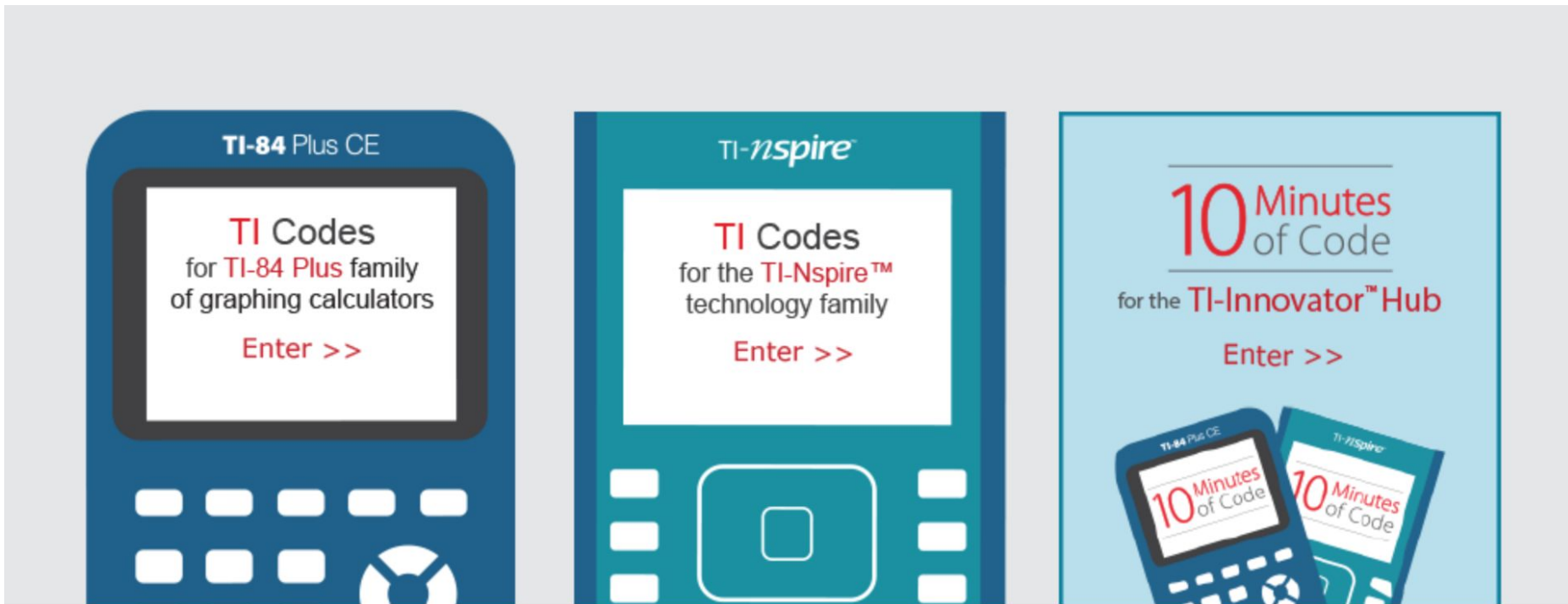
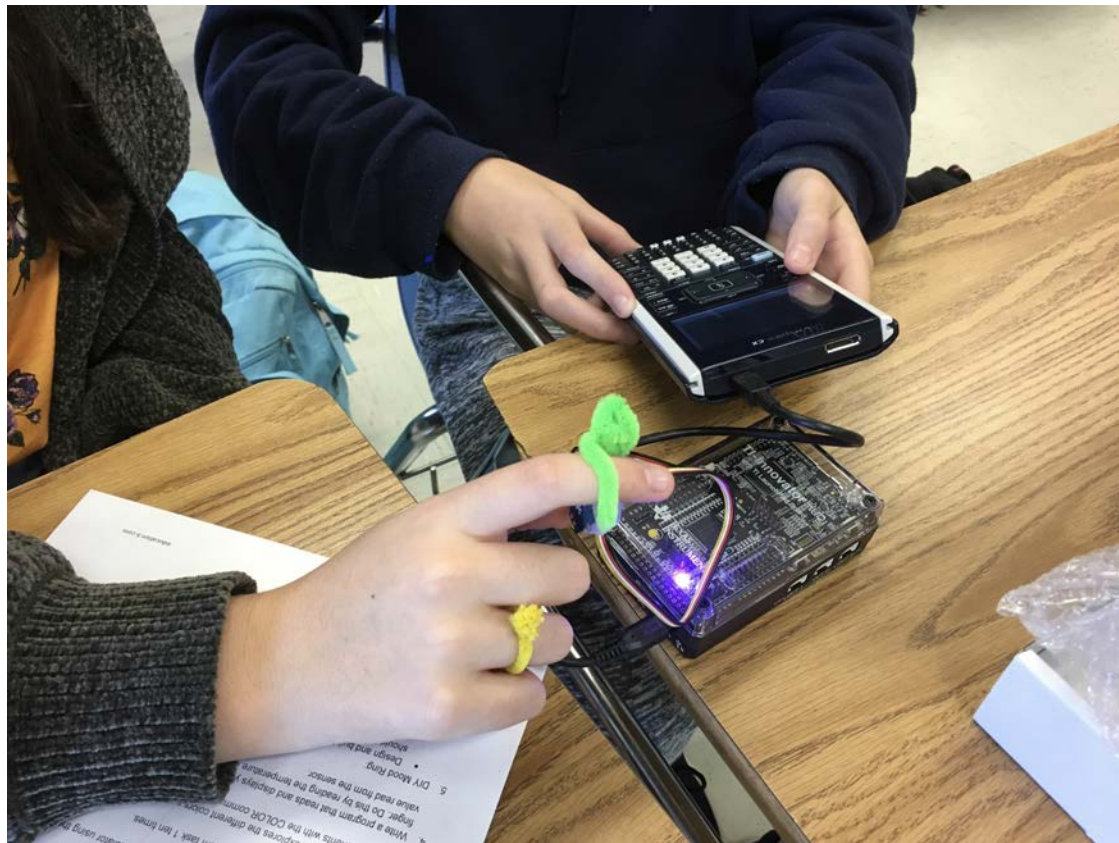


Adventures in Coding and STEM in the Math Classroom

Ellen Browne and Brad Posnanski

10 minutes of Code



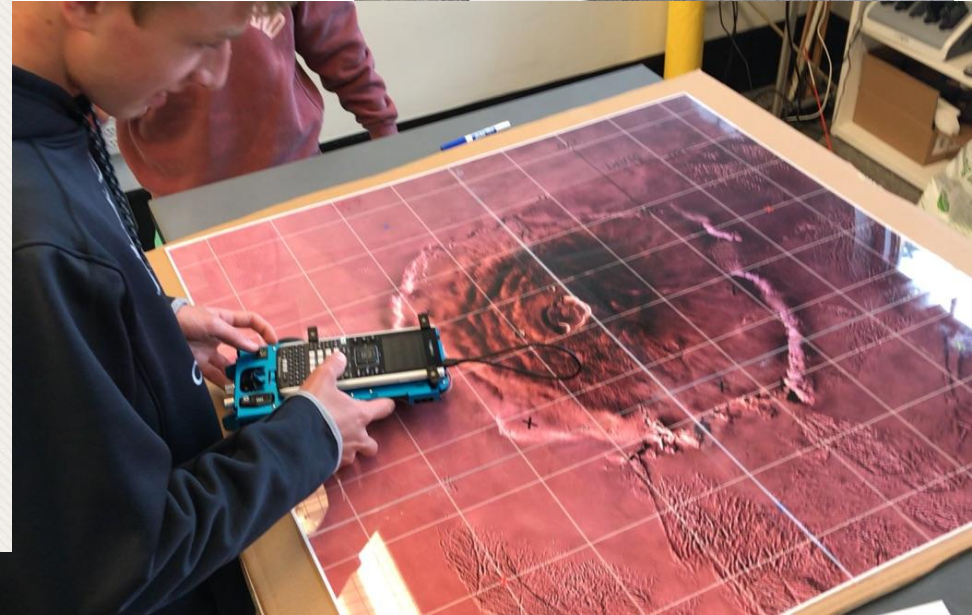
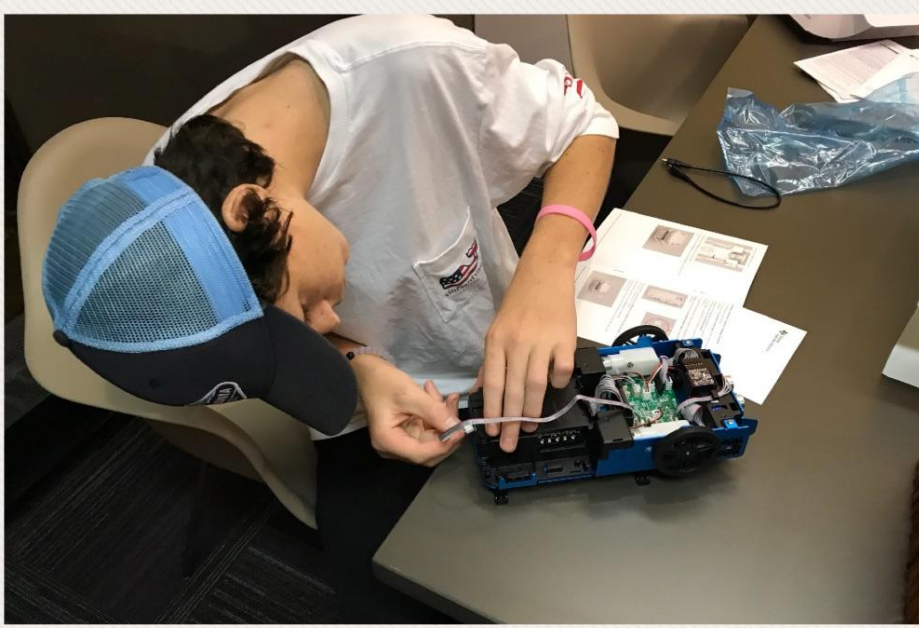


Mood Ring





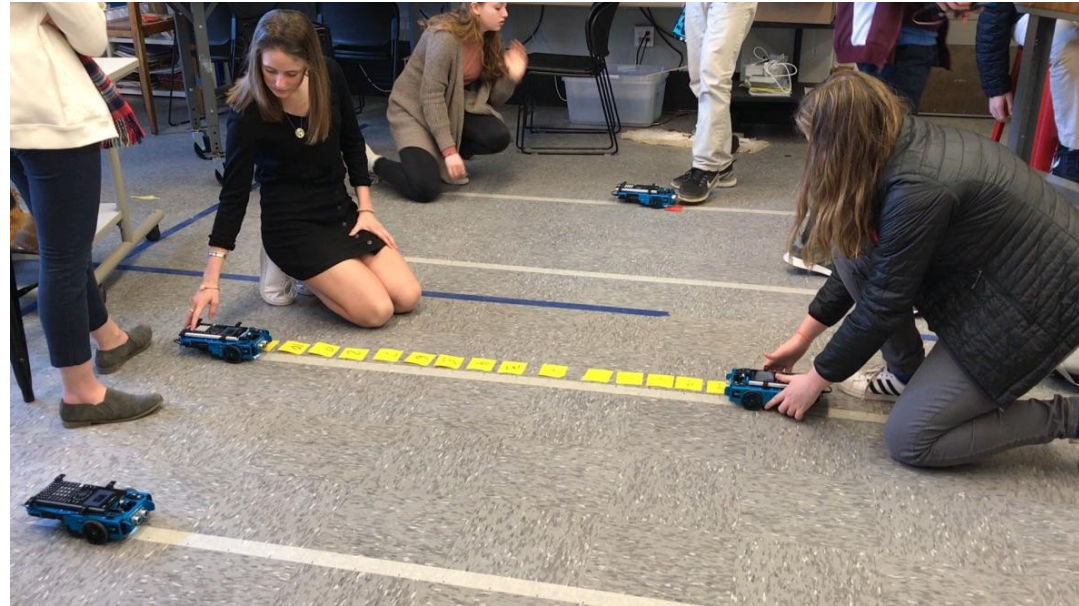
Rovers





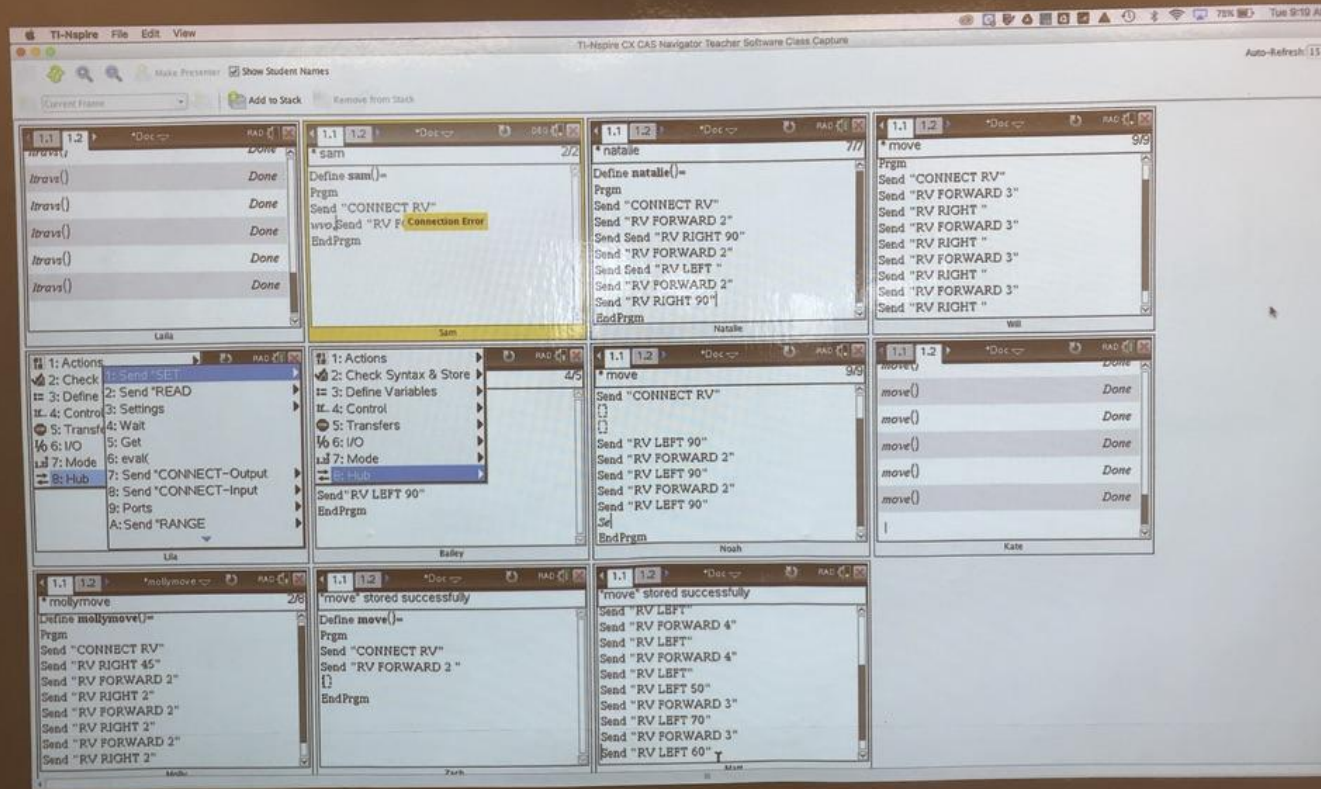
Parallel parking activity

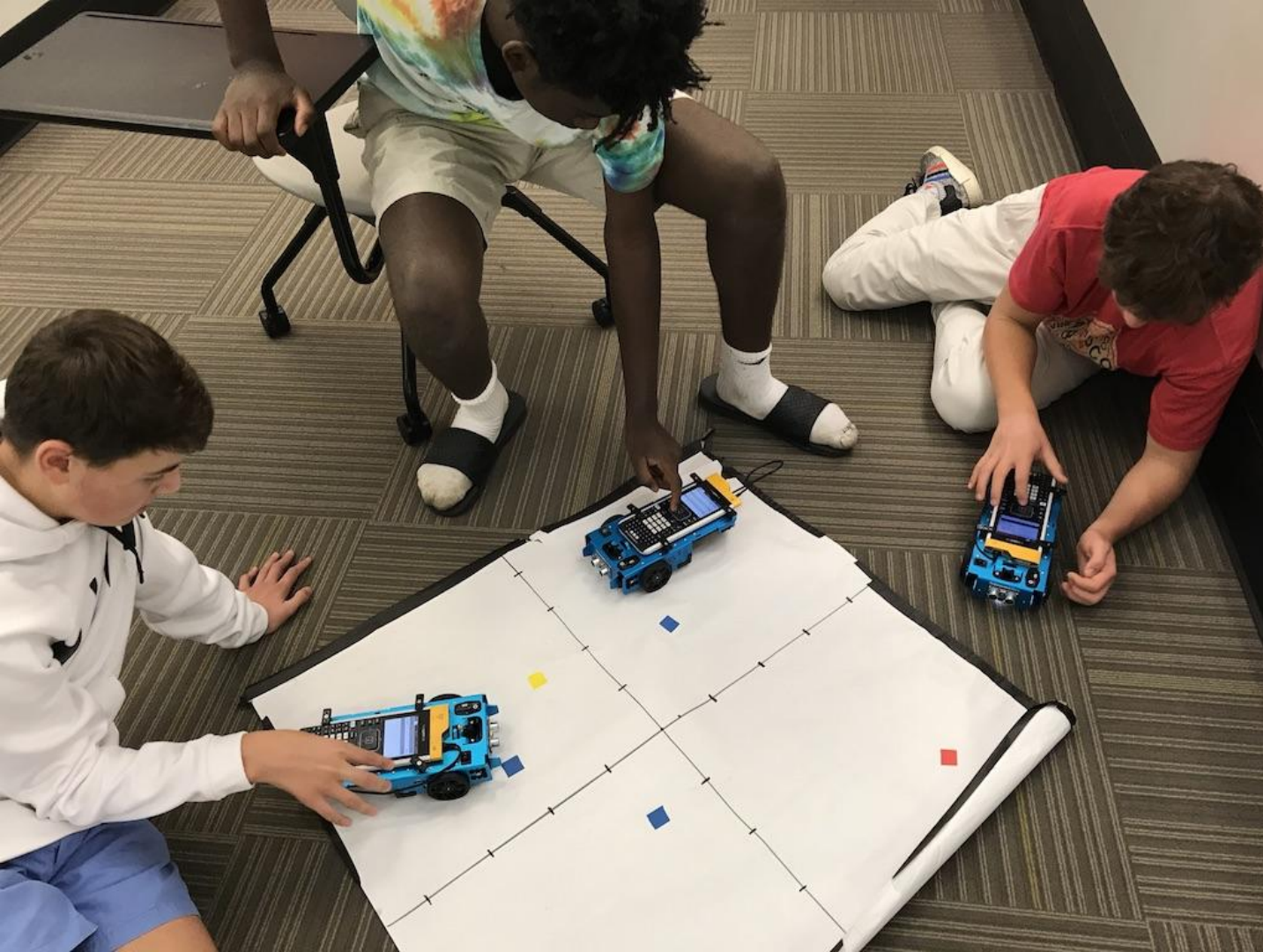
Two Rovers leave the station...



Coding the Rovers

The students work in teams





Coding the Rovers to drive TOXY, then another XY and calculate the distance

Rover Square

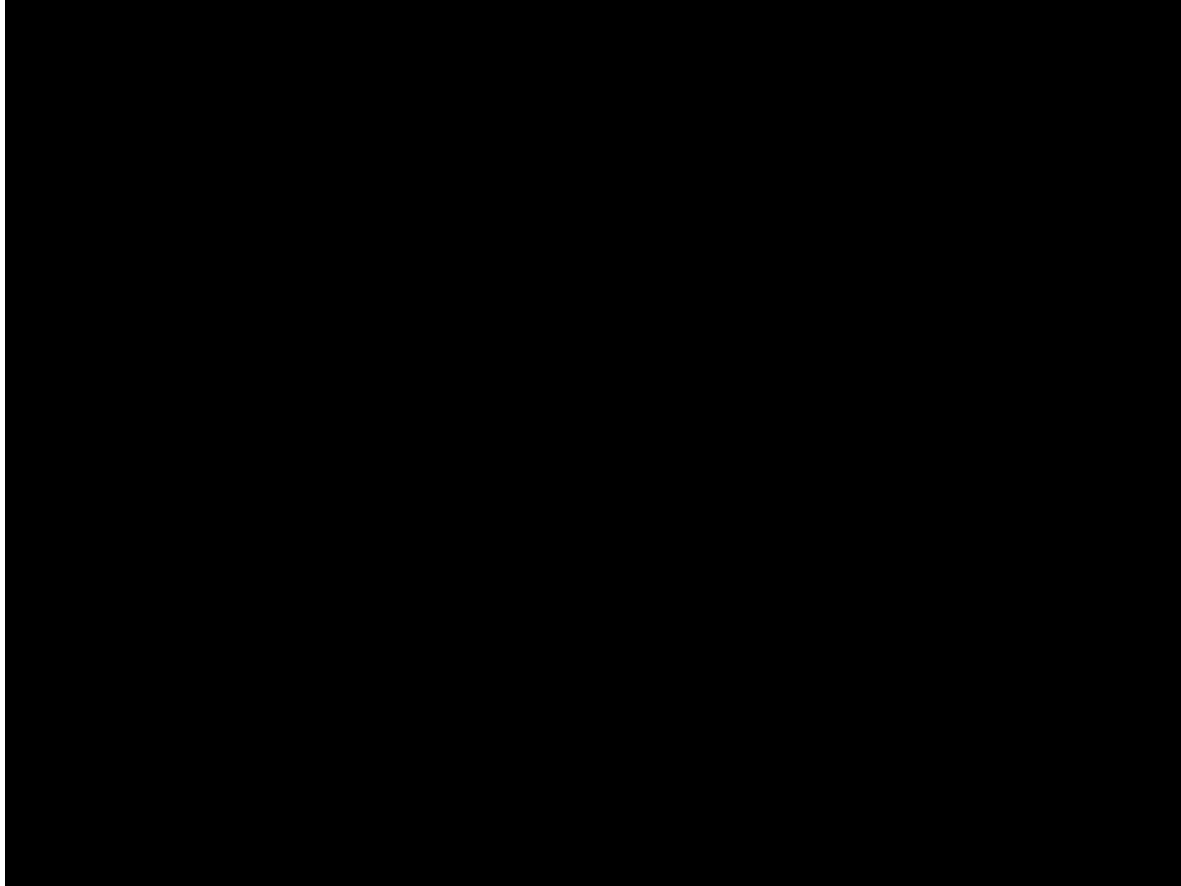
This video represents a terrific view into a freshman girls determination to succeed at a new skill. The Rovers were brand new, and this student wanted to make it drive a square. She coded it by herself on the TI-Nspire™ and asked me to bring a Rover to the library during a free block so she could test it out. This was the result.

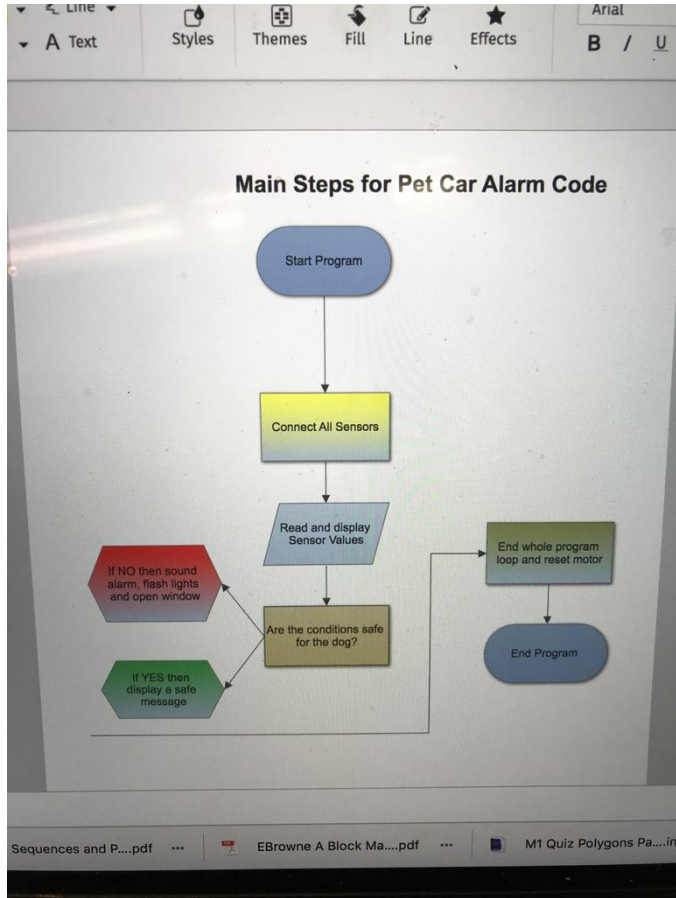


Priceless look of "I did it!!"



Pet Car Alarm

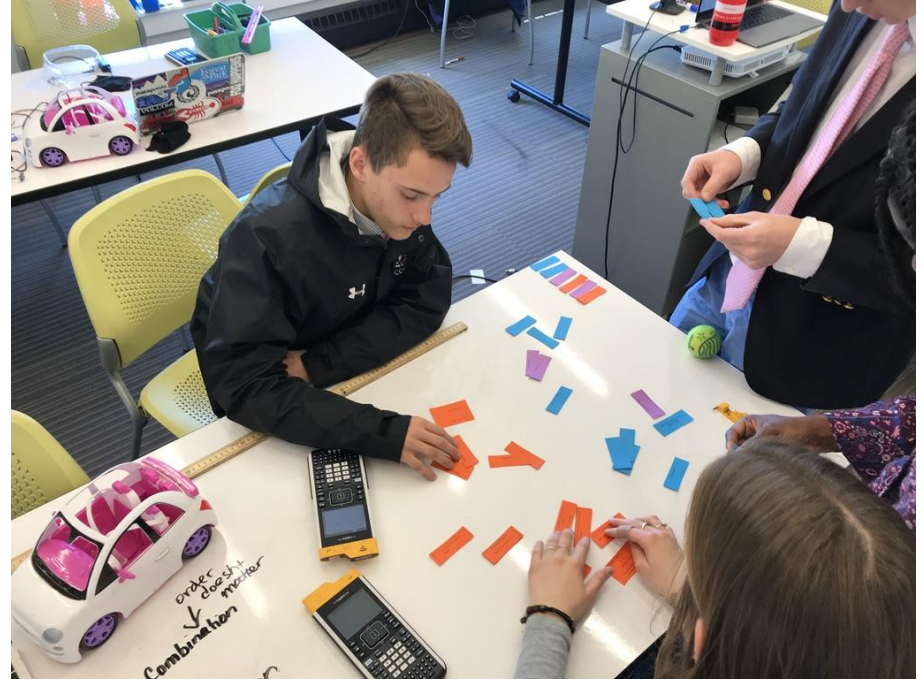




Coding steps order

Each main step has several sub steps. The students got colored cards with the steps that they put in order before writing the code. This helped them organize their thinking.

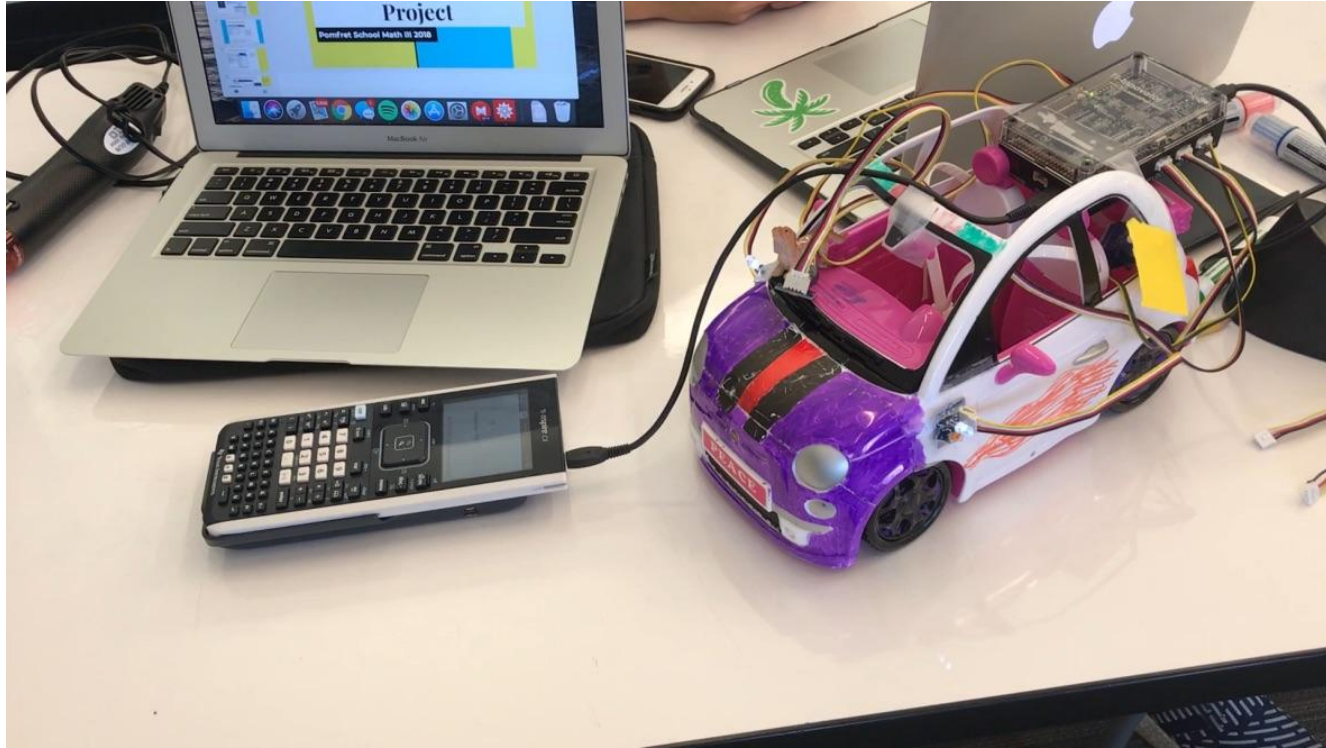
Discussion on order of code steps



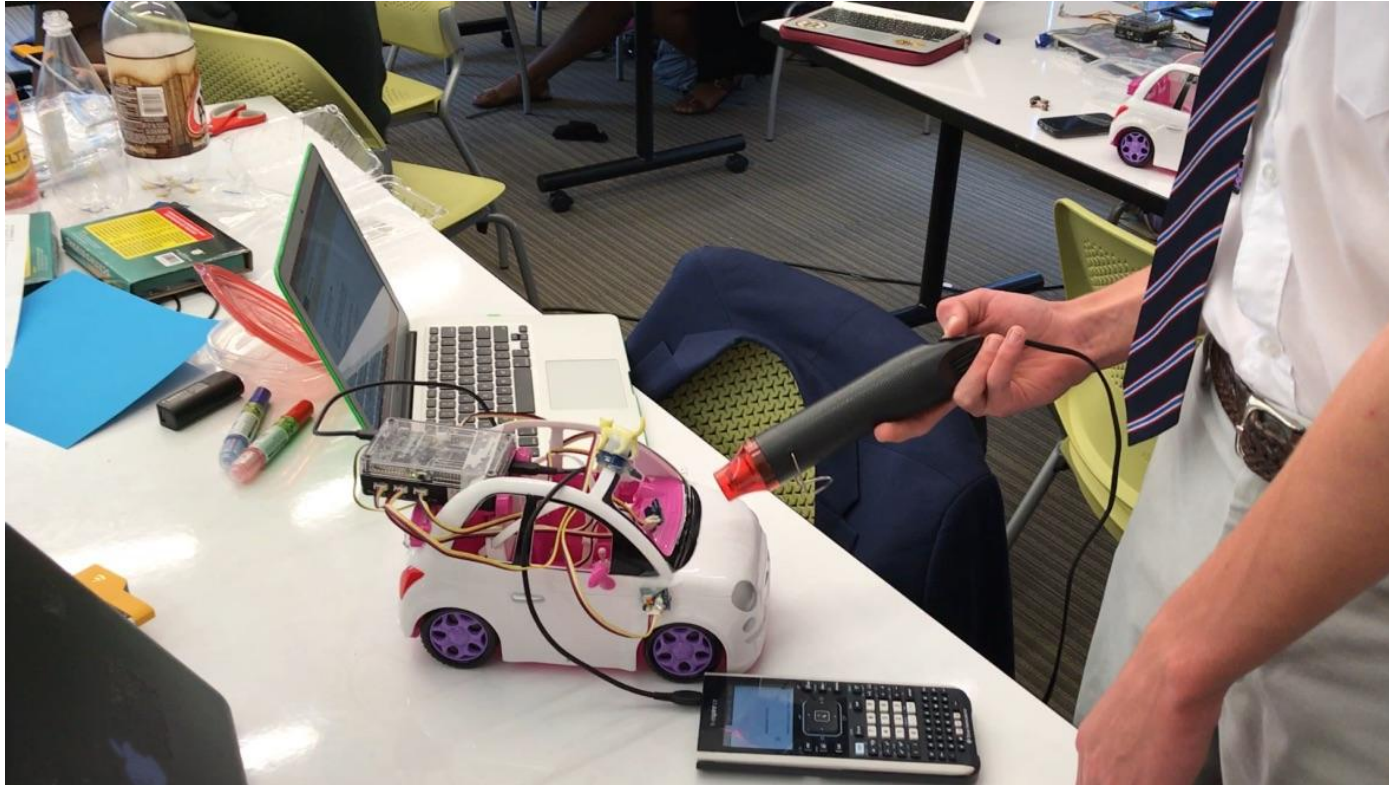
Wiring up the car with the sensors.



Ready to test

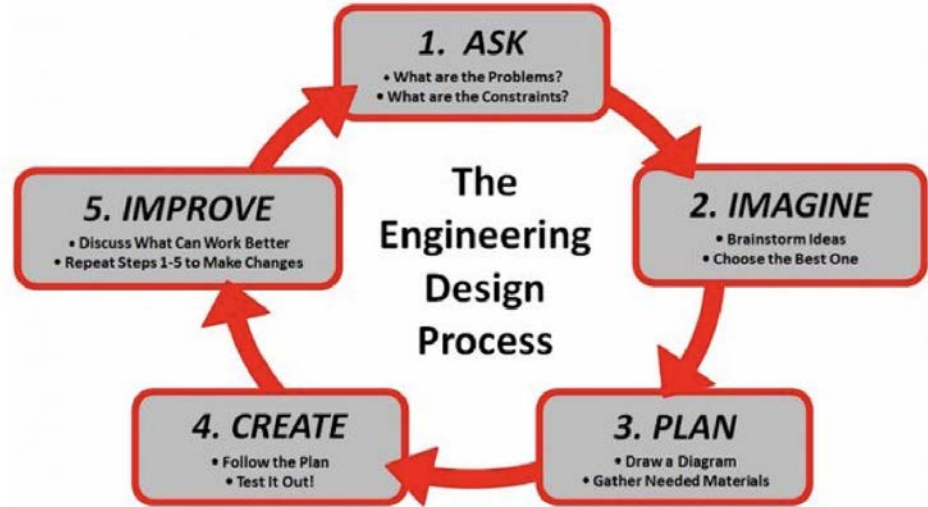


Using the heat gun for testing



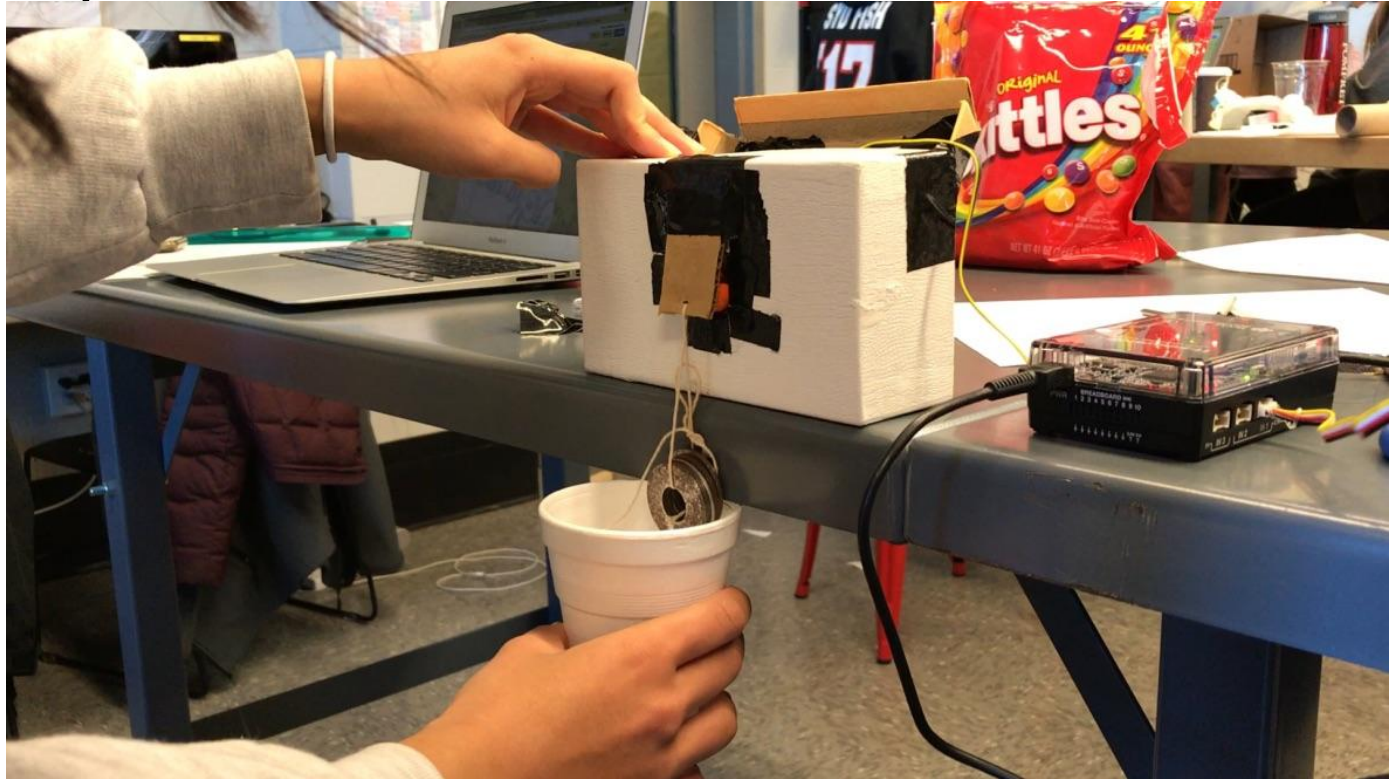
The Engineering Design Process

The following two projects use the Engineering Design Process. (EDP) Although the previous projects used some aspects of this process, the automatic dispenser and the smart water project have the best outcome when the students follow the EDP cycle.



Automatic Dispenser

This project uses only the sensors included in the kit. Original idea by Cassie Whitecotton.



Automatic Dispenser Code Example

By giving the students code to modify, the emphasis is shifted from coding to the EDP. The students can change the light level, motor direction and speed, and the amount of time the motor runs. They must decide what works best for THEIR design.

```
autodispenser
Define autodispenser()=
Prgm
Send "CONNECT LIGHTLEVEL 1 TO IN 1"
Send "CONNECT SERVO 1 TO OUT 3 "
For n,1,50
Send "READ LIGHTLEVEL 1"
Get b
DispAt 1,"Light Level=",b
If b<4000 Then
Send "SET SERVO 1 CW 50 2"
Send "SET COLOR.RED 1"
EndIf
If b≥4000 Then
Send "SET COLOR.RED 0"
EndIf
Wait 0.5
EndFor
EndPrgm
```

Light level, you can change
this depending on the
brightness of the room

This is the red light on
the innovator (black box)

The Servo Motor must be connected to OUT3 for the reason that it runs on 5 Volts of power. The external power supply is also needed. Make sure you have the external power supply plugged in (and turned on). A green LED on the HUB will light when powered.

This controls the speed and direction for the servo motor:

Direction	Speed	Time
CW (clockwise)	0 (OFF)	Default 1 second
CCW (counterclockwise)	100 (Maximum)	

You need to figure out which direction YOUR design needs

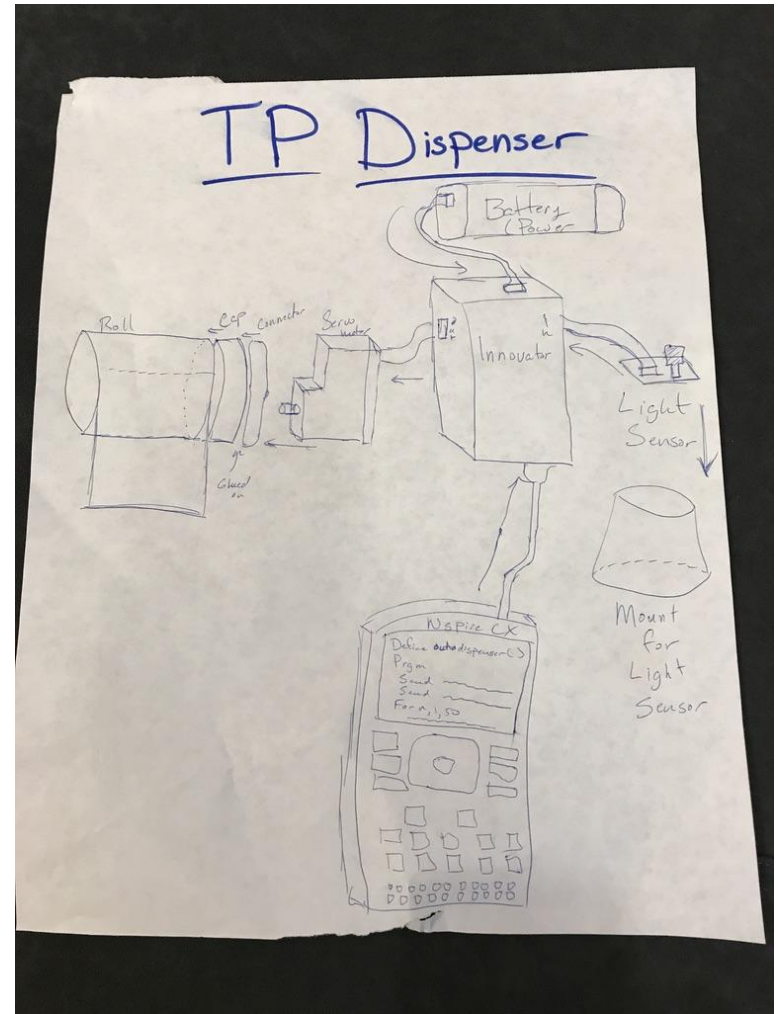
Make it happen with these inexpensive supplies!

Possible Dispenser Ideas

- Candy
- Toilet Paper
- Ping Pong Balls
- Business Cards
- More!

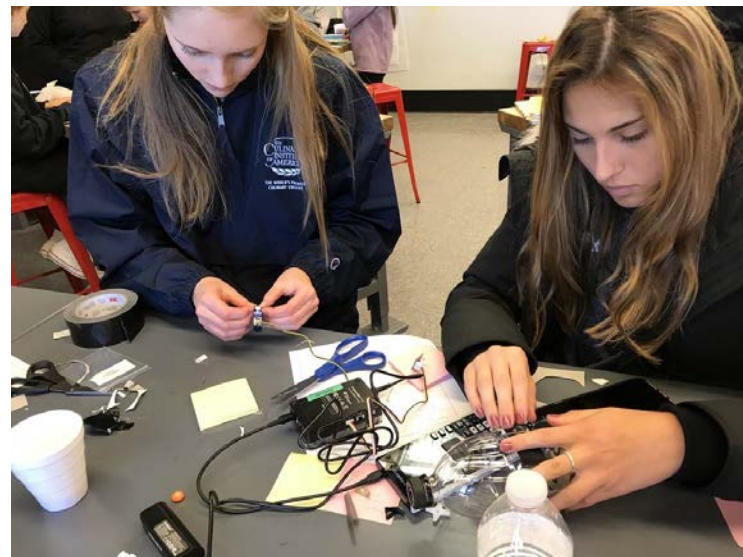
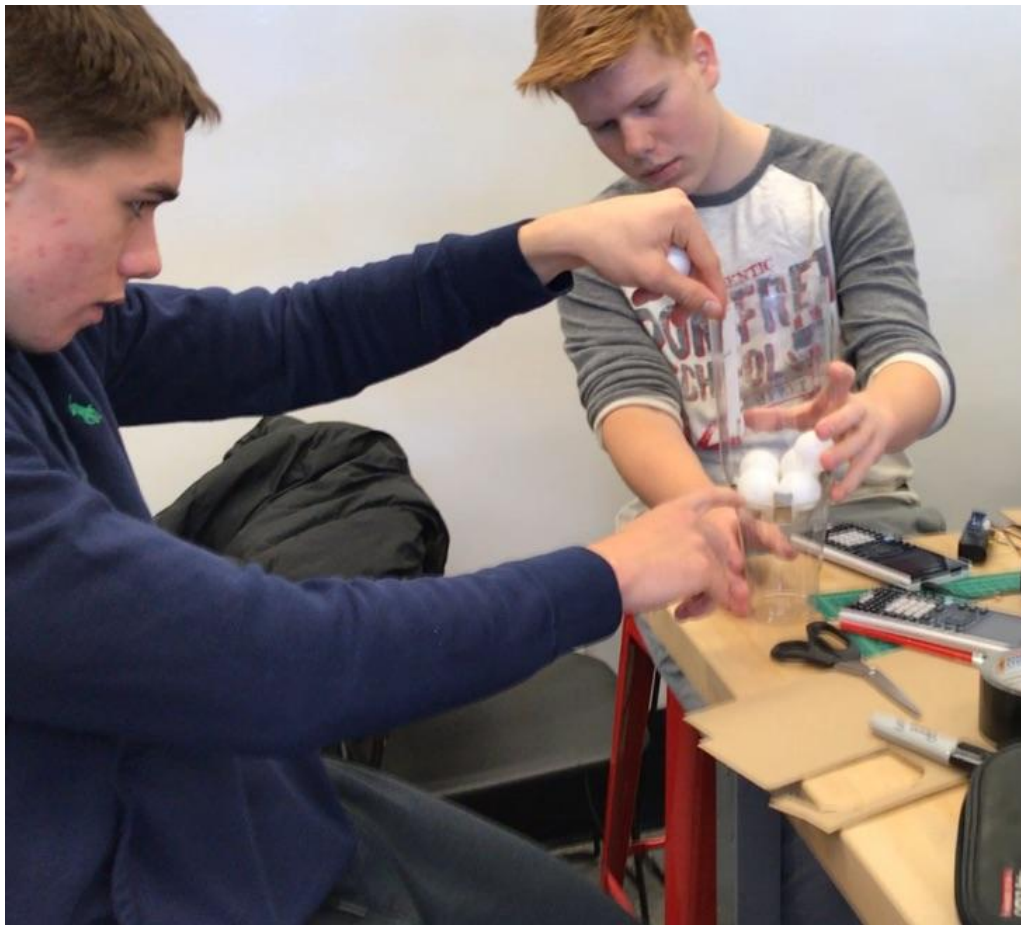


Create a product design. One technique is to require the students to do [this](#) C-Sketching activity.



Bring the drawing to life!





Tweak, test, tweak, test. Follow the EDP to achieve success!

More Dispensers in Action

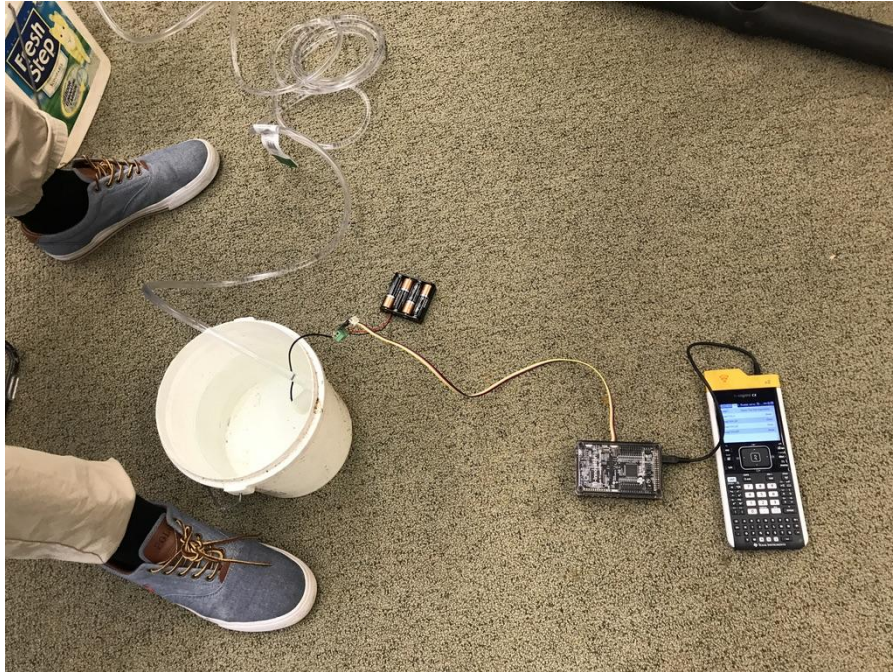


Smart Water

4 Solutions



Figuring out how the pump and the sensors work



Testing and Measuring





Unique solutions using recycled materials



Links to Projects

10 Minutes of Code: <https://education.ti.com/en/activities/ti-codes> (includes the Innovator and the Rover)

Mood Ring: <http://bit.ly/TIMoodRing>

Pet Car Alarm: <http://bit.ly/PetCarAlarm>

Smart Water: <http://bit.ly/SmartWaterInnovator>