

CRITICAL THINKING, DATA ANALYSIS AND SCIENCE

Incorporating Science into the ESOL Classroom

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Overview

This section of the workshop will focus on the practices of **inquiry and investigation**, two processes that promote language learning and concept development simultaneously. The activity reflects many of the guiding principles and all of the habits of mind described in the *Massachusetts Adult Basic Education Science Curriculum Framework, Life Science Strand*: curiosity, open mindedness, creativity, wonderment, and confidence.

OBJECTIVES

After attending this part of the workshop participants will be able to

- explain the similarities between effective science teaching and effective language learning;
- describe an inquiry process activity designed to introduce science concepts and build language structures and vocabulary, and
- brainstorm ideas for adapting the activity, and extension activities, for their own classroom.

RATIONALE

Why do science in ESOL classes?

- Learning language around content—providing a context—helps students learn and retain new vocabulary and concepts by building on what they know. Science can provide that content. Doing science is appropriate for multi-level classes, allowing many ways in to learning tasks.
- Doing science is often experiential and hands-on. “While working with, manipulating, and thinking about things, a student can often understand concepts even without the vocabulary to express the learning.”
Science for English Language Learners, Ann K. Fathman and David T. Crowther, Editors. National Science Teachers Association Press, 2006.
- Science touches on many aspects of ESOL students’ lives: health, nutrition, environmental issues, understanding current events, making informed choices as citizens, workers, and parents.

CURRICULUM

Where can you incorporate science into your ESOL curriculum?

- *Themed Units on*
 - Health and wellness
 - Community concerns (pollution, lead paint, etc.)
 - Food/nutrition

Reading, writing, grammar, and structure practice could be incorporated into each unit.

METHODS

How can you integrate science in an ESOL curriculum?

- **Use experiential, hands on, multi-sensory approaches** Effective approaches to teaching language are similar to effective approaches to teaching science: they are often experiential, hands-on, multi-sensory, and allow for students to participate according to their levels.
- **Use research** (Web, text sources,) to follow up with hands on activities and to answer student generated questions
- **Use science museum resources** (go to museums, invite museum educators into you classrooms)
- **Consult the resources attached to the ABE Life Science Framework** for a variety of practical tools and information.

LEMON ACTIVITY

Materials

- A dozen or so fresh lemons
- Several small boxes of lemon candies
- Drawing paper
- Markers and colored pencils
- Self-adhesive newsprint and markers
- Cards and language strips with question words on them: who, what, where, what, what if, how, how come, where, when

Purpose

The purpose of this activity is to engage us in an inquiry process designed to introduce science concepts and build language structures and vocabulary for students.

Keeping in mind that the habit of mind is curiosity, the approach today is INQUIRY: asking questions to generate language learning and to begin thinking about science content.

Overview/Background to Activity

- (In advance, place one lemon and a box of candy on the table at each participant's place)
- Ask students
 - What did you think when you saw the lemon and lemon candies on the table?
 - Did it make you curious? Did you have questions about them?
- **Explain:** I placed the objects there so you would generate questions. *(In my experience, when students are curious and want their questions answered, they will work harder to use their new language for a specific purpose and will become actively involved to investigate the answers to their questions, as well as listen with a purpose to understand explanations given by the instructor or other students.)*

Step by Step

Note: Depending on how much students have learned regarding verb tenses, teachers may want to review tenses or ask them to keep the questions in the present tense; later you can change each question to the past tense.

- Explain to students: This activity will help you practice asking questions in English.
- Review Questions words and have them posted around the room: Who, What, When, Where, How, “How come” (slang), Why. If same language class, compare in students’ first language.
- Review punctuation of a question.

ASKING THE QUESTIONS

1. Break students up into small groups or pairs depending on size of group.
2. Ask each group to choose a recorder.
3. Give each group sheets of newsprint and marker.
4. Instruct each group to ask **at least ten** questions, but as many questions as they can about the lemon. Explain that it is fine if they make mistakes because they are going to practice correcting the grammar together anyway.
5. Model a couple of questions together: *What color is it? What does it taste like?*
6. Give participants 20 minutes to generate questions. (Modify this amount of time depending on the level of your students.)
7. Recorder writes questions on newsprint.
8. When everyone is done, hang one sheet at a time up on the board/front of room.
9. Allow students to make corrections on the questions according to the grammar/structure points you want to focus on.
10. Make corrections in another color marker. Let students copy the questions into their notebooks, if you have time.

CLASSIFYING THE QUESTIONS

1. Look at questions. See where there are similarities and differences among the questions. How can you classify the questions? *Stress that there is no one answer here—let us look at some ways to classify the questions*

Possibilities:

- Classify by question words: who, what, when, where, how, why,
- Classify by:
 - Things you can answer by observation
 - Things you can answer by research
- Classify by categories such as environmental, economic

ANSWERING THE QUESTIONS

- How many questions can you answer by observation?
- Where can you get information to answer the other questions? (Ask someone, look online, cut open the lemon, etc.)
- What do you think you already know the questions?

LANGUAGE AND GRAMMAR BUILDING

- Explore new vocabulary (sour/sweet, tangy, sections, seeds, pith, rind, colors, texture—bumpy, smooth, depending on your level)
- Explore sentence frames/sentence structures If x, then y
- Introduce and practice description of a process: first, then, finally
- Idioms
 - A lemon – term for a bad used car
 - If life gives you lemons, make lemonade - a cliché, saying, advice (See reading attached)

EXTENSION ACTIVITIES

To answer other questions:

- Guided research and reading
- Science in the kitchen – making lemonade: ratio of sugar to lemon juice
- Math – cutting the lemon into fractions
- Lemon recipes—savory, sweet, dessert, main dish, etc.

Language	Science
Practice generating questions using –wh and other question words: who, what, why, when, where, how, what if others?	Promote curiosity and interest in exploring traits of an object—in this case, a lemon
Practice correcting questions generated in small groups for proper verb tenses, spelling, and punctuation	
Learn new vocabulary for categories and classifying	Classify questions into scientific categories (observable non/observable, etc.)
Practice conditional sentences If X then Y	Begin to investigate answers to the questions; speculate on answers that cannot be immediately observed
Generate and practice new vocabulary that arises in the activity; introduce slang and idioms related to “lemon” “If life gives you lemons, make lemonade,” a bad used car is a “lemon” “Lemon laws”	