**INTRODUCTION TO LEGO ROBOTICS**

**Lesson 1**

**Goal:** I can use observation and manipulation to determine the uses of various LEGO pieces.

**Materials:**

Website: [www.legoengineering.com](http://www.legoengineering.com)

Black (friction) pin, and grey pin

2 large beams, exact size unimportant.

Video: Black and Grey Pins on website

**Procedure:**

1. Using observation only, partners should write down any differences they notice between the two coloured pins. Students can use a Venn diagram or a T-chart to record their observations.
2. Partners share their observations.
3. Students now pick up the beams and use manipulation of the objects to see if they can further determine the differences between the two coloured pins.
4. Have the students write word pairs to describe the two pins; tight/loose, stuck/non-stuck (friction/non-friction) etc.
5. Ask them to share their word pairs.
6. Ask students to summarize their discoveries and to theorize what they might use the different pieces for.

See Appendix Robotics, LEGO, first day…What do I do?!

**LESSON 2 – Input/Output and Flow Charting**

**Goal:** I understand the difference between input and output on a robot.

**Materials:**

Cue cards with commands

Student as robot

**Procedure:**

1. Lingo –
	1. Sensors (5 senses) – Interacts with the brain and gives instructions
		* 1. Touch
			2. Colour/Light
			3. Sound
	2. Computation (Instructions) - If you feel this then do this.
	3. Actuators (Action/Movement)
2. Have a student be the robot, his input is his senses. Ask the student to walk forward until the teacher tells him to stop. The output is the teacher telling him to stop.
3. Blind Robot – Have the student close his eyes,
	1. His sense of touch can be compared to a robots touch sensor. The student holds his hand up and he continues to walk until he touches the teachers’ hand.
	2. His sense of hearing can be compared to a robots sound sensors. The student continues to walk until he hears a command.
	3. His sense of sight can be compared to a robots colour/light sensor. The student continues to walk until a specific colour is seen or the lights are turned off.
4. Have students pick a routine and write out the steps. Eg. Washing the dishes, brush your teeth, turning the tv on, etc. Discuss what would happen if you changed the order.
	1. Do one as a whole class and then the students can do their own.

**LESSON 3 – Movement Activities**

**Goal:** I can move a person around objects and using commands. I understand how a robot moves forward, backward and spins left and right.

1. Have students do a movement activity.
	1. In the class room, have students on a line and give cue cards commands (Simon Says). Walk forward (+), spin left. Watch for precision 5 vs 4 steps, spun too far left etc.
		1. Goal – Students are given a command and have to follow it. ‘Power Setting’ is 1 tile per command.
	2. In the gym, give commands on a cue card to each group to complete a task. Define power setting as Every student’s ‘power setting’ is different because we use toe to heel per step.
		1. Move steer brick –
			1. Arrow
				1. Move right (positive)
				2. Move left (negative)
			2. Speedometer – power setting
				1. Positive – move forward

Can be negative but inverts the turn value. Keep value positive

* + - * 1. and create commands for their peers. Use cue cards for commands (move forward 3 seconds, turn to the right etc.).
	1. Or, set up an obstacle course and write the code for your ‘robot’. Write the power setting on the cue card (toe to toe steps, quick steps etc.)
	2. Links to power settings – determine

**LESSON 4 – Introducing the software**

**Goal:** I understand how to turn on a robot. I understand how to connect my robot to a computer or via WiFi. I understand how to use the coding bricks. I understand how to upload my program.

**Materials:**

EV3 Robot
Computer
iPad for WiFi
Book: Classroom Activities for the Busy Teacher: EV3

**Procedure:**

1. Introduce the green brick and how it meets all of the movement needs. Show the colour printout of the brick and put into their journals. Talk about and label all 5 parts of the brick.
	1. Explain the On for Seconds. The robot will move for the number of seconds indicated.
	2. Arrow. Positive means forward and negative means backwards.
	3. Speedometer. This is the power setting and each student will create their own power setting based on a calculation.
		1. Take the day of the month you were born, add 15 to it and multiply it by 2. This will give each student their unique power setting.
	4. Stop Watch - # of seconds robot will move
	5. Break is on or break is off.
2. Program brick to move forward for # of seconds. Connect wire to robot which will auto detect. To download software click arrow at the bottom right corner of the EV3 program to make robot move. Must click arrow every time something in the brick has changed.
	1. WiFi – ensure robot is set for WiFi and press play using the iPad

**LESSON 5 –** Road Kill Challenge

**Goal:** I can move a robot forward to a target