond to well organized instruction that requires them recall and construct correct responses.

Abstract-Sequential learners respond to collaborative instruction that requires them analyze information and explain answers.

Concrete-Random learners respond to opportunities to be creative and design products and individual responses.

Abstract-Random learners respond to creative learning activities that emphasize brainstorming and role playing.

In the following chart, each strategy is rated as to it usefulness for each of the four learning styles.

Instructional Strategies and Learning Styles

Strategy	Concrete-Sequential	Abstract-Sequential	Concrete-Random	Abstract-Random
Brainstorming	★	★★	★★	★★★
Cooperative Learning	★	★★★	★★	★★
Demonstration	★★★	★★	★★	★
Guided Practice	★★★	★★	★★	★
Inquiry	★	★★	★★	★★★
Instructional Technology	★★	★★	★★★	★★
Lecture	★★★	★★	★	★
Memorization	★★★	★	★★	★
Note-taking/Graphic Organizers	★★	★★	★★	★★
Presentations/ Exhibitions	★★	★★	★★	★★★
Problem-based Learning	★	★★★	★★★	★★
Project Design	★★	★	★★★	★
Research	★★	★★★	★★	★
Simulation/Role-Playing	★	★	★★	★★★
Socratic Seminar	★	★★★	★	★★
Teacher Questions	★★★	★★	★★	★
Work-based Learning	★★	★	★★★	★★

Key ★★★ Ideal Strategy   ★★ Appropriate Strategy   ★ Least Appropriate Strategy

Assessment

Various types of assessments are used to measure what a student knows and is able to do. Learning through a particular instructional strategy is best measured by an assessment type that parallels the strategy. A conscious effort to mirror instruction in assessment will enhance the student's ability to perform. The following chart correlates the instructional strategies to their most appropriate form of assessment. Each of the strategies is matched to eight most frequently used types of assessment.

Types of Assessment

- Multiple Choice
- Constructed Response
- Extended Response
- Process Performance
- Product Performance
- Portfolio
- Interview
- Self-reflection

Instructional Strategies and Assessment

Strategy	Multiple Choice	Constructed Response	Extended Response	Process Performance	Product Performance	Portfolio	Interview	Self Reflection
Brainstorming	★	★	★	★★★	★★	★★	★★	★★★
Cooperative Learning	★	★	★★	★★★	★★★	★★	★★	★★
Demonstration	★★	★★★	★★	★★★	★★	★★	★	★
Guided Practice	★★★	★★★	★★	★★★	★★	★★	★	★
Inquiry	★	★	★★	★★	★★★	★★	★★★	★★★
Instructional Technology	★★	★	★	★★	★★★	★★★	★★	★★
Lecture	★★★	★★★	★★★	★	★	★	★★	★
Memorization	★★★	★★★	★★	★★★	★★	★	★	★
Note-taking and Graphic Organizers	★	★★	★★★	★	★★	★★	★★	★★★
Presentations/ Exhibitions	★	★	★★	★★★	★★★	★★★	★★	★★★
Problem-based Learning	★	★★	★★★	★★★	★★★	★★	★★	★★
Project Design	★	★★	★★★	★★★	★★★	★★★	★★	★★
Research	★	★	★★	★★★	★★★	★★★	★★	★★★
Simulation/Role-playing	★	★	★★	★★★	★	★	★★	★★★
Socratic Seminar	★	★	★★★	★★	★	★	★★★	★★★
Teacher Questions	★★	★★★	★★	★	★	★	★★	★★
Work-based Learning	★	★	★★	★★★	★★★	★★★	★★★	★★

Key ★★★ Ideal Strategy   ★★ Appropriate Strategy   ★ Least Appropriate Strategy

Use of Technology

A continuing debate centers on whether technology is the panacea that will help many students learn at higher levels or an exciting fad that is a temporary distraction from the real process of learning. The potential is there for either outcome. The degree to which technology has positive impacts on learning, depends on the way it is applied in the classroom and beyond. Implementation decisions and staff development will determine the positive or negative impact of technology.

When used effectively, technology offers exciting possibilities for expanding learning beyond what schools have taught before. Technology accommodates various learning styles. Technology puts vast amounts of knowledge at students' fingertips. Data bases on every subject imaginable are made available for study in all curriculum areas. Encyclopedias and complete collections of literary works on compact disk and telecommunication satellite links expand the walls of classrooms into the world.

Technology offers students a chance to delve deeply into subjects. Greater accessibility to information gives students the opportunity to gather data easily and analyze and synthesize it in new ways. Students can manipulate data to identify those portions that are relevant to their needs. They can integrate data from one subject area to another and use the information to enhance their understanding.

Technology provides teachers a tool to create their own teaching materials, to go beyond what's in the textbook and use alternate resources, and to reorganize information in new ways. Students can also manipulate and reorder what they learn, giving them greater control over their learning.

Technology links curriculum with real-world experiences both inside and outside the school. Using telecommunications and computer networks, students can work together in cooperative learning situations to help solve real problems, tying their education to real-life situations and giving them invaluable learning experiences.

There are many ways that versatile powerful information technology can be used to enhance any of the instructional strategies. The following chart lists a few ways that education technology can be used in each of the strategies.

Instructional Strategies and Educational Technology

Strategy	Application of Technology
Brainstorming	• Students can use computers to record and display brainstormed ideas. • Word processing software is excellent for editing, sorting and organizing brainstormed lists.
Cooperative Learning	• Distribute discussion topics to students via computer. • Students can research topics via the Internet and software resources. • Students can record reflections on computer. • Students can illustrate group findings with computer graphic displays.
Demonstration	• Use computer demonstration software packages to show complex tasks that are too expensive or dangerous to do live. • Students can review previous demonstrations from computer files or the Internet.
Guided Practice	• Students can use drill and practice software to reinforce fundamental skills. • Provide enhancing activities for students who learn at a faster pace.
Inquiry	• Pose initial questions and intriguing investigations on computer. • Students can collaborate with other students and experts off-site via the Internet. • Students can record reflections on computer.
Instructional Technology	• Technology must be used to give students direct experience learning with multi-media.
Lecture	• Use computer visuals to illustrate lectures.
Memorization	• Students can practice mnemonics on computer.
Note-taking/ Graphic Organizers	• Students can use word processing software for taking notes. • Make reference notes available for students on the Internet. • Graphic organizing software is excellent for creating graphical displays of information. • Distribute note-taking templates to students via networks.

Instructional Strategies and Educational Technology, continued

| Strategy	Application of Technology
Presentations/ Exhibitions	• Students can use multimedia software to create presentations. • Students can use the Internet and reference software for researching topics.
Problem-based Learning	• Pose problems on computers. • Students can use computer networks to research problems. • Students can use computer software for reference of decisions and expert systems. • Students can create and display solutions with visual software.
Project Design	• Students can create project designs and model solutions on computers. • Students can use calculators and computers for calculating design data. • Students can use robots to conduct design tests. • Students can use the Internet to collect information on design needs.
Research	• Students can use the Internet and reference software to research topics.
Simulation/Role-playing	• Students can use computer simulations. • Students can use education learning games for individual instruction.
Socratic Seminar	• Students can engage in discussion with students at remote locations through the Internet. • Students can use the Internet to research questions posed.
Teacher Questions	• Use software for brainstorming and keeping track of effective classroom questions.
Work-based Learning	• Students can use computer software as it is used in the workplace.

A.
Workshops
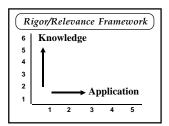
Professional development is the key to achieving rigorous and relevant learning in the classroom. This Resource Kit contains everything needed to conduct 20 90-minute staff development sessions. The modular approach allows for flexible creation of professional development workshops.

1. Using the Rigor/Relevance Framework
2. Instructional Planning
3. Selecting Instructional Strategies
4. Brainstorming
5. Cooperative Learning
6. Demonstration
7. Guided Practice
8. Inquiry
9. Instructional Technology
10. Lecture
11. Memorization
12. Note-taking/Graphic Organizers
13. Presentations/Exhibitions
14. Problem-based Learning
15. Project Design
16. Research
17. Simulation/Role-playing
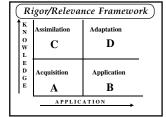18. Socratic Seminar
19. Teacher Questions
20. Work-based Learning

Using the Rigor/Relevance Framework

Rigor/Relevance Framework

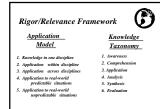|	Knowledge	
6		
5	↑	
4		
3		
2		→ Application
1		
	1 2 3 4 5	

This session covers the use of the Rigor/Relevance Framework.

Presentation on the following topics:

- Overview Rigor/Relevance Framework

- Research on International Standards and Assessment

- Unique Characteristics of the Rigor/Relevance Framework

- Uses of the Rigor/Relevance Framework

- Application Model

- Knowledge Taxonomy

Rigor/Relevance Framework

K N O W L E D G E	Assimilation **C**	Adaptation **D**
	Acquisition **A**	Application **B**
	A P P L I C A T I O N →	

Rigor/Relevance Framework

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

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

Activities

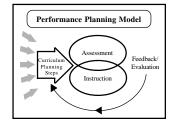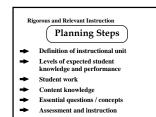1. Determining Levels of Rigor and Relevance

2. Rigor and Relevance Challenge

Instructional Planning

This session covers the use of the Rigor/Relevance Framework in instructional planning.

Factors in Planning

Goal Assessment Practices
Effective Instruction
Content Knowledge
Curriculum Standards
Student Knowledge
Community Expectations
Self Knowledge

Planning Steps

Performance Planning Model

Assessment

Curriculum Planning Steps

Instruction

Feedback/ Evaluation

Rigorous and Relevant Instruction

Planning Steps

➡ **Definition of instructional unit**
➡ **Levels of expected student knowledge and performance**
➡ **Student work**
➡ **Content knowledge**
➡ **Essential questions / concepts**
➡ **Assessment and instruction**

Presentation on the following topics:

- Performance Planning Model

- Curriculum Planning Factors

- Planning Steps

- Student Needs

- Applying Brain Research

- Interdisciplinary Instruction

Activities

3. Developing Instructional Plans
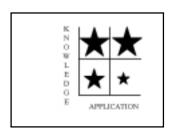
4. Put It In Writing!

Workshop 3

Selecting Instructional Strategies

This session covers the selection of teaching strategies using the Rigor/Relevance Framework.

Strategies

- Brainstorming
- Cooperative Learning
- Demonstration
- Guided Practice
- Inquiry
- Instructional Technology
- Lecture
- Note-taking/Graphic Organizers
- Memorization
- Presentations/Exhibitions
- Research
- Problem - based learning
- Project Design
- Simulation
- Socratic Seminar
- Teacher Questions
- Work - based Learning

Selection of Strategies Based on Rigor/ Relevance Framework

Matching Strategies to Learning Style

Activity

5. Strategies for Rigor and Relevance

Presentation on the following topics:

- Description of Each Strategy

- Relationship between Effectiveness of Each Strategy and Rigor/Relevance Framework

- Matching Strategies to Learning Styles

- Matching Strategies to Assessments

- Use of Technology in Each Strategy

Activity

6. What is Your Style?

Brainstorming

This session covers the use of Brainstorming as an instructional strategy.

Presentation on the following topics:

- Definition of Brainstorming

- Rules for Brainstorming

- Steps in Brainstorming

- Disadvantages of Brainstorming
  – Superficial Ideas
  – Specific, Simple Problem to Be Effective
  – No Individual Student Recognition of Ideas
  – Idea of a Waste of Time

- Uses of Brainstorming
  – Generate Ideas
  – Solve Problems
  – Turn Individual Ideas into Group Ideas
  – Provide Ideas for Goal Setting
  – Determine Needs
  – Engage All Students
  – Evaluate Activities
  – Create an Icebreaker

- Guidelines for Effective Brainstorming
  – Begin with a Well Defined, Clear Problem
  – Have All Ideas Recorded Where They Are Visible to Others
  – Encourage Students to Call Out Thoughts
  – Permit Only One Idea at a Time
  – Tell Students to Be Brief
  – Suspend Judgment; Keep an Open Mind
  – Record Every Idea

Brainstorming
   Rules:

Disallow Critical Remarks
Permit "Hitchhiking"
Welcome "Free-wheeling"
Encourage Quantity of Ideas
Be Patient with Silence
Stick to A Time Limit
Hold off Evaluation

Brainstorming
   Steps:

Preparation
Fact-finding
Warm-up
Idea Finding
Solution Finding
Implementation

Brainstorming
   Variations:

Reverse Approach

SIL Method

Pause That Refreshes

**Workshop
4**

Brainstorming, continued

- – Encourage Scaffolding of Ideas
- – Appoint a Timekeeper
- – Appoint a Rulekeeper
- – Evaluate, Discard, Sort, Mix and Match Ideas
- – Arrive at Three to Five Solutions
- – Encourage All Students to Participate

- • Brainstorming Variations

Activities

8. Carousel

7. Using Checklists

Cooperative Learning

This session covers the use of cooperative learning as an instructional strategy.

Presentation on the following topics:

- Definition of Cooperative Learning

- The Value of Cooperative Learning
  - Higher Achievement
  - Socialization Enhanced
  - Self-esteem Nurtured

- Basic Elements

- Comparison with Traditional Groups

- Methods

- Teacher's Role

- Teacher Responsibilities
  - Making Various Decisions
  - Setting Task and Positive Interdependence
  - Monitoring and Intervening
  - Evaluating and Processing

- Student Responsibilities
  - Trying   – Extending Courtesy
  - Asking   – Filling Roles
  - Helping

- Team Responsibilities
  - Solving Own Problems
  - Answering Only Team Questions
  - Consulting with Other Teams and the Teacher
  - Helping Teammates and Other Teams
  - Listening

Cooperative Learning

Basic Elements:

Positive Interdependence
Face-to-Face Interaction
Individual Accountability
*Interpersonal and Small
Group Skills*
Group Processing

Cooperative Learning

Cooperative Learning Groups	*vs.*	*Traditional Groups*	*1 of 2*
Positive Interdependence		*No Interdependence*	
Individual Accountability		*No Individual Accountability*	
Heterogeneous		*Homogeneous*	
Shared Leadership		*One Leader*	
Shared Responsibility for Each Other		*Responsible Only for Self*	

Cooperative Learning

Cooperative Learning Groups	*vs.*	*Traditional Groups*	*2 of 2*
Emphasis on Maintenance and Task		*Emphasis on Task Only*	
Social Skills Taught		*Social Skills Ignored*	
Teachers Observes and Intervenes		*Teacher Ignores Group Functioning*	
Group Processing		*No Group Processing*	

Cooperative Learning

Methods:

*Student-Teams-Achievement Divisions
(STAD)*
Teams-Games Tournament (TGT)
Jigsaw
Jigsaw II
Learning Together
Group Investigation
Think-Pair-Share

Cooperative Learning

Methods continued:

Numbered Heads Together
Roundtable
Roundrobin
Three-step Interview
Lineup

Workshop 5

Cooperative Learning, continued

Activities

9. Numbered Heads Together

10. Think-Pair-Share

7. Using Checklists

Demonstration

This session covers the use of demonstration as an instructional strategy.

Demonstration

Characteristics

Capture student interest
Draw on experience of students
Create student desire to replicate
Make students think
Provide transition from observing to doing
Set good example to follow
Be followed by student application

Demonstration

Steps in Preparing a Demonstration

Analyze skill or process
Divide into steps
Identify difficult or dangerous parts
Prepare notes
Assemble materials
Set up demonstration
Prepare handouts and visuals

Demonstration

Steps in Giving a Demonstration
Explain purpose
Check what students know
Point out new features
Review key steps
Describe the process
Demonstrate
Point out important aspects
Repeat as necessary
Introduce essential information
Prepare students to practice

Activity

9. Seeing is Believing AND Understanding

Presentation on the following topics:

- Characteristics of Effective Demonstration

- Steps in Preparing a Demonstration

- Steps in Giving a Demonstration

Activity

7. Using Checklists

Guided Practice

This session covers the use of guided practice as an instructional strategy.

Guided Practice

Homework   Worksheets

Computer-based
Drill and Practice

Guided Practice

Homework Tips

Lay out expectations early
Create assignments with purpose
Make sure students understand
Make assignments clear
Create challenging assignments
Vary assignments
Give homework that makes learning
personal
Tie assignments to the present
Match assignments to students

Guided Practice

Homework Tips, continued

Use school/community resources
Match to your style of teaching
Assign appropriate amount of homework
Encourage and teach good study habits
Provide constructive feedback
Give praise and motivate
Give help as needed
Communicate with parents
Show respect for students

Presentation on the following topics:

- Types of Guided Practice

- Homework Tips

- Worksheet Tips

- Computer-based Drill and Practice Tips

Activities

Homework review

Have each teacher bring samples of student homework assignments and/or worksheets. Using the checklist have teachers review homework in comparison to the checklist. Divide teachers into groups of 4-6. Have teachers work individually to review their homework assignments based on criteria. Each teacher then presents results of analysis to small group of teachers and shows homework assignments. Group offers suggestions and positive feedback as appropriate.

Drill and Practice Review

Using a computer-based drill and practice program, have teachers use the program and then analyze the quality of the program using the checklist.

**Workshop
8**

Inquiry

This session covers the use of inquiry as an instructional strategy.

Presentation on the following topics:

- Inquiry Defined

- Elements of Inquiry
    - Intriguing Investigations
    - Student Discourse
    - Thoughtful Reflection

- Teacher Behaviors
    - Culture of High Expectations
    - Rich, Varied Resources and Experiences
    - Focus on Individual Student Progress
    - Listen and Respond to Questions
    - Use Questions to Expand Thinking
    - Use Appropriate Assessment

Activities

12. Sink or Float

7. Using Checklists

Optional Activity: There is an excellent multimedia CD-ROM produced by the New York State Education Department entitled *Just Think: Problem Solving Through Inquiry.* Teachers can use it as an independent study resource to explore inquiry as a strategy. It is available from the Office of Television and Public Broadcasting, NYSED, Albany, NY 12234.

**Workshop
9**

Instructional Technology

This session covers the use of instructional technology as an instructional strategy.

Instructional Technology

Evaluating Software

Educational Value

Engagement

Independent Learning

Instructional Technology

Selecting Interactive Multimedia Software

Student Control
Provides a Safe Place to Fail
Starts with Problem then Explanation
Makes the Subject the Focus
Navigation to Answers
The Software is the Test
Learning Should Be Fun

Instructional Technology

Learning Context

Multimedia engagement should not isolate learner from other students
Multimedia should link to real-world problem solving
Learning environment should 'scaffold' to higher level skills appropriate for each learner

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Presentation on the following topics:

• Unique Learning Strategy

• Evaluating Instructional Technology

• Selecting Interactive Multimedia Software

• Learning Context

Activity

Demonstration: Select a multimedia instructional program which is in a curriculum area related to teachers' responsibilities. Demonstrate this software or have a vendor demonstrate it. Engage teachers through small discussion groups to discuss:

• Educational Value
  – Link to Standards
  – Accuracy of Content
  – Opportunities for Links to Other Learning Experiences
• Engagement
  – Relates to Student Experience
  – Ability to Hold Interest
  – Student Feedback
  – Balance of Entertainment and Education
• Independent Learning
  – Ease of Student Use
  – Scaffolding

Workshop 10

Lecture

This session covers the use of lecture as an instructional strategy.

Opening Activity

Have participants brainstorm characteristics of good lectures.

Presentation on the following topics:

- Review Suggestions for Effective Lectures

- When to Use Lectures

- Preparing Lectures

- Pre-lecture Activities

- Giving Lectures

- Use of Visuals

- Strategies for Improving the Quality of Lectures

Activities

13. Planning Lectures

7. Using Checklists

Lecture

When to Use Lecture:

You are the primary source of knowledge
Critical prior knowledge required, e.g., safety rules
Limited time
Change of pace needed
Interesting story to share
Using an outside expert

Lecture

Suggestions in Preparing a Lecture:

Know your subject
Use Visuals
Develop related stories
Relate to previous student knowledge
Plan an engaging opening

Lecture

Pre-Lecture Student Activities:

Reading Assignment
Case Problem
Opinion Question
Personal Response
Puzzle Exercise
Questions
Structured Note Taking

Lecture

Suggestions During Lectures:

State objectives
Be enthusiastic and animated
Keep it short
Move around room
Make eye contact
Change the pace, if you are losing student interest

Memorization

This session covers the use of memorization as an instructional strategy.

Memorization

Examples

Acronym	*Number/Rhyme*
Acrostic	*Number/Shape*
Rhyming	*Journey*
Image Links	*Roman Room*
Story Method	

Memorization

Tips
- *Don't confuse memory with understanding*
- *Creative works best*
- *Encourage students to create their own techniques*
- *Use positive images*
- *Closing your eyes aids visualizing images*
- *Use humor*

Memorization

Tips, continued
- *Symbols work*
- *Vivid images are easier to remember*
- *Use all the senses*
- *Make images 3D with motion*
- *Make location of images unique*
- *Have student create individualized images*

Presentation on the following topics:

- Situations Where Memorization Is Useful

- Examples of Memorization Techniques
  – Acronym
  – Acrostic
  – Rhyming
  – Image Links
  – Story Method
  – Number/Rhyme
  – Number/Shape
  – Journey
  – Roman Room

- Tips

Activity

14. Developing Story Mnemonics

Workshop 12

Note-taking/Graphic Organizers

This session covers the use of note-taking/graphic organizers as an instructional strategy.

Presentation on the following topics:

- Definition and Explanation of the Value of Note-taking

- Note-taking Strategies

- How to Help Students Take Better Notes

- Definition of Graphic Organizers

- Purposes of Graphic Organizers
  For Students:
  – Identify and Isolate Important Information
  – Organize Information
  – Integrate Information and Draw Relationships
  – Clarify Concepts
  For Teachers:
  – Help Teach Thinking Skills
  – Help Reach Visual Learners
  – Provide Stimuli for Right-brain Thinking

- Uses of Graphic Organizers

- Types of Graphic Organizers

- How to Choose Appropriate Graphic Organizers

- Designing Graphic Organizers

- Assisting Students to Design Graphic Organizers

Activity

15. Picture This

Note-taking
  Strategies
  Preparation
  During the Lecture
  After the Lecture

Note-taking
  Helping Students Take Better Notes
  Outline Your Lecture
  Use a Framework
  Tell Students What to Record
  Guide Students on Taking Better Notes
  Provide Time for Note-taking

Graphic Organizers
  Designing
  Identify Information to Be Depicted
  List the Main Idea and Key Points
  Choose an Organizing Format
  Show Inter-relationships Among Points
  Include Items Requiring Higher Level Thinking Skills
  Show Summative/Synthesizing Items
  Use Adequate Connecting Lines

Graphic Organizers
  Helping Students Design Graphic Organizers
  Explain and Show Graphic Organizers and Their Use
  Provide Examples
  Use Graphic Organizers As You Teach
  Provide Templates of the Graphic Organizers
  Have Students Work in Small Groups to Complete Graphic Organizers Have Students Create Their Own
  Have Students Present Their Organizers to the Class

Workshop 13

Presentations/Exhibitions

This session covers the use of presentations/exhibitions as an instructional strategy.

Presentation on the following topics:

- Presentations/Exhibitions Defined

- Guidelines for Developing an Effective Presentation

- Presentation Tips

- Elements of Successful Exhibitions

- The Exhibition Process

- Questions to Consider When Selecting the Topic
  – Interest
  – Sufficient Material Available
  – Potential Project/Product Development
  – Desire to Share
  – Topic Too Broad
  – Connections to Other Subjects
  – Challenging Topic
  – Coach/Mentor Agreement

- Conducting Research and Writing the Paper

- The Project

- The Presentation
  – Preparation
  – Outline
  – Predicting the Judges' Questions

- Exhibition Scoring Guide

Activities

16.   The Final Word

7.   Using Checklists

Presentations

Strategies

Analyze the Situation
Analyze the Audience
Define the Objectives
Create the Opening
Outline the Content
Add "Spice"
Choose an Appropriate Style
Design Visual Aids

Exhibitions

Elements

The Prompt
Expectations
Standards
Public Context
Coaching
Reflection

Exhibitions

Process

Choosing the Topic
Conducting Research and Writing the Paper
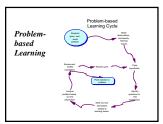*Developing the Project*
Delivering the Presentation
Scoring Guide

**Workshop
14**

Problem-based Learning

This session covers the use of problem-based learning as an instructional strategy.

Presentation on the following topics:

- Components

- Problem-based Learning Cycle

- Finding Problems

- Teacher's Role

Activities

17. PBL Case Study

7. Using Checklists

Project Design

This session covers the use of project design as an instructional strategy.

Project Design

Definition

Clarify, investigate, develop, make, test evaluate and improve solutions to problems
Create a device or system which meets a need
Group problem solving
Often technology-based
Integrate math, science and communication
Use systems and processes

Project Design

Tips

Choose projects which relate to your curriculum
Be sure you have adequate time
Begin slowly and simply
Do what is comfortable for you
Give students time to practice related skills
Generate group decision making processes
Evaluation is based on more than the final product

Project Design

Tips, continued

Make sure materials and resources are available
Take some risks with the students
Integrate several of the skills you teach
Remind students of the skills they are learning
Keep administrators informed
Make connections to the community

Project Design

Tips, continued

Keep documentation
Encourage use of models and pictures
Encourage students to consider multiple solutions
Have students gather information independently
Students should clarify ideas through discussion, drawing, and modeling

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Presentation on the following topics:

- Definition

- Design Process

    1. Problem
    2 Design Brief
    3. Investigation
    4. Alternative Solutions
    5. Best Solution
    6. Models and Prototypes
    7. Testing and Evaluation
    8. Manufacturing

- Tips

Activity

18. Tower of Pasta

Research

This session covers the use of research as an instructional strategy.

Research

Types of Student Research

	Scientific	*Social*
Primary		
Information Source		
Secondary	*Analytical*	*Descriptive*

Quantitative   Qualitative

Type of Information

Research

Scientific Research Steps

Make Initial Observation
Gather Information
Clarify the Purpose of the Project
Identify Variables
Make Hypothesis
Design Experiments
Do the Experiments and Record Data
Record Observations
Summarize Results
Draw Conclusions

Research

Social Research Steps

Make Initial Observation of Behavior
Clarify the Purpose of the Project
Make Hypothesis
Design Survey Instruments
Collect Data
Summarize Results
Draw Conclusions

Research

Analytical Research Steps

Identify a Topic
Clarify Needs to Be Addressed
Gather Information
Interpret Data
Share Research Findings

Research

Descriptive Research Steps

Identify and Develop the Topic
Find Background Information
Find Print Resources
Find Internet Resources
Evaluate Information Resources
Cite Resources Using a Standard Format
Write Descriptive Report

Presentation on the following topics:

- Types of Research

- Scientific Research Steps

- Social Research Steps

- Analytic Research Steps

- Descriptive Research Steps

Activities

Demonstrate and give teachers practice with research techniques using the Internet. Pay particular attention to the proper use of search engines, distinguishing types of references, and citation of references.

7. Using Checklists

Workshop 17

Simulation/Role-playing

This session covers the use of simulation/role-playing as an instructional strategy.

Presentation on the following topics:

- Definition of Simulation

- Advantages of Using Simulations

- Limitations of Simulations
    - Unable to Replicate All Situations
    - Generalization May Occur from a Small Representation of Reality
    - Contains a Degree of Unpredictability
    - Has a Degree of Chaos, Uncertainty, Noise, and Overactivity
    - May Be Quite Complex
    - Cost
    - Teacher Unfamiliarity
    - Limited Student Participation

- Classroom Uses

- Considerations in Simulation Selection
    - Match the Instructional Objective
    - Correlation of Purpose, Content, and Competencies
    - Placement Within the Course
    - Time
    - Degree of Student Participation
    - Role Assignments
    - Need for Teams
    - Student Debriefing Activities
    - Resources

- Implementing the Simulation

- Designing a Simulation

Activity

19. Archaeological Simulation

Simulation

Advantages

"Life-like" Experience
Active Learning
Discovery Learning
Immediate Feedback
Risk-free Environment
Teacher As Facilitator/Coach
Increased Interaction

Simulation

Advantages, continued

Real-world Applications
Variety in Instructional Approaches
Effective Transfer of Learning to Real-world Situations
Time Spans Compressed
Greater Student Motivation

Simulation

Classroom Uses

Icebreakers
Develop Empathy and Understanding
Analyze Social Problems
Explore the Future
Develop Analytical and Research Skills
Develop Oral and Written Communication Skills

Simulation

Implementation Tips

Be Familiar with the Simulation
Determine Your Role
Assess Performance in the Simulation
Consider Grouping Carefully
Allow Enough Instructional Time
Determine Educational Value of the Simulation

Simulation

Designing a simulation

Identify the Educational Objective
Define the Model to Be Replicated
Explain the Dynamics of the Model
Outline the Participation Rules
Prepare Debriefing Questions

Socratic Seminar

This session covers the use of Socratic seminar as an instructional strategy.

Socratic Seminar

Elements

Text Being Considered
Questions Raised
Seminar Leader
Participants

Socratic Seminar

Tips for Preparation

Read and assign texts
Prepare brief comments to start the seminar
Choose an introductory question
Set the room arrangement

Socratic Seminar

Tips for Conducting

Listen hard and follow comments with questions
Don't let the discussion wander
Help participants clarify and amplify comments
Insist on rigor
Remember you are learner as well
Ask for reflection at the end

Socratic Seminar

Guidelines for Participants

Do not participate if not prepared
Mark text to refer to citations in discussion
Refer to text when needed
Form opinions you can defend
If you don't understand, ask for clarification
Stick to the point under discussion
Listen carefully and completely to others

Socratic Seminar

Guidelines for Participants, continued

Listen critically and take issue with inaccuracies
Maintain an open mind
Speak up so all can hear
Be courteous
Avoid repeating comments
Talk to fellow participants
Discuss ideas not opinions

Presentation on the following topics:

- Elements

- Tips for Preparation

- Tips for Conducting

- Guidelines for Participants

Activity

There is an excellent video on Socratic seminar from Association for Supervision and Curriculum Development (ASCD). Obtain this video, present to participants, and discuss effective ways to implement Socratic seminar.

Teacher Questions

This session covers the use of teacher questions as an instructional strategy.

Teacher Questions

Effective teacher questioning :

is planned and directly relates to the topic,
focuses on depth of response rather than breadth,
is precise rather than vague, and
has follow-up questions used to probe for more answers.

Teacher Questions

Types of Questions

1. *Information*
2. *Analytical*
3. *Imaginative*
4. *Follow-up*
5. *Opinion*
6. *Conversational*

Teacher Questions

Follow-Up Questions

Probe
Refocus
Redirect
Rephrase

Teacher Questions

Tips :
Plan with other teachers to create a good list of questions.
Compliment students.
Give time for students to think.
Wait 3-5 seconds.
Listen to the student.
Call students by their names.
Use active listening.
Encourage non-participants by calling on a specific student to answer a question.
Randomly select students to respond.

Presentation on the following topics:

- Effective Teacher Questions

- Types of Questions

- Follow-up Questions

- Tips

Activities

20. Imagining Imagination Questions

7. Using Checklists

Work-based Learning

This session covers the use of work-based learning as an instructional strategy.

Presentation on the following topics:

- Definition of Work-based Learning

- Purposes of Work-based Learning

- Benefits of Work-based Learning

- Work-based Learning Strategies

- Structure of Work-based Learning Programs
  - Location
  - Supervision
  - Time
  - Compensation
  - Participation

- Considerations to Ensure Educational Value

- Quality Assessment of Teaching and Learning at Work

Activities

Have participants discuss various work-related opportunities for teachers and/or work experiences in which they have engaged. Have group identify the "teacher" learnings from these experiences. Examples include: business/industry advisory council to educational program, summer work experience, business/industry mentors, surveys and interviews of local business organizations, and guest speaker programs.

In small groups, have participants discuss the advantages and disadvantages of various work-based learning strategies. Then have individuals identify which strategies could work in their school and develop an action plan to implement one.

7.   Using Checklists

Work-based Learning

Purposes
Enhance Student Motivation and Academic Achievement
Increase Personal and Social Competencies Related to Work
Gain a Broad Understanding of an Occupation or Industry
Provide Career Exploration and Planning
Acquire Work Competencies

Work-based Learning

Benefits

Students Gains

Business Community Gains

School Gains

Community Gains

Work-based Learning

Strategies
Field Trips
Job Shadowing
Mentoring
Special Projects
Structured Work Experiences
Service Learning
Apprenticeships
School-based Enterprises

Work-based Learning

Considerations to Ensure Program's Value

Student Readiness
Match Between Student and Work Site
Size of Program
Connections Between School-based and Work-based Learning

B.
Teacher Learning
Activities

1. Determining Levels of Rigor and Relevance
2. Rigor and Relevance Challenge
3. Developing Instructional Plans
4. Put It In Writing!
5. Strategies for Rigor and Relevance
6. What's Your Style?
7. Using Checklists
8. Carousel (Brainstorming)
9. Numbered Heads Together (Cooperative Learning)
10. Think-Pair-Share (Cooperative Learning)
11. Seeing is Believing AND Understanding (Demonstration)
12. Sink or Float? (Inquiry)
13. Planning Lectures (Lecture)
14. Developing Story Mnemonics (Memorization)
15. Picture This (Note-taking)
16. The Final Word (Presentations)
17. PBL Case Study (Problem-based Learning)
18. Tower of Pasta (Project Design)
19. Archaeological Simulation (Simulation)
20. Imagining Imagination Questions (Teacher Questions)

Activity 1

Determining Levels of Rigor and Relevance

| Time | 30-40 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
1. Rigor/Relevance Framework
2. Determining Levels of Rigor and Relevance - Worksheet/ Answer Sheet
3. Knowledge Taxonomy Verb List
4. Application Model Decision Tree (2 pages)

Procedure

1. Have participants sit in groups of three or four.

2. 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.

3. Review the results with the entire group.

4. 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.

5. Next plot these skill and knowledge statements on the Rigor/ Relevance Framework.

Suggestions

Discuss with entire group any difficulties they had and the usefulness of the tools.

Activity 2

Rigor and Relevance Challenge

| Time | 10-15 minutes |

Purpose

This activity reinforces the use of the Rigor/Relevance Framework and encourages teachers to think about creative instructional activities that will raise the level of instruction.

Materials

Index cards (one per group)

Procedure

1. 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 and Application Model. These are examples of quadrant A learning. 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.).

2. Have the groups select one of their topics that is a good candidate for improvement and write it on an index card.

3. Collect the cards and redistribute them, making sure no group gets its card back.

4. Have the groups write a skill and/or knowledge statement for the topic which is at level 5 or 6 of the Knowledge Taxonomy and level 4 or 5 of the Application Model — quadrant D learning. They should then suggest at least one instructional activity that would raise student performance to the high level of rigor and relevance.

5. Have groups report out: (1) their assigned skill, (2) the higher level that is their target on the Rigor/Relevance Framework, 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.

Activity 3

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
5. Performance Planning - Worksheet
6. Performance Planning Questions

Procedure

1. Have participants work individually unless there are natural small groups, such as teachers in the same grade or same subject.

2. Following the Sample Instructional Plan, have each participant develop an instructional plan for a familiar topic using the worksheet.

3. Recommend that participants select at least three instructional strategies appropriate for the expected level of rigor and relevance.

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 instructional 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.

Activity 4

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

1. 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.

2. 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 introduce project-based learning in social studies?

3. Collect and redistribute the envelopes, instructing participants to ask for another if given theirs back.

4. 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 are passed to the next person.

5. 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.

Activity 5

Strategies for Rigor and Relevance

Time	10 minutes

Purpose

This activity will help participants begin to understand how various instructional strategies are more appropriate for certain quadrants of the Rigor/Relevance Framework. It works best if it is introduced after an explanation of the Framework and prior to any extensive discussion of the instructional strategies.

Materials

Handouts

7. Strategies that Work

Procedure

1. After participants are familiar with the Rigor/Relevance Framework, distribute the worksheet.

2. Have participants write the names of various instructional strategies which are most appropriate for each of the types of learning in the four quadrants.

3. After working individually, have the group share examples of the strategies they have listed for each quadrant. You might summarize these on an overhead transparency.

4. The important concept to recognize from this activity is that different strategies are appropriate for different quadrants of the Framework.

Activity 6

What's Your Style?

Time | **15-40 minutes**

Purpose

This activity will stimulate participant reflection about the importance of learning styles and using learning styles as a criterion for the selection of instructional strategies

Materials

- Transparency or handout with learning style question
- Newsprint and four easels

Procedure

1. Show participants the four statements below which relate to four different learning styles. Identify four areas of the room as A, B, C, and D. Ask participants to select the statement that best describes them.

   Learning Style statements:

   A. I am well organized, and I like structure and precise instructions. I enjoy facts and details, and I work hard to finish projects. (CS)

   B. I am an information person. I like ideas, facts, and theories. I work best with clear structures, and I like to analyze things. (AS)

   C. I am experimental and independent. I like to take risks when I learn. The process of working with an idea is more interesting to me than the final product. (CR)

   D. I am a people person. I try for personal understanding of what I learn. I care about values and feelings, and I like to look at things from different points of view. (AR)

2. After participants have made a selection, ask them to move to the designated area of the room.

Activity 6, continued

What's Your Style?

Procedure

3. Ask each group to role-play as students. They will brainstorm a list of the ways they prefer to learn. This list will be given to a group of teachers to plan activities they will value and enthusiastically participate in. Use the newsprint to list 8-10 characteristics and then select a name for the group which reflects their preferred learning.

4. If time permits, have groups exchange lists. Now have the groups role-play as teachers. Give all of the groups an instructional topic such as American Revolution, photosynthesis, or grammar. Have each group brainstorm a list of strategies that would respond to the student learning style they are working with. Have groups display their ideas on newsprint.

Activity 7

Using Checklists

Time | **20-30 minutes**

Purpose

The checklist included in the Instructional Strategies resource are valuable tools for teachers to do self-evaluation of their effectiveness in teaching. This activity is used to acquaint teachers with the criteria in the checklist.

Materials

Copies of the checklist for the strategy being reviewed (make copies of the checklist from the Teacher Handbook so teachers will not have to mark up their copies).

Procedure

1. The general procedure for getting teachers acquainted with the checklist is to break teachers into pairs.

2. The procedure will vary depending on whether teachers have experience with using this specific strategy. In most cases, the strategy will not be new to teachers, and they will be able to use the experienced teacher procedure in step 3. Inexperiences teachers should be assigned to do step 4.

3. The pair of experienced teachers are asked to think about a lesson in which they used the strategy that is being reviewed. They then take turns describing briefly to each other the nature of that lesson and what happened. After sharing descriptions of the lesson, each teacher independently self-reviews the lesson using the criteria in the checklist. After both complete the self-review checklist, have each teacher share thoughts of strengths and areas in need of improvement in the use of the strategy.

4. Inexperienced teachers will each read the checklist and then rank the items in priority order (highest to lowest) based upon their perception as to which criteria are most important. After each person independently ranks the criteria, the pair of teachers compares their rankings and discusses any differences in those ranked highest.

Activity 8

Carousel

| Time | 45-60 minutes |

Purpose

This activity will engage teachers in brainstorming; thus, they will become familiar with the technique, be able to practice effective brainstorming guidelines, and evaluate their success in using the strategy as well as its effectiveness in helping them to generate ideas.

Materials

- Large sheets of newsprint
- Colored markers
- Masking tape or thumb tacks

Procedure

1. Post large sheets of newsprint on the wall at various places around the room. Have a brainstorming topic or question on each sheet.

2. Review the guidelines for effective brainstorming.

3. Divide the participants into groups of six people.

4. Have each group choose a recorder.

5. Designate a timekeeper for the activity and instruct the timekeeper to give a signal after three minutes.

6. Have each group start with a different colored marker in front of one of the posted pieces of newsprint.

7. Instruct the groups to brainstorm responses to the posted question/topic. Indicate that they will only have three minutes on each topic.

8. After three minutes and the time signal, direct the groups to move to the next sheet on their right.

9. Have the groups brainstorm quickly and add to the new sheet.

10. At the time signal of three minutes, direct the groups to move again to their right and repeat the process.

Activity 8, continued

Carousel

Procedure

11. Continue this procedure until each group has brainstormed responses to all of the topics posted.

12. Have each group return to the topic where they began. Have groups look over ideas and see what was added to the list.

13. Instruct the groups to organize the ideas into categories and eliminate repeated ideas.

14. In their same groupings, have the teachers discuss the effectiveness of the brainstorming in helping them to generate ideas and evaluate how well they followed the guidelines for effective brainstorming (refer to Checklist for Effective Brainstorming).

Sample Topics:

* Guidelines for Effective Brainstorming
* When to Use Brainstorming
* Steps in the Brainstorming Process
* Sample Brainstorming Topics for English Language Arts Instruction
* Sample Brainstorming Topics for Mathematics Instruction
* Sample Brainstorming Topics for Science Instruction
* Sample Brainstorming Topics for Social Studies Instruction
* Ways Visual Tools Enhance Student Learning
* Characteristics of Effective Professional Development
* How to Involve Parents and the Community in Your School

Activity 9

Numbered Heads Together

Time 30-45 minutes

Purpose

This activity will give participants an opportunity to engage in a cooperative learning method and process content on cooperative learning.

Materials

None

Procedure

1. Divide participants randomly into teams.

2. Explain Numbered Heads Together structure.

   Have each team member count off. If teams are made up of different numbers of participants, even teams off; or if only one or two teams have five members and the rest have four members, then participant four or five may respond when four is called. Thus, all teams have an equal chance to answer each question.

3. Ask a question related to cooperative learning. Sample questions include:

   What are the four elements of cooperative learning?
   What are some ways to accomplish interdependence?
   Why is individual accountability important?
   How are cooperative learning experiences different from traditional group work?

4. Give participants 20 minutes to be sure that everyone on the team knows the correct answer. The entire team must reach consensus on the correct answer. At this point, the participants "put their heads together," discuss the question, and make sure that everyone on their team knows the answer to the question. Assign one person on each team the role of "checker" to be sure that each team member is able to express the correct answer if called upon.

Activity 9, continued

Numbered Heads Together

Procedure

5. After participants have time to ensure knowledge of the answers, call a number at random. Participants with this number raise their hands to respond to the question. Select one participant to provide the answer. If only a few participants with the number called raise their hands, give participants a few more minutes to ensure that all numbers within their teams know the correct answer.

(Adapted from Kagan, S. *Cooperative Learning Resources for Teachers.* Riverside, CA: University of California, 1989.)

Activity 10

Think - Pair - Share

Time	Varies

Purpose

This method builds thinking time into the discussion process. It gives individuals an opportunity to think and organize their thoughts before someone else shares his/her ideas. All participants get to share their thinking with at least one other person. This improves engagement with the content, facilitator, and group. This activity can be used frequently during a training session.

Materials

None

Procedure

1. Participants listen while you poise a question. Question can be on any aspect of cooperative learning. This activity can also be used on any subject area.

2. Provide "wait time" so each person can formulate a response. (Think)

3. Have participants pair with one another to discuss their responses. (Pair)

4. Ask participants to share their responses with the entire group. (Share)

Activity 11

Seeing is Believing AND Understanding

Time	30 minutes

Purpose

This activity illustrates, in a humorous manner, the need for demonstrations and visuals in learning. Some skills and knowledge can be reduced to descriptions in language, but there are many instances where language alone is inadequate to convey meaning, and a demonstration is needed. This activity takes a routine physical task and calls for one person to describe the steps to complete the task correctly without any visuals aids or demonstration.

Materials

Props that would be used for performing a task. A screen or curtain to separate the two demonstrating teachers.

Procedure

1. Pick a skill, technique, or process that most people know. Putting on a coat or tying a bow knot are good examples.

2. Pick two volunteers to conduct a lesson on how to do the task. One person will be the teacher and the other, the student. The teacher will teach the student how to put on the coat, for example, without the aid of visuals or a demonstration.

3. Position the teacher and student on opposites sides of the screen; it is best if you can position the screen so the audience can see both the teacher and the student. But, the audience should be able to at least see the student.

4. Ask the student to pretend never to have seen a coat before and have no idea what it is used for. The teacher will tell him or her what to do with it.

5. Ask the teacher to analyze the steps to be taught in this task and carefully go through an explanation to the student. The initial instruction will show how difficult it is to teach even the simplest skills when you do not have the opportunity to demonstrate. Conveying information only in words is often ineffective.

Activity 11, continued

Seeing is Believing AND Understanding

Procedure

6. Hold a discussion about the importance of using visuals and demonstrations.

7. If time is available, brainstorm several skills that are best taught through demonstration.

Activity 12

Sink or Float?

Time	30 minutes

Purpose

Inquiry as a strategy begins with an intriguing investigation around which students make observations and pose questions. One of the best ways for teachers to appreciate the learning that takes place in an inquiry lesson is to have them directly experience an inquiry lesson. Science is rich with inquiry examples. This activity is easy to set up and gives teachers a chance to participate in an inquiry and reflect on the ways inquiry can be used as a strategy.

Materials

Have participants work in groups of two or three. For each group have the following materials.

- Clear plastic drinking cup
- Clear soda (7-Up or Sprite) enough to fill each cup 2/3 full
- Three raisins
- Grapes
- Paper towels
- Salt
- Sugar

Procedure

1. Have participants examine their cups of clear soda and raisins. Have each group list as many characteristics of each as possible. Share the observations with the larger group.

2. Pose the question to the groups: "Will the raisins sink or float when we place them in the soda?" Have the participants make predictions as to what will happen.

3. Have the groups place raisins in soda and make observations. The raisins will usually sink and then float to the surface; some will return to the bottom. Have participants pose hypotheses as to why raisins sink and then float.

4. Have groups modify the investigation by changing the shape of the raisins, using a grape, and adding salt or sugar to the soda to see what happens. How do these observations change your understanding of why the raisins float. (The CO_2 gas in the soda attaches to the rough surface of raisins and causes many to float.)

Activity 12, continued

Sink or Float?

Procedure

5. Have participants brainstorm ways this scientific phenomenon is used. (Think about submarines and the way that air in human bodies helps us float.)

6. Have teachers reflect on the inquiry nature of this lesson.

What were the elements of the investigations which engaged participants?

How important was it to encourage discourse among the individuals?

What teacher behaviors encourage or discourage inquiry?

How important was the reflection at the end of the investigation?

Activity 13

Planning Lectures

Time | 40-60 minutes

Purpose

This activity will help teachers develop a pattern of thinking and planning which will create effective lectures in appropriate learning settings. This activity also highlights the important enhancements to make lectures more interesting.

Materials

Handouts

8. Lecture Planning Worksheet

Procedure

1. Review the characteristics of effective lectures.

2. Divide the participants into groups of two or three people.

3. First have the participants work for 20 minutes as individuals to answer the Objectives and Organizing Content questions (1 - 6) on the Lecture Planning Worksheet. Individuals may select their own instructional topic or one may be assigned. If there are logical groupings of teachers, such as several teachers at a grade level or high school social studies teachers, it makes sense to assign them to work in groups on the same lecture topic so they can share good lecture ideas.

4. Have members share the information they developed with the other members of the small group.

5. Now have each teacher work individually on the questions related to pre-lecture activities, visuals, and stories (7 - 10).

6. Have the teachers share with the small group the ideas they generated in each of these sections.

7. Give each teacher the opportunity to reflect and discuss the importance of developing lecture enhancements.

Activity 13, continued

Planning Lectures

Suggestions

Conduct a demonstration to reinforce the techniques to enhance lectures. Have two teachers give short lectures on similar topics. Have one present a straight lecture with few enhancements. Have the other include opening questions, visuals, and a story. Discuss the strengths and weaknesses of each lecture. This will help the teachers "discover" the importance of visuals, stories, and opening questions.

Activity 14

Developing Story Mnemonics

Time | **30-40 minutes**

Purpose

This activity gives practice in the use of a picture link type of mnemonic technique to remember information. It illustrates how useful mnemonic techniques are to remember a long list of items.

Materials

None

Procedure

1. Assume you want to memorize these ten everyday, somewhat un-related items: baby, towel, flower, fishbowl, hat, microwave, magazine, bed, telephone, hairdryer.

2. First read the list off to the group. Indicate that you would like them to recall the items on the list. Repeat the list, and have participants recall it as best they can. You might have them try to write them down in sequence.

3. Then read the following story and repeat it. Strongly emphasize each key word. Then have participants try to recall the list. The use of the story and images will significantly increase the ability to recall the items.

   As you enter the department store and walk past the perfume counter, you hear the loud cry of a **baby**. You want to cover your ears to stop the sound and the only thing you see is a yellow **towel**. You pick up the towel to cover your head and you notice there is a beautiful purple **flower** printed on one side. But the flower is not in a pot, it is in a **fishbowl**. You cover your head with the towel and realize you have a fishbowl for a **hat**. Walking though the store with a towel for a hat you remember you are there to buy a new **microwave** oven. You want to find the fancy one you read about in a **magazine** that is so automatic you can control it while lying in **bed**. After all you use the **telephone** while lying in bed, why not the microwave for making popcorn and while watching the late movie. Isn't technology great. Now they need to make a **hairdryer** you can use in bed.

Activity 14, continued

Developing Story Mnemonics

Procedure

4. To illustrate how to use this technique to help students re-member, walk through the process of selecting images. As-sume you want to memorize these ten everyday, unrelated items, in sequence: tomato, car, newspaper, sausage, pen, tree, watch, tie, television, and football.

   In order to remember these unrelated items, you can relate these to pictures and tie it together in a story.

5. Next try the story tying these words together is a series of ridiculous images — you can remember any new information if you associate it with something you already know.

   Follow this script to take participants through a story to re-member this list.

   First, picture a red tomato in your mind. But now we come to the next item – car. If we assume that you already know to-mato, you can now apply the memory rule. You simply need to create a ridiculous picture, or image, in your mind's eye — an association between tomato and car. In order to do this you need a ludicrous, farfetched, crazy, absurd picture or image to associate the two items. What you don't want is a logical or sensible picture. For example, a sensible picture might be some-one riding in a car and running over the tomato. Although this would not be something you would expect to see every day, it is in not in any way bizarre or impossible. An impossible, crazy, picture might be — a gigantic tomato driving a car along the highway, or you open a car door and tons of tomatoes tumble out and knock you over. These are ludicrous, illogical pictures.

   What you need to do is select one of these pictures, or a crazy image you thought of yourself, and see it in your mind for just a fraction of a second. Be careful not to picture the words 'to-mato' and 'car.' You need to see the action you've selected –

Activity 14, continued

Developing Story Mnemonics

Procedure

the huge tomato driving the car, or the mountain of tomatoes tumbling out of a car, or whichever image you've decided on—for just an instant, right now.

The next item on your list is newspaper. Assuming that you already remember car, you now need to form a ridiculous association in your mind between car and newspaper. For example, you open a newspaper and a car leaps out of the pages and knocks you over. Or you are driving a huge rolled up newspaper instead of a car. Or you are driving a car when a massive sheet of newspaper appears in front of you, which the car rips as you drive through it. Choose one of these images, or one you conjured up yourself, and picture it clearly for a split second.

Sausage is the next item to remember, so you now need to form a ludicrous connection between newspaper and sausage. You could picture yourself eating rolled up newspapers and eggs for breakfast instead of sausages and eggs, or you are reading a gigantic sausage which has lots of news printed on it, or a paperboy is walking along a street pushing very long sausages through letterboxes instead of newspapers. See one of those crazy images.

Next on the list is pen. Associate it to sausage. See yourself trying to write with a sausage instead of a pen, or you cut into a sausage with a knife and fork and gallons of ink shoot out of the sausage into your face. Picture one of these scenarios clearly in your mind.

The next item is tree. Picture millions of pens growing on a tree instead of leaves or a colossal fountain pen growing in your garden instead of a tree. Be sure to see the image clearly.

Watch is the next item on the list. Picture a tree with lots of branches wearing giant wristwatches, or look at your watch and

Activity 14, continued

Developing Story Mnemonics

Procedure

see a tree growing out of it, with roots curling up your arm. Select an image and see it for an instant in your mind's eye.

Tie comes next. See yourself wearing an elongated wristwatch instead of a tie, or an enormously long tie is tied around your wrist instead of a watch, so long that it drags along the floor.

The next item to be remembered is television. You might picture yourself with a television hanging around your neck instead of a tie, or you switch on the television and a vast, horribly spotted tie bursts out of the screen, unrolling itself for yards and yards. Select a crazy association between tie and television, and see the picture in your mind.

The final item on the list is football. See a football match where the players are kicking around a television instead of a football. Or you are watching a football game on television when millions of footballs suddenly burst through the screen and hit you in the face. Picture one of those images.

If you have really tried to see all those pictures, you will now remember the list of ten items in sequence, both forwards and backwards. Test yourself now, by writing them down on a sheet of paper.

Suggestions

As a follow-up activity, give each participant a list of unrelated words. Have them develop a mnemonic story and see if they can create a set of images to help another person recall the words.

Activity 15

Picture This

Time **45-60 minutes**

Purpose

This activity introduces teachers to types of graphic organizers and the decision-making process for selection of graphic organizers for various types of information.

Materials

Handouts

9. Types of Graphic Organizers
10. Graphic Organizer Information Activities

Procedure

1. Divide the audience into groups of three or four.

2. Review the types of graphic organizers using Handout 9.

3. Assign the following information task to all groups and have them select an appropriate graphic organizer for the information. Next have the group work together to create a graphic organizer.

    Information task:

    You are asked by the state board of education to develop a new plan for teacher preparation. Describe through a graphic all of the steps and activities you would require in an ideal teacher preparation program.

4. Have several of the groups share the graphic organizer type they selected and show their graphic. (Use overhead transparencies or an image projector to show the graphics.)

5. Have each person, working independently, select an information task and an appropriate graphic organizer and develop it. After completing individual task, have the groups share their organizers.

Activity 16

The Final Word

| Time | 60 minutes |

Purpose

This activity will give participants an opportunity to become familiar with various school districts' graduation by exhibition requirements, expand individual knowledge of exhibitions, and build upon other's perceptions of exhibitions.

Materials

A school district's graduation by exhibition requirements, general description, scoring guides, and sample student work.

Procedure

1. Divide participants into groups of five.

2. Have groups sit in a circle.

3. Give groups 20 minutes to read and preview material on graduation by exhibition.

4. Then have the first person in a group begin by pointing out the most striking thing found in the materials. This should take no more than three minutes.

5. Proceed around the circle and have each person respond briefly to the first person's remarks. This should take no more than one minute per person.

6. The person who began the discussion then has the "final word," which should be no more than one minute. This is a response to what everyone has stated.

7. The next person shares what was most significant for him/her.

Keep the conversation moving; encourage participants to stay focused on the exhibition materials; keep time so that everyone has an opportunity to participate.

Activity 17

Problem-based Learning Case Study

Time | 60 minutes

Purpose

This activity simulates problem-based learning with a problem centered around a teacher exploring the use of problem-based learning. The case study and related questions will cause teachers to reflect on their own ideas related to problem-based learning and steps they can take to implement it in their classrooms.

Materials

Handout

11. Problem-based Case Study

Procedure

1. Introduce the case study and distribute copies of Handout 11.

2. Organize participants into groups of no more than six people.

3. Have the groups read the case study section by section and discuss the questions following each section.

4. After completing the case, lead a whole group discussion on strategies to implement problem-based learning.

Activity 18

Tower of Pasta

Time	90 Minutes

Purpose

The best way for teachers to understand the usefulness of design is to engage in a simple project and reflect on the learning activities. This design activity incorporates a construction project using marshmallows and spaghetti. Participants will understand the relationship between shapes and strengths of structures in construction.

Materials

Work space for participants to construct their tower, working in groups of three or four.

- 20 pieces of dry spaghetti for each group
- 20 large marshmallows
- Meter stick

Procedure

1. The design brief: "Construct the tallest tower possible using only 20 marshmallows and 20 pieces of spaghetti." Groups can cut or break the materials as they wish. They will have a fixed time limit to construct their tower. A prize will be awarded to the group that constructs the tallest tower which remains standing for at least five minutes.

2. The first step is to submit a tower design for approval. Groups should brainstorm alternative designs, agree on a design, and sketch it on paper. Give groups 20 minutes to come up with their design.

3. Check to see that all groups have a design sketch. Allow them to begin construction. Give groups 20 minutes to complete construction. They should follow their sketch but are allowed to make design alternations during construction.

Activity 18, continued

Tower of Pasta

Procedure

4. Following construction, have each person complete a written summary. This summary should include a description of the planned tower they intended to build, design modifications they made during construction, and suggestions to other builders on techniques to improve designs of towers.

5. Measure the towers and award prizes or recognize the winning groups. For added interest you might give other humorous awards (smallest, fattest, flimsiest, etc.).

6. After designs are completed, discuss what design elements led to the construction of a tall, stable structure.

7. Finally, ask the group to resume the role of teachers and discuss this project design as a learning activity. The following discussion questions will be helpful.

   • What skills and knowledge were developed in this project?

   • How would this project be different if each group were given a sketch and asked to follow the directions for construction?

   • How would this have been different if you were allowed to go back and design and construct a second tower based upon what they had learned?

   • What roles did various people play in the group? Is it necessary to provide additional guidance to the group to ensure that all contribute to the design?

   • Why was it important to require the sketch and how did that contribute to a discussion of design principles?

   • What is the importance of having each student write up an individual summary?

Activity 18, continued

Tower of Pasta

Procedure

- How could this be modified to challenge students design skills more?

Design projects do not need to be complex, expensive, or sophisticated. Have the groups share ideas on planning design projects.

Suggestions

This was a limited design activity. It could be expanded by having more flexibility for students to select and substitute other materials. The goal could also be more demanding, such as a bridge spanning a chasm or a platform to support a weight.

Activity 19

Archaeological Simulation

Time	45 minutes

Purpose

This simulation game will point out to teachers how our "screening mechanisms" filter out unwanted data, detail, and trivia through selective attention. This is important so that individuals can accomplish tasks throughout a day without being sidetracked by the unimportant and insignificant. (Do not reveal this purpose up front to teachers since this perceptual phenomenon is what they will learn from the game.)

Materials

- Printed set of instructions
- Large sheets of newsprint
- Colored markers
- Masking tape or thumb tacks

Procedure

1. Divide the participants into groups of six people.

2. Give participants the following instructions:

   - You are archaeologists in the future interested in reconstructing a culture based on artifacts you discover.

   - The culture you are concerned with is the United States in the 20th to 21st centuries.

   - You are on a "dig" and come up with a small, flat round object. It has a man's face on it; the man has a beard. (The object is a U.S. penny.)

   - Come up with as many characteristics of U.S. culture as you can from this artifact. This is what archaeologists have to do. You are in competition with the other teams. You have five minutes to deduce as much information as possible. Record responses on flip chart paper.

Activity 19, continued

Archaeological Simulation

Procedure

3. After five minutes, call time and ask participants to total up and post their cultural characteristics.

4. Have the team with the highest total report verbally their characteristics to the entire group.

5. Anticipate friendly rivalry; some items will be challenged.

   Possible characteristics:

   • Bilingual (English and Latin)
   • Architecture (Lincoln Memorial)
   • Calendar
   • Mining
   • Patriarchal society
   • Coinage system
   • System of writing
   • Liberty-loving
   • Religious ("In God We Trust")
   • Agriculture (if a "wheat" penny)
   • Appearance conscious (Lincoln's beard)
   • Dress conscious (coat, tie)

6. Add additional characteristics from the other teams.

7. To process the game, ask participants what they learned. Record responses on a flipchart.

8. Discuss responses from group. Learnings should include the value of teamwork, importance of background in perception (different groups see different things), the fact that it is difficult to single out things that are common in daily activities, etc. Discuss further why we overlook the detail—phenomenon of perceptual choice or selective attention that screens out the unimportant. This screening de-

Activity 19, continued

Archaeological Simulation

Procedure

vice is helpful for it enables us to get through tasks and activities without being overwhelmed by trivia; on the other hand, the device may work in reverse. It may screen out information that we need to be aware of. For example, we may forget to make an important phone call.

9. Participants will better understand their perceptual processes and strengthen their abilities to attend to important stimuli while appreciating the ability to overlook myriad stimuli that are not important.

10. Have participants in pairs outline the advantages of reinforcing this learning through the simulation game. What did they learn from the game? What encouraged participation? Was it enjoyable? How could the game be improved?

11. In small groups, share responses and identify a similar game simulation for a content area. Have groups report out their ideas.

(Source: Julius E. Eitington, *The Winning Trainer*. Houston, Texas: Gulf Publishing Company, 1984)

Activity 20

Imagining Imagination Questions

Time | 30-40 minutes

Purpose

This exercise will illustrate to teachers the importance of using planning sessions to develop good questions and assist teachers in developing imaginative questions to use.

Materials

Handout

12. Creating Imaginative Question Guide

Procedure

1. This activity consists of groups of teachers brainstorming imaginative questions for typical lesson topics. Teachers will be asked to create questions three different times; first on their own, second using the Creating Imaginative Question Guide, and third working as a small group.

2. Assign teachers to small groups of four to eight people. Have them agree on an instructional topic. Each person in the small group should work on the same topic.

3. First review the descriptions of imaginative questions, including the two types of hypothetical and creative questions.

4. Give participants five minutes to work on their own writing down as many imaginative questions as they can think of for their topic.

5. Distribute copies of the Creating Imaginative Question Guide. Now have teachers see if they can create additional questions using the guide.

6. Have the teachers meet in small groups. Using the guide and previously brainstormed questions, agree on three or four good questions that might be used in an instructional setting.

Activity 20, continued
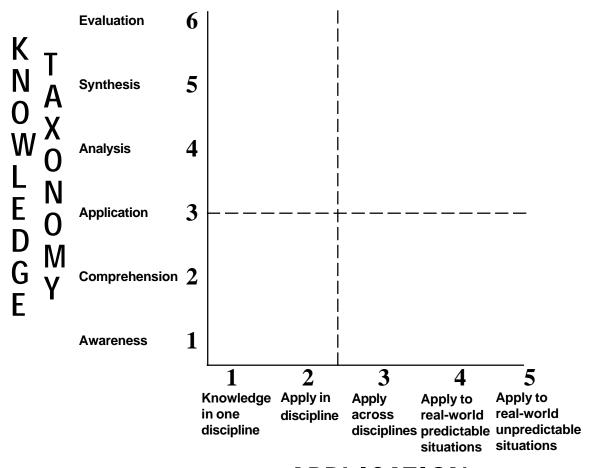
Imagining Imagination Questions

Procedure

7. If time allows, have the groups select a new instructional topic. This time start the brainstorming in the group and refer to the Creating Imaginative Question Guide and generate as many questions as possible. Finally, select four or five good questions.

8. Have teachers reflect and discuss as a large group on this process of creating imaginative questions.

C.

Handouts

1. Rigor/Relevance Framework
2. Determining Levels of Rigor and Relevance - Worksheet/Answer Sheet
3. Knowledge Taxonomy Verb List
4. Application Model Decision Tree
5. Performance Planning Worksheet
6. Performance Planning Questions
7. Strategies that Work Worksheet
8. Lecture Planning Worksheet
9. Types of Graphic Organizers
10. Graphic Organizer Information Activities
11. Problem-based Case Study
12. Creating Imaginative Question Guide

Rigor/Relevance Framework

K N O W L E D G E　**T A X O N O M Y**

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

1　**2**　**3**　**4**　**5**

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

APPLICATION MODEL

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.		

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

Knowledge Taxonomy Verb List

1
Knowledge

arrange	match
check	name
choose	point to
find	recall
group	recite
identify	repeat
label	say
list	select
locate	write

2
Comprehension

advance	interpret
calculate	outline
change	project
convert	propose
contemplate	reword
define	submit
explain	transform
extrapolate	translate
infer	vary

3
Application

adopt	manipulate
consume	mobilize
capitalize on	operate
devote	put to use
employ	relate
exercise	solve
handle	start
maintain	take up
make use of	utilize

4
Analysis

assay	include
audit	inspect
breakdown	look at
canvass	scrutinize
check out	sift
dissect	survey
deduce	study
divide	test for
examine	uncover

5
Synthesis

blend	develop
build	evolve
cause	form
combine	generate
compile	make up
compose	originate
conceive	produce
construct	reorder
create	structure

6
Evaluation
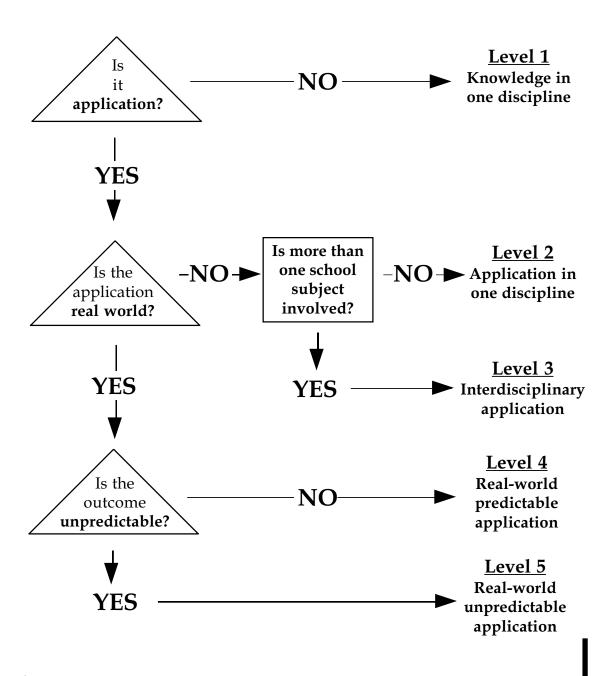
accept	grade
appraise	judge
arbitrate	prioritize
assess	rank
award	rate
classify	reject
criticize	rule on
decide	settle
determine	weigh

Application Model Decision Tree

Directions: Select a task, application, or activity and then answer the following questions. See next page for clarification of the questions.
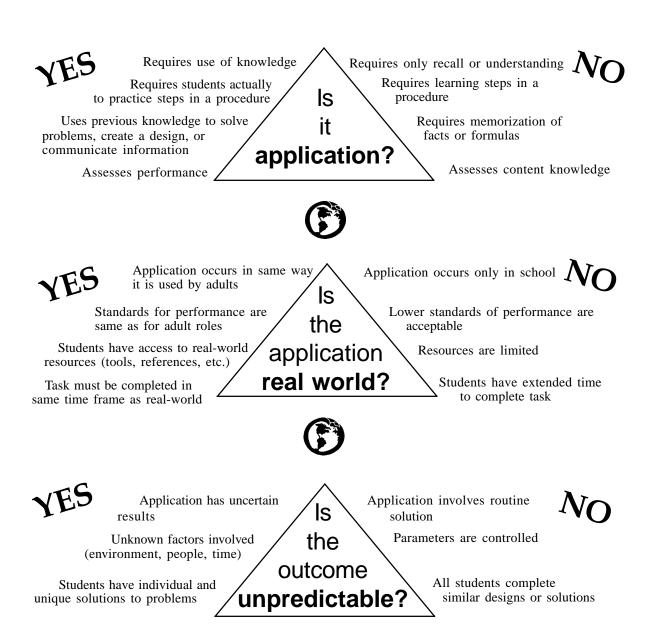
Is it **application?** — NO ⟶ **Level 1** Knowledge in one discipline

YES ↓

Is the application **real world?** —NO→ **Is more than one school subject involved?** —NO→ **Level 2** Application in one discipline

YES ↓   YES ⟶ **Level 3** Interdisciplinary application

Is the outcome **unpredictable?** — NO ⟶ **Level 4** Real-world predictable application

YES ⟶ **Level 5** Real-world unpredictable application

Application Model Decision Tree

Directions: Use the following statements to clarify where a task, application, or activity belongs on the Application Model.

YES

Requires use of knowledge

Requires students actually to practice steps in a procedure

Uses previous knowledge to solve problems, create a design, or communicate information

Assesses performance

Is it application?

Requires only recall or understanding

Requires learning steps in a procedure

Requires memorization of facts or formulas

Assesses content knowledge

NO

YES

Application occurs in same way it is used by adults

Standards for performance are same as for adult roles

Students have access to real-world resources (tools, references, etc.)

Task must be completed in same time frame as real-world

Is the application real world?

Application occurs only in school

Lower standards of performance are acceptable

Resources are limited

Students have extended time to complete task

NO

YES

Application has uncertain results

Unknown factors involved (environment, people, time)

Students have individual and unique solutions to problems

Is the outcome unpredictable?

Application involves routine solution

Parameters are controlled

All students complete similar designs or solutions

NO

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

Performance Planning

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

4. What content will students need?

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?
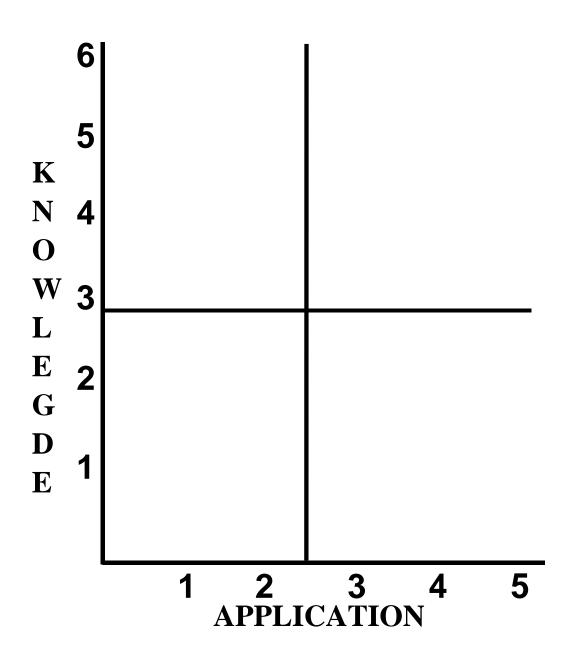
Performance Planning Questions

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 ?**

Strategies that Work

Some teaching strategies work best on each type of objective. List two or three instructional strategies which you think would be effective in each of the four quadrants of the Rigor/Relevance Framework.

6

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    1   2   3   4   5
        APPLICATION
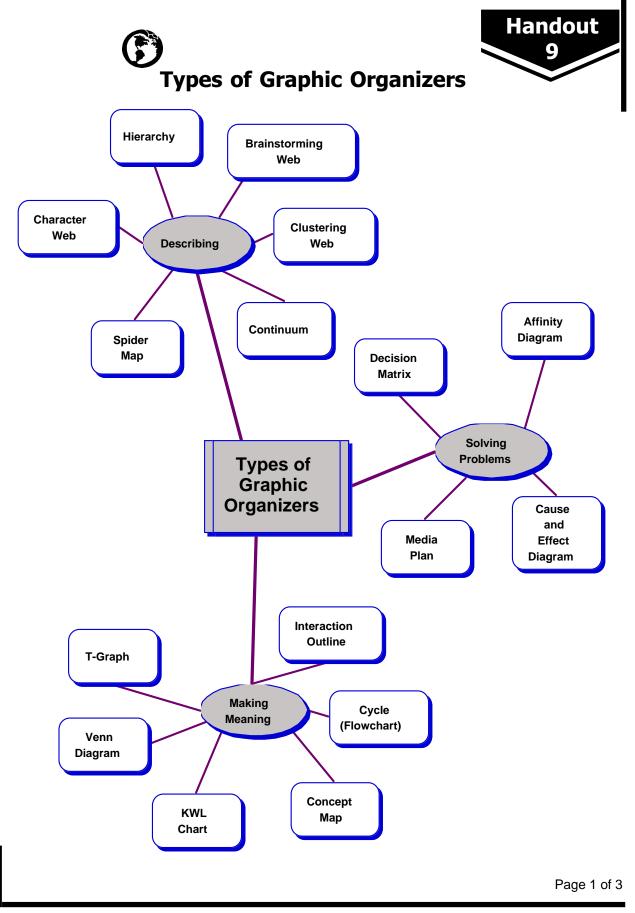
Lecture Planning

1. What is the title of your lecture? Decide what message you wish to deliver.

2. What are your overall objectives?

   To inform _____   To persuade _____   To entertain _____

3. What are the characteristics of the student audience?

4. After your lecture, the main thing the audience will know is:

5. After your lecture, the audience will feel the emotion(s) of:

6. After your lecture, the audience will take the following action(s):

Lecture Planning

7. **What pre-activity will introduce the lecture and stimulate interest?**

8. **What are the main topics to cover?**

9. **In what order should you deliver the content?**

10. **What visuals will support the lecture?**

Types of Graphic Organizers

Hierarchy

Brainstorming Web

Character Web

Describing

Clustering Web

Spider Map

Continuum

Types of Graphic Organizers

Decision Matrix

Affinity Diagram

Solving Problems

Media Plan

Cause and Effect Diagram

Interaction Outline

T-Graph

Making Meaning

Cycle (Flowchart)

Venn Diagram

KWL Chart

Concept Map

Types of Graphic Organizers

Describing

Brainstorming Web—A brainstorming web starts with a core concept, or main idea, at its center. Information related to the main idea is identified in a free flowing manner and radiates outward from most general to most specific, with links between related ideas.

Clustering Web—Clustering generates ideas, images, and feelings around a stimulus word. One idea builds on another, enabling students to enlarge and categorize their ideas for writing and to see patterns in their thoughts. Clustering differs from the brainstorming web in that ideas are grouped in logical categories or clusters.

Character Web—A character web represents a character in a work of literature. It depicts the character's traits and can include quotations that illustrate those traits.

Hierarchy—A hierarchy shows connections between people or objects in a logical hierarchical manner. These might represent groupings such as animal species or show a traditional organization chart. Another type of hierarchy is a family tree, which shows how family members are related.

Continuum—This is a simple tool to demonstrate a sequence of events. This graphic organizer is used to show time lines of historical events, degrees of something, shades of meaning (Likert scales), or rating scales. The main organizers are what is being scaled and the extremes, or end points. This might be used for a listing of major wars or events that occurred in a story.

Spider Map—This is used to describe a central idea, process, thing, concept, or proposition. This mapping is useful for brainstorming ideas and to organize thoughts for a writing project. The main ideas are illustrated as well as their attributes or functions.

Solving Problems

Affinity Diagram—This graphic sorts many ideas into logical groupings. Solving problems or making decisions frequently starts with generating a long list of brainstormed ideas. The affinity diagram leads to more thoughtful analysis by sorting and labeling these ideas .

Cause and Effect (Fishbone Map)—This graphic organizer, sometimes called a fishbone map, is often used for problem solving. It is helpful in analyzing changes, conflicts, and cause-and-effect situations. Using the diagram, the factors that cause the problem or event and their interrelationship are identified and recorded. The varied causes are analyzed, ordered, and prioritized as to the most rational conclusions.

Handout 9

Types of Graphic Organizers

Media Plan—This is a graphic, sequential depiction of a narrative. Students recall major events of the story, then illustrate the events in the squares provided.

Decision Matrix—This graphic requires students to identify a problem and evaluate possible solutions. After identifying solutions, several criteria are identified to rate the alternative solutions. These are organized in a matrix. Each alternative solution is evaluated against each criteria. This systematic evaluation and graphic presentation of alternative solutions can lead to easier decision making.

Making Meaning

Concept Map—This is used to show connections among complex ideas (democracy) or branching procedures (the circulatory system). Key questions illustrated are: What is the superordinate category? What are the subordinate categories? How are they related? How many levels are there?

Cycle—The cycle shows how a series of events interact to produce a set of results that repeat. Some examples of this would be weather patterns, the life cycle, cycles of achievement and failures. The cycle depicts the responses to the main events in the cycle.

KWL Chart—KWL stands for Know, Want to know, and Learned. This chart helps students activate prior knowledge and reflect on learning. Students determine: What they know; what they want to know; and what they learned.

Interaction Outline—An interaction outline is used to show the nature of an interaction between persons or groups, such as the interaction between European settlers and American Indians. The graphic depicts a response to the persons or group: What were their goals? Did they conflict or cooperate? What was the outcome for each person or group?

T-Graph—This is used to show similarities and differences between two things (people, places, events, ideas, etc.) The graphic shows what is being compared and how they are similar and different.

Venn Diagram—This is made up of two or more overlapping circles. It is often used in mathematics to show relationships between sets. In English language arts instruction, Venn diagrams are useful for analyzing similarities and differences in characters, stories, poems, etc. This organizer is an effective pre-writing activity. It helps students to organize thoughts, quotations, and similarities and differences visually, prior to writing a compare/contrast essay.

Graphic Organizer
Information Activities

Use the following activities to practice developing different types of graphic organization of information. Refer to the Types of Graphic Organizers chart to select the appropriate type of organizer.

- Identify, sequence, and show the relationship among the steps in creating a new law.

- Using a book you have recently read or a movie you have seen, show the principal characters and their relationships.

- Brainstorm characteristics of schools. Answer the question, "School is......" with as many charateristics as you can think of.

- Compare and contrast the cultures of the United States and Japan in as many ways as applicable.

- Describe the administrative organization of your school district without leaving anyone out.

- Show a recipe in graphic form.

- Describe the cultural backgrounds of your students.

- Develop a slide presentation for other teachers on graphic organizers.

- Identify the causes of student absences from school.

- Describe the school curriculum.

- Identify all of the activities at school that involve parents.

- Develop a pattern of looping of elementary teachers to stay with a group of students for multiple years.

- Develop a personal plan for learning more about graphic organizers.

- Represent graphically the source of drinking water in your area.

Problem-based Learning Case Study

Rick Tries Problem-based Learning

Getting Started With Problem-based Learning

Rick Martin had spent his entire teaching career of almost two decades in the science department of a large high school. Of all the courses he taught, the Living Environment elective was his favorite. The course demanded hard work and emphasized thinking. Rick's lectures focused on advanced concepts in biology and the connections between biology and environmental issues. Students consistently rated the course high. They liked Rick's casual style, his enthusiasm for the subject, and his obvious interest in each student.

Despite the uniform praise he received from students and teachers, Rick always sensed he could do better. Too many of his former students, even the brightest, had graduated with a superficial understanding or outright misunderstanding of many of the concepts that he had covered thoroughly in his course. To him, these graduates seemed to lack the enthusiasm for continued learning that would carry them to successful careers. He believed that a truly excellent teacher could change this situation. Furthermore, he was beginning to worry about whether his excellent teaching ratings reflected the student's appreciation of him rather than what he was teaching. Perhaps in frustration and partly out of curiosity, Rick decided to take a radically different approach to teaching. What harm could it do?

Rick had read about problem-based learning (PBL) as it was used in medical schools and throughout the pedagogical principles of that approach could apply anywhere, including biology. After discussing PBL with a few colleagues who had tried the approach in other disciplines, he took the plunge and revamped the Living Environment course completely. No longer did he lecture. Rather, he used class time to move among groups of four or five students who were discussing biology problems and experiments that he had carefully selected and assigned.

That happened a year ago. There were still bugs to work out. He knew that some things hadn't gone as planned and that there had been a lot of confusion initially until he and the students recognized what they needed to do. He had anticipated there would be some difficulties because students were not used to taking as much responsibility for their own learning and many students (and some of his colleagues) felt that, "If you don't lecture, you're not teaching."

Handout 11

Initially he was worried that the new format would force the elimination of topics he had always included in the lecture format. True, there were environmental topics that he did not cover in the PBL structured course. However, several students embarked on detailed problems and solutions that included much greater depth of understanding of biology than he covered previously. On a couple of problems, Rick even learned some new material.

Now that he had a year of experience, he was all charged up to do it again, only better. His revised syllabus was ready and the schedule was set. He could hardly wait to get the course rosters so he could assign students to groups and get started.

How did Rick's course change as a result of using problem-based learning? What didn't change?

Some of Rick's colleagues respond that PBL may be okay for an elective, but the courses they teach have required content. Spending time on group problems will reduce the time necessary to cover required content. How should Rick respond to those concerns?

Constructing Groups

A total of 27 students had registered for Rick Martin's Living Environment elective. He noted that three of them had not taken the Introduction to Biology prerequisite. This, he mused, was a common problem. Every year, it seemed, there were a few students who did not read the course description and registered for his course mistakenly thinking it would be easy and look good on college applications. If they showed up at all, they would undoubtedly drop after the first class when they found out the course required knowledge of basic biology. For the remaining students, Rick had available grades in science courses and gender. He proceeded to assign students to different groups with the objective of maximizing heterogeneity without making any group academically unbalanced. He was particularly pleased to see so many honors students registered. There were enough to have at least one, and sometimes two, in each group. After three hours of shifting and balancing, he felt he had made five well balanced, heterogeneous groups. No identifiable type of student was concentrated in any particular group.

Later Rick began to wonder whether it was worth the effort. Was he fooling himself to think that he could take a few pieces of information about each student and be able to create groups that would function well for the whole semester? Maybe he should just assign students randomly or let students choose their own groups.

What are the advantages and disadvantages of forming groups the way Rick did?

Are there types of information you would not have used or other information you would want to use in constructing groups?

The First Class

Rick knew that the first day of class was the most important of the whole semester, because it set the tone. Consequently, he did not want to repeat last year's mistake of lecturing about the course for the whole period. That sent entirely the wrong message. Yet he still wanted to communicate what the course was about and how it was likely to be different from any other course they had encountered. He had thought this all through and was ready.

On the board he listed the students in each group. He arranged the tables and chairs in this new room specifically for PBL teaching. (It had been a mess last year in a traditional classroom where the students didn't have room to spread out their things.) The first student arrived, Rick greeted her, handed her a syllabus, asked her name, and pointed to the table where her group would be. As more students came, he repeated the personal greeting. He also suggested that the students in each group get to know each other, because they would be together for the rest of the semester and later that period each would have to stand up and introduce a fellow group member.

At the starting time five students were still missing. (They never showed up.) Unfortunately three were from one of the groups. All of the students who had not taken biology showed up. It turned out they were taking Introduction to Biology concurrently this semester. In order to have functioning groups, he tentatively assigned all three to the group with the missing members. Under his breath, he recited Robert Burns' line about the best laid plans of mice and men. Nevertheless he forged ahead with his plan and had each student stand up and introduce the next person. This proved to be a traumatic experience for several students. Lisa, for example, was very shy. Her whisper hardly could be heard above the whir of the ventilator fan in the room. Anna had been in this country only a few months and clearly was uncomfortable speaking publicly. Jason, on the other hand, enjoyed the limelight and introduced the next student with some ill-considered "joke" about his new friend. After what seemed like a very long 15 minutes, Rick explained the assignment for the rest of the period.

Rick had each group read the syllabus with the objective of making a list of at least five items – either suggestions for improving the syllabus or questions about the course that were not answered to their satisfaction in the syllabus. After a few minutes of silence, the chatter of each group began and continued until the end of the period. Rick moved from group to group listening to the discussion and answering questions, usually with other questions that pointed the discussion in the right direction. While he had no trouble fielding the questions from each group as he visited it, his attention was distracted once when he heard some hostile remarks from another group nearby.

"This is, like, unreal. Really, I mean, if this guy expects me to be here every morning ready to participate in some geek discussion, he's gotta be crazy. My brother had this kind of class last year and said the teacher didn't do anything. Like, he just used the group discussions to get out of teaching." (Another male student) "Yeah, and if I didn't need this course, I'd drop it now. I don't know about the rest of you guys, but I'll be happy to get a 'C.' Don't plan on me to bust my butt studying every weekend." June, another student, responded, "But that's unfair, if my grade depends partly on you.   Maybe you ought to drop!" Several students said they would rather choose their own groups.

At the end of class, Rick collected the lists from each group and walked to the department office where he planned to read the lists and reflect on the first class.

Was a critique of the syllabus a good group activity for the first day of class? Should Rick have done anything differently in setting up the first class?

Were the comments he overheard legitimate student concerns? How should he deal with them?

Preparing for the Second Class

The group responses to the syllabus revealed a general concern. Students wanted to know why so much of their grade (20%) was for "APPA" Attendance, Preparation, Participation, and Attitude. Why, they asked, should they be graded on such things that, with the exception of attendance, were subjective and seemed irrelevant to course content? Why wasn't there a textbook? How many absences would be allowed before it affected one's grade? Was it really necessary to spend a whole class period on how to use the library because everything was easily accessible by computer? One group felt it was unfair to have part of one's grade be dependent on the performance of other people in the group, particularly if some people were satisfied with a "C" and others were willing to work for "A's." Wouldn't the students learn more if he would simply lecture about each problem and tell them what was important? What would the tests be like?

How should Rick respond to these issues at the next class?

Problems with the Groups

Five weeks had passed. The class was working on a third problem. By now Rick knew each student and group well. Each group had developed a character of its own. In general, Rick thought the class was going well. Compared to the previous year, he was more directive, and he thought it made things better. There was less confusion about the roles of the student and the instructor. After completing each problem, he led a discussion with the whole class that dealt with the problem's significance. The students participated and made comments that showed a real depth of understanding. His major concerns at this point had nothing to do with content. Two of his five groups showed signs of tension. He

had received requests from several students who wanted to talk with him privately.

Jeff, a good student, continued to miss class about once a week. In the same group, Joan had missed four classes due to a broken leg. The remaining students resented Jeff because he disrupted the activities of the group. When he wasn't there, he couldn't contribute and couldn't be assigned learning issues to look up. When he was there, other group members thought they wasted valuable time explaining what they had gone over the class before. This was especially annoying because Jeff was probably the brightest person in the group and easily could have helped the group considerably. One student asked if it were possible to kick someone out of the group or exclude someone from the group part of the exam. Rick had to think about that.

The other problem group included Jason, Anna, and Jamal. Anna was used to working hard and prepared thoroughly for each class. In most courses she quickly determined what the teacher wanted, anticipated test questions, and was used to getting good grades. She claimed that "group assignments" were mostly her work, and she complained that some of the students came to class without having read the assigned problem. Those students expected the other students to tell them what was important. Jason jumped to conclusions, generated incorrect explanations that seemed plausible, dominated discussions, and didn't listen very well to alternate points of view. Jamal talked a lot but treated things rather superficially.

Characterize the situations in the two problem groups.

What could Rick have done to avoid these problems?

What should Rick do now?

 Planning the Examination

Several students wanted to know, what would be on the exam. Rick suggested that they look at last year's exam on the course Website. He said that their examination would be totally different from any examination they had ever had and that it would stress thinking, conceptualization, communication, and group processes.

One week before the examination, he gave the students a new problem. Most of the exam would relate to this problem. The groups could use any of the resources at their disposal to prepare for the examination. Resources could include other teachers, students in other groups, books in the library, and the Internet. Their goal was to use the skills they had learned to understand the problem thoroughly in the week they had before the examination.

Such an examination could not be completed in a single one hour class period as Rick had

painfully discovered last year. In order to allow for "unlimited" time for second part, he scheduled the examination over three days. The first part of the examination (50%) would have four questions to be done individually and handed in. The second part would take the last of the four questions, which was also the most difficult question from the first part, and open it up to group analysis and discussion. The question for the group part was especially important. It had to be sufficiently difficult so that few, if any, students would be certain of the answer after they had worked on it individually in part one. On the other hand, it couldn't be too difficult or the synergistic benefits of group work would not be apparent.

Throughout the course, Rick had stressed again and again to the students the importance of being able to define as precisely as possible what they didn't know but needed to know to understand a problem. These were the learning issues that they had to pursue in their efforts to completely solve the problem. It was Rick's firm belief that no matter how well someone understood a problem, there would be still more learning issues to pursue. This was true for him because every time he reread these case problems he saw something new he hadn't appreciated before. To address this aspect of the course, the first question on the individual part of the examination asked every student to make a list of their remaining learning issues, ranked in order of importance, and justified with respect to their importance. Rick got a perverse pleasure out of asking this question for 20% of the examination grade because it permitted students to get credit for identifying what they didn't know. As he said to the students, "Knowing what you don't know, in a sense, means you know everything." Such knowledge was power because it focused one's learning where it had the most impact.

For many years, Rick had rejected multiple-choice and short-answer examinations because he felt they didn't reveal how much the students really understood. But grading essay examinations was painful and time consuming. He concluded that there was no way to evaluate answers objectively. Some students seemed to understand but they couldn't communicate their understanding. Some students took paragraphs to explain what others could say in a sentence. How should he deal with peripheral misinformation or beautifully written wrong answers? How could he explain to a student why the "quality" of his answer was poor?

Rick read and reread each answer, compared student answers, and finally assigned numerical grades to each answer. A real dilemma arose when Rick graded the group part of the examination. Jason's group had completely blown the second part of the examination. They got only 20 out of 50 points. Everybody's answer read the same and their group answer was almost the same as Jason's answer to that question on the individual part of the examination. Was it fair to add the grades from both parts of the examination? After all there was an element of chance here and why should everyone in a group be penalized? Most of all Rick was concerned about Anna. She had done rather well on the individual

part of the examination but, when the group part was added to her grade, she was in the bottom 25% of the class. He knew this would upset her totally. Furthermore it didn't reflect what she had learned in the course or the contributions she had made to the group.

Jeff's group revealed another pattern. After discussing the group problem, they couldn't come to agreement and so they decided to hand in individual answers. Although there were similarities, each student's answer on the group part was distinct. Jeff in fact had done very well – the best in the group. Apparently he couldn't communicate or couldn't convince his group of the correctness of his answers. Considering Jeff's frequent absences, it didn't seem fair that he got one of the highest scores in the class.

What issues did Rick's examination address that aren't normally addressed in a examination?

What changes in testing and grading are necessary to reduce these issues and complement a PBL approach to learning?

Grading Students and the Teacher

The students performed very well in the course and their grades reflected that. Seventy-two percent of his class got A's or B's. That compared with only 45% in the previous year. Rick struggled with this apparent grade inflation and so did his principal. Had he lowered his standards? Did he need to raise his standards? Would it be fair to students who had taken the course previously but had suffered because he had not handled group process issues very well? Would his colleagues think he was getting soft and had confused content issues with process issues?
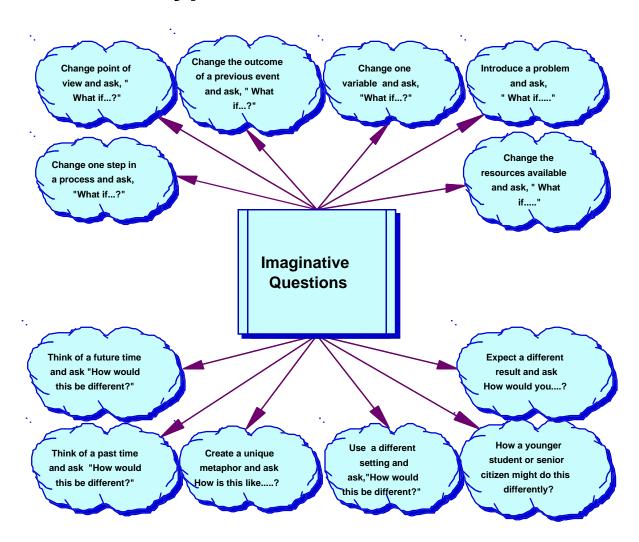
Rick again collected student evaluations of the course and compared the student responses this year to those of the last year, when he first used problem-based learning, and to earlier years when the course had a predominantly lecture format. While the evaluations improved over the previous year and were generally good, they were not as good as when he had lectured. This troubled him because it seemed that the course in its current format was superior to the earlier format. If this were a general phenomena on reflecting some reluctance by students to take responsibility for their learning, would other teachers really want to jeopardize their ratings in a change to a problem-based approach?

Two weeks after the end of the semester, the principal, who had noticed the increase in the student's grades, called Rick into his office. He wanted Rick to explain why the grades this year were out of line with the grades he had given in previous years. In addition, he showed Rick an anonymous letter written by a student who complained that Mr. Martin expected students to learn on their own and to spend too much time in the library tracking down obscure facts. The student also said that the grades were totally subjective and
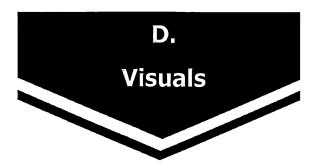
Creating Imaginative Question Guide

Hypothetical Questions

Change point of view and ask, " What if...?"

Change the outcome of a previous event and ask, " What if...?"

Change one variable and ask, "What if...?"

Introduce a problem and ask, " What if....."

Change one step in a process and ask, "What if...?"

Change the resources available and ask, " What if....."

Imaginative Questions

Think of a future time and ask "How would this be different?"

Expect a different result and ask How would you....?

Think of a past time and ask "How would this be different?"

Create a unique metaphor and ask How is this like.....?

Use a different setting and ask,"How would this be different?"

How a younger student or senior citizen might do this differently?

Creative Questions

D.

Visuals

Visuals to support workshop presentations are included on CD-ROM in the form of PowerPoint 95 slides. The CD contains 20 files corresponding to each of the workshops. Also included is a file of black and white copies of each visual, grouped by workshop.

Rigor/Relevance Framework

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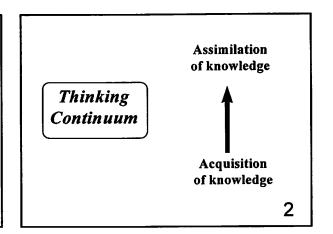
**International Center for
Leadership in Education, Inc.**

Instructional
Strategies:
How to Teach for Rigor
and Relevance
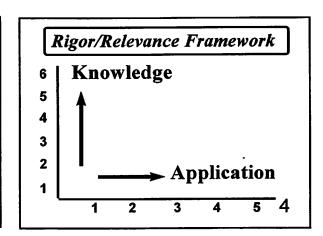
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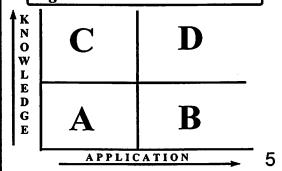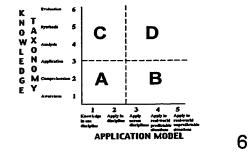
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*Thinking
Continuum*

Assimilation
of knowledge

↑

Acquisition
of knowledge

2

Action Continuum

Acquisition
of knowledge ⟶ Application
of knowledge

3

Rigor/Relevance Framework

Knowledge

6
5
4
3
2
1

↑

⟶ **Application**

1   2   3   4   5   4

Rigor/Relevance Framework

K
N
O
W
L
E
D
G
E

C	D
A	B

APPLICATION ⟶

5

Rigor/Relevance Framework

K
N
O
W
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E
D
G
E

T
A
X
O
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M
Y

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

C	D
A	B

1 2 3 4 5
APPLICATION MODEL

6

Rigor/Relevance Framework

Rigor/Relevance Framework

K N O W L E D G E	Assimilation **C**	Adaptation **D**
	Acquisition **A**	Application **B**

APPLICATION →

7

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

8

Knowledge Taxonomy

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

9

Rigor/Relevance Framework

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

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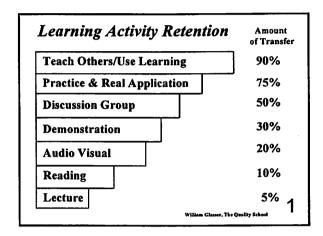
1. Awareness
2. Comprehension
3. Application
4. Analysis
5. Synthesis
6. Evaluation

10

Instructional Planning

Learning Activity Retention — Amount of Transfer

Learning Activity	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

1

Traditional Planning

Curriculum → Instruction → Assessment

2

Factors in Planning

Good Assessment Practices
Effective Instruction
Content Knowledge
Curriculum Standards
Student Knowledge
Community Expectations
Self Knowledge

→ Planning Steps

3

Performance Planning Model

Curriculum Planning Steps → Assessment / Instruction → Feedback/Evaluation

4

Rigorous and Relevant Instruction

Planning Steps

✓ Definition of instructional unit
✓ Levels of expected student knowledge and performance
✓ Student work
✓ Content knowledge
✓ Essential questions / concepts
✓ Assessment and instruction

5

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? **6**

Visuals 3

Selecting Instructional Strategies

File: STRAT03.PPT

Strategies

- Brainstorming
- Cooperative Learning
- Demonstration
- Guided Practice
- Inquiry
- Instructional Technology
- Lecture
- Note-taking/Graphic Organizers
- Memorization
- Presentations/Exhibitions
- Research
- Problem-based learning
- Project Design
- Simulation/Role-playing
- Socratic Seminar
- Teacher Questions
- Work-based Learning

1

Selection of Strategies Based on Rigor/ Relevance Framework

Strategy	Acquisition Quadrant A	Assimilation Quadrant C	Application Quadrant B	Adaptation Quadrant D
Understanding	★★	★★★	★	★★★
Cooperative Learning	★★	★★	★★★	★★★
Demonstration	★	★	★★★	★★
Guided Practice	★★★	★★	★★	★
Inquiry	★	★★★	★★	★★★
Instructional Technology	★★	★★★	★★★	★★★
Lecture	★★★	★★	★	★
Memorization	★★★	★★	★★	★
Note-taking/Graphic Organizers	★★	★★	★★	★★
Presentations/Exhibitions	★	★★	★★	★★★
Problem-based Learning	★★	★★	★★★	★★★
Project Design	★	★	★★★	★★★
Research	★★	★★★	★	★★★
Simulation/Role-playing	★★	★★	★★★	★★★
Socratic Seminar	★	★★★	★	★★★
Teacher Questions	★★	★★★	★	★★★
Work-based Learning	★★	★★	★★★	★★★

2

Selecting Strategies on Rigor/Relevance

Best Strategies for Quadrant A - Acquisition

- Guided Practice
- Lecture
- Memorization

3

Selecting Strategies on Rigor/Relevance

Best Strategies for Quadrant B - Application

- Cooperative Learning
- Demonstration
- Instructional Technology
- Problem-based Learning
- Project Design
- Simulation/Role Playing
- Work-based Learning

4

Selecting Strategies on Rigor/Relevance

Best Strategies for Quadrant C - Assimilation

- Brainstorming
- Inquiry
- Instructional Technology
- Research
- Socratic Seminar
- Teacher Questions

5

Selecting Strategies on Rigor/Relevance

Best Strategies for Quadrant D - Adaptation

- Brainstorming
- Cooperative Learning
- Inquiry
- Instructional Technology
- Presentations/ Exhibitions
- Problem-based Learning
- Project Design
- Research
- Simulation/Role-playing
- Socratic Seminar
- Teacher Questions
- Work-based Learning

6

Selecting Instructional Strategies

Matching Strategies to Learning Style

Strategy	Concrete-Sequential	Abstract-Sequential	Concrete-Random	Abstract-Random
Brainstorming	★	★★	★★	★★★
Cooperative Learning	★	★★★	★★	★★
Demonstration	★★★	★★	★★	★
Guided Practice	★★★	★★	★★	★
Inquiry	★	★★	★★	★★★
Instructional Technology	★★	★★	★★★	★★
Lecture	★★★	★★	★	★
Memorization	★★★	★	★★	★
Note-taking/Graphic Organizers	★★	★★	★★	★★
Presentations/Exhibitions	★★	★★	★★	★★★
Problem-based Learning	★	★★★	★★★	★★
Project Design	★★	★	★★★	★
Research	★★	★★★	★★	★
Simulations/Role-playing	★	★	★★	★★★
Socratic Seminar	★	★★★	★	★★
Teacher Questions	★★★	★★	★★	★
Work-based Learning	★★	★	★★★	★★

7

Matching Strategies to Learning Styles

Best Strategies for Concrete-Sequential Learners

- Demonstration
- Guided Practice
- Lecture
- Memorization
- Teacher Questions

8

Matching Strategies to Learning Styles

Best Strategies for Abstract-Sequential Learners

- Cooperative Learning
- Problem-based Learning
- Research
- Socratic Seminar

9

Matching Strategies to Learning Styles

Best Strategies for Concrete-Random Learners

- Instructional Technology
- Problem-based Learning
- Project Design
- Work-based Learning

10

Matching Strategies to Learning Styles

Best Strategies for Abstract-Random Learners

- Brainstorming
- Inquiry
- Presentations/Exhibitions
- Simulations/Role-playing

11

Matching Strategies to Forms of Student Assessment

Strategy	Multiple Choice	Constructed Response	Extended Response	Process Performance	Product Performance	Portfolio	Interview	Self Reflection
Brainstorming	★	★	★	★★★	★★	★★	★★	★★★
Cooperative Learning	★	★	★★	★★★	★★★	★★	★★	★★
Demonstration	★★	★★★	★★	★★★	★★	★★	★	★
Guided Practice	★★★	★★★	★★	★★★	★★	★★	★	★
Inquiry	★	★	★★	★★	★★★	★★	★★★	★★★
Instructional Technology	★★	★	★	★★	★★★	★★★	★★	★★
Lecture	★★★	★★★	★★★	★	★	★★	★	
Demonstration	★★★	★★★	★★	★★★	★★	★	★	★
Note-taking and Graphic Organizers	★	★★	★★★	★	★★	★★	★★	★★★
Presentations/Exhibitions	★	★	★★	★★★	★★★	★★★	★★	★★★
Problem-based Learning	★	★★	★★★	★★★	★★★	★★	★★	★★
Project Design	★	★★	★★★	★★★	★★★	★★★	★★	★★
Research	★	★	★★	★★★	★★★	★★★	★★	★★
Simulations/Role-playing	★	★	★★	★★★	★	★	★★	★★★
Socratic Seminar	★	★	★★★	★★	★	★	★★★	★★★
Teacher Questions	★★	★★★	★★	★	★	★	★★	★★
Work-based Learning	★	★	★★	★★★	★★★	★★★	★★★	★★

12

Visuals
4

Brainstorming

File: STRAT04.PPT

Brainstorming

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Brainstorming

When to Use Strategy Based on Rigor/Relevance Framework

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APPLICATION

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Brainstorming

Rules:

- **Disallow Critical Remarks**
- **Permit "Hitchhiking"**
- **Welcome "Free-wheeling"**
- **Encourage Quantity of Ideas**
- **Be Patient with Silence**
- **Stick to Time Limit**
- **Hold off Evaluation**

3

Brainstorming

Steps:

- **Preparation**
- **Fact-finding**
- **Warm-up**
- **Idea Finding**
- **Solution Finding**
- **Implementation**

4

Brainstorming

Variations:
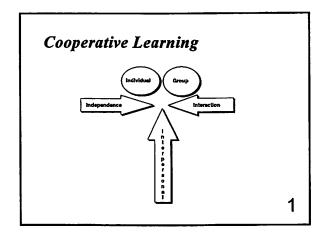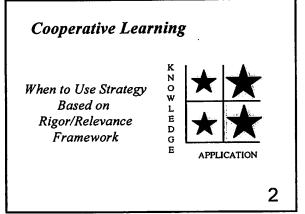
- **Reverse Approach**
- **SIL Method**
- **Pause That Refreshes**

5

**Visuals
5**

Cooperative Learning   File: STRAT05.PPT

Cooperative Learning

Individual | Group

Independence → ← Interaction

Interpersonal

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Cooperative Learning

*When to Use Strategy
Based on
Rigor/Relevance
Framework*

KNOWLEDGE

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APPLICATION

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Cooperative Learning

Basic Elements:

- Positive Interdependence
- Face-to-Face Interaction
- Individual Accountability
- Interpersonal and Small
  Group Skills
- Group Processing

3

Cooperative Learning

Cooperative Learning Groups vs.	*Traditional Groups* 1 of 2
• Positive Interdependence	• No Interdependence
• Individual Accountability	• No Individual Accountability
• Heterogeneous	• Homogeneous
• Shared Leadership	• One Leader
• Shared Responsibility for Each Other	• Responsible Only for Self

4

Cooperative Learning

Cooperative Learning Groups vs.	*Traditional Groups* 2 of 2
• Emphasis on Maintenance and Task	• Emphasis on Task Only
• Social Skills Taught	• Social Skills Ignored
• Teacher Observes and Intervenes	• Teacher Ignores Group Functioning
• Group Processing	• No Group Processing

5

Cooperative Learning

Methods:

- Student-Teams-Achievement Divisions
  (STAD)
- Teams-Games Tournament (TGT)
- Jigsaw
- Jigsaw II
- Learning Together
- Group Investigation
- Think-Pair-Share

6

Visuals
5

Cooperative Learning

Cooperative Learning

Methods continued:

- **Numbered Heads Together**
- **Roundtable**
- **Round Robin**
- **Three-step Interview**
- **Lineup**

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Demonstration

Demonstration

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When to Use Strategy Based on Rigor/Relevance Framework

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Demonstration

Characteristics
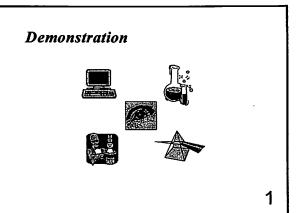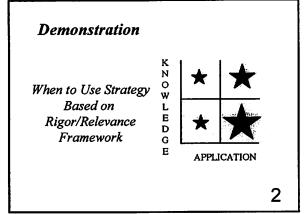
- Capture student interest
- Draw on experience of students
- Create student desire to replicate
- Make students think
- Provide transition from observing to doing
- Set good example to follow
- Be followed by student application

3

Demonstration

Steps in Preparing a Demonstration

- Analyze skill or process
- Divide into steps
- Identify difficult or dangerous parts
- Prepare notes
- Assemble materials
- Set up demonstration
- Prepare handouts and visuals

4

Demonstration

Steps in Giving a Demonstration
- Explain purpose
- Check what students know
- Point out new features
- Review key steps
- Describe the process
- Demonstrate
- Point out important aspects
- Repeat as necessary
- Introduce essential information
- Prepare students to practice
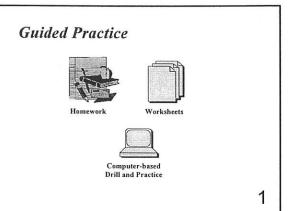
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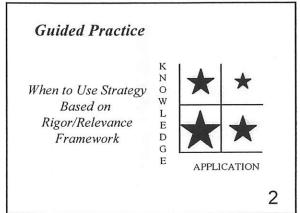
Guided Practice

File: STRAT07.PPT

Guided Practice

Homework   Worksheets

Computer-based
Drill and Practice

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Guided Practice

*When to Use Strategy
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Rigor/Relevance
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APPLICATION

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Guided Practice

Homework Tips

- Lay out expectations early
- Create assignments with purpose
- Make sure students understand
- Make assignments clear
- Create challenging assignments
- Vary assignments
- Give homework that makes learning personal
- Tie assignments to the present
- Match assignments to students

3

Guided Practice

Homework Tips, continued

- Use school/community resources
- Match to your style of teaching
- Assign appropriate amount of homework
- Encourage and teach good study habits
- Provide constructive feedback
- Give praise and motivate
- Give help as needed
- Communicate with parents
- Show respect for students

4

Inquiry

Inquiry

Elements

1 **Intriguing Investigations**
Create initial experiences to trigger student interest and wonder.

2 **Student Discourse**
Promote thoughtful student discussions by preparing students, planning topics and coaching groups.

3 **Thoughtful Reflection**
Encourage reflection through thought, writing and conversation and bring closure to understandings.

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Inquiry

When to Use Strategy Based on Rigor/Relevance Framework

K N O W L E D G E

APPLICATION

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Inquiry

Teacher Behaviors

Create a classroom culture where everyone is expected to learn.

Provide rich, varied resources and experiences for individual students and groups.

Focus on individual student's learning progress and specific performances.

Listen and respond to student questions, accounts and other work.

Use questions to expand and deepen students' thinking.

Use appropriate assessments which support inquiry and student understanding.

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**Visuals
9**

Instructional Technology

File: STRAT09.PPT

Instructional Technology

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Instructional Technology

*When to Use Strategy
Based on
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APPLICATION

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Instructional Technology

Evaluating Software

• **Educational Value**

• **Engagement**

• **Independent Learning**

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Instructional Technology

Selecting Interactive Multimedia Software

• Student Control
• Provides a Safe Place to Fail
• Starts with Problem then Explanation
• Makes the Subject the Focus
• Navigation to Answers
• The Software is the Test
• Learning Should Be Fun

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Instructional Technology
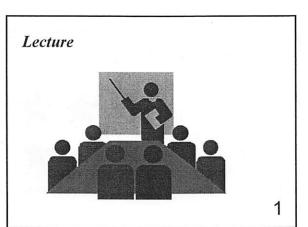
Learning Context

• Multimedia engagement should not
  isolate learner from other students
• Multimedia should link to real-world
  problem solving
• Learning environment should
  'scaffold' to higher level skills
  appropriate for each learner

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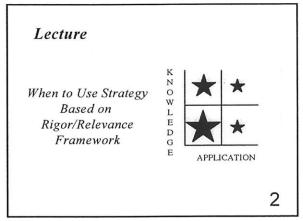
Lecture

File: STRAT10.PPT

Lecture

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Lecture

*When to Use Strategy
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Rigor/Relevance
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APPLICATION

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Lecture

When to Use Lecture:

- You are the primary source of knowledge
- Critical prior knowledge required, e.g., safety rules
- Limited time
- Change of pace needed
- Interesting story to share
- Using an outside expert

3

Lecture

Suggestions in Preparing a Lecture:

- Know your subject
- Use visuals
- Develop related stories
- Relate to previous student knowledge
- Plan an engaging opening

4

Lecture

Pre-lecture Student Activities:

- Reading Assignment
- Case Problem
- Opinion Question
- Personal Response
- Puzzle Exercise
- Questions
- Structured Note-taking

5

Lecture

Suggestions During Lectures:

- State objectives
- Be enthusiastic and animated
- Keep it short
- Move around room
- Make eye contact
- Change the pace, if you are losing student interest

6

**Visuals
10**

Lecture

Lecture

Things to avoid:

- Reading material or notes
- Using a lot of personal references
- Using a lot of statistics

7

Lecture

Use of visuals:

- Prepare visuals in advance
- Keep eye contact with audience
- Make sure visuals can be seen
- Keep them simple
- Build your ideas

8

Lecture

Use of questions:

- Allot time for questions
- Wait for questions
- Encourage questions
- Use cards to have students write down
  questions
- Compliment questioner
- Give rewards
- Listen carefully to questions

9

Memorization

File: STRAT11.PPT

Memorization

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Memorization

When to Use Strategy Based on Rigor/Relevance Framework

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APPLICATION

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Memorization

Examples

- Acronym
- Acrostic
- Rhyming
- Image Links
- Story Method
- Number/Rhyme
- Number/Shape
- Journey
- Roman Room

3

Memorization

Tips

- Don't confuse memory with understanding
- Creative works best
- Encourage students to create their own techniques
- Use positive images
- Closing your eyes aids visualizing images
- Use humor

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Memorization

Tips, continued
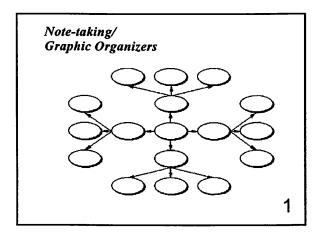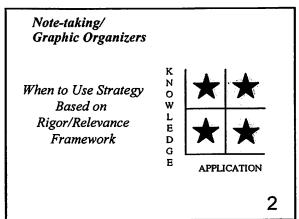
- Symbols work
- Vivid images are easier to remember
- Use all the senses
- Make images 3D with motion
- Make location of images unique
- Have student create individualized images

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Visuals
12

Note-taking/
Graphic Organizers

File:STRAT12.PPT

Note-taking/
Graphic Organizers

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Note-taking/
Graphic Organizers

When to Use Strategy
Based on
Rigor/Relevance
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APPLICATION

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Note-taking

Strategies

- **Preparation**

- **During the Lecture**
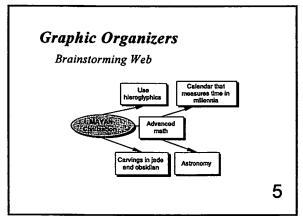
- **After the Lecture**

3

Note-taking

Helping Students Take Better Notes

- **Outline Your Lecture**
- **Use a Framework**
- **Tell Students What to Record**
- **Guide Students on Taking Better Notes**
- **Provide Time for Note-taking**

4

Graphic Organizers

Brainstorming Web

5

Graphic Organizers

Clustering Web

6

Note-taking/
Graphic Organizers

Graphic Organizers

Character Web

7

Graphic Organizers

Hierarchy

8

Graphic Organizers

Continuum

Time Line

1900   1950   2000

9

Graphic Organizers

Spider Map

10

Graphic Organizers

Affinity Diagram

11

Graphic Organizers

Cause and Effect/Fishbone Map

12

Note-taking/
Graphic Organizers

Graphic Organizers

Media Plan

| Opening | Scene 1 | Scene 2 | Scene 3 |
| Scene 4 | Scene 5 | Scene 6 | Ending |

13

Graphic Organizers

Decision Matrix

Main Idea	Criteria A	Criteria B	Criteria C
Idea 1	✓	✓	
Idea 2	✓		✓
Idea 3		✓	
Idea 4	✓	✓	✓

14

Graphic Organizers

Concept Map

15

Graphic Organizers

Cycle

16

Graphic Organizers

Interaction Outline

17

Graphic Organizers

KWL Chart

| Know | Want to Know | Learned |
| What I Know | What I want to know | What I learned |

18

Note-taking/
Graphic Organizers

Graphic Organizers

T-Graph

New Concept — Familiar Concept

Similarities Differences

1. _____   1. _____
2. _____   2. _____
3. _____   3. _____
4. _____   4. _____

Categories

1. _____ 2. _____ 3. _____

Analogy Organizer

19

Graphic Organizers

Venn Diagram

A   B

C

20

Graphic Organizers

Choosing Appropriate Organizers

- Which best supports the lesson's purpose?
- Which is developmentally appropriate?
- How will students use this tool?
- How will the organizer be assessed?
- Are graphic organizers going to be a part of instructional activities throughout the year?

21

Graphic Organizers

Designing

- Identify Information to Be Depicted
- List the Main Idea and Key Points
- Choose an Organizing Format
- Show Interrelationships Among Points
- Include Items Requiring Higher Level Thinking Skills
- Show Summative/Synthesizing Items
- Use Adequate Connecting Lines

22

Graphic Organizers
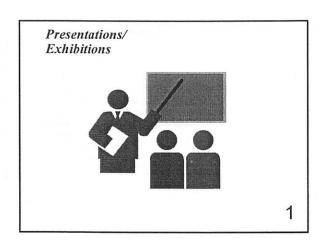
Helping Students Design Graphic Organizers

- Explain and Show Graphic Organizers and Their Use
- Provide Examples
- Use Graphic Organizers As You Teach
- Provide Templates of the Graphic Organizers
- Have Students Work in Small Groups to Complete Graphic Organizers
- Have Students Create Their Own
- Have Students Present Their Organizers to the Class

23

Visuals 13

Presentations/Exhibitions

File: STRAT13.PPT

Presentations/ Exhibitions

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Presentations/ Exhibitions

When to Use Strategy Based on Rigor/Relevance Framework

2

Presentations

Strategies

- **Analyze the Situation**
- **Analyze the Audience**
- **Define the Objectives**
- **Create the Opening**
- **Outline the Content**
- **Add "Spice"**
- **Choose an Appropriate Style**
- **Design Visual Aids**

3

Exhibitions

Elements

- **The Prompt**
- **Expectations**
- **Standards**
- **Public Context**
- **Coaching**
- **Reflection**

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Exhibitions

Process
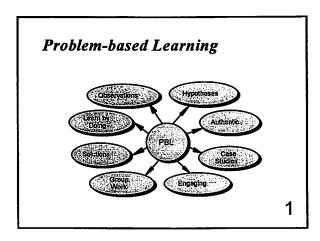
- **Choosing the Topic**
- **Conducting Research and Writing the Paper**
- **Developing the Project**
- **Delivering the Presentation**
- **Scoring Guide**

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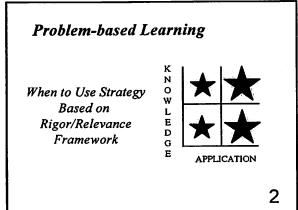
Problem-based Learning

File: STRAT14.PPT

Problem-based Learning

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Problem-based Learning

When to Use Strategy Based on Rigor/Relevance Framework

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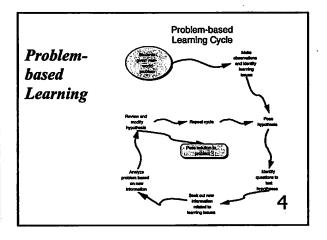
Problem-based Learning

Components

- Learning starts with a problem with no simple solution
- Students work collaboratively in groups
- Teacher plays role of facilitator
- Students assume significant responsibility for their own learning

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Problem-based Learning

Problem-based Learning Cycle

4

**Visuals
15**

Project Design

File: STRAT15.PPT

Project Design
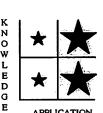
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Project Design

*When to Use Strategy
Based on
Rigor/Relevance
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APPLICATION

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Project Design

Definition

- Clarify, investigate, develop, make, test, evaluate and improve solutions to problems
- Create a device or system which meets a need
- Group problem solving
- Often technology-based
- Integrate math, science and communication
- Use systems and processes

3

Project Design

Design Process

1. Problem
2. Design Brief
3. Investigation
4. Alternative Solutions
5. Best Solution
6. Models and Prototypes
7. Testing and Evaluation
8. Manufacturing

4

Project Design

Tips

- Choose projects which relate to your curriculum
- Be sure you have adequate time
- Begin slowly and simply
- Do what is comfortable for you
- Give students time to practice related skills
- Generate group decision-making processes
- Evaluation is based on more than the final product

5

Project Design

Tips, continued

- Make sure materials and resources are available
- Take some risks with the students
- Integrate several of the skills you teach
- Remind students of the skills they are learning
- Keep administrators informed
- Make connections to the community

6

Project Design

Project Design

Tips, continued

- Keep documentation
- Encourage use of models and pictures
- Encourage students to consider multiple solutions
- Have students gather information independently
- Require students to clarify ideas through discussion, drawing, and modeling
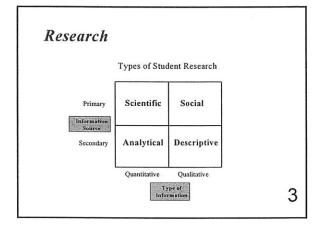
7

Visuals 16

Research

Slide 1

Research

Slide 2

Research

When to Use Strategy Based on Rigor/Relevance Framework

Slide 3

Research

Types of Student Research

	Quantitative	Qualitative
Primary	Scientific	Social
Secondary	Analytical	Descriptive

Information Source

Type of Information

Slide 4

Research

Scientific Research Steps

- Make Initial Observation
- Gather Information
- Clarify the Purpose of the Project
- Identify Variables
- Make Hypothesis
- Design Experiments
- Do the Experiments and Record Data
- Record Observations
- Summarize Results
- Draw Conclusions

Slide 5

Research

Social Research Steps

- Make Initial Observation of Behavior
- Clarify the Purpose of the Project
- Make Hypothesis
- Design Survey Instruments
- Collect Data
- Summarize Results
- Draw Conclusions

Slide 6

Research

Analytic Research Steps

- Identify a Topic
- Clarify Needs to Be Addressed
- Gather Information
- Interpret Data
- Share Research Findings

Research

Research

Descriptive Research Steps

- Identify and Develop the Topic
- Find Background Information
- Find Print Resources
- Find Internet Resources
- Evaluate Information Resources
- Cite Resources Using a Standard Format
- Write Descriptive Report

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Visuals
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Simulation/Role-playing

File: STRAT17.PPT

Simulation/Role-playing

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Simulation/Role-playing

When to Use Strategy
Based on
Rigor/Relevance
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APPLICATION

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Simulation/Role-playing

Advantages

- "Life-like" Experience
- Active Learning
- Discovery Learning
- Immediate Feedback
- Risk-free Environment
- Teacher As Facilitator/Coach
- Increased Interaction

3

Simulation/Role-playing

Advantages, continued

- Real-world Applications
- Variety in Instructional Approaches
- Effective Transfer of Learning to Real-world Situations
- Time Spans Compressed
- Greater Student Motivation

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Simulation/Role-playing

Classroom Uses

- Icebreakers
- Develop Empathy and Understanding
- Analyze Social Problems
- Explore the Future
- Develop Analytical and Research Skills
- Develop Oral and Written Communication Skills

5

Simulation

Implementation Tips

- Be Familiar with the Simulation
- Determine Your Role
- Assess Performance in the Simulation
- Consider Grouping Carefully
- Allow Enough Instructional Time
- Determine Educational Value of the Simulation

6

Simulation/Role-playing

Simulation

Designing a simulation
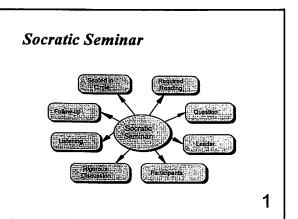
- Identify the Educational Objective
- Define the Model to Be Replicated
- Explain the Dynamics of the Model
- Outline the Participation Rules
- Prepare Debriefing Questions

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Socratic Seminar

Socratic Seminar

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Socratic Seminar

When to Use Strategy
Based on
Rigor/Relevance
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APPLICATION

2

Socratic Seminar

Elements

- **Text Being Considered**
- **Questions Raised**
- **Seminar Leader**
- **Participants**

3

Socratic Seminar

Tips for Preparation

- **Read and assign texts**
- **Prepare brief comments to start the seminar**
- **Choose an introductory question**
- **Set the room arrangement**

4

Socratic Seminar

Tips for Conducting

- Listen hard and follow comments with questions
- Don't let the discussion wander
- Help participants clarify and amplify comments
- Insist on rigor
- Remember you are learner as well
- Ask for reflection at the end

5

Socratic Seminar

Guidelines for Participants

- Do not participate if not prepared
- Mark text to refer to citations in discussion
- Refer to text when needed
- Form opinions you can defend
- If you don't understand, ask for clarification
- Stick to the point under discussion
- Listen carefully and completely to others

6

Socratic Seminar
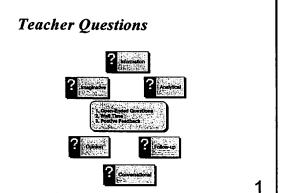
Socratic Seminar

Guidelines for Participants, continued

- Listen critically and take issue with inaccuracies
- Maintain an open mind
- Speak up so all can hear
- Be courteous
- Avoid repeating comments
- Talk to fellow participants
- Discuss ideas, not opinions

7

Visuals 19
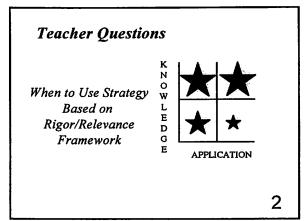
Teacher Questions

File: STRAT19.PPT

Teacher Questions

1

Teacher Questions

When to Use Strategy Based on Rigor/Relevance Framework

K N O W L E D G E

APPLICATION

2

Teacher Questions

Effective teacher questioning:

- Is planned and directly relates to the topic
- Focuses on depth of response rather than breadth
- Is precise rather than vague
- Has follow-up questions used to probe for more answers

3

Teacher Questions

Types of Questions

1. **Information**
2. **Analytical**
3. **Imaginative**
4. **Follow-up**
5. **Opinion**
6. **Conversational**

4

Teacher Questions

Follow-Up Questions

- **Probe**
- **Refocus**
- **Redirect**
- **Rephrase**

5

Teacher Questions
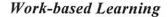
Tips

- Plan with other teachers to create a good list of questions.
- Compliment students.
- Give time for students to think.
- Wait 3-5 seconds.
- Listen to the student.
- Call students by their names.
- Use active listening.
- Encourage non-participants by calling on a specific student to answer a question.
- Select students randomly to respond.

6

Work-based Learning

File: STRAT20.PPT

Work-based Learning

1

Work-based Learning

*When to Use Strategy
Based on
Rigor/Relevance
Framework*

KNOWLEDGE

APPLICATION

2

Work-based Learning

Purposes

- Enhance Student Motivation and Academic Achievement
- Increase Personal and Social Competencies Related to Work
- Gain a Broad Understanding of an Occupation or Industry
- Provide Career Exploration and Planning
- Acquire Work Competencies

3

Work-based Learning

Benefits

- Student Gains

- Business Community Gains

- School Gains

- Community Gains

4

Work-based Learning
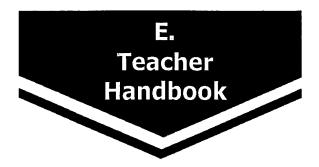
Strategies

- Field Trips
- Job Shadowing
- Mentoring
- Special Projects
- Structured Work Experiences
- Service Learning
- Apprenticeships
- School-based Enterprises

5

Work-based Learning

Considerations to Ensure Program's Value

- Student Readiness
- Match Between Student and Work Site
- Size of Program
- Connections Between School-based and Work-based Learning

6

E.
Teacher
Handbook

The **Teacher Handbook** complements the professional development activities in this resource kit. It reinforces the ideas presented in the professional development workshops. Moreover, the **Handbook** provides a handy classroom resource for choosing and designing effective instructional strategies. It is a practical text material for developing an individual's capacity to choose from a variety of instructional strategies and to know when a particular strategy is most appropriate.

While some of the information in this kit is repeated in the **Handbook**, new material such as a "Teacher Checklist" to measure the effectiveness of the strategy has been added. This tool provides a self-check for the teacher on delivery of the instructional strategy. The simple format helps the teacher collect data and reflect on the use of the strategy.

As a stand-alone guide, new and experienced teachers as well as teachers in training will find the **Teacher Handbook** an excellent resource for expanding and improving their teaching techniques.

Brief Overview of the Teacher Handbook

The Rigor/Relevance Framework is introduced as a way for teachers to raise rigor, or cognitive skill development, and increase relevance by providing real-world learning experiences that require the learner to transfer knowledge to application.

The Performance Planning Model is explained. The interrelationship of curriculum, instruction and assessment becomes apparent as the teacher explores the various components of the curriculum planning process. Effective instructional strategies, as a part of this process, lead to more rigorous and relevant instruction while cultivating higher levels of motivation for learning.

The 17 instructional strategies are introduced and correlated to the Rigor/Relevance Framework, learning styles, and types of assessment. The teacher realizes that the choice of an instructional strategy can make a difference in improving teaching and learning. With a variety of instructional strategies in his/her repertoire, the teacher can create more effective learning situations to meet the needs of learners.

The instructional strategies are also correlated to technology applications. Various uses of educational technology as tools to enhance instruction in relation to each strategy are provided.

The Instructional Strategies

The **Teacher Handbook** section on each instructional strategy provides step-by-step instructions on how to implement the strategy in the classroom.

Brainstorming

The guidelines introduced enable the teacher to transform a brainstorming session from a "helter-skelter" generation of ideas to a productive learning experience. Suggestions for appropriate uses of brainstorming as well as rules and guidelines are provided. A number of variations on brainstorming are described to give the teacher brainstorming options depending upon the desired end result.

Cooperative Learning

The basic elements of classrooms where students work in collaborative groups are outlined. This section gives practical classroom applications of cooperative learning principles and describes various cooperative learning methods. A discussion of student and teacher roles and responsibilities in the collaborative process is included to assist the teacher in establishing effective procedures for implementing cooperative learning.

Demonstration

The various components of a live exhibition of a process or an experiment are introduced. Steps in preparing and giving demonstrations are outlined along with suggestions on how to use this strategy successfully.

Guided Practice

The teacher becomes familiar with guidelines to follow when using common forms of guided practice, including homework, worksheets, and computer-based drill and practice. Tips for providing good feedback to correct and incorrect answers are also given to enhance the teacher's sensitivity to the learner's success or failure and ability to adapt questions to the learner's needs.

Inquiry

The basic elements of inquiry — intriguing investigations, student discourse, and thoughtful reflection — are explored at length. These elements give the teacher observable activities to plan, prepare, and carry out. Aspects of an effective inquiry environment are also described to help the teacher cultivate instructional habits that bring the elements of inquiry to life in the classroom.

Instructional Technology

This section gives tips on selecting interactive multimedia software. The components of software evaluation are outlined to enable the teacher to choose software packages that integrate a variety of criteria. Effective technology-based instruction is set in a particular context. The teacher becomes familiar with these contexts and how to create them.

Lecture

This age-old strategy is enhanced with suggestions on when to use a lecture, how to prepare one, and how to engage student interest prior to a lecture. Numerous ideas on improving the quality of lectures are suggested, including tips on the use of visuals and techniques to stimulate students' questions

Memorization

Techniques for remembering information are given along with several examples of mnemonic devices that can be used to memorize information. Tips for the teacher to share with students on the use of memory systems provide helpful techniques to recall information intended to be memorized.

Note-taking/Graphic Organizers

Various suggestions for helping students take better notes and ways of improving note-taking skills are outlined. Instructional uses of graphic organizers are discussed and the teacher is introduced to 15 graphic organizers. Guidelines for assisting students to design and use graphic organizers are provided.

Presentations/Exhibitions

In this section, the teacher is given a variety of strategies for successful presentations along with tips for creating accompanying visuals. Practical steps are described for each aspect of exhibition — choosing the topic, conducting research and writing the paper, preparing the presentation, preparing for questions, and designing exhibition scoring guides.

Problem-based Learning

The problem-based learning cycle is reviewed. Teachers are given suggestions on finding problems and connecting related skills. The teacher's roles as designer, coach, and evaluator are described.

Project Design

The design process is introduced. The teacher is given a comprehensive description of the eight-step design process along with practical tips to share with students. Suggestions for bringing design projects into a classroom are also provided.

Research

This section provides a description of the four types of research — scientific, social, analytical, and descriptive. Suggestions on using the Internet and the library are given. Various criteria to help the teacher work with students in selecting good research topics are outlined. Evaluation criteria are given for measuring the success of student research.

Simulation/Role-playing

Uses of simulations in various phases of instruction are described. Evaluative criteria are given to assist the teacher in selecting a simulation. Tips for implementing the simulation are provided, and guidelines for designing a simulation are outlined.

Socratic Seminar

The techniques to engage students in the exploration and evaluation of the ideas, issues, and values in a particular text are presented. These elements of a Socratic Seminar are presented as interdependent. The teacher is also given specific suggestions on preparing for and conducting a Socratic Seminar.

Teacher Questions

In order to ask the appropriate questions at the right time, teachers must understand the different types of questions. Six major types and the responses they elicit are described. Questions types include information, analytical, imaginative, follow-up, opinion, and conversational. Some general suggestions on improving questioning techniques are also given.

Work-based Learning

Various examples of work-based learning strategies are presented, with special emphasis on structured work experiences. The teacher is given practical suggestions on organizational structures supportive of work-based learning programs and considerations to ensure the educational value of work-based learning opportunities when developing programs. Finally, the teacher is provided with factors to address in assessing the quality of teaching and learning at work.

V. Making a Difference with Professional Development

Effective Professional Development
Focus of Professional Development
Teacher Priorities
Characteristics of Effective Professional
Development
Alignment with School Improvement
Models of Professional Development
Workshops
Distance Learning
Self-Study/Resource Centers
Study Groups/Teams
Play/Experimentation
Teacher Research
Partnerships
Immersion
Coaching/Mentoring

Problem-based Learning

Keys to Success

1. Focus on Something
2. Make Teachers and Administrators Feel the Pressure and See the Light
3. Keep One Eye on the Prize and One Eye on the Ground
4. Involve Everyone
5. Change Both Individuals and Organizations
6. Provide Follow-up and Support

Evaluation

Measuring Results

Suggestions for Evaluation

Tools to Measure Effectiveness

V. Making a Difference with Professional Development

Effective Professional Development

"Education change depends on what teachers do and think — it's as simple and as complex as that."

- Fullan and Steigelbauer -

Professional development suffers a paradoxical existence in schools. There is a decided love–hate relationship with professional development. Schools love learning but teachers hate to admit that they too need to spend time learning. Parents love talented teachers but hate to see them absent from class for professional development. Education decision makers love working aggressively to strengthen the quality of schools but hate to fund expansion of professional development. Teachers love to proclaim the importance of personal, lifelong learning but hate to see the cost of professional development not covered by their school. Staff developers love to espouse the latest research on learning but hate to change their own methods of providing professional development. Resolving these quixotic conflicts is the key to creating schools where there is a culture of rich, ongoing professional development that directly contributes to changes in instructional practices and enables all students to learn well.

Research shows that the most powerful changes occur through teacher collaboration within a school building. One of the primary things learned from successful schools is that very effective professional development can be created at the building level by establishing an expectation for change, providing access to people and ideas, and then giving teachers time to create their own development.

Professional development is often delivered through teacher workshops, which can compete with the time teachers could be working directly with students. Workshops have a role in professional development but they are not the only model and probably not the most useful model.

Obviously, changes in student achievement will require changes in education practice. If we continue to do the same things we have always done, we will get the same results. Most teachers are effective; they teach and many

students learn. For these teachers, there is not a strong urgency to change. A few hours of workshop activities will not cause teachers to discard the beliefs and practices that have served them well for so many years. In order to implement change, professional development must be a planned and comprehensive set of experiences that are continually evaluated and improved. All too often, staff development programs skip beliefs and attitudes and focus on teacher behaviors; the training is done as a pull-out program. By focusing on individuals and not organizations, culture usually wins and the innovation dies. Professional development must include increasing amounts of "job-embedded learning," activities like study groups, collegial planning, peer review, and action research.

This discussion of professional development is based on the following research-validated assumptions:

- Professional development programs are the foundation for systems change at the district and school level.

- When schools become places for teachers to learn, they become schools on the way towards improvement.

- Improving the skills and knowledge of teachers will result in the improved performance of students.

It is not too difficult to get educators to agree that professional development is important. However, that agreement often falls apart when they begin discussing which approach to take. Many argue that professional development is primarily for the purpose of transferring knowledge of latest research on learning theory or the procedures in research-validated effective programs. In this case, staff development has a focus on training, similar to training manufacturing workers on the operation of new technology.

A second group would argue that it is core knowledge that distinguishes competent teachers. The trend in teacher preparation in the past few years has been to encourage achievement in a core discipline prior to spending time

In order to implement change, professional development must be a planned and comprehensive set of experiences that are continually evaluated and improved.

Focus of Professional Development

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developing pedagogical skills. Following this line of reasoning, professional development should focus on subject matter knowledge.

A third view is based on the assumption that teaching is more of a craft. Teaching cannot be improved in a mechanistic training process but is best learned from other practitioners through observing teaching, engaging in coaching conversations, experimentation, and reflection. In this focus, professional development cannot be standardized but is best promoted by giving teachers the opportunity to collaborate at the school level.
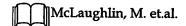
None of these approaches is wrong. Each has merits.

Carnegie Foundation for the Advancement of Teaching

The Condition of Teaching

Studies have shown that while most teachers work alone, they desire to have more collaboration with their peers (Carnegie Foundation). Research has also shown that schools are more effective when teachers have opportunities for observing their peers, helping one another, and participating in plans for school improvement (McLaughlin). Teachers are more likely to change if they see similar changes attempted by peers and have opportunities to discuss challenges, ideas, and implementation.

McLaughlin, M. et.al.

Teacher's Workplace: The Social Organization of Schools

Students learn better when they are able to construct knowledge by linking new experiences to previous ones. Teachers, too, need to learn through discovery and constructing knowledge. Professional development is not exclusively training, content learning or collegial support. It's a balance of all three. There are times when training in a new technique or technology is essential. However, when professional development is designed as training, it has limited transfer and implementation possibilities. The subject-matter approach may be fine for initial teacher preparation but it is difficult to convince practicing teachers they need more content knowledge. There is often additional content that teachers need to learn, but professional development must emphasize an ongoing structure of collegial support if any change is to occur.

Teachers, too, need to learn through discovery and constructing knowledge.

In a National Education Association study, teachers ranked 14 sources of professional development with respect to providing knowledge and skills needed in teaching situations. These sources, ranked in order, were:

1. direct experiences as teachers
2. consultation with other teachers
3. study and research pursued on one's own
4. observation of other teachers
5. graduate courses in field of specialization
6. consultation with specialists
7. undergraduate courses
8. professional conferences/workshops
9. professional journals
10. graduate courses in education
11. formal evaluation of teaching performance
12. consultation with building-level administrators
13. undergraduate education courses
14. inservice training provided by school district

Judith Ponticell writes: Teachers' beliefs and occupational ethos are foundations for teacher learning that are often overlooked in staff development practices. Teachers' beliefs about themselves, teaching, learning, students, and the contexts in which they teach form perceptual screens through which they decide whether or not to learn new skills.

Gordon, Edward E., Ronald R. Morgan, and Judith A. Ponticell.

FutureWork

Professional development appears to work best at changing classroom practices when:

1. Teachers perceive a personal need for change.
2. Teachers' learning is context-specific, i.e., combining new information with what they already know.
3. Teachers are instrumental in designing and taking charge of their own professional growth activities.
4. Sustained, substantive, and structured collegial interactions are built in to enhance mutuality and support risk-taking.
5. Learning occurs over time.
6. Teachers' professionalism is validated by commitment and support from the building principal, central office, and Board of Education in trusting teachers to take control of their professional growth.

Charateristics of Effective Professional Development

What is good professional development? The following standards comprise an excellent set of criteria for good professional development. This list was adapted from National Staff Development Council's National Standards For Professional Development.

Professional Development:

* Focuses on teachers as central to student learning, yet includes all other members of the school community
* Focuses on individual, collegial, and organizational improvement
* Respects and nurtures the intellectual and leadership capacity of teachers, principals, and others in the school community
* Reflects best available research and practice in teaching, learning, and leadership
* Enables teachers to develop further expertise in subject content, teaching strategies, uses of technologies, and other essential elements in teaching to high standards
* Promotes continuous inquiry and improvement embedded in the daily life of schools
* Is planned collaboratively by those who will participate in and facilitate that development
* Requires substantial time and other resources
* Is driven by a coherent long-term plan
* Is evaluated ultimately on the basis of its impact on teacher effectiveness and student learning and this assessment guides subsequent professional development efforts.

Alignment with School Improvement

In recent years, most school districts have identified goals for student learning and achievement and adopted improvement plans at the district, building, and often grade levels. These comprehensive education plans are usually developed by a team representative of the organization's various stakeholders, including students. A mission statement and clear expectations for measuring student progress are at the core of these plans. The mission and objectives, in turn, guide the selection of professional development activities that will enable the district to achieve its goals.

"Staff development becomes a means to an end rather than an end in itself; it helps educators close the gap between current practices and the practices needed to achieve the desired outcomes. This comprehensive approach to change assures that all aspects of the system— for example, policy, assessment, curriculum, instruction, parent involvement—are working together with staff development toward the achievement of a manageable set of student outcomes that the entire system values." (Stephanie Hirsh and Dennis Sparks)

Hirsh, S. and D. Sparks

A New Vision for Staff Development

As school districts evaluate improvement plans, the following questions should be considered to ensure that the plan is aligned with meaningful professional development:

1. Are district and school improvement plans and processes of high quality?
2. What is the relationship of staff development to district and school goals for student learning?
3. What criteria will guide the staff development that is designed and delivered?
4. Are adequate resources set aside to ensure that staff development can fulfill its obligations to district and school improvement goals?
5. What steps will ensure that staff development decision making is aligned with district and school improvement plans?

Major models of providing professional development are described below. (Adapted from Loucks-Horsley *et al.*)

The most common professional development activity is the workshop. Teachers convene at a location away from their teaching responsibilities and listen to a presentation. Workshops are improved with engaging activities that stimulate more discussion and reflection. Workshops are efficient in that they can cover a lot of ideas in a short amount of time. They also can make a single expert available to a large number of people. Workshops are weak on implementation since participants have little time to reflect on ideas and apply them to their own situations.

Models of Professional Development

Workshops

Loucks-Horsley, S., P. Hewson, and N. Love

Designing Professional Development for Teachers of Science and Mathematics

Distance Learning

Distance learning allows workshops to be delivered to more people at a lower cost. Instead of traveling to a workshop, the information comes electronically to the teacher. Content can be divided into more manageable pieces and offered through more sessions over longer periods of time. The advantages of increasing the number of participants and delivering information in smaller bites needs to be weighed against the frequent problem of lack of personal interaction in distance learning.

Self-Study/ Resource Centers

Some people learn best on their own. "Give me a book, or videotape. I will digest the material and apply those ideas to my own practice." Excellent professional development can be accomplished by giving teachers regular access to periodicals, training materials, videotapes, computer study guides, and CD-ROMs. Providing these materials in a resource room makes them available to the entire staff. While this is convenient and low cost, the disadvantages are that teachers will use the material unevenly which will result in uneven implementation. Also, maintaining currency of a resource room is time consuming.

Study Groups/ Teams

Some of the most valuable learning comes from regular conversations among small groups of peers focused around a single topic. These teams can be set up to meet regularly to discuss a particular problem or initiative. The groups help to increase the accountability of all members. Frequently, combining self-study or reading with a study group becomes a powerful learning situation.

Play/ Experimentation

Young children do most of their learning through play and experimentation. There is virtue in maturing and discarding childlike ways. However there is still a place for play and experimentation even as adults. Teachers can learn by merely observing the environment around them and trying things out. By replicating things that work and continuing to collect new ideas, learning can result. Computer skills are an excellent example of new skills that can be learned through play. The rich features of computer software can be learned merely by exploring and experimenting. This form of learning is frustrating as well as fun, but truly empowers the individual.

Teacher Research

Don't underestimate the power of learning through action research. When some teachers remain skeptical about a new technique, encourage them to structure their own action research in the classroom. Set up experimental designs and collect evidence of the differences that result. By directly measuring the impact of changes in instructional practice, teachers will acquire a new appreciation for the changes. No amount of logical or passionate rhetoric will convince some teachers, but researching their own practice can yield significant change.

Partnerships

Staff development is frequently provided by an outside organization. The organization partners with a school for a specific purpose. One common example is partnering with a computer software vendor to provide training and ongoing support for teachers as they acquire new skills. Partnering with a social service or law enforcement agency can bring in professionals to work in the school community, which has an added benefit of providing new ideas to teachers and further expanding their knowledge.

Immersion

Immersion involves creating situations outside of the classroom where teachers are fully engaged in an activity that helps them develop a new perspective and acquire new skills. A frequent form of immersion is a summer internship in a business in which teachers can acquire technical skills related to their subject area responsibility. Immersion can also be an effective technique for learning computer skills.

Job enhancements are a change of responsibility which results in developing new skills. For example, team teaching situations or doing peer evaluations can lead to teachers developing new skills and knowledge. Challenging a talented teacher to become a lead teacher, a member of a curriculum team, or a trainer can help to develop their expertise further. The highest level of learning is achieved when someone has to actually teach skills to another person.

Coaching/ Mentoring

People are more inclined to embrace a new idea when it comes from a respected and trusted peer rather than from a stranger. Setting up pairs or small groups of teachers to work together results in dynamic learning. Small groups ensure that each teacher is involved and that ques-

tions are answered and needs are met. Coaching and mentoring also provide the ongoing feedback and support that is essential to full implementation of new practice.

Coaches and formal mentors guide, help, and encourage. They provide feedback on pedagogy and content, guide teachers in adapting the new practices to their unique contextual conditions, help to analyze the effects of their efforts, and encourage them to continue despite minor setbacks. In other words, coaching/mentoring is personal, practical, on-the-job assistance that can be provided by consultants, administrators, directors, peers, or other professional colleagues.

Problem-based Learning

Research on student learning emphasizes the importance of student engagement and inquiry. Why should it be any different for teachers when they become the students in professional development? Professional development should be designed in a way that maximizes learner engagement and poses situations for inquiry based learning. One of the recent changes taking place in professional development has exactly this objective: transforming professional development from passive information lectures to active learning through experiencing real problems. This type of professional development is called problem-based learning.

Problem-based professional development has four characteristics:

1. A problem from actual practice is the starting point.
2. The knowledge and skills to be acquired result from the experience of seeking a solution to the problem.
3. Teachers, individually and collectively assume major responsibility for the professional development.
4. The learning occurs in the context of small group discussion rather than lectures.

It is no surprise that powerful learning occurs when we are actively engaged in a problem that directly relates to our work. Several researchers have found that problem-based learning results in increased learning.

When starting to redesign professional development, greater burden falls to the leader to create and introduce problems, handle the facilitation, and serve as resident expert. Begin slowly and introduce problem-based professional development in an incremental fashion.

Here are some suggestions for introducing problem-based professional development.

- Ask a small group of teachers to come up with a description of a problem related to the topic for professional development. For example, if the objective you are addressing is creating individualized instruction, have the group prepare a description of a challenging instructional assignment that would require more individualized instruction. As part of the professional development, have small groups of teachers work on the problem.

- Create a strand of professional development which is organized around problems. Set up a series of times for teachers to work together. Have the initial session focus on brainstorming and reaching consensus on critical problems. Assign topics for individual teachers to research prior to the next session. At subsequent sessions, engage in problem solving activities using the research information.

- When analyzing the professional development needs of teachers, focus on the problems. Rather than asking teachers what topics they are interested in for professional development workshops, structure a survey or conduct focus groups to elicit problems. Then summarize the most significant problems and either address these problems in a problem solving session or a workshop.

Professional development programs can take a variety of paths. Certain components, however, are critical to effective professional development. Following the guidelines below will not always bring success, but ignoring the issues raised will limit success and inhibit significant change.

Keys to Success

1. Focus on Something

The problem in schools is not the lack of innovation, but too much innovation. Each year new programs are introduced in schools without any effort to show how they relate to the ones that came before or those that may come afterward. Teachers are exposed to multiple professional development programs with little explanation how or if the programs are connected. No wonder teachers find themselves confused about which skills to embrace and which to discard. The result is an enormous overload of fragmented, uncoordinated and superficial attempts at change.

The steady stream of innovations in education causes many practitioners to view all new programs as fads that will soon be gone, only to be replaced by yet another bandwagon. This pattern of constant, yet unrelated, short-term innovations not only obscures improvement and provokes cynicism, but also imposes a sense of affliction. Having seen a multitude of innovations come in and go out of fashion, veteran teachers frequently calm the fears of their less experienced colleagues who express concern about implementing a new program with the advice, "Don't worry; this too shall pass."

New innovations must be presented as part of a coherent framework for improvement.

New innovations must be presented as part of a coherent framework for improvement. Everyone keeps searching for the best practice or program. It matters less which program is chosen than whether a concerted effort is focused on that program and carried to full implementation. All school sponsored professional development should directly relate to this program.

2. Make Teachers and Administrators Feel the Pressure and See the Light

Pressure is often necessary to initiate change among those whose motivation for change is not great. In addition, pressure provides the motivation, and occasional nudging that many practitioners require to persist in the challenging tasks that are intrinsic to all change efforts.

In some contexts, a substantial amount of pressure from leaders may be necessary to overcome inertia, recalcitrance, or outright resistance. Moreover, the change from emphasizing teachers' personal preferences to emphasizing student learning can be a difficult transition. Remember to stress that we should be engaged in education for students' sake and not for the convenience of adults.

Pressure in the extreme is counterproductive. Strong-armed tactics can stifle innovation. The key is to find the optimal mix to ensure that teachers feel the heat of increased expectations without becoming alienated or panicked.

The pressure of increased expectations, when coupled with an inspiring vision, can be a winning combination. Merely sharing visions when there is no incentive or encouragement to change has little impact on staff. However, the combination of expectations and accountability can make educators much more receptive to visionary ideas and subsequent professional development. By providing external pressure and emphasizing a clear, internal vision, teachers will use their own talents to make changes in teaching practice that will raise student achievement.

The pressure of increased expectations, when coupled with an inspiring vision, can be a winning combination.

Another balancing act in professional development is to pay attention to both the goal (the prize) and the current conditions (the ground). Paying too much attention to either one can lead to changes that fall short of the mark. Keep the ideal vision of what you are trying to achieve but pay attention to the reality around you.

> **3. Keep One Eye on the Prize and One Eye on the Ground**

There is also no easier way to fail than to take on too much at one time. In fact, if there is one truism in the vast research literature on change, it is that the magnitude of the change individuals are asked to make is inversely related to their likelihood of making it. Successful professional development programs are those which approach change in a gradual and incremental fashion. If a new program does require major change, it is best to ease into using it rather than expect comprehensive implementation at once.

Successful professional development programs are those which approach change in a gradual and incremental fashion.

The changes advocated in a professional development effort must not be so ambitious that they require too much too soon from the implementation system, they need to be sufficiently broad in scope to challenge teachers and kindle interest. Professional development efforts should be designed with long-term goals based on a vision of what is possible. That vision should be accompanied by a strategic plan that includes specific in-

cremental goals for three to five years into the future, gradually expanding on what is successful in that context and offering support to those engaged in the change.

4. Involve Everyone

The discomfort that accompanies change is greatly compounded if the individuals involved perceive that they have no say in the process or if they feel isolated and detached in their implementation efforts. For this reason, it is imperative that all aspects of professional development be fashioned to involve teams of individuals working together. This means that planning, implementation, and follow-up activities should all be seen as joint efforts, providing opportunities for those with diverse interests and responsibilities to offer their input and advice.

To insure that the teams function well and garner broad-based support for professional development efforts, it is important that they involve individuals from all levels of the organization.

To insure that the teams function well and garner broad-based support for professional development efforts, it is important that they involve individuals from all levels of the organization. In school improvement programs, for example, the most effective professional development teams include teachers, non-instructional staff members, and building and central office administrators. In some contexts, the involvement of parents and community members also can be helpful.

Working in teams allows tasks and responsibilities to be shared. This not only reduces the workload of individual team members, but also enhances the quality of the work produced. Bringing groups of individuals together expands the pool of good ideas and builds a sense of shared responsibility for success of the initiative.

The notion of teamwork must be balanced by efficiency, however. There is evidence to show, for instance, that large-scale participation during the early stages of a change effort is sometimes counterproductive. Elaborate needs assessments, endless committee and task force debates, and long and tedious planning sessions often create confusion and alienation in the absence of any action. Extensive planning can also exhaust the energy needed for implementation, so that by the time change is to be enacted, people are burned out.

Success in any improvement effort always hinges on the smallest unit of the organization, and, in education, that is the classroom. An important lesson learned from the past is that we cannot improve schools without improving the skills and abilities of the professionals within them. In other words, we must see change as an individual process and be willing to invest in the intellectual capital of the individuals who staff our schools.

Looking at change as only an individual responsibility will not make professional development completely successful. Principals and teachers are often reluctant to adopt new practices or procedures unless they feel sure they can make them work. To try something new means to risk failure, and that is both highly embarrassing and threatening to one's professional pride.

It is important to keep in mind that organizations, like individuals, also adopt change. Neglecting organizational features and system politics severely limits the likelihood of success of any development or improvement effort.

On the other hand, focusing on change as only an organizational matter is equally ineffective. Tweaking the organizational structure or adopting a new policy is a favorite device of educational decision makers and administrators because it communicates to the public in a symbolic way that they are concerned with the performance of the system. To facilitate real change we must look beyond policy structures and consider the embedded structure that most directly affects the actions and choices of the individuals involved.

The key is to find the optimal mix of individual and organizational processes that will contribute to success in a particular context. Viewing change as both an individual and organizational process will help clarify the steps necessary for successful professional development.

Few persons can translate a professional development experience directly into successful implementation. Implementation requires attempts, reflection, and then further attempts. Adapting new practices and techniques to existing teaching conditions is an uneven process that requires time and extra effort, especially when begin-

5. Change Both Individuals and Organizations

It is important to keep in mind that organizations, like individuals, also adopt change.

6. Provide Follow-Up and Support

ning. Guidance, direction, and support are crucial when these adaptations are being made.

The early stages of implementation are complicated. There is a natural initial state of confusion and loss of productivity. Problems encountered at this time are often multiple and unanticipated. Regardless of how much planning or preparation takes place in an effort to establish readiness, it is when professionals actually implement the new ideas or practices that they have the most specific problems and doubts. Support at this time is vital for continuation. Support allows those engaged in the difficult process of implementation to tolerate the anxiety of initial failures. Not all efforts will be successful, but teachers should be encouraged to take risks and be free of negative consequences for initial failures. Judgment should be made on ultimate success.

Of all aspects of professional development, follow-up is perhaps the most neglected. Learning to be proficient at something new or finding meaning in a new way of doing things is difficult. Any change that holds great promise for increasing individuals' competence or enhancing an organization's effectiveness is likely to be slow and require extra work. If it were easy, everyone would have reached this level of competence. It is imperative that improvement be seen as a continuous and ongoing process.

Learning to be proficient at something new or finding meaning in a new way of doing things is difficult.

Support does not have to be provided through an extensive formal program. Simply offering opportunities for practitioners to interact and share ideas with each other can be very valuable.

If a new program or innovation is to be implemented well, it must become a natural part of practitioners' repertoire of professional skills and be built into the normal structures and practices of the organization. The new techniques must become habit. For this to occur, continued support and encouragement are essential.

Does professional development make a difference? Subjective opinions often are used to support investment in professional development, but the reality is that we do not have enough overall evidence of the effectiveness of professional development. One of the areas in which professional development needs to be strengthened is in the collection of systemic evidence of impact.

Evaluations of professional development programs often focus on superficial issues (sometimes called the "happiness scales") rather than on substantive impact on teacher practice and student learning. Although each professional development program should contribute to the personal growth of the participants, its main goal should be to increase student achievement.

It is essential to think about and design the evaluation process at the beginning of an initiative rather than to add it on later. There are three types of evaluation:

1. Participant Feedback
2. Change of Teacher Practice
3. Impact on Student Achievement.

1. *Participant Feedback* - Evaluation of a professional development activity often consists of filling out an evaluation form at the end of the activity. Surveys at the end only affect subsequent programs and do not allow for corrections to be made or concerns to be addressed during the activity. To ensure that activities are useful and relevant, the participants' feedback and comments should be collected at intervals during the program and be used to modify and improve it.

2. *Change of Teacher Practice* - This could be in the form of a follow-up survey, completed after teachers have had time to understand and implement what they learned in a professional development activity. This type of survey is more useful than participant feedback immediately after an activity in assessing changes in teacher practice. This measurement of impact on change in practice should be on a time frame of six months to a year.

3. *Impact on Student Achievement* - This level of evaluation is very difficult to measure. Many factors contrib-

Evaluation is essential for garnering resources to sustain professional development and building quality activities.

ute to increasing achievement and it is hard to assign improvement in achievement to any specific professional development activity. This evaluation needs to look at trends in student achievement as a result of changes in the pattern and scope of professional development. This usually has to be measured over at least a three-year period.

Early in the school improvement process, staff members may feel a strong desire to solve problems by moving quickly to take some action. Evaluation may seem like a time-consuming process that requires technical skills beyond those possessed by most teachers and the process may be viewed as an unnecessary intrusion into their work. In addition, evaluation questions related to measurable outcomes and indicators of success are difficult to design, especially if the staff members are not accustomed to thinking in those terms. However, evaluation is essential to garnering resources to sustain professional development and building quality activities.

Measuring Results

Measuring educational outcomes from professional development usually focuses on the teacher, the organization, and the student. To determine the affect the professional development has had on the participant, the following should be measured: progress in knowledge, behaviors and practices, and attitudes, beliefs, and perceptions. Participants' knowledge base can be assessed by pre- and post-assessments, exit interviews or surveys, and self-report questionnaires. To determine behaviors and practices, one can observe, interview or survey, and administer self-assessment checklists. In the area of attitudes, beliefs, and perceptions, participants' outcomes can be assessed through interviews or surveys, self-report questionnaires, testimonials, and analyses of records.

Organizational progress can be correlated with increased shared decision making and expanded roles for participants. Direct observations or interviews, records of personnel involvement, and/or evidence of the impact on decision making can be used to determine the increased level of collaboration. The participants' degree of participation in the organization may be measured through direct observations or interviews, analyses of records and job descriptions, and surveys or questionnaires.

Students' results are twofold—cognitive (performance) and affective (behavioral). The impact of professional development on students' ability to demonstrate cognitive knowledge is determined by teacher-developed assessments, standardized assessments, portfolios of students' work, performance records or progress reports, grades or grade distributions, and standardized achievement tests. In the affective or behavioral areas, measurement is made by direct observations or interviews; district, school, or classroom records; self-report questionnaires or surveys; self-assessment checklists; and testimonials.

Here are some key objectives to keep in mind.

* Evaluation should be ongoing.

* Evaluation expectations and procedures should be explicit and public.

* Evaluation should be informed by multiple sources of data.

* Evaluation should use both quantitative and qualitative data.

* Evaluation should be considerate of participants' time and energy.

* Evaluation results should be presented in forms that can be understood by all participants.

The key to greater success in professional development rests not so much in the discovery of new knowledge, but in our ability to apply what we already know. The process of change is difficult and complex. We facilitate that process through well-planned, ongoing professional growth leading to improved professional practice.

> **Suggestions for Evaluation**

**Tools to Measure
Effectiveness**

Two tools are provided to measure the effectiveness of professional development in a school district.

Table 1, Professional Development Rubric, is an analytic guide that provides criteria for looking at professional development in the six categories; Goal Setting, Needs Analysis, Program Creation, Implementation, Climate/ Culture, and Evaluation.

Table 2, Holistic Checklist for Professional Development, is a more complete tool for examining the important characteristics of professional development.

Table 1. Professional Development Rubric

	Goal Setting	Needs Analysis	Program Creation	Implementation	Climate/ Culture	Evaluation
Exemplary	Clear goals and expected results for schools/teachers are directly tied to attainment of student results. Goals understood by all.	Meaningful participation of all stakeholders in identifying needs and developing long-range professional development plans.	Uses a variety of strategies, delivery systems, models and techniques to meet the needs of staff over a period of time. Includes content and best practices based on research.	Continuous follow-up and opportunities for staff to practice skills. Ongoing coaching and strong evidence of administrative support to continue with follow-up activities.	Administrators are instructional leaders. Mutual respect and collaboration at all levels. Professional development recognized as an essential part of change.	Ongoing data collection and analysis linked to student results. Outcomes consistent with plan. Data results drive ongoing planning cycle.
Effective	Goals exist but are either broad or diverse. Generally related to student achievement. Limited understanding of goals among staff.	Some participation by stakeholders. Plan is developed but not tied to goals. Needs are assumed but not individually identified by staff.	Limited but generally effective programs. Based on research and school needs but not linked to student results or individual needs.	Follow-up activities are encouraged, primarily at the group level, with some administrative involvement.	Professional development is valued as a powerful change agent but top-level leadership is not apparent.	Student outcomes are evaluated but not in relation to interventions provided through a professional development plan.
Wishful Thinking	Goals identified but not shared or not based on student achievement needs.	Process owned and controlled by a few people. Research or regulation driven with no relation to school or individual needs.	Menu approach to selection of programs. Many programs offered out of tradition.	Occasional informal follow-up. Administrative support may occur but without systematic structure.	Professional development tolerated, but not consistently available to staff. Individual initiative and risk-taking discouraged.	Any evaluations based solely on participant reaction to session (happiness scales).
Inadequate	No obvious relationship to district needs or school improvement.	Superficial or no plan developed, no input of stakeholders to topics selected.	Single presentation workshop, often to fill an available time slot. One-shot program.	No follow-up provided. Very limited opportunity to monitor and refine skills. Any follow-up is self-driven.	Professional development not encouraged. Manditory participation of an unwilling audience.	No evaluation conducted.

Table 2. Holistic Checklist for Professional Development

Use the following to reflect on the quality of professional development.

Professional Development

____ is aligned with the school's and the district's strategic plan.

____ is based on a careful analysis of disaggregated student achievement data.

____ is part of a long-term plan of three to five years.

____ is based on the school, not the district, as the primary unit of change.

____ is adequately funded.

____ provides knowledge, skills, and attitudes regarding organization development and systems thinking.

____ uses content that has proven value in increasing student learning and development.

____ requires an evaluation process that is ongoing, includes multiple sources of information, and focuses on all levels of the organization.

____ uses a variety of staff development approaches to accomplish the goals of improving instruction and student success.

____ includes the follow-up and support necessary to ensure improvement.

____ increases administrators' and teachers' understanding of how to provide school environments and instruction that are responsive to the developmental needs of students.

____ prepares educators to demonstrate high expectations for all student learning.

____ facilitates staff collaboration with and support of families for improving student performance.

____ provides adequate time during the work day for staff members to learn and work together to accomplish the school's mission and goals.

____ uses strategies that emphasize adult learning principles including learning by doing as an important component.

(Adapted from the Professional Development Standards, National Staff Development Council)

VI. Techniques
for Improving
Instruction

Collaborative Peer Review Processes

Collaborative School Review

Conducting Learning Experience
Reflections

Conducting Peer Teaching
Observations

Action Research

VI. Techniques for Improving Instruction

Collaborative Peer Review Processes

Among many techniques that are useful in helping teachers to improve instruction, several stand out for their effectiveness and their reliance on the teacher self reflection. Discussed below are peer reviews and action research.

Peer review is a process that uses one's peers to examine aspects of teaching and learning. It is an opportunity for staff to reflect on their strengths and weaknesses, and to work together for improvement. The overall goal is to establish a culture of self-study that stimulates continuous inquiry, reflection, information sharing, and improvement. Through a peer review process, schools periodically examine and reflect on where they stand in relation to their goals for improving teaching and learning.

Purpose

There are three types of peer review — school review, peer teaching observation, and a peer learning experience reflection. Regardless of the type, the goal is the same: to improve the quality of teaching and learning. Reviews assume a high level of professional responsibility. Colleagues, other educators, administrators, and community members become trusted and respected by the teachers and schools under review. The belief is that the process will provide honest and constructive feedback, establish an ongoing culture of continuous reflection and improvement, and provide data for the development of either individual or school improvement plans. Teaching and learning are strengthened because reviews enable individual teachers and schools to assume primary responsibility for improving the quality of the services they provide. It also can provide strategies to help a community work collaboratively to continue improving its schools.

"We shall not cease from exploration, and the end of our exploring will be to arrive where we started and know the place for the first time."

— T. S. Eliot —

Benefits

The major benefits of implementing review processes are:

- increasing student achievement by establishing a culture of review that helps each school focus on its primary mission: teaching and learning
- increasing student achievement by providing a means of sharing effective educational practices among teachers
- providing a realistic and meaningful way to engage the wider community in education
- providing a way to increase public confidence in and support for public schools
- enhancing a shared sense of responsibility for improving learning.

Characteristics of a Culture of Review

A culture of review is present in a school community when:

1. Everyone wants growth opportunities.
2. Everyone wants to continue improving.
3. Everyone can assume responsibility for his/her own growth.
4. Everyone wants/needs information about performance.
5. Collaboration enriches growth.
6. A community of learners is committed to continued growth.

In a culture of review, reflection occurs around habitual behavior, actions, beliefs, and means to self-awareness about performance. Peer reviews and self-questioning are typical strategies used to sustain the culture. Staff collegially share and pool information, and people from multiple constituencies work collaboratively to promote continuous improvement by questioning levels of expectations and commitment, redesigning programs, and reallocating resources. The school leader views teachers working collaboratively. Faculty and school community meetings focus on professional growth. Review processes stimulate continuous examination and refinement of teaching and learning.

...reflection occurs around habitual behavior, actions, beliefs, and means to self-awareness about performance.

Assumptions

Any review process begins with five basic assumptions:

1. Teaching and learning are the primary focus of review.
2. The people at the school—administrators, teachers, students, parents, and support staff—have the most knowledge about the school's strengths and weaknesses.
3. Adults in the school community will continue to learn, acquire, and use new skills through interaction with one another.
4. A learning organization that encourages reflection on one's work will enable its members to improve their craft.
5. Collegiality, collaboration, and sharing reduce classroom isolation and are essential to creating a "culture of review."

For the review experience to be successful, these assumptions must be made explicit.

Collegiality, collaboration, and sharing reduce classroom isolation and are essential to creating a "culture of review."

Collaborative School Review

School reviews can be either self-reviews, external reviews, or both. In a self-review, the staff of the school engages in activities that encourage self-reflection. A self-review team is formed; this may be drawn from the building leadership teams. Representation of all stakeholders including older students will strengthen the process and the subsequent participation in identified improvement initiatives.

An external review is an extension of the self-review process. This gives a school an objective perspective on its progress. The external review can take place at any point in the school's self-review cycle. Members of the external review team include administrators, parents, community members, and students. As in a self-review, the external review reflects on teaching and learning within the school; it is a mirroring process. Team members document their observations in a collective perspective similar to one that is generated by the self-review team. The report of the external review team does not contain recommendations but outlines areas of concern designed to

External review is a mirroring process.

stimulate further inquiry and discussion. The report is sent to the principal, who shares it with staff and any other appropriate audience. Otherwise, the report is kept confidential unless the school decides to make it public. In some instances, the report becomes an excellent public relations tool and may validate initiatives already begun by the school.

Conducting a School Review Process

Readiness — A school must want to enter the review process. Typically, a group of highly motivated and interested people in a school will raise the idea to the faculty. Rarely does an entire school community unanimously agree to join the initiative. A school must therefore provide sufficient assurances for people who feel anxious about studying their own practice and, perhaps eventually, asking outsiders in to observe and interview them.

The following indicators of readiness are most desirable for a school to conduct a self-review:

How do you tell if a school is ready for a peer review?

- a willingness to trust
- existing useful communication patterns
- a shared understanding of past school improvement efforts
- a decision-making process that focuses on the core of curriculum and instruction
- a shared schoolwide perception of anticipated outcomes as a result of the process
- sufficient knowledge about the review initiative.

Developing a School Profile — When a school chooses to conduct a review, it begins assembling a school profile and raising critical questions for staff's consideration. The profile establishes an accurate baseline for improvement activities and gives review teams a starting point for a review. A succinct compilation of statistical information, the profile reflects the relationship between the school's mission and goals and the teaching and learning taking place in the school. The profile includes statements of the school's vision, mission, and goals and whatever else the school believes is pertinent from available current records.

The profile reflects the relationship between the school's mission and goals and the teaching and learning taking place in the school.

A school profile might include the following items:

- statements of vision, mission, and goals
- grouping patterns
- school and community demographics
- student and teacher attendance figures
- number of students with free or reduced lunch
- grading summaries by grade and discipline
- student achievement test data
- extracurricular activities
- organization of curriculum
- relationships with community, cultural, business, and social services agencies.

If the profile is for an external review team, it might also include:

- planning documents
- policy statements
- floor plan of school
- school schedule
- areas of staff responsibility
- professional development activities.

Strengths and Areas for Consideration — Teaching and learning practices consist of the methods, strategies, resources, techniques, and materials that are used, in the classroom and related learning environments, to motivate students and engage them in an active, challenging process of acquiring the skills and knowledge needed for adult life. Teaching and learning which are present in a school should relate directly to the school's vision and goals, the values and assumption of the community, and accepted "good practice" as identified in current education research.

Although there are many beliefs about teaching and learning, a school review does not favor certain methods of teaching over others. The emphasis in a review is on inquiry rather than judgment. Through observation, exploration of student work, collection of documents, analysis of data, and above all, rigorous discourse, the partners in a review help a school learn what it does well for students.

Teaching and learning strengths are identified by engaging faculty and other staff in specific observation techniques to gather evidence of practices in the school that result in significant student engagement and higher student achievement. Self-review team members and other staff observers record only what they see and hear, without imposing personal judgment or bias. Evidence about teaching and learning is collected from various sources including peer classroom observations, student shadowing, review of student work, interviews, surveys, and other information-sharing techniques. A variety of evidence is important so that the school portrait is not skewed to the perceptions of one segment of the school community.

Evidence from classroom observations is collected and organized by using an observation form, which has been agreed to by the staff. The form provides points of departure to help the reviewer organize observed information. These points include teaching and learning environment, relationship of student work and classroom activities to learning standards, teaching strategies and learning opportunities, and student response.

A review might include student shadowing: a reviewer follows a student's schedule and observes the instruction and type of student experiences. Evidence from student shadowing centers on the kind of work in which the student participates while in the classroom. The reviewer might focus on answering the following questions: How engaged is the student? What is the student's level of concentration? How appropriate is the task to the student's levels of development, ability, and interests? What kinds of encouragement and opportunities are there for the student to think and work independently? Cooperatively? What opportunities are there for the student to reflect on progress?

When reviewing students' work, the work selected should represent a range of student abilities and types of work. Some things to look for when looking at student work include the range of the curriculum, the quantity of work covered, presentation expectations, and trends or signifi-

"There is no single route to classroom effectiveness. Teachers know this. It is one of the reasons that makes them wary of proposals for evaluation and appraisal which do not recognize the complexity of the teaching/learning relationship."

- W. Taylor -

Reviewing student work can be the most informative activity in determining the quality of teaching and learning.

cant features. Reviewing student work can be the most informative activity in determining the quality of teaching and learning. Some focus questions to consider include:

1. What kind of work are students engaged in?
2. What kinds of products and/or performances are students producing?
3. What kinds of inferences can you make about the quality of learning these students are experiencing?
4. Keeping in mind that what you saw is only a sample, are there any surprises/concerns?
5. Is there anything missing in these samples which requires further investigation?

Developing a Collective Perspective — The self-review team and/or the external team must achieve a shared view of how teaching and learning actually takes place in the school. This collective perspective informs plans for school improvement, including staff development, allocation of budget resources, and efforts to involve the larger community. The collective perspective is formed from the information gathered through the activities of the review. Each activity centers on finding responses to four fundamental questions that form the basis of the team's collective perspective.

- What do we want others to know about our school?
- What are we most proud of concerning our students' achievement, our curriculum, and the teaching and learning opportunities available in the school?
- How have we shared information and research about best teaching and learning practices?
- What do we need to do in order to continue improving?

The collective perspective is an expression of common understanding that emerges from systematic observation.

The collective perspective is an expression of common understanding that emerges from systematic observation. It evolves from rigorous exploration of experiences and understandings and through honorable sharing and commitment to the legitimate resolution of difficulties. The collective perspective is the core of the review's report. Professional development initiatives and resources align

with the needs and interests identified. The collective perspective becomes the driving factor in developing the action steps for improvement and criteria for success. The school may use the review process as the link between planned action and specific outcomes.

Using the Data Gathered in a Review — The information obtained through a self-review or an external review can be combined with student test scores to measure a school's success in improving teaching and learning. The review helps to define the baseline against which to measure the success of school improvement initiatives. It also provides data for decision making in regard to the alignment of professional development, curriculum development and revision, and the alignment of curriculum and assessment.

Creating a School Portfolio — The school portfolio provides a comprehensive view of the school and its community. It keeps an ongoing, dynamic record of school life, school change, and school progress. It also serves to document efforts and accomplishments and helps in planning future activities in school improvement. Information gained through the review's collective perspective as well as the information gathered before and during the review enable a school to answer the three focus questions of the portfolio: Who are we? What have we done that makes us proud? Where do we want to be? The portfolio can provide information to a variety of audiences, from prospective teachers and administrators to legislators and voters.

The portfolio addresses:
- *Who are we?*
- *What have we done that makes us proud?*
- *Where do we want to be?*

Celebrating — Those most affected by change must be aware of the progress being made. Teachers need to know what has worked well. It is equally important for the larger school community to feel the sense of accomplishment that encourages continued commitment to improvement activities. Periodically, the school should publicly acknowledge and celebrate the positive changes and improvements that have been made and applaud the individuals and activities that have contributed to the school's successes. Celebrations can include special publications, fairs and performances, and other community events.

Beginning Again — After the celebration, the school is ready to begin another period of inquiry, reflection, and improvement. After several years of self-review processes, a school can request an external review to get another perspective on how the school is doing at achieving its goals.

Conducting Learning Experience Reflections

Peer reviews can take the form of peer reflections on instruction or a review of teaching plans and learning experiences. The objective is the same in all peer reviews — to help teachers improve instruction. In each type of review, it is important to have a clearly defined process that outlines the roles and responsibilities of the reviewers and the teacher whose practice/work is being reviewed. Equally important is a set of criteria for the review. This guides the teacher's work and provides the reviewer with a focus for commenting on the teacher's work.

Peer Review Format

- *Introductions*
- *Teacher Presentation*
- *Quiet Time*
- *Reviewers' Feedback*
- *Teacher Response*
- *Full Group Conversation*
- *Summary*
- *Consultation*

Format for Peer Review of a Teacher's Presentation of a Learning Experience

Introductions — The facilitator gives an overview of the review's format, asks for a recorder, and distributes to each reviewer a reporting form that contains the criteria for review.

Teacher Presentation — The teacher presenter outlines the learning experience, providing information on the context in which the work was done, the targeted learning standard(s), and the performance indicators. The teacher may suggest a focus question for the review.

Quiet Time — All reviewers read the learning experience, examine all corresponding materials, and take notes on the reporting form.

Reviewers' Feedback — During this time, the teacher listens and takes notes; reviewers provide warm feedback (supportive and empathetic responses that emphasize the promise of the learning experience) and cool feedback (critical and comparative responses that emphasize the ways in which the learning experience may be enriched).

Teacher Response—The teacher responds to the peer reviewers' comments. Reviewers become the active listeners.

Full Group Conversation— Both teacher and reviewers engage in open conversation about the learning experience.

Summary—The recorder summarizes the session, reviews reference made to the criteria, and offers a general overall impression.

Consultation—The facilitator, recorder, and teacher presenter confer and complete a written report so that the teacher has immediate feedback on the learning experiences.

This design achieves a reasonable balance of teacher presentation, attention to the work submitted, warm and cool reactions, teacher response, and open conversation. The criteria for the review include:

- Relation to learning standards—Is the learning experience linked to performance indicators for specific standards?
- Construction of knowledge—Does the learning experience require students to construct their own knowledge?
- Challenge—Is the learning experience appropriately challenging to the learner?
- Engagement—Does the learning experience appear likely to engage students?
- Assessment plan—Are elements of good assessment incorporated in the experience?
- Adaptability—Can the learning experience be replicated in other classrooms?
- Integration of technology—Does technology, when used, assist students to complete the learning experience and achieve the learning standard?
- Value beyond school—Is the learning experience relevant? Based on real-world applications?
- Presentation—Is the learning experience developed so that other teachers can relate to it and easily adapt it to their own classrooms?

Conducting Peer Teaching Observations

The value of peer observations is universally endorsed by education groups; however, finding the time to do it is difficult. To have a valuable peer observation, the full process of conferencing is essential: discussions about teaching prior to delivery of instruction, classroom observations, and discussions about teaching after delivery of instruction. Peer observation is simply providing for teacher-to-teacher support just as educators provide teacher-student support. Peer observation can be the most accessible and least expensive form of professional development.

Having a peer in the classroom to judge performance can initially be threatening to many teachers. It is best to perform peer observations around a specific purpose rather than judging overall instruction. For example, the peer review might focus on the effective use of group learning or the integration of technology. Both reviewer and review are more comfortable when there is a well-defined focus.

Observing

The willingness to teach before a peer promotes professional growth. Teachers tend to be more thoughtful in instructional preparation, delivery, and follow-up when they know that a colleague is going to observe. Some teaching behaviors that might be the focus of data gathering during an observation are:

- patterns of calling on students
- balance of negative and positive feedback
- clarity of directions
- body language
- communication of intent
- wait time for questions
- balance of teacher and student talk
- dealing with mistakes
- correlation of activities to objectives
- checking for understanding
- strategies for helping students understand
- recognizing different learning styles
- strategies for encouraging students who choose not to participate

- time actually spent on instruction vs. administrative details
- reducing interruptions

To be successful, the observation needs to be done by a trusted and respected colleague who will give honest and constructive feedback. Throughout the process, the teacher and the peer observer should follow predetermined routines that guarantee the teacher will gain feedback relative to his/her interests in a dignified and constructive climate.

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Other Purposes

Not all observations are done to critique teacher's skills. Other purposes are:

1. "Kid watching" to give feedback to the teacher on the behavior of certain students.
2. Observing to learn about a curriculum, course, different grade, etc.
3. Demonstration teaching so that the observer can learn a new strategy or technique.
4. Analysis of an identified aspect of teaching for the teacher's reflection.
5. Observing to collect data for action research projects.
6. Idea sharing to gain new approaches or content to try back in his/her classroom.
7. Coaching by the observer on a technique or skill which the observer is more experienced.

Significance of Teacher Reflection on Teaching

Reflective practice is a tool for teachers to improve their own practice and become more effective professionals in their own right. Teachers must frequently make judgments and decisions with limited information and background on curriculum, the needs of individual students, methodologies, district goals, etc. To enhance teaching and learning, teachers need to be given the time, opportunity, and incentive to reflect critically and analytically on what they are doing and not doing and why. Developing reflective practice strengthens teaching. A teacher who is a reflective decision-maker finds joy in learning and in investigating the teaching/learning process.

To enhance teaching and learning, teachers need to be given the time, opportunity, and incentive to reflect critically and analytically on what they are doing and not doing and why.

Action Research

There are many variables that contribute to effective instruction. The characteristics of good learning experiences are as unique and varied as each student who makes up a class. This uniqueness and variation make it impossible to identify a simple standard prescription for improving teaching and learning. What works with one group of students may be unsuccessful with others.

Teachers make improvements by relying on a variety of sources: the advice of others, validated successful practices, and education research studies. One of the best ways to match an effective strategy to a teaching situation is through action research. Action research is a process in which participants examine their own practice systematically. It is a process or approach for solving problems. By carefully using research techniques, the teacher collects data and makes objective observations on the implementation of a particular strategy to determine if it is working. Action is a good term to describe this because these are active steps that a teacher takes to raise student achievement. Action researchers seek systematic answers to education problems or issues.

...the teacher collects data and makes objective observations on the implementation of a particular strategy to determine if it is working.

Action research is a powerful improvement technique since teachers work best on problems they have identified for themselves. Teachers become more effective when encouraged to examine and assess their own work and then consider ways of working differently.

...teachers work best on problems they have identified for themselves.

For example, a teacher might use action research to evaluate two algebra classes. The students in one class had instruction supplemented with computer-based instruction. The other class did not. Were there differences in achievement, or in areas of strengths and weaknesses? Another example would be to measure whether students working in groups who have greater choice in research topics prepare better reports.

This type of research leads to the continuous improvement of instruction. Teachers look for innovations they can introduce and systematically collect data to determine whether one technique works better than another. Teachers should continually pose questions about their innovations and apply action research techniques to reflect on which innovations led to greater improvement.

Collaborative action research involves teams of teachers inquiring into teaching responsibilities that they share. Often this might involve use of outside experts, such as university professors. Action research can also be schoolwide; the entire staff undertakes a problem and collects data on a course of action.

Action research begins with a question.

Action research begins with a question — with wanting to know whether a strategy does or does not improve learning. To get started, the teacher chooses a researchable topic. For example, if students have just started to use instructional technology in their independent research reports, the teacher could collect data on whether these reports are of better quality than those completed by students who did not have access to the new technology. By continually asking questions about their own instruction and collecting data, teachers can become researchers.

It is important that the educational practice being studied is one that the participants are committed to. This is often difficult to accomplish, which is why action research is most frequently done by the individual teacher. If teams or the entire staff engage in a research question, it should be a question that directly affects all of them.

Once the question is identified, decide how to collect data. One immediate thought is student test scores. This is an important data source, but often there are not test scores to measure the question being addressed. In this case other forms of data will work fine. Written materials, such as interviews, observations, logs, journals, and other reports all provide data that can be used for comparison and reflection. Data might also be in visual form, such as videotape. When collecting data through interviews or observations, try to have a specific set of questions to guide the data collection. By carefully thinking through the questions in advance, the information collected will be more precise.

Action research is systematic and involves collecting evidence on which to base rigorous reflection.

Action research is more extensive than teachers simply thinking about their teaching and how it can be improved. Action research is systematic and involves collecting evidence on which to base rigorous reflection. It is not just problem solving. Action research involves problem pos-

ing. It does not start from a problem, but is undertaken by a desire to improve and understand teaching and learning.

Action research is research by people on their own work to help them improve their practice. It treats people as autonomous, responsible agents who participate actively in making their own histories by knowing what they are doing.

Benefits of Action Research

- increased sharing and collaboration across departments, disciplines, and grade levels

- increased dialogue about instructional issues and student learning

- enhanced communication among teachers and students

- improved performance of students

- revision of practice based on new knowledge about teaching and learning

- increased teacher motivation

- teacher designed and initiated staff development

- development of priorities for schoolwide planning and assessment efforts

- contributions to the profession's body of knowledge about teaching and learning.

Stages in Action Research

1. Posing research questions around student learning

2. Systemically collecting research data

3. Taking action to make changes based upon data

4. Evaluating results by collecting more data.

Steps in Action Research - A Guide for Classroom Teachers

1. Develop research questions based on your own curiosity about teaching and learning in your class rooms.

2. Systematically collect data from and with your students.

3. Share and discuss your data and research methodology with fellow teacher researchers.

4. Analyze and interpret your data with the support of your colleagues.

5. Write about your research.

6. Share your findings with students, colleagues, and members of the education community.

7. Discuss with colleagues the relationships among practice, theory, and research.

8. Assume responsibility for your own professional growth.

(Source: Fairfax Co. Public Schools, Office of Research and Policy Analysis)

Action research involves changing both the researcher and the situation...

Action research is not just about hypothesis testing or about using data to come to conclusions. It is concerned with changing situations, not just interpreting them. A researcher makes passive observations. The teacher as researcher may make observations but also is interested in making changes based on those observations. Action research involves changing both the researcher and the situation in which he or she works.

VII. Additional Resources

Bibliography

    Print Resources

    Internet Resources

International Center Materials and

  Services

    Model Schools Conference

    Staff Development

    Tapes and Publications

Bibliography

VII. Additional Resources

The print and Internet resources below are organized in four sections:

- Teaching for Rigor and Relevance (Chapter I)
- Focus on Learning (Chapter II)
- Making a Difference with Professional Development (Chapter V)
- Techniques for Improving Instruction (Chapter VI)

These resources sections may be duplicated for distribution to workshop participants.

Teaching for Rigor and Relevance

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 peoples' "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.

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.

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.

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, National Center for Education Statistics. *Pursuing Excellence.* Washington, D.C.: 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.

Focus on Learning

Barringer, C., and Gholson, B. "Effects of Type and Combination of Feedback upon Conceptual Learning by Children: Implications for Research in Academic Learning," *Review of Educational Research* 49 (1979): 459-478.

> Reviews research that compares the effects of different kinds of feedback (verbal, symbolic, tangible) and feedback combinations on student's learning. Symbolic and verbal feedback had more powerful effects than tangible rewards.

Brophy, J. E. "Teacher Behavior and Its Effects," *Journal of Educational Psychology* 71 (1979): 733-750.

> Discusses findings of process-product research conducted during the 1970s; also discusses methodologies used in this research and presents research trends and recommendations for research activities in the future. Includes a section on the effects of teacher praise.

Brophy, J. E., and Evertson, C. M. *Learning from Teaching: A Developmental Perspective*. Boston, MA: Allyn and Bacon, 1976.

> Reports findings from the Texas Teacher Effectiveness Study on the effects of the behavior and expectations of second and third grade teachers on the achievement and attitudes of their students. Focuses on teachers' classroom management, questioning patterns and use of motivational techniques in high and low SES classrooms.

Brophy, J. E., and Good, T. L. "Teacher Behavior and Student Achievement." In: *Handbook of Research on Teaching*, edited by M. C. Wittrock. New York: Macmillan Publishing Company, 1986.

> Reviews and summarizes over 200 reports of process product research linking teacher behavior to student achievement. Includes a section on teacher praise and other verbal reinforcement.

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 ex-

perts go beyond research and theory to apply their work in two schools to change classroom instruction.

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.

Collins, M., Carnine, D., and Gersten, R. "Elaborated Corrective Feedback and the Acquisition of Reasoning Skills: A Study of Computer-Assisted Instruction." *Exceptional Children,* 1986.

> Studies the relative effects of basic feedback and elaborated feedback on the development of reasoning skills by special education and Chapter 1 students learning via CAI. Students receiving elaborated feedback outperformed the comparison group.

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.

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,* 2nd 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.

Good, T. L., and J. E. Brophy. *Looking In Classrooms* (3rd ed.). New York: Harper and Row, 1984.

> Discusses teacher behaviors and their influence on students. Provides guidelines for implementing effective classroom practices. Contains a section on reinforcement.

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.

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. *ITI: The Model — Integrated Thematic Instruction,* 3rd ed. Kent, WA: Books for Educators, 1994.

> This book describes a "brain-compatible" integrated curriculum, with sample materials.

Lysakowski, R. S., and Walberg, H. J. "Classroom Reinforcement in Relation to Learning: A Qualitative Synthesis," *Journal of Educational Research* 75 (1981): 69-77.

> Analyzes statistical data from 39 studies involving nearly 5000 students in over 200 classes to determine relationships between reinforcement and achievement. Found that the effects of reinforcement were positive and were constant across grades, races, private and public schools, students, and community types.

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.

Slavin, R. E. *Educational Psychology: Theory Into Practice.* Englewood Cliffs, NJ: Prentice-Hall, 1986.

> Presents concepts and practices from the field of educational psychology, accompanied by numerous real-life examples and commentary from teachers.

Walberg, H. J. "Improving the Productivity of America's Schools," *Educational Leadership,* Vol. 41, no. 8, (1984): pp. 19-27.

> Synthesizes the findings from approximately 3000 studies to determine the relative effect of over 40 factors, including student aptitude levels, instructional practices, and environmental factors. Found that the largest effects were produced by reinforcement.

Making a Difference with Professional Development

Carnegie Foundation for the Advancement of Teaching. *The Condition of Teaching: A State-by-State Analysis.* Princeton, NJ: Carnegie Foundation for the Advancement of Teaching, 1990.

Cordeiro, Paula; Kraus, Christine; Hastings, Sandi; and Binkowski, Kathleen. "A Problem-Based Learning Approach to Professional Development: Supporting Learning Transfer." Paper presented at the American Educational Research Association, March 1997.

Defour, Richard and Eaker, Robert. *Professional Learning Communities at Work: Best Practices for Enhancing Student Achievement.* Bloomington, IN: National Education Service, 1998.

> This excellent book is written from the actual experience of school practitioners who successfully created a culture of growth in school staff by looking at professional development as continuous process in a "learning community."

Guskey, Thomas R. "Research Needs to Link Professional Development and Student Learning." *Journal of Staff Development,* Vol. 18, No. 2, Spring 1997.

> Thomas Guskey is a leading expert on evaluation of professional development. This article outlines many of the issues related to improving the evaluation of professional development.

Joyce, Bruce; Wolf, J., and Calhoun, E. *The Self-renewing School.* Alexandria, VA: ASCD, 1993.

Lewis, Anne. "A New Consensus Emerges on the Characteristics of Good Professional Development." *The Harvard Education Letter.* Vol. 13, No. 3, May/June 1997.

Loucks-Horsley, Susan; Hewson, Peter W.; Love, Nancy; and Stiles, Katherine E. *Designing Professional Development for Teachers of Science and Mathematics.* Corwin Press, 1998.

> This publications provides an analysis and recommendations for various models of effective professional development. While written for mathematics and science education, it applies to all subject areas.

McLaughlin, M., Talbert, J., and Rosenholtz, S. *Teachers' Workplace: The Social Organization of Schools.* White Plains, NY: Longman, 1989.

National Foundation for Improvement of Education (NFIE). *Teachers Take Charge of Their Learning: Transforming Professional Development for Student Success.* Annapolis Junction, MD, 1996.

Gordon, Edward E., Morgan, Ronald R., and Ponticell, Judith A. *FutureWork.* Westport, CT: Praeger, 1995.

Sparks, Dennis, and Hirsch, Stephanie. *A New Vision for Staff Development.* Alexandia, VA: ASCD, 1997.

> 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.

Walberg, Herbert. "Generic Practices" in Gordan Cawelti, (ed). *Handbook of Research on Improving Student Achievement.* Arlington, VA: Educational Research Services, 1995.

Techniques for Improving Instruction

Anderson, C. L., Herr, K., and Nihlen, A. S. *Studying Your Own School.* Thousand Oaks, CA: Corwin Press, 1994.

Blum, R.E. *Effective Schooling Practices: A Research Synthesis.* Portland, OR: Northwest Regional Education Laboratory, 1984.

Brubacher, John W., Case, Charles W., and Reagan, Timothy G. *Becoming a Reflective Educator: How to Build a Culture of Inquiry in the Schools.* Corwin Press, Inc., 1994.

Calhoun, Emily Y. *How to Use Action Research in the Self-Renewing School.* Alexandria, VA: ASCD, 1993.

Costa, Art, and Garmston, Robert. *Cognitive Coaching: A Foundation for Renaissance Schools.*

Frenck, James H. *Peer Response and Exchange Process PREP.* Plattsburgh, NY: Champlain Valley Educational Services, 1997.

Glatthorn, Allan A. *Teachers As Agents of Change: A New Look at School Improvement.* National Education Association School Restructuring Series, 1992.

Kemmis, Stephen, and McTaggart, R. (eds.). *The Action Research Reader* (3rd. ed.); *The Action Research Planner* (3rd ed.). Deakin: Deakin University Press. [Australia], 1988.

McKernan, James. *Curriculum Action Research: A Handbook of Methods and Resources for the Reflective Practitioner* (2nd ed.). London: Kogan Page, 1996.

McLean, James E. *Improving Education Through Action Research: A Guide for Administrators and Teachers.* Thousand Oaks, CA: Corwin Press, Inc., 1995.

New York State Education Department. *The School Quality Review Initiative.* Albany, NY: New York State Education Department, September 1997.

Oja, Sharon N., and Smulyan, L. *Collaborative Action Research: A Developmental Approach.* London: Falmer Press, 1989.

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Selener, Daniel. *Participatory Action Research and Social Change.* Ithaca, NY: Cornell University, 1997.

Sergiovanni, T. J. *The Principalship: A Reflective Practice Perspective.* 3rd ed. New York: McGraw Hill, 1995.

Sergiovanni, T. J. and Staratt, R. J. *Supervision: Redefinition.* 5th ed. New York: McGraw Hill, 1993.

Short, Kathy, and Burke, Carolyn. *Creating Curriculum: Teachers and Students as a Community of Learners.* Heinemann Press, 1991.

Schmuck, Richard. *Practical Action Research for Change,* Allyn Bacon, 1998.

Sullivan, Cheryl Granade. *How to Mentor in the Midst of Change.* Alexandria, VA: Association for Supervision and Curriculum Development, 1992.

Winter, R. *Learning From Experience: Principles And Practice In Action Research.* London: Falmer Press, 1989.

Teaching for Rigor and Relevance

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.

The Effective Schools Home Page
http://www.voyager.net/
effectiveschools/
index.html

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.

TIMSS
http://ustimss.msu.edu/

Focus on Learning

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.

Pathways to School Improvement
http://www.ncrel.org/
sdrs/pathways.htm

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.

Ask ERIC Lesson Plans
http://ericir.syr.edu/
Virtual/Lessons/

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.

The Theory Into Practice Database
http://www.gwu.edu/tip/

This comprehensive site describes various funding programs and federal education initiatives.

U.S. Department of Education
http://www.ed.gov/
index.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.

Developing Educational Standards
http://putwest.boces.org/
standards.html

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.

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.

Making a Difference with Professional Development

Corcoran, Thomas B. *Helping Teachers Teach Well: Transforming Professional Development.* CPRE Policy Brief. **U.S. Department of Education, 1995**
http://www.ed.gov/pubs/CPRE/t61/

This research monograph highlights the important role of effective professional development in improving teaching.

Darling-Hammond, Linda. *Becoming a Teacher: A Never Ending Journey.* **Learn & Live George Lucas Foundation**
http://glef.org/learnlive/book/learn/darling1.html

Linda-Darling Hammond is recognized as one of the leading researchers on teacher preparation. She shares her perspectives in this excellent publication on school reform issues.

National Board for Professional Teaching Standards. *The Standards: What Teachers Should Know and Be Able to Do*
http://www.nbpts.org

The new national certification program has defined quality teaching and how to measure teacher preparation.

National Commission on Teaching & America's Future. *What Matters Most: Teaching for America's Future*
http://www.tc.columbia.edu/~teachcomm

This is a summary of teacher preparation recommendations following the work of a national commission.

National Staff Development Council
http://www.nsdc.org

The National Staff Development Council includes recommendations and resources for improving professional development systems including Staff Development Standards.

Includes excellent recommendations for teachers, synthesizing research and best practices. There are several excellent articles on professional development.

North Central Regional Educational Lab (NCREL). *Pathways to School Improvement*
http://www.ncrel.org/sdrs

Techniques for Improving Instruction

This regional science and mathematics center has collected several excellent resources on action research.

Regional Alliance
http://www.ra.terc.edu/alliance/
TEMPLATE/regional_networks/
cia/action/

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.

International Center Materials and Services

The following is a brief overview of some of the services. Additional information can be found in the back pocket of the binder.

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.

Model Schools Conference

Comprehensive staff development is essential to changing the way students are educated. Without a focused and sustained staff development program, any reform effort will fail to change what happens in the classroom. The International Center has developed a wide array of resources for developing and implementing high-quality staff development.

Staff Development

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 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.

Leadership Academy and Network

The International Center runs an annual Leadership Academy that covers topics including creating leadership teams, collecting and using data, and understanding what is on state and national tests. Principals, building-level administrators, and lead teachers are eligible to attend. A three-day workshop kicks off a year of support services known as the Leadership Network.

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. Educational practitioners describe proven techniques to manage change in schools and share results using case studies from around the world

The International Center's videotapes 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 research conducted by the International Center, compilations of case studies of schools and districts that have been successful in restructuring their education systems, staff development kits, and classroom resources.

Tapes and Publications

For additional information on any of the International Center's
services or resources, please contact:

International Center for Leadership in Education
1587 Route 146 • Rexford, New York 12148

(518) 399-2776 • (518) 399-7607 fax

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