This is an excerpt modified from Waterman and Stanley "Investigative Case Based Learning," a text module in the BioQUEST Library V, John Jungck and Virginia Vaughan (Eds) Academic Press, 1998. Sections on line at http://bioquest.org/case99.html

Writing a Case and Developing a Problem Space

A. Developing Case Drafts- a procedure.

1. **Inspiration: Identify Topics, Labs or Resources and Learning Goals**.
   To begin, the authors are asked to write down a topic they would like to teach, and one big "take home" message on this topic. Some people want a case to go with a specific lab investigation, a set of analytical techniques, a piece of software, or an online resource, for example. Consider what content the methodology goes with.

2. **Identify Potential Scenarios**.
   Next, authors are asked to think of two or three realistic settings or scenarios useful for leading students to explore that topic. Consider how the concept or topic is used or encountered outside of school. Consider also the people who will be in the story. Who could tell it? A medical story will be quite different told from the patient's perspective as compared to a therapist's or physician's perspective.

   For example, we wanted to get to bioinformatics using a great website on whale meat forensics. But we needed a scenario to which students could initially relate and which would make that problem meaningful. Our solution was to have two friends talking about one's trip to Japan, experiences with Kujira (whale meat dishes), and problems with importing whale meat. They had this conversation while running at the track together after work. Initially we considered having a Norwegian grandmother try to bring back whalemeat from a trip to Norway. We also thought about an American Japanese couple wanting to serve kujira here in the U.S.

   We have found that everyday settings and non-biology occupations are powerful settings for scenarios. We have people in restaurants, waiting in line for a boat trip, meeting strangers on airplanes, preparing for trips, or at work.

   > Avoid sci-fi scenarios, or having animals, microbes or plants talking. It's very confusing and not usually appreciated by learners.
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   > AVOID school and research lab as settings, especially if you are writing for beginning students (e.g., Chao-hui and Julio were discussing the latest biology assignment). The point of the case is to provide a context in the real world. School is, of course, in the real world, but it is a brief period in the lives of these students. Cases are an opportunity to show biology in action outside of school or research lab.
   >
   > Don't make the student a part of the case (e.g., You are a plastic surgeon and need to solve a big problem). Students are more likely to be able to criticize the decisions of others if THEY are not a character. Contrary to intuition, making the student part of the story does not engage them more – it inhibits them.

3. **Evaluating the scenario ideas.**
   Working in pairs, each member explains their topic and possible scenarios, with the intent of convincing the partner of the utility of at least one of the scenarios. The partner provides feedback and suggestions.

4. **Bite the Bullet: Write a Draft.**
   Next, each individual drafts a few brief paragraphs describing the scenario/situation as though writing to a nonscientist friend. About 15 minutes is allotted for writing this very drafty draft.

B. Initial Case Review

1. In case review, new partnerships form, or small groups. Without preamble or explanation of any kind, the case author reads the case out loud to a small group of willing listeners whose job is to tell the author what the case is about. This is a way for the author to see if the objectives of the case are being recognized.

2. The other members of the group offer suggestions (preferably in the form of questions that the case stimulates for them) as to what the case is about. The author writes these down. The author does not yet respond to the feedback from the listeners.

3. After all the listeners have had their say, then the author shares what he or she intended the case to be about. Sometimes there is great congruence between what the listeners think and what the author intended, often there is some incongruity.

4. When there is much incongruity, it's time to think about recasting the case, perhaps in a new scenario, or told from a different point of view.

   Note: It's best to delay the discussions of teaching strategies, assessment strategies, and the like, until steps 1-3 are complete

C. Structuring the Case-for Learning

Once the story clearly leads to the intended objectives (this may be a draft or two later), it is time to start structuring the case for teaching.

1. Go through the case and decide which terms or phrases are the "hooks" -- those that stimulate questions, learning, etc. Underline these. Then, write down the issues that are stimulated by that part of the case. This step allows the author to decide if any paragraph has too much or too little content.

   Here's an example of some of the kinds of issues raised in one paragraph of the longer case "Fleaing Louisiana" (M. Waterman, 1996):

Moses Anders **hung up the phone** after talking with Ella Cardinale-Jones about her trouble. She had **ticks on the dog, roaches in the house and hungry mosquitoes** chewing up her kids. "Now Mr. Anders, I'm used to seeing some bugs around -- this is **Louisiana,"** she had said. "But it seems no matter what I do **there are more and more of them**. How can I **get rid** of them? I don't feel like my children are **safe**." Ms. Cardinale-Jones was the **29th caller** to **the Extension Service** about these problems this month, and it was only **January 7th.**

What we know now: It's January in Louisiana. There are lots of insects, perhaps more than usual, and people with safety concerns are calling Moses Anders about this.

Potential learning issues: Insect/tick populations and the factors that affect them. Problems posed to humans by insects and ticks. Pest control measures. Unusual insect occurrences in winter. What Moses does at the Extension Service.

2. Decide where the story should be broken up into parts for the students to work on a bit at a time. **Keep the parts short. They will contain much more learning material than you anticipate.** This is called "splitting up the case" for teaching/learning. Of course, if you choose to have a case with only one part this step will be unnecessary.

D. Developing the Rest of the Story: The Case Module

Case modules are problem spaces in which students work

1. In addition to the story (the narrative) the case problem space might include:
    - How you want students to analyze the case
    - Learning objectives
    - Investigations and other activities
    - Resources
    - Data tables, graphs, images that you supply

2. A case-based problem space also needs assessment and implementation plans.
    - Statement about student products –
    - An assessment plan (what you will evaluate and how)
    - An implementation plan (how many days, when, etc.)

See the Investigative Case Based Learning Problem Spaces produced by workshop participants in the LifeLines OnLine, BioQUEST and HHMI workshops for examples samples of the ways cases are linked to activities and assessed. http://bioquest.org/icbl

Note: These suggestions are drawn from work done by the case development group at the 1996 BioQUEST summer workshop,* following a framework commonly used in English writing classes and for developing cases at Harvard Medical School.

*Members of the 1996 BioQUEST case development group included: Melissa Howse, Kay Grimnes, Karen Klyczek, Judith Fischer, Margaret Waterman, Linda Weinland, and Peter Woodruff