Lesson Plan

Pond Life: Macro & Microscopic Views
Teacher Guide

Time of Activity:
One lab block plus one additional class period

Objectives:
1. Students practice microscopy and diagramming techniques.
2. Students examine pond life on both macroscopic (using a stereo microscope) and microscopic (using a compound microscope) scales.
3. Students study the characteristics and behaviors of various protists, recording their similarities and differences.
4. Students identify specific structures found in some protists after examining protist-related web sites.

National Science Standards:
The Cell, Behavior of Organisms
Biological Evolution (Diversity of Life)
Science as Inquiry
Use of Technology

Materials:
Stereo Microscope
Compound Microscope
Pond water sample(s)
Slides
Cover slips
Protist cultures (possible choices: amoeba, euglena, paramecium, blepharisma, stentor, volvox)
Computer access (laptop computer for each lab group if available)

Procedure:
Part One: ***Pond water examination (30 minutes)***
Students examine water samples under a lower magnification (Stereo or macro-view), in search of any living organisms. After observing the water, students answer questions 1 & 2 on the lab activity sheet. Students then prepare a wet to obtain the sample from the bottom of the container or sample. Students should examine using a compound microscope, and answer questions 3 & 4 on the lab activity sheet.

Part Two: ***Protist Culture examination (70 minutes for microscope study, 50 minutes for internet research.)***
Students are introduced to protists in a short paragraph in their lab activity sheet, and then examine specific examples of protists under the microscope. Suggested cultures are listed in the materials section above. Students are instructed to prepare wet mount slides of all protist samples and should sketch them under the highest possible power. Students must also answer specific questions about the six protists – some of these questions they may be able to answer via observation, but others will require some research. Students may view and sketch all specimens, or capture images of the specimens using imaging software and then perform the research, or they may complete all three tasks related to one organism before moving on to the next. The student activity sheet includes a list of web sites that can be used as starting points for the research. Some of these sites also include pictures of the various protists in order to help students identify various structures.

Suggested Assessment:
Students should turn in their packet containing responses to questions asked throughout the lab. They should also turn in their labeled diagrams and information about each of the six protist samples. A quiz, written or virtual, on the material may also be given.

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Pond Water Examination

In this activity you will examine a sample of pond water in search of living organisms. You will begin by collecting the water in a clear container, and examining the water under the lowest possible power using a stereo microscope. Gradually increase the magnifying power up to 40X (note that stereo microscopes have different objectives with different powers. You will need to adjust to your particular microscope.) and answer questions 1 and 2 below. Then switch to a compound microscope and prepare a wet mount slide of the pond water. Begin by examining the water under 100X and gradually increase the magnifying power up to 400X. Answer questions 3 and 4 below.

Initial Examination

Use the stereo microscope to view your water samples under low power (10X- 40X), and answer the questions below.

1. Are you able to detect any signs of life in the pond water under low magnification? If so, what characteristics of life are the organisms displaying?

2. Estimate the number of living organisms in your water sample. Explain how you arrived at this number.

Digital Microscopy Applications:

Use your Swift Cam and the SwiftCam imaging software to capture an image at each magnifying power. You may also use the software to record a video file or time lapse. Tip: Video files take up space. Make sure to record for a specific amount of seconds. You may annotate the images that you capture now or at a later time. Label with the magnifying power, date and your observations.

Detailed Examination

Use your compound microscope to view your water sample under higher power (100X – 400X), and answer the questions below.

3. Describe the differences that you see in your pond water now that you are viewing it under a higher magnification. Are you able to see more organisms?

4. Describe the organisms that you see. (Do they all look the same? Do they all have similar behavioral patterns? Do they appear to be single or multi-celled? Etc.)

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Digital Microscopy Applications:

Using your SwiftCam attached to the microscope and the Swift Cam imaging software, capture an image at each magnifying power. You may also use the software to record a video file. Tip: Video files take up space. Make sure to record for a specific amount of seconds. You may annotate the images that you capture now or at a later time. Label with the magnifying power, date and your observations.

Protist Culture Examination:

When examining your pond water, you most likely observed a large variety of different organisms. Many of these organisms would probably be classified as protists. The ancestors of our modern day protists are thought to have given rise to all eukaryotes – plants, fungi, animals, and the modern protists. Their classification as eukaryotes is about where the similarities in protists stop. While most protists are single celled, some are multicelled. While many of them are heterotrophs, many others are autotrophs. While some have cilia or flagella for movement, others have drastically different methods of locomotion. In this next phase of the lab, you will be introduced to six common types of protists.

Examining the protists

Prepare a wet mount slide of each sample. Locate your specimen under low power; focus and continue to magnify until you have as clear a view as possible. Sketch a diagram of your specimen, and label the structures listed in the chart below.

Protist Culture	Parts to Identify
Algae	Cell membrane, cytoplasm, chloroplasts
Euglena	Cell membrane, cytoplasm, chloroplasts, flagellum, nucleus, contractile vacuole
Amoeba	Cell membrane, pseudopod, nucleus, food vacuole, cytoplasm
Paramecium	Cell membrane, cytoplasm, cilia, contractile vacuole
Blepharisma	Cell membrane, cytoplasm, cilia, contractile vacuole

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Researching the Protists
Next to your diagram of each protist, provide the following information:

- Is this protist unicellular or multicellular?
- Is this protist an autotroph or heterotroph?
- In what environment is this protist usually found?
- How does this protist move?
- How does this protist feed?

The following web sites are suggested to help you to label the parts of your protists, as well as to answer the above questions. These provide you with a starting point – you are not limited to this list.

http://ebiomedia.com/gall/drop/dropmain.html

http://www.sidwell.edu/us/science/vlb5/Labs/Classification_Lab/Eukarya/Protista/

http://www.berkeleyprep.org/lifescience/protists.htm

http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/P/Protists.html

http://www.tnmanning.com/id151.htm

Digital Microscopy Applications:
Using the SwiftCam imaging software you may capture an image of each protist and save to a file or folder. You may also use the software to record a video file. Tip: Video files take up space. Make sure to record for a specific amount of time.

You may annotate the images that you capture now or at a later time. Use the tool bar to add text to answer the questions or to label the parts to identify. You can add icons to point to the parts that you identify. You can use different colors to denote different protists. You can measure or use filtering edits to further analyze each protist.