

Microscopy: The playground uncovered



Extreme Science

Background

A microscope is an instrument that is used to see objects that are too small to be seen with the human eye, or to see fine details of larger items such as bugs and leaves. There are several types of microscopes, including stereo (or dissecting) microscopes and light transmission microscopes. These microscopes use light and special pieces of magnifying glass to make the samples appear much larger than we can see them with our own eyes.

Stereo microscopes are used to look at the finer details of larger objects, and are useful for dissections, and anything bulky. Generally, you can only see the external part of the sample. In this type of microscope, the light source shines down onto the sample, which is then viewed by the user through the eyepieces. Generally, magnification is below 50x.

Light transmission microscopes are used to look at the internal parts of a sample – for instance skin sections, blood, insects, and drops of water. In the type of microscope, the sample is located in between the light source and the eyepieces, so the light shines through the sample. For this reason, only very small samples can be used, and they are mounted onto a glass slide, which is placed on the platform of the microscope. Magnification settings are typically 40 to 1000x.

Objectives

- Learn how to use a dissection microscope, including focussing and magnifying
- Learn to identify samples and objects using the microscopes
- Learn to describe and share observations in small groups and as a class

Equipment list

- 12 stereo microscopes- one microscope per pair of students
- 2-4 transmitted light microscopes- demonstration only
- Lunch boxes with samples
- 'Mixed' bug/garden samples in blue box
- Glass slides with insects etc
- Electron micrographs
- Empty petri dishes
- Power cords and boards

Safety notes

- Electrical extension cords and powerboards are used in this workshop - care should be taken to minimise trip hazards from cords
- Students should not touch the powerboards
- Only the student using the microscope should adjust any of the settings

Workshop activities

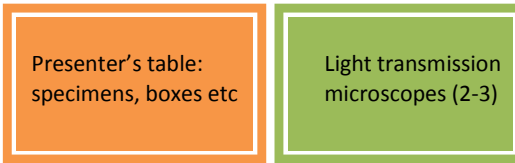
In this workshop there are 3 main activities. For preschool groups have samples already set up on microscopes. For year one and two students show them how to focus microscopes. For years 3 and above, show both focus and magnification. Activities are as follows:

1. **Samples in lunch boxes.** Students use stereo microscopes to look at samples from the lunch boxes, focus microscope and investigate samples.
2. **Slides under the transmitted light microscopes.** Students are brought up in their groups to the microscopes. Setup transmitted light microscope with a head lice slide flea slide and/or a blood film. *Ensure students do not touch these microscopes-* they should just look and place their hands on the table on either side of the microscope they are using.
3. **Mixed samples.** Students choose from a selection of samples that is put out on a table from the blue box. Put out about half of the samples from the box, this will be enough to keep the class going. If the class focus in on insects/bugs, then samples relating to this can be selected from the sample box.

Rundown of workshop

Time	Activities	
0-10	Introduction and explanation of microscopes, get students into groups	
10-25	Activity 1: Students explore samples in lunch boxes	Activity 2: this should be run during the course of the workshop
25-30	Pack up lunch boxes, explain next part of workshop	
30-45	Activity 3: Students choose samples from blue box	
45-48	Pack up	
48-55	Show electron micrographs, wrap up, can spend time answering questions	

An example of a good setup for this workshop is illustrated below. The best setup will change depending on the location of the power points in the room, how many tables you're given, and how big they are. Make sure you leave space for the class to come in that is clear from power cords, and also that you leave a space for the class to sit. Do your best to keep all power cords and power boards out of the way of the students. Some further examples of set up are on the following page.



Students are seated in this area for the introductory talk, activity instructions and wrap-up discussion.





A good way to keep cords out of the way



Set up two transmission microscopes on a separate table



Putting out the samples from the blue box for the last activity

Script

Introduction takes around 10 minutes. Dialogue is in italics.

Hi I am From QUT Extreme Science. Today we are going to work like scientists using a very important scientific tool. Who can tell everyone what these instruments are called? Microscopes- you will often get telescopes as an answer, even from teachers. Reinforce that although telescopes are another important scientific instrument, they are used to look at very large things that are a long way away, compared to microscopes which look at very small things up close.

Who knows what microscopes do, or why are microscopes used by scientists? Microscopes are used to make small things big (magnify) and to show detail not visible to the naked eye.

Does anyone know the word for something so small you can't see it without using a microscope? Microscopic.

Does anyone know an example of something that is microscopic? Prompt towards germs, older kids may see bacteria or viruses.

There are many different microscopes all designed to look at certain things. The two types of microscope you will be using today are stereo dissecting microscopes and biological, transmitted light microscopes. The stereo, dissecting microscope is called stereo because it has 2 eyepieces so you see your sample in 3-D and dissecting because there is a big space between the stage (where you put the sample) and the lens so you can do things like dissect a toad under the microscope. This type of microscope is good for big, bumpy things as it shows you the detail on the surface.

The biological, transmitted light microscope uses glass slides. The sample that you look at needs to be so thin that it is see through, and it is then goes on the slide. A piece of glass goes on top trapping your sample in a glass sandwich. These microscopes can magnify much more than the stereo microscopes, but are much more difficult to use.

Give a demo of using the microscopes, making sure that all students can see what you are doing. Today you will be investigating a whole heap of samples using the stereo, dissecting microscopes. Firstly choose a sample from the lunchbox. Don't open the lids on the dishes. Put the sample on the stage. Look through the eyepieces. These eyepieces are adjustable so make sure they are set properly for your eyes. Look through the eyepieces and see if you sample is in focus (clear) or out of focus (blurry). If it is blurry very slowly adjust the black knob on the side of the microscope whilst looking down the microscope until the sample is in focus.

If this is a preschool or grade 1 group then don't show them the magnification control. If you want to magnify your sample you need to turn the top dial with numbers. When you increase the magnification your sample will go blurry so what do you need to do to fix this? You need to refocus with the black knob.

Make sure that whenever you put on a new sample you always turn the magnification back to the smallest number.

You will also get to have a look at the samples on the transmitted microscopes but please LOOK BUT DO NOT TOUCH THESE MICROSCOPES. They are already set up so you just need to

look into them. Only one group/pair can come up at once. I'll come and tell you when it's your group's turn. You can either guide the students into arriving at the insect name using the sheet of bugs; or use as a game and have the students guess. The answer can then be given at wrap-up time.

Okay, you need to get into pairs. Ask the teacher if students can choose their own partners. If the class has more than 24 students, there will need to be some groups of 3.

Allow students 10-15 minutes to look at the samples in their boxes. Need to judge when students have almost finished. Generally when they start becoming distracted and no longer on task. Then get them to pack away the boxes and be seated ready to listen to your next instruction.

Now we are going to look at some bugs and other samples from the garden! For this part, it is very important that you take only one sample at a time. Choose someone in your group/pair to pick the first sample, and make sure you return these samples as soon as you have looked at them. Then let someone else in your group/pair pick the next sample. If you have brought your own samples make sure they go in a dish.

Allow the students 10-15 minutes to look at the bugs. You need to judge when they have finished (when they lose interest). Ask them to switch off the microscopes, return all the samples, and sit back down on the floor.

Allow 5-10 minutes to wrap up. To sum up introduce the electron micrographs. Explain that an electron microscope is a very big, very expensive (1Million dollars) and very powerful- can magnify up to 1 million times. Show them some of the insects-show them a few to guess what they are. To finish up ask 3-4 students what their favourite thing was that they looked at, and why?

Acknowledgements

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