Research Based Strategies for the Classroom

Part # 10 - Generating and Testing Hypotheses

Introduction

Across content areas and grade levels, inquiry in the classroom turns native curiosity to the learner's advantage. Effective teachers create these opportunities to guide students through the process of asking good questions, generating hypotheses and predictions, investigating through testing or research, making observations, and finally analyzing and communicating results. Through active learning experiences, students deepen their understanding of key concepts.

Inquiry extends far beyond the science classroom. In math, students make predictions based on their understanding of statistics. In history, students look for evidence to support their theory about why certain events unfolded. In language arts, students predict what comes next in a story based on events that have already transpired. In every context, teachers can make inquiry more effective by scaffolding the learning experience.

Key Research Findings

- Understanding increases when students are asked to explain the scientific principles they are working from and the hypotheses they generate from these principles (Lavoie, 1999; Lavoie & Good, 1988; Lawson, 1988).
- By generating and testing a hypothesis, students are applying their conceptual understanding (Marzano, Pickering, & Pollock, 2001).
- In comparisons of inquiry-based instruction and more traditional teaching methods (such as lectures and textbook-based instruction), researchers have found that inquiry methods help students gain a better understanding of fundamental concepts in science (White & Frederickson, 1997, 1998).
- An interactive approach to teaching physics concepts provides a better environment for student learning than traditional textbook-based instruction (Hake, 1998).

Implementation

Fine-tune your use of inquiry by focusing on how students generate and test hypotheses and predictions. Research suggests best practices for instruction:

1. Good questions make better hypotheses. Teach students how to frame a good question. Help them narrow their inquiry to a topic they can reasonably explore.

2. Ask for explanations. Encourage students to explain their hypotheses or predictions aloud. This will prompt them to explain their understanding of underlying concepts, giving you a window into their understanding.

3. Watch for (and mediate) misconceptions. If students are basing a prediction on a false premise or conceptual misunderstanding, set up activities to challenge their thinking.

4. Scaffold investigations. Structure their learning experience to maximize results. Provide them with a framework for investigating.

5. Use role play. Acting out characters (Hamlet) or agents (red blood cell) prompts students to make predictions. Based on what they know about their role, how will their character react? How will the agent interact with other agents?

6. Highlight patterns and connections. Help students recognize patterns in their findings. Show them how to transform raw data into graphs or other visual representations that will help them see patterns and make connections.

7. Use questioning strategies. Ask questions throughout the inquiry cycle—when students are posing questions, while they are investigating, when they analyzing results or presenting conclusions. At each stage, challenge them to explain their reasoning and defend results.

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