

## Motivating first-year biology students to use microscopes and the scientific method

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Two of the most fundamental skills that biology students need to acquire are: 1) the ability to use microscopes effectively, and 2) an ability to use the scientific method. The first lab exercise in our General Biology sequence provides students with both the opportunity and (more importantly) the motivation to begin developing these skills. Parts 1 and 2 of the exercise are fairly traditional. Part 1 introduces students to the parts and proper use of the compound microscope and Part 2 is a description of the scientific method. Part 3, however, requires that students actively engage themselves with both microscopes and the scientific method in order to answer the question: Does *Euglena* (a unicellular photoautotrophic protist that can be heterotrophic) prefer to be in a light or dark environment?

Students are provided with a solution of *Euglena* (obtained from Ward's; 1-800-635-8439), pipets, glass U-shaped tubes with one arm of the U wrapped in duct tape, a clamp and ringstand to hold the U-tube, microscope slides, and cover slips. Working in pairs, students must design their own experimental protocol. Students typically spend a significant amount of time discussing the pros and cons of different experimental designs before starting their data collection. This discussion gives them insight into the thought processes that scientists face when addressing questions with truly unknown answers. Students also feel ownership of the lab exercise so they are motivated to collect their data. In order to collect data they must develop their microscope skills. The lab report and subsequent lab activities throughout the semester further reinforce the importance of microscopy and the scientific method. Instructors in this course have been generally pleased with the level of student engagement in this lab exercise, and with the students' level of proficiency in using microscopes by the end of this lab meeting.

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