

THE CASE STUDY

Sorting Potatoes for Miss Bonner

Bringing Order to Case-Study Methodology through a Classification Scheme

Clyde Freeman Herreid

And out of the ground the Lord God formed every beast of the field and every fowl of the air; and brought them unto Adam to see what he would call them: and whatsoever Adam called every living creature, that was the name thereof.—Genesis 2:19

To classify, order, name, and organize is a very human endeavor. In Genesis, God has Adam doing it right off the bat. The first man gets to name all the cattle, the fowl, and every beast of the field even before he is put into a deep sleep, deribbed, and meets up with Eve. Although I am not attempting so august an enterprise, I would like to take up the challenge to catalog some of the types of case study approaches that have captured my attention.

I had an old Latin teacher in high school who was as fond of a story as she was of Virgil and the *Aeneid*. She was the quintessential Latin teacher, short, slightly rotund, white haired, and with sparkling blue eyes set in a round face. I see her smiling in a spring-flowered print dress. She was unfailingly kind and liberally dispensed "A" grades to lure callow youths into her underenrolled classes. I think I was one of her favorites as I progressed from *amo, amas, amat* to become the Latin Club President whose only known function was to preside over the annual Roman festival of milling students clad in sandals and bed sheets.

Miss Bernice Bonner told a favorite story to successive years of students extending back perhaps to Romulus and Remus themselves. She invariably told it when faced by a hesitant freshman who was conjugating verbs and

groping for the proper ending.

Once there was a man who was hired to sort potatoes into two piles—big potatoes placed in one corner and small potatoes into the other. That was all he had to do. It was a simple task, requiring a couple of hours. His employer left him there in the morning and returned in the afternoon. He was stunned. The pile was untouched. Not a single potato had been sorted. What was wrong? The man was still sitting in front of the pile with a potato in each hand, looking worriedly back and forth, shaking his head muttering to himself, 'Decisions, decisions, decisions.'

Forty-five years has not made the story any funnier, but it was memorable, for I recall it now as I approach the problem of categorizing types of case studies. Much like sorting potatoes, decisions must be made, otherwise we will be left with a heap of indiscriminate spuds.

In 1994, I took a crack at cataloging the types of case study methods in an article published in the *Journal (JCST)* February 1994, pp. 221-229. I mentioned eight techniques where cases could be employed: lectures, discussions, debates, public hearings, trials, problem-based learning, scientific research teams, and team learning. Several years later, I, like a taxonomist exploring the kinds of ants in the jungle, find that I have seriously underestimated the number of extant species and must revise my scheme. Now I am pre-

pared to throw the following methods into the hopper: dialogues, structured controversy, role playing, poster sessions, symposia, and a cluster of other formats. I will explore many of these approaches in the columns to come, but at the moment, I wish to discuss the basis for my classification scheme.

I have four major classification headings: **individual assignment, lecture, discussion, and small-group activities**. These are based upon who will do the case analysis. In all instances, we deal with *stories with a message* (my definition of a case), but the role of the students and instructor will vary as will the case material itself. In one format (individual assignment) the student largely works alone. In another format (lecture) the faculty instructor works alone. In the other two formats there is collaboration in analyzing the case. In discussion the instructor (especially in Socratic questioning) still is the controlling force in the analysis. In small group activities the tables are reversed with the students largely controlling the flow of analysis.

Clyde F. Herreid, editor of JCST's "The Case Study" department, is Distinguished Teaching Professor in the department of biological sciences, State University of New York at Buffalo, Buffalo, NY 14260-1300; e-mail: herreid@acsu.buffalo.edu.

THE CASE STUDY



MCMASTER UNIVERSITY

time. Few faculty have followed Conant's lead.

Yet all teachers tell stories. It is hard to call these off-the-cuff vignettes case studies. Many are brief anecdotes to whet the interest of the audience, but some stories are more elaborate and memorable. My first-year biology instructor at Colorado College, Robert Stabler, a parasitologist, used an entire class period to tell his puzzled students about the life of Moses and the perils of his people: starvation, plagues, and spiritual deprivation. Wondering what this long preamble had to do with biology, we were at last rewarded in the final minutes of class. Stabler spoke of diseases afflicting people of the Middle East, especially the guinea worm, *Dracunculus medinensis*. The female worms, which could reach a meter in length, lived just under the skin releasing eggs out of a small wound when an infected person waded into water. The people still removed these "fiery serpents" from their legs with the same folk remedy used by Moses. They used a forked stick to nip the end of the worm protruding from the skin and slowly rolled the parasite out over several days. Modern medical techniques are not as colorful. More to the point: I never forgot the story of the "fiery serpents."

Zoology professor Richard Eakin of Berkeley went even further. He became known for his dramatic presentations dressed as famous scientists. He lectured as Pasteur, Mendel, and Darwin complete with accent and costume, enchanting students with a glimpse of these scientific giants and their time.

Also fitting into this case lecture category are dialogues and debates. Occasionally, two instructors may work together in front of a class covering a story line with different perspectives and arguments. A single instructor may even do this using an intriguing method called a "Two Hat Debate." Here a teacher will "debate" himself, first giving an argument on one side of

McMaster University in Hamilton, Ontario, is a success story in the use of case studies. Their medical school curricula, which centers around patient cases, has students working in small groups with a faculty tutor to reach a diagnosis.

▲ **Individual Assignment Format.**

There is no need to dwell on this format for we all have experienced it, though we probably have not thought of calling it a case study approach. I argue for its inclusion as many assignments involve students building a story line—anytime a student is asked to write a historical account of events seems to fit. Many term papers, dissertations, theses, book reviews, plays, and written dialogues qualify, even though you may believe I am pushing the envelope

too much. If it is a story with a message it counts.

▲ **Lecture Format.** James Conant, chemist and past president of Harvard University, introduced his lecture version of the case method in the 1940s. His freshman-sophomore course for nonscientists was constructed around long elaborate case histories that illustrated how great discoveries were made. Described in his book, *The Growth of the Experimental Sciences*, he wished students to see science in the historical and human setting of the

THE CASE STUDY

a contentious problem, then arguing the other side. In its most theatrical form, the teacher will literally change hats as he changes perspectives. He might don a beret as he argues the French viewpoint that Dr. Luc Montagnier discovered the HIV virus first. Then he could wear a baseball cap to represent the American viewpoint that Dr. Robert Gallo of the United States was first.

▲ **Discussion Format.** The best known method for conducting a case study is by discussion. This is *the* case method used in both business and law schools. The instructor to varying degrees questions the students about their perspectives on a case. The technique requires great skill to ensure that the students do not simply have a “bull session” and do have a sense of completion once the case is over. (See Welty’s 1989 article in *Change* magazine.)

Most business cases are dilemmas where a decision must be made. These cases require significant time and money to prepare. Harvard University, the University of Virginia, and the University of Western Ontario each have a major collection of business cases that can be purchased by instructors from other universities. The University of Minnesota has a similar arrangement for cases written on the topics of agriculture, food, natural resources, and environmental problems (<http://www.decision.edu/>). The State University of New York at Buffalo has a number of science cases and teaching problems that are free to the public on its case study web site (<http://ublib.buffalo.edu/libraries/projects/cases/case.html>). If case study teaching is to become common in science, it seems clear that we must have a national repository so we each do not have to write all of our own cases.

One of the greatest problems in the use of dilemma cases is that most teachers do not know how to use them. Raised and nurtured via the lecture method in our youth, we are not

Table 1. Case Study Teaching

Teaching Method	Individual Assignment	Lecture	Discussion	Small Group
Thesis	—x—			
Term Paper	—x—			
Directed Case Study	—x—			
Story Telling		—x—		
Theoreticals		—x—		
Socratic Method			—x—	
Symposium			—x—	
Trial			—x—	
Hypotheticals			—x—	
Public Hearing			—x—	
Structured Controversy			—x—	
Debate			—x—	—x—
Role Playing			—x—	—x—
Interrupted Case			—x—	—x—
Journal Article Cases			—x—	—x—
Promo Presentation			—x—	—x—
Poster Presentation				—x—
Team Learning				—x—
Problem-based Learning				—x—
Research Team				—x—
Book/Paper Review	—x—	—x—	—x—	—x—
Dialogue	—x—	—x—	—x—	—x—

usually skilled discussion leaders. In writing science cases we should follow the lead of business cases and provide extensive teaching notes. For an illustration, see Fournier *et al.* on the Tuskegee syphilis experiments (*JCST* March/April 1994, pp. 277-285). This style should become standard practice.

▲ **Small Group Format.** If we are to believe the extensive meta-analysis of over 1,200 studies by the Johnson brothers at the University of Minnesota, the use of cooperative learning strategies in small groups is the best method for learning. This may prove to be true for case study teaching as well. Let us take a look at some of the interesting strategies that have evolved.

In the last issue of the *Journal* (*JCST* November 1997, pp. 121-126), instructors at The College of St. Catherine in St. Paul, Minnesota, wrote about how they set up research teams of students to carry out long-

term projects and had them set up poster sessions to summarize their work. Frank Dinan of Canisius College has used Michaelson’s team learning strategies to teach organic chemistry with great success (*J. Chem. Ed.*, 1995). Permanent groups of students took individual and group tests, solved problems, and analyzed case studies without formal lectures.

Problem-based learning, pioneered by McMaster University Medical School in Hamilton, Ontario, is a spectacular success story in the use of cases. It and a couple of dozen other medical schools have completely revamped their curricula around patient cases. Students working in small groups with a faculty tutor deal with a new case every three class periods. On the first day, they receive a new case, a patient with a set of symptoms, and some clinical test results. (They may actually see the patient in the flesh

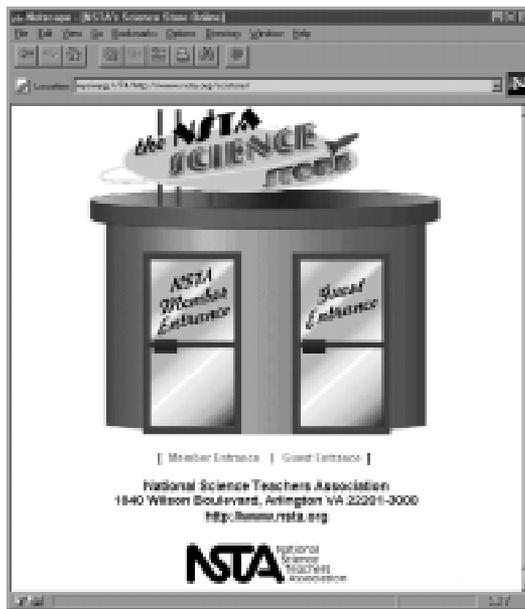
THE CASE STUDY

or on video.) The students with reference books in hand analyze the case. With the help of the tutor, they decide what the issues are and what they need to find out to deal with the patient. They subdivide the workload among themselves then leave class for the libraries and the Internet. When they return to the next class they share the fruits of their labors. Again, they ponder the problem and perhaps receive more clinical information before adjourning for another search through the literature. The following class brings the case to closure as the group pools its knowledge, finishes its diagnoses, and plans its final report. As this class period ends, they are given their next case to begin anew. The University of Delaware (<http://www.udel.edu/pbl/>) has taken this model and applied it to undergraduate courses in physics, chemistry, and biology with great success.

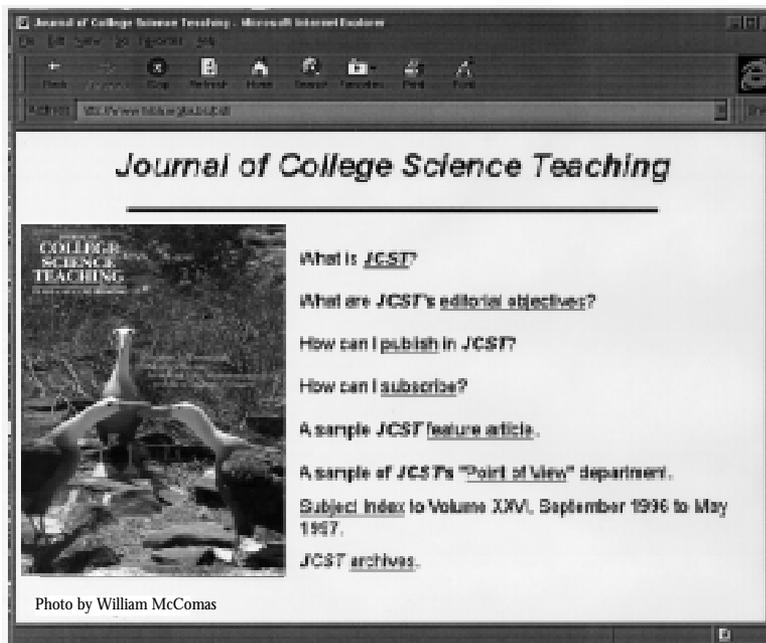
So much for the taxonomy. It is evident that many of the stories (cases) that we might cover in a class may be put into any format—individual assignment, lecture, discussion, or small group. Take the problems of global warming, toxic waste disposal, or species extinction. All would work in any format.

Many of the specific teaching methods can be used in more than one format. For instance, a dialogue might be a written assignment, used as a lecture, discussion, or small group. In contrast, a public hearing or symposium is restricted to the discussion format. The accompanying chart (see Table 1) gives an overview of the case-study landscape. The “Xs” show where the method is most likely to be used. Perhaps you will view the chart as too inclusive. Perhaps you feel that I would classify everything as a case study approach if I could. Perhaps you are right. But at least give me this: I think that Miss Bernice Bonner would approve. There are no more potatoes on the floor. Decisions have been made. ■

The NSTA Science Store Online
is now open for business!



<http://www.nsta.org/scistore>



**Learn more about JCST
by visiting our home page at
www.nsta.org/pubs/jcst/**

JCST's editorial staff invite electronic submission of letters to the editor.

Let us hear from you soon!