

## Snapshot #13

### Teaching Questioning Skills: Franklin Elementary School

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#### RESEARCH FINDINGS

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The Northwest Regional Educational Laboratory's 1984 document, *EFFECTIVE SCHOOLING PRACTICES: A RESEARCH SYNTHESIS*, identifies several research findings related to the development of higher-level thinking skills. In schools and classrooms where students' higher-level thinking is encouraged and fostered, many effective schooling principles are in place, especially:

**L.2 THERE ARE HIGH EXPECTATIONS FOR STUDENT LEARNING.**

**L.4 INSTRUCTION IS CLEAR AND FOCUSED.**

- Students have plenty of opportunity for guided and independent practice with new concepts and skills.
- To check understanding, teachers ask clear questions and make sure all students have a chance to respond.

**L.5 LEARNING PROGRESS IS MONITORED CLOSELY.**

In addition, recent research in the area of critical thinking demonstrates that when teachers ask questions calling for such higher mental operations as application, analysis, synthesis, and evaluation, student achievement is enhanced. Finally, research on questioning reveals that teaching students how to respond to and how to frame higher-level questions is positively related to their voluntary participation in these higher cognitive processes in classroom discussions.

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#### SITUATION

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On the northern coast of Washington's Olympic Peninsula, overlooking the Strait of Juan de Fuca, lies the city of Port Angeles. Port Angeles is home to approximately 17,000 people, whose livelihood depends on such local commercial enterprises as shipping, logging, and paper mill operation. Port Angeles is also the site of a Coast Guard base, and the city's proximity to Olympic National Park has created a brisk tourist industry.

The Port Angeles School District serves 4,600 students in one high school, two middle schools,

and six elementary schools. Franklin is one of the elementary schools, with a student population of 561 in grades K- 5. Reflecting the surrounding community, Franklin students are nearly all white/non-Hispanic, and the socioeconomic levels of Franklin families range from low income to upper middle class.

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## CONTEXT

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"Questions--not answers--are the heart of education." These could be the words of Socrates, but were in fact spoken by Franklin teacher, Dennis Duncan. A teacher for more than 30 years, Duncan has always been interested in the role of questions in classroom instruction and has familiarized himself with the research on effective classroom questioning strategies. About 20 years ago, he also began working with techniques for teaching students to ask clear, pertinent questions that will enable them to find out what they need to know.

This dimension of Duncan's interest in questioning strategies began when he participated in a series of workshops presented by the Northwest Regional Educational Laboratory in the early days of the Laboratory's operation. The workshop series, titled Inquiry Development, was aimed at training teachers to ask more effective questions and to teach their students questioning strategies and other critical thinking skills.

A summer course called Operation Innovation helped Duncan to refine his strategies and to take the focus off learning CONTENT in favor of learning PROCESSES. Within the context of the science laboratory classes he was teaching at that time, Duncan came to realize that if students have well-developed inquiry skills, they will have no difficulty acquiring content knowledge.

"Kids need to be able to state a problem clearly in their minds and then know how to systematically ask the questions that will help them resolve it," Duncan says. He believes that students need to be able to understand syllogisms, construct "if...then" propositions, and to reflect on the data produced by the inquiries they make. "Kids need to be able to formulate theories, and then gather data to refine those theories."

Today Duncan teaches gifted students in grades four and five from all schools in the Port Angeles district and heterogeneous classes of second and third graders. He teaches critical thinking skills, particularly logical reasoning and questioning, with the approach differing depending on the students, the subject matter, and the setting (whole class, small group, or tutorial).

At the time the present writer visited Franklin, Duncan was also teaching remedial mathematics students in grades one through five. In his experience these students often need extra help because numbers and the processing of numbers are not meaningful activities for them. "Kids who have trouble in math generally can't count backwards," says Duncan. A simple exercise like learning to count backwards and then to count backwards in clusters (by sevens, for example), can often "loosen up" a child's ability to process numbers mentally and provide an experience of success. These students also work with manipulatives and are taught to ask the kinds of questions that will help them solve math problems.

Gifted students participate in inquiry classes. A major feature of these classes is the presentation of a situation with some element of mystery to it, e.g., "A boy was playing by himself in an old abandoned house. Later, he was sitting with a paper bag over his head." Students ask Duncan questions that will enable them to get at the who-what-where-when-how-why of the situation and solve the mystery. These questioning games have different rules within which the students must operate, e.g., during some rounds, students may ask only yes-or-no questions. One constant rule, however, is that students may not ask questions which would require Duncan to do their thinking for them. Questions structured such as, "Will you explain why...?" are not permitted. Work with the gifted classes also includes computer programming. Students use the Logowriter

program to solve problems put to them by Duncan. Getting the answers they need requires that they use the inquiry skills they have been practicing in other class activities.

Charged with developing a thinking skills class for some of Franklin's second and third graders, Duncan has developed a series of games which comprise the heart of the thinking skills curriculum. These may involve identifying a mystery number or a mystery president, or call for exposing a tricky construct. For example, in the Gramma Game, students may be told that gramma likes apples but not pears, and that she likes puppies but not dogs. Whereas students usually begin by trying to identify conceptual similarities among the things "gramma" likes, persistent application of inquiry skills reveals, in this variant of the game, that gramma likes things with double letters and doesn't like things which lack them. Duncan has packaged some of his Interactive Thinking Skills Games and made these available to teachers in the Port Angeles district and beyond.

Duncan also teaches the New Jersey-based curriculum, Philosophy for Children, which uses stories to stimulate questioning and discussion, with the teacher serving as a facilitator of classroom interactions.

Whether he is working with gifted, average, or remedial students, there are several elements that Duncan brings to his teaching, and these reflect his overall goal of "sending students out into the world so that they can learn forever."

He is respectful of students and holds high expectations for them. These he communicates by offering them challenging but attainable tasks and letting students know he believes in their ability to succeed at them. He communicates warmth through words, tone, and gestures, such as a supportive hand on the shoulder. He creates a responsive environment in which questioning by students is not merely acceptable; it is encouraged and actively taught. Duncan also uses cooperative learning groups for some activities, so that students learn to function as team members and practice their inquiry skills with one another. These practices are congruent with research findings regarding effective classroom instruction and were readily observed in the classes visited.

What about the cognitive and affective results produced by Duncan's approach? Data from the gifted and the third grade thinking skills classes are mostly anecdotal: students claim the strategies Duncan teaches them are useful in their other classes, and they like the thinking skills games. In fact, Duncan's reduced availability to some of his students (now that he has been given additional program development tasks) is viewed with disfavor by virtually all affected students. Parents like and support the inquiry classes and enjoy their own participation in the thinking skills games during parents' nights at Franklin. Teachers whose students work with Duncan report increases in those students' analytical skills-- increases which they believe are enhancing overall achievement. Finally, former students frequently contact Duncan, thanking him for his role in teaching them how to think.

Identifying changes in the achievement of remedial mathematics students is a more straightforward matter, and Duncan's tutoring program has been credited for improvements in student achievement. On the average, his students have demonstrated a ten percent gain per year on the mathematics subtest of the Comprehensive Test of Basic Skills (CTBS). Duncan is quick to point out, as have countless others, that remediation is most effective with younger children. In 1987-88 his fifth graders gained only five percent on the CTBS, while his second graders' scores increased by 26 percent.

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### **PRACTICE: INQUIRY SKILL DEVELOPMENT IN A SECOND GRADE CLASSROOM**

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Duncan entered a second grade classroom and the regular teachers turned the class over to him.

He told the students that their task would be to identify the number he had in mind from a chart which he taped to the chalkboard. This is the chart:

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1 7 2 6 3 + - 1,820

2 669 10,000 666 1,357 33,420 44 x

3 11,111 55 124 12 40 140 1,11

4 2 180 33 4,570 160 10 980

5 333 9 888 3,170 5 15 1

6 1,234 3,339 33 91 10,120 2,170 900

A B C D E F G

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The numbers and symbols were written in four different colors. The numbers and letters which appear outside the chart were written on the chalkboard to identify the vertical and horizontal rows. Duncan began by telling the students they could ask yes-or-no questions, one question per turn.

The children were obviously familiar with this kind of game and immediately began waving their hands to be called on. "Is it even?" one student asked. "Is it a number (as opposed to a symbol)?" asked another. "Does it have more than three digits?" "Is it black?" "Is it in a row marked with a vowel?"

Throughout the exchange, Duncan worked with students to summarize what they had learned so far: "We know that the number is this, this, and this, so what have we eliminated?" He also stimulated students to ask more incisive questions: "Can you think of a question that will eliminate more than one row?" At no time did Duncan rush students while they were trying--sometimes struggling--to formulate their questions. In addition, Duncan spoke to the students by name and behaved in a warm and friendly manner toward them. There was a high level of participation and enthusiasm in this and the other classes observed.

Students in this game were at liberty to attempt to identify the mystery number at any point, keeping in mind that they would be eliminated from the game if mistaken. When a student attempted to identify the number, Duncan asked him or her for a line of reasoning: "What three things make you think it's that number?" If a student was incorrect in an attempt to identify the number, Duncan went over the student's line of reasoning with him/her and with the class to determine where the problem lay.

Duncan and the students played three more rounds in this class, with progressively more restrictive rules: no color questions, no number-of-digit questions, etc. In the final round, the student who had identified the previous mystery number chose a new mystery number, and Duncan helped to facilitate the question-and-answer exchange of this student and her classmates.

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\*\*\* Practice: Inquiry Skill Development \*\*\* \*\*\* in a Third Grade Classroom \*\*\*

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A similar number chart was used for a game with a class of third graders, but the game structure was more complex. Students could each ask two yes-or-no questions and receive two answers, but Duncan did not tell them which answer went with which question. This produced an array of summaries such as, "We know it's either blue or in the third row (neither blue nor in

the third row, both blue and in the third row)." When a student formulated a question based on his/her memory of previous answers, Duncan asked a question such as, "Why did you put it that way instead of this way (asking a related question)?" This gave the student an opportunity to describe the process of elimination represented by the questions which had been asked up to that point. Other variations of the game followed this one. One game was limited to 15 "no" answers--a rule which motivated students to ask well thought-out questions that would eliminate the maximum number of alternatives. In another game, students were allowed brief conferences so as to draw upon one another's recall of facts revealed up to that point in the game.

In this class as in the second grade class, Duncan acknowledged incisive, creative approaches, saying such things as "Good question!" and "Very good strategy!"

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\*\*\* Practice: Inquiry Development with \*\*\* \*\* Fourth and Fifth Grade Gifted Students \*\*\*

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In the afternoon Franklin's gifted students in grades four and five assembled to discuss the inquiry problem of the day. As students were arriving, Duncan engaged in a friendly exchange with them about local sports events and other local matters. These amenities appeared pleasant and were also in keeping with Duncan's conviction that "kids need to be relaxed to pursue higher-order thinking."

The inquiry problem of the day was the one cited earlier in this report: "A boy was playing by himself in an old abandoned house. Later he was sitting with a paper bag over his head. What do you suppose is going on?" A lengthy and detailed question-and-answer session followed, with reminders about the structure and rules of the inquiry game: "My role is to give you information, not to do your thinking for you."

Student questions were often clever and probing, framed in such a way as to offer hypotheses and elicit data which would help them refine those hypotheses. Some examples:

"If I asked the boy if he was embarrassed to have a paper bag on his head, what would he say?"

"Who put the paper bag on his head?"

"If I were to ask his mother if she disliked the boy's haircut, what would she say?"

"If he took the paper bag off his head, would his mother make him put it back on? Would she say harsh words to him?"

"Were there eye-holes in the paper bag."

At one point, when the inquiry had veered off in an unfruitful direction, Duncan had the students close their eyes and "get a mental picture" of the situation as revealed by their questions. In addition, he was very adept at extracting conclusions from students regarding what they had learned thus far, e.g.:

Student: "Were there spiders in the old house where the boy was playing?"

Duncan: "I don't know."

Student: "Would things have been the same whether or not there were spiders in the house?"

Duncan: "Probably. Therefore...?"

Student: "Therefore spiders don't have anything to do with it."

At another point in the inquiry, a student became confused and flustered while attempting to frame a question and abandoned his attempt, saying, "Oh, never mind." Duncan responded, saying, "But I want to mind. I want to know what you're thinking," and guided the boy through the process of asking a useful question.

"Questioning sets up tension which is not resolved until all pertinent answers are uncovered," said Duncan earlier in the day, drawing from the work of a theoretician whose work he admires. This tension--a healthy, curious tension--was evident in the enthusiastic pursuit of answers by the students in this inquiry class.

Upon resolving the mystery, Duncan had the students review their inquiry process. They went back over the

details: "First we found out \_\_\_\_\_, then we found out \_\_\_\_\_, then somebody asked about the boy's mother and we found out \_\_\_\_\_," and so on

through the process of piecing together the boy's story. The students then proceeded to the school library to pursue their computer projects.

Readers who wish to know more about Duncan's inquiry development classes--or who can't stand not knowing why the boy had a paper bag on his head--are encouraged to contact Dennis Duncan, who may now be reached at Port Angeles High School, Room 982, 304 E. Park, Port Angeles, Washington 98362 (206) 452-7602.

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