Invention

"All perceiving is also thinking, all reasoning is also intuition, all observation is also *invention*."

- Rudolf Arnheim

Discussion Questions While Playing in *Invention*

- Tell me about your structure.
- What are you discovering?
- What challenges did you face while building?
- How many pieces are in your structure?
- How is your ball moving on the *Whoosh* wall?
- What will happen if you …..?

children's museum of Tacoma

Overview

Invention offers endless opportunities to build, tinker, and discover. A multitude of open-ended building materials encourage experimentation and innovation as children experience the scientific concepts of force, motion and balance. At the *Whoosh!* wall, watch as balls flow up a tube and down moveable track pieces. Send scarves racing through a series of winding clear pipe at *Airways*. What will your imagination devise in *Invention*?

Experiences and Skills Practiced in *Invention*

Children may:

- Collaborate and negotiate with peers
- Share ideas, space and materials with others
- Experiment with cause and effect
- Explore concepts of balance and motion
- Increase self-efficacy, the belief in one's abilities
- Refine eye-hand coordination and fine motor skills
- Increase ability to match, sort, put in a series and compare objects according to attributes
- Develop mathematical concepts like number sense, operations and geometry
- Observe, wonder, question, explore and investigate (Scientific Inquiry Skills)
- Analyze and predict actions and reactions

Connection to Washington State Standards

Early Learning and Development Benchmarks

Physical Well-Being, Health and Motor Development
- Goals: 1-3

Social and Emotional Development
- Goals: 11-18, 21-25

Approaches Toward Learning
- Goals: 27-31

Cognitive and General Knowledge
- Goals: 32-35, 38-43, 47, 56-57

Language, Communication and Literacy
- Goals: 58-59, 61-62, 65

EALRs and Performance Expectations

Reading
- 1.3, 2.3

Communication
- 1.1, 1.2, 2.2

Math
- K.1, K.2, K.3, K.4, 1.1, 1.3, 1.4

Science
- K-1 INQ, K-1 APP, K-1 PS1

Arts
- 1.1, 1.2, 2.1, 3.1, 3.2

Related Classroom Activity
Exploring Simple Machines

Materials:
- Stack of heavy books
- Skateboard (or other, larger, rolling devise)
- Building blocks
- Toy cars

Vocabulary:
- **Force** – a push or pull that can change the way something moves. Example: When you roll a ball, you are using force to make the ball move. When you put your hands out to catch a ball, you are using force to stop the motion of the ball.
- **Motion** – movement
- **Simple Machine** – a tool that uses force to make our work easier
- **Inclined Plane** – a flat surface with one end raised higher than the other, like a ramp, that helps move things from higher and lower places. Examples: slide, moving ramp.
- **Wheel and Axel** – a wheel turns on a rod, called an axle. Together, they help to move things faster, more easily, and with the ability to turn. Examples: skateboards, carts, bicycles, cars.
- **Lever and Fulcrum** – a bar that moves or turns on a fulcrum. The fulcrum is a point that doesn't move. When force is applied to one side and pushed down, the other side lifts up. Example: seesaw. (Not explored in activity.)
- **Pulleys** – one or more grooved wheels connected by a rope that moves objects up, down and across a long distance. Examples: flagpole, zip-line. (Not explored in activity.)

Activity:
This activity focuses on: inclined planes and wheels and axels.

- Present children with a stack of heavy books. Share that their challenge is to discover the most efficient way for one person to move all of the books at once. Discuss some of the different ways they could move the books (picking them up and carrying them, pushing them …).
- Encourage each child to try carrying and/or pushing the stack across the room. Ask the group to reflect on some of the challenges of this experience.
- Introduce a skateboard. Engage children in a conversation about what they notice about the skateboard. When children bring up that the skateboard has wheels, share that wheels and axels are a simple machine.
- Invite children to place this same stack of books on the wheels and axels. Provide sufficient time for each child to experience moving the books with a simple machine.
- Bring the group together and compare the two different methods for moving books. Which way was easier and faster, or more efficient: pushing and/or carrying the books or using a simple machine with wheels and axels?
- After following an exploration of the advantages of a simple machine with wheels and axels, introduce an inclined plane. Begin by holding up a toy car, and as with the skateboard, ask children to share what they notice about the car. Children may immediately notice the wheels and axels.
- Model creating an inclined plane with a tower of building blocks and a book. Ask children to predict what will happen if you let go of the car at the top of the inclined plane. Share that children will be working with a partner to roll a car down the inclined plane and see how far it travels.

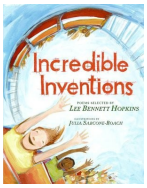
Discussion Questions During Lesson

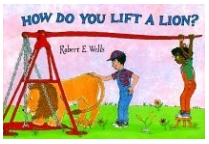
- What simple machines do you see in our room?
- Where do you see simple machines at work in our daily lives?
- Why are simple machines important?
- Do you notice any simple machines, especially levers, in our bodies? (Example: arms are levers.)

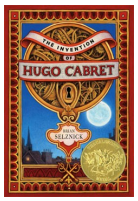
Exploring Simple Machines continued.

- Provide time for students to create their own inclined planes and test rolling cars down the ramp. Encourage children to change the steepness of their inclined plane by adding or removing books. What changes do they observe?
- Bring the group together and discuss what they have discovered during their exploration of inclined planes. What type of inclined plane helped the car to travel the longest distance: a steep or level plane?
- Discuss how inclined planes and wheels and axels might be a combination of simple machines used in daily life. (Example: a moving ramp and cart, ramp for skateboard or motorcycle jumps, boat launching ramp.)
- As a fun extension to this activity, introduce children to Rube Goldberg machines. These are whimsical compound machines that incorporate a combination of levers, pulleys, ramps and wheels to perform a simple task. Look for videos of Rube Goldberg machines on a video search engine site, like YouTube. Ask children to identify the simple machines they recognize. You may discover that children are inspired to make their own Rube Goldberg inspired machines!

Resources for Children







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- Portis, Antoinette. 2007. *Not a Box*. New York: Harper Collins.
- Ljungkvist, Laura. 2007. *Follow the Lines through the House*. New York: Penguin Group.
- Crosbie, Michael K. and Steve Rosenthal. *1993. Architecture Colors*. New York: John Wiley & Sons, Inc.
- Gibbons, Gail. *1996. How a House is Built*. New York: Holiday House.
- Wells, Robert. 1996. *How Do You Lift a Lion?* Morton Grove, IL: Albert Whitman & Company.
- Hopkins, Lee Bennet. 2009. *Incredible Inventions*. New York: Greenwillow Books
- Selznick, Brian. 2007. *The Invention of Hugo Cabret*. New York: Scholastic Press

Resources for Adults

- Baker, Wendy and Andrew Haslam. 1993. *Make it Work!: Machines*. New York: Thompson Learning.
- Chalufour, Ingrid and Karen Worth. 2004. *Building Structures with Young Children*. St. Paul: Redleaf Press.
- Hodge, Deborah. 1996. *Simple Machines*. Toronto, ON: Kids Can Press LTD.
- www.brainpopjr.com/science

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