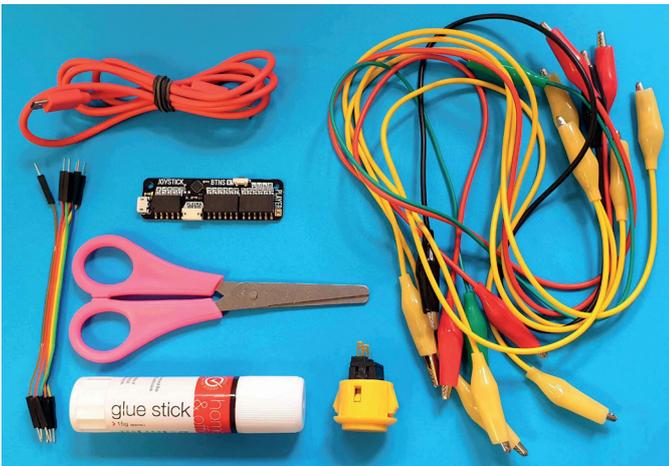


# PIMORONI education

## Lesson Plan Accessible Controllers



You will need	Age & Ability
<ul style="list-style-type: none"> <li>• Player X</li> <li>• USB lead</li> <li>• laptop or PC</li> <li>• jumper jerky</li> <li>• crocodile clips</li> <li>• cardboard</li> <li>• aluminium foil</li> <li>• scissors</li> <li>• glue</li> </ul>	<ul style="list-style-type: none"> <li>★ 11-14 years (KS3)</li> <li>■ 14-16 years (KS4)</li> </ul>
	Additional Info

### Background

Are games controllers suitable for everybody?

This lesson uses the Player X board as starting point to building your own controller.

For background and a talking point to the lesson, you could watch the Xbox Accessible Controller advert which has a variety of children explaining why they need a different kind of controller to be able to play games with their friends.

[https://youtu.be/\\_YISTzpLXCY](https://youtu.be/_YISTzpLXCY)

Why might someone need a different controller?  
What does accessible mean?

This fits in with:  
KS3 Science - Physics - Electrical circuits, Conductivity  
KS4 Product Design - Designing and Making Innovation

### Outcomes

From this lesson, students could...

- gain an understanding of some of the barriers to gaming
- consider adaptations for of people with different abilities
- design and use simple mechanical and electrical systems
- make a 3D prototype using appropriate media
- prepare and use materials economically
- use symbols to represent components in a circuit
- understand the difference between a conductor and an insulator
- identify and correct problems in a series circuit



CC BY-NC-ND 4.0

# PIMORONI education

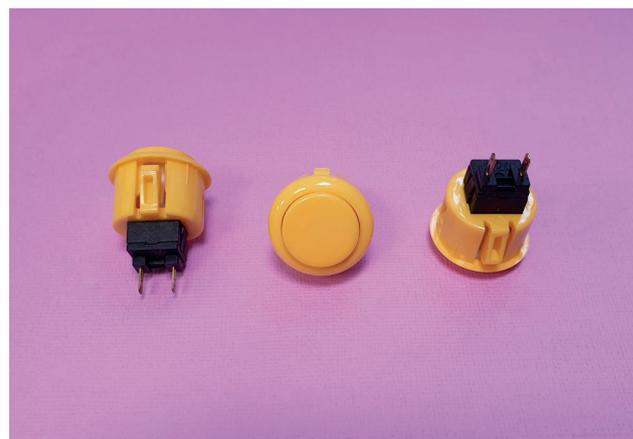
## Lesson Plan Accessible Controllers

### Starter ideas

How does a button work?

Hand round some arcade buttons or some devices with buttons on (eg calculators, remote controls, a toaster, laptop etc). What are the bits of a button? How many connections are there on it? What is the outside made of? What do you think is inside? How do you stop pressing it? What happens when you stop pressing it?

Discuss accessibility if not already done.



### Main

Students design and make a button or 3 button controller, using card and foil. See handout.

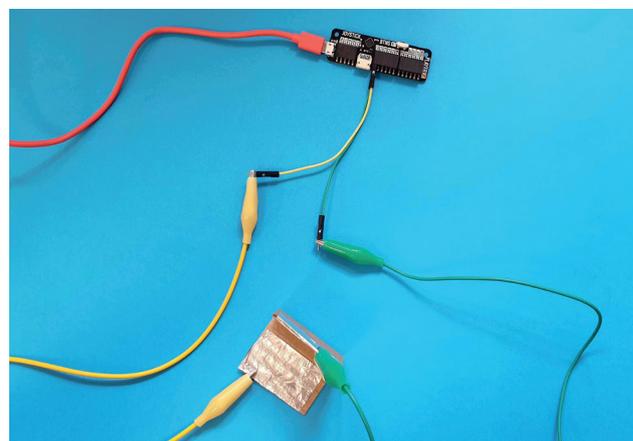
Task 1 - make a button and test it using wires, a battery pack, and a bulb/LED.

Task 2 - make buttons to use as a controller, taking into account the user/adaptation you have been assigned.

### Plenary

Students test their designs by connecting to the Player X using croc clips and jerky wire, as shown in the photo opposite. Choose a controller-compatible game for them to play.

How durable are the buttons you made? Do they need altering? Did they make a good electrical connection? Did they stay connected or do you need a better mount point? How easy was it to use? What would you change?



### Links

[www.ablegamers.org](http://www.ablegamers.org)  
[www.specialeffect.org.uk](http://www.specialeffect.org.uk)

### Handouts

Why do we need accessibility? / How a button works / Make a controller / Wiring diagram

# PIMORONI education

## Handout

### Why do we need accessibility?



Image was originally posted to Flickr by na0905 at <https://www.flickr.com/photos/24784125@N07/4087618965> under the terms cc-by-2.0



Image was originally posted to Flickr by avlxzyz at <https://www.flickr.com/photos/10559879@N00/107168188> under the terms cc-by-sa

#### What is accessibility?

The design of products, services, environments, or devices for people with disabilities.

In gaming, sometimes this is shortened to a11y (A-eleven-Y) which is sometimes used as a hashtag - #a11y - when developers are talking about equipment or games designed with accessibility in mind.

In this case, it means that changes are made to a standard design so that people can have the same experience of gaming.

#### Some of the barriers to gaming with a controller:

- Too many buttons
- Buttons too small
- Difficulty in pressing more than one button at once
- Layout fixed in one position
- Not able to grip the control stick
- Unable to feel for buttons

#### What do people say about using adapted controllers?

"I play laying down, so the challenge for me is always finding the right place to mount the controller."

"...every single button can be linked to a separate button, switch, or joystick. This allows for a wide variety of diversity when it comes to your set up"

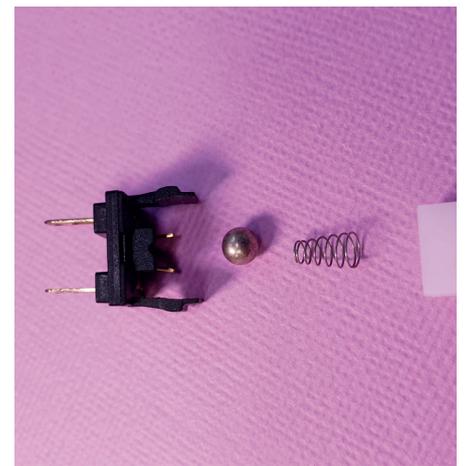
"My current set up is an Xbox Adaptive controller with 2 pedals as well as a standard Xbox One controller, using Co-pilot to allow two controllers to work as one. I then have left trigger mapped to my left foot and left bumper to the right foot."

"The problem for me is with the peripherals, as they are not available [...] here. There's a one-handed joystick that looks like a Wii nunchuk that I can't find anywhere else that would really help with my setup."

*All quotes from <https://www.kotaku.co.uk/2018/11/30/two-months-on-heres-how-disabled-gamers-feel-about-the-xbox-adaptive-controller>*

# PIMORONI education

## Handout How a Button Works



### How does it work?

A button makes and breaks an electrical circuit.

In the arcade button, a spring and a piece of plastic (white in this picture) hold the metal ball away from the metal pieces.

When the button is pushed, the spring squashes and the metal ball (conductor) lowers down to join the two metal pieces (conductors) together, connecting the circuit.

When you let go, the spring pushes the ball back out of the way behind the plastic (insulator) and breaks the circuit.

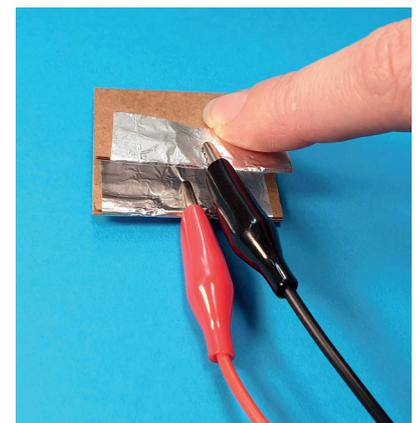
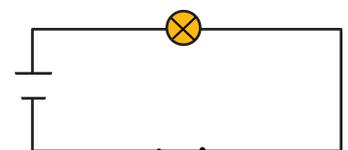
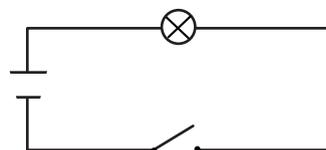
### You will need

- crocodile clips
- cardboard
- aluminium foil
- scissors
- glue
- LED or bulb
- battery pack

### Can I make one?

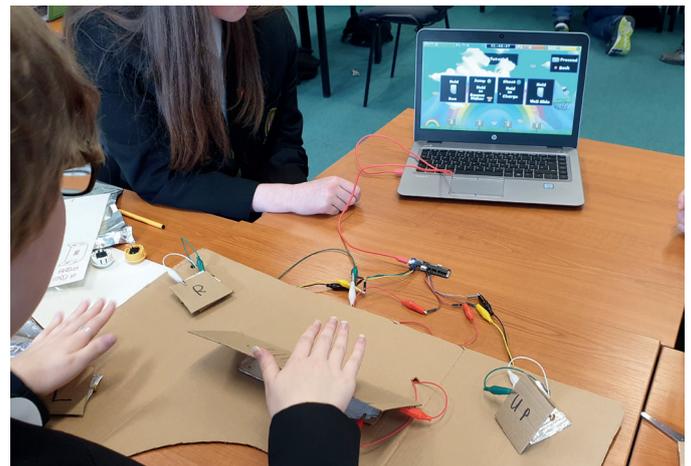
To make a test button, take a piece of card about 5cm x 10cm and fold it in half.

Glue foil over each end and test that the two pieces touch when you press the folded card down.



# PIMORONI education

## Handout Make a Controller



### Task 1

Sketch some ideas on paper. Think about the size, shape, and amount of buttons.

For this task, you may want to stick to Left, Right, and Jump.

Choose one of the following cases to adapt for:

- foot control only (standing or sitting)
- weak muscles and clenched fists
- one handed control

### Task 2

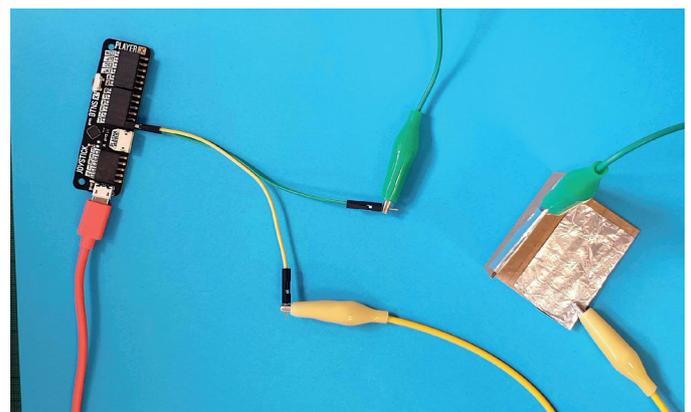
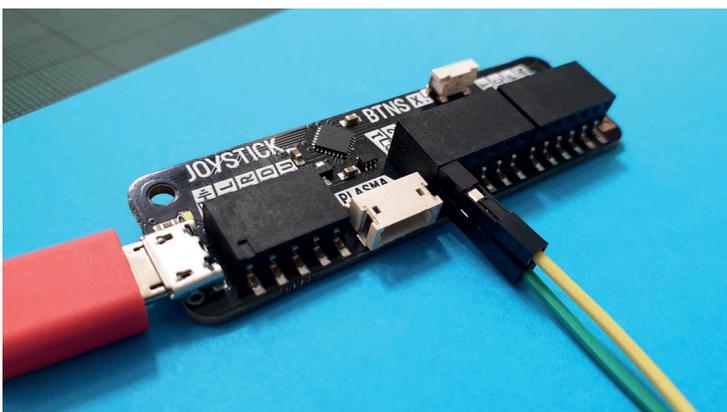
Make and test the controller. You may want to refer to the wiring diagram on the other handout.

Are your buttons sturdy enough?

Do you need to modify your original design?

### You will need

- crocodile clips
- jumper jerky
- Player X
- USB cable
- computer/laptop
- cardboard
- aluminium foil
- scissors
- glue



# PIMORONI education

## Handout Wiring Diagram

### For the connections:

You will need jumper jerky or a wiring loom to connect to the Player X.

You will need crocodile clips to connect your controller contacts to the jumper jerky.

Alternatively, you can add crocodile clips to long pieces of 22AWG single-core wire and make your own extension cables.

The direction buttons are the most complicated because they share a ground pin. Each button connects to the labelled direction, and to the ground pin.

