
# Teachers Guide to using the Smartphone Microscope

## Curriculum Experiences and outcomes:

Using a microscope, I have developed my understanding of the structure and variety of cells and of their functions. SCN 3-13a

By investigating the lifecycles of plants and animals, I can recognise the different stages of their development. SCN 2-14a

## Aims

To use the constructed microscope to look at thing closely.

How can we look at things more closely?

## Outcomes

By the end of the lesson, pupils should understand that microscopes magnify things, allowing us to see more closely. They should have found out how to use the microscope focus and selected things to look at more closely, to reveal the hidden detail of those things.

## Equipment

* Smartphone microscopes, fully constructed.
* Pupil smartphones and / or computer tablets
* Selection of things to look at with microscope.

## Method

Hopefully, your class set of microscopes are now set up and you are ready to use them! If not please find instructions on how to build the microscope at [www.enlightenment.hw.ac.uk](http://www.enlightenment.hw.ac.uk), and watch the video called ‘enlighten me’

The smartphone scope can be used with a smartphone, obviously, but also with a tablet or iPad. You can take photos with these and they can be the class results. You can then upload the best images to the Enlightenment website to win £1000 for you school science budget!

**A quick guide**

* Good light: microscopes always work better with strong light, these ones work well near a window or other light.
* Always have the scope placed on top a white background, like a piece of paper – this will reflect more light up into the lens.
* Place samples on the sample stage and beneath the lens.
* Place the smartphone on top of the main stage, with the camera lens aligned with the microscope lens.
* Turn the camera function on.
* Focus the scope using the focus screw.
* You can use the zoom to look more closely / increase the magnification.
* Take a photo.

**What should you look at?**

Whatever you and your pupils want to look at, that will fit under the scope.

If you have the capacity, there are usually many different kinds of plant/weed/tree planted around every school, go out with pupils to collect things.

#### Suggestions basic:

* Leaves – all different types, variegated ones are of interest, thin leaves are much easy to see.
* Grass seed heads
* Flower – petals, stamen, anthers, pollen etc (reproductive biology)
* Feather
* Paper – compare different types, printer paper, toilet roll, newspaper, printed leaflet
* Salt or sugar crystals
* Instant coffee granules, drinking chocolate
* Fabric – school tie, shirt, sweatshirt etc

### Understanding resolution using the microscope

#### Suggestions

* Colour printed leaflet – you should be able to see the dots that form the images
* Newspaper text – low resolution text
* Text on a laserjet printed sheet – should be very high resolution text
* Smartphone – by putting a second phone under the lens, you should be able to see the individual pixels on other phone screen, blue, green and red. This will require pupils to make a big adjustment to the sample platform….

### Cells and micro-organisms

#### Suggestions

* Plant cells – in some plants, these can be seen in a leaf with no special preparation, just put the leaf under the lens.
* Onion cells on a slide – you know the drill
* Pond water on a slide.

## Results

Pupils should take photos using the device, and if allowed, upload the best to the Enlightenment website competition.

They could print photos out and annotate what they saw.

They could draw the microscope and annotate it.

Guide courtesy of Sarah Keer-Keer, Wellcome Trust Centre for Cell Biology @ University of Edinburgh