



LOT Unit Overview

Intro

Activity Formats

A familiar and recognizable format makes curricular materials easier for teachers to review and use. The format used in our existing LOT units (and in the SRT activities on a smaller scale) has been developed, revised, and tested over more than 10 years at both the APS and the AAAS. Each new LOT unit should follow a similar format. Each new LOT unit should include the following components:

I. Introduction

The unit should include a brief introduction that provides an overview for the teacher in terms of 1) major concepts covered by the unit; and 2) the pedagogy used in the unit (for example, concept mapping, inquiry-based activities, etc.)

II. Engagement Activity¹

The engagement activity should be a brief, easy-to-do activity to get students interested in the topic and leave them with some questions. Engagement activities "...capture the student's attention, stimulate their thinking and help them access prior knowledge." The engagement activity can also serve as a pre-assessment for the unit. General examples include (but are NOT limited to):

- concept map (with or without preset concepts to include);
- KWL chart;
- demonstration;
- hands-on activity;
- readings from current media release, science journal or book, other literature;
- interactive viewing of video clips or web site;
- "free write;"
- analyzing a graphic organizer; and
- Internet exploration of topic.

III. Exploration Activity

In this section, students are given time to think, plan, investigate, and organize collected information. This also is a good time to introduce lab methods that must be learned before they can be used in later inquiry-based activities. It is important that students generate and record the questions they have on the topic/content during both the Engagement and Exploration stages. Activities may

include (but are not limited to):

- performing preset experiments;
- designing and performing experiments;
- solving problems;
- constructing models; and
- accessing and utilizing resources to collect information to 1) answer an open-ended question; and/or 2) make a decision.

IV. Explanation Activity

In this part of the lesson, students analyze their observations and reflect on what they have found/learned. Typical activities include:

- student analysis and explanation of data collected/observations made;
- supporting ideas with evidence;
- readings and discussion (various media);
- classroom review; and
- consultation with experts.

Each LOT unit should include in the Explanation section, a brief (5-6 pages max, 3 illustrations max) background piece on the specific content covered in the unit. Please note that the background should be written for use by the teacher, but keep the language/detail at no higher than a lower level undergraduate course so that the teacher can use the text with students, if desired. Each LOT is asked to be cognizant of copyright restrictions for illustrations that are published in print and/or on web sites.

V. Elaboration/Extension Activity(ies)

This part of the lesson gives students "...the opportunity to expand and solidify their understanding of the concept and/or apply it to a real world situation."^[2] Examples include (but are not limited to):

- designing and performing experiments (that is, inquiry);
- problem-solving;
- thinking skills activities (classifying, abstracting, error analysis, etc.); and
- decision-making.

VI. Evaluation

This part of the lesson should include evidence of learning in the first four parts (e.g., lab reports, posters, or presentations; problem solving results; models developed, etc.) but may also include, for example: a revamping of concept maps or KWL's done earlier; development of a research plan for further investigation based on findings from the Exploration and Elaboration activities; and/or peer review or grading (especially for cooperative groups). If appropriate, include a sample scoring tool or rubric. The Evaluation component may also include formal quizzes and tests. You are encouraged to include some type of student reflection activity as part of the lesson evaluation.

Important!!

Within the Learning Cycle framework above, your unit must contain the following...

1. At least one structured or open inquiry activity (see following chart for definitions); and
2. At least one Internet exploration/activity.

Assessing the Inquiry Level of An Activity/Lab

Points	Prelab		Lab	Postlab	
	Proposes the problem or issue to be explored	Plans the procedure to be used	Carries out the procedure	Supplies answers or conclusions	Lab outcomes used to determine applications, implications, or further exploration/instruction.
0	Teacher	Teacher	Teacher	Teacher	Teacher
1	Teacher	Teacher	Teacher	Teacher	Teacher/Student
2	Teacher	Teacher	Teacher	Student	Student
3	Teacher	Teacher	Student	Student	Student
4	Teacher/Student	Student	Student	Student	Student
5	Student	Student	Student	Student	Student

From Frank X. Sutman, Senior Scholar, Science Education, Temple University. Paper presented at the annual meeting of the AAAS, Philadelphia, PA, February 1998.

We call Level 4, "Guided inquiry": TEACHER generates the question(s); STUDENT designs the experiment.

We call Level 5, "Open inquiry": STUDENT generates the question and designs the experiment.

[1] The description of Learning Cycle and component examples was adapted from the Maryland Virtual High School of Science and Mathematics web

page, <http://mvhs1.mbhs.edu/mvhsproj/learningcycle/lcmodel.html>.

[2] Ibid.