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The Teacher's Crucial Role in Helping Students Learn Through Inquiry

Michael P. Clough, Editor

Learning and effective teaching are both highly complex acts. Leinhardt and Greeno (1986, p. 75) write that "teaching occurs in a relatively ill-structured, dynamic environment". Classroom conditions change in unpredictable ways, and information arises during the act of teaching that by necessity must inform practice as it occurs. While this is true of all teaching, it is all the more so when effectively teaching science through inquiry. This, in part, may explain the all too common practices of lecturing, textbook assignments, worksheets, and cookbook activities in science teaching. Each of these approaches severely constrains students' input into a lesson and reduces the complexities in teaching. Teaching science through inquiry is more complex because through that approach students' misconceptions and thinking spill out into the classroom. Ironically, this increased complexity sets the stage for promoting learning because in expressing their misconceptions and thinking, students are more mentally engaged and teachers begin to understand and thus can better respond to students' misunderstandings.

Prefabricated direct experience cookbook laboratory activities are enticing to both teachers and students because in making most all the conceptual decisions for students, complexity is significantly reduced. However, as noted earlier, without significant decision making students are not encouraged to be mentally active, express their thinking, and face head on the inadequacies of their initial ideas.

What this means is that hands-on experiences, by themselves, are insufficient for helping students understand the scientific community's explanation for natural phenomena. Pre-fabricated cookbook activities, so ubiquitous in science teaching, rarely engage students in ways necessary to facilitate such an understanding. As Bransford et al. (2000) write, "Hands-on experiments can be a powerful way to ground emergent knowledge, but they do not alone evoke the underlying conceptual understandings that aid generalization" (p. 22). Students must also be mentally engaged, and teaching science through inquiry demands that mental engagement.

The increased complexities inherent in effective teaching make apparent the crucial role of teachers in teaching and learning through inquiry. Teachers exert the greatest influence in the classroom through the way in which they engage students in the curriculum. However, the overwhelming layered complexities of learning and teaching often cloud the value of important findings regarding the teacher's role in creating powerful learning experiences for children. Teachers must deliberately create interactions with students (at times in a whole class setting and at other times in small groups or individually with students) that draw out students' thinking. As students express their ideas and rationale for them, teachers must think of questions or experiences that will help students scaffold to desired understandings. These crucial decisions must often be made on the fly in the act of teaching. No wonder so many science teachers resist teaching through inquiry.

How teachers interact with students--the behaviors they exhibit to draw out and play off students' ideas--is crucial for helping students abandon misconceptions and make desired connections. Too often teachers are provided foggy characterizations of their role (e.g. "facilitator," "guide at the side," and "giving students opportunities to construct"). Such ambiguity obscures the importance of decisions teachers must consider and the intricate behaviors they must implement to shape classroom experiences that promote desired science education goals. This in turn interferes with teacher education efforts as teachers are presented with black boxes and vague generalizations that provide little guidance in efforts to improve practice.

In future editorials I will address in far more detail several of the non-trivial decisions that teachers constantly make, how they reflect the complex nature of learning and effective teaching, and what makes them non-trivial. Here I simply want to emphasize that teachers are key to students' success at learning through inquiry. Both the ISTJ Managing Editor, Joe Taylor, and I strive to ensure that articles appearing in ISTJ provide teachers with worthwhile inquiry activities that make clear the crucial role teachers play in those experiences. Teaching through inquiry demands highly knowledgeable and skilled teachers who are justly respected and compensated for the complex decisions they incessantly make in helping students reach meaningful science education goals.