First Lego League Curriculum - Ontario

Activity Sheet	
Gr 7 - Lesson #6	Stop at Line – A Bit of Light Sorting
Date:	Name(s):

Check That I'm Done ☑		
☐ Commented on my code	☐ Modify it task	☐ Coding Challenge

Learn

The main way we separate mixtures is to first find out what physical property makes it different than the other materials in the mixture. Next we find a way to exploit that property in order to extract it.

For example, in recycling, when we want to extract the metal, we use **magnets** because most metal is magnetic.

If a substance is very light, and non-soluble, **floating** may be a good way to get it out of particular mixture. Conversely, heavy particles may **settle** to the bottom (like mud in water).

If a piece of a substance is consistently larger (or smaller) than the other pieces around it, **settling** can be a great method. This works great with gold nuggets in sand (which rise up), or raisons in cereal (which sink down). **Sieving** can also be appropriate here depending on substances.

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Filtering works great for particles that don't dissolve in a fluid such as water or air such as left over coffee grinds, or air pollution. If the two substances are similar in all of these qualities it may be difficult to separate them.	

Predict and Plan

Imagine your robot as a sorting machine. What qualities of materials can it best detect using its sensors? _____

Demonstrate/Design/Discover

- ✓ Rotate your colour sensor 90° so it's facing straight out away from the robot.

- ✓ Using coloured paper (you can use construction paper, or colour the paper yourself) stand them up in a circle around your robot (folding them so they stand up). In addition to them being coloured, each will have a separating method written on the front. See figure below.

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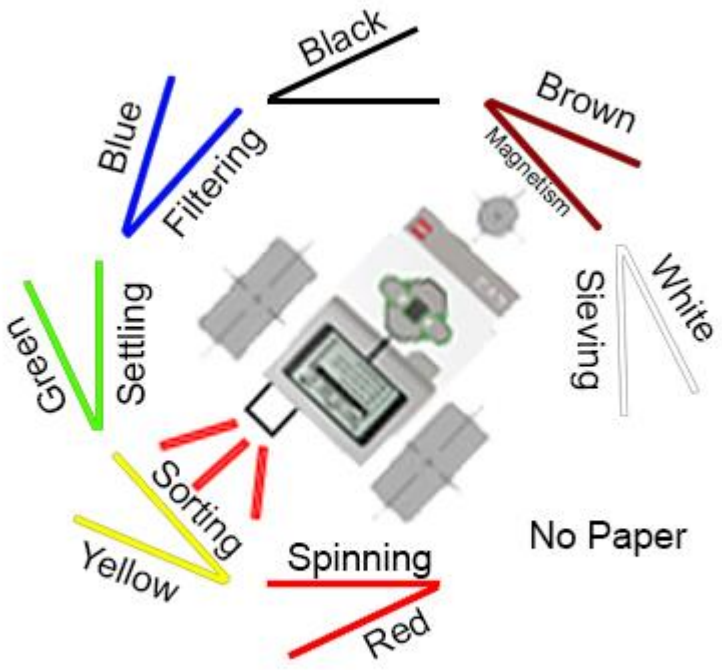

- ✓ Remember to set the paper up nice and close to your robot as the colour sensor is only accurate about 2cm away. Positioning will be tricky.

- ✓ Create a program that rotates on the spot (one wheel forwards and one wheel backwards) and waits until it sees a certain colour.

- ✓ If the robot does see the desired colours (or set of colours) it should move forward just enough (~2.5cm) as to knock over the paper (or at the very least set it back, this sorting it out. Then your robot will backup to the center again.

- ✓ By checking and unchecking the different colours in you wait block, create the following variations of this program, to sort out these colours by their various attributes.

1. Colours that start with “B”
2. Primary colours
3. Separating methods that utilise the size of the particles
4. Separating methods that work with wet mixtures
5. Separating methods that only work on metals

***Put your program in a loop so it can continue to search for multiple colours.**

Tips: Your teacher may give you further programs to create. Keep them organized by creating new tabs and don’t delete them when they’re done.

If your robot is knocking over other pieces of paper when it spins you can either tape them to the ground (and watch which ones it nudges) or extend your colour sensor farther away from the robot using more Lego.

Record
Which of your programs were able to sort everything efectively? _____

Questions	
Question 1 Science	Imagine you had a mixture of thousands of small beads that were exactly the same except for their colour. Which separating methods would not work? Explain.

Filtering, magnetism, sieving, and settling would all not work. You would need to find a custom sorting method.	
Question 2 Robotics	Referring to the example in question one, can you think of a way a robot could assist in this difficult task?
If you lined up the beads in a row, you could use a colour sensor to select only one of a certain colour.	
Question 3 Math	Now imagine a mixture of beads where half of them are slightly larger than the others. What options of sorting are available to us now?
Sieving and settling (mainly)	
Question 4 Science	What separating method would you use to remove dirt from water?
Filtering	
Question 5 Robotics	Other than colour, what aspects of an object can an EV3 robot detect (using any of its sensors).
Size (using the ultrasonic sensor)	

Extension Coding and Science	Incorporate the use of the robot arm to knock over the pieces of paper (or replace paper with something more creative).

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