THE LEARNING CYCLE MODEL

"Class, you'll notice that I've given each lab group a D-cell battery and battery holder, a flashlight bulb, and a piece of insulated wire," Mrs. Smith began. "Using these materials, I'd like you to light the bulb." As the students succeeded in lighting their bulbs, she asked them to explain how they had done it.

After students had shared ideas about their bulb systems, Mrs. Smith introduced the terms in their science textbook *current* and *open* and *closed circuit*. She had students read about these terms and then discussed the reading with them.

Finally the students applied their knowledge of electric circuits to a new situation. Each group connected a switch and two new pieces of wire to their bulb system and created a closed circuit. Mrs. Smith asked them to describe how the switch worked, and to try to explain how the light switches in the classroom turn the overhead light on and off.

The steps in Mrs. Smith's method may seem to be in reverse, but she was practicing a teaching strategy called the Learning Cycle to develop students' understanding of open and closed circuits. In the Learning Cycle, students first engage in hands-on activities to familiarize them with the concepts and relationships <u>before</u> being introduced to new terms, reading text material, graphing or otherwise analyzing their observational data. Next, concepts are developed based on experiences acquired from exploratory activities. It appears that students are more receptive to understanding a concept if they have first engaged directly in a concrete experience which has raised a question in their minds. It is this need for further understanding that urges them to enter in to the reevaluating old or building new concepts. The third part of the Learning Cycle features an application activity where the concept is used in a slightly different setting than was originally developed, thus giving them a chance to more fully understand the concept in terms of a wider frame of reference.

The Learning Cycle is anchored in a thorough understanding of learning theory. Although Robert Karplus is generally viewed as the "father" of this model of instruction, its roots go back to the developmental learning theories of Piaget. A slightly more theoretical discussion of the model is provided below in more psychological terms.

Piaget (1964) identified four major factors which he believes relevant to the development of cognitive reasoning abilities. These factors are

1 <u>Maturation</u> - students must be biologically mature and physically developed and therefore capable of operating physically in their environment.
2. <u>Experience</u> - students past concrete experience and the ability to recall these experiences are critical for further development. Piaget outlines two types of experience: <u>Physical Experience</u> (drawn directly from objects) and <u>Logical-Mathematical Experience</u> (drawn by actions which affect objects).
3. <u>Social Communication</u> - students must be capable of communicating information via written and oral language.
4. <u>Equilibration</u> - for cognitive growth, students must be supplied a situation of cognitive challenge where their existing mental operations are not adequate. The accommodative process (called equilibration) by which the student deals with this new information will result in cognitive growth.

A translation of this Piagetian theory into a workable model for designing learning experience should incorporate each of these factors (Campbell, 1977). When applied to adolescent students, factors one and three are probably not as important as factors two and four. Piaget himself stresses the interdependence of all four factors but suggests factor two and its proper relation to factor four are fundamental to learning and development.

The Learning Cycle Model, as originally conceived by Robert Karplus in the 1960s, can be divided into three major segments: **Exploration**, **Concept Invention**, and **Concept**

Extension. The following is an overview illustrating the important general characteristics of each phase.

<u>Exploration</u> - Following a brief statement of topic and direction, students are encouraged to learn through their own experience. Activities may be supplied by the instructor which will help the students recall (and share) past concrete experiences or assimilate new concrete experiences helpful for later invention and/or extension activities. During this activity the students receive only minimal guidance from their instruction and explore new ideas spontaneously.

1. This phase of the Learning Cycle provides students with reinforcement of previous concrete experience and/or introduces them to new concrete experience related to the intended outcome objectives.
2. The activity allows for "open-ended" considerations, encouraging students to allow concrete experiences to evoke non-concrete ideas as possible relevant factors.
3. During the exploration activity the instructor supplies encouragement and hits and/or suggestions to maintain an appropriate level of disequilibrium.
4. This activity provides the instructor information concerning the students ability to deal with the concepts and/or skills being introduced. In addition, the students will deal the reasoning skills which they may evoke in search for the solution to a problem.

<u>Concept Invention</u> - In this phase, the concrete experience provided in the exploration is used as the basis for generalizing a concept, for introducing a principle, or for providing an extension of students' skill or reasoning. Student and instructor roles in this activity may vary depending upon the nature of the content. Generally, students should be asked to "invent" part or all of the relationship for themselves with the instructor supplying encouragement and guidance when needed. this procedure allows for students to "self-regulate" and therefore move toward equilibrium with the concepts introduced.

1. During the invention activity students are encouraged to formulate relationships which generalize their ideas and concrete experiences.
2. The instructor acts as a mediator in assisting students to formulate these relationships so as to be consistent with the outcome objectives.

<u>Concept Extension</u> - the extension or application phase of the Learning Cycle allows each student an opportunity to directly apply the concept or skill learned during the invention activity. This activity allows additional time for accommodation required by students needing more time for equilibration. It also provides additional equilibrating experiences for students who have already accommodated the concepts introduced.

1. To begin the extension activity, students and instructors interact in planning an activity for apply the "invented" concept and/or skill in a situation relevant to the instructional objectives.
2. Finally, students are asked to complete the designed activity to the satisfaction of the instructor. While this extending activity allows students to directly apply the invented concept to a new situation, the broadening nature of the activity provides for further equilibration of new cognitive abilities.

Although the Learning Cycle allows each student the opportunity to think for himself, the instructor must be an ever present "overseer" of the activity, and by providing probing questions, hints, and encouragement keep the activity going. Yet the instructor must guard against over playing his role as director and planner. It is here that many of you who implement the Learning Cycle for the first time may have trouble. Traditionally, the teacher has been the "fount of knowledge" in both the classroom and laboratory settings. We have been the ones with all the answers and with the "best way" to get the results that we want our students to use. Our role changes when using the Learning Cycle. We are now facilitators. Yes, we can still be a source of knowledge, but it is not volunteered. Rather, we consultants and cheerleaders instead of authority figures that students follow in lockstep. It is oh so hard to stand by and watch the students figure out solutions when we could with a few well placed instructions save them time and allow them to get better results. But what we deprive them of is the pleasure of building their own knowledge. When they invent it, they have ownership. When they invent it, they remember it. And after they get over the shock of having this type of freedom (and responsibility) and experience the thrill of succeeding, some will even like science.