Kindergarten

Unit 2: Motion

Essential Questions	Enduring Understandings
Science • How do objects move? • How can you make an object move? • What kinds of objects roll? • Why do some objects move slowly and some move quickly? • How can you stop an object from moving? • What happens when you drop an object? • Why do some objects fall to the ground • How do we know if a set has more or less? • How can tally marks represent a set? • How can we use tally marks to help represent data in a table or chart? • How do tables and charts help us organize our thinking? • What information do we get from a table or chart? • How can we use information from questions to create a table or chart? • How can we collect data? • What do less than, greater than, and equal to mean? **Social Studies** • How are you different now than you were last year? • Can you do things now that you couldn't do last week/year? • How are you different from your older/younger brother or sister? • How are you different from your mom and dad? • How many days are in a week? • Why do we keep track of time?	**Science** • Things move in many different ways, such as straight, zigzag, round and round, back and forth, fast and slow • The way to change how something is moving is to give it a push or a pull • The sun, moon, and stars are consistent components of our universe. • Things near the earth fall to the ground unless something holds them up. **Math** • A number's place affects its value. • Counting tells how many things are in a set. • The last number word, when counting, names the quantity for that set. • Counting objects in a different order does not change the quantity. • Each successive number name refers to a quantity that is one greater. • A number can be represented by a set of objects and then by a numeral. • Sets of objects can be compared to determine more than, fewer than or equal. • Numbers are related to each other through a variety of number relationships. For example, 6 is one more than 5 and 4 less than 10, is composed of 3 and 3 as well as 4 and 2, and can be recognized quickly in patterned arrangements of dots. • The numbers 5 and 10 are benchmark numbers. (Is a number closer to 5 or 10? How close?)

• What did you do yesterday? Today? Tomorrow? What do you do in the morning? Afternoon? Night?	

Real World Connection/PBL:

Six Flags would like to add a new ride to the park and they have asked you to help design it. Using rulers, cardboard tubes, masking tape, and marbles, complete a model that would give the rider (marble) a fun ride. You may wish to use a small rubber ball instead of a marble with very young students.

Once happy with the design the students should draw their design on paper and explain the direction of the motion, the speed of the rider at different places on the ride (fast, slow), and what force causes the rider to move. Students may also use a digital camera and take a picture of finished roller coaster and label the parts.

Students will:

• Students will investigate different types of motion
• Students will observe and communicate effects of gravity on objects

Enduring Understandings

• Things move in many different ways, such as straight, zigzag, round and round, back and forth, fast and slow
• The way to change how something is moving is to give it a push or a pull

Essential Questions

• How do objects move?
• How can you make an object move?
• What kinds of objects roll?

STEM Careers

1. Nuclear Physicist — More than just impressing people at cocktail parties, Nuclear Physicists figure out ways to improve and test nuclear energy. Through research, you help create the weapons, lasers, and medical technology of the future.

2. Medical Physicist — The perfect field for those who, as children, were obsessed with finding a working pair of X-ray glasses. You work in hospitals and medical clinics to ensure that radiology is done safely and correctly. Specifically, you oversee and administer MRIs, CAT scans, and X-rays.

3. Physics Teacher — Teach others the science of matter at the high school, college, or advanced level. Like any Teacher, you spend your days giving tests, grading assignments, and helping out confused students.

4. Geophysicist — Combine geology and physics to study the mysteries of the earth, from the bottom of the sea to the top of the atmosphere. Use your knowledge to specialize in a specific area of earth science, like seismology, hydrology, or gravity.

5. Astrophysicist — Spend your days looking up at the skies and delving into the physics of the stars. Answer questions like “How do stars go extinct?” or plot the quadrants of the next major black hole.

6. Computational Physicist — Combine computers with physics to become a super genius. This field mixes computer science and math with (of course) physics to solve problems in fields like environmental management, aerospace, and energy.

Vocabulary

PBL Vocabulary:

Science:
Push, pull, sun, moon, stars, gravity, motion, straight, zigzag, round and round, back and forth, fast and slow, motionless

Math:
Combine, count, digits, efficient, equal, estimate, greater, less, more

Science Standards

Expectations: Students need to understand that things move in different ways and that gravity affects objects. Activities in a unit on gravity and motion should give them context for the two concepts and stepping stones for additional knowledge and understanding in subsequent years.
Simple concrete explanations of gravity and motion are appropriate, and may be addressed with the specific examples in the standards.

SKP2. Students will investigate different types of motion.
a. Sort objects into categories according to their motion. (straight, zigzag, round and round, back and forth, fast and slow, and
motionless)
b. Push, pull, and roll common objects and describe their motions.

SKP3. Students will observe and communicate effects of gravity on objects.
a. Recognize that some things, such as airplanes and birds, are in the sky, but return to earth.
b. Recognize that the sun, moon, and stars are in the sky, but don't come down.
c. Explain why a book does not fall down if it is placed on a table, but will fall down if it is dropped.

Technology (websites and 21st Century Tools)

SKCS3. Students will use tools and instruments for observing, measuring, and manipulating objects in scientific activities.
a. Use ordinary hand tools and instruments to construct, measure (for example: balance scales to determine heavy/light, weather data, nonstandard units for length), and look at objects (for example: magnifiers to look at rocks and soils).
b. Make something that can actually be used to perform a task, using paper, cardboard, wood, plastic, metal, or existing objects. (For example: paper plate day and night sky models)

Children's Literature
- Fixman, Jennifer, Gravity, Science Songs With Miss Jenny, EduTunes
- Cobb, Vicki, (2004), I Fall Down, New York: Harper Collins
- The Magic School Bus Plays Ball, Scholastic

Teacher Resources
- Breckenridge, Judy, (1993), Simple Physics Experiments with Everyday Materials
- Teaching Physical Science with Toys

Internet Resources
- www.sciencenetlinks.com

- www.terrificscience.org/freeresources/presentations
- http://science.nsta.org/earlyyearsblog/
- http://www2.scholastic.com/browse/subarticle.jsp?id=2819

Engineering (Implementation of STEM)

Puff Mobile

Mathematics

SMP s:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others. Students begin to explain
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision. =
7. Look for and make use of structure=
8. Look for and express regularity in repeated reasoning.

MGSEK.CC.4 Understand the relationship between numbers and quantities; connect counting to cardinality.
a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.(one-to-one correspondence)
b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.
c. Understand that each successive number name refers to a quantity that is one larger.

Social Studies Integration

Unit 2:
SSKH3 The student will correctly use words and phrases related to chronology and time to explain how things change.
a. Now, long ago
b. Before, after
e. First, last, next
g. Past, present, future

Reading/Writing Integration

ELAGSEKRF1: Demonstrate understanding of the organization and basic features of print.
ELAGSEKRF2: Demonstrate understanding of spoken words, syllables, and sounds (phonemes).
ELAGSEKRF3: Know and apply grade-level phonics and word analysis skills in decoding words
ELAGSEKRF4: Read common high-frequency words by sight. (e.g., the, of, to, you, she, my, is, are, do, does); read emergent-reader texts with purpose and understanding.
ELAGSEKW2: Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic

Puff Mobiles:

Materials Needed:

- 3 straws
- 4 Lifesavers
- 1 piece of printer paper
- 2 paper clips
- 50 centimeters of tape

Before Class:

-Remind students to be on time as this will take up the entire class period

-Prep materials

-Figure out where teams are racing, mark it off if possible (contact Howe office?)

-Write on board materials + product process

-Write on board the standards met and give them any concepts they will need to know to complete this activity (how to write step by step instructions

Story:

You all work for a company, Puffmobile Inc., which designs and manufactures racecars that run solely off the human breath. It's a fantastic new eco-friendly company and you all are so excited to be a part of their various teams, especially since the Puffmobile 500 is in a matter of days. You've created fast and reliable racecars out of the finest materials available and sent the plans over to manufacturing, when disaster strikes. Manufacturing calls, they've received your plans, instructions, and the materials but something's not right. They don't all match up. Your design calls for the finest tongue depressors money can buy, but they've received straws. The finest linen, but they've received paper. And so on and so forth. You find out that in order to compete in the Puffmobile 500 you along with your team must design a new racecar that runs off the human breath using only the materials available because there is no time to order new materials and you've already spent millions of dollars on straws and paperclips. Here's the deal: you have an hour to design a new racecar, create a sketch and set of instructions to send over to manufacturing, and for manufacturing to create your vehicle. + Rules **(15 min)**

Rules:

1. Design a car out of the materials given. (you do not have to use all of them) **(30 mins)**
2. Draw a sketch of your proposed vehicle to send to manufacturing and write a detailed set of instructions to aid your construction crew as they assemble your vehicle. (Put the names of group members and the name of your racecar on the design/instructions so we know whose is whose) **(30 mins)**

3. Teams switch instructions and create each other's vehicles. Since this is the 21st century you can contact the design team, but for every question your construction crew asks you, your team is awarded one point (this is like golf, where you want the least amount of points). In order to ask a question you must approach a TA to be your "telephone". They will ask the question to the other team and relay the answer to you. To detest unfair questioning for the sake of sabotage, the TAs are the question police. If you feel that your instructions were perfectly clear, we will come over and make a final ruling. If manufacturing's question is deemed unnecessary or saboteur-like they will be given one point. **(30 mins)**

4. Puffmobile 500: Teams race their constructed design (1st – 0 points, 2nd – 1 point, 3rd – 2 points, etc) (Clarification: you race and receive points for your design, not the car you constructed for another team) **(10 min)**

Basic Background Information:

Puffmobile (Force/Friction/Drag) –

In order for a vehicle of any type to move, it must produce or harness a force strong enough to overcome the resistance of friction or drag. Most vehicles rely on internal power sources to convert energy into a force that propels them forward. However, some vehicles, including sailboats, use the wind's energy to generate the force that makes them move.

Wind can move a vehicle forward if, and only if, the force it applies to the vehicle is enough to overcome forces like friction and drag that resist forward motion.

Reducing friction across the ground or reducing drag through water or air is another way to increase the performance of vehicles. Wheels are probably the best way to minimize friction on land. Rather than dragging and scraping across the ground, automobiles roll on wheels -- so easily, in fact, that a person can push a car to a gas station, if necessary. Likewise, the hull of a boat and the fuselage of an airplane are designed to cut through water and air with a minimum of drag