

# Essays on Teaching Excellence

## *Toward the Best in the Academy*

*Volume 15, Number 2, 2003-04*

A publication of The Professional & Organizational Development Network in Higher Education ([www.podnetwork.org](http://www.podnetwork.org)).

# Promoting Learning through Inquiry

*Virginia S. Lee, North Carolina State University*

## **Background and Rationale**

Inquiry as a way of knowing has its origins in the oldest university in the country and one of the premier research universities in the world. Charles Peirce, the brilliant but highly erratic son of a Harvard mathematician, was an early pragmatist and the inspiration for the later pragmatists, Harvard psychologist William James and John Dewey, the noted philosopher and educator. As a devout empiricist, Peirce characterized the rhythm of real thinking as corresponding to scientific methods of inquiry. In his 1878 essay *How to Make Our Ideas Clear* Peirce wrote: "...[T]he action of thought is excited by the irritation of doubt, and ceases when belief is attained." Each belief is at once a "stopping place...[and] a new starting point for thought."

By extension genuine uncertainty and doubt, formalized as questioning, are the natural provocations for knowing and real learning. All human beings are like amateur scientists whose cognitive development advances through continuous interaction with and exploration of the environment. Repeatedly new experiences cause us to question and ultimately modify our existing theories about how the world works and is organized. We promote learning, our own and others', by engaging with compelling questions that arise out of direct experience.

The Boyer Commission's 1998 report, *Reinventing Undergraduate Education: A Blueprint for America's Research University*,

highlighted the importance and appropriateness of inquiry-guided learning (IGL) in undergraduate education, particularly in research universities. IGL capitalizes on one of the key strengths of research universities, the expertise of its faculty in research. It lowers the boundaries between faculty and student views of learning. Faculty learning in research universities is exploratory, problem-centered, and research-oriented. It involves recursion or the refinement of each successive approach based on what was learned during previous attempts. In contrast, all too often students view learning as the memorization of information, a view reinforced by traditional teaching methods.

### **What is Inquiry-guided Learning?**

Inquiry-guided learning (IGL) refers to an array of classroom practices that promote student learning through guided and, increasingly, independent investigation of complex questions, problems, and issues, often for which there is no single answer. Rather than teaching the results of others' investigations, which students learn passively, instructors assist students in mastering and learning through the process of active investigation itself. This process involves the ability to formulate good questions, identify and collect appropriate evidence, present results systematically, analyze and interpret results, formulate conclusions, and evaluate the worth and importance of those conclusions. It may also involve the ability to identify problems, examine problems, generate possible solutions, and select the best solution with appropriate justification. This process will differ somewhat among different academic disciplines.

Learning in this way promotes other important outcomes as well. It nurtures curiosity, initiative, and risk taking. It promotes critical thinking. It develops students' responsibility for their own learning and habits of life-long learning. And it fosters intellectual development and maturity: the recognition that ambiguity and uncertainty are inevitable, and in response, we must learn to make reasoned judgments and act in ways consistent with these judgments.

Instructors can provide support to students in a variety of ways. These ways include well-constructed syllabi and lesson designs, carefully designed assignments with accompanying evaluation

criteria (or "rubrics"), good questioning strategies, constructive feedback, and much more. In addition, a variety of teaching strategies, used singly or, more often, in combination with one another, are consistent with inquiry-guided learning: interactive lecture, discussion, group work, case studies, problem-based learning, service learning, simulations, fieldwork, and labs as well as many others (Hewlett Steering Committee, 2000).

In addition to these more general kinds of support, instructors can provide more specific guidance in doing the discipline and the processes of inquiry. Certain kinds of support unmask and reveal the structure and mechanisms of inquiry itself in the same way external scaffolding reveals a building's internal system of balance and support. Derived from the Greek word for to discover or find, heuristics are guides to discovery and learning and rules of thumb that help learners proceed along empirical lines to find solutions or answers. Examples of specific heuristics include vee diagrams, the IDEAL problem solver, and the MORE thinking frame. With constant repetition and use over time students will internalize the structure of heuristics as internal guides to independent thought and inquiry (Lee, 2003).

### **Specific Examples of Inquiry-guided Learning**

Below are specific examples of inquiry-guided learning drawn from the work of faculty who have participated in one of several IGL programs at NC State University:

#### *Latin American History*

In his courses on Latin American history, Rich Slatta (Department of History) (<http://social.chass.ncsu.edu/slatta/>) allows students, even first year students, to act as apprentice historians. History becomes a dialogue between students, historical sources, and other historians, rather than a closed, fixed set of dead facts. In his transition from a more traditional approach, Rich now assigns far more primary rather than secondary sources and provides students specific guidance on how to examine and interpret historical documents. Instead of traditional exams and research papers, he now uses a variety of assignments such as short, 250-word papers in which students respond to thought questions, role plays in which students take on the identity of historical characters, and many informal activities that

are ungraded. With assistance from another faculty member, Rich also developed a four-part essay rubric that explicitly lays out the competencies necessary for good historical writing.

### *Pulp and Paper Science*

Conventional wisdom holds that highly technical fields, due to their high "content load," don't lend themselves to IGL approaches. Adrianna Kirkman, Med Byrd, Hassan Jameel, and John Heitmann in the Department of Pulp and Paper Sciences have found otherwise. As early as the first year students confront actual problems encountered in paper mills by experienced practitioners. While they have a much smaller knowledge base and backlog of experience on which to draw, they can still grapple with perplexing problems encountered in industry. For example, working in groups students consider the potential impact of available timberwood for the coming year having a 20% higher ratio of summerwood to springwood as compared to the wood supply for the past several years. They consider the implications for chipping, digestion, bleaching, and finished product strength, surface and optical properties. Med has completely revamped an introductory survey course on the paper industry through the widespread incorporation of problems and team learning. And Adrianna, Hassan and others in the Department have created a research-based capstone course. As a result from the beginning of the curriculum until the end, students practice problem-solving and inquiry in ways appropriate to the discipline and their developmental level.

### *Foreign Languages and Literature*

Using inquiry-guided learning, Arlene Malinowski (Department of Foreign Languages and Literatures) (<http://www4.ncsu.edu/~arlene/>) has turned her French civilization course topsy-turvy. Rather than beginning with the caves of Lescaux and marching dutifully through time to present-day France, Arlene structures her course around one big, over-riding question: How can the study of French history and civilization help us to understand the complexity of contemporary life and thought in France? Structuring the course in this way provides a coherence that it lacked previously. Throughout the course, she presents students with perplexing cultural dilemmas which they are asked to analyze and interpret based on what they have learned in the course. Critical thinking questions — "France

holds third place, just after Japan and Australia, for longevity. How would you explain this high rating?" and problem-based learning scenarios — "You've just been promoted to the position of manager of the branch office of a large fast food chain in France. The Executive Director in New York has given you instructions to investigate the feasibility of establishing a new franchise in Nice. Develop a plan for how you would present your enterprise to the average French citizen." —form the basis of many writing assignments.

### **Conclusion**

For both faculty and students inquiry-guided learning represents a new way of thinking about teaching and learning. Instructors need to go back to a time when their disciplines were a novel way of knowing and being in the world and consider how they can assist students to practice their disciplines at increasing levels of sophistication (Doherty, A., Riordan, T. & Roth, J., 2002, p. 10). Students need to appreciate the role of uncertainty and struggle in learning, concepts that are unfamiliar to students accustomed to lecture as the predominant teaching strategy and rote memorization. The benefits of inquiry-guided learning are substantial, however: for both instructors and students a revitalized interest in the process of learning and a deeper understanding of how we develop complex abilities such as critical thinking, independent inquiry, and responsibility for one's own learning.

### **References**

The Boyer Commission on Educating Undergraduates in the Research University (1998). *Reinventing Undergraduate Education: A Blueprint for America's Research University*. Stony Brook, NY: State University of New York at Stony Brook.

Doherty, A., Riordan, T. & Roth, J. (2002). *Student Learning: A Central Focus for Institutions of Higher Education. A Report and Collection of Institutional Practices of the Student Learning Initiative*. Milwaukee, WI: Alverno Institute.

Hewlett Steering Committee (2000). What is Inquiry-guided

Learning? Raleigh, NC: Faculty Center for Teaching & Learning, North Carolina State University.

Lee, V.S. (2003). Vees, Thinking Frames, and Concept Maps: Supporting Student Thought and Inquiry. *The National Teaching & Learning Forum*, 12(4).

Peirce, C. (1878). How to Make our Ideas Clear. *Popular Science Monthly*, January, 286-302.

*Virginia S. Lee (Ph.D., University of North Carolina at Chapel Hill) is Associate Director, Faculty Center for Teaching and Learning, North Carolina State University.*