*These lesson plans are created under the assumption that the classes range between 30-45 minutes.
When an outcome has been divided among two lessons, it has been noted with two Astrix (\*\*) directly underneath the curriculum outcome of the lesson.*

**UNIT 3**

**PHYSICAL SCIENCE: INVISIBLE FORCES**

**MAGNETIC FORCES**

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**NSES Outcomes:** Content standard B: Physical Sciences

* Light, heat, electricity and magnetism (PS-3)

**Curriculum Outcomes:** Investigate to identify and group materials that can be magnetized and materials that are attracted by magnets, and distinguish these from materials that are not attracted to magnets. (100-31, 202-2)
*\*\* Lesson 1 of 2*

**Content to Be Taught:**
Students will learn that some metal and materials are attracted by magnets whereas some are not.

**Children’s Prior Knowledge and Misconceptions:**
Students may be aware of magnets and the fact that they stick onto surfaces such as the fridge, or only metal based objects. Students may not know what objects are magnetic and what objects are not magnetic.

**Performance Objective:**
Condition:
Students will be given materials (some that are magnetic and some that are not).
Performance:
They will then be given a magnet and through exploration, they will determine which of their materials are magnetic and which ones aren’t.
They will then write in their journal, grouping the objects between magnetic and non-magnetic (students should be directed to make a chart).
Criteria:
Students will discover that the materials that are made of steel and iron are attracted to magnets whereas copper, aluminum, wood, plastic, etc. make up materials that are not attracted to magnets.

**Concept Development:**

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| **ENGAGEMENT** |
| Materials: * Magnets
* 1 magnetic object
* 1 non-magnetic object

\* These objects will not appear under the “exploration” section. The goal here is for students to be introduced to magnetic objects and non-magnetic objects in order for them to then explore different objects that surround them. These two objects above will simply be used for demonstration.Safety:* Magnets are to be kept away from any electronic devices (smart board, any computers/netbooks, ipod/ipads, etc).
* Materials are tools not toys!

Procedure:* As this is the very first lesson to a new unit, a K-W-L chart  should be created with the students:What do you already **K**now about magnets?What do you **W**ant to know about magnets?

           What did you **L**earn about magnets?* Teacher will now hold up one magnetic and one non-magnetic object. The students will be asked which object the magnet will be attracted to and why. The teacher will then make a demonstration by testing out the two objects with the magnet; this will create a discrepant event.
* The essential question to guide student’s learning at this time will be asked: *What makes a material magnetic?*
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| **EXPLORATION** |
| Materials:* 1 magnet per group of 2
* 1 paper bag full of magnetic and non-magnetic materials
* Student’s science journals

Procedure:* Students will be divided into pairs and each pair will be given one paper bag filled with both magnetic and non-magnetic objects.
* As the pairs empty out their bags, students will be asked to make notes in their journal of their predictions of which objects they think will be magnetic and which ones will not. They must explain their reasoning for their choices.
* Once the predictions have been made, pairs are to raise their hand in order to let the teacher know that they have completed the first part of the activity and that they are ready to receive their magnet and put their hypothesis to the test. Students will now determine which objects are magnetic and which are not.
* When students have finished examining which objects are magnetic and which objects are non-magnetic, they will then write in their science journal their final conclusions.Students must also make a list of which items are magnetic and which ones are non-magnetic.
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| **EXPLANATION** |
| Have a whole-class discussion of the items that have been found to be magnetic and the ones that are not. What were the main reasoning from the pairs for explaining why certain materials showed to be magnetic while others showed not to be. Students can refer to their science journals to share their observations with the rest of the class.  |
| **ELABORATION** |
| * Ask the students to make predictions about other objects that they see in the classroom that could be magnetic or non-magnetic.
* Ask the students to make predictions about other objects that they may find in their homes that could be magnetic or non-magnetic.
* Students will explain why they think these items are magnetic or non-magnetic based on what they have found in the previous experiment.
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| **EVALUATION** |
| Assessment will take place in the forms of formative assessment which would include the K-W-L chart, the class discussion which is to take place after the exploration and the student’s science journals.  |
| **ACCCOMMODATIONS** |
| * Accommodations for this activity could include letting the students draw the objects that are magnetic and the objects that are non-magnetic.
* Another accommodation could include letting students make their predictions orally and then giving their explanations orally as well.
* Gifted learners can be challenged to look around the classroom to find other objects that were not presented to them in the bag. They would first predict whether or not the items were magnetic and then test it. They would then explain the reasoning for why they are magnetic or why they are not magnetic.
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**NSES Outcomes:** Content standard B: Physical Sciences

* Light, heat, electricity and magnetism (PS-3)

**Curriculum Outcomes:** Investigate to identify and group materials that can be magnetized and materials that are attracted by magnets, and distinguish these from materials that are not attracted to magnets. (100-31, 202-2)
\* Lesson 2 of 2

**Content to Be Taught:**
Students will learn that certain objects such as iron nails, can be magnetized by stroking it with a magnet. Students will discover that when magnetizing an object, the force for hold for only a short period of time, and that some objects magnetize better than others.

**Children’s Prior Knowledge and Misconceptions:**
In the lesson prior to this lesson, students explored what materials are attracted to magnets and which are not.  Students believe that magnets are what provide the magnetic field/invisible force, but may have the misconception that the material that magnets can attract can be turned into a magnet/magnetized themselves.

**Performance Objective:**
Condition:
Students will be presented with objects that were found to be attracted by magnets in the previous lesson, including paper clips, iron nails, and steel staples.  Students will also be given a strong magnet.
Performance:
Students will explore how to magnetize objects, and in sum “make a magnet.”  Students will be shown that my stroking the given material with a magnet, that the material will be given the magnetic field and will, itself, become a magnet
Criteria:
Students will record which materials can be magnetized and which can not be magnetized.

**Concept Development:**

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| **ENGAGEMENT** |
| *Include safety, materials, procedures, tips, etc.* |
| Safety:* Magnets are to be kept away from any electronic devices (smart board, any computers/netbooks, ipod/ipads, etc).
* Materials are tools not toys!
* When given materials such as nails, staples, etc...use them responsibly and as directed

Procedure:* Students will review what was discovered during the previous lesson, and what they discovered in regards to what materials are attracted by magnets and which are not.
* The teacher will hold up various items that were explored during the previous lesson and students will be asked whether the object is a magnet, was attracted by a magnet, or was not attracted by a magnet.
* The teacher will pick up one of the objects that was attracted to a magnet, and stroke the object (such as a paper clip) with a strong magnet
* Students will be shown that by doing this, the teacher has created a magnet out of the paper clip, and that the paper clip can now attract things such as paper clips and staples.
* The essential question to guide student’s learning at this time will be asked: *What materials can be magnetized/turned into a magnet?*
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| **EXPLORATION** |
| Materials:* 1 magnet per group of 2 students
* 1 paper bag full of magnetic and non-magnetic materials (the bag will contain similar object from the previous lesson)
* Student’s science journals

Procedure:* Students will be divided into pairs, perhaps the same pairs as the previous day if the partners were successful pairs.
* Students will be given one paper bag per pair, filled with both magnetic and non-magnetic objects.
* As pairs, students will empty out their bags, and will be asked to make notes in their journal of the predictions of which objects they think will be able to be magnetized and which ones will not.
* They will be asked to explain the reasoning of their thinking, and are encouraged to use the findings of their previous exploration
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| **EXPLANATION** |
| **ELABORATION** |
| *Include safety, materials, procedures, tips, etc.* |
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| **EVALUATION** |
| *Include safety, materials, procedures, tips, etc.* |
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| **ACCCOMMODATIONS** |
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**NSES Outcomes:** Content standard B: Physical Sciences

* Light, heat, electricity and magnetism (PS-3)

**Curriculum Outcomes:** Investigate the polarity of a magnet, determine the orientation
of its poles, and demonstrate that opposite poles attract and like poles repel (100-32)

**Content to Be Taught:**
Students will understand the overall concept of polarity and that magnets are composed of two separate polarities: north and south poles. They will come to understand which poles attract each other and which poles repel one another.

**Children’s Prior Knowledge and Misconceptions:**
For this lesson, students may assume that all magnets will stick to each other. They may not be aware of the concept of poles within magnets and that in order for the magnets to stick, a north pole must meet with a south pole.

**Performance Objective:**
Condition:

Performance:
Students will identify and describe the poles of a magnet. They will demonstrate how the poles interact with one another.

Criteria:

**Concept Development:**

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| **ENGAGEMENT** |
| *Include safety, materials, procedures, tips, etc.* |
| Materials:* N/A

Safety:* Beware of others around you and be sure to keep your head up in order to avoid stumbling upon your neighbours.

Procedure:* The entire class is to stand up and form a closed circle where everyone is facing forward (toward the center).
* The teacher must explain to the students that they are essentially acting as magnets. What is noticed about what is seen when everyone is facing the same way?
* The teacher then asks that every second student is to turn around to face “the back” while the others remain facing the front. At this point, students should make a connection with one another by holding hands.
* At this time, the teacher will ask the students to observe what they see in in front of them now. Students here are to make connections with the fact that they are able to see the person’s face who are standing next to them, on both sides.
* The comparison of what is seen should be made based on what is seen when students have become “opposites” rather than when everyone was the same. The teacher then explains that this is the way magnets work, based on showing that opposites attract while same sides are limited to certain connections.
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| **EXPLORATION** |
| Materials:* Maze
* Two bar magnets (unlabelled)
* Science journal

Procedure:* Have students be divided into pairs and distribute one maze and two bar magnets per pair.
* Students are to first examine the maze before them and explain in their journal how they think they will use one magnet to get the other out of the maze without touching them.
* Once they have made a few predictions, pairs will raise their hand and once approached by the teacher, they will have to explain their game plan.
* Upon the approval of the teacher, students must then put their hypothesis to the test. They will place one magnet in the maze and use the other one to get it from start to finish.
* Once the pairs have successfully completed the maze, they must then refer back to their journal and make additional comments about their initial hypothesis.
 |
| **EXPLANATION** |
| Upon every pair’s completion of the maze, the teacher will bring the attention back in order to have a whole-class discussion on the conclusions made based on this experiment. The teacher will explain the concept of the north polarity and the south polarity by explaining that magnets are composed of two separate poles creating different forces. The opposite polarities attract one another (North-South and South-North) while the like polarities will repel one another (North-North and South-South). Refer back to the engagement activity and explain that when everyone was facing the same way, you were acting as “like” magnets. When every second person turned and presented their opposite side, you were acting as “opposites” making the magnetic forces attract rather than repel.  |
| **ELABORATION** |
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| **EVALUATION** |
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| **ACCCOMMODATIONS** |
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**NSES Outcomes:** Content standard B: Physical Sciences

* Light, heat, electricity and magnetism (PS-3)

**Curriculum Outcomes:** follow a simple procedure where instructions are given one step at a time to increase and test the strength of a temporary magnet by stroking it or storing it next to a stronger magnet (201-1)

**Content to Be Taught:**

**Children’s Prior Knowledge and Misconceptions:**

**Performance Objective:**

**Concept Development:**

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| **ENGAGEMENT** |
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**NSES Outcomes:** Content standard B: Physical Sciences

* Light, heat, electricity and magnetism (PS-3)

**Curriculum Outcomes:** follow a simple procedure where instructions are given one step at a time to increase and test the strength of a temporary magnet by stroking it or storing it next to a stronger magnet (201-1)

**Content to Be Taught:**

**Children’s Prior Knowledge and Misconceptions:**

**Performance Objective:**

**Concept Development:**

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| **ENGAGEMENT** |
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**NSES Outcomes:** Content standard B: Physical Sciences

* Light, heat, electricity and magnetism (PS-3)

**Curriculum Outcomes:** identify familiar uses of magnets (102-14)

**Content to Be Taught:**

**Children’s Prior Knowledge and Misconceptions:**

**Performance Objective:**

**Concept Development:**

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| **ENGAGEMENT** |
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| **ACCCOMMODATIONS** |
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**NSES Outcomes:** Content standard B: Physical Sciences

* Light, heat, electricity and magnetism (PS-3)

**Curriculum Outcomes:** make predictions about the number of objects a magnet can pick up under different conditions (200-3)

**Content to Be Taught:**

**Children’s Prior Knowledge and Misconceptions:**

**Performance Objective:**

**Concept Development:**

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**NSES Outcomes:** Content standard B: Physical Sciences

* Light, heat, electricity and magnetism (PS-3)

**Curriculum Outcomes:** make and record relevant observations during investigations about the number of objects a magnet can pick up under different conditions, and use the observations to identify conditions that affect the force of magnets (100-33, 201-5)

**Content to Be Taught:**

**Children’s Prior Knowledge and Misconceptions:**

**Performance Objective:**

**Concept Development:**

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**NSES Outcomes:** Content standard B: Physical Sciences

* Light, heat, electricity and magnetism (PS-3)

**Curriculum Outcomes:** propose answers to questions related to magnetizing materials (202-7)

**Content to Be Taught:**

**Children’s Prior Knowledge and Misconceptions:**

**Performance Objective:**

**Concept Development:**

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| **ENGAGEMENT** |
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**NSES Outcomes:** Content standard B: Physical Sciences

* Light, heat, electricity and magnetism (PS-3)

**Curriculum Outcomes:** In cooperative groups, construct and evaluate a toy that is moved by attractive or repulsive magnetic forces (201-3, 202-8, 203-5)

**Content to Be Taught:**

**Children’s Prior Knowledge and Misconceptions:**

**Performance Objective:**

**Concept Development:**

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| **ENGAGEMENT** |
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| **ACCCOMMODATIONS** |
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**ELECTROSTATIC FORCES**

**NSES Outcomes:** Content standard B: Physical Sciences

* Light, heat, electricity and magnetism (PS-3)

**Curriculum Outcomes:** describe and demonstrate ways to use everyday materials to produce static electric charges, and describe how charged materials interact (attract, repel) (101-8, 203-3)

**Content to Be Taught:**

**Children’s Prior Knowledge and Misconceptions:**

**Performance Objective:**

**Concept Development:**

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| **ENGAGEMENT** |
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| **ACCCOMMODATIONS** |
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**NSES Outcomes:** Content standard B: Physical Sciences

* Light, heat, electricity and magnetism (PS-3)

**Curriculum Outcomes:** identify materials to be used to investigate conditions which affect the force of static electricity, and suggest ways to use them in their investigations (202-7)

**Content to Be Taught:**

**Children’s Prior Knowledge and Misconceptions:**

**Performance Objective:**

**Concept Development:**

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| **ENGAGEMENT** |
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| **ACCCOMMODATIONS** |
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**NSES Outcomes:** Content standard B: Physical Sciences

* Light, heat, electricity and magnetism (PS-3)

**Curriculum Outcomes:** make and record relevant observations during investigations to identify conditions that affect electrostatic forces, draw simple conclusions about these conditions (100-33, 201-5, 202-7)

**Content to Be Taught:**

**Children’s Prior Knowledge and Misconceptions:**

**Performance Objective:**

**Concept Development:**

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| **ENGAGEMENT** |
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| **ACCCOMMODATIONS** |
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**NSES Outcomes:** Content standard B: Physical Sciences

* Light, heat, electricity and magnetism (PS-3)

**Curriculum Outcomes:** identify new questions from what has been learned about static electricity (202-9)

**Content to Be Taught:**

**Children’s Prior Knowledge and Misconceptions:**

**Performance Objective:**

**Concept Development:**

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| **ENGAGEMENT** |
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| **ACCCOMMODATIONS** |
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**NSES Outcomes:** Content standard B: Physical Sciences

* Light, heat, electricity and magnetism (PS-3)

**Curriculum Outcomes:** describe examples of the effects of static electricity in their daily lives, and identify ways in which static electricity can be used safely or should be avoided (102-15)

**Content to Be Taught:**

**Children’s Prior Knowledge and Misconceptions:**

**Performance Objective:**

**Concept Development:**

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| **ENGAGEMENT** |
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**NSES Outcomes:**

**Curriculum Outcomes:**

**Content to Be Taught:**

**Children’s Prior Knowledge and Misconceptions:**

**Performance Objective:**

**Concept Development:**

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| **ENGAGEMENT** |
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| **ACCCOMMODATIONS** |
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Cross-curricular ideas:

1- With ART: draw portrait of their partner
- teach the proper facial proportion (half the class)
- students draw their partner with static hair.
- we will attach a balloon to the portrait when its all done.

2- With LANGUAGE ARTS: story book
- strange forces
- “Mystery forces”

3- With MATH: pop can race
- students will measure the distance of their can before the can looses its static force.