CER Rubric

	2	1	0
Claim A conclusion that answers the original question	Makes an accurate claim that answers the question	Makes a claim that answers the question, but it is inaccurate	Does not make a claim, or the claim does not answer the question
Evidence Scientific data that supports the claim. The data needs to be appropriate and sufficient to support the claim	Provides appropriate and sufficient evidence to support claim	Provides appropriate, but insufficient evidence to support claim; May include some unnecessary evidence	Does not provide evidence or only provides inappropriate evidence (evidence that does not support claim)
Reasoning An explanation of scientific concepts that relate to the claim and evidence	Completely and accurately explains at least one scientific concept that relates to the claim and evidence	Attempts to explain at least one scientific concept that relates to the claim and evidence	Does not provide reasoning, or only provided inappropriate reasoning
Feedback Comments on what was done well and suggestions on improvements	Provides three or more specific feedback ideas; includes both suggestions and praise	Provides two or more specific feedback ideas	Only one specific feedback idea or feedback is not specific

Collaboration Rubric

Name: _____ Activity _____ Date _____

	Novice 1 point	Developing 2 points	Accomplished 3 points	Exemplary 4 points
Contribution	One or more members do not contribute.	All members contribute, but some contribute more than others.	All members contribute equally.	All members contribute equally and their contributions relate to each other.
Cooperation	Teacher intervention was often needed to help group cooperate.	Members work well together some of the time. Some teacher intervention was needed.	Members work well together most of the time.	Members work well together all of the time and assist each other when needed.
On task	Team needs frequent teacher reminders to stay on task.	Members are on task some of the time. Some teacher intervention was needed.	Members are on task most of the time.	Members are on task all of the time. If someone went off task, team immediately steered group back on task.
Communication	Members need frequent teacher reminders to listen to each other and speak to each other appropriately.	Members need some teacher reminders to listen to each other and speak to each other appropriately.	Members listen to each other and respond politely most of the time.	Members always listen to each other and respond politely.

Collaboration Group Work Rubric

Name: _____ Activity _____ Date _____

	Novice 1 point	Developing 2 points	Accomplished 3 points	Exemplary 4 points
Contribution	One or more members do not contribute.	All members contribute, but some contribute more than others.	All members contribute equally.	All members contribute equally and their contributions relate to each other.
Cooperation	Teacher intervention was often needed to help group cooperate.	Members work well together some of the time. Some teacher intervention was needed.	Members work well together most of the time.	Members work well together all of the time and assist each other when needed.
On task	Team needs frequent teacher reminders to stay on task.	Members are on task some of the time. Some teacher intervention was needed.	Members are on task most of the time.	Members are on task all of the time. If someone went off task, team immediately steered group back on task.
Communication	Members need frequent teacher reminders to listen to each other and speak to each other appropriately.	Members need some teacher reminders to listen to each other and speak to each other appropriately.	Members listen to each other and respond politely most of the time.	Members always listen to each other and respond politely.

Forces Investigation

Question

- ☐ Investigable Question about forces
- ☐ Tests one variable

Procedure

- ☐ Tests one variable
- ☐ Identifies specific amounts/measurements
- ☐ Provides specific directions
- ☐ All steps are identified (no steps are missing)
- ☐ Controls variables for fairness
- ☐ Uses only common household objects
- ☐ Addresses number of trails
- ☐ Includes safety measure

Comments/Feedback
Glows:
Grows:

Connecting to the *Next Generation Science Standards* (NGSS Lead States 2013)

Standard
3-PS2-1 Motion and Stability: Forces and Interactions
https://www.nextgenscience.org/dci-arrangement/3-ps2-motion-and-stability-forces-and-interactions
The chart below makes one set of connections between the instruction outlined in this article and the *NGSS*. Other valid connections are likely; however, space restrictions prevent us from listing all possibilities. The materials, lessons, and activities outlined in the article are just one step toward reaching the performance expectations listed below.

Dimensions	**Classroom Connections**
Science and Engineering Practices **Asking Questions and Defining Problems** • Ask questions about what would happen if a variable is changed.	• Students work in groups to create investigable questions about forces (gravity, friction or magnetism) that ask what would happen if they change a variable.
Planning and Carrying out Investigations • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials is considered.	• Student collaboratively plan investigations related to forces using a fair test, controlling variables and considering the number of trials.
Analyzing and Interpreting Data • Represent data in tables and/or various graphical displays	• Students follow investigations and represent the data in tables and graphs.
Constructing Explanations and Designing Solutions • Use evidence to construct or support an explanation.	• Students construct an explanation based on the data collected in the investigation.
Disciplinary Core Ideas **PS2.A: Forces and Motion** • Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.)	• Students design investigations to explore how a force (gravity, friction, or magnetism) acts on an object and has both strength and direction.
Crosscutting Concepts **Cause and Effect** • Cause and effect relationships are routinely identified.	• Students follow an investigation to determine the cause and effect relationship when a variable is changed.

Building Towards Performance Expectation (PE listing with Clarification Statement and Assessment Boundary)

3-PS2-1. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. [Clarification Statement: Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from both sides will not produce any motion at all.] [Assessment Boundary: Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.]

Connections to the *Common Core State Standards* (NGAC and CCSSO 2010)

ELA/Literacy -

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-PS2-1)

W.3.7 Conduct short research projects that build knowledge about a topic. (3-PS2-1)

W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-PS2-1)

Mathematics

MP.2 Reason abstractly and quantitatively. (3-PS2-1)

MP.5 Use appropriate tools strategically. (3-PS2-1)

3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. (3-PS2-1)

	Gravity	Friction	Magnetism
Question Prompts at Station	What is gravity? What are some variables that might affect gravity? What are some investigable questions about gravity?	What is friction? What are some variables that might affect friction? What are some investigable questions about friction?	What is gravity? What are some variables that might affect magnetism? What are some investigable questions about magnetism?
Materials at Stations	• Balls of different sizes • Stopwatch • Meter stick • Flat paper • Wadded up paper	• Books • Small board or thick piece of cardboard • Various materials including cloth, sandpaper, construction paper, foil, etc. • Spring scale • String • Timer • Measuring tape • Tape	• Bar magnets • Horseshoe magnets • Ruler • Large and small paperclips • Tape • Various materials including cloth, foil, wax paper, plastic, etc.