

Thinking & Learning

Conference



BRUCE WELLMAN

Monday 25 May

Engaging and Extending Student Thinking

Session 1

MELBOURNE

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Engaging and Extending Student Thinking

Patterns & Practices in the Learning-Focused Classroom

Developed by
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Co-Directors



About the Developers

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Four Box Synectics

_____ is like

_____ because

Strategy Instruction

Cognitive activities learners can use to bring meaning to a task

1. Effective learning involves being able to access specific strategies with flexibility.
2. There should be a clear relationship between the strategy chosen and the task.
3. Expert learners know when to use a strategy, when to continue and when to abandon use.
4. Strategies should be taught as purposeful for effective learning and not as ends in themselves.
5. Explicit strategy instruction is an effective intervention with low achievers.
6. Transfer of specific skills use is not likely to occur without explicit instruction.
7. There are a number of skills which are critical across content areas.
8. Skills instruction seems most effective when the teacher models the skill, provides guided practice, and then moves to independent learning.

Adapted from: Jones, Palincsar, Ogle and Carr (1987) *Strategic Teaching and Learning*, Association for Supervision and Curriculum Development: Alexandria, VA.



PATTERNS & PRACTICES: A Teaching/Learning Cycle

As you peek into the classroom, the entire class has their eyes closed. The teacher verbally guides the students up and down the aisles of a large supermarket. She vividly describes the sounds, scents and colors of the various departments. As students are visualizing the products and displays, she asks them to imagine all the places that they might find numbers. Once the teacher finishes the visualization process, the students form trios to generate specific examples of numbers in action. Each team brainstorms examples of specific products and the weights, measurements and pricing structures related to them. These then become the springboard for a lesson on unit pricing.

Activating prior knowledge and linking it to the learning at hand is a fundamental practice in teaching for connection-making. Further learning in this unit will build upon these real world connections. These connections facilitate the application of knowledge and skills in and outside of school.

The Pathways Learning Model

Learning is a continual, developmental process in which individuals move through a series of phases. During this process the ways in which the learner relates to the information evolves. Think of learning something new as embarking on a long journey to an unknown territory. Initially, we acquire concrete information and the rote learning of relatively isolated facts. The terrain is strange, but we have some referents from previous experiences. Gradually we find ourselves primarily memorizing landmarks, and the names of important places. As we progress, we begin to discern patterns and relationships between discrete pieces of information, organizing it into an overview of the new territory. A schema or integrated map develops. We then have a global understanding, concepts which can be interpreted and applied to deepen understandings. At this stage alternative routes to navigate from one place to another begin to appear, and we can transfer understandings to new settings.

As we engage in new learning, we travel through three phases which correspond to the input, process, and output nature of learning tasks. Various models of thinking use different language to describe these phases of learning. All agree that different skills and strategies are employed by strategic learners at each phase. In the first phase we prepare for learning. In the second phase we explore and process information. In the third phase we apply, organize and integrate new information.

The learning-focused teacher organizes instruction in phases and is mindful of the developmental, nonlinear nature of learning. At each phase it is important to encourage students to pause, check, process, continue with or redirect their thinking. Our current knowledge about learning informs us that we must support students in making connections; connections between what they know and what they are learning, between what they are learning and the opportunity for application in a variety of contexts; and between the relevance of their newly gained understandings and their own lives.

The teaching/learning cycle presented here is the foundation of The Pathways Learning Model, which offers a framework for instructional design which applies current research to teaching for connectedness. This framework organizes instruction for connecting new information to existing understanding, discovering relationships, and integrating concepts for application and transfer. It creates a unity of knowledge which is functional, relevant and available for further learning.

The teaching/learning cycle defines three phases of instruction: 1) activating and engaging; 2) exploring and discovering and 3) organizing and integrating. These phases occur within a learning environment where teachers manage, mediate, model, and monitor; providing purposeful tasks, ongoing authentic assessment and structured group work. Focus on thoughtful processing, specific thinking skills and hands-on

application is a key component of each phase.

Phase One: Activating and Engaging

Meaningful learning is an interactive and cumulative process which occurs between a learner and new information. Effective learners are active, strategic, thoughtful and constructive in linking new information to prior knowledge. There is a strong connection between success in integrating new information and the level of background knowledge that the student brings to the situation. Ensuring that students access and bring their background knowledge to a learning task is crucial to their success.

Students who have been unsuccessful in a learning situation often do not have strategies for linking previous learnings to new information. For these students, prior knowledge is unavailable. Strategies to provide access to what learners already know, as well as strategies for organizing new information into patterns which will help them make connections and integrate new understandings are necessary for successful learning.

The *activating and engaging* phase is a launch point for learning. When organizing opportunities for activating and engaging, learning-focused teachers are aware of three critical functions. Activating and engaging activities enable students to 1) engage prior knowledge and experience, 2) enrich the mutual knowledge base by using individual and group work to organize an exchange of information, and 3) surface and clarify any misconceptions that they may be bringing to the learning situation. This phase also provides an opportunity for mental rehearsal, encouraging and supporting participation from all learners.

For those students who do not have success in recognizing or accessing

what they bring to a learning task, the activating and engaging phase provides strategies for making prior experience available.

Generally, activating and engaging calls for generative and associative thinking. Activities like brainstorming, identifying, listing, and envisioning are particularly powerful. In addition, during

this phase, the strategic learner will be setting the purpose for the task, considering and choosing specific learning or problem-solving strategies, forming predictions or questions, or looking for cues to begin organizing information.

The Pathways Learning Model

Organizing and Integrating

Synthesize and represent information
Develop frameworks and models
Catalog and index new understandings

Managing
Modeling
Mediating
Monitoring

Activating and Engaging

Engage prior knowledge, skills, and understandings
Expand the knowledge base for individuals and groups
Surface and articulate frames of reference

Exploring and Discovering

Examine and differentiate information in light of current schema
Investigate hypotheses, concepts, and principles
Reconsider and tentatively refine schema

Organizing Principles of Learning-focused Classrooms

Each phase of the teaching/learning cycle is purposefully designed to support current learning theory. The framework is implemented in a learning environment where student engagement with information and materials (authentic tasks) and with fellow students (interactive group work) combines with conscious monitoring of student success and instructional effectiveness (on-going assessment).

**Phase Two:
Exploring and Discovering**

During the *exploring and discovering* phase, students process and sort as they engage with the new material and with each other. Learners connect new information to prior knowledge activated in the preparation phase. Thinking

focuses on analysis, inference making, explaining and determining cause-effect relationships.

Learners compare and contrast information, identify gaps, consider new ideas and raise new questions. They monitor understanding by metacognitive self-questioning, such as “does this make sense; what do I know now, what do I need to know?”

The Pathways Learning Model

Organizing and Integrating

- classifying
- defining
- dev. analogies
- dev. metaphors
- evaluating
- generalizing
- interpreting
- prioritizing
- reflecting
- representing
- sequencing
- seriating
- sorting
- summarizing
- symbolizing
- synthesizing

Activating and Engaging

- associating
- brainstorming
- enumerating
- estimating
- forecasting
- hypothesizing
- identifying
- predicting
- problem posing
- recalling
- speculating
- visualizing

Declarative
Procedural
Conditional

Exploring and Discovering

- analyzing
- comparing
- computing
- contrasting
- describing
- distinguishing
- experimenting
- explaining
- identifying
- inferring
- measuring
- observing
- questionin
- relating
- seeking causality
- seeking effects

Cognitive Processes in Learning-Focused Classrooms

Strategies in each phase of the teaching/learning cycle cue specific types of student thinking. The Activating and Engaging phase prompts generative and associative thinking; Exploring and Discovering exercises processing skills; and the Organizing and Integrating phase directs the learner towards synthesis and evaluation. The dotted lines connecting the three phases indicate the recursive nature of learning. Although the instructional design identifies strategies in each phase of the cycle, an engaged learner’s thinking will move within and among each phase in a variety of ways while moving towards deeper understanding.

Learning-focused teachers support student discovery by organizing students into groups which are actively and directly involved in learning activities which are nonroutine and ill-structured. This encourages experimentation and problem solving. They can structure the opportunity for students to manipulate materials, explore a range of perspectives, and grapple with complex issues. The problems are open-ended and can have many possible correct responses. Success includes methods to demonstrate the problem-solving process as well as the solution.

Hands-on activities, problem-based learning, and case studies allow students to explore and discover together. Thus, the learning-focused teacher emphasizes the notion that we are all smarter together than any one of us is alone.

Phase Three: Organizing and Integrating

During the *organizing and integrating* phase students begin to “own what is now known.” At this stage effective learners integrate their recent experience and make connections between the new information and what they already know. They expand and refine their existing thinking patterns, or create new ones to incorporate their evolving understandings. Previously held concepts may be confirmed, refined or abandoned. To help them make sense of and retain new learnings they identify relevant examples and make personal applications.

Activities during this phase include summarizing, categorizing, mapping or graphic outlining, confirming or revising hypotheses and predictions, and generating examples and non-examples to test out new theories. Extending and elaborating new ideas also occurs when learners make novel applications or generate examples which require transfer to different situations. By mediating

students’ connection making, teachers create a bridge over which learning transfers to other contexts.

Learning-Focused Environments: The Teacher as Master Weaver

Learning-focused teachers integrate the threads of effective practice, weaving the patterns and themes that are the fabric of dynamic learning environments. They manage resources for high engagement and high success. They organize instruction and scaffold learning tasks to ensure high achievement for all learners. Learning-focused teachers model a commitment to continuous learning and mediate the students’ own meaning-making process. They monitor continually, and with a variety of methods, to determine the appropriateness of their curricular objectives, the effectiveness of their instructional design and the levels of successful learning for all students.

Managing

Learning-focused teachers manage the resources of the learning environment to organize authentic, meaningful instructional activities, and provide group experiences which support student learning. The classroom described in Chapter One featured carefully structured time, physical space, instructional materials and lesson formats. The interaction patterns enabled students to organize information, develop conceptual understanding, recognize patterns and themes, and learn from their own endeavors. Academic tasks were structured with clear directions, clear objectives and clear procedures. The teachers provided time and space for social information processing with peers. They managed curricular decisions, moving from isolated skills lessons to learning strategy lessons, sending the message to students that acquiring information is most useful when we understand it and can apply it.

Scaffolding

The scaffold is one of the most powerful managing strategies in the learning-focused teacher's repertoire. Just as the construction metaphor might suggest, an instructional scaffold is designed to be a temporary structure which is made available on an as-needed basis and removed when it is no longer necessary. Scaffolds allow learners to reach higher than they might without this support. Assistance may include verbal or visual prompts, gestural cues, remodeling of a strategy, structural formats, additional examples or whatever is necessary to ensure students' success in a learning task that might otherwise have been beyond them. Scaffolding strategy instruction gives students the confidence to strive for independent success, knowing that assistance will be available if necessary.

Scaffolds can be created for both process and product. For example, a classroom chart which posts the procedures or rules for brainstorming (see FLOW on p. 25), or examples of a particular social skill the class is working on are visual cues which remind students of important

process norms. A simple paragraph frame (see p. 37) is a powerful example of a product scaffold.

Scaffolds need to be both intentionally constructed and just as intentionally decomposed. Once students become increasingly independent, and have integrated the thinking and skills required for success, it is important to remember to remove the support.

These simple structures and purposeful teaching behaviors build capacity; creating a classroom where more learners are more successful more of the time—particularly at increasingly complex tasks.

Modeling

Ralph Waldo Emerson is credited as saying, "What you do speaks so loudly, they can't hear what you say." We agree; the power of modeling cannot be underestimated. Learning-focused teachers model metacognition; they think out loud about their own approach to a problem or learning task. They describe their own processes for creating an effective plan, or reflecting on a learning

Instructional Scaffolds

- Develop independent and strategic learners
- Support high performance learning levels early on
- Foster confidence and success

Designer's Mind: Developing Scaffolds

1. Project potential problem areas
In this (unit, topic, lesson, etc.) where might my students get stuck?
2. Analyze the task/process/content
*How might I break this task/process into increments?
What are the "walk-away" ideas?*
3. Identify strategies necessary for success
How do effective learners achieve success with this task/process?
4. Identify prerequisite learnings
What fundamental concepts, facts, knowledge, skills, attitudes are prerequisites to this learning?
5. Design prototypes
What models of process or products would support learning success?
6. Determine learner's focus
Where and how does the learner's attention need to be focused along the way?

experience. They model application of specific strategies and what to do when stuck or unsure, as well as a willingness to learn through trial and error.

They demonstrate the conventions of written, oral and mathematical language, through usage and displays; and exhibit the rigor of precision and high standards for learning.

Further, they display critical dispositions, such as curiosity, flexibility and perseverance. Most importantly, they model their commitment to learning by sharing their own learning challenges and goals, and by learning with and from their students on a daily basis.

Mediating

Learning-focused teachers mediate the interaction between the student and the learning environment; anticipating confusion, providing support, facilitating the acquisition of information, providing feedback and coaching students towards independence as learners.

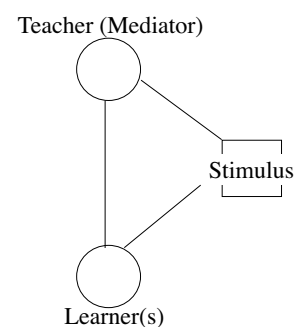
We borrow the term mediating from the work of Reuven Feuerstein, an Israeli psychologist who developed the concept of cognitive mediation. Cognitive mediation is a three-point interaction between the teacher (as mediator), the learner (an individual student or group of students), and a stimulus. The stimuli can include a body of information (text, video, music, etc.) a demonstration or the observation of some natural phenomena, or any event. Mediation can occur prior to, during and/or following any experience.

Cognitive mediation enhances learning and increases the likelihood of transfer by deepening the meaning-making process and by developing generalizations beyond the specific event or interaction. Learning-focused teachers intentionally guide experiences to clarify their purpose and importance, and to create opportunities for students to construct understanding.

Art Costa and Robert Marzano have identified seven ways that teachers can

begin to mediate the learning of their students by teaching the language of thinking. Their seven starting points suggest that teachers can:

1. Label thought processes, their own and their students', by using precise vocabulary for thinking processes.
2. Incorporate classroom questions that will require students to examine their own behavior.
3. Provide information to help students solve problems, rather than providing the solutions.
4. Give directions which require students to analyze the task and consider what resources or information they will need to perform the task successfully.
5. Be clear in defining terms, actions and descriptions by avoiding vague generalities.
6. Encourage metacognition by asking students to describe their thinking, to verbalize the questions they are asking themselves, and to plan out loud. Further, teachers can model these behaviors for their students on a regular basis.
7. Highlight linguistic cues which indicate relationships, such as sequence, causality, compare/contrast and addition (e.g., *then, since, but, however, and, both*).



Monitoring

Teaching and learning are an ongoing and reciprocal process. Teachers make purposeful choices during four distinct phases of this instructional process; while planning a lesson or unit of instruction, during the implementation of this plan; after teaching, while reflecting on the effectiveness of the instruction and then again while applying new learnings to the ongoing planning process.

Learning-focused teachers are reflective practitioners who engage in a continual cycle of self-assessment and self-directed learning based on their experiences. At each phase of decision making, these teachers monitor for the best match between instructional decisions and student success. Purposeful attention to the relationship between their own behaviors and the students' performance allows learning-focused teachers to make adjustments, modifications and refinements—in their “seat” while planning and reflecting, and on their feet while teaching.

Determinations are made about a variety of variables using multiple methods. These include the appropriateness of curricular outcomes, the effectiveness of teacher choices and behaviors on student performance, and the level of student achievement—academically and socially.

Gathering quantitative information, such as test scores, frequency of student responses, and attendance records, as well as qualitative information, such as students' expressions of understanding or confusion, social interaction patterns, and teachers' anecdotal records, drives the continual learning about, and improvement of, practice.

Three Levels of Knowledge

Current theories in learning and knowledge acquisition make distinctions between three levels of knowledge; declarative, procedural and conditional.

Declarative knowledge is knowing *what*. Facts, figures, dates and the famous people connected to historical events are all examples of declarative knowledge. Procedural knowledge is knowing *how* to do something. Examples of procedural knowledge include following directions, applying a principle or theorem, exercising a skill, such as measurement, or creating a visual display of data, such as a chart or graph. Conditional knowledge is knowing *when* or *why* to choose one strategy or process over another. Application of conditional knowledge presupposes a repertoire of learning strategies, as well as some criteria for choice-making.

Effective problem solving and decision making is contingent upon the application of conditional knowledge. While traditional classrooms engage students in sophisticated problem solving, the problems tend to be routine and highly structured. There is a correct response. In the learning-focused classroom, problems are nonroutine and ill-structured; there can be many possible appropriate responses. These problems are more “lifelike” in that the world is full of messy problems with no set answer. Conditional knowledge is applied to resolve uncertainty by making a well-thought-out choice. In fact, the process of problem-solving is as important as the final answer.

3 Levels of Knowledge

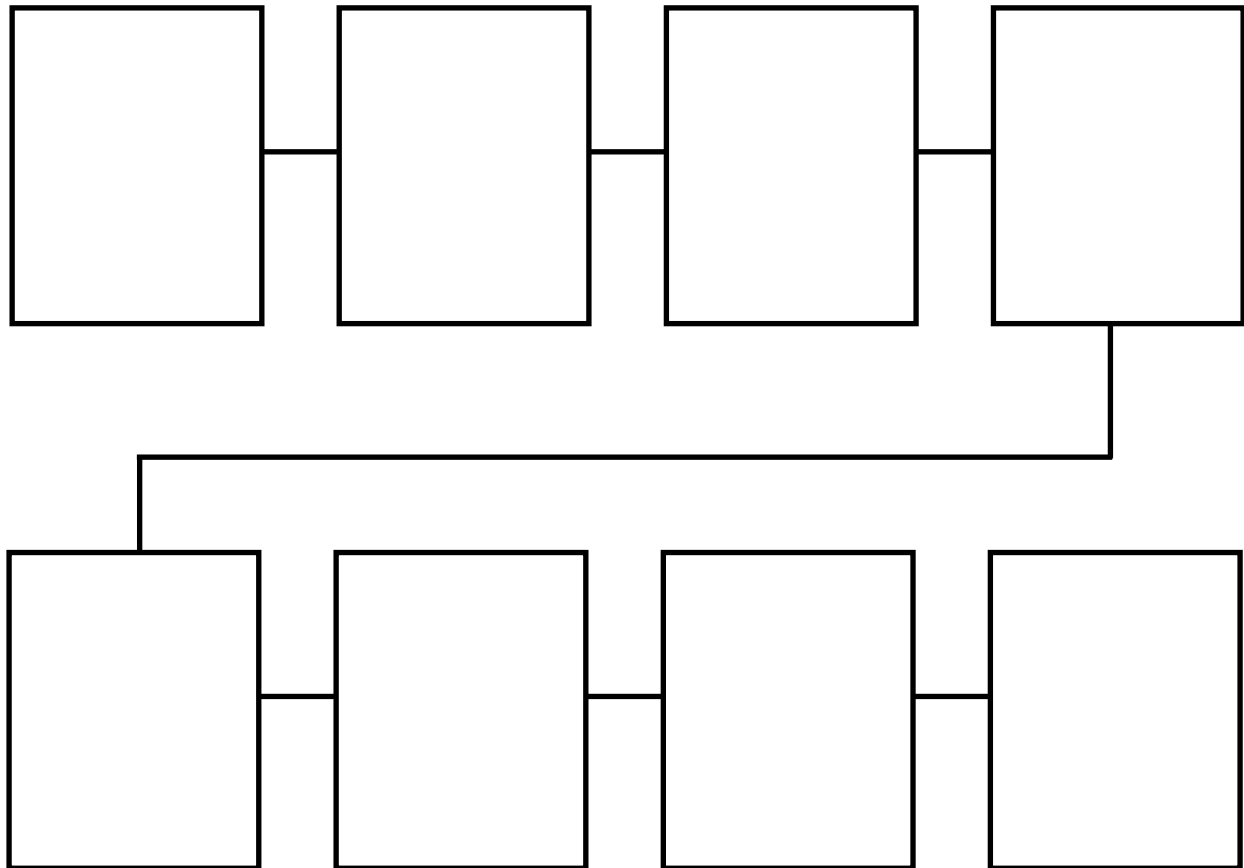
- **DECLARATIVE**
knowing *what*
- **PROCEDURAL**
knowing *how*
- **CONDITIONAL**
knowing *when*
and *why*

Beyond Beef

Iguana Farms -- A Wave of the Future

deforestation *Panama* *Costa Rica*
Stan Rand
dull-witted *52 acres*
chicken *50-cents-a-pound*
96 percent mortality rate
40 *five years*
domesticate *drainage pipe* *6.5 pounds*
2.5 acres *Styrofoam ice chests*

Chain of Events



OPIN

Many Moons

James Thurber

The king put his head in his hands again and _____. Suddenly he jumped up from his throne and pointed to the windows. "Look!" he cried. "The moon is already _____ into the Princess Lenore's bedroom. Who can explain how the moon can be shining in the sky when it is hanging on a golden chain around her neck?"

The Court Jester stopped _____ on his lute. "Who could explain how to get to the moon when your wise men said it was too large and far away? It was the Princess Lenore. Therefore the Princess Lenore is wiser than your wise men and knows more about the moon than they do. So I will ask her." And before the king could stop him, the Court Jester _____ quietly out of the throne room and up the _____ marble staircase to the Princess Lenore's bedroom.

The princess was lying in bed, but she was wide-awake and she was _____ out of the window at the moon shining in the sky. Shining in her hand was the moon the Court Jester had got for her. He looked very sad, and there seemed to be tears in his eyes.

"Tell me, Princess Lenore," he said mournfully, "how can the moon be shining in the sky when it is hanging on a golden chain around your neck?"

The princess looked at him and _____. "That is easy, silly," she said. "When I lose a tooth, a new one grows in its place, doesn't it?"

"Of course," said the Court Jester. "And when the unicorn loses his horn in the forest, a new one grows in the middle of his forehead."

"That is right," said the Princess, "and when the Royal Gardener _____ the flowers in the garden, other flowers come to take their place."

"I should have thought of that," said the Court Jester, "for it is the same way with the daylight."

"And it is the same way with the moon," said the Princess Lenore, "I guess it is the same way with everything." Her voice became very low and faded away, and the Court Jester saw that she was asleep. _____ he tucked the covers in around the sleeping Princess. But before he left the room, he went over to the window and _____ at the moon, for it seemed to the Court Jester that the moon had _____ back at him.

Button-Button

Materials

Buttons - 20-30 per student pair
 Chart paper and markers
 Paper or cloth bags (1 per pair)
 Drawing paper
 Crayons



Buttons can be sorted by many different properties -- color, size, number of holes, etc.. In these activities, children explore button sorting and the properties of buttons through literature, science, math, art and writing.

Preparation:

1. Prepare a language chart with the heading -- The Properties of Buttons for use after reading The Lost Button chapter in Frog and Toad Are Friends.
2. Prepare bags of buttons for student pairs. Put an assortment of 20-30 buttons in each bag.

Activating and Engaging

1. Gather the class and read The Lost Button chapter from Frog and Toad Are Friends. Ask children to listen carefully for words that describe buttons.
2. On the chart paper, list the words that the children suggest describe buttons. (black, white, two holes four holes, small, big, square, round, thin, thick)
3. Display a group of buttons and ask the children to find Toad's button.
 (white, four-holed, big, round, thick)
4. Ask the children for other words that describe buttons. Add these to the chart with a different colored marker than you used for the initial list.

Exploring and Discovering

1. Pair students off and give each pair a bag of buttons. Ask the student pairs to sort their buttons in many different ways. After ten to fifteen minutes, gather the class and ask teams to describe and demonstrate ways to sort buttons.
2. Add any new words to the Button Chart. Use a different colored marker than any you have used so far.

Going Further

1. Review the list of property words for buttons. Challenge student pairs to think of new ways to sort their buttons. Buttons can be sorted by texture, sound (by dropping on tables or floor), material, function (coat button, shirt button, etc.) edge standing, floating-sinking, and many other ways.
2. After sufficient working time, gather the class and have students share their sorting schemes.
3. Add any appropriate new words to the Button Chart. Again, use a different colored marker from any used previously.
4. Buttons can be explored by feel alone. Provide student pairs with paper or cloth bags. While one partner closes his or her eyes, the other puts a button in the bag. The first partner then reaches in the bag and while feeling the button, describes it to their partner. More than one button can be placed in the bag, with the challenge being to find, by feel alone, the button that the partner describes.
5. Buttons can be sorted and grouped by more than one property at a time. Thin, white buttons is an example of a two-property sort. Generate examples of other two property sorts with the class.
6. Have student pairs explore two property sorting. This has important developmental implications. Some students will be able to do two, three, and possibly four property sorting. Others will have difficulty moving easily beyond one property.
7. You can further extend the idea of unusual sorting schemes by challenging student pairs to develop a unique sorting systems. Others can then try to figure out the key property or properties that define a group of buttons. It may be best to demonstrate this with the whole group first. This makes an excellent on-going circle time activity or learning center "puzzle of the day".

Favorite Buttons

1. Read The Button Box by Margarette S. Reid to the class. In this delightfully illustrated book, a young boy plays with the buttons in his grandmother's button box. He imagines where the buttons came from and his grandmother tells him about the materials from which the buttons are made. The final page gives a history of buttons.
2. After reading, have each child select a favorite button from his or her button bag. Ask them to think about the button and imagine the garment from which it came. Have the students draw the garment and its buttons. When the drawings are complete, have students write about the garment and its buttons using appropriate property words from the Button Chart.

Organizing and Integrating

1. Read The Important Book by Margaret Wise Brown to the class. This classic is worth reading more than once. It has a predictable pattern.
2. Use the pattern of The Important Book as a model for writing about buttons. Have children generate a list of the important things about buttons. Discuss which of these are the really important things. Have students use these as the first and last lines of their writing pieces.
3. Read The Yellow Button by Anne Mazer. This book uses a widening horizons pattern. Again, this pattern can be used as a model for student writing and illustrating.

SCRAMBLED SENTENCES

Purpose

Scrambled Sentences close a lesson by capturing and sharing important idea from the session. This high energy strategy provides opportunities for individual and collective synthesis with a ceremonial spirit or ending a session.

Intention

This strategy focuses energy and attention by providing a clear structure for integrating ideas and information from a session. Scrambled Sentences provides each participant with a means for contributing to the final summary of the session and builds community through group member interaction and sharing.

Instructions

1. Distribute index cards and instruct each participant to record a keyword that captures an important idea from the session.
2. Have participants leave their tables and move around the room greeting others.
3. Signal a halt and instruct participants to form groups of four and share their key words. Have the groups eliminate any duplicates and substitute other appropriate key words.
4. Direct the groups of four to craft a sentence using their keywords.
5. Form a circle around the perimeter of the room and have each group share

Tips

Line up the quartet members to match the order of the keywords in their sentences. This adds to the clarity of the presentations. Suggest that groups practice their sentence and add verbal and nonverbal impact to their presentation.

Logistics

Materials and Preparation
An index card for each participant

Variation

If time permits, especially at the end of longer sessions or series, have quartets write their Scrambled Sentences on chart paper with the key words emphasized. Post these on the wall.

Time

10–15 minutes depending on full group size
Grouping: Quartets, full group

If... Then...

If I remember to . . .

Then I'll be able to . . .

Name

3 :

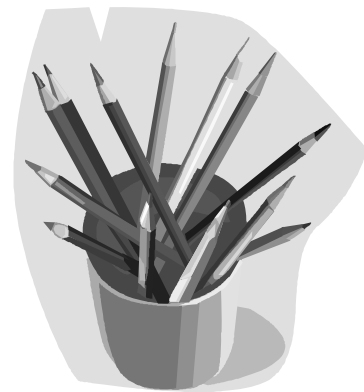
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Learning Partners

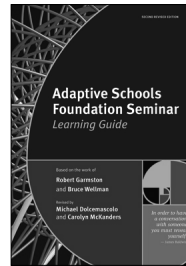
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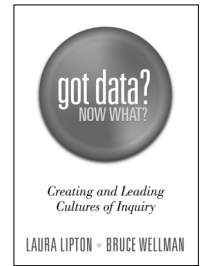
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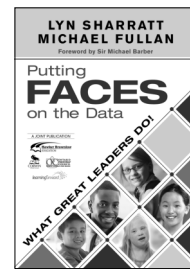
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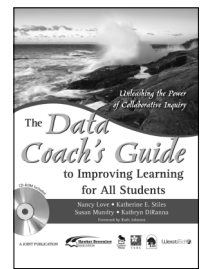
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