

Designing Workshops à la Don Finkel

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The Evergreen State College

What is a "Workshop à la Don Finkel"?

In its outward appearance, it is a class activity that resembles many other kinds of workshops: students divide up into small groups and work on tasks prescribed for them by their instructor(s). At the heart of this approach, however, lies a conception that is both distinctive and challenging. This kind of workshop may be thought of as an alternative to a lecture, an alternative in which the students are required to do the intellectual work that normally would be performed by the lecturer. The process of designing such workshops may be characterized as "turning the products of knowledge [that you are trying to teach] back into the processes that led to them." The workshop designers must find ways to lead the students to construct the knowledge they would have them understand. The designers must devise "conceptual activities" for students-- individual and group activities that provoke the students to alter their conceptual structures.

The process of designing such activities is intellectually challenging. It usually requires a re-thinking of one's own subject matter (from a learner's point of view). In the final analysis designing these workshops is an art form; no simple techniques will guarantee results, yet there are both principles and guidelines on which you may rely, and you can learn from examples, from critique, and most importantly, from trial and error (i.e., watching the results of an attempt and revising accordingly.)

In this institute you will get a chance to try your hand at designing such a workshop on a topic of your own interest, to try it out on colleagues, and to revise it based on the results you observe. Each workshop will be designed by a team of two: one person knowledgeable in the subject matter and one "naive but intelligent" partner. Each participant should have one finished workshop to use in his or her teaching during 1996-97.

Though it is possible to design workshops in literature, the process is more amenable to subject matter that has a conceptual structure. It is NOT an approach suited to the transmission of information, the training of skills, the teaching of foreign languages, or for teaching in studio or performance arts.

Schedule of Activities in Brief

Monday

9:00-10:00: Introduction

10:00-12:00: Puzzling Scenes

LUNCH

1:00-4:00: Conceptual Analysis

Evening Assignment

Tuesday

9:00-9:30: Conceptual Goals

9:30-10-15: Describing Student Conceptions - I

10:30-12:00: Writing and Posing Structural Questions - I

LUNCH

1:00-1:30: Describing Student Conceptions - II

1:30-2:30: Writing Structural Questions - II

2:45-4:00: Formulating your Conceptual Goal

Evening Assignment

Wednesday

9:00-10:30: Pushing Students into Disequilibrium

10:30-12:00: Fieldwork

LUNCH

1:00-4:00: Writing your Worksheet

Evening Assignment

Thursday

9:00-12:00: Worksheet Tryouts

LUNCH

1:00-2:30: Revising your Worksheet

2:45-4:00: Final Discussion

MONDAY (9-9-96)

- I. 9:00 - 9:30: GROUP INTRODUCTIONS (30 minutes)
- II. 9:30 - 10:00: INTRODUCTION TO INSTITUTE (30 mins.)
- III. 10:00 - 10:30: PUZZLING SCENES - The Canary Problem (30 mins.)

Introduction: One of the most effective ways for teachers to increase their students' intellectual engagement is first to convert the products of their field into intellectual processes for students and then to induce their students to go through these processes by setting *problems* for them. These problems should first draw the students in at their present level of understanding and then, by progressive questioning, throw this understanding into a state of disequilibrium, a state which, when resolved, leads to new, deeper understanding. The Canary Problem is meant to be an example of such a problem.¹

Divide into groups of four or five and work on the following questions together. Try to agree on an answer to each. Appoint one person to record the group's answers, so that they can be reported back to the entire group for a general discussion. Appoint another person to keep track of the time, so that you move through all five questions in the allotted 30 minutes.

1. (10 mins.) A canary is standing on the bottom of a very large sealed bottle that is placed on a scale. The bird takes off and flies around the inside of the bottle. What happens to the reading on the scale? Explain.
2. (5 mins.) A goldfish is lying on the bottom of a large goldfish bowl filled with water that is placed on a scale. The fish takes off and swims around the inside of the bowl. What happens to the reading on the scale? Explain.
3. (5 mins.) A man is standing on a scale. He then gets off the scale, places a large spring on the scale, and stands on top of the spring. What happens to the reading on the scale? Explain.

¹ The Canary Problem below is an adaptation of a question raised in *Conceptual Blockbusting*, by James L. Adams, W.W. Norton & Co., New York, 1979.

4. (5 mins.) Suppose the man above replaces the spring on the scale by an "air spring." This is a cylinder with a piston that slides down into it. There is a column of air trapped in the cylinder, and the man stands on a platform mounted atop the piston. Compare the scale readings when the man is on the air spring as opposed to when he is directly on the scale.

Explain.

5. (5 mins.) In the canary problem in 1., suppose the bottle is replaced by a glass cage, which is mostly glass, but has very thin spaces between the glass bars. What happens? Suppose it is replaced by an ordinary wire cage? Suppose the bird is hovering over the scale and is not enclosed at all? What if the bird simply flies over the scale? Discuss.

10:30 - 10:45: BREAK (15 mins.)

IV. 10:45 - 11:15: DISCUSSION OF CANARY PROBLEM (30 mins.)

1. (10 mins.) Discussing the answers.
2. (20 mins.) Discussing the experience.

V. 11:15 - 12:00: YOUR OWN PUZZLING SCENES (45 mins.)

1. (30 mins) Individual Writing

In the next few days you will be writing a worksheet that should generate the kind of puzzlement, sharing of views, and refinement of ideas that I hope you have just experienced or witnessed in the Canary Problem.

Think back to your teaching in your own field. Select a topic on which you wish to write a workshop during this institute. If you have trouble selecting a topic right now, then just proceed to the writing exercise ahead. With any luck it will lead you to your topic.

Within the subject matter area you have selected, or if you haven't selected one, then in general: can you identify "puzzling situations," or "confusing concepts," or "paradoxes" that usually generate energy, frustration, or perplexity in your students? Such situations, here called "puzzling scenes" for short, are often the best places to start from in thinking about writing a worksheet. The puzzlement, confusion, and perplexity are signs that the students are already engaged in trying to understand, that the mental processes have already begun, but that the

students need some guidance in enabling those processes to lead to an adequate understanding of the concept in question.

Describe in writing a few of these "puzzling scenes." For each of them, describe in some detail the concept or problem involved and then tell what it is about the way students see things--the way they approach or conceive of the subject matter when they come to it--that leads to their being confused, puzzled, bothered, or energized by the situation. Then put yourself in the student's place and write out the questions that puzzle you (as a student) in these scenes. What are the questions you would like to have answered to cut through the confusion?

At the end of the 30 minutes of individual writing, select a topic on which to write your worksheet (during the institute), if you have not already done so. Write it down.

2. (15 mins.) Explaining your Puzzling Scenes

Choose a partner to work with. This partner should be someone whose main field is from a DIVISION different from your own. This person will be your partner for all "partner activities" during the institute, and will assist you in writing your worksheet.

In the time remaining, explain the puzzling scenes you wrote about to your partner (using your writing as notes, not as something to read aloud). Answer his or her questions about the scenes, and try to get the source of the students' perplexity across. Use half the time for each person's puzzling scenes.

12:00 - 1:00: LUNCH (1 hr.)

VI. 1:00 - 2:00: CONCEPTUAL ANALYSIS - Baseball/Family/Money (1 hr.)

The goal of this exercise is to practice analyzing concepts. You will begin with a fairly general subject, pull out its main concepts, describe how they are related to one another, and explain how they are central to the subject. Afterwards, you will be doing this same kind of conceptual analysis in your own subject.

Decide whether you wish to analyze the game of Baseball, the concept of the Family in modern society, or the concept of Money. Form small groups based on your selection. Locate the appropriate section below, based on your choice of topic, and proceed. As before, select a scribe to record your results, and someone else to keep an eye on the time.

CONCEPTUAL ANALYSIS OF BASEBALL

Alphonso, an exchange student from Moravia, is living with you for six months. He has become fascinated with trying to understand the game of baseball. The three main sports in Moravia are soccer, tennis, and tag (which is played in a series of intricate versions). You and Alphonso have watched baseball games together on TV, but he consistently misunderstands the game, because he relates everything to the three sports he knows. So you undertake a more systematic approach to teaching Alphonso about the game of baseball.

As you begin the instructional sessions, you decide to think through how to do it. Before getting caught up in the rules, strategies, or subtleties of the game, it is a good idea to get clear on a few central concepts around which Alphonso can build his understanding of the game. These concepts will form the core of your teaching; they are the objects you set your sights on.

Describe a network of concepts that are central to an understanding of baseball. This network should consist of a small number of interconnected concepts (4-8) and should provide an underlying framework for understanding. However, don't spend time deciding which concept is THE most important one. On the other hand, you should be able to tell how the concepts are related. As you think of the concepts, you might think of critical moments in the game that are described in terms of them. Each person should write down the set of concepts your group formulates as central to an understanding of baseball.

CONCEPTUAL ANALYSIS OF "THE FAMILY"

You are a member of a planning team for an interdisciplinary course on the Family, to be taught to college freshmen. Among the other team members are a sociologist, a psychologist, an economist, a historian, and an anthropologist. You all agree that the students will have a strong notion of what a family is, based on their own experience of growing up in one, and on images of the family depicted in the mass media (especially television programs). You agree that you want to considerably widen your students' views, but that you want to do it in such a way that they will be able to rethink their own childhood family experiences (and their TV watching) from these wider perspectives.

Describe a network of concepts that is central to a wider understanding of the family. This network should consist of a small number of interconnected concepts (4-8) which help explain the many functions performed by the family in all societies. However, don't spend time deciding which concept is THE most important one. On the other hand, you should be able to tell how

the concepts are related, and give some examples of key aspects of family life that are explained by them. Each person should write down the set of concepts your group formulates as central to an understanding of the family.

CONCEPTUAL ANALYSIS OF MONEY

Imagine that you are planning a course for sixth grade students in which the concept of money is to be studied. The students are likely to see money as the same thing as cash, and are unlikely to see the many functions performed by money in a complex society such as ours, or even a relatively primitive society. You want to give them a much wider, more integrated view of what money is and the purposes it serves.

Describe a network of concepts that is central to a wider understanding of money. These need not be (in fact, should not be) the concepts that economists would use. They should be the concepts that help you as an adult understand the concept of money better than the typical sixth grade student. This network should consist of a small number (4-8) of interconnected concepts which help explain the various forms money can take and how it works in an economy. However, do not try to decide which concept is THE most central one. On the other hand, you should be able to tell how the concepts are related and give some examples of key aspects of money that are explained by them. Each person should write down the set of concepts your group formulates as central to an understanding of money.

VII. 2:00 - 2:30: DISCUSSION OF CONCEPTUAL ANALYSIS (30 mins.)

2:30 - 2:45: BREAK (15 mins.)

VIII. 2:45 - 3:45: YOUR OWN CONCEPTUAL ANALYSIS (1 hr.)

You will be writing alone, but you should be sitting near your partner.

1. (30 mins.) You have taken the first step in preparing to write your own worksheet in the writing you did on "Puzzling Scenes." The next step is to analyze the concepts that lie behind those puzzling scenes in the same way that you analyzed baseball, the family, or money. Read back over the writing you did on "puzzling scenes" and select a central concept, or several, that underlie those scenes, that help make sense of them. Writing on your own, break down the central concept into a network of a small number of interrelated concepts ("sub-concepts"), ones that are crucial for student understanding in the area. These sub-concepts should be simpler than, or at the same level as, the central concept--not more comprehensive and

abstract than it.

2. (20 mins.) At the end of a half hour of writing, get together with your partner and share your conceptual analysis, explaining it to his or her understanding as far as you can. Spend about 10 minutes on each person's conceptual analysis.

3. (10 mins.) In the time remaining, writing alone again, further revise your conceptual analysis, or make notes you can draw on tonight for the further revision and elaboration of your network of central concepts.

IX. 3:45 - 4:00: DAY'S ENDING (15 mins.)

1. Questions, comments, discussion on the day.
2. Discussion of Evening's Assignment.

MONDAY EVENING ASSIGNMENT

1. Revise and further develop in writing your conceptual analysis of the subject matter about which you will be designing a workshop.
2. Read chapters 1 - 4 in *Contexts for Learning*. (If you don't have enough time for all four assignments, then you should skip this reading, in favor of the other three assignments.)
3. Go back to the two worksheets you studied from the WORKSHEET SAMPLER. Read them over again. Extract and formulate in writing the CONCEPTUAL GOAL of each. Do more than two if you feel like it. We will discuss these formulations in class tomorrow morning.
4. Read and digest the handout on STRUCTURAL QUESTIONS which you will be drawing on for Tuesday's work.

TUESDAY (9-10-96)

- I. 9:00 - 9:30: DISCUSSION OF ASSIGNMENT ON CONCEPTUAL GOALS
(30 mins.)
- II. 9:30 - 9:45: INTRODUCTION TO STUDENT CONCEPTIONS
(15 mins.)
- III. 9:45 - 10:15: DESCRIBING STUDENT CONCEPTIONS -
Baseball/Family/Money (30 mins.)

Later on you will be putting to your non-expert colleagues questions about your central concept(s). You will find in most cases that while they can give you answers to your questions, they cannot actually explain to you what they understand, or how their understanding differs from the way you, the expert, see things. Your job will then be to study their answers, trying to figure out how they really understand the concepts. This will require that you guess backwards from the text of their answers to their underlying beliefs. This "deciphering of text" is somewhat similar to what U.S. State Department employees used to do with Soviet newspapers; they studied the texts of articles in order to reconstruct the latest opinions of the Kremlin leaders. The exercises below will give you practice both in deciphering text and in writing the kind of questions that *elicit* text--i.e., Structural Questions (see separate handout).

Return to the small group in which you discussed baseball, the family, or money, yesterday. Find the appropriate section below and proceed.

DESCRIBING STUDENT CONCEPTIONS IN BASEBALL

The following are comments made by Alphonso, the exchange student from Moravia, while watching his first baseball game.

- a. I can tell that the man with the bat is trying to score a goal by hitting the ball into the scoring area -- which is between the two yellow posts and into the seats where the audience sits. The other team tries to get the ball to the opposite end of the field by throwing rather than hitting, but I still don't see where the scoring area for them is.
- b. What is the point of all this running that the batting team does? They stay on and leave the field at the most peculiar times. They seem to be trying to get possession of the ball from the other team, but they don't always seem to have a bat to hit it with. They always run towards the ball; they always seem to know where the thrower is going to pass it off, even before he throws it, but they never seem to take it away. And they never run towards the pitcher, even

through the ball always ends up being thrown to him.

- c. The throwing team runs around a little, but not much. Some are bunched and others are spread out. Why don't they cover the field more evenly?
- d. Some of the time everybody is in such a hurry to throw the ball or run, and other times they are so casual in both throwing the ball and strolling around the field.
- e. What is the pitcher doing for so long each time before he throws the ball? Is he calculating strategy, trying to reach a decision, or what? Can he throw the ball anytime he wants?
- f. Why is there no public clock to indicate when periods are over? How do they know when to switch without having a whistle or anything? And how long are the periods anyway?

In these comments there is implicit a naive view of baseball, a way of looking at the events on the field that only an "outsider" would have. As you work over the text, you may find that the views expressed seem disconnected, illogical, perhaps simply wrong. However, make the hypothesis that, from the point of view of the person speaking, the ideas reflect a positive way of seeing things, a relatively coherent point of view. Your job is to uncover and describe that point of view. Try to formulate the set of beliefs that makes the ideas expressed sensible, and write them down. These beliefs or ideas represent the "student conceptions" of the person speaking, the person's current level of understanding of baseball, before you, his teacher, get to do anything.

DESCRIBING STUDENT CONCEPTIONS OF THE FAMILY

These are the views of "the family" as given by a 17-year old high school senior.

- a. Your family's job is to take care of you until you're old enough to make it on your own. Sometimes, though, parents try to hold onto their children too long. They should let them go--when the children are ready. Otherwise children end up by resenting their family.
- b. When I meet the right person, I want to get married, because I think it would be wonderful to spend the rest of my life with the person I love. I want to have children, too. I'm not going to make the same mistakes my parents did. I'm going to make my home a fantastic place for my children to grow up in.

- c. A family should be the place you can always go to when you're in trouble or need help, no matter how old you are. You don't need to spend that much time with your family (once you're not a kid anymore), but it's important to know it's always there if you need it.
- d. Parents shouldn't try to impose their values on their kids. Times change too fast, and what was right for them growing up doesn't always work in today's world. Let the kids work it out for themselves. Families would be so much happier if parents didn't try to define and enforce right and wrong for their kids.
- e. There is so much divorce these days, I think it's really tragic. The government is making a big mistake by letting people get divorced so easily. People should work their problems out instead of splitting up.

In these comments there is implicit a naive view of the family, a way of looking at the events of family life that probably only a teenager would have. As you work over the text, you may find that the views expressed seem disconnected, illogical, perhaps simply wrong. However, make the hypothesis that, from the point of view of the person speaking, the ideas reflect a positive way of seeing things, a relatively coherent point of view. Your job is to uncover and describe that point of view. Try to formulate the set of beliefs that makes the ideas expressed sensible, and write them down. These beliefs or ideas represent the "student conceptions" of the person speaking, the person's current level of understanding of the family, before you, his teacher, get to do anything.

DESCRIBING STUDENT CONCEPTIONS OF MONEY

These are the views of an 11 year-old boy about money, given in response to questions.

- a. Coins and dollar bills are money, but so are checks. You can write checks and use them just like dollar bills.
- b. Credit cards aren't money, because you don't give them to the store owner for keeps when you buy something. But they are *like* money, because they let you buy things. You have to pay later and then you use a check, which *is* money. You have to pay more if you're late with your check, because it's a punishment.
- c. Bank cards are kinda like credit cards. They aren't money, but you can get money with them--out of bank machines. The money you get out of the machine is your

money, because it comes from the money you put in the bank.

- d. Jewels and gold aren't money. They are things you buy with money.
- e. The government makes the money. It doesn't cost very much to make. Why don't they just make more money and give it to the poor people?
- f. When you trade, it's like using money, but not quite the same. I could trade a baseball card and get more back from Bobby than I could get from Tim--because Bobby wants the card more. But a dollar is always worth a dollar and everyone knows it.
- g. We couldn't use baseball cards as money--instead of coins and dollar bills, because some people wouldn't want to trade their cards, and then they wouldn't be able to buy anything!

In these comments there is implicit a naive view of money, a way of looking at the events surrounding monetary exchange and the physical properties of money that probably only a child would have. As you work over the text, you may find that the views expressed seem disconnected, illogical, perhaps simply wrong. However, make the hypothesis that, from the point of view of the person speaking, the ideas reflect a positive way of seeing things, a relatively coherent point of view. Your job is to uncover and describe that point of view. Try to formulate the set of beliefs that makes the ideas expressed sensible, and write them down. These beliefs or ideas represent the "student conceptions" of the person speaking, the person's current level of understanding of money, before you, his teacher, get to do anything.

10:15 - 10:30: BREAK (15 mins.)

IV. 10:30 - 11:15: WRITING STRUCTURAL QUESTIONS -
Baseball/Family/Money (45 mins.)

Now that you have some notion of the actual conceptual system (the student conceptions) on baseball, the family, or money, of the person whose text you studied, the next job is to get a clearer view of those conceptions by eliciting more text. To elicit such text, you will need to write some Structural Questions about the phenomenon. You want to write questions that will summon forth the student's conceptions more decisively, so that you can see and understand them more clearly. In most

cases, you will find that the confusions are rooted in such problems as: mistakenly fused concepts (i.e., concepts not yet differentiated), concepts that are artificially held apart (i.e., distinctions not yet made), and concepts that are too rigidly applied.

By using the handout on STRUCTURAL QUESTIONS as your guide, and by studying the student conceptions you wrote down for Part III above, (still working as a group) write several structural questions (about baseball, the family, or money) that you could usefully put to the person whose views you have studied in III in order to get a fuller and clearer picture of those views.

V. 11:15 - 11:30: POSING STRUCTURAL QUESTIONS (15 mins.)

As a means of testing both the Structural Questions you wrote and your understanding of the text you studied, choose one of your members to role-play the author of the text (Alphonso, the 17 year-old teenager, or the 11 year-old child). Then try out your Structural Questions on this naive person, one question at a time. Push it as far as you can into a full role-play to get a sense of the power and coherence of the naive views held by this person, as well as to see how the questions would be responded to.

VI. 11:30 - 12:00: DISCUSSION (30 mins.)

12:00 - 1:00: LUNCH (1 hr.)

VII. 1:00 - 1:30: DESCRIBING STUDENT CONCEPTIONS IN YOUR OWN SUBJECT (30 mins.)

Write alone, but sit near your partner.

Drawing on your experience with former students in your field, describe in writing the "average" students' conceptions which underlie their understanding of the topic about which you have performed conceptual analysis and described puzzling scenes, i.e., the topic on which you will be designing your workshop. These are the conceptions your students bring with them before you ever get to teach them anything about this area. In addition, try to compose some hypothetical text that might be elicited by your average student in response to questions about the topic. If you get stuck, write down questions you might pose to students in order to elicit such text, and thereby uncover their conceptions. (Refer again to the STRUCTURAL QUESTIONS handout for guidance.)

VIII. 1:30 - 2:30: WRITING STRUCTURAL QUESTIONS IN YOUR OWN SUBJECT (1 hr.)

1. Working as a pair, spend the first half-hour on one person's workshop topic, and then the next half-hour on the other's.

(a) The expert should describe and explain the student conceptions of the subject that he or she has formulated in VII above.

(b) Together, the partners should formulate structural questions which you can use to elicit text from students (your institute colleagues, in this case) so that you will be able to describe their conceptions of your workshop topic. Tomorrow you will be putting these questions to them as a way to get started designing your workshop.

(c) After a half-hour, you should switch roles, and repeat steps (a) and (b) above on the other partner's topic.

2:30 - 2:45: BREAK (15 mins.)

IX. 2:45 - 3:00: FORMULATING YOUR CONCEPTUAL GOAL (15 mins.)

The work you have done so far in recalling puzzling scenes, analyzing concepts, and describing student conceptions should have helped orient you toward what you want to accomplish in your workshop. Now you will pull that work together by *selecting and formulating a conceptual goal* for your workshop. Assume your workshop will take three hours of class time. By reflecting on where your students are in their thinking at the start, and by reflecting on the direction in which you want their thinking to move, you should be able to formulate a realistic conceptual goal. Focus on a part of the network of sub-concepts you described in your conceptual analysis, preferably an area that is likely to generate the greatest puzzlement or energy in your students, and from that part of your network, formulate a realistic conceptual goal for your three-hour workshop. Write it down in one or two clear sentences.

X. 3:00 - 3:45: DISCUSSION OF CONCEPTUAL GOALS (45 mins.)

XI. 3:45 - 4:00: DAY'S ENDING (15 mins.)

1. Questions, comments, discussion on the day.
2. Discussion of Evening's Assignment.

TUESDAY EVENING ASSIGNMENT

1. Revise your conceptual goal for your workshop, if needed.
2. Revise and further develop your Structural Questions on your topic. You will be posing these to your colleagues tomorrow as a kind of informal "fieldwork." Bring in a tape recorder for your fieldwork, if you want to record the answers to your questions. If not, be prepared to take good notes.
3. Bring in or arrange to borrow a lap-top computer, if you want to use one for writing your worksheet tomorrow afternoon.
4. Finish reading *Contexts for Learning*. (If you don't have enough time for all the assignments, then you should skip this reading, in favor of the other assignments.)

WEDNESDAY (9-11-96)

I. 9:00 - 10:30: PUSHING STUDENTS INTO DISEQUILIBRIUM
(90 mins.)

This exercise is designed to give you some practice with Steps IV and V of STEPS TO DEVELOPING A WORKSHEET.

Divide into groups of 4 or 5.

Re-read Steps IV and V of STEPS TO DEVELOPING A WORKSHEET.

Introduction: You will be working together writing a worksheet designed for students in a program called "The Individual and Society." The worksheet focuses on the concepts "Nature" and "Culture." Your students tend to think of Nature as the expression of everything inside them, and Culture as everything that is artificial and imposed from the outside. Many of them feel that they, as opposed to their parents, lead lives that are quite "natural," and that with just a bit more effort they could reduce the "cultural" proportion to a minimum. The object of this worksheet is to break down this rather simple-minded dichotomy--to get the students to realize that almost all of their life is influenced by culture, and that, in turn, their culture is influenced by nature.

The worksheet you are designing will have three sections. The first section has been started in the material below. Your work will be to complete the first section, to begin the second, and to decide on a focus for the third section.

CAUTION: Do not get started actually working on this worksheet on Nature and Culture. Your task is to continue designing it as teachers, not to work on it as students.

1. (30 mins.) Section 1 of the worksheet on Nature and Culture begins with Question (a) below. The goal of Section 1 is to get the students to reflect on their own lives and to see how little of it could be classified as purely "natural." Question (a) starts them on this process. *Agree together on a series of questions to follow Question (a) in order to complete Section 1 of the worksheet.* Your questions should build organically out of Question (a) and focus on the goal of Section 1. Try to write three to five questions that would take students from 30 to 60 minutes to complete.

(a) *Consider a cat, or some other animal you have been around. My cat spends his days sleeping, eating, killing things, rubbing up against me and getting petted, fighting, mating, and playing. All of these are instinctive, biologically gratifying activities,*

pleasures in themselves (I assume). The only things he has been trained to do (things he does for the sake of something besides the impulses of his body and its urges) are: he meows to be fed, he relieves himself outside the house instead of inside, and he avoids walking on the table.

Individually, start at midnight yesterday, or some typical day, and run through your activities consecutively. Make a list of everything you do which is instinctively, biologically gratifying, in the way my cat's activities are. Include anything that feels as though you do it in the way a cat eats or purrs--some moments eating might count, for instance, and some might not.

How much time out of the 24 hours do these natural activities of yours take up?

Compare your estimates (but not the specifics of your activities) within your small group.

2. (20 mins.) The goal of Section 2 of the worksheet is given below, but only the goal. Your task is to decide on a Concrete Context and an initial question or two about that context that will make a good beginning for Section 2. Your task is not to sketch out the whole section, but to work just on the opening: the Concrete Context and the initial questions that will start pushing the students into disequilibrium (as the question about the cat presumably did for Section 1).

Goal of Section 2: Section 2 of the worksheet focuses on the active suppression of the "natural" in our lives. Its goal is to help students see that not only is the natural ruled out of our lives in advance, but that when it threatens to intrude by accident, we take steps, either individually or collectively, to keep it out. A system of social and psychological controls operates to regulate and channel biological instinct and impulses.

3. (20 mins.) Your final task is to decide what Section 3 should be about. Go back and review the goal for the whole worksheet, the subsidiary goals of Sections 1 and 2, and read over the questions you have produced thus far for the worksheet. Section 3 should be a natural continuation and conclusion following Sections 1 and 2, and should help the students pull together the set of ideas from the whole workshop on Nature and Culture. Your task is to agree on the goal of Section 3. Write a paragraph expressing that goal, analogous to the paragraph above on the goal of Section 2. (If you have time left over, you can start to sketch a concrete context and some questions for

Section 3.)

4. (20 mins.) Whole group discussion of this exercise.

NO OFFICIAL BREAK THIS MORNING; FIELDWORK WILL NATURALLY PROVIDE FOR INFORMAL BREAKS.

II. 10:30 - 12:00: FIELDWORK (90 mins.)

Use the next 90 mins. to mingle amongst the group and interview as many people as you comfortably can in the time provided in order to elicit responses (text) from them pertinent to their conceptions of the ideas central to your workshop topic. Use the structural questions that you formulated yesterday and last night. Follow up on these questions in ways that will help you better understand the conceptions that lie behind the responses of the person you are interviewing. Record the responses on tape or paper so you can examine them carefully later. Be sure to divide your time equally between interviewer and interviewee.

12:00 - 1:00: LUNCH (1 hr.)

III. 1:00 - 3:30: WRITING YOUR OWN WORKSHEET (2 1/4 hrs.)

There are two ways to go about the task of writing your own worksheet this afternoon. You and your partner should decide which mode you prefer. Either (a) work side by side, sitting near each other, each working on his or her own worksheet, but feeling free to interrupt the other to get help when stuck, or (b) divide the time in half and work as a team designing each worksheet as a fully collaborative project.

Whichever mode you choose, you should start the process with the following step: Lay out before you the previous work you have done to get ready: (1) your puzzling scenes, (2) your conceptual analysis, (3) your estimate of student conceptions, (4) the text you elicited this morning from your colleagues, and (5) your conceptual goal. Spend some time thinking about the text you elicited this morning, then consider your conceptual goal in the light of all the other material, and revise it if necessary. Then start writing the workshop with your conceptual goal as your focus. Use the handouts STEPS TO WRITING A WORKSHOP and STRUCTURAL QUESTIONS as guides, if necessary. Get as far as you can by 3:30. You are unlikely to finish. You will have tonight to finish your worksheet.

Take a BREAK from 2:30 to 2:45. (15 mins.)

IV. 3:30 - 4:00: DAY'S ENDING (30 mins.)

Questions, comments, discussion on the day; evening's assignment.

WEDNESDAY EVENING ASSIGNMENT

Complete your worksheet.

Make sure all necessary instructions and explanations are explicitly written out on the worksheet. The workshop "tryouts" tomorrow will require that the worksheet authors remain silent and observe only. Make sure your worksheet does all the "talking" for you. You will not be able to supplement your worksheet with any speech of your own.

Come to class with 16 copies of your worksheet. Make sure your name is on the worksheet. Include as well the program you intend to use it in, and a statement of the conceptual goal. It would also be nice if it had a title.

THURSDAY (9-12-96)

I. 9:00 - 11:30: WORKSHEET TRYOUTS (2 1/2 hrs.)

Unfortunately we will not have time for everyone to try out his or her worksheet; there will be time for 9 tryouts and each partnership will try out at least one worksheet. Form three small groups, making sure that partners are in the same group (i.e., two groups of four, and one of six). You will stay in these groups for the whole morning.

Each group will have time for 3 tryouts, but there will be time for only the first 2 of these to be discussed afterwards *within the small group*. Decide in advance which worksheets will be tried out and in what order. Make sure that each partnership tries out at least one worksheet.

The author of the worksheet is to be an observer. He or she should sit outside of the circle, observe carefully, and take notes, while the others proceed with the workshop. For this part of the exercise THE AUTHOR IS ABSOLUTELY FORBIDDEN TO SPEAK EXCEPT TO ANSWER PURELY PROCEDURAL QUESTIONS. The group will have only 30 minutes to work. Don't expect to finish the worksheet; simply do the first half-hour's work on it.

For the following 25 minutes, the author should rejoin the circle for a discussion of what he or she observed, and what the participants experienced doing the workshop.

The last 5 minutes will provide a brief break before the next tryout. The author and her partner should use this time, however, to take some notes (each individually) toward revising the worksheet.

Here is the overall schedule:

- 9:00 - 9:30: Tryout #1
- 9:30 - 9:55: Discuss the experience of the worksheet within your small group.
- 9:55 - 10:00: Worksheet author and his or her partner take notes; SHORT BREAK for others.
- 10:00 - 10:30: Tryout #2
- 10:30 - 10:55: Discussion of Tryout #2 in small group
- 10:55 - 11:00: Author and partner take notes; SHORT BREAK for others.
- 11:00 - 11:30: Tryout #3

II. 11:30 - 12:00: DISCUSSION OF RESULTS (including Tryout #3) (30 mins.)

12:00 - 1:00: LUNCH (1 hr.)

III. 1:00 - 2:30: REVISING YOUR WORKSHEETS (90 mins.)

Partners work together.

1. If both of your worksheets received a tryout, spend 45 minutes working together to revise and extend each worksheet.
2. If only one worksheet received a tryout, spend the first hour working together to revise and extend that worksheet. Spend the remaining half-hour discussing and making notes toward a revision and extension of the other worksheet.

2:30 - 2:45: BREAK (15 mins.)

IV. 2:45 - 3:30: FINAL DISCUSSION

Final questions, guidance for future, using workshops within a program, closure on workshops and worksheets.

V. 3:30 - 4:00: EVALUATION OF INSTITUTE

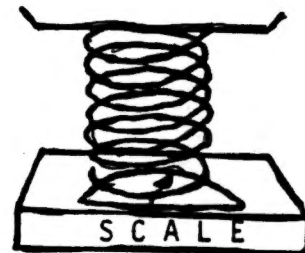
MONDAY (9-9-96)

- I. 9:00 - 9:30: GROUP INTRODUCTIONS (30 minutes)
- II. 9:30 - 10:00: INTRODUCTION TO INSTITUTE (30 mins.)
- III. 10:00 - 10:30: PUZZLING SCENES - The Canary Problem (30 mins.)

Introduction: One of the most effective ways for teachers to increase their students' intellectual engagement is first to convert the products of their field into intellectual processes for students and then to induce their students to go through these processes by setting *problems* for them. These problems should first draw the students in at their present level of understanding and then, by progressive questioning, throw this understanding into a state of disequilibrium, a state which, when resolved, leads to new, deeper understanding. The Canary Problem is meant to be an example of such a problem.¹

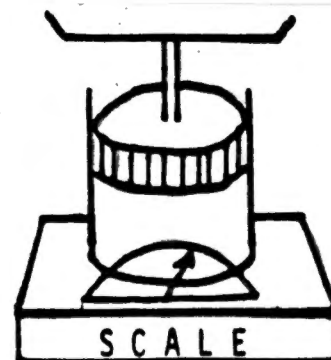
Divide into groups of four or five and work on the following questions together. Try to agree on an answer to each. Appoint one person to record the group's answers, so that they can be reported back to the entire group for a general discussion. Appoint another person to keep track of the time, so that you move through all five questions in the allotted 30 minutes.

1. (10 mins.) A canary is standing on the bottom of a very large sealed bottle that is placed on a scale. The bird takes off and flies around the inside of the bottle. What happens to the reading on the scale? Explain.
2. (5 mins.) A goldfish is lying on the bottom of a large goldfish bowl filled with water that is placed on a scale. The fish takes off and swims around the inside of the bowl. What happens to the reading on the scale? Explain.
3. (5 mins.) A man is standing on a scale. He then gets off the scale, places a large spring on the scale, and stands on top of the spring. What happens to the reading on the scale? Explain.



¹ The Canary Problem below is an adaptation of a question raised in *Conceptual Blockbusting*, by James L. Adams, W.W. Norton & Co., New York, 1979.

4. (5 mins.) Suppose the man above replaces the spring on the scale by an "air spring." This is a cylinder with a piston that slides down into it. There is a column of air trapped in the cylinder, and the man stands on a platform mounted atop the piston. Compare the scale readings when the man is on the air spring as opposed to when he is directly on the scale. Explain.



5. (5 mins.) In the canary problem in 1., suppose the bottle is replaced by a glass cage, which is mostly glass, but has very thin spaces between the glass bars. What happens? Suppose it is replaced by an ordinary wire cage? Suppose the bird is hovering over the scale and is not enclosed at all? What if the bird simply flies over the scale? Discuss.

10:30 - 10:45: BREAK (15 mins.)

IV. 10:45 - 11:15: DISCUSSION OF CANARY PROBLEM (30 mins.)

1. (10 mins.) Discussing the answers.
2. (20 mins.) Discussing the experience.

V. 11:15 - 12:00: YOUR OWN PUZZLING SCENES (45 mins.)

1. (30 mins) Individual Writing

In the next few days you will be writing a worksheet that should generate the kind of puzzlement, sharing of views, and refinement of ideas that I hope you have just experienced or witnessed in the Canary Problem.

Think back to your teaching in your own field. Select a topic on which you wish to write a workshop during this institute. If you have trouble selecting a topic right now, then just proceed to the writing exercise ahead. With any luck it will lead you to your topic.

Within the subject matter area you have selected, or if you haven't selected one, then in general: can you identify "puzzling situations," or "confusing concepts," or "paradoxes" that usually generate energy, frustration, or perplexity in your students? Such situations, here called "puzzling scenes" for short, are often the best places to start from in thinking about writing a worksheet. The puzzlement, confusion, and perplexity are signs that the students are already engaged in trying to understand, that the mental processes have already begun, but that the