

Teacher Tune-up

Quick Content Refresher for Busy Professionals

How do I teach students about (and with!) microscopes?

Microscopes provide students with the sheer joy of seeing the invisible. Unfortunately, students often fail to appreciate that scientists use microscopes to solve problems and investigate questions, not just to admire the pretty view.

Students often assume that microscopes are mainly tools for biologists who stare at cells and microorganisms all day long. Microscopes are certainly an important tool in biology, but many other professions use them as well. Pathologists study tissues from the body using microscopes, determining whether cells are cancerous or perhaps why a person has died. Forensic scientists often need them for identifying fibers or hairs collected at a crime scene. Geologists rely on microscopes to identify and study different rocks, while environmental scientists might use them for examining pollutants. Jewelers use them to see the fine details of their work, or to appraise the quality of gemstones. Microscopes are also common in industry, where engineers use them to examine their work for flaws. Using magnification, they can find a crack in an engine part or see how well a new material holds up under use. Students may appreciate learning about how the skills they are learning in science class relate to many career opportunities.

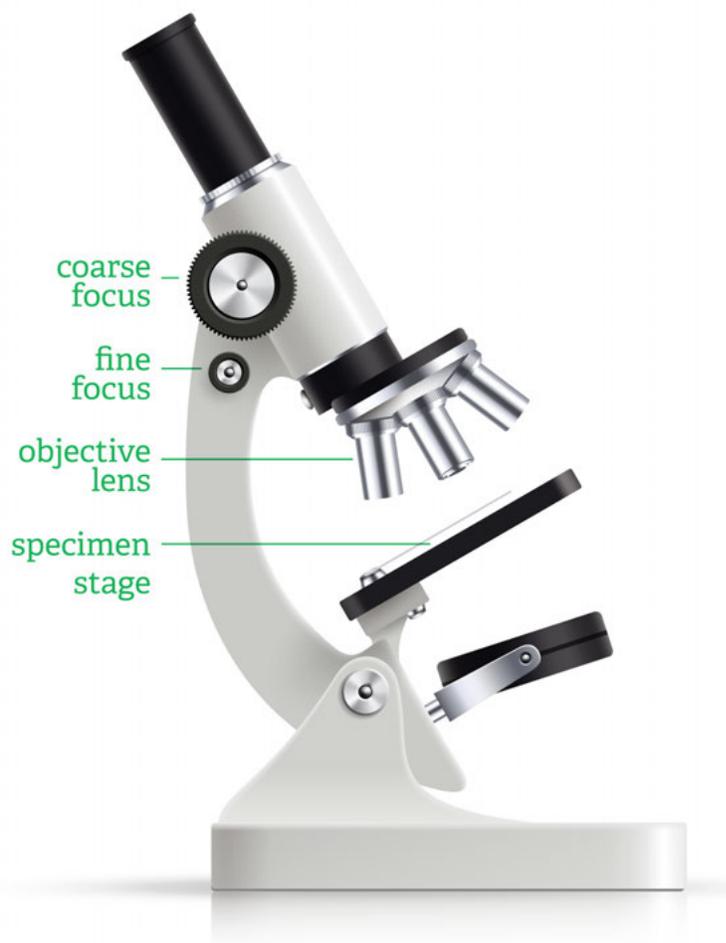
Use with Purpose

Providing students with opportunities to use a microscope with a clear purpose will help them see the use of the equipment as a scientific tool. Some teachers, for example, have students solve a “crime” by identifying fibers. Students may conduct experiments to investigate questions such as, how do cells respond to being immersed in different solutions? Or, how do different hair products affect the thickness of hair?

Used in an inquiry-based investigation, microscopes become more than just a viewing device; they become a tool for scientific exploration and discovery.

Tripped up by Technology

Using microscopes in class can often be a frustrating experience. Many a teacher has looked across the room of scope-users to notice a sea of hands, each requiring individual attention because of problems correctly locating, focusing, and identifying specimens. Carefully helping students to master the steps of using the microscope, and explaining the rationale behind these steps, can help avert some of their most common problems.



Important Steps to Using the Microscope	Common Problems Students Have When They Skip This Step
Turn on the light source.	They see nothing when they look through the oculars, or eye pieces, because no light shines through their specimen.
Put the slide on the specimen stage, held by the slide clip.	Without a secured slide, when students attempt to move the slide around, it may fall off and break, or it may be difficult to move it with precision to locate a particular part of the specimen.
Select the objective (the part containing the lens) with the lowest magnification.	Starting with a high magnification makes it difficult to locate what you are looking for on the slide. Also, if you start focusing using the coarse focus knob while using a high magnification, you may smash the objective into the slide, potentially damaging the slide or the microscope.
Center the specimen over the circle of light.	Without light coming through the specimen, students can't see what they are looking for.
Use the coarse focus knob first before using the fine focus knob.	Starting with the fine focus knob can require a long period of knob-spinning in order to see an image. This mistake can lead to impatience and rapid spinning of the focus knob, which can cause the objective to crash into the slide.
Position the part of the specimen you want to see more clearly in the center of view.	If the image isn't centered, it won't appear in the field of vision when viewed through an objective with higher magnification.
When you change to a higher magnification objective lens, focus with the fine focus knob.	Using the coarse focus knob with a higher magnification objective can cause the objective to smash into the slide. It also makes it more difficult to see the image clearly, because the image rapidly comes in and out of focus as you spin the knob.

Note: Depending on your microscope, you may have additional steps, such as adjusting the amount of light for your image, adjusting the two oculars, or eyepieces, or using an attached camera.

Tutorials for Technicalities

A virtual microscope, such as one developed at the University of Delaware (<https://www1.udel.edu/biology/ketcham/microscope/scope.html>) can help your students master the technical details of using a microscope. It allows students to practice setting up a microscope, locating a specimen, and carefully focusing an image without any risk of breaking slides or equipment. The online tutorial also offers immediate feedback for students who are struggling, such as a visual reminder of what steps to follow and a set of sample microscope problems that allow students to test their skills. Once students have practiced with the virtual microscope, they can transfer these skills directly into the lab.