

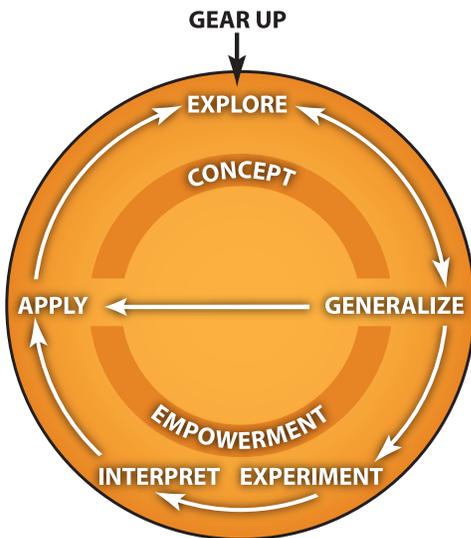
# The Learning Cycle Model for Science Teaching

The Learning Cycle is a widely recognized model for teaching inquiry-based science. It can be traced back to an elementary school science curriculum project during the late 1950s, the Science Curriculum Improvement Study (SCIS).<sup>\*</sup> Most of the lessons in this curriculum have been designed according to the Learning Cycle Model.

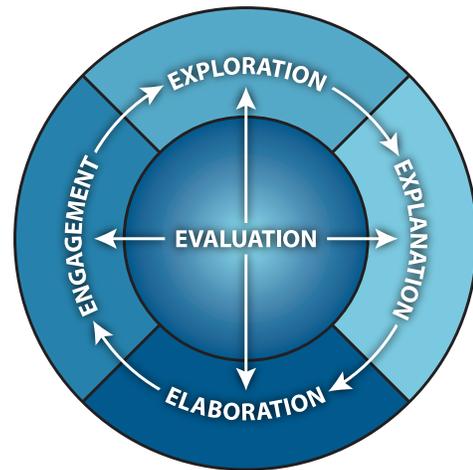
<sup>\*</sup>Atkin, J.M. & Karplus, R. (1962). Discovery or invention? *The Science Teacher*, 29(5), 45-51.

## There are two very similar but slightly different models of the Learning Cycle used commonly in Alaska:

The Alaska Science Consortium uses this model for the learning cycle:



Another commonly used model is called the "5E's Learning Cycle":



### Gear-Up

### Engage

The purpose of the Gear-Up or Engagement is to motivate and interest students, and to help them focus their attention on the topic. Teachers present a stimulating experience for students that will raise questions, or they pose a problem to be solved. They assess what students already know about the topic and help them to make connections to their existing knowledge and experience. The students find out the purpose and objectives of the lesson and where they are heading. At the end of the Gear-Up or Engagement phase, the learner should have a need to know about a question, issue, or problem that relates to his or her world.

#### **Examples of activities that might take place during this phase:**

Presentation of discrepant events, puzzles, connections to current events, mysteries, poems, stories, movies, readings, explanations of environmental issues, invention or design challenges. Concept mapping and KWL charts are also often used during this phase.

### Explore

### Explore

This phase allows students to actively find out more about the question or problem they've identified. They collect and organize data that they can use to solve the problem, test out their ideas, make conjectures, and "mess around" with ideas about cause and effect. They become familiar with materials, and try to discover explanations and answers to their questions.

The teacher acts as a facilitator to keep students on target, asking inquiry-oriented questions, and making sure that they collect and organize their information and data. Students are encouraged to cooperate and given time to think and reflect.

#### **Examples of activities that students might take place during this phase:**

Open-ended investigations using teacher-provided materials, simulations, research, guided observations or discovery.

| Generalize  | Explain |
|---|---------|
| <p>In this phase of the process, students use their own observations, information and data to explain what they have learned, discovered, or inferred. The teacher introduces new vocabulary and technical terms. Students clarify their discoveries, draw conclusions, and make generalizations. They communicate in a variety of forms. Teachers question the students, ask for clarification and justification, help students compare their new understandings to their preconceptions, and determine whether more time should be spent exploring. They use convergent (not yes or no) questions to help students verbalize their discoveries. If the lesson will move on to the experiment stage, the students develop testable questions with the teacher's support.</p> <p><b>Examples of activities:</b><br/>Writing, art, discussion, revisiting concept maps or KWL or OWL charts.</p> |         |

| Experiment  | Elaborate  |
|---|--|
| <p>With teacher guidance, students design and conduct an experiment (fair test) to prove a hypothesis. They refine their testable question, control variables, conduct repeated tests, and accurately record data.</p>  | <p>Students extend and expand upon what they have been learning in the earlier parts of the learning cycle.</p> <p>They gain new information through formal experimentation, further research, or other sources. The teacher may give them additional information.</p> <p>They might ask new questions, seek clarification, or plan and carry out a new project.</p> |
| Interpret   |  |
| <p>Students display and interpret the data they have collected. They use graphs or charts, organize information logically and honestly, and compare results to predictions. They reflect upon the successes or mistakes of their experimental design, and share insights with others. They listen to others' interpretations that may differ from their own. They may design new testable questions as spin off for further verification.</p> |  |
| Apply   | <p>Students apply the newly-learned concept to a new context. They have opportunities to use their new terms and definitions. They might solve a new problem, make a decision, perform a task, resolve a conflict, invent something, or make meaning through a model, a report, an illustration, story, role play, or PowerPoint presentation.</p>                   |
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| Evaluation  |
|---|
| <p>Although Evaluation is not listed as a separate step in the Alaska Science Consortium's Learning Cycle Model, ongoing evaluation is always a part of effective teaching. Formative evaluation takes place during each phase of the cycle. Here are some examples:</p> <p><b>Gear-Up or Engage:</b> Pre assessment, concept map, KWL chart, written or oral responses to questions</p> <p><b>Explore:</b> Observe students' process skills: Are they observant? persistent? on-task? Can they collect and record data? Are they cooperative and open to others' ideas? Can they use the tools correctly? Do they follow safety procedures?</p> <p><b>Generalize or Explain:</b> Evaluation here focuses on the process the students are using—how well can students use the information they've collected, plus what they already knew to come up with new ideas? Using questions, the teacher can assess the students' comprehension of the new vocabulary and new concepts.</p> <p><b>Experiment, Interpret and Apply, or Elaborate:</b> In addition to formative evaluation, summative evaluation can take place during this phase. It may be in the form of an application problem to solve, a test, or a culminating project. Rubrics or other forms of criteria for summative evaluation are shared with the students at the beginning of the lesson.</p> |