SGI Biology Training Guide

EVOLUTION

*Science and Global Issues: Biology* (SGI Biology) was developed by the SEPUP group, at the Lawrence Hall of Science, University of California Berkeley, under the direction of Dr Barbara Nagle, SEPUP Director. Development of *SGI Biology* is supported by grants from the National Science Foundation. *SGI Biology* is published by, and available exclusively from, LAB-AIDS, Ronkonkoma NY, 800.381.8003.

There are five units in *SGI Biology*, as follows:

- Sustainability, pp. 1-46
- Ecology: Living on Earth, pp. 43-154
- Cell Biology: World Health, pp. 155-258
- Genetics: Feeding the World, pp. 259-412
- Evolution: Maintaining Diversity, pp. 413-512

**READ ME FIRST**

The following outlines/notes are meant to provide direction for pilot or implementation training for teachers using the program. This is not a substitute for the *SGI Biology* Teacher’s Guide and Teaching Resources, but will enhance their use with teachers. It is assumed that trainers are familiar with and have taught the *SGI Biology* program, and that at minimum there is one full day available for training on each unit. This guide assumes that teachers have access to student books and teacher’s guide materials as well as laptops and a connection to the Internet. The CD that contains TR 1-IV as well as student sheets and transparencies, etc., is also a must-have for teachers and trainers.

You will likely work closely with the area sales manager from LAB-AIDS to prepare for and deliver this training. They may assist in setting up for the workshop, travel logistics, and more, and will often be able to communicate key expectations for the workshop.

Make sure you have copies of student sheets, transparencies, etc., as needed for the workshop.

---

1 This document was prepared by Mark Koker, Ph D, Director LAB-AIDS INSTITUTE and Donna Parker, LAB-AIDS Senior Consultant.
GETTING STARTED (Up to 20 min)
We suggest that trainers start by introducing themselves and mention their classroom use of the SGI Biology program, then spend 10-15 minutes providing a basic overview of the SEPUP program using the powerpoint at [insert web address here]. Time for teachers to introduce themselves can be nice, but keep this short and sweet – by suggesting questions like "how long have you taught biology," or "do you have any experience with the SEPUP curricula?" – as this routine can eat into your training time significantly if there are long-winded teachers in the group.

Tell teachers you will work through 4-5 activities in ‘real’ time (i.e., do the activity rather than discuss it) and that these activities have been selected because they exemplify some special aspect of the program design (content, issue, literacy, inquiry, assessment, etc.) or the content or equipment merit special attention. These will give teachers a real sense of how the program ‘unfolds’ in the classroom, and you can summarize the activities in between for continuity. They are shaded in the following table.

DOING THE ACTIVITY/IES (5 to 6 hours)
Make sure to stick to the teaching suggestions in the TG with new teachers. Emphasize that they should ‘try it once the way it is written’ before they modify it, for the sake of instructional fidelity. If you model any changes you have done to the activity up front, the subliminal message you may send to teachers is that the activity requires modification in order to teach. This is not to say you can’t pass along tips and tricks, etc.

In the following table, there are shorthand letter icons on the top of each cell for each activities to suggest opportunities to call attention to the instructional design for the program:

• C  Content  
• I  Issue  
• L  Literacy  
• IN  Inquiry  
• A  Assessment

Absence of an icon does not necessarily mean that the instructional element is not present, just that it may not be the best place to give emphasis to it. The power points and simulations will become available beginning in June 2011, so make sure that you call them out to teachers even if you do not focus on them during training. Also recently available is the Exam View treatment for SGI Biology, and this should be either mentioned or demonstrated briefly during the workshop.

FOLLOW UP
Use the TG suggestions for follow up. It is not necessary (and generally very boring) to answer every AQ in depth, particularly if teachers talk to one another during the activity and stay on task. Rather, pick a representative example and discuss this in detail; often this is a formal assessment question and may provide an opportunity to reinforce its use.
We would suggest doing one or two AQ that show how content is pulled together from the activity. Otherwise, teachers may agree that, while a fun activity, content is not meaningfully addressed.

CLOSURE
Make sure you post your name and contact e-mail for follow up questions. Help with the clean up and return of materials. Make sure to post a short report of your workshop on the SEPUPPIES list-serve. Often, there are local workshop evaluation forms used by the host district.
## Talk it Over: Human Activities & Biodiversity

**Time needed:** 60-70 minutes

### Getting started
- Model this first activity from start to finish (if this is the first day of training) including set up, procedure, analysis questions and post-activity discussion. Avoid procedural questions at this point.
- Set up notebooks with participants if this is the first unit for training.
- Project Transparency 2.1 and ask participants to journal what types of human activities might be contributing to species extinction.
- Share as a large group then discuss the five main human impacts on biodiversity (TG pg. 632)

### Doing the activity
- Discuss group interaction expectations using Group Interaction Scoring Guide and Group Interaction Student Sheet 2.
- Explain 4-2-1 SEPUP philosophy
- Have participants read the introduction on page 422 and review the type of biodiversity
- Split participants up to read scenario. However, be sure you have a plan to share the scenarios between groups since each group is only reading one scenario.

### Follow up
- Ask participants to reflect about the activities and the impact of humans on themselves and other species.
- Discuss AQ 4 in group

### Materials needed (not in kit)
- Transparency 2.1, Copies of Scoring Guide: Group Interaction (GI) & Group Interaction Student Sheet 2: Developing Communication Skills (optional)

### SEPUP Pedagogy

<table>
<thead>
<tr>
<th>Content</th>
<th>Process Skills</th>
<th>Issue</th>
<th>Literacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inquiry</td>
<td>Assessment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Investigation: Using Fossil Evidence to Investigate Whale Evolution

**Time needed:** 45 minutes

### Getting started
- Have participants compare and contrast mammal and fish characteristics then ask group which one whales belong to.
- Tell group in this activity we will investigate the evolutionary history of whale using fossil evidence – much as paleontologists do.

### Doing the activity
- Pass out Fossil Skeleton cards M, K, T, B, O and have the group complete Procedure Steps 1-6.
- Suggest to participants they laminate all cards to help preserve them.
- Introduce the claim, evidence and reasoning strategy highlighted on page 666 of TG.
- Provide cards A & D and have participants do procedure step 10.
- Procedure step 11 refers to an activity not done in training so explain connection to activity 3.2

Follow up
- Project Transparency 5.2 “Whale Evolutionary Tree” and discuss the correct placement of fossils A & D. (Model Claim, Evidence Reasoning strategy)
- Discuss AQ 1 and highlight AQ 4 as a quick check assessment opportunity.
- Have participants reflect on activity using SS 3.1. Explain how this set of student sheets is used throughout the unit to track changes in student’s perceptions.
- Revisit the challenge using page 668 of TG.

Materials needed
- Copies of Student Sheet 5.1 & 5.2
- Copies of Student Sheet 3.1
- Copies of Transparency 5.1 & 5.2 (which are SS 5.1 & 5.2)

<table>
<thead>
<tr>
<th>SEPUP Pedagogy</th>
<th>Content</th>
<th>Process Skills</th>
<th>Inquiry</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>7 Investigation: The Phylogeny of Vertebrates</strong></td>
<td>Time needed: 60 minutes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Getting started**
- Write the words strawberry, apple and orange on the board. Add the word “fruit” next to each and ask students by what specific physical characteristics in these fruits we could classify them into two groups.
- Use student responses to develop a classification system for those fruits.
- Explain to participants they use Transparency 7.1 to review taxonomy and binomial nomenclature.

**Doing the activity**
- Pass out the vertebrate cards and have participants complete Part A of the procedure.
- Project Transparency 7.2 and explain those limbs are an example of a shared derived character. Explain that forelimbs all have the same basic structure and bone parts but have been modified through natural selection for different functions.
- Point out that while there are similarities in the
functions and shapes of the forelimbs, function and shape do not mean the organisms have a shared derived characteristic. Use the bird and bat wings on Transparency 7.3 to highlight this point and introduce the term analogous structure.

- For Part B, review the character matrix and what information it provides.
- Use Transparency 7.4 to complete an evolutionary tree as a large group. Discuss the difficulties in placing the whale, human and pig on the tree then provide Student Sheet 7.1 via a copy or project as transparency.
- Discuss how the additional information assists in the placement of the whale, pig and human. Emphasize that scientists often have to work with the information available and revise their work as new information becomes available.
- Have participants do Procedure step 7 & 8.

**Follow up**
- Review the connection between Activity 5 & 7.
- Point out AQ 4 as a quick check assessment opportunity

**Materials needed (not in kit)**
- Copies of Transparency 7.1, 7.2, 7.3, 7.4 & 7.5
- Copies of Student Sheet 3.1 & 7.1 (for each participant)

**SEPUP Pedagogy**
Content Process Skills Issue Inquiry
Assessment (Quick Check only)

<table>
<thead>
<tr>
<th>10 Investigation: What is a Species?</th>
<th>Getting started</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time needed: 60 minutes</td>
<td>• Have participants answer the following questions in their notebooks: 1. What is a species? 2. Some examples of species are ___________. 3. How do you think biologists decide if two populations are of the same species? • Point out these could be done as a pre-assessment if teacher wishes. • Have participants share responses with a partner then discuss answers as a large group.</td>
</tr>
</tbody>
</table>
Doing the activity

- Review the Claim, Evidence, Reasoning strategy introduced in Activity 5.
- Have participants read “Background Information” on page 473 and summarize how species were determined in the past versus the present.
- Work through an example or two with the group – emphasize the claim is whether the species are early, middle or late in separation.
- Have participants select four or five more examples to complete and review how participants placed their examples on the continuum.
- Begin Part B by passing out the 14 Species Pair Cards. Point out to group this is a GI assessment opportunity.
- Complete Procedure Steps 9-11 then have a large group discussion about groups organized the cards.
- Complete Procedure Steps 13-16 and go over the correct pairings.

Follow up

- Point out AQ 2 & 3 as UC assessment opportunities.
- Emphasize to group that in many of the examples there is a degree of grey area in speciation process and the biology species concept is just one snapshot of what is happening as a population becomes two species.
- Revisit the challenge and key points as instructed on pages 729 of the TG.

Materials needed (not in kit)

- Chart paper, markers
- Copies of Understanding Concepts (UC) Scoring Guide, Student Sheet 10.1 (one for each participant)

SEPUP Pedagogy

<table>
<thead>
<tr>
<th>Content</th>
<th>Process Skills</th>
<th>Literacy</th>
<th>Inquiry</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 Modeling: Natural Selection</td>
<td>Getting started</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Needed: 30 minutes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Getting started

- Project Transparency 4.1 and explain to the group you review natural selection, which was introduced in Activity 4, before beginning.
- Have participants read introduction on page 482.

Doing the activity

- All instructions for this activity are on Student Sheet 11.1, which is also not done.
- Have participants complete this activity then complete Procedure Step 2.
### 12 Modeling: The Genetic Basis of Adaptation

**Time needed:** 30 minutes

#### Getting started
- Project Transparency 12.1 and have participants count as many light mice as they can in three seconds. Explain that before the volcano erupted most of the mice were naturally light colored.
- Project Transparency 12.1 and have participants count as many as white mice as they can.
- Discuss what is likely to happen to the mouse population as a result of the environmental change.
- Tell participants they will be simulating what is likely to happen over several generations to the population at the genetic level.

#### Doing the activity
- Inform participants this activity assumes basic genetic terminology highlighted on page 740 of TG.
- Do Procedure Step 1-2
- Pass out Student Sheet 12.1 and model how to complete Procedure Steps 3-8. If you have an overhead or projector, make a copy of Student Sheet 12.1 to show participants what to do in each step.
- Have group finish the next four generations then stop group and note what is to happen in Procedure Steps 9-10. Do those steps if time permits.
- Discuss with group how they would accomplish Procedure Step 11 and 12 in a classroom.

#### Follow up
- If time permits tally data and discuss the trends participants note.
- Point out that AQ 1 is a quick check assessment opportunity.
- Revisit Student Sheet 3.1 to additional evidence to add to sheets.

#### Materials needed (not in kit)
- Colored Pencils

---

### Follow up

- Wrap up the content associated with this activity using the AQs. See page 732 of TG for suggestions and answers to AQ.

### Materials needed (not in kit)
- Computer with internet for simulation
- Transparency 4.1
- Student Sheet 3.1 (from previous activity)
- Transparency 12.1 & 12.2
- Student Sheet 12.1 (one for each participant) & Student Sheet 3.1 (from previous activity)

### SEPUP Pedagogy

<table>
<thead>
<tr>
<th>Content</th>
<th>Process Skills</th>
<th>Issue</th>
<th>Inquiry</th>
<th>Assessment (Quick Check only)</th>
</tr>
</thead>
</table>