Lesson Title	Balloon Rocket and Checker Challenge
Length of Lesson	One (50 minute) class period
Created By	Charlotte Buehler
Subject	General Science
Grade Level	7th grade
State Standards	7th: Inquiry (1b), Physical Science (2b)
DOK Level	DOK 3
DOK Application	Predict, Determine, Carry out
National Standards	5-8: Inquiry (A), Physical Science (B)
Graduate Research Element	Earth processes occur because forces are in action resulting in various happenings, such as earthquakes, hurricanes, and even erosion. Soil formation is a process that occurs via gradual erosion of rock. Studying various soil properties is thus possible because once solid rock was eroded by gradual force.

Student Learning Goal:
MS 7th Grade:
Inquiry- (b) Organize data in tables and graphs and analyze data to construct explanations and draw conclusions.
Physical Science- (b) Compare the force required to do the same amount of work with and without simple machines.

National Science Education Standards of Content 5-8:
Inquiry (A)-- Use appropriate tools and techniques to gather, analyze, and interpret data.
Physical Science (B)-- Motion and Forces

Materials Needed (supplies, hand-outs, resources):
Balloons, 2 m twine, 2 m fishing wire, tape, straw, timer clock, poker chips, rulers, Balloon Rocker/Checker Challenge worksheet
(INSPIRE_Buehler_Forcewksht_10_15_11)

Lesson Performance Task/Assessment:
This lesson will cover the components of unbalanced and balanced forces. The instructor will begin this lesson by showing the Balloon Rocket (see Capture). After the capture has been demonstrated, the instructor will ask the students to recall, analyze, and critically think about what the Balloon Rocket demonstrated. This will be an exercise of inquiry. The students will also be reminded to recall pertinent vocabulary such as force,

motion, and friction when explaining the Balloon Rocket. The students should come away understanding why the big balloon fishing wire combination was the fastest compared to the small balloon and twine combination. The students will see that the time recorded for each balloon rocket differ, and understand that twine adds more friction to the balloon rocket compared to the fishing wire and the big balloon provides more force than the small balloon.

Nest, the lesson will continue to the Checker Challenge which will be an exercise practicing the scientific method. The students will form into groups of four. One set of 5 checkers and one ruler will be given to each group. The objective for the Checker Challenge will be to knock out the bottom checker from the checker tower with the ruler without disturbing the other checkers in the tower. The students will begin by predicting what will happen to the tower of checkers when they attempt to knock the bottom one out. The students should focus on using vocabulary such as motion and force to describe their prediction. Next the students should attempt the task and then record their observations, being as thorough as possible. The next prediction will incorporate having the students use the ruler again, but instead using it flat on the table. They should predict if this new method will work better than their first method. The third attempt at knocking the bottom checker out from the tower should incorporate their own idea. They should have three predictions and three observations total.

Lesson Relevance to Performance Task and Students:
The lesson incorporates inquiry about unbalanced and balanced forces and focuses on vocabulary terms such as friction, motion, force, and gravity. Understanding these concepts is essential for building their foundation in physics.

Anticipatory Set/Capture Interest:
The instructor will set up the balloon rocket in front of the classroom and ask for three student volunteers. One student will be the timer and the other two students will hold each end of the 2m long string. The instructor will blow up the balloon, tape the balloon to the straw (which has been strung though the string), and release the balloon. Ideally the balloon should zip down the length of the string and the timer records the time. This is repeated four times with different variables, either different sting type or balloon size but *not* changing both variables together. Example variables include: (1) Big balloon, twine string, (2) Small balloon, twine string, (3) Big balloon, fishing wire, (4) Small balloon, fishing wire.

Guided Practice:
The students watch the Balloon Rocket demonstration and are guided through the activity with the instructor posing inquiry questions.

Independent Practice:
The students complete the Checker Challenge exercise in groups using the worksheet (INSPIRE_Buehler_Forcewksht_10_15_11)

Remediation and/or Enrichment:
Remediation- Individual IEP; work in groups
Enrichment – For the Balloon rocket demonstration, ask the students to think about other variables that could be incorporated (e.g. angle of the string, other types of string)

Check(s) for Understanding:
Can the students recall vocabulary terms related to the Balloon Rocket and the Checker Challenge? Can the students give a summary of what was demonstrated in both activities?

Closure:
Question 1: What is an unbalanced force? What is friction? What is gravity?

Question 2: How did the Balloon Rocket and Checker Challenge incorporate Newton's 1^{st} law?

Possible Alternate Subject Integrations:
Mathematics

Teacher Notes: