The Learning Cycle: A Reintroduction

Steven J. Maier, Northwestern Oklahoma State University, Alva, OK
Edmund A. Marek, University of Oklahoma, Norman, OK

The learning cycle is an inquiry approach to instruction
that continues to demonstrate significant effectiveness in the classroom. Rooted in Piaget's theory of intellectual development, learning cycles provide a structured means for students to construct concepts from direct experiences with science phenomena. Learning cycles have been the subject of numerous articles in science practitioner periodicals as well as the focus of much research in science education journals. This paper reintroduces the learning cycle by giving a brief description, followed by an example suitable for a range of physics classrooms.

The development of the learning cycle dates back to the work of Atkin and Karplus in 1962. Papers discussing the use of learning cycles can be found in *The Physics Teacher* and the *American Journal of Physics*. The most thorough of these deals with the use of learning cycles for large-enrollment courses. More recent articles suggest applications of the learning cycle for classrooms ranging from conceptual to calculus-based physics but do not offer details of its theory base. This paper serves to reintroduce the time-tested inquiry approach to science known as the learning cycle.

Learning cycles consist of three distinct phases: exploration, concept development, and concept application. The phases and the order of the phases were derived from the mental processes individuals engage in as learning occurs. A brief description will be outlined here, followed by an example.

Learning cycles begin with an exploration where students are charged with collecting data. This phase
has always been called the "exploration," beginning with Karplus et al. Explorations can be done in the form of open or guided inquiry, in small or large groups, or as an entire class. However, the exploration must result in "good" data that were gathered by the students. The design of the exploration must be constructed so that reproducible data ensure that students will be armed with the evidence required to derive the concept. Data collected must also be free of "noise" that would require students to know the concept *a priori* in order to elicit data relevant to the concept to be developed in the next phase.

Ideal explorations are designed to reveal something unexpected to students, causing them to think about how the data or experience they encountered fit with what they already know. If a student can account for the data based on prior knowledge or if the experience was not unexpected after all, assimilation has occurred. During assimilation, observations or experiences are accounted for by students' existing knowledge. A failed attempt at reconciling the unexpected results or observations with what one already knows is termed "disequilibrium" by Piaget.

Because students have varying experiences and knowledge bases, it is unrealistic to expect collective assimilation or collective disequilibrium in the classroom. Furthermore, some students may have assimilated the experiences based on alternative understandings. That is, students may arrive at correct expectations based on false premises. For these reasons, assimilation and disequilibrium will occur among different students simultaneously during the exploration.