County Implementation Award Program (CIAP) Math and Science Lesson

Unit Title:
Force & Motion: Magnets

Lesson Title:
Magnets: What attracts them?

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Grade Level:
third grade

Time Frame:
45 - 60 minutes

Targeted Standard(s):
NGSS
3-PS2-3. Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
ELA
RI.3.1 Ask and answer questions to demonstrate an understanding of a text, referring explicitly to the text as the basis for the answers. (3-PS2-3)
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), (3-PS2-2)
SL.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail. (3-PS2-3)
Math
MP.2 Reason abstractly and quantitatively. (3-PS2-1)
MP.5 Use appropriate tools strategically. (3-PS2-1)
MP.8 Look for and express regularity in repeated reasoning

Short Description of Targeted Phenomenon: Share the following video with students of magnets causing each other to move https://media.giphy.com/media/26tn9Qrs7avBUskNi/giphy.gif
Ask students what they notice and wonder.

Through experimentation, students will understand how magnets work, what causes them to be attracted or repelled by other magnets. They will be able to explain to others that positive-negative poles attract and how like poles repel each other. They will learn and be able to explain that items with metal attract items and how through the use of magnetic forces they can manipulate objects to make them move.

Three Dimensions of NGSS

Science & Engineering Practice/s (SEP):

- Ask questions that can be investigated based on patterns such as cause and effect relationships. (3-PS2-3)
- 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 considered. (3-PS2-1)
- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (3-PS2-2)
- Science findings are based on recognizing patterns. (3-PS2-2)
- Science investigations use a variety of methods, tools, and techniques. (3-PS2-1)

Disciplinary Core Idea/s (DCI):
- Each force acts on one particular object and has both strength and a direction. (3-PS2-1)
- Objects in contact exert forces on each other. (3-PS2-1)
- Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. (3-PS2-3), (3-PS2-4)

Crosscutting Concept/s (CCC):
- Patterns of change can be used to make predictions. (3-PS2-2)
- Cause and effect relationships are routinely identified. (3-PS2-1)
- Cause and effect relationships are routinely identified, tested, and used to explain change. (3-PS2-3)

Language Supports: slide deck or anchor chart with visual vocabulary (magnet, attract, repel, force)

Materials Needed:
A teacher device (laptop, tablet, etc.) with access to the internet for opening; sets of magnets for students to use in pairs or triads; a variety of magnetic (paper clips, tacks, brads, whiteboards; iron ore, etc.) /nonmagnetic (erasers, pencils, books, paper, markers, crayons, etc.) items for students to use in experiments; written summaries; an example of the data table students will use

Objective(s):
1. Students will use data gathered from their experiments to create data sets and tables

2. Students will be able to explain to others how magnets attract and repel each other and how they interact with objects, not in contact with each other.

3. Students will be able to articulate their findings in a written summary.

How Math and Science concepts/skills/practices were integrated in this lesson:
This lesson is designed to address third grade NGSS science standards. Math is integrated into the lesson as students create data tables, Students will reason abstractly and quantitatively as they determine which items are magnetic, how magnetic poles attract and repel each other, and how they cause items to move due to their magnetic pull. Students will use data tables to collect and display data that they collect throughout the lesson. Students will use the data in their data tables to look for and explain any patterns that they may find.

Possible Challenges /Misconceptions:
Students playing rather than recording findings
Students not working in collaborative groups

(If using colored magnets) thinking that magnets attract/repel based on colors rather than on magnetic poles	
Formative Assessment: Teacher observation as students conduct experiments, group interactions; data tables; class discussion.	
Lesson Opening Activate prior knowledge and student interest- teacher presents an interesting situation, phenomenon, or dilemma that helps students connect to the content	
Teacher Actions Show the first 40 seconds of this Loony Toon clip Take notes of student discussion summaries Lead them to questions/or ask: What items do you think magnets will work with? Why? Do you think that magnets have the ability to move items? Why? Why not? How? What evidence will we need to prove our hypothesis?	**Student Actions** Will view video clip discuss how the magnet may work Share out a summary of discussions The class discusses teacher's questions.
Lesson Introduction Getting students ready - teacher introduces the task and makes sure students understand *what* they are trying to accomplish, but not *how* they are to do it	
Teacher Actions Provides students with one or two sets of magnets and a baggie of things that will/won't interact with the magnets Provide a time limit for experimentation Explain that students need to conduct a variety of experiments to determine how magnets work (i.e. T: Today we will be studying how magnets work. With your partner(s) you will create a number of experiments with the magnets and items at your table to determine how magnets work and what they may be attracted or what repels, or pushes them apart) Demonstrate how to record information into the data table (Use a teacher created a data table to remind students how to collect and record data.	**Student Actions** Create a list of guiding questions about how magnets may work & may/not interact with magnets

See sample below.)

Sample Data Table:

What makes a magnet work?			
Item	**Number of magnets**	**Attracts magnets**	**Repels magnets**

Body of Lesson

Students working on content - teacher observes students, monitors their progress, and provides clarification as necessary

Teacher Actions	**Student Actions**
Circulate room, observing groups, ask questions of students to check for understanding (Why do think ____just happened? How did ____ happen? What would happen if ____?)	Experiment with magnets & objects to determine how magnets attract & repel objects & each other Record information in a data table

Lesson Closure

Wrapping Up - teacher facilitates group discussion, helps students share their work/progress, helps students make connections, and ensures that big ideas are brought forward

Students share findings of their data tables - discuss results - determine what, if any, patterns exist

Teacher Actions	**Student Actions**
Has students share findings Record findings on an anchor chart Chart list for next steps Have students write a summary of their findings	Share findings Generate questions about their findings Create a class list of next steps to test magnetism

Summative Assessment:

Collect student data sheets, review data tables, and findings, use student responses to determine what may need to be retaught, or what misconceptions students may have.

Other Teaching Resources:

Lab Safety: Provide clear directions about how to use magnets on materials not on their bodies, or on items students are wearing. No other lab specific rules apply
Extensions (if any):

- Students must be given opportunities to grapple with the content
- Students are actively engaged in the construction of knowledge
- Vocabulary and notation are introduced in context and as needed