Otto DIY Activity+Workshop build your own Otto!

Welcoming builders will discuss ahead of time what are the components of a robot and then use that knowledge to BUILD their own Otto

Title: build your own Otto!
Time: 1-2 hours *
Level: Beginner * 7+ (5-6 also possible if have a companion)
Notes: *Depending on the level of your student, you can adapt examples

Materials & Tools needed: (per Otto and builder)

- Arduino Nano
- Arduino Nano Shield
- Mini usb cable
- HC-SR04 Ultrasound sensor
- Mini servo SG90 9g x4

(each comes with 2 pointed screws and one small screw also arm keys to attach legs and feet)

- 5V passive Buzzer 12mm
- Female to Female breadboard connectors cable 10cm x6
- 4 AA Battery case
- 1.5V AA batteries x4
- Phillips screwdriver (important: magnetized)
- Square micro Switch 8x8mm
- 3D printed head
- 3D printed body
- 3D printed leg x2

- 3D printed right foot
- 3D printed left foot
- Computer with mblock installed and tested
- Instruction manual from ottodiy.com
- Otto builder badges, stickers, name cards.

Learning Objectives:

- Learners can describe the components of a Robotic system, including hardware, software systems, and applications.
- Learners can give examples of how Robots are used in the real world.
- Learners build Ottos and drag and drop blocks of code.

• Key Stage 1: recognise common uses of information technology beyond school • Key Stage 2: use technology safely, respectfully and responsibly • Key Stage 3: understand the hardware and software components that make up Robotic systems, and how they communicate with one another and with other systems	**Standards:** **UK National Curriculum**
• CSTA: Computing Practice & Programming (CPP): 5. Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions. • CCSS.MATH.PRACTICE.MP1 Make sense of problems and persevere in solving them.	**Standards:** **US Common Core Math and CSTA**

Linking: 10 min

Today learners will build a Robot! Before they do, challenge them. Ask them to write down as many parts of a Robot (legs, eyes, brain, etc) as they can in 2 minutes. After the time is up, have them compare with their partner. As a group, share out your answers and the lead write them down so the class can see the parts. Discuss the difference between hardware and software.

A great resource for this:

Close your eyes and think "robot." What picture leaps to mind? Most likely a fictional creature like R2-D2 or C-3PO from Star Wars. Very likely a humanoid—a human like robot with arms, legs, and a head, probably painted metallic silver. Unless you happen to work in robotics, I doubt you pictured a mechanical snake or a clockwork cockroach, a bomb disposal robot, or a Roomba robot vacuum cleaner.

What you pictured, in other words, would have been based more on science fiction than fact, more on imagination than reality. Where the sci-fi robots we see in movies and TV shows tend to be humanoids, the humdrum robots working away in the world around us (things like robotic welder arms in car-assembly plants) are much more functional, much less entertaining. For some reason, sci-fi writers have an obsession with robots that are little more than flawed, tin-can, replacement humans. Maybe that makes for a better story, but it doesn't really reflect the current state of robot technology, with its emphasis on developing practical robots that can work alongside humans.

Engage: 5 min

We were able to name a lot of parts for a Robot, and today we will focus on these **hardware** pieces.

Some we always knew, some we just learned. Today, we are going to see how all these parts interact and make a computer. We will have our own components, and by the end of the day we will build, and have a Robot called "Otto" that walk and dance!

Bring Otto DIY kits: 5 min
Computers: Turn On, Log In, usb and ports COM detection...
(drivers, mblock and Arduino must be previously installed and tested)

Exploration Activities: (60 min)

Challenge 0 - What Can Robots Do?
Ask learners what they think Robots can do. As they discuss write their responses down.

- What are they used for?
- What is code?
- What is a Arduino?

Challenge 1: Build a Robot!
Pass out the Otto DIY kits. Ask learners whether any of them have built their own robots before to get them excited.

Optional: demonstrate how exciting and important it is to get a look *inside* of the technology we use everyday.

Build! Kids build their Ottos. Clap and cheer as kids get powered up and dance with the smooth criminal
Give Otto builder badges

Challenge 2: Explore Otto with mBlock
If you have a little time, let the kids play around and move into different blocks on mblock.cc. Direct them to the Arduino mode so they can start coding Otto! By just drag and drop functions, If you have a lot of time left to explore then move on to Otto builder community to see what can be made

Challenge 3: Clean Up Time!
Power down and put away the Ottos and computers
As you start using the Ottos in class, how you clean up will become important. Take a substantial amount of time (10 - 15 minutes) to practice your clean up routine with your students.

Evaluation: 5 min
Once the Ottos are picked up, ask a few reflection questions:

- What was your favorite part about today's session?
- What was your least favorite part about today's session?
- What are 3 things you learned today?
- Why is it important to create, not just consume, technology?

Call on 4 people to answer 1 of the 4 questions above.

Closing/Homework: 5 min
Before everyone leaves, ask the learner to go home tonight and draw or write what it was like to build a Otto DIY. Did they enjoy it? Were they excited? What was the Robot like?

If you want to give out a worksheet you can give learners the instruction manual list of PARTS. Ask them to identify each part of the Otto robot and explain in their own words what that part does. INPUT or OUTPUT?

NOTES & ANSWERS from the new Otto builders:

SHARE YOUR EXPERIENCE!
In the Otto builder group in Facebook
or post photos and videos anywhere with #OttoDIY!