Class: Grade 3 Science

Lesson Title: Magnetic Forces & Fields

Class Size: **20**
Time: **50 mins**

Curriculum Outcomes:

100-32 investigate the polarity of a magnet, determine the orientation of its poles, and demonstrate opposite poles attract and like poles repel

203-5 respond to the ideas and actions of others and acknowledge their ideas and contributions

Learning Objectives:

1. Students will be able to demonstrate an understanding of push and pull magnetic forces.
2. Students will understand the differences between north and south poles and magnetic fields created by differing charges.

Materials:

- Two different colored pinnies (blue and red are optimal) – class set
- Basketball or other object to act as the center of an electric field
- Tape

Preparation beforehand:

- Make sure a large space is cleared for the activity (a gym area is preferable)
- Tape a straight line somewhere in the room (long enough for all students to assemble themselves on it)

Introduction:

1. Introduce the topic. Possible prompt questions include:
    a. What do you about magnets? How do they work?
    b. What do you know about push/pull forces? Are you able to see them with your eyes?
    c. What is the difference between North and South poles?

2. Explain what a kinulation is (broken up into kinesthetic and simulation). Tell them that these are used to help students learn difficult concepts that are otherwise difficult to picture. It allows students to become part of the demonstration, and therefore easier to remember and learn. Ask students if they would like to try one.

Activity #1: N+N/S+S and N + S Pole Effects

1. Hand out the pinnies to the students in the class:
    a. Half of the class will wear blue to represent North Poles
    b. Half of the class will wear red to represent South Poles
2. Have the students sit down on the floor and ask for two volunteers wearing blue.
    a. Ask these two students, as North Poles, to act out how they would attract or repel (students should repel one another). Ask these students why they acted this way, and whether they could actually see any force acting (there was no physical pushing, etc.)
    b. Repeat the same activity, instead with two red volunteers.
    c. At this point they should be comfortable with push magnetic forces.
3. Ask the blue students to line up on one side of the wall and the red students on the other side of the wall.
    a. First ask the students how they feel, as North or South Poles, about the students standing in line beside them (do they feel like they should be pulled toward these or pushed). This is just a refresher of the first activity (push forces).
    b. Now ask them to simulate how they feel about the students on the other side of the room (they should all feel attracted to the Poles on the other side of the room and should move toward each other and meet somewhere in the middle.
    c. If only one color of students moves, and the other remains still, discuss with students the fact that pull forces are felt by both Poles, i.e. North pulls on South and South pulls on North, so they would both want to move toward each other.

Activity #2: Magnet

1. Ask students to assemble themselves on the straight line so that they represent a magnet. Let them do this on their own (if they have trouble, you might drop some hints like the North and South Pole ends of a magnet; students should be assembled so all of the red and all of the blue are at opposite ends of the line).
2. Pull one blue and one red student out of the ends of the magnet and tell them that they are no longer part of the magnet; they are each on their own as South or North pole charges.
3. Guide the blue student toward the blue end of the magnet and ask him/her to act out the according push or pull force he/she would feel at that end of the magnet (should be repelled).
4. Take this blue student to the red end of the magnet and do the same (should be attracted toward the magnet).
5. Repeat this activity with the red student (the results will be opposite of above).

Activity #3: Magnetic Field

1. Talk to the students about a magnetic field being an area where a number of South and North Pole charges are present, sort of like a minefield with different types of Poles scattered about.
2. Place a basketball at the center of the room (or other object) to represent the center of the magnetic field.
3. Assemble the magnetic field using all students except 1-blue and 1-red.
    a. Start by taking 6 students to form a circle around the basketball, back-turned to the ball (3-red, 3-blue). The orientation can be mixed, i.e. 2-red, 2-blue, 1-red, 1-blue or whichever way you wish.
    b. Next, have some students (5-6) stand about 2m from the center of the magnetic field. They can somewhat form a circle around the center (obviously much more spaced out than the center circle students).
    c. With the remaining students (other than the 1-red, 1-blue student reserved), have another circle about 3m away from the last circle of students. The grouping of blue and red does not really matter; it is completely preferential.
4. Have the two remaining students walk around the magnetic field that is setup. Talk about what kind of forces they are feeling as they go past Poles (attracted and repelled by certain ones).
5. Talk about how the students near the center of the field are much closer together, meaning the forces at the center of the field are much stronger, so as soon as students reach the center, they would be attracted to the opposite color very quickly.
6. *Optional*: assemble the magnetic field so that all the blue students are in one half of the field, and all of the red are in the other half (how does this affect a red student trying to enter from the red side? Blue side?).

Conclusion – Possible wrap-up questions:

1. Why can't we see these forces?
2. Can you think of any real-life examples of North/South Poles?
3. What do you think would happen if we didn't have magnetic forces in the world?