Using the Learning Cycle

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The purpose of science and technology/ engineering education in Massachusetts is to enable students to draw on the skills and habits of science and engineering, as well as on their subject matter knowledge, in order to participate productively in the intellectual and civic life of American society and to provide the foundation for their further education in these areas if they seek it. (Massachusetts Department of Education, p. 7 ). In addition, current research indicates that the most effective opportunities for our children require that we create learning opportunities that help children relate new ideas to their experience and place new ideas into a framework for understanding (National Research Council, 2000). A model that helps teachers bring the skills and knowledge together is the learning cycle. The learning cycle was originated in 1967 with the development of a program called the Science Curriculum Improvement Study (*SCIS*). This approach helps teachers bring hands-on learning together with minds-on learning. This is the approach:

***Exploration****,* providing students with firsthand experiences to investigate science phenomena- doing hands-on activities; 2) ***Concept Introduction****,* allowing students to build science ideas from their explorations and interactions with peers, texts, and teachers-introduce/**explain** vocabulary or scientific principles; 3) ***Concept Application****,* which asks students to use these science ideas to solve new problems- building on understanding.

This approach to teaching involves taking the lessons and units you have and considering moving the activity to the beginning- have children begin by exploring. Guiding children to make observations will help them develop explanations and descriptions from their own experiences. As they observe and describe what they notice, then teachers can introduce terms and concepts. For concept application, giving children an opportunity to apply their learning to a new situation by using what they learned and demonstrate understanding. Throughout the stages of the learning cycle, teachers can assess understanding through discussions, interviews, journals, etc… In the example cited below, children applied their learning by building a prototype and describing it. This is also a way to integrate science and use engineering. For a complete example of a k-1, 6 day learning cycle lesson, see [www.maryhattonscience.weebly.com](http://www.maryhattonscience.weebly.com). Other samples lessons can be found the NSTA journal *Science and Children* at www.nsta.org.

Sources:

Brown, P.L. & Abell, S.A. (2007). *Examining the learning cycle*. Science and Children.44(5): 58-59.

National Research Council. How People Learn: Brain, Mind, Experience, and School: Expanded Edition. (J. D.Bransford, A.L.Brown, and R. R.Cocking. Eds). Washington, DC: The National Academies Press, 2000.

Sarow, G. A. (2001). Miniature sleds, go, go, go. *Science and Children*. 93(3):16-21

A Unit on Motion for k-1

**Overview:**

This is a k-1, six day unit about motion. This series of lessons engages children in exploring motion and forces and applying their knowledge to building a prototype- miniature sled. Children also practice and use preK-2 skills of inquiry. The series of lessons were inspired by a sled engineering lesson. In this unit, the sled engineering component was designed as a performance assessment to give students an opportunity to demonstrate their understanding of motion. When children are given time to explore, explain, and apply their understanding, they use knowledge and terms in daily discussions, drawings, and writing.

Day 1: Exploring forces and motion  
Day 2: Exploring Gravity  
Day 3: Exploring Balance  
Day 4: Exploring Friction  
Day 5: Making and testing sleds  
Day 6: Testing sleds and reflecting on engineering

**Ma Learning Standards  
Massachusetts PreK-2 Science Learning Standards: Position and Motion of Objects**

1. Describe the various ways that objects can move, such as in a straight line, zigzag, back-and-forth, round-and-round, fast, and slow.
2. Demonstrate that the way to change the motion of an object is to apply a force (give it a push or a pull). The greater the force, the greater the change in the motion of the object.
3. Recognize that under some conditions, objects can be balanced.

**Massachusetts PreK-2 Engineering Learning Standards: Materials and Tools**

1.1 Identify and describe characteristics of natural materials (e.g., wood, cotton, fur, wool) and human-made materials (e.g., plastic, Styrofoam).

1.2 Identify and explain some possible uses for natural materials (e.g., wood, cotton, fur, wool) and human-made materials (e.g., plastic, Styrofoam).

**Inquiry Skills Grades PreK–2**

* Tell about *why and what would happen if*?
* Make predictions based on observed patterns.
* Name and use simple equipment and tools (e.g., rulers, meter sticks, thermometers, hand lenses, and balances) to gather data and extend the senses.
* Record observations and data with pictures, numbers, or written statements.
* Discuss observations with others.