Long Island Children's Museum
School Visit Program
How Things Work—Grades 1–5

Pre-Visit Materials

Thank you for bringing your class to the Long Island Children's Museum! To help you get the most out of your visit, we have created this pre-and post-visit packet for you and your class. The pre-visit activities are designed to prepare and excite your students about the field trip, and to spur them to ask questions. After your visit to the Museum, the post-visit activities will help you to reinforce the concepts that the children explored while they were here.

Exhibits you will explore: ToolBox, Comings & Goings
Workshop: Simple Machines, Please (Theater)

Learning standards addressed:

Math, Science, Technology: 1, 3, 4, 5, 6
English Language Arts: 1, 2, 3, 4
Career Development: 1, 2
The Arts: 1, 2, 4

Before you come:

Have a discussion with the class about what to expect on your visit to the Museum. Begin with what students know and think about museums: What are museums? What is their purpose? How many different kinds of museums (art, science, children's, history, culture) are there? Which museums have your visited? How are you supposed to act in a museum? How is a hands-on museum (children's museum, science center) different from other types of museums? This talk will help students begin to think about their trip and prepare for what they'll be doing in the Museum. Inform your students that at the Long Island Children's Museum they will get to touch, try, explore, pretend, wonder, investigate and observe by using their senses.

Pre-Visit Activities

1. Love my Lever!

Activity goal:

Students will explore the lever as a simple machine that makes work easier.

Materials:

For each team of two or three:

- A 12-inch (30 cm) ruler
- A pencil
- 10 pennies (newer ones work best—the weight is more uniform!)
- A level desk top or table

Background:

Levers belong to a class of objects called "simple machines" because they all have a minimal amount of moving parts. Other simple machines include the screw, the wheel and axle, the inclined plane, the pulley and the wedge. The job of a machine, whether simple or complex, is to accomplish work more easily by somehow transforming energy or motion. To put it another way, machines help you get a job done with less effort.

The origin of the lever goes back to prehistoric times when people discovered that placing a rock under the end of a strong stick made it easier to lift heavy objects.

All levers have two main parts: the arm, which does the actual movement, and the fulcrum, the point at which the lever pivots. In this activity, the pencil is the fulcrum. The end of the lever on which the force is applied is called the effort arm because this is where you must exert the effort (this can be done with a physical push, or with a weight of some sort). The end of the lever that does the lifting is called the load arm. By changing the position of the fulcrum, you can use a lever to lift a greater load without expending as much effort.

Procedure:

Ask students to lay down the pencil flat on the desk and lay the ruler across the pencil so that the two ends balance perfectly. The balance point should be at the mid-way (six inch) mark. Have students put a stack of five pennies all of the way on one end of the ruler, and another five pennies in a stack at the other end. Since the two piles of pennies are about equal in weight, the ruler should remain balanced. Now ask stu-

dents what they think will happen if they take three pennies from one side and add them to the other side. Record their predictions and then have them try it. They should now have eight pennies on one side and two on the other. What happened? Why? This is an example of a lever.

Vocabulary:

Lever
Balance

Extensions:

Without adding any new weight to either side and without moving the pennies from where they are (eight on one far side, two on the other), try to get the two ends of the ruler to balance. Note—the ruler doesn't have to be perfectly balanced—it just needs to be at the point where both ends are not touching the table. How can this be accomplished?

Have the class make a list of all the levers that they find in the classroom. What are some examples of the tools that use levers? Ask them to continue the search at home.

2. Become an Inventor

Activity goal:

Children will better understand the relationship between structure and function by inventing a tool or machine that makes life easier in some way.

Materials:

Paper and pencils

Procedure:

An inventor is someone who comes up with a new product, device, or idea that helps accomplish a task or makes something easier to do.

Ask students to think of an invention that would make their life easier. It might be something that helps them eat, move, do homework or play. Discuss the structure of the invention. It's not easy to talk about how something will look before you decide what it will do! This is what we mean when we say that structure follows function—how something looks usually depends on what it does. Once you decide on what you want something to do, then you can start developing a plan of what it will look like and how it will work. A lot of new inventions are adaptations or improvements of old inventions, like the cellular phone or the electric wheelchair. Applying knowledge of how things work to create practical tools, objects or projects is called technology.

Have students write two paragraphs on their invention. The first paragraph describes the invention. The second paragraph explains how the invention will make life easier for them. Students may want to spend some time brainstorming this topic before starting, so that you don't have two inventions that do the same thing. Students should make a drawing of their invention and attach it to their paragraphs.

Vocabulary:

Invention
Inventor
Technology

Extensions:

Have students brainstorm ideas of how they would actually go about creating their invention for real. What materials would they need? Collect materials, recyclables and found objects for students to construct a model of their invention. Hold an Invention Convention and have students present their ideas/model to the class.

Back in the Classroom:

Ask the children to recall their visit to LICM. What were the exhibits they explored? What was their favorite thing they did here? What senses did they use while here? What did they wish they could do more of during their visit?

Post-Visit Activities:

1. Anatomy of a Machine

Activity goal:

Children will better understand simple machines and how they can work together to become complex machines by exploring and sketching a machine.

Materials:

- Paper
- Pencils with erasers
- List of the six simple machines for reference
- A collection of small machines with visible working parts: egg beater, cork screw, car jack, can opener, garlic press, tongs, monkey wrench, hand drill, Vise-Grip®, the mechanism from a music box, wind up toy, pencil sharpener, stapler.

Procedure:

Drawing a schematic or scientific illustration of an object often helps scientists and engineers understand it better. Many times, a person does not have the real item in front of them and they rely on other's illustrations to guide them to understanding. This activity was designed to be done after an exploration of the six simple machines in our Tool Box gallery.

Have students work in small groups (two-five children). Provide each group with one machine to explore. Students should take turns operating the machine while the others watch to see how each part moves.

Challenge each group with the following questions to encourage thought and discussion. Invite them to investigate

their own questions as well.

- What is the function of this machine?
- How many moving parts does it have?
- How are the moving parts connected to each other?
- What does each moving part do in the machine?
- How many simple machines can you see? Which ones?

Place the machine at rest so that everyone in the group can see it and distribute paper, pencils and erasers. Students should sketch diagrams of their machines. They should draw the machine from their own point of view first. Later they can trade places and draw it from different points of view to show all working parts. When the diagrams are completed, students should add arrows and written notes to indicate directions of motion for each part, label the elements of simple machines involved and explain connections. Have students display and explain their diagrams to other groups. If time permits, give each group a new machine to investigate and sketch.

Vocabulary:

Schematic
Scientific Illustration
Simple Machine

Extensions:

Ask students to get their parents involved in helping them locate examples of machine diagrams from home. The instructions provided by manufacturers with bicycles, furniture, kitchen appliances, tools, and lawn mowers often contain explanatory diagrams (schematics) to help you understand these machines. Auto repair manuals also contain dozens of these diagrams. Many construction sets such as LEGO® and K'NEX® also have similar kinds of diagrams to help you build particular designs.

Resources for Teachers:

The Power of Play: Learning What Comes Naturally, David Elkind, Da Capo Press, December 25, 2007.

Einstein Never Used Flashcards: How Our Children Really Learn—and Why They Need to Play More and Memorize Less, Roberta Michnick Golinkoff, Kathy Hirsh-Pasek Ph.D., Diane Eyer, Rodale Books, August 12, 2004.

Learning About the Way Things Move, Heidi Gold-Dworkin and Robert K. Ullman, McGraw-Hill; 1 edition, August 10, 2000

Encyclopedia Smithsonian: Engineering, Industry, and Invention
http://www.si.edu/Encyclopedia_SI/science_and_technology/EngineeringandIndustry_Technology.htm

The Franklin Institute Resources for Science Learning
http://www.fi.edu/qa97/spotlight3/spotlight3.html

Resources for Students:

Looking at Simple Machine Series, Helen Frost, Capstone Press, August 2001.

How Do you Lift a Lion?, Robert E. Wells, Albert Whitman & Company, October 31, 1996.

Forces and Simple Machines (Science Factory), Jon Richards and Ian Thompson, PowerKids Press, January 30, 2008.

The New Way Things Work, David MacCaulay, Houghton Mifflin Books for Children; Rev Sub edition, October 26, 1998.