Unit Overview	
Content Area: Physical Science	
Unit Title: Measurement and Motion & Forces	**Unit: 2**
Target Course/Grade Level: Kindergarten	**Timeline: 20 days**

Unit Summary:

What happens if you push or pull an object harder?

During this unit of study, students apply an understanding of the effects of different strengths or different directions of pushes and pulls on the motion of an object to analyze a design solution. The crosscutting concept of *cause and effect* is called out as the organizing concept for this disciplinary core idea. Students are expected to demonstrate grade-appropriate proficiency in *planning and carrying out investigations* and *analyzing and interpreting data*. Students are also expected to use these practices to demonstrate an understanding of the core ideas.

This unit is based on K-PS2-1, K-PS2-2, and K-2 ETS1-3.

How can we introduce measurement in the classroom?

Measurement is often defined as a comparison to a standard. In order to take a measurement, you need two things: something to be measured and a tool to perform the measurement. During this unit of study, students apply an understanding of comparing properties (same/different, height/length, weight & capacity) by measuring objects found in the classroom.

This unit is based on K-MD-A-1, K-MD-A-2

Learning Targets

NJSLS-Science

K-PS-2-1	Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
K-PS2-2	Analyze data to determine if a design solution works as intended to change the speed of direction of an object with a push or a pull.

Disciplinary Core Ideas

PS2.A: Forces and Motion

- Pushes and pulls can have different strengths and directions. (K-PS2-1), (K-PS2-2)

- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS2-1), (K-PS2-2)

PS2.B: Types of Interactions

- When objects touch or collide, they push on one another and can change motion. (K-PS2-1)

PS3.C: Relationship Between Energy and Forces

- A bigger push or pull makes things speed up or slow down more quickly. *(secondary to K-PS2-1)*

ETS1.A: Defining Engineering Problems

- A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. *(secondary to K-PS2-2)*

ETS1.A: Defining and Delimiting Engineering Problems

- A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1)
- Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1)
- Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)

Science and Engineering Practices

Planning and Carrying Out Investigations

- With guidance, plan and conduct an investigation in collaboration with peers. (K-PS2-1)

Analyzing and Interpreting Data

- Analyze data from tests of an object or tool to determine if it works as intended. (K-PS2-2)

Asking Questions and Defining Problems

- Ask questions based on observations to find more information about the natural and/or designed world(s). (K-2-ETS1-1)
- Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)

Developing and Using Models

- Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2)

NJSLS Connections

Primary Interdisciplinary Connections

English Language Arts/Literacy:

SL.K.1- Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups.

SL.K.4- Describe familiar people, places, things, and events and, with prompting and support, provide additional detail.

Mathematics:

K.CC.A.1- Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of same object.

K.CC.A.3- Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects.)

K.MD.A.2- Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference.

Unit Essential Questions	**Unit Understandings**
Is it the same or different? Is it longer or shorter? How can we compare height? How can we measure length? How can we measure weight? How does a balance work and how does it compare weight?	-Knowing the concepts of same and different is foundational to the act of comparing: a "big idea" of science. Developing an awareness and understanding of the concept of length is a simple form of classification essential to understanding linear measurement. -Develop the concept of length through both direct comparison and use of nonstandard units of measure. -Provide students with practice in identifying how sets of objects are the same as one another or different from one another. (comparing objects) -Develop the concept of weight through both direct comparison and use of nonstandard units of measure. -Explore and develop the concept of capacity through direct comparison using materials and containers common to daily life and experiences. -Develop the concept that the motion of an object can be described by the distance it has moved from its initial position to its final position. -Experience contact forces, classify forces as pushes or pulls, discover that heavier objects require more force to move, and realize that objects thrown with more force will travel a greater distance.

Unit Learning Targets (Outcomes) – Formative Assessment
Students who understand the concepts are able to …

- Identify and describe two objects as the same or different & communicate their understandings.
- Compare three or more objects according to their length as same or different; long, longer, longest; tall, taller, tallest; and short, shorter, shortest.
- Describe the length of different objects using comparative language.
- Use direct comparison and nonstandard units to measure the length of common objects.
- Compare two objects according to their weight as about the same or different, heavier or lighter.
- Describe the weight of different objects as heavy (heavier) or light (lighter).

· Use a balance and nonstandard units to measure the weight of common objects.
· Compare relative capacities of various common containers.
· Describe the capacity of the containers using comparative language such as some, more and most.
· Work cooperatively to share materials and complete tasks.
· Measure the distance that an object has traveled.
· Compare speeds of two objects using a stopwatch and analyze a bar diagram.
· Differentiate between pushes and pulls.
· Make predictions about the application of a force.
· Measure and record on a chart the distance of a thrown object travels.
· Analyze data and draw conclusions about the effect of applying more or less force when throwing an object.
· Relate the change of speed or direction of motion to the action of a force.
Cross Cutting Concepts: **Cause and Effect** ● Simple tests can be designed to gather evidence to support or refute student ideas about causes. (K-PS2-1), (K-PS2-2) **Structure and Function** ● The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-1) - ***Connections to the Nature of Science*** **Scientific Investigations Use a Variety of Methods** ● Scientists use different ways to study the world. (K-PS2-1)
Integration of Technology: Web-based textbook, interactive whiteboard, interactive texts, videos, digital board builder
Technology Resources: http://www.knowingscience.com/TeacherRessources - google drive- Kindergarten Knowing Science
Opportunities for Differentiation: Differentiation and support tips, which includes suggestions for ELL, struggling students, and accelerated students, are available below the instructional practice section of each model lesson.
Teacher Notes:

Career Ready Practices: *In this unit the following career ready practices are addressed*
CRP1: Act as a reasonable and contributing citizen and employee
CRP2: Apply appropriate academic and technical skills
CRP3: Attend to personal health and financial well-being
CRP4: Communicate clearly and effectively and with reason
CRP5: Consider the environmental, social and economic impacts of decisions
CRP6: Demonstrate creativity and innovation
CRP7: Employ valid and reliable research strategies
CRP8: Utilize critical thinking to make sense of problems and persevere in solving them
CRP9: Model integrity, ethical leadership and effective management
CRP10: Plan education and career paths aligned to personal goals
CRP11: Use technology to enhance productivity
CRP12: Work productively in teams while using cultural global competence

Prior Learning- by the end of Grade __ , students understand that:

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Evidence of Learning

Summative Assessment

N/A

Equipment needed: Whiteboard, laptops, headphones, and hands-on materials for lessons

Teacher Instructional Resources:
Fiction:
What is an Attribute?- Nancy Kelly Allen
The Ant and the Elephant- Bill Peet
The Best Bug Parade- Stuart J. Murphy
Curious George Roller Coaster- H. A. Rey
Mighty Maddie- Stuart J. Murphy
A House For Birdie- Stuart J. Murphy
Room for Ripley- Stuart J. Murphy
Inch by Inch- Leo Lionni
Oscar and the Cricket- Geoff Waring
NonFiction
Motion: Push and Pull, Fast and Slow- Darlene R. Stille
The Fastest Animals- Catherine Ipcizade
Push and Pull- Patricia J. Murphy
Pushing and Pulling- Natalie Hyde

Modifications for ELL's, Special Education, 504, and Gifted and Talented Students:

(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Students, All Students/Case Studies for vignettes and explanations of the modifications.)

· Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.

· Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).

· Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).

· Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

· Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.

· Use project-based science learning to connect science with observable phenomena.

· Structure the learning around explaining or solving a social or community-based issue.

· Provide ELL students with multiple literacy strategies.

· Collaborate with after-school programs or clubs to extend learning opportunities.

· Restructure lesson using UDL principles (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

ACTIVITIES	**MATERIALS**
1.1- Session 1- Is it the same or different?	-Learning to Measure Kits -Let's Teach Comparison Kit
1.2- Session 1- Is it longer or shorter?	-Learning to Measure Kits -Let's Teach Comparison Kit -Activity Sheet 1: How Tall?
1.2- Session 2- How can we compare the height of two books?	-Collection of books of different heights
1.2 Session 3- How can we compare the heights of our class members?	-Means to records students heights
1.2 Session 4- What is a standard?	-Book collection from Session 2 -Mouse & Giraffe drawings -Activity Sheet 2: What is a standard? -Let's Teach Comparison Kit

1.2 Session 5- How can we use Learning to Measure Kits to measure the length of blocks?	-Learning to Measure Kits
1.2 Session 6- How can we use Learning to Measure Kits to measure length?	-Learning to Measure Kits -Let's Teach Comparison Kit -Activity Sheet 3: How many cubes?
1.2 Session 7- How do we measure with a measuring tape?	-Learning to Measure Kits
1.2 Session 8- How can we measure the difference in height between two objects?	-Learning to Measure Kits -Book collection from Session 2
1.3 Session 1- Is it the same, heavier, or lighter?	-Let's Teach Comparison Kit -Let's Compare Kits
1.3 Session 2- Is it the same, heavier, or lighter than my water bottle?	-Let's Teach Comparison Kit -Let's Compare Kits -Learning to Measure Kit
1.3 Session 3- How does a balance allow us to compare the weights of two objects?	-Bucket balances -Let's Compare Kits -Activity Sheet 1: Which Weighs More?
1.3 Session 4- How does a balance compare weight?	-Let's Teach Comparison Kit -Bucket balances -Let's Compare Kits -Learning to Measure Kit -Activity Sheet 2: How many cubes?
1.3 Session 5- How does a balance work?	-5 Bucket balances -Sticky notes -Activity Sheet 3: Balance -Activity Sheet 4: Weight Assessment
1.4 Session 1- How much will your hands hold?	-Let's Teach Capacity Kit -Fun with Capacity Kits -Activity Sheet 1: Capacity Basics -Activity Sheet 2: It's a Handful!
1.4 Session 2- How much will your shoes hold?	-Let's Teach Capacity Kit -Fun with Capacity Kits -Activity Sheet 3: Really Big Shoes

1.4 Session 3- How much do containers hold?	-Fun with Capacity Kits
1.4 Session 4- How much liquid do containers hold?	-Let's Teach Capacity Kit -Fun with Capacity Kits -Small dishpans full of water
1.4 Session 5- How do eye droppers work?	-Let's Teach Capacity Kit -Fun with Capacity Kits -Small dishpans full of water -Activity Sheet 4: Capacity Assessment
2.1 Session 1- What is motion?	-Activity Sheet 1: Distance -Measuring tapes -Let's Teach Motion Kit -26 rubber balls
2.1 Session 2- How do we measure the distance traveled?	-Remote control car -Traffic cones -Measuring tapes -Let's Teach Motion Kit -How far? Table
2.1 Session 3- How fast?	-Remote control car -Traffic cones -Let's Teach Motion Kit -Car Race Table -Activity Sheet 2: Race Times Bar Graph
2.2 Session 1- What's a push? What's a pull?	-Let's Teach Motion Kit -Push/Pull Table
2.2 Session 2- How does the strength of a force affect an object's motion?	-Let's Teach Motion Kit -Throw Distance Table -Activity Sheet 1: Bean Bag Bar Graph