# WELLSTON CITY SCHOOLS

## CURRICULUM & INSTRUCTION FOCUS

May 20, 2009 Submitted by Donna Allen and Karen Boch

***"There are two possible outcomes: if the outcome confirms the hypothesis, then you've made a discovery. If the result is contrary to the hypothesis, then you've made a discovery." ---Enrico Fermi***

**Purpose:**

- **To recap the Generating and Testing Hypothesis professional development**
- **To provide examples of generating and testing hypothesis**

### A Special Teacher

Years ago, a John Hopkins' professor gave a group of graduate students this assignment: Go to the slums. Take 200 boys, between the ages of 12 and 16, and investigate their background and environment. Then predict their chances for the future.

The students, after consulting social statistics, talking to the boys, and compiling much data, concluded that 90 percent of the boys would spend some time in jail.

Twenty-five years later another group of graduate students was given the job of testing the prediction. They went back to the same area. Some of the boys—by then men—were still there, a few had died, some had moved away, but they got in touch with 180 of the original 200. They found that only four of the group had ever been sent to jail.

Why was it that these men, who had lived in a breeding place of crime, had such a surprisingly good record? The researchers were continually told: "Well, there was a teacher…"

They pressed further, and found that in 75 percent of the cases it was the same woman. The researchers went to this teacher, now living in a home for retired teachers. How had she exerted this remarkable influence over that group of children? Could she give them any reason why these boys should have remembered her?

"No," she said, "no I really couldn't." And then, thinking back over the years, she said musingly, more to herself than to her questioners: **"I loved those boys…"**

Bits & Pieces – June 1995
Economics Press

### Generating and Testing Hypotheses

Generating and testing hypotheses is an instructional strategy that requires students to apply their knowledge and to use higher-level thinking skills by asking questions about what they know, finding ways to test those questions, and then explaining their conclusions. Although this strategy is most often used in science, it can be applied to all subject areas.

The secret to using this strategy outside of science is to get students to ask "what if" questions. For example, 'What would happen if we took red-lights out of the highway system?' Or 'What would have happened if Hitler would have succeeded in taking over London? What effect might that have had?'

There are two approaches for this strategy—inductive and deductive. Inductive is when you are given the particular examples or set of conclusions (trees) and asked to come up with the big idea or generalization (forest). Deductive is when you are given the big idea or general rule (jar) and asked to come up with particular examples or draw logical conclusions (candies).

Generally speaking, deductive approaches produce better results. Inductive approaches should not be used as an introductory activity. It should also be noted that thinking in real life is probably never purely inductive or deductive but is more "messy" and nonlinear.

**DEDUCTIVE**

**Generalization:** Fairytales are stories that teach a lesson.

- Example
- Example
- Example

**INDUCTIVE**

**Generalization:** _____
_____

- Goldilocks eats Baby Bear's Porridge.
- Goldilocks breaks Baby Bears' Chair.
- Goldilocks falls asleep in Baby Bears' Bed.

### Key Research Findings

- Hypothesis generation and testing can be approached in a more inductive or deductive manner.).
- Teachers should ask students to clearly explain their hypotheses and their conclusions.
- Don't forget to find the imbedded question and e-mail a response to Karen. The first from each building wins a prize!

## Classroom Implications

How can I use this strategy in my classroom? There are six different types of tasks you can use with students to engage them in generating and testing hypotheses:

### SYSTEMS ANALYSIS

Across the disciplines, students study systems: computer network systems, the highway system, ecosystems, government systems, weather systems. One way to enhance and exercise students' understanding of these systems is to ask them to generate hypotheses that predict what might happen if an aspect of a system changes.

### PROBLEM SOLVING

Students encounter structured problems all the time—in textbooks, worksheets, and homework. This strategy deals with unstructured problems—problems that do not have clearly defined goals or constraints and that usually have more than one solution, the kind of messy problems that we face in everyday life.

### HISTORICAL INVESTIGATION

Students engage in historical investigation when they construct and investigate a plausible scenario for a historical event from the past about which there is no general agreement. A student must understand the circumstances surrounding the event. The investigation grows out of confusions or contradictions found in available information about the topic, *not* from the students' confusion.

### INVENTION

The idea of inventing a product or a process might intimidate some students. They might think big when you mention invention: the skateboard, the mobile phone, e-mail, the Internet. Let students know that although some inventions change the world, some inventions make one small thing a little better. Students will fell less intimidated by the invention process if they know you aren't expecting them to invent the wheel and if they know that they can use it in their daily lives.

### DECISION MAKING

Making a decision generally entails making a prediction and weighing that prediction against other possible alternatives. For example, when choosing the best or worst movie of the 1990s, students might consider several movies on the basis of such attributes as the quality of the dialogue, the camera work, and how good or bad the actors are.

### EXPERIMENTAL INQUIRY

Many educators equate experimental inquiry for generating and testing hypotheses in science. But we can use the same process to describe observations, generate explanations, make predictions, and test them in humanities classes, liberal arts, or the fine arts.

### Recommendations for Classroom Practice

- Give students a model of the process
- Use familiar content to teach students the steps of the task
- Give students an appropriate graphic organizer
- Ask student to explain their hypotheses and conclusions.

## *Resources*

*Classroom Instruction That Works: Research-Based Strategies for Increasing Student Achievement* by Robert J. Marzano, Debra Pickering, and Jane E. Pollock (Paperback *Jan 2001)*

*A Handbook for Classroom Instruction that Works (ASCD)* by Robert J. Marzano, Jennifer S. Norford, Diane E. Paynter, and Debra J. Pickering