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Professor Bean has published numerous articles on writing and writing-across-the-curriculum as well as on literary subjects including Shakespeare and Spenser. In 2001, he was invited to present a keynote workshop at the conference of the European Association of Teachers of Academic Writing at the University of Groningen in The Netherlands. His current research interest is the development of institutional assessment strategies that promote productive faculty conversations about teaching and learning.

WRITING ASSIGNMENTS AS ILL-DEFINED PROBLEMS: Promoting Students' Growth as Critical Thinkers, Communicators, and Practicing Professionals in Agricultural and Food Science

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***Writing and Student Engagement:** . . . The results are stunning. The relationship between the amount of writing for a course and students' level of engagement—whether engagement is measured by time spent on the course, or the intellectual challenge it presents, or students' level of interest in it—is stronger than the relationship between students' engagement and any other course characteristic. . . . (55)*

--from Richard J. Light. (2001). Making the Most of College: Students Speak Their Minds. Harvard U. Press.

SOME GENERAL PRINCIPLES FOR TEACHING ACADEMIC WRITING IN THE DISCIPLINES

1. Take an inventory of course goals.

- subject matter goals--essential concepts and knowledge (conceptual knowledge)
- critical thinking goals—processes of inquiry, research, critical reading, analysis, argument, and general problem-solving in the discipline (procedural knowledge)
- other goals set by the professor

2. Design critical thinking problems that focus on these goals.

- problems should focus on course subject matter and help students learn disciplinary ways of thinking, analyzing, and arguing
- problems should encourage students to question assumptions and to explore alternative ways of thinking and acting
- problems should engage student interest and promote inquiry

3. Develop a repertoire of ways to give critical thinking problems to students

- as thought provokers for exploratory writing (one-page "thinking pieces," in-class freewrites; journal entries; other kinds of informal, non-graded, or low-stakes writing)
- as short formal assignments (often called "microthemes")
- as longer, formal writing assignments
- as tasks for small-group or team problem solving
- as opening questions for a whole-class discussion
- as questions for in-class debates
- as essay exam questions or practice exam questions

4. When assigning formal writing, treat writing as a process

- create a rhetorical context for assignments—audience, purpose, genre
- help students determine what constitutes old and new information for the audience
- help students understand features of genre as well as appropriate style and language level
- emphasize initial problem-posing, exploring of alternative views, reflective research
- encourage imperfect first drafts
- stress substantial revision reflecting increased complexity and elaboration of thought and increased awareness of readers' needs
- where possible, allow rewrites; write comments that encourage revision and that emphasize the higher order concerns of ideas, thought content, organization, and development
- encourage peer reviews, use of writing centers, and other strategies for getting reader feedback on drafts

5. Develop clear scoring criteria and give them to students in advance

- Simple +/check/- scales for exploratory writing
- Grading rubrics such as holistic, analytic, or primary trait scoring guides for formal writing

STAGES OF DEVELOPMENT: NOVICE TO EXPERT WRITING

Stage 1: Nonacademic or pseudo-academic writing

Stage 2: Generalized academic writing concerned with stating claims, offering evidence, respecting others' opinions, and learning how to write with authority.

Stage 3: Novice approximations of particular disciplinary ways of making knowledge.

Stage 4: Expert, insider prose.

Adapted from Susan Peck MacDonald, Professional Writing in the Humanities and Social Sciences. Carbondale, Southern Illinois UP, 1994 (p. 187)

Possible Forms That Expert, Insider Prose Can Take

- **Academic writing in the disciplines** (examples: conference presentations; journal articles; technical reports; scholarly books; professional book reviews)
- **Professional workplace writing** (examples: memoranda; technical documentation; marketing brochures; business plans; white papers; consultant reports; proposals)
- **Disciplinary writing for general or popular audiences** (examples: explanations of disciplinary subjects for lay audiences in the form of pamphlets, brochures, patient instructions; op-ed pieces on a public issue related to one's discipline; disciplinary-based articles in popular magazines; trade books)
- **Literary non-fiction with a disciplinary focus** (examples: personal or expressive writing on disciplinary subjects—focus on discovery process, ethical quandaries, exploration of meaning, value, or significance of disciplinary questions. Professional examples include Loren Eiseley, Annie Dillard; Stephen Gould; Michael Pollan)
- **Professional writing in an electronic context:** (examples: websites on disciplinary topics/issues; hypertext documents; multi-media presentations; postings in newsgroups and chat rooms)

Workshop Task: *What are examples of expert, insider prose in agriculture and food science? What are the typical kinds of writing that students might expect to do as professional? With one or two colleagues sitting close to you, make a list of different kinds of writing typically done in your professions. Particularly, how do audiences vary for professional writing in your fields?*

SOME DEFINITIONS OF CRITICAL THINKING

KURFISS'S DEFINITION OF CRITICAL THINKING

"An investigation whose purpose is to explore a situation, phenomenon, question, or problem to arrive at a hypothesis or conclusion about it that integrates all available information and that can therefore be convincingly justified."

KURFISS'S EXPLANATION OF PROBLEM TYPES

- *Well-structured problem:* A problem with a right answer. Often well-structured problems can be solved algorithmically through calculations using the right formulae. Most quantitative homework sets are based on well-structured problems.
- *Ill-structured problem:* An open-ended question that does not have a clear right answer and therefore must be responded to with a proposition justified by reasons and evidence. Often it is difficult to determine which information is relevant to a solution and which isn't. Ill-structured problems require the highest level of critical thinking. "In critical thinking, all assumptions are open to question, divergent views are aggressively sought, and the inquiry is not biased in favor of a particular outcome" (Kurfiss, p. 2). For Kurfiss, critical thinking involves three elements: (1) An open-ended (ill-defined, ill-structured) problem; (2) a proposed solution; (3) an argument justifying the solution.

[From *Critical Thinking: Theory, Research, Practice, and Possibilities* by Joanne Kurfiss (Gainen), ASHE-ERIC Higher Education Report No. 2. Washington, D.C.: Association for the Study of Higher Education, 1988]

THINKING DISPOSITIONS/ABILITIES (PERKINS, JAY, AND TISHMAN)

1. **Think in a broad, adventurous way**
 - Search for new ideas, take risks, demonstrate intellectual confidence and independence
 - Generate diverse options, create new connections, be imaginative
2. **Sustain intellectual curiosity**
 - Wonder, probe, find problems, explore anomalies
 - Observe closely and pose problems.
3. **Think across multiple contexts and perspectives**
 - Be flexible; search for alternative frameworks, perspectives, views
 - Question assumptions and transfer concepts to new contexts
4. **Build knowledge and understandings**
 - Pursue connections, explanations, implications, consequences
 - Build conceptualizations
5. **Be intellectually careful and clear**
 - Be precise, thorough, alert to possible error or inaccuracy as well as need for focus, clarity
 - Be judicious and avoid hasty, unwarranted conclusions
6. **Seek truth through reasons and evidence**
 - Question the given, demand justification, seek to disconfirm hypotheses
 - Be fair and impartial, open to other viewpoints
7. **Be metacognitive and strategic**
 - Monitor and regulate one's own thinking, setting goals and making plans, alert to lack of direction
 - Apply standards to thinking processes and products.

[From "Assessing Thinking: A Framework for Measuring Critical Thinking and Problem-Solving Skills at the College Level" by David Perkins, Eileen Jay, and Shari Tishman, in *The National Assessment of College Student Learning: Identification of the Skills to be Taught, Learned, and Assessed*, National Center for Education Statistics Research and Development Report, August, 1994 (document #NCES 94-286)]

PAUL AND ELDER'S DESCRIPTION OF A SKILLED CRITICAL THINKER

A well cultivated critical thinker:

- raises vital questions and problems, formulating them clearly and precisely
- gathers and assesses relevant information, using abstract ideas to interpret it effectively
- comes to well-reasoned conclusions and solutions, testing them against relevant criteria and standards
- thinks openmindedly within alternative systems of thought, recognizing and assessing, as need be, their assumptions, implications, and practical consequences; and
- communicates effectively with others in figuring out solutions to complex problems.

Critical thinking is, in short, self-directed, self-disciplined, self-monitored, and self-corrective thinking. It presupposes assent to rigorous standards of excellence and mindful command of their use. It entails effective communication and problem solving abilities and a commitment to overcome our native egocentrism and sociocentrism.

[From A Miniature Guide to Critical Thinking: Concepts and Tools by Richard Paul and Linda Elder, The Foundation for Critical Thinking, California State College at Sonoma: www.criticalthinking.org, 2001]

CHAFFEE'S DEFINITION OF CRITICAL THINKING

Critical thinkers are people who have developed thoughtful and well-founded beliefs that guide their choices in every area of their lives. In order to develop the strongest and most accurate beliefs possible, you need to become aware of your own biases, explore situations from many different perspectives, and develop sound reasons to support your points of view. These abilities are the tools you need to become more enlightened and reflective—a “critical thinker” (p. 28).

For Chaffee, critical thinking involves the following:

- Carefully analyzing and evaluating your beliefs in order to develop the most accurate beliefs possible.
- Viewing situations from different perspectives to develop an in-depth understanding.
- Supporting viewpoints with reasons and evidence to arrive at thoughtful, well-substantiated conclusions.
- Thinking critically about our personal “lenses,” which shape and influence the way we perceive the world.
- Synthesizing information into informed conclusions that we are willing to modify based on new insight. (p. 35)

[from The Thinker's Way by John Chaffee, Boston: Little, Brown, 1998]

CRITICAL THINKING FOR WRITERS: SUBJECT-MATTER PROBLEMS AND RHETORICAL PROBLEMS

For writers, an ill-structured problem mixes subject-matter and rhetorical questions:

SUBJECT-MATTER QUESTIONS	RHETORICAL QUESTIONS
<ul style="list-style-type: none"> • What is the problem that I am addressing? • Why is this problem worth pursuing? What makes it problematic? • What is currently known and unknown about this problematic situation? • What have other researchers/critics said about this problem? • What evidence bears on this problem? How can I gather evidence? • How can I set up an appropriate research study? • What are the assumptions, values, beliefs, or theories that account for my approach to the problem? • What are alternative views? • In light of my research and thinking, what is the best solution to this problem? • What are the consequences of different solutions or courses of action? 	<ul style="list-style-type: none"> • What is my purpose for writing? (To inform? Analyze? Persuade?) • Who is my audience? What is their level of expertise? How much do they already know about the problem I am addressing? Do they already care about it? • How can I tie my writing to the needs and expectations of my audience? • What style and level of language should I use? (Can I say "I"? Short or long paragraphs? Formal or informal style? Technical words or not?) • What are the features and constraints of the genre I am writing in? (technical report, extension service bulletin, op-ed piece for newspaper, business memo, instructions for workers or users of a product) • How should I organize this piece? • How should I design the document (use of headings, white space, manuscript form, etc.)? • Should I incorporate visuals?

STUDENT OUTCOMES FOR THE COLLEGE OF AGRICULTURE, IOWA STATE UNIVERSITY

INTENDED STUDENT OUTCOMES FOR THE GENERAL EDUCATION COMPONENTS OF CURRICULA WITHIN THE COLLEGE OF AGRICULTURE (IOWA STATE UNIVERSITY)

Communications

- Be able to speak and write clearly and persuasively
- Demonstrate the skills necessary to prepare effective visual presentation
- Be able to receive information effectively through reading, listening and observation

Problem-Solving/Critical Thinking

- Be able to work effectively with others on complex, issue-laden problems requiring holistic problem-solving approaches
- Demonstrate an ability to:
 - distinguish verifiable facts from value claims
 - determine the accuracy of statements
 - identify assumptions and detect bias
 - distinguish relevant from irrelevant information
 - prioritize needs
- Be able to summarize, analyze, and interpret simple research data

Ethics

- Develop an ethical perspective and sense of moral responsibility and values
- Be able to discuss contemporary ethical and moral issues in professional and private life
- Be able to critically evaluate their own arguments and those of others

Environmental Awareness

- Understand the physical and biological properties of the environment and how these properties are interlinked within ecological systems
- Understand how human activities, such as modern agricultural practices, impact on the environment and how societies are affected by environmental change

International/Multicultural Awareness

- Have an awareness and understanding of cultural diversity within our own nation and around the world
- Develop a global perspective on agricultural, environmental, economic, and natural resource issues.

[SOURCE: email correspondence with Dr. Tom Polito, Assistant Professor of Agronomy and Director of Student Services for Agriculture, Iowa State University, March 11, 2003]

COMPETENCIES FOR GRADUATES IN HORTICULTURE AT IOWA STATE UNIVERSITY

Graduates possess a broad understanding of horticulture and the underlying plant sciences. They are able to communicate effectively with members of the scientific community, industry groups, and the general public. They are experienced in conducting and writing the results of research. They are capable of addressing and solving complex problems associated with the agricultural and plant science professions. They understand the ethical, legal, social, and environmental issues associated with modern agricultural practices.

[SOURCE: Iowa State University Bulletin]

ASSESSING CRITICAL THINKING: AN ASSESSMENT PROJECT IN FINANCE AT SEATTLE UNIVERSITY

THE ASSESSMENT TASK

Senior finance majors in a capstone course were given a case problem in which they played the role of financial advisor to husband and wife clients faced with an investment dilemma. The retiring couple were considering two choices for investing the wife's lump sum payment (\$155,673.53) from a 401 K plan.

- *Choice A:* Buy an "Immediate Single-Life Annuity" which promises a monthly payment of \$1225.85 for the rest of her life and a lump sum payout to a designated survivor of \$37,000.
- *Choice B:* Invest the lump sum in a growth mutual fund which was yielding 10 percent annual return at the time (the case study was developed in 2000). At 10 percent, the plan would pay the same \$1225.85 but return the original principle at time of the wife's death.

Students were given the following task: *You have crunched the numbers on the two plans, analyzed the results, and begun to formulate some conclusions and advice. Write a 2-3 page memo to David and Marilyn in which you analyze the benefits and risks of each plan and offer advice on how they can make a decision. Explain to David and Marilyn the different methods of analysis you used, why you used them, and what useful information each method revealed. Attach to your memo any visuals or graphics that would be useful to them in comparing the two plans. Note that David and Marilyn are well-educated college graduates but they have no background in finance.*

THE METHOD

Members of the finance faculty met for an all-day meeting to create a primary trait scoring rubric for the assignment and staff-grade the memos. Following the grading, the department held a detailed discussion of their findings.

THE FINDINGS

- Approximately half of the students scored in a range which the faculty consider cause for concern while even top-half students showed considerable critical thinking weaknesses
- Almost all students used tools and methodologies covered in the finance curriculum (NPV analysis, calculating an IRR, etc.) but many students used them randomly, often applying them to extraneous data, and revealing no purpose or goal in the calculation
- Many students failed to address the client's problem and provide the requested financial counsel
- Many student were unable to translate finance concepts/methods into lay language
- Generally students failed to construct rhetorically useful graphics

FEEDBACK LOOP TO IMPROVE CURRICULUM AND INSTRUCTION

- Finance faculty realized that instructors of 300-level finance courses preceding the capstone course assigned primarily algorithmic homework sets based on formulas and quantitative story problems (well-structured problems)
- Faculty are developing methods to place more ill-structured problems into these earlier courses through writing assignments or small group activities requiring group speakers to present extended arguments in support of solutions.
- Overall goal is more balanced attention to mastery of algorithmic tools and "big-picture" use of tool

COMMON PRINCIPLES OF DISCIPLINARY COURSES THAT TEACH CRITICAL THINKING

1. Critical thinking is a learnable skill; the instructor and peers are resources in developing critical thinking skills.
2. Problem, questions, or issues are the point of entry into the subject and a source of motivation for sustained inquiry.
3. Successful courses balance challenges to think critically with support tailored to students' developmental needs.
4. Courses are assignment centered rather than text and lecture centered. Goals, methods, and evaluation emphasize using content rather than simply acquiring it.
5. Students are required to formulate and justify their ideas in writing or other appropriate modes.
6. Students collaborate to learn and to stretch their thinking, for example, in pair problem solving and small group work.
7. Several courses, particularly those that teach problem-solving skills, nurture students' metacognitive abilities.
8. The developmental needs of students are acknowledged and used as information in the design of the course. Teachers in these courses make standards explicit and then help students learn how to achieve them.

Summary:

"In each case [of well-regarded critical thinking courses in the disciplines], the professor establishes an agenda that includes learning to think about subject matter. Students are active, involved, consulting and arguing with each other, and responsible for their own learning."

[SOURCE: Kurfiss, J. (1988). *Critical thinking: theory, research, practice, and possibilities*. ASHE-ERIC Higher Education Report No. 2. Washington, D.C.: Association for the Study of Higher Education, pp. 88-89]

DESIGNING HOMEWORK TO GUIDE STUDENTS' STUDYING AND THINKING PROCESSES

Imagine that you are a student in an agricultural economics course. In this particular course unit you are learning about futures markets. Part of your homework for this unit is the following writing assignment:

Assignment for Agricultural Economics 183, University of Missouri (Professor Bruce Bullock)

You are a new employee in the purchasing department of Acme Flour Milling Company. Acme has never used the futures market to remove price uncertainty from the purchase of wheat that will be used to make flour for delivery on a contract at some future date. However, the boss knows that you are an "expert" on the use of the futures market and has given you the following assignment.

Acme is preparing to bid on a large Defense Department contract to deliver flour in January [year]. Prepare a report for the boss that:

1. Explains how Acme can use the futures market to (a) determine a bid sale price for flour for the proposed contract and (b) hedge the purchase of wheat to be milled into flour if the contract is received.
2. Compares the advantages (and/or disadvantages) of hedging the purchase of wheat with the alternative of waiting and purchasing the wheat in the cash market at the end of December [year].

Your future with Acme depends on the quality of this report (i.e., how effective you are at answering the questions asked by the boss and how effective you are at communicating your answer to the boss). The boss expects to receive a professional report that helps her understand how Acme can benefit from using the futures market in normal business operations. The boss does not expect to receive a sloppy "rough draft" that will be returned to the employee for corrections and improvements. Prepare your paper with that in mind.

WORKSHOP DISCUSSION TASK:

Background: *In the above assignment, students are asked to write a report explaining market hedging to a hypothetical boss who doesn't understand the concept. Suppose that instead of a writing assignment, the instructor gave a set of quantitative homework problems such as the following story problem:*

Holly Kombs, a speculator, expects the spot price of wheat to decline in the near future. Thus, she purchases a call option on interest wheat futures with an exercise price of 92-10. The premium on the call option is 2-24. Just before the expiration date, the price of a wheat futures contract is 97-14. At this time, Kombs decides to exercise the option and closes out the position by selling an identical futures contract. What is Kombs' net gain or loss from this strategy?

Task: *What do you hypothesize will be the differences in students' studying/thinking processes when given the writing assignment versus the quantitative homework set? What are the strengths and weaknesses of each kind of homework assignment?*

EXAMPLE WRITING ASSIGNMENTS FOR DISCUSSION

1. Another Assignment from Agricultural Economics 183, University of Missouri (Professor Bruce Bullock)

The operation of a market generates a market clearing price (P) and quantity (Q) in each time period of operation. Let V represent the value to buyers (consumers) of the Q units of consumption and let C represent the cost of producing Q units of the product.

QUESTION: What will be the relationship between (relative values) of P , V , and C ?

TASK: Write a short essay explaining to your journalism friend which one of the following statements will always describe the relationships generated by the operation of the market and why each of the other relationships will never be true.

1. P is greater than V , which is greater than or equal to C
2. V is greater than or equal to P , which is greater than, less than, or equal to C
3. P is greater than V , which is less than or equal to C

Keep in mind that your journalism friend has no understanding of economics, so you will need to begin at ground zero to help her understand your explanation. Use graphs to explain your point if you wish. However be sure to title and label your graph properly.

2. Biology 108, University of Missouri (Professor Miriam Golomb)

Should the FDA require the labeling of genetically modified foods? You are to write two short essays in the form of letters to the New England Journal of Medicine (exact format doesn't matter, but you should assume your audience is scientifically literate and socially aware). A. Write the first letter from the point of view of a consumer advocate who *favors* the labeling of genetically modified foods. B. Write the second from the point of view of a Monsanto researcher who *opposes* labeling. In each case, put forward the strongest and most convincing arguments to support your point of view. It will help to do some research: a brief Web search will turn up all kinds of useful debates.

3. Nutritional Science 334, University of Missouri (Professor Ruth MacDonald)

Dietary lipid intake has been associated with risk of cardiovascular disease and several types of cancer in human populations. Most current dietary recommendations focus on total fat intake and the relative ratio of saturated and unsaturated fatty acids. Recently, however, experimental evidence seems to suggest that *specific fatty acids* in the diet have effects on metabolism that might influence disease risk.

For this paper, you are to identify one fatty acid that has been found to influence disease risk (could be CVD, cancer or something else.) Research the biochemical role of this fatty acid, and the theoretical mechanism through which it influences disease risk. To do this properly, you must read and cite basic research papers in peer reviewed journals, not lay publications. Cite at least 5 papers. I want to know the scientific data that provides evidence for the relationship you have found. The experimental studies you cite may be from work done in animals, cultured cells or humans, but should not be based solely on human (i.e., epidemiological) data.

4. Assignment #1 from Plant Microbiology and Pathology 305, University of Missouri (Professor Jim Schoelz)

Journal Article Critique: Choose one of the articles provided by the instructor and analyze its content by answering the following questions in a 2-3 page paper.

- (1) Why did the authors do this study?
- (2) How is the article structured?
- (3) What methods did they use to investigate this subject?
- (4) List each experiment and explain how it helps them to answer their questions.
- (5) In your opinion, have they proven their point?
- (6) What are the implications for future research and/or for society?

5. Assignment #2 from same Plant Microbiology and Pathology Course

Memo to boss: Your supervisor has recently learned of a pathogen called (fill in the pathogen of your choice) that affects (fill in the crop of your choice). To learn more about this pathogen, your boss has asked you to write a short report in which you are to consider the following questions:

- (1) How widespread is this pathogen?
- (2) How can you recognize its signs and symptoms?
- (3) How does the pathogen initially infect its hosts?
- (4) Where does the inoculum come from?
- (5) Does it pose a threat to your company?
- (6) What is your recommendation for countering this problem?

6. Assignment #5 from the same course

Opinion on fungicides: Write a paper arguing for or against the following thesis: "Pesticides are an absolute necessity for modern agriculture."

7. Invertebrate Zoology 230, University of Missouri (Professor Gerald Summers)

The following graph is from a study of the spider, *Dolomedes triton*.

Write a paper (no more than 2 pages) in which you address each of the following points:

- What specific question is addressed by this figure?
- Why would anyone be interested in this question?
- What do you know about how this study was done?
- What do you not know about how this study was done?
- What is the most important result shown in this illustration?

WORKSHOP DISCUSSION TASK

Peruse these preceding assignments from the University of Missouri. Then, turning to colleagues sitting close to you, share insights, ideas, questions, or problems arising from your discussion of these assignments. Particularly, raise one or two questions that you hope will be addressed during the two days of this conference.

DESIGNING SHORT WRITING/THINKING TASKS: TEN EASY-TO-USE STRATEGIES

1. Think of tasks that would let students link concepts in your course to their personal experiences.

Example: In your own words, explain why a learned behavior is less resistant to extinction if it is reinforced regularly rather than only occasionally. Illustrate your explanation with an example from your own life.

2. Ask students to teach difficult concepts in your course to a new learner.

Example: Explain to your kid brother the difference between "reliability" and "validity" in the construction of an assessment instrument. Invent your own examples.

3. Think of controversial theses in your field (for thesis-support assignments or believing/doubting exercises).

Example: "The overriding religious view expressed in *Hamlet* is an existential atheism similar to Sartre's." In your argument summarize fairly and respond reasonably to opposing views.

4. Think of problems, puzzles, or questions you could ask students to address (old essay exam questions are often excellent here).

Example: You are an accountant in the tax department of Kubiak, Kartcher, and Elway, CPAs. Last Saturday morning you were in Winchell's Donuts, as is your norm. Just as you finish reading *Doonesbury* and start on your second apple fritter, a gentleman sits down beside you. He introduces himself as Fred O. McDonald, a farmer from up in the valley. He says he recognizes you as "that CPA who frequents the donut shop." Fred has a problem and asks tax advice from you. Here is Fred's problem:

Last Tuesday farmer McDonald planned to remove stumps from a pasture. So, he drove out to the pasture, lit a stick of dynamite and tossed it near the base of a stump. Fred's playful dog Boomer saw his master throw the "stick" and scampered to fetch it. Boomer picked up the stick. Fred yelled at the dog. Boomer, thinking he was going to be punished, ran under Fred's pickup truck. Boomer dropped the dynamite stick. The dog escaped harm just as the truck was totally destroyed by the blast. Fred wonders if he can deduct the loss of the truck for tax purposes.

Write a letter to Fred O. McDonald to answer his question.

5. Think of ways to give students raw data (such as lists, graphs, tables, etc.) and ask them to write an argument or analysis based on the data.

Example: To what extent do the attached economic data support the hypothesis "Social service spending is inversely related to economic growth"? First create a scattergram as a visual test of the hypothesis. Then create a verbal argument analyzing whether the data support the hypothesis.

6. Think of opening "frame sentences" for the start of a paragraph or short essay; students have to complete the paragraph by fleshing out the organizational structure predicted by the frame.

Example: To solve the problem of homelessness in America, we must realize that not all homeless fit into the same category. In fact, we ought to specify X categories of homeless people. First [develop with details]. . . . Second [develop with details]. . . . Third [?] Fourth [?]

7. Think of ways to ask students to role-play unfamiliar points of view (imagine X from the perspective of Y) or to encounter "what if" situations.

Example: Assume that Nike has invented a space suit that will let you run and throw freely enough to play baseball on the moon. Lay out the dimensions for a baseball park on the moon and justify your park design by explaining how the reduced gravity and the lack of atmosphere will affect the pitching, batting, base-running, and fielding.

8. Select several important articles in your field, put them on reserve in the library, and ask student to write 100-word or 250-word summaries or abstracts of them. (Or ask students to write a summary of one of your lectures.)

Example: Write a 250-word summary of the attached article from *Scientific American*. Your summary should make the main ideas of this article clear to someone who hasn't read it.

9. Think of a controversy in your field and ask students to write a dialogue between characters with different points of view.

Example: "In order to reduce the illegitimacy rate in the United States, the federal government should enact Charles Murray's proposal that welfare payments to single mothers be eliminated." Write a mini-play in which two or more characters of your choice disagree about the above proposal. Make their arguments reflective and rational.

10. Create cases that place students in a realistic situation relevant to your discipline where they must reach a decision to resolve a conflict.

Example: Based on the attached case, explain what course of action you would take and justify your decision with a reasoned argument.