John Barell

John Barell, Ed.D., is professor emeritus of Curriculum and Teaching at Montclair State University, Montclair, New Jersey, and a former public school teacher in New York City. Since 2000, he has been a consultant for inquiry-based instruction and creation of science/social studies networks at the American Museum of Natural History in New York City in collaboration with the International Baccalaureate Organization. For most of his educational career, he has worked with schools nationally to foster inquiry, problem-based learning, critical thinking, and reflection. He is the author of several books, including *Teaching for Thoughtfulness: Strategies to Enhance Intellectual Development*, *Developing More Curious Minds*, *Problem-Based Learning—An Inquiry Approach*, and *Why Are School Buses Always Yellow?*

In this chapter, Barell shows that problem-based learning is an ideal way to develop 21st century skills. He describes how teachers shift their standards-based curriculum from direct instruction of passive students to active engagement of problem solvers and question askers. His concrete examples illustrate ways problem-based inquiry can be adapted for meaningful use with students of all ages, talents, and challenges.

Excerpts from "Problem-Based Learning: The Foundation for 21st Century Skills"

By John Barell
2010

What makes the 21st century special? What are the new and threatening problems we face, both domestic and foreign, that necessitate more attention to how we think and solve problems? In addition to the complexities of energy production and conservation, preserving the planet, and fighting terrorism, we face almost intractable situations when it comes to providing health care, ensuring equity within all of our educational and judicial systems, and figuring out how to preserve our financial markets after the worst economic meltdown since the Great Depression.

The increased complexity of these challenges makes it all the more important that we do a better job preparing our students to become inquirers, problem solvers, critical and creative thinkers. We must provide students with improved strategies to help them deal with these very complex situations.
Problem-based learning (PBL) is one such strategy.

What is PBL?

Problem-based learning goes well beyond short-term instructional instances or simple questions requiring factual, yes/no answers. It encompasses a rethinking of the entire curriculum so that teachers design whole units around complex, "ill-structured" problematic scenarios that embody the major concepts to be mastered and understood. By "ill-structured" or "ill-defined" I mean the realistic, authentic problems—such as pollution of the planet and feeding the hungry—that are so complex, messy, and intriguing that they do not lend themselves to a right or wrong answer approach. On the other hand, "How far does an automobile travel in 3.5 hours going 60 mph?" would be an example of "well-defined" problem for which there is a right answer.

While engaged in such a PBL unit, students will ask good questions, conduct purposeful investigations, think critically, draw conclusions, and reflect until they arrive at meaningful solutions.

PBL requires a complete rethinking of the roles of teachers and students, as well as the goals of educational programs. PBL teachers not only present information, but they also learn along with students and help them become more skillful inquirers and thinkers. In this capacity, students are no longer passive recipients of knowledge;

they are, with teachers, collaborative decision makers about the nature and structure of their own learning as they work their way through the problem-based unit. Teachers and students are mastering new and exciting content as investigative partners.

The Problem Scenario

At the beginning of an interdisciplinary unit exploring the geography, politics, economics, history, art, and religion of Africa, Cheryl put her students into the roles of problem solvers. She used this scenario:

> *You are an African nation that desires a substantial loan from the World Bank. Your goal is to convince the World Bank that your country's needs are great and you deserve a loan. The World Bank has a limited amount to lend and many other countries are asking for loans. Therefore, you must prepare a strong case for receiving a loan and be able to defend your need for the money.* (Barell, 2003, p. 145)

Imagine being a student confronted with this challenge of not only learning about an African nation of your choosing, but also conducting extensive research about the nation's natural resources, history, and culture—all based on students' and teachers' good questions. Imagine having to identify a country's most pressing economic, political, and health needs; devise a plan to meet them; and then present your plan to the World Bank—in this case, Mrs. Hopper herself. This is not passive learning.

What Do We Know About the Effectiveness of PBL?

Some researchers caution that we need to strengthen the conceptual foundations of PBL research (Belland, French, & Ertmer, 2009). There are others who tell us that challenging students to think through problematic situations can be "superior when it comes to long-term retention, skill development and satisfaction of students and teachers" (Strobel & van Barneveld, 2009, p. 44).

In terms of the efficacy of inquiry, however, we hear stronger support. A 2009 study concluded that "developmental research confirms the idea that curiosity drives intellectual development. . . . When a situation is designed to arouse curiosity, children display improved academic performance" (Engel & Randall, 2009, p. 184). Other studies indicate that when all students are challenged to "organize, synthesize, and explain" a complex problem or issue using the methods of inquiry and research, there is a positive impact on learning (Newmann & Associates, 1996, p. 29).

Other evidence of efficacy comes directly from teachers who have used these kinds of problematic scenarios with an emphasis on inquiry. Teacher Kim Nordin, for instance, tells us that this structure gave her students "focus, drive and excitement . . . allowing them to be inquirers . . . [who] felt like they had ownership of their projects" (personal communication, January 15, 2009).

References:

Barell, J. (2003*). Developing more curious minds*. Alexandria, VA: Association for Supervision and Curriculum Development.

Belland, B. R., French, B. F., & Ertmer, P. A. (2009). Validity and problem-based learning research: A review of instruments used to assess intended learning outcomes. *Interdisciplinary Journal of Problem-Based Learning*, 3(1), 59–89.

Newmann, F. M., & Associates. (1996). *Authentic achievement: Restructuring schools for intellectual quality*. San Francisco: Jossey-Bass.

Strobel, J., & van Barneveld, A. (2009, Spring). When is PBL more effective? A meta-synthesis of meta-analyses comparing PBL to conventional classrooms. *Interdisciplinary Journal of Problem-Based Learning*, 3(1), 44–58.