

## TECHNOLOGY IN THE CLASSROOM

# Digital Microscopy: New Gateway to the Microscopic World

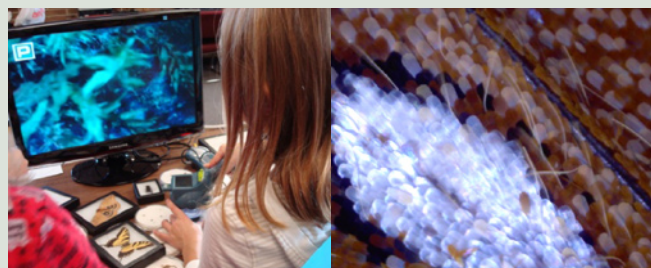
By Ruth Bates and Deborah Bates

"It's like a jungle!" said a 10 year-old peering at a clump of moss under a digital microscope. Since many kids (and some adults) find conventional microscopes confusing and difficult to use, digital microscopy offers students a more immediately engaging means of investigating the microscopic world. This is especially true of the Eyeclips BioniCam, an inexpensive, hand-held, battery-powered microscope with built-in screen and simple controls. Rather than struggle to focus and orient themselves to a pre-prepared two-dimensional tissue section, students can independently gather and magnify three-dimensional objects, discovering incredible detail which, while entirely unexpected, still makes logical spatial sense. Real-time images can be viewed on the microscope screen or displayed on a computer or television for the entire class. As a distinctively convenient feature, the Eyeclips BioniCam allows images to be viewed and stored on a USB memory stick and later downloaded to create high-quality student presentations.

For the past year, my sister (a Nursing student at Lansing Community College) and I (a second-year medical student at MSU) have been intrigued by the power of digital microscopes to inspire students to unlock the wonders of the science, particularly those students without the resources or natural inclination to pursue the study of science without encouragement.

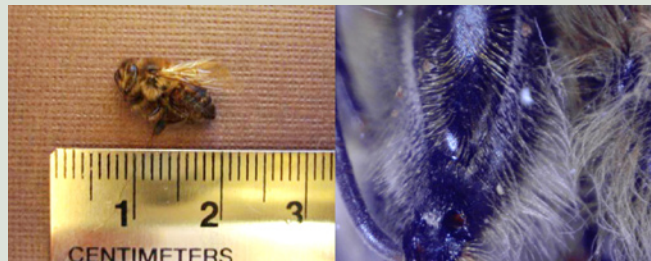
Testing the impact of this new technology at Lansing Community College's (LCC) Science and Math Elementary Exploration (SMEE), we designed a lesson plan using digital microscopy to meet several of the fourth-grade educational standards (GLICS) mandated by the State of Michigan. After learning to use the Eyeclips BioniCam, students chose two insects from the broad selection of species that we provided, including everything from giant butterflies to common mosquitoes. They then compared and contrasted these two specimens by viewing them with their eyes, a hand lens, and with the Eyeclips microscope and recording their observations on a pre-prepared Venn diagram. In a classroom setting, this project would take roughly an hour, including a brief introduction to the microscope, a conceptual explanation of a Venn diagram, and time for the students to write paragraphs summarizing their observations.

This project was designed to fulfill several Inquiry Process GLICS - including making purposeful observations (S.IP.04.11), manipulating tools to aid scientific observations (S.IP.04.14) and constructing simple charts summarizing data (S.IP.04.16). The Eyeclips BioniCam, however, is remarkably versatile, adding a fun discovery element to learning. Everything from skin, hair and tiny

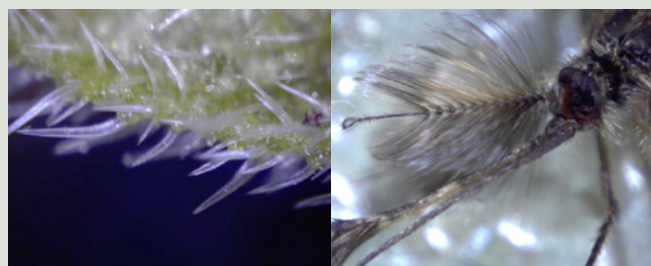


Student investigating moss under the microscope.

Wing of a Great Spangled Fritillary.



Honey bee: Life-size and magnified.



Edge of geranium leaf.

Head of a Mosquito.

fibers to plants, rocks, and crystals - such as salt, sugar, and magnesium sulfate - create incredibly detailed images. Thanks to the unique ability of digital microscopes to motivate students' curiosity and exploration, educational objectives can easily be expanded to many other science topics (including plant structure, crystal formation, geology, etc.) as well as interdisciplinary topics such as writing, vocabulary, and PowerPoint presentations.

The price of the Eyeclips on Amazon.com varies between \$40 and \$80, much cheaper than other available digital microscopes of the same resolution. We purchased 30 microscopes for this pilot study, partnering with Impression 5 Science Center and LCC to create flexible curriculum-based activities. In a classroom setting, as few as 10 units allow each student to have individual access to highly magnified images.

From our experience, the Eyeclips is uniquely student-friendly, easily portable, and even durable enough to take on outdoor explorations. Digital microscopes used to be confined to research settings and health care facilities and the potential of putting this technology into the hands of a student has yet to be calculated. As students digitally discover the strange and unexpected beauties hidden in the world around them, some really do experience the microscopic world like never before.