Objective:

Students will understand the relationship between the force applied to an object and resulting motion of the object.

Students will use scooters to apply a variety of pathways, specifically focused on force, motion, and changes of speed that effect the primarily object.

Students will have an opportunity to independently manipulate, pull, push, force and apply motion with a hands on individual scooter to see cause and effects of studied applications in science lesson applicable to Utah State Core Standard

Strand 3.3: Science/Force Affects Motion

Forces act on objects and have both a strength and a direction. An object at rest typically has multiple forces acting on it, but they are balanced, resulting in a zero net force on the object. Forces that are unbalanced can cause changes in an object's speed or direction of motion. The patterns of an object's motion in various situations can be observed, measured, and used to predict future motion. Forces are exerted when objects come in contact with each other; however, some forces can act on objects that are not in contact. The gravitational force of Earth, acting on an object near Earth's surface, pulls that object toward the planet's center. Electric and magnetic forces between a pair of objects can act at a distance. The strength of these non-contact forces depends on the properties of the objects and the distance between the objects.

Standard 3.3.1

Plan and carry out investigations that provide evidence of the effects of balanced and

unbalanced forces on the motion of an object. Emphasize investigations where only one variable is tested at a time. Examples could include an unbalanced force on one side of a ball causing it to move and balanced forces pushing on a box from both sides producing no movement. (PS2.A, PS2.B)

Equipment:

Scooters- partner scooters and individual scooters, gator balls (various sizes), various balls of different weights (tennis balls, pickleballs) to measure distances and force, deck rings, cones and bean bags.

Lesson and Schedule:

Week 1	Exploration Part 1. Introduce scooters and safety rules and proper use of appropriate equipment names. Introduce key vocabulary, use cards and vocabulary outlined in Utah State Motion and Force. Let kids explore, ask questions, and inquire how they can connect vocabulary to equipment provided. (bean bags, gator balls, scooters, cones for boundaries, deck rings, etc.). Part 2. Read: Move It!: Motion, Forces, and You by Adrienne Mason Part 3. Draw pictures of what the parts and pieces of a scooter is made up of. Make a detailed diagram. After approval of demonstrating

	accurate terminology of push/pull have students get in groups of two and practice pushing and pulling using scooters. Part 4. . Pre-test vocabulary by having students write down words and what they think it means prior to starting.
Week 2	Definitions and Investigations Part 1 Lead a discussion on other objects you can push and pull. Demonstrate force, motion, push, pull, friction, and gravity using equipment. How and why that happens. Make connections with other students and compare what happens with multiple scooters verses one scooter. How does that change the force and motion. Discuss. Part 2. Re-visit safety and clean up rules for new equipment. Plan and carry out investigations that provide evidence of the effects of balanced and unbalanced forces on the motion of an object. For example, how can we balance on our knees using scooters, how can we balance a ball on top of a deck ring. Why is it unbalanced when we use two balls on a deck ring or cone. Emphasize investigations where only one variable is tested at a time. Examples could include an unbalanced force on one side of a ball causing it to move and balanced forces pushing on a scooter from both sides producing no movement. *Part 3.* Have students take notes and write down their findings, share their ideas. Collaborate with groups on ways they can investigate and manipulate equipment safely to demonstrate the vocabulary presented**.** *Practice taking turns.* Part 4. Break students into groups and do a book chat/vocabulary activity. Give students a variety of books at their level on Force and Motion along with vocabulary cards. Students will read the books looking for vocabulary words and notice other words/pictures associated with them. Books for students include, but is not limited to: And Everyone Shouted (PULL!): A First Look at Forces and Motion by Claire Llewellyn, Forces and Motion by Alvin Silverstein, What Makes it Swing? by Jim Pipe, Gravity is a Mystery by Franklyn Branley
Week 3	Connections and Integration Part 1. Define, provide examples, demonstrate, and allow independent hands- on implementation of various key vocabulary words outlined in

	Utah State Core Motion and Force. Have students come up with gestures for each word. Use word maps and posters to prompt as needed. Play and move in gym and follow up using all the different ways we have brainstormed on how to move. Create an anchor chart prior to going to the gym and post. Part 2. Explore and practice measuring various objects by throwing, tossing, and manipulating. Measure how long distances are with each object and mark down results. Compare their results with a partner. Prompts: Where do you think the object will go? How can you build a track to slow the ball down? Speed it up? Make it go further? Make it go a shorter distance? Turn a corner? What objects would you need to build a track for your scooters? How many moves does that need? How many objects would you need to make it? Estimate and calculate. Part 3. Explore how to manipulate objects. The scooters and balls will be the objects which can speed up or slow down when pushed or pulled. The definitions of force, motion, speed and pulling will be taught. For example, a pull moves an object closer, and a push moves the object away. Gravity and friction will also be taught which will benefit students in their science background and vocabulary references. Gravity is a type of force that can influence how your object moves. Gravity pulls objects towards the Earth's center - when you throw a ball into the air, it comes back down because of gravity. Friction is a force that slows an object down. Have you ever tried to throw a ball on a very windy day? The wind that made it harder was a type of friction. Part 4. Review and answer questions. Have students draw what they know and how they use the equipment to make connections with the science material learned. Reflections on what they have learned so far- journal.
Week 4	Deeper Connections and demonstrate competency Bring connections from vocabulary to science and language arts integration units, use 3rd grade state core for units for those. Part 1. Construct an explanation that the gravitational force exerted by Earth causes objects to be directed downward, toward the center of the spherical Earth. Emphasize that "downward" is a local description

	depending on one's position on Earth. For example, a ball that falls to the ground without using motion to lift or drop, but that automatically gravitates to the ground. Part 2. Clarify concepts on science, vocabulary, and Earth. Select choices for students to demonstrate competency in which they need to demonstrate the key concepts with equipment, and model how and why that is the way it is. What other objects demonstrate force, motion, gravity, friction, pulling and pulling. How do you know. Justify. Choices: Written form Video/google slides. Modeling and verbal explanation Poster Part 3. Design a solution to a problem in which a device functions by using scientific ideas. Define the problem, identify criteria and constraints, develop possible solutions using models, analyze data from testing solutions, and propose modifications for optimizing a solution. Examples could include a device to keep two moving objects from touching each other, or force that manipulates two objects at a given time. Can gravity be changed by objects that are lighter or heavier? How can we measure that? Can a force be changed with weight on it? How can I calculate that and be accurate? Part 4. Participation, sharing findings of facts, classroom discussion and observations of student ability to apply various motions in place.
EXTENSIONS: Common Core Rap song about Force and Motion - http://commoncorerap.com/zencart/ Bill Nye the Science Guy (Motion) http://www.youtube.com/watch?v=ZB7w6e-Hz6s Gravity, Force, Push/Pull Videos/Activities – http://www.brainpopjr.com/science/forces/gravity/	