# When Teachers Tackle Thinking Skills

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Asking the right questions in the right ways can prompt well-developed, detailed, and thoughtful responses from all students.

"If I could start over again, I would teach kids how to think before teaching them how to write."

It was this casual remark that spurred a group of teachers in Highland Park, Illinois, to begin research that eventually led to a districtwide thinking skills program. With financial support from the district, this nucleus of teachers initially investigated two subjects during a summer workshop: making inferences and making analogies.

There was a clearly indicated need for focusing on these two areas. Teachers noted that kindergarten children had problems making inferences from pictures. Similarly, 6th graders failed to see the humor in political cartoons because of their inability to interpret clues in the pictures and captions. The group administrator noted as well that the best teachers used analogies to help children see relationships between new ideas and concepts they already understood. We hoped to improve students' independent reasoning by helping them make these connections.

During the summer, the teachers compiled a list of source readings and worksheets on inferences and analogies. We soon discovered, however, that these materials were ineffective

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**Figure 1. Making Inferences.**

| | *Innate—but need to be made aware* | | *Requires some introductory teaching* | | *Requires understanding of previous stages to interpret material* | |
|---|---|---|---|---|---|---|
| *From:* | Body language | Sound, silence, taste, touch, smell | Visual clues (using artifacts, pictures, symbols, cartoons, maps) | Simple written text | Complex written text | Propaganda, evaluation of text—point of view, political speech, advertisement, political cartoons |

because they lacked continuity and relevance to the total learning process.

## Developing a Continuum Model

What proved most valuable was an original continuum of separate skills that the teachers had identified as developmental stages in the making of inferences (see Figure 1). The kindergarten teacher in the group recognized that the practice of making inferences does not begin as we teach reading comprehension but rather in early childhood—children make inferences from body language, sounds, and visual clues long before they enter school.

To implement this continuum, workshop participants suggested strategies they were already using in their classrooms. Teachers began to see the connection between ideas they practiced regularly and a process of thinking. They also saw how strategies to help kindergarten children make inferences from body language later enabled 4th grade students to make inferences from a reading passage. For the first time, teachers could see the sequential stages necessary to develop a thinking skill.

During fall staff meetings, the summer workshop participants began to share some of these strategies with colleagues. As we worked through the strategies, we began to see the interconnection between one thinking skill and another.

Staff members agreed to use John Wyeth's painting, *Christina's World*, to see what inferences K-6 children would make from visual clues. Some teachers were more successful than others. One 1st grade teacher complained, "All I got were literal answers. The children made no inferences at all. Why, the kindergarten teacher had better responses from her children than I did from my 1st graders. I must have been asking the wrong questions."

She was. As a result, the group decided that we needed to backtrack, to learn more about questions that would raise the level of thinking from literal to interpretive.

## Questions: Key Element in Thinking

While "questioning" exists in all classroom settings—in oral discussions, written assignments, and tests—current research states that 80 to 85 percent of all questions asked by teachers are on a factual level. This was something we certainly wanted to change. We felt that the starting point for stimulating student thinking skills begins with the teacher's ability to handle questioning techniques. We also felt that good teacher modeling is the first step in helping children create good questions themselves.

Once aware that the questions we posed determined the level of thinking and the quality of the response, it made sense to introduce all teachers to Bloom's Taxonomy of Educational Objectives (1969). Many teachers found the taxonomy rather complex, so we created a simplified version of question types correlated with the taxonomy and Guilford's Structure of the Intellect. The four types of questions

**Figure 2. Four Types of Questions.**

| *Question Types District #108* | *Bloom's Taxonomy* | *Guilford's Structure of the Intellect* |
|---|---|---|
| 1. Factual | Knowledge/Comprehension | Cognition/Memory |
| 2. Interpretive | Application/Analysis | Convergent Thinking |
| 3. Creative | Synthesis | Divergent Thinking |
| 4. Evaluative | Evaluation | Affective, Convergent Thinking |

are factual, interpretive, evaluative, and creative (see Figure 2).

Improving questioning techniques involved a three-step process:

1. Teachers needed to know the four question types and the quality of responses that resulted from each type.

2. Students needed to be able to identify and respond appropriately to each question type.

3. Students themselves needed to begin to ask better questions.

A problem arose when teachers applied higher level questioning skills to class assignments as well as discussion. Students understood that a higher level answer could not be simply repeated from the book, but they did not know how to begin developing an appropriate response.

A teacher on the thinking skills committee reported she had given her 5th grade class what she thought was an excellent assignment: "Compare the Iroquois Indian family with a modern American family." It combined higher levels of thinking with the process of essay writing. To her dismay, her students struggled, frustrated, unable to meet or even understand the expectations of their teacher. To her credit, the teacher was able to pinpoint the problem: she was asking her students higher level questions without providing them with the strategies they needed to give a good response.

We obviously needed to spend more time with the second step of our three-step questioning process. We could not ask children to answer questions requiring them to make relationships without reviewing with them the various stages of the process. Whether we used the phrase "transfer theory," "making analogies," or followed the synectics philosophy of "making connections," the point was the same. We needed to help students integrate new material with concepts already familiar to them. What evolved was an easy-to-follow, systematic approach to the process of making relationships, beginning in kindergarten and building each year through 8th grade (see Figure 3).

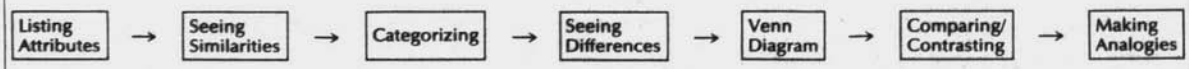
## Putting the Show on the Road

We were now ready to share our information throughout the district. In one building, we tried out the continuum on inferences and the underlying strategies. We had teacher feedback on what strategies worked and how they could be adapted for various grade levels. During the second summer of planning we included teachers from other buildings and from junior high subject areas, such as science and math. Through them we were able to add new strategies to our repertoire—strategies adaptable to all subjects and all grade levels.

Last year we began a districtwide program of thinking skills, using members of the committee to lead grade-level workshops on inservice days. At each of the workshops, the leaders gave a rationale for the thinking process being taught. They helped teachers to realize that they were probably already using many of these techniques. Our goal, they explained, was to make teachers aware of how these and other strategies improve thinking and how they fit into particular curriculums.

The first workshop focused on questioning skills. In addition to providing teachers with our questioning model, we showed them how children could practice writing questions—for example, by giving children an answer and having them compose an appropriate and corresponding question. We began with factual questions, which are the easiest type and which can help children quickly learn the need to be specific and precise. From there, we moved to interpretive, creative, and evaluative questions. The more we worked with teachers and students on the four question types, the more *we* learned. We found, for instance, that (1) interpretive questions were the most effective and most frequently used to achieve higher level thinking in the content area, and (2) in order to answer the majority of interpretive questions, students needed to know how to make inferences.

**Figure 3. Making Relationships/Analogies.**



Thus, our next set of workshops dealt with making inferences. Teachers first worked through the continuum, and at each stage were given background theory along with practical strategies they could use immediately in their classrooms. No matter what grade level the workshop was intended for, we began with what we had learned from the kindergarten teacher who clued us into the first developmental stage of making inferences. She reminded us that children know much about inferring long before they enter kindergarten and that they enjoy using big words. They can understand and use the word "infer" provided they have experiences that teach and reinforce the concept.

### Making Inferences from Sensory Clues

Each teacher was given a continuum on making inferences (see Figure 1). We began with simple strategies, such as the following:

*What Is My Mood?* Stand in front of the room and ask the children to guess how you are feeling as you frown, fold your arms tightly across your chest, and tighten your lips. Within moments the children will begin to use adjectives to describe your mood. The key is to ask them, "How do you know?" Children need to be able to substantiate their inferences by saying, "You are angry *because* your mouth is tight," and so on.

### Making Inferences from Visual Clues

*What Do I Know About This Culture?* Ask students to pretend they are archeologists living 500 years from now. They uncover an American coin. What inferences might they make from the coin? (The society knew about metallurgy, had a writing and number system, probably had a government that minted the coins, and so forth.)

*Making Inferences from Text.* With enough practice in making inferences from visual and sensory clues, children should be able to make inferences from word clues in a sentence. With the "cloze" technique, youngsters guess a word or the meaning of a

**"Children can learn to ask pertinent questions and make inferences and analogies if taught in sequential steps beginning as early as kindergarten."**

**"Advertising is a natural for inferential analysis; text can be interpreted from different points of view or analyzed for propaganda."**

word early on in the reading process. (For a complete description of the cloze test, see Thelen, 1982). For example, "The boy tripped and, f--- into the river." Good readers, using context to infer the unfamiliar word, know it is *fell*. A good teacher will capitalize on this skill and ask children to explain *why* they picked this word. (It begins with an "f" sound; if the boy tripped, he probably *fell* into the water).

From such an inference based in the 1st and 2nd grades, we can then ask children to make inferences from a paragraph. Too often, teachers spend too much time on literal questions and do not take time to ask probing inferential questions. Lessons then become mere exercises in rote recitation of facts rather than discussions using thinking skills. Yet research supports the idea that children apparently make inferences *as* they read (Carr, 1982), not only after they have discussed the facts. We often do not give children enough credit for their innate reasoning ability.

Kathryn Carr uses the story "Stone Soup" to describe the "empty slot" technique, the next step following the "cloze" strategy. The empty slot is the unwritten information that can be inferred between one group of sentences and another. Here is Carr's example: "There once was a poor man who was lost in a bad storm. He had only a few nuts to eat that he found in the forest." (Much can be inferred about the man and his actions between these and the following sentence.) "Finally, he went to a large house to beg for food." Note the data that can be gained by asking probing questions:

1. What do we know about the man besides what is stated in the first two sentences? (He was probably hungry; he saw a large house; he had been walking through the forest.)

2. What clues tell us this? (He had only a few nuts to eat; he begged for food; he went to a large house.)

By exposing children to such paragraphs and making them aware of the clues they used to support their conclusions, we enable them to use this strategy in future lessons. As children develop greater skills in making inferences from simple contextual clues, teachers can move to more difficult and varied materials. Advertising is a natural for inferential analysis; text can be interpreted from different points of view or analyzed for propaganda. Even political cartoons require children to recognize symbols, be aware of current events, and make connections between reality and the absurd.

### Making Relationships/ Analogies

Middle grade teachers often assume that children have learned how to compare and contrast—to see relationships. We have learned that making relationships requires preliminary skills. For instance, children need to conceptualize what an attribute is before they can see similarities. (The term "attributes" was chosen for continuity through the grade levels, but other terms—traits, properties, characteristics—could be used.) Once children can identify the common factor in two items, they have advanced to categorizing. It is important that children give a rationale behind their thinking, for unless we specifically point it out, most students are unaware of the thinking processes involved in formulating relationships. Children need to be consciously aware of "thinking about their thinking" (metacognition).

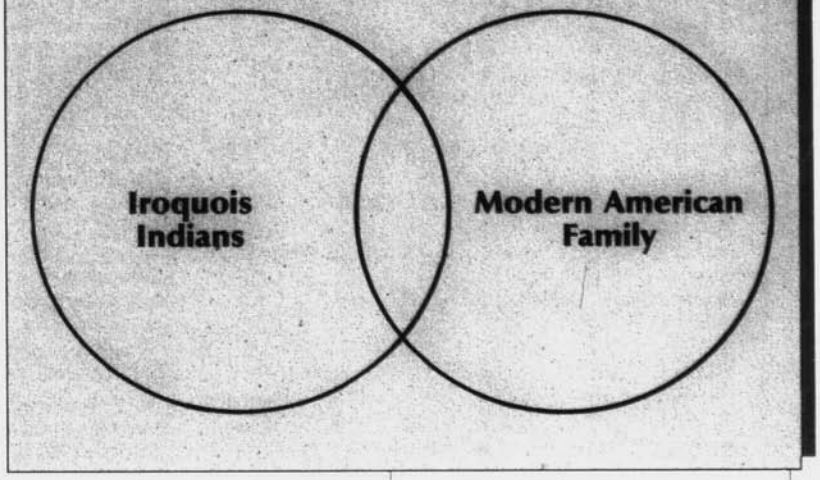
When they understand relationships, students are ready to tackle comparing and contrasting. Practice on the initial steps enables them to eventually succeed at making complex curriculum-based relationships and analogies. At last, our students were equipped to respond to the request, "Compare an Iroquois Indian family with a modern American family."

Taking students through this step-by-step process enables teachers to determine at exactly what point students have problems and more adequately help them. Students will eventually integrate the preliminary steps.

Not all students make this intuitive leap from lists of similarities and dif-

ferences to well-organized written and oral comparisons. One method we found to visually assist them makes use of the Venn diagram. The 5th grade teacher who posed the comparison with the Iroquois Indians had observed the kindergarten teacher using jump ropes to create Venn circles as a means of demonstrating overlapping attributes. Piggy-backing on this idea, the 5th grade teacher had students put the attributes in the two circles, similarities in the intersection. The visual imagery simplified the use of the data when it was time for writing the essay.

**Figure 4. Venn Diagram Showing Common Characteristics of Iroquois Indians and a Modern American Family.**




### Lessons Learned from Our Experience

1. In summary: Because teachers were involved from the beginning of the thinking skills learning process, they were invested in the program.

2. Teachers supplied continuous feedback on the program as they tried out strategies in their classrooms and reported what worked and what did not.

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3. As committee members taught thinking skills to their students, they became more comfortable with the process and were more willing to share with colleagues throughout the district.

4. Theories and practical strategies are equally important but the presentation of both in a unified manner, at each grade level, motivated teachers to work on the process.

5. With teacher workshop hours the only expense, program costs were minimal; using staff "experts" eliminated any need to hire outside personnel.

6. For the first time, teachers were able to see how strategies they use at one grade level are necessary in developing more sophisticated thinking skills at the upper grades. Primary teachers can now see the ultimate goals toward which children are working, and upper grade teachers can appreciate each preliminary stage on which elementary teachers have worked.

Though immediate plans for the future call for workshops on making analogies, our teachers have begun exploring other areas for future delivery. One teacher recently developed materials for teaching math problem solving; our 1984 summer workshop explored "sequencing and patterns," and "cause and effect." We also hope to devise tests that will validate our efforts.□

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