DISCOVERING LIFE SCIENCE

Plan of the Textbook

Discovering Life Science is divided into ten units. Within a unit, there are 5 to 12 lessons - a total of 72 lessons. [The Table of Contents is provided at the end of this introduction.]

Each lesson is short, with the content nearly always covered in about 500 words. With diagrams and photos appearing throughout, the core information is typically covered in two pages - an amount of reading well suited to a single night's assignment. For student populations that are less likely to complete work at home, each lesson could easily be read during the first half of one class period, leaving the second half to introduce the corresponding lab or activity. The lab could then be completed during the following class period(s).

All lessons follow the same format. The title is in the form of a question that focuses on the key objective. Of course, students should be able to answer this question after completing the lesson. In addition, behavioral objectives are provided in the teacher's guide.

Exploring Science / Historical Steps

Following the title / question, there is a short story related to the lesson's topic. The story is designed to spark interest and encourage further reading. In most cases, the story incorporates a historically significant scientist or event. As mentioned previously, the scientists are not limited to those of widespread fame; they often are females or people of color whose efforts have for too long been given inadequate credit.

A secondary goal of the Exploring Science / Historical Steps section is to demonstrate that science material can be read simply for enjoyment. While this section often introduces content that will be elaborated upon in the next part, it does so in a less formal style.

In most cases, this section closes with an inference question or a suggestion for further research. These are designated by a "➢".

Teachers may want to use this section to concentrate on students' reading skills. For example, students might be asked to share what key point is being made, what supporting information helped to make the story convincing, or what seems to be foreshadowed in the story.

Content

The key content of the lesson is introduced via a subtitle. Important words are printed in heavy type, and a pronunciation guide is provided (in parentheses) after the more difficult words.

To Do Yourself

Simple activities, entitled **To Do Yourself,** are provided for most lessons. A teacher may opt to complete some of these activities for their class. However, as the title suggests, these are primarily intended as activities that a motivated student might complete as enrichment. Students are able to perform most of these investigations individually or in small groups, but a few require adult assistance. Materials are simple and inexpensive. Each activity is directly related to the content of the lesson, although some may extend that content slightly. Suggestions for handling each activity, and expected outcomes, are provided in the teacher's guide.

Lesson Reviews

The review material at the end of each lesson contains three or more parts, indicated by Roman numerals. Within a part, there is generally more than one question. Types of questions include fill-in-the-blank paragraphs, multiple choice, matching, arranging the steps of a process in the correct order, true/false (often with the requirement that false statements be corrected). A final question challenges the student to infer or to predict; this answer will require a complete sentence or two.

Unit Reviews

All units end with a review of the content, entitled **Review What You Know**. The unit review is divided into four parts. **Part A** reviews material in the unit in a motivational context. It is always a puzzle of some sort. **Part B** is a set of multiple-choice questions. **Part C** is visually oriented, getting at student learning in a different modality. **Part D** consists of one or more projects that can be used to extend the unit or to challenge the motivated students to deepen their understanding. Most of these could be used as group activities; many will take more than a single day to complete.

Teachers may find it useful to look at **Part D** before they begin a unit. In some cases, they may want students (or a select few students) to work on a project while the unit is being taught. On the other hand, working on a project *after* the unit has been taught is a good way to reinforce the ideas of the unit.

Summing Up / Cumulative Reviews

Except for Unit 1, odd-numbered units are followed by a cumulative review. As with **Part C** of the unit reviews, the cumulative review relies largely on a visual modality.

In general, half or more of each review is concerned with the content of the previous two units, while the remaining parts of the review are on earlier units. Since there is a cumulative review every two units (starting with Unit 3) this plan ensures that all of the units are reviewed intensively. In all cases, the questions in **Summing Up** are keyed in this *Teacher's Guide* to the units that they cover.

Support for Thinking Skills

In addition to the strategies mentioned previously (the inference question at the end of each **Exploring Science / Historical Steps** section, the inference question at the end of each lesson's **Review**, and the **To Do Yourself** hands-on activities that challenge students to 'go deeper'), two entire lessons in Unit 1 are devoted to the thinking strategies used by scientists. One lesson focuses on the scientific method. The second lesson stresses the following: pattern recognition, inferring, avoiding biases, incorporating controls, and the role of verification.

Careers in Life Science

A careers page is provided after the first unit, and then after each even-numbered unit. These pages introduce careers that are related to that particular unit. At least two careers are presented on each page; the first career requires limited preparation or training, while the others require more extensive education.

Major figures of biology included in this textbook
(in the order in which they appear)

-Francesco Redi (life from life)
-Louis Pasteur (microbes)
-Edward Jenner (scientific thinking; vaccination)
-E. O. Wilson (biodiversity / Half-Earth Project)
-Sylvia Earle (ocean biodiversity / Mission Blue)
-Simard, Suzanne (mycorrhizal network)
-Rachel Carson (pollution / biomagnification)
-Dr. Jane Goodall (chimpanzee behavior)
-Anton van Leeuwenhoek (microscope)
-Robert Hooke (cells; microscope)
-Carolus Linnaeus (classification)
-Luther Burbank (grafting)
-Stanley Miller (origin of life experiment)
-Harold Urey (origin of life experiment)
-Joseph Priestley (oxygen)
-C.E. Bloch (vitamin A)
-E.V. McCollum (vitamin A)
-Chris Servheen (grizzly bears)
-Henry Judah Heimlich (choking maneuver)
-Alexis St. Martin (digestion)
-William Beaumont (digestion)
-Stanley Dudrick (total peritoneal nutrition)
-Charles Drew (blood plasma)
-Florence Sabin (embryology)
-William Harvey (circulation)
-Marcello Malpighi (capillaries)
-Chris Pizzo (mountain air)
-Jimmy Tontlewicz (mammalian diving reflex)
-Konrad Lorenz (imprinting)
-Stephen Hawking (ALS / genius)
-Wilder Penfield (brain map)
-Keith Sedlacek (biofeedback)
-Alexander Fleming (penicillin)
-Valerie Pence (plant tissue culture)
-Ernest Just (embryology / cytoplasm)
-Louise Brown (IVF / “test tube baby”)
-Rosalind Franklin (DNA)
-Maurice Wilkins (DNA)
-James Watson (DNA)
-Frances Crick (DNA)
-Barbara McClintock (genes)
-Gregor Mendel (genetics / dominant & recessive)
-Thomas Hunt Morgan (genetics / fruit flies)
-Alec Jeffreys (DNA fingerprinting)
-Kary Mullis (PCR - polymerase chain reaction)
-Angela Ferguson (sickle cell disease)
-Jennifer Doudna (CRISPR)
-Emmanuelle Charpentier (CRISPR)
-Robert Bakker (dinosaurs)
-Charles Darwin (natural selection)
-Jayakumar Rajadas (Lyme disease antibody)
-Venkata Raveendra Pothineni (Lyme disease)
-Erol Fikrig (Lyme disease tick vaccine)
-Andreas Gruentzig (angioplasty)
-Paul Talalay (chemoprotection)
-Jed Fahey (chemoprotection)
-Paul Anastas (SADD)
-Neil Shubin (Tiktaalik / evolution)
-Lynn Margulis (endosymbiosis)

MATERIALS AND EQUIPMENT

for **"To do Yourself" Activities**

At the start of each "To Do Yourself" activity, a list of materials is provided. Many of these materials may be obtained at any time up to the day of the activity. Other materials, such as frog's eggs, animal parts, plant parts, and food samples, must be as fresh as possible on the day of use. A few materials should be prepared a couple of days before they are to be used.

This materials list is divided into three categories: Supplies and Apparatus; Readily Available Materials; and Fresh or Living Materials.

SUPPLIES AND APPARATUS

This list includes equipment and materials that should be on hand early in the school year. Many of the items in this list may already be a part of your science department's stock. All other items can be ordered from a science supply company.

burner
Biuret solution
dissecting needle or probe
iodine, Lugol's solution
sugar-test tablets
bromothymol blue solution
microscope
pins, large (for dissection)
slides (prepared)
-human blood
-mammal artery & vein (c.s.)
test tubes and holder
test tube - heat proof
test tube rack
test tube corks
tubing, rubber

READILY AVAILABLE MATERIALS

This is a list of "non-science" items that are readily available in the school or at home, or are easily obtained at a local supermarket or hardware store.

alcohol
aluminum foil
apple-coring tool
bags, plastic (small)
bags, plastic, (large)
baking soda
beans, dried (red and white)
board, wood
bowl, small
bottle, dropper
cardboard
carton, juice
cereal
clay
disinfectant, household
drawing paper
glass-marking pencil
fish food
flashlight
hammer and nail
hand lens
hot plate, electric
jars, large, wide-mouth
jars, small, wide-mouth
knife
knife (plastic)
plaster of Paris
plates, paper
pot holder
powder, (baby)
ruler
salt, table
sand
saucer
saucepan
scissors
shell
soil
spoon, metal (old)
spoon, plastic
stapler
straw, plastic
sugar
measuring cup
medicine droppers
nail polish remover (optional: for teacher demonstration)
napkins, paper
petroleum jelly
pipe cleaners
tank, glass
tank, for fish or aquarium
tape, cellophane
tape, package
thermometer, clinical
timer
thermometers, household
toothpicks
towels, paper
tobacco, cigarette
tray
tweezers or forceps
wrap, plastic
yeast, dry

FRESH OR LIVING MATERIALS

This list includes material that should be obtained as close as possible to the day on which the items are to be used. If it is necessary to retain any of these materials for any length of time, it will be necessary to refrigerate them.

apple
bananas, green
bones, chicken and beef
brain, seep
bread, white,
(with preservatives)
bread, white,
(without preservatives)
caterpillar
chicken leg
dechlorinating solution
earthworms
eggs, brine shrimp
eggs, chicken
eggs, frogs
fish, for dissection
flowers
food samples
fruit juices
goldfish
grapefruit
grass, dried
grass, fresh
guppies
hair strands (from parent and offspring)
heart, pig
lard
potato
seeds, dry and fresh
(of various fruits)
seeds, for sprouting
snails
spinach
starch solution
mealworms
onion (or lettuce)
orange
Planaria (living)
plant parts (leaves, stems, roots, fruits, flowers)
plants, aquatic
tangerine
tangelo
tap water
tea, brewed (strong)
terrarium organism