

The Evergreen Summer Institute for College Teachers

June 25 - 29, 1984

DESIGNING CONCEPTUAL ACTIVITIES

Daily Schedule

8:00 - 11:30 AM	Morning Session
11:30 - 1:30 PM	Lunch Break
1:30 - 3:00 PM	Afternoon Session
3:00 - 3:15	Break
3:15 - 4:30 PM	Seminar

Meeting Room: SEMINAR BUILDING - Room 3151

Evening Assignments

Sunday evening - Read "The Design of Intellectual Experience."

Monday evening - Read "A Worksheet Sampler" to see the range and diversity of worksheets, as well as the underlying commonalities.

Tuesday evening - Read Contexts for Learning, Chapters 1,2,3,4.

Wednesday evening - Study "Text" (on tape) -- see page 10.

Read Contexts for Learning, Chapters 5,6.

Thursday evening - Complete or revise your own Worksheet.

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Schedule

	<u>Time</u>	<u>Activity</u>	<u>Page</u>
Monday	8:00	INTRODUCTION	
	9:00	LECTURE	
	9:30	BREAK	
	10:00	A. The Canary Problem	1
	11:00	B. Puzzling Scenes	2
	11:30	LUNCH BREAK	
	1:30	B. Puzzling Scenes, continued	2
	1:50	C. Conceptual Analysis in a Neutral Subject	3
	3:00	BREAK	
	3:15	SEMINAR	
Tuesday	8:00	D. Conceptual Analysis in Your Own Subject	3
	9:00	PIAGET FILM - "Checking Up"	
	10:00	BREAK	
	10:30	E. Deciphering and Eliciting Text in a Neutral Subject	5
	11:30	LUNCH BREAK	
	1:30	E. Deciphering and Eliciting, continued	5
	2:00	F. Selecting Your Conceptual Goal	7
	3:00	BREAK	
	3:15	SEMINAR	

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Schedule

	<u>Time</u>	<u>Activity</u>	<u>Page</u>
Wednesday	8:00	G. Writing Structural Questions on Your Concepts	7
	9:30	BREAK	
	10:00	H. Pushing Students into Disequilibrium	7
	11:30	LUNCH BREAK	
	1:30	I. Fieldwork on Your Concepts	9
	3:00	BREAK	
	3:15	SEMINAR	
Thursday	8:00	K. Writing Your Own Worksheet	11
	9:30	BREAK	
	10:00	K. Writing Your Own Worksheet, continued	11
	11:30	LUNCH BREAK	
	1:30	L. Trying Out a Worksheet	11
	3:00	BREAK	
	3:15	SEMINAR	
Friday	8:00	L. Trying Out a Worksheet, continued	11
	9:00	BREAK	
	9:30	FITTING WORKSHEETS INTO A COURSE	
	11:00	EVALUATION OF INSTITUTE	
	11:30	LUNCH BREAK	
	1:30	CONCLUSION	
	3:00	End	

The Evergreen Summer Institute  
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ROADMAP FOR WORKSHOP -- KEYED TO "STEPS TO DEVELOPING A WORKSHEET"

NEUTRAL SUBJECTS

OWN CONCEPTS

I. PUZZLING SCENES

Canary Problem (A)

Reflect on your own teaching. (B)

II. ANALYZE CONCEPTS

Task in baseball,  
family, and money (C)

Select and break down own  
Concept from B above. (D, F)

III. STUDENT CONCEPTIONS

Text in baseball,  
family, and money  
(E, Part I)

Do Fieldwork and think about  
your colleagues' conceptions. (I, J)

IV. STRUCTURAL QUESTIONS

Writing Structural  
Questions about  
baseball, family,  
money (E, Parts II-III)

Write Structural Questions on  
your own Concept(s). (G)

AND

Section 1 of Nature/  
Culture (H)

V./VI. PLOT OUTLINE/WRITE WORKSHEET

Sections 2 and 3 of  
Nature/Culture (H)

Write Worksheet draft for  
colleagues. (K)

Try it out. (L)

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DESIGNING CONCEPTUAL ACTIVITIES

**A. The Canary Problem (60 minutes)**

We have found that one of the most effective ways for teachers to increase student involvement is first to convert the products of their disciplines into processes for students and then to induce their students to go through these processes by setting problems for them. These are problems that 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.

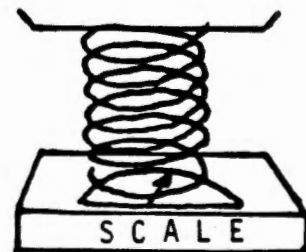
1. Divide into groups of four and work at the following questions together. Appoint a scribe to record your group answers, so that they can be reported back to the entire group for a general discussion. (30 minutes)

a. 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 of the scale? Explain.

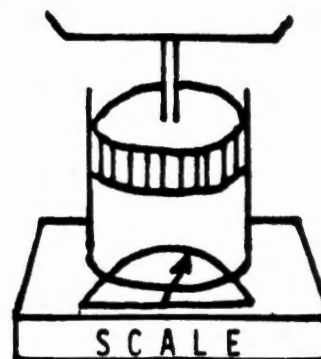
b. A goldfish is lying on the bottom of a large goldfish bowl filled with water that is placed on a scale. The fish takes off and swims around the inside of the bowl. What happens to the reading on the scale? Explain. How does this situation differ, if at all, from the situation in a.?

c. 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 of the scale? Explain. How does this situation differ from the preceding two?

d. Suppose the man in c. 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. How does this situation differ from the preceding ones?



e. In the canary problem in a., 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.

[The above problem is an adaptation of a question raised in Conceptual Blockbusting, by James L. Adams, W. W. Norton & Co., New York, 1979.]

2. The entire group reconvenes to share answers and reach some consensus on them. (10 minutes)
3. Group discussion of the experience. (20 minutes)

#### B. Puzzling Scenes (50 minutes)

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

Think back on your teaching of your own discipline. Can you think of "puzzling situations," or "confusing concepts," or "paradoxes" that usually generate energy, frustration, or bafflement in your class? Such situations, which we call "Puzzling Scenes," are often the best places to start from in thinking about writing a worksheet. The puzzlement, confusion, and bafflement 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 a 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?*

*Spend about 30 minutes writing. There will be time at the end of the exercise for you to share some of it with your colleagues.*

#### **C. Conceptual Analysis in a Neutral Subject (60 minutes)**

The goal of this exercise is to practice analysing concepts. Thus, 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. You will be doing this later with concepts in your own subject. The three subjects are: baseball, the family, and money.

*There is a section in Appendix 1, "Baseball, Family, and Money," on each of these subjects. First read the "Task" in each of these sections and decide as a group which subject you wish to work on. Then follow the instructions in that Task.*

#### **D. Conceptual Analysis in Your Own Subject. (60 minutes)**

1. Set aside baseball, the family, or money for a while and go back to your own discipline.

You have taken the first step in preparing to write a worksheet in your own discipline in the writing you did on "Puzzling Scenes." The next step, which you will now undertake, is to analyze the concepts that lie behind those Puzzling Scenes as you analyzed baseball, the family, or money. Later on, you will share this work with a few colleagues.

~~QUESTIONS ON COLD WAR~~ QUESTIONS ON COLD WAR

1. If the earth were invaded by Martians, and the US and USSR became allies against the invaders, could they still be engaged in a cold war with each other?

2. Suppose that the US and USSR agreed to total disarmament, and carried it out? Would that end the cold war? Are there other ways they could continue the war?

3. How can one country win a cold war? How could it lose one? If there are no meaningful ways to win or lose a cold war, then in what way is it a war?

4. Would the cold war still continue if:

(a) All the allies of the US and USSR abandoned them and declared themselves neutral.

(b) All the neutral and developing countries became totally allied with either one side or the other.

(c) Every country in the world was an ally of one side and the other side had no allies.

If the cold war could continue under any of these conditions, how would it change?

5. Could the USSR and China, both Communist countries, yet countries with a long history of distrust and enmity, as well as border disputes, have a cold war with each other? Are they presently having a cold war with each other?

6. Could the competition between Democrats and Republicans in the US be called a cold war in any meaningful sense? Why or why not? How about between men and women? How about the US and Cuba?

7. Can two individuals have a cold war with each other; say in a marriage?



DISEQUILIBRATING QUESTIONS ON MONEY

The following questions would be suitable for a group of Junior High School students in a class in which the general concept of money was being discussed.

a. There are poor and starving people in our country today. Why doesn't the government just give them money to help them out? If the government doesn't have enough money, why doesn't it just print up some more?.

b. Joe owes Charlie \$100, but is very short of cash. Joe offers to pay his debt by giving Charlie 20 of his best and latest records, and Charlie accepts. Does this mean that records are the same as money...in this case?

c. Imagine that you work in a grocery store and, instead of paying you in cash, or by paycheck, they pay you in groceries. Is this just as good as being paid in cash? What if they gave you lots of pieces of paper that allowed you to get things from lots of other stores; would this be as good as money?

d. In the 16th Century the main form of money in Spain was gold. During that period Spanish explorers plundered South America and sent back tons of gold, which made Spain a very rich country. Suppose that in 1990 an American space ship landed on a distant planet and sent back tons of the money of this planet. Would this make America very rich? What if the money of this strange planet exactly resembled our money?

e. In England in the 17th Century the only money used was gold. So gold was money. But then as now, gold was used for jewelry. How can you decide when gold is money and when it is jewelry? Or is jewelry the same as money in such a situation?

f. Are the following money?

- Savings account passbook
- Endorsed paycheck
- A check made out to you and signed by me
- Postage stamps
- Canadian money
- Gold bullion
- Platinum bars

g. Suppose you and one hundred other people founded a colony on a newly discovered island off the Washington State coast. Would you need to have some sort of money? Why or why not? If you wanted to have money, what would you use as currency? Could you use pine cones, or land, or animal skins?

*Read back over the writing you did on "Puzzling Scenes," and select a Central Concept (or several) that underlie these 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, ones that are crucial for student understanding in the area. These concepts should be simpler or at the same level as the Central Concept, not more comprehensive and abstract than it.*

(30 minutes)

2. Share the results of your writing with other members of the group.

(30 minutes)

**E. Deciphering and Eliciting Text in a Neutral Subject (90 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 concept. This will require that you guess backwards from the text of their answers to their underlying beliefs. We call this activity "Deciphering Text," and think of it as similar to what employees of the U.S. State Department do with Soviet newspapers; they study the texts of articles in order to reconstruct the latest opinions of the Kremlin leaders. The purpose of this exercise is to give you practice at both Deciphering Text and writing the kinds of questions that elicit text -- what we call "Structural Questions."

In this exercise you will get practice at Deciphering and Eliciting Text in the same subject you worked on in "Conceptual Analysis in a Neutral Subject," yesterday, i.e. baseball, the family, and money. Unless you experienced some particular aversion to yesterday's subject, you should now form a group with the same people you worked on "Conceptual Analysis" with.

Part I. Deciphering Text (30 minutes)

In the "Text" of the section you worked on yesterday on baseball, family, or money there is a naive view of that subject, a way of looking at things that only an outsider would have. As you work over the Text you will probably find that the views expressed seem disconnected, illogical, perhaps simply wrong. However, we make the hypothesis that from the point of view of the person speaking, the ideas are quite logical and coherent.

*Your job is to uncover and describe this point of view. That is, you need to describe a system of beliefs that makes the ideas expressed sensible. We call such a system of beliefs "STUDENT CONCEPTIONS." As you study the text, write down what you take to be the Student Conceptions behind it.*

Part II. Writing Structural Questions (30 minutes)

Now that you have clearer statements of the actual Conceptual System, on baseball, family, or money, of the person whose views you studied, your next job is to pose the kinds of questions that would elicit text like the material you started with. You want to write questions that will summon forth Student Conceptions more decisively, so that you can see and understand them more clearly. In almost all cases, you will find that the confusions are rooted in such problems as: mistakenly fused concepts, concepts that are artificially held apart, and concepts that are too rigidly applied. Appendix 3, "Structural Questions" is a guide to asking questions that get at these problems, and therefore, diagnosing Student Conceptions.

*By reading Appendix 3 and studying the Student Conceptions you wrote down in Part I, write several Structural Questions that will help you get a clearer view of the naive beliefs you saw in your text.*

Part III. Eliciting and Deciphering Text (30 minutes)

*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. 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.*

F. Selecting Your Conceptual Goal (60 minutes)

1. The work you have done thus far toward writing your own worksheet is contained in the first two steps as outlined in Appendix 2, STEPS TO DEVELOPING A WORKSHEET. Spend the next 30 minutes writing individually in order to complete the second step called "Analyze and Focus Your Central Concept" by selecting a conceptual goal. That is, you should focus down on a part of the network of subconcepts that could be worked on by your students in one or a few class sessions. It would be best if this is the part of the network that seems to give rise to the greatest puzzlement within your students, since that is the place where you are most likely to change their understanding. (30 minutes)

2. Discussion of Conceptual Goals (30 minutes)

G. Writing Structural Questions on your Concepts (90 minutes)

In this exercise you will write the Structural Questions that will be used to Elicit Text from students (your colleagues, in this case) on your own Central Concept(s). Thus, you will be starting on Step III ("Describe Student Conceptions") of Appendix 2, STEPS TO DEVELOPING A WORKSHEET. Your questions should be of the same kind as the questions you devised on baseball, the family, or money, and you will probably once again want to use Appendix 3, STRUCTURAL QUESTIONS, to get some ideas on how to write them. In an exercise to come, you will be using these questions to Elicit Text from your colleagues, in order to understand more clearly their underlying "Student" Conceptions of your Central Concept(s).

Although writing Structural Questions is essentially individual work, we propose that you team up with a partner to do this work. After writing individually for about 30 minutes, you and your partner should share your work, helping one another refine it, and then go back to individual work.

H. Pushing Students into Disequilibrium (90 minutes)

This exercise is designed to give you some practice with Steps IV and V of Appendix 2, "Steps to Developing a Worksheet."

Divide into groups of 4.

Read Steps IV and V of "Steps to Developing a Worksheet."

You will be working together writing a Worksheet designed for students in a course called "The Individual and Society." The Worksheet focuses on the concepts Nature and Culture. Students tend to think of "Nature" as being the expression of everything inside them, and "Culture" as being everything that is artificial and imposed from the outside. Many students 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 the worksheet is to break down this rather simple-minded dichotomy -- to show that almost all of one's life is influenced by culture, and, in turn, our culture is influenced by our nature.

*The Worksheet will have three sections. We have started the first two, and, in the material below, ask you to complete them. You will then be asked to decide on a focus for the third section.*

*<CAUTION: Don't get started actually working on this Worksheet on Nature and Culture -- engaging as it may be. Your task is to extend it.>*

#### Section 1

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." Section 1 starts as follows:

a) Consider a cat, or some other animal you have been around. My cat spends his day sleeping, eating, killing things, rubbing up against me and getting petted, fighting, mating, and playing. All of these are instinctively, biologically gratifying activities, pleasures in themselves (I assume). The only things he has been trained to do, and does for the sake of something besides the impulses of his body and its urges are meow to be fed, not to walk on the table, and relieve himself outside instead of in the house.

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

How much time out of the twenty-four hours do these times involve?

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

*1. Agree together on a series of questions to follow question a) above to complete Section 1 of the Worksheet you are writing. Your questions should build organically out of question a) and focus on the goal of Section 1 as formulated above. Try to write three to five questions that would take the students about 30 to 60 minutes to complete. (30 minutes)*

## Section 2.

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 actively keep it out. A system of social and psychological controls operates to regulate and channel biological instinct and impulses.

*Work together as a group to decide on a Concrete Context and an initial question or two about that context that will make a good starting point for this section. This time 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 the process of disequilibrium.*  
(20 minutes)

## Section 3

*3. Your final step is to decide what Section 3 should be about. Go back and review the goal for the whole Worksheet, the subsidiary goals for 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 Worksheet. The main task here is to agree as a group on the focus and goals of Section 3. If you have time, you can start to sketch a context and some questions.*

(20 minutes)

4. The whole group meets together to share and discuss selected answers to the above three questions. (20 minutes)

### I. Fieldwork on Your Concepts. (90 minutes)

*Spend the next 90 minutes pairing up with various people (other than your partner) outside your discipline and interviewing them by means of the Structural Questions you just wrote. Use these questions informally, following them up with probes and qualifying questions in order to grasp as fully as you can how your "future students" initially understand the subject matter you will be teaching. Take turns, so that each person gets a chance to try out her questions. Try not to spend too much time with one person, so that you can get some diversity of views. Take careful notes on your "students'" responses, or use a tape recorder, so that you will have a text to analyze in order to describe your Students' Conceptions. The description of your Students' Conceptions will be an starting point of the Worksheet you will write and try out tomorrow.*

*As you put your questions to your colleagues, be careful not to try to teach them. Your role in this exercise is very much like that of an anthropologist doing fieldwork. You want to find out what the "natives" think, without trying to change their views.*

J. Assignment IV

In preparation for the Worksheet you will write tomorrow, you will need to do two things this evening. First, you should review the Text you elicited in "Fieldwork" today and write down a clear description of the Student Conceptions your worksheet will be directed at changing. Second, you should read Chapters V and VI of Contexts for Learning.



**K. WRITING YOUR OWN WORKSHEET** (3 hours)

Your next task is to write out a Worksheet -- in the next exercise you will get an opportunity to try it out on your colleagues. Although this is individual work, you should do it seated near your partner, working with him or her in the same alternating pattern of writing and sharing that you followed in "Writing Structural Questions" yesterday.

The instructions for this exercise are to go as far as you can in Steps IV, V, and VI of Appendix 2, "*Steps to Developing a Worksheet.*" If you find that you don't have enough time to write out a full worksheet, make you sure you get enough of one written out, so that your colleagues will have something to really engage with, and you can get a sense of how well your ideas worked.

**L. TRYING OUT A WORKSHEET** (2½ hours)

Form into groups of three or four to try out your worksheets. In most cases, it is best not to have people in the same discipline in the same group. Also, in order to get new energy and new perspectives, people who have worked as partners should try to be in different groups.

Round 1. (1 hour)

One person in the group should volunteer to try out her worksheet on the others.

The author of the worksheet is to be an observer. She should pull her chair to the outside of the circle, observe carefully and take notes, while the others proceed with the worksheet. (Thus it would be best to select a worksheet that requires predominantly group discussion as opposed to individual writing.) For this part of the exercise **THE AUTHOR IS ABSOLUTELY FORBIDDEN TO SPEAK EXCEPT TO ANSWER PURELY PROCEDURAL QUESTIONS.** The group should spend about 30 minutes working the worksheet--don't necessarily try to finish it.

After the group has worked on the worksheet, the author should rejoin the circle for a discussion of what she observed, and what the participants experienced in doing the worksheet. This discussion should run for the remainder of the hour devoted

to Round 1.

General Discussion (30 minutes)

The small groups will join together for a general discussion of principles of Worksheet design based on what they have observed or experienced in the Worksheet Tryout. This discussion should inform the completing or revising of worksheets to be done this evening.

Round 2 (1 hour)

Another person in the small group (from yesterday's Worksheet Tryout) should volunteer to try out his worksheet. Following the instructions from Round 1, repeat the cycle of worksheet tryout and discussion.

**Tasks and Texts: Baseball, Family, and Money**

**Baseball**

**TASK**

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 variations). 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 on 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.*

(TEXT on next page)

TEXT

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 though 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?

## Family

### TASK

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.*

### TEXT

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 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 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.

## Money

### TASK

Imagine that you are planning a course for Junior High School 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 Junior High School 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 explain by them.*

### TEXT

The following are paraphrases of statements made by a twelve-year old child about money.

a. We can't use cans of mushroom soup for money, because not everyone likes mushroom soup, and so you would always have to bargain with it .... so that would be trading, and it wouldn't be buying. A dollar bill is worth a dollar, and everyone always knows it.

b. If an Indian tribe traded, and they wanted to have money instead, then they would have to have a government that made money. Then their money could be almost anything they wanted.

c. If they WANTED to have money, then the Indians in the Pacific Northwest couldn't use pine cones, because there are too many pine cones. The Indians in the desert could use pine cones, because there are not too many pine cones in the desert. But then maybe in some tribes you could use skins for money, if not that many Indians in the tribe hunted.

d. When the Indians used rabbit skins to get other things, it

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wasn't money, because rabbit skins could be used to keep them warm, and you would want them more in the winter than the summer. They couldn't make wagon wheels into money either. We can't use our money for anything.



## STEPS TO DEVELOPING A WORKSHEET

Like any creative process, writing a worksheet can be done intuitively and can be done in a variety of ways. Moreover, the process can be entered from a number of points. We have outlined below the main steps in this process as we have followed them in this Workshop. But note, in particular that the early steps can be done in almost any order. What we do find to be important is that they all be gone through.

### I. Recall Puzzling Scenes.

Puzzling Scenes are those times when questions lying within a subject spark a natural curiosity in students. This can be seen as energetic confusion, frustration to get at the real answers, or a feeling of paradoxical bafflement.

1. Recall exactly what went on publicly in these puzzling scenes.
2. Try to recreate the Puzzling Scene from the student's point of view. What was the concept involved; how do students see this concept; what kinds of questions would they ask about it, if they could get through some of their confusion?

### II. Analyze and Focus Your Central Concept.

Whether you have chosen a Central Concept for your worksheet by recalling Puzzling Scenes or by thinking about the subject matter, you need to have a very precise understanding of the concept in order to work with it.

1. Break the Central Concept down into interrelated subconcepts and neighboring concepts. This Network of subconcepts and neighboring concepts should provide an underlying framework for the students' understanding of the Central Concept.
2. Either from your own imagination, or by recalling Puzzling Scenes, think of Concrete Contexts that exemplify the particular power of this Network of concepts. These Concrete Contexts should be "testing grounds" for the deeper problems in understanding this Central Concept.

3. **Select a Conceptual Goal.** Focus down to one particular part of the Network of subconcepts within the Central Concept and a few important Concrete Contexts, and think about one goal or one organized experience you would hold for your students with respect to this aspect of the Central Concept. What do you want your students to see, do, or understand differently about this Central Concept?

### **III. Describe Student Conceptions.**

You need to be able to figure out approximately how your students think about the Central Concept, its subconcepts, and the phenomena it is supposed to describe. For this you need to do a kind of "fieldwork."

1. Write some Structural Questions you can informally put to students that will reveal their thinking in this area. (See additional handout on Structural Questions.)

2. Do some "Fieldwork." That is, put your Structural Questions from 1. to some students and elicit some text, text that you can then "Decipher" in order to be able to describe more accurately how your students understand the Central Concept. That, is, you want to describe their Student Conceptions. Either take notes on their answers or use a tape recorder to have a clear record of what your students say.

3. Study the text in order to decipher Student Conceptions about the concepts.

4. Review and perhaps revise your Conceptual Goal in the light of what you have discovered in 3.

### **IV. Formulate A Progression of Structural Questions.**

These questions will be the skeleton for your worksheet. They require a Concrete Context, as well as several questions about that context which engage your students with your Central Concept and lead them to rework their thinking about it. These questions are a way of promoting the process of disequilibrium, a process that will help them take apart their Student Conceptions and reconstruct new, more adequate conceptions in their place. These questions should have the following effect:

a. After the students have engaged with the scene, they will be puzzled, tweaked, or curious about the questions, because they mean something to the students.

b. But their puzzlement will not be quite resolved--they

will feel a little off balance.

c. A tension will be created by the questions that will motivate them to rethink some of their ideas. This tension derives from the partial inadequacy of their own ideas as to how to solve the problem.

d. The Progression of Questions will have enough intrinsic interest that the group will want to work together toward a resolution.

1. Formulate the Concrete Context with the Progression of Structural Questions.
2. Try out the Progression of Questions on a group of students. You act as much as possible as observer and take notes.
3. Revise the questions in the light of 2.

#### V. Write a Plot Outline for a Full Worksheet.

As with writing essays, outlines are not always necessary, but they are usually helpful to the beginner. The Plot Outline will help you articulate a direction for the worksheet, will insure that you have a beginning, a middle, and an end, and will help you articulate specific steps on the way to your goal. Here are some tips:

a. The worksheet should have three distinct phases characterized by:

ENGAGEMENT. Where the students' own ideas about the concepts are elicited and given a first testing.

PROGRESSIVE EXPLORATION. Where the students' ideas about the concept are further stretched, tested, and thrown into disequilibrium or conflict.

PULLING IDEAS TOGETHER. Where the students' new ideas about the concept are stabilized and integrated with old concepts.

b. It is helpful in the course of a worksheet to come at a set of ideas from many angles; one should avoid a monotonic or purely linear approach to the development of ideas. It is helpful to use several different contexts for the same concept.

c. If possible, the worksheet should allow students of diverse levels of understanding to interact with it, each in his or her own way.

d. The worksheet should not try to accomplish too much. It is better to allow for serious engagement and working out of ideas, which takes considerable time, than to try to cover a lot of ground.

e. Try to include a variety of modes of work, so that new energy can be generated as the workshop proceeds.

#### VI. Write the Worksheet.

You have already begun your worksheet with your Concrete Context and Progression of Structural Questions. Now you will fill out your Plot Outline in detail. As you write, keep constantly in mind both your Conceptual Goal, and your student audience and their Student Conceptions. At each step of the way you will have to ask yourself: How are my students likely to respond to this question? Is this question taking me toward my goal?

1. Write the worksheet.
2. Critique the worksheet with the aid of peers.
3. Revise the worksheet in the light of 2.

## STRUCTURAL QUESTIONS

A Structural Question is one which invites the listener to actively use his or her Conceptual System on a particular phenomenon. Sometimes we use such questions to get a clearer view of the listener's Conceptual System, sometimes to change his or her Conceptual System, and sometimes to confirm and crystallize the System. In any event, Structural Questions should depend as little as possible on memorization or matters of fact, convention, or pure opinion. We have found that the one certain way NOT to elicit an individual's Conceptual System is to simply ask for an explicit verbal explanation of the given concept.

To devise Structural Questions you must first focus on one Central Concept and understand the subconcepts that make it up, and the network of related concepts that surround it. In most cases, the Structural Question will not be felt as a question by the students unless you focus it down to a specific CONCRETE CONTEXT or contexts. Thus, you should also have a list of examples from the field of phenomena which the concept illuminates, particularly those that present particular difficulties as one applies the concepts to them.

The following is a partial list of strategies for devising Structural Questions, along with examples of each.

1. Provide disparate examples of phenomena for students to classify, order, or organize by the Conceptual System.

"Which, if any, of the following are governments? NATO, a Public Utility District, the Communist Party of the USSR."

2. Provide a counterexample, a borderline case, or an unusual example for students to examine by means of the Conceptual System.

"Charlie watches football for five or six hours every

Sunday of the football season. Would you say that Charlie is 'addicted'?"

3. **Introduce a new factor** into the field of phenomena and have the students trace out the consequences.

"Suppose a law were passed forbidding the use of students' college transcripts for job applications, grad school, medical school, etc. What would be the effect on colleges?"

4. **Provide an illuminating shift of context** which requires students to carry the structure of the Conceptual System across from one field to another.

"A small group is in many ways like a family, with the group leader playing the role of father. If this is the case, how is the 'mother-role' carried out?"

5. **Introduce a decisive conceptual distinction or a decisive conceptual connection** and have the students explore the effects of using the distinction or connection on the field of the phenomena.

"What are the differences and connections between the concepts 'career' and 'profession'?"

6. **Apply a transformation to the conceptual system** and have the students trace out the consequences.

"Imagine that, because of illness, a person loses 75% of the functioning of one of the following organs: Stomach, Liver, Kidneys, Pancreas, Intestines. For each of the organs describe the short- and long-term effects on the individual."

## CREATING AN ISLAND OF CHANGE

The following are steps for converting a teacher's impulse for change into a new course activity to be carried out in a specific clearly bounded "place" in a course. We call this place, with its new activity, an ISLAND OF CHANGE.

1. Devise a changed activity for the teacher and students. This activity should be a significant realization of the teacher's impulse for change. It can be a new classroom format, a different mode of evaluation, innovative homework assignments, a novel form of materials, or whatever seems appropriate. The best way to convert an impulse for change into a new course activity is to think about the attached list of teaching functions and ask which of these functions expresses the impulse and is not presently performed by the teacher to her satisfaction. At this stage, do not worry about the feasibility or practicality of the changed activity; be guided by your fondest hopes.
2. Locate a limited and specific place in the course where the changed activity will be performed. Examples of such "places" are: Friday's lecture period, the four days preceding the midterm exam, every other laboratory period, student study sessions, the fifth and sixth weeks of the term, the last twenty minutes of three class periods a week. This specific place with its changed activity is the ISLAND OF CHANGE.
3. Decide what to give up. Introducing an Island of Change into a course inevitably requires that something presently in the course be given up. Decide what to give up, and make sure that it is not indispensable. A teacher who has trouble giving up anything should remind himself of the substantial gains the new teaching and learning activities will bring, and try again.
4. Clearly mark off the boundaries around the Island of Change. Since the Island of Change has been created to satisfy a teaching impulse which may differ strikingly from the impulses behind the rest of the course, the new rules set up within the Island may contradict the normal rules of the course. This will lead to mis-

matched expectations and serious confusions unless everyone is crystal clear as to which rules hold in which parts of the course. Be explicit and systematic in marking boundaries.

5. Integrate the Island of Change into the course. The Island of Change will not work if it is felt to be an irrelevant adjunct to the course. After marking off clear boundaries among the different components of the course, and distributing teaching functions into them, make sure the whole course hangs together. A whole is not disturbed by having greatly modified parts, just as long as they work together. Here are some questions to ask to see if the Island of Change has been well integrated into the course.

Can things be arranged so that the Island of Change is taken seriously?

Is the Island made to count in the grading or evaluation system of the course?

Is it of sufficient magnitude to warrant the students' effort?

Does the Island of Change in any way seriously conflict with or undermine the values of the rest of the course?

The Island of Change is a device to allow teachers to introduce substantial new ways of teaching into their courses without threatening the entire course as it is presently taught. Over the long run, the creation of an Island of Change may be the first step toward a gradual restructuring of the course, or it may remain as it was first created. In either case the teacher has found a direct and explicit way to act on his or her original impulse for change.



## TEACHING FUNCTIONS

### 1. PLAN STUDENTS' WORK

Make up assignments  
Determine classroom activities  
Lay out projects  
Write tests

### 2. SUPPORT INDIVIDUAL STUDENTS

Praise, reinforce students  
Bring out low participators  
Make sure students have had  
their questions answered  
Respond to and encourage  
students who are ahead

### 3. ASSESS STUDENT UNDERSTANDING

Interpret mistakes they make  
Assess what they know and don't  
know  
Describe and analyze student  
belief systems

### 4. EVALUATE STUDENTS' WORK

Grade tests, papers, projects  
Assign grades for course

### 5. SET AND CLARIFY LEARNING GOALS

### 6. INDUCE STUDENTS TO THINK

Ask pressing and probing  
questions  
Get students to clarify  
what they mean  
Point out implications  
contradictions

### 7. HELP STUDENTS WORK TOGETHER

Take account of differences  
among students  
Deflect questions to others  
Direct students to each other  
Group or regroup people  
Regulate pace of the class

### 8. ELUCIDATE SUBJECT MATTER

Explain material  
Demonstrate procedures  
Summarize, crystallize,  
organize  
Give information and sources  
of information  
Give fresh perspectives  
Draw parallels, make  
connections

### 9. RESPOND TO STUDENTS' WORK

Respond to written work  
Respond to oral work  
Make suggestions for revisions

### 10. DETERMINE RANGES AND LIMITS OF TEACHER'S AND STUDENTS RESPONSIBILITIES

### 11. HELP MOTIVATE STUDENTS

Generate enthusiasm and  
excitement  
Boost morale  
Encourage groups

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A WORKSHEET SAMPLER

Health: Individual & Community  
Winter, 1981

### Psychology Workshop I: Perception

Break up into groups of five. The group should try to agree on the answer to each question. All answers should be written down by each individual in his or her class notes. (Responses to workshops are never collected or evaluated; they are a record of your own progress in understanding.)

Pay attention to the allotted times, so the whole worksheet can be completed in 90 minutes.

#### Part I (30 minutes)

1. Look through your own notes and underlining to Chapter 8 in the text (Miller & Buckhout) and individually write down a single sentence which states a thesis about perception which you think captures the most important idea of Chapter 8 as a whole. (15 minutes)
2. Share your sentences with the rest of the group. Together as a group, reformulate the best possible sentence to answer question 1. (15 minutes)
3. Later this evening, for homework, look through Chapter 9. How do its main points connect with the thesis for Chapter 8 that your group has formulated above?

#### Part II (30 minutes)

4. Consider the following experiment by Haber & Hershenson. Using a device called a tachistoscope (T-scope), they flashed single English words at subjects for very brief exposure times. Subjects were told to report only what they had actually seen, regardless of whether they could guess the word or not. If a word or any stimulus is presented briefly enough, subjects will not see it. As the exposure time is increased, subjects will see more and more, until they see the whole stimulus easily. This has been known for a long time. What Haber & Hershenson found was the same thing happened merely by repeating the same word on each trial, without increasing the exposure time beyond the original value at which the subject could not see the word. At the first few exposures, subjects saw nothing; then parts of letters or a few individual letters were seen; after a few more trials, more letters, and finally the whole word was clearly seen -- at the same exposure duration at which originally they could see nothing.

Make sure you understand the above experiment. What does this result tell you about seeing? List one or several clearly stated conclusions (10 minutes)

5. In an experiment by Bruner & Potter, a slide of a photograph was put totally out of focus, and projected on a screen. Subjects were asked to try to identify the contents of the picture as the slide was gradually (in stages) brought back into focus. When the picture was in a middle range of focus, or even fairly well focused, subjects were more inaccurate in identifying the picture than other subjects who hadn't seen or tried to identify the picture at the less well-focused stages.

Formulate a hypothesis to explain this result. Be as specific as you can, and write it down. (10 minutes)

6. The following phenomenon is called backward masking and was discovered by Heinz Werner in 1935.

A T-scope is used to present a black disc to subjects for a very brief duration (12-25 milliseconds). At varying brief delays after the disc has ceased to appear, a ring is presented. The ring is positioned so it would have fit perfectly around the disc, had the disc still been present. When the disc is presented alone, it is clearly visible. But at certain delay intervals, the presenting of the ring erases the perception of the disc. The subject sees only the ring, with no black disc present.

Although the ring does not interfere with the seeing of the disc, when they are present simultaneously, it does interfere when it is presented after the disc (at just the right interval). What does this finding tell you about the process of perceiving the first stimulus (disc) and by implication, the process of seeing in general? Formulate a brief written answer. (10 minutes)

Part III (15 minutes)

7. Look back over your three conclusions from questions 4, 5, and 6, and try to integrate them into one general statement about the process of visual perception (1 sentence). (5 minutes)
8. Compare the sentence you formulated in question 7 with your group's response to question 2. How different or similar are they? (5 minutes)
9. Summary (5 minutes)

In a now classic book on perception published in 1967, Ulric Neisser summarizes the point of view on perception that most contemporary psychologists now hold (partly as a result of the influence of his book) as follows:

We must begin by abandoning a set of assumptions on which much of the research has implicitly been based. Taken together, these assumptions add up to the position that is sometimes called naive realism. Even psychologists who ought to know better have acted as if they believed (1) that the subject's visual experience directly mirrors the stimulus pattern; (2) that his visual experience begins when the pattern is first exposed and terminates when it is turned off; (3) that his experience, itself a passive -- if fractional -- copy of the stimulus, is in turn mirrored by his verbal report. All three of these assumptions are wrong. The information reaching the eye is subjected to complex processes of analysis, extended in time. Visual experience results from some of these processes. As for verbal report, it depends partly on visual experience, i.e., on further transformations of the information given there, and partly on other factors.

- ... The burden of the argument will be that perception is not a passive taking-in of stimuli, but an active process of synthesizing or constructing a visual figure. (Neisser, Cognitive Psychology, p. 16)

If this conclusion does not seem in line with the conclusions you have drawn on this worksheet, go back over it tonight, rethinking the questions in the light of Neisser's perspective.

Development: The Aim of Education  
Fall 1981

Developmental Theory: Workshop 7 - Piaget

Form groups of three.

Part I (20 minutes)

The following quotes from Piaget occur between the middle of page 6 and the middle of page 7 in Essay 1 of Six Psychological Studies.

"In an absolutely general way, ...all action -- that is to say, all movement, all thought, or all emotion -- responds to a need. Neither the child nor the adult executes any external or even entirely internal act unless impelled by a motive; this motive can always be translated into a need (an elementary need, an interest, a question, etc.)."

"...a need is always a manifestation of disequilibrium: there is need when something either outside ourselves or within us (physically or mentally) is changed and behavior has to be adjusted as a function of this change."

"Conversely, action terminates when a need is satisfied, that is to say, when equilibrium is re-established between the new factor that has provoked the need and the mental organization that existed prior to the introduction of this factor."

"At any given moment, one can thus say, action is disequilibrated by the transformations that arise in the external or internal world, and each new behavior consists not only in re-establishing equilibrium but also in moving toward a more stable equilibrium than that which preceded the disturbance."

Using the objects at hand as imaginary props, construct and have two people act out a brief scenario between a baby and its surrounding physical (non-human) world which illustrates the way one piece of behavior fits the description Piaget gives above. Your skit should have three moments:

- (1) The baby is doing something.
- (2) A transformation (human intervention o.k.) arises in the external world which disturbs the equilibrium present in moment (1).
- (3) The baby does an act which re-establishes equilibrium, but in more stable form than in moment (1)

Have one person play the baby and the other be responsible for the external transformation that disturbs the baby's equilibrium.

Describe in words what specific scheme or schemes were involved in the skit, and explain how they became more adaptive as a result of the three-step sequence in the skit.

## Part II (90 minutes)

Keep the same groups. Elect a scribe. The results of this section will be read to the class as a whole.

- a) On page 4 of Essay 1, Piaget distinguishes between two aspects of the development of intelligence: its variable structures and the constancy of its functioning.

Here is the quote:

"This is the distinction between the variable structures that define the successive states of equilibrium (i.e., "stages") and a certain constant functioning that assures the transition from any one state to the following one."

While understanding both these aspects of intellectual development is important, this workshop focuses only on the constancy of functioning. The terms below represent theoretical concepts from Piaget that deal with functioning. They thus apply to knowing at all levels of development (regardless of age or stage).

· scheme	formal abstraction
assimilation	disequilibrium
accommodation	equilibration
adaptation	decentering
egocentrism	

- b) Have one person read aloud to the rest of the group the final paragraph on Essay 1, on pages 69-70.
- c) Construct a story (and have the scribe write it down) that describes a dramatic change in the life of an adolescent or young adult. This change should be a significant instance of personal growth or social-emotional development. The story should explain the nature of the change, how it came about, and the conditions that were necessary for it to occur. (An alternative is to describe an opportunity for development that failed. In this case, you will have to describe the conditions that were not present, why the change did not come about, and what would have been needed in order to bring it about.)

Then go through the list of terms above and show where in your story each term is illustrated. (Every piece of development according to Piaget should involve all these concepts.) Adjust your story as you need to so that all the terms can be illustrated. Start with "scheme." You should not go too far in elaborating your story without being able to specify what scheme or schemes are altering in this piece of development.

BREAK - (15 minutes)

## Part III (30 minutes)

The group meets as a whole and hears the stories constructed by each group.

Development: The Aim of Education  
Fall 1981

Philosophy of Education: Workshop 5 - The Republic

This class requires you to prepare for and participate in something of a performance. While it may sound a trifle anxiety-inducing on paper, it should actually be a lot of fun, as well as illuminating, just as long as we can all enter into it in the proper spirit of adventure. Remember, we're all friends now -- and if you can't make a fool of yourself in front of your friends, then in front of whom, can you??

Break up into four groups of equal size. Each group will work on one of the central ideas of Plato covered in Books 4 and 5 that are listed below. You can choose which group you would like to be in, based on which idea you would like to delve into.

- A. "The lovers of sights and sounds . . . like beautiful sounds and colours and shapes, and all the objects fashioned from them but their thought is unable to see and welcome the nature of Beauty itself." (p. 136-top)

Your topic is the theory of the Forms and your job is to convince the class that a collection of beautiful things are beautiful not because they possess Beauty in themselves but because they participate in or partake of something beyond themselves: pure Beauty -- the unchanging essence of beautifulness. You need to make the case that this is a sensible and useful distinction.

\* \* \*

- B. "I think that justice is the very thing, or some form of the thing which when we were beginning to found our city, we said had to be established throughout . . . that everyone must pursue one occupation of those in the city, that for which his nature best fitted him." (p. 97-bottom)

Your topic is justice in the state, and your job is to convince the class that justice in the state is as stated above. Remember the broad definition of justice, and note the phrase on p. 98 -- "that each man, a unity of himself, performed his own task and was not meddling with that of others." You may interpret the term "state" or "city" loosely.

\* \* \*

- C. Your topic is the three-part nature of the soul: the reasonable part, the appetitive part, and the spirited part. Your job is to convince the class that it makes sense to divide the psyche, personality, mind, or whatever term you want to use for "soul" (assuming that you want a more modern term) into exactly three parts, and that these three parts are as Plato says. (The argument begins in the middle of p. 99). As with soul, you will probably want to find more contemporary vocabulary to describe the parts Plato is talking about. For example, the spirited part might correspond to what Thelen was calling aggression in Dynamics of Groups at Work, or what we might call assertiveness of will.

\* \* \*

- D. "Justice does not lie in a man's external actions, but in the way he acts within himself, really concerned with himself and his inner parts. He does not allow each part of himself to perform the work of another, or the sections of his soul to meddle with one another. . . He binds them all together, and himself from a plurality becomes a unity." (p. 107-middle)



Your topic is justice in the individual and your job is to convince the class that justice in the individual is as stated above. Remember the broad definition of justice. You can presuppose that we are made up of different parts, and you do not need to agree with Plato about the specific nature of these parts.

Part I: You have forty minutes as a group to prepare an argument (or a series of arguments) to convince the class of Plato's claim. You do not need to use Socrates' arguments in the text, though you may draw on them if you find them persuasive. You will need first to think of more modern ways of stating the essential Platonic position, or at least ways that make them feel and sound more convincing. You may use whatever arguments you may think persuasive, but make sure you are specific and concrete, and have some examples to work with. Before starting to work, read Part II below so you understand clearly what the task is that you will be called on to perform. You will need some good clear notes, and probably want to rehearse some before you are ready for Part II.

Part II: Each group will have twenty minutes to present their case. The method of presentation will be the following. One volunteer from the rest of the class will come forth to represent common sense or the public's view. One member of your team will start out in the role of persuader -- presenting the arguments directly to this person, while the class watches and listens. The persuader will engage the volunteer in conversation and the volunteer will respond. The rest of the persuader's team will function as a tag-team of relief pitchers, if I may so mix my sports metaphors. Whenever someone feels the persuader is faltering, or losing his cool, that person can come forth to tag the persuader and change places. The persuader can similarly come back in later if he feels like it. Everyone on the team should play the persuader role at least once. In the same way, anyone from the class can come forth and tag the volunteer in order to change places with him. Whenever a person is tagged, whether persuader or volunteer, she has the right to make one more point, ask one more question, or complete the line of thought she was engaged in, before giving up her chair. Thus, tagging will result in slightly delayed replacements.

When the session is over, we will poll the class informally to see how many people had their views altered as a result of each team's arguments. If we need more time than what is allotted here, we will take it.

Form into groups of four; choose a scribe to write down your group's answers and report them.

This workshop assumes you have selected a thesis. Its goal is to widen your concept of supporting a thesis. The thesis we are working with is, "American women should be drafted if American men are."

1. Here is a short paper. Its thesis is, "Socrates is mortal."

Socrates is a man.  
All men are mortal.  
Therefore, Socrates is mortal.

Try to agree on a sentence or two which explain why the first two sentences support the third one. Write down your explanation.

2. We will hear each group's explanation and work out one we agree on together.

3. (Return to your groups of four.) This kind of support, that involved in a logical proof, is not the only kind writers use. Here are some other sentences using the word "support."

She bought a pair of support stockings.  
Ronald Reagan increased his support by persuading the teamsters that his measures to fight inflation would not raise unemployment.  
The bridge is supported by 960 stainless steel cables.  
So then, the bastard stopped making his child support payments.  
Sally and I started a women's support group.

Try to find at least one thing which supporting a thesis shares with each of these other kinds of support.

4. Nonetheless, this workshop is about logical support. A list of sentences follows. Select the ones which you think help support the thesis, "American women should be drafted if American men are."

1. Women should not be discriminated against because of sex.
2. Russian women help out the Russian army a lot.
3. The draft would be a great opportunity for all women to prove to the United States just how equal we are to men both mentally and physically.
4. Men are born with stronger upper torsos, and therefore have a better physical ability to handle hand-to-hand combat.
5. The draft is bad because it infringes on individual liberty.
6. Our society needs to try and think of women as having the same rights and responsibilities to our country as men do.
7. Women could do a real good job flying aircraft, sailing on ships, being medics, and even working on some of the technology.
8. Women who are expecting babies or have small children need to take care of them and they can't possibly do that in the Army.
9. I'm a member of the Twelve Day Love Church, and my minister says women were made by God to be calm and gentle.

10. Most Americans believe we need some kind of Army.

10 min.  
5. If I changed audiences, would that change the way you answered question 2? Try to invent audiences which would mean that a couple of the sentences you said supported the thesis no longer do. Try to invent audiences for whom a couple of the sentences you said did not support the thesis do.

6. Break. End of Part 1.

15 min.  
7. Take the sentences which your group thinks would not support the thesis if you were writing for an ordinary American audience. One thing you could do is leave them out. Try to decide as a group if there are any you can get away with omitting. Write a sentence which sets up guidelines for when you can get away with leaving out something which does not support your thesis. (There may be several different kinds of things you can leave out.)

7a. The group as a whole will hear each small group's sentence about when you can leave out something which doesn't support your thesis.

8. There are several other things you might do with the sentences you decide you can't leave out. If the problems they pose for your thesis seem minor, you might modify the thesis in such a way that they are not objections to it any more, but you have not given up the central point you want to make. There is no reason to ask for an argument if you can sidestep one. For example, suppose my thesis were "Moby Dick offers the most profound analysis of pride in American literature," and then I started thinking, "What about The Scarlet Letter?" Unless I'm very concerned about ranking, I might want to handle this problem by changing my thesis a bit, to "Moby Dick offers one of the most profound treatments of pride in American literature" or even "Moby Dick returns again and again to the psychology of pride." Take three of the sentences you could not use and try to modify the thesis so they are not problems any more. Write out the new versions of the thesis.

min.  
9. Another thing you can do is deal with the problem in passing, if it is not too important a problem. For example, suppose your thesis is, "Everyone should obey the 55 mph speed limit" and one of the objections is, "What about fire trucks and police cars?" You might want to stick a sentence in somewhere which dealt with the issue in passing, say, "Although there will obviously always be emergencies in which people like policemen and firemen should ignore any standard speed limit, whether fifty-five or seventy, the savings in energy, the increased safety, and the greater enjoyment produced by driving at fifty-five make it a much better limit for normal conditions." Take three of the sentences you could not use and write new sentences which deal with the problems they raise like this.  
15 min.

15 min. 10. If you have an important objection, you cannot get it out of the reader's mind by ignoring it. Your hard-nosed professor will always complain that you did not deal with it. Therefore, you have to introduce important objections in the paper and try to answer them. For example, "Some people have argued that ... However, they are mistaken because ..." Or, "The number of Vietnamese leaving the country suggests at first glance ... However, ...." This maneuver can take many forms, some considerably more elegant than these. Take two of the sentences you could not use and write a brief treatment like this for each of them.

11. Break. End of Part 2.

30 min. 12. Here is a student paper. Read it together carefully and try to identify the places in which the author has tried to deal with sentences like the ones we have been working with in this workshop. Do not worry about other ways you might improve the writing; just concentrate on the ways she dealt with points which did not support her thesis. Take each maneuver and see if you think some other way of dealing with the point might have been more effective. If so, rewrite the paper accordingly.

Draft Women  
By Julie Milligan

Although there are certain conditions that could prevent some women from being drafted, the majority of the women should be drafted if men are. I think that some exceptions would have to be made as to just who should be required and who not. Women who are expecting a baby, or have small children, for example, should not be drafted. Another exception would be, of course, if she was not healthy enough or had some kind of a mental or physical disability.

In many other countries around the world, such as Russia, and Israel, they have been proving for some time now just how much a woman can do to help in a war. The United States needs to be shown once and for all, just how much a woman can do to help her country. Women have been labeled as the weaker of the sexes for too long. The draft would be a great opportunity for all women to prove to the United States just how equal we are to men both mentally and physically.

Even though, men seem to have been born with stronger upper torsos than most women, this does not mean they should be denied the right to work in other areas. There are many different positions a woman could take part in and do a real good job in a draft. Women should not be denied the right to fly aircraft, sail on ships, and be medics or even work on some of the technology. Men might have a better physical ability to handle hand-to-hand combat, but there are several other things women are equally as good at, and I believe that women would be an enormous help to the draft.

Women have been fighting for equal rights for a very long time now, so why shouldn't they be drafted if men are? Our society needs to try and think of men and women as having the same rights and responsibilities to our country as men do. In conclusion, I believe the draft is bad but why should men just suffer? Women should not be discriminated against because of sex.

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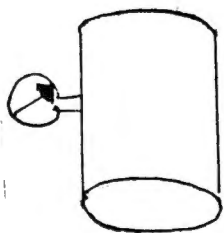
CHEM 101A  
February 3, 1976  
Meyer

### The Ideal Gas Law

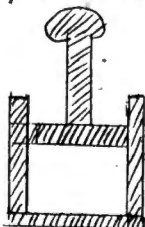
These problems are to be done without the formula. You may use the formula to guide your reasoning if you wish, but give your explanations in your own common sense terms.

We have three devices:

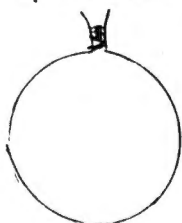
- 1) A given amount of gas (a given number of gas molecules) is put into a steel canister and sealed. The canister has a pressure gauge on its side. This canister keeps the volume constant. We can vary the temperature by immersing it into different vats of water at different temperatures. If I have it at  $X$  degrees absolute, and read the pressure as 40 units, then I immerse it into a new vat at  $2X$  degrees, what will the new temperature reading be? Explain in your own words the reasoning behind your answer.



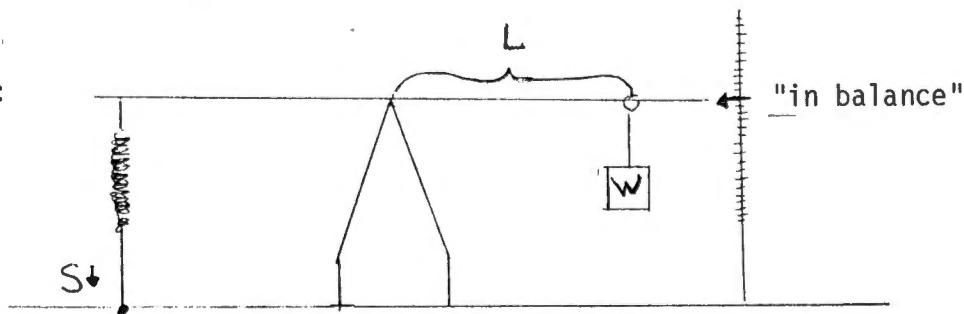
- 2) We have a given amount of gas in a cylinder with an adjustable cap. There is a pressure gauge on the side. The cylinder is kept in a vat of water so that temperature is constant. I can control the volume by moving the cap in and out. If I have an initial pressure of 120 units, and I push the cap in, reducing the volume by  $1/2$  (by  $1/3$ ), what will the resulting pressure be? Explain in your own words the reasoning behind your answer.



- 3) We have a given amount of gas in a perfectly flexible balloon. Since the balloon always has 1 atmosphere of pressure against its walls, the pressure is constant in this situation. If the temperature inside the balloon is 300 deg. A, and I heat it up to 600 deg. A, what happens to the volume? Explain.



- 3a) We have a balance beam:



The balance beam has a spring on the left side with a device to vary tension ( $S$ ), a set of weights that can be put on a hook on the right side which can be moved back and forth. The amount of weight ( $W$ ) and the length ( $L$ ) between the fulcrum and the weight are variable, as is the tension ( $S$ ).

There are three variables and if the system is to be kept in balance, changing one or more means changing some others to compensate for the original change.

In order to keep the beam balanced the three variables must interact in much the same way as the three variables in the ideal gas law: P, V & T.

- i) Suppose you wanted to write some problems for learning about how a balance beam works. Consider problem 1. Give a correspondence (or dictionary) from the set of variables: pressure, volume, and temperature, to our new set: length, weight, and tension.
  - ii) Now rewrite problem 1 in terms of the balance beam -- if you have trouble, reconsider your dictionary and see if it needs alteration.
  - iii) Repeat i) and ii) for problems 2 and 3.
  - iv) As you do the rest of the problems on this sheet, try to keep the analogy of the balance beam in mind. It may help you.
- 4) I can vary the pressure on the balloon by taking it to different places with different atmospheric pressures (the moon, the top of Mt. Everest, under the ocean, etc.). Suppose I take my sealed balloon to a place with half the pressure, what happens to the volume? Suppose at the same time I increase the temperature four times, what is the resulting volume? Suppose I triple the pressure and double the temperature, what happens to the volume? Explain.
  - 5) I now decide to move my cylinder to different vats of water at different temperature. Suppose I move it to a cooler vat, one that is 200 deg. A instead of its original 400 deg. A, and at the same time I increase the volume from 150 to 450. The original pressure was 10 units, what is the resulting pressure?
  - 6) We have been discussing "a given number" of molecules. Suppose we change the number of molecules: If I put twice as many molecules of the same gas into my balloon, and keep pressure and temperature constant, what happens to the volume? Explain.  
  
If I put three times as many molecules into my canister, keeping temperature constant, what happens to the pressure reading on the gauge?
  - 7) Suppose I put four times as many molecules into the canister and at the same time put it into a vat of water which is 1/3 cooler than its original one. The original pressure reading was 100 units, what is the new one?

LAW for an (ideal) gas: The number of molecules affects the volume, or pressure, regardless of what they weigh. Thus, 423 molecules of a gas made up of light molecules (say helium) and 423 molecules of a gas made up of heavy molecules (say krypton) will occupy the same volume, if temperature and pressure are constant, or will exert the same pressure if volume and temperature are constant.

- 8) Suppose a balloon full of 2222 molecules of oxygen on the earth at 400 deg. A expands to a volume of 50 units. I fill up a second balloon with 6666 molecules of hydrogen, take it to a planet where the pressure is four times that on earth and the temperature is 400 deg. A. What is the volume of the balloon? Which balloon will weigh more?

The ideal gas law states that  $PV=nRT$ , where  $R$  is some constant depending on units used. If temperature is held constant at 400, explain in your own words what this formula tells you. There are alternative but equivalent ways of writing this. Some of these ways make things easier to understand, depending on what you are using the formula for, e.g.

$$V = \frac{nRT}{P}$$

- 9) We have a given number of molecules at 400° absolute. Using whatever form of the formula you wish, explain how a change in one of the variables  $P$  or  $V$  affects the other.
- 9a) Remember the balance beam. Write the formula that expresses the relationship of  $S$ ,  $W$ , and  $L$  when the beam is in balance. Considering some alternate forms of this formula, which one helps you understand the situation the best? Why? Compare this form with the form(s) of the gas law formula you found most understandable.
- 10) Repeat question 9, keeping  $P$  and  $n$  fixed and allowing  $T$  and  $V$  to vary.



Teaching in the Twentieth Century  
Autumn, 1979

FREUD WORKSHOP III

Goal of the workshop: To provide a better understanding of Freud's theory of human sexuality.

Divide into groups of five.

- I. Five minutes. In these five minutes, write down all the things you can think of that you consider to be sexual perversions in adults. Do this individually, not as a group. Note that in this part we are not asking you to use Freud's definition, but to use your own idea of what a perversion is.
- II. Ten minutes. Each group should select, from its members' lists, the five things that seem to be the best examples of what group members consider adult perversions to be. (Don't argue about definitions yet--just choose the best examples, and try to do it quickly.)
- III. Twenty minutes. Using the five things on the group's list, decide what it is about these acts that distinguishes them from normal adult sexual behavior--i.e., construct a definition of adult sexual perversion. Write this down.
- IV. Twenty minutes. Decide whether, according to your definition, the following acts of adults should be considered perversions. After discussing this list, decide whether your definition still seems adequate; if not, revise it.
  - a) a middle-aged man wearing skirts and women's high-heeled shoes for sexual excitement
  - b) playing with feces for sexual excitement
  - c) sharing sexual fantasies
  - d) homosexuality
  - e) having intercourse with a dog
  - f) having intercourse with one's sister or brother
- V. Forty minutes. Reread Freud's discussions of perversion on pp. 208-209 and 315-317 of ILOP. Go through your group's list of five perversions, and list the acts in part IV, and decide which of these would be considered as perversions by Freud. For each "Freudian perversion," identify an activity of children that seems to correspond to it. Would you call these activities of children perversions? Why or why not?

VI. Forty minutes. Have someone in your group read aloud the paragraph on pp. 311-312 of ILOP.

- a) If, after reading Freud and participating in this workshop, some of you are still "inclined ... to deny the whole business" and deny "the fact that children have anything that can be described as sexual life," discuss the reasons for denial within your group. At least two people in the group must argue for the Freudian position as outlined in this paragraph.
- b) Discuss the statement in this paragraph that "society must undertake as one of its most important educative tasks to tame and restrict the sexual instinct when it breaks out as an urge to reproduction and to subject it to an individual will which is identical with the bidding of society." What would a society be like that had no restrictions in sexuality?

## GENETICS WORKSHOP

PART I. Answer the following questions by yourself until you come to the instruction STOP. Then raise your hand and the instructor will assign you to discuss your answers with someone else.

1) We are going to try to understand the mechanism of human heredity. Perhaps you already know something about the subject, but we are going to ask you to look at this problem with "fresh eyes" as much as you can, so that you see the reasons for inferring a certain kind of genetic mechanism.

We have the following situation; it involves a little incest, but we won't let that bother us, for the sake of illustration. A brown-eyed man and a blue-eyed woman have several children, all of whom have brown eyes. We then breed these children with each other and get a lot of grandchildren; approximately  $3/4$  of them have brown eyes and  $1/4$  have blue eyes.

This story contains enough information to distinguish between two general ideas about heredity:

a) Blending heredity: the characteristics of two parents are blended together to make children with intermediate characteristics, through a kind of averaging of the parents' characteristics.

b) Discrete heredity: the characteristics of all people are determined by discrete units that produce definite characteristics; they may be combined with each other in different ways, but they are not changed by such combination.

Consider the evidence and explain why you believe that this information points to one theory or the other as being correct.

2) We think you will agree that the evidence favors the discrete heredity theory (but we're willing to argue about it if you're unconvinced). We call the discrete units that are inherited "genes." We don't have to know much about them at this point; we just assume that each gene determines a characteristic, such as brown eye color or blue eye color. Now since the brown-eyed parents (2nd generation) do, in fact, have brown eyes, what kind of genes do they have to have?

3) But those same 2nd-generation parents, with brown eyes, produce children (3rd generation) with blue eyes. What does that imply about the genes that those parents are carrying?

4) On the basis of your answers to questions 2 and 3, what is the minimum number of genes for eye color that those 2nd-generation parents--and therefore all people--must carry?

5) If you have the correct idea about the number of genes that people must have for eye color, you should be able to solve this problem. Get some poker chips and let a white chip be a gene for brown eyes and a blue chip be a gene for blue eyes. Put together the combinations of genes that the two grandparents must have. Then figure out how they can put some of their genes together to make the 2nd-generation parents. Finally, work out how those parents can combine their genes to make the grandchildren. If your ideas about heredity are correct, you should be able to explain why the grandchildren are  $3/4$  brown-eyed and  $1/4$  blue-eyed. (Notice that you will have to make an assumption at some point about how many genes each parent gives to each child.)

If you can't work this out the first time, make some different assumptions and try again. Work on this problem until you either get the correct result or become totally frustrated.

STOP. Once you have solved the problem or given up, raise your hand.

Key Question. You own a print shop, and, in order to attract larger orders, you have devised a sliding price scale. You charge \$15 a ream for an order of one ream (=500 pages), \$14 for each ream for an order of two reams, \$13 for each ream for an order of 3 reams, and so forth. The paper you use costs \$4 a ream.

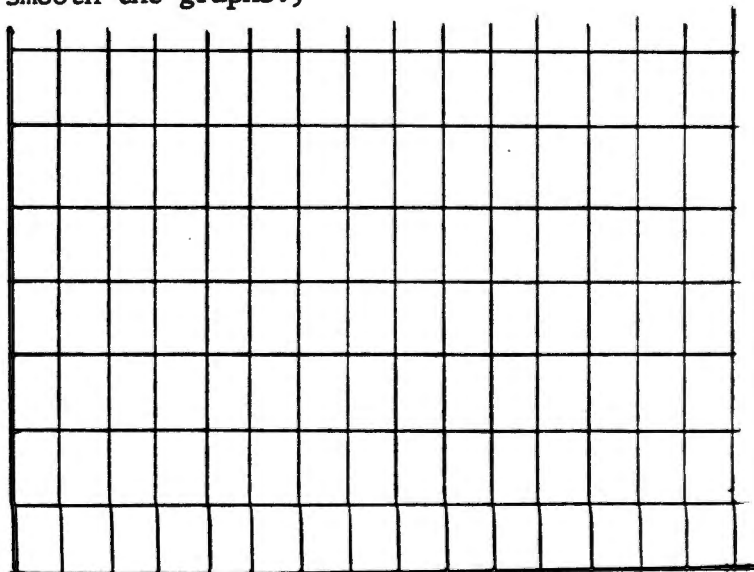
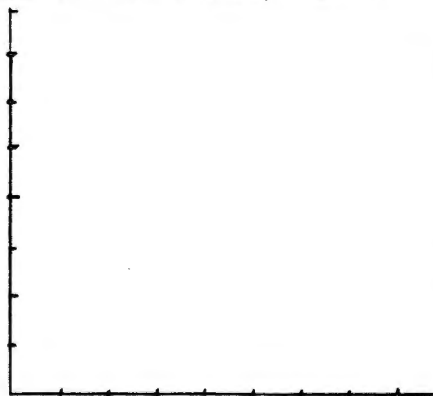
Your partner says that you cannot run a business by charging less for more, and thinks that you will be losing money every time a customer increases his order size. You say that as long as you get more than \$4 a ream, you're still ahead. Who is right? Are both wrong or both right?

1. First deal with your partner's assertion that you are "charging less for more." What is the total bill for an order of 1 ream; for an order of 2 reams; for an order of 3 reams? Is there actually some quantity that is getting smaller as the orders get bigger - other than the price?

2. To explore the Key Question further we need some more systematic tables and graphs. In the table below, q stands for the number of reams in an order, p stands for the price for each ream in the order, and TR stands for the total bill for an order of that size. ("TR" is actually an abbreviation for the economists' term "Total Revenue.") Complete the second and third rows of this table and ignore, for now, the fourth and fifth rows.

q	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
p	15	14	13	12											
TR	15	28	39	48				64	63	60	55				
TVC					20	24	28								
P							35	32	27			0			

3. On the axes to the left below plot the graph of p vs q (with p on the vertical axis). On the axes to the right below plot the graph of TR vs q (with TR on the vertical axis). (As usual, smooth the graphs.)



4. Now what do you think of your partner's assertion that you are "charging less for more?" It doesn't look like you want to take a lot of orders for 15 reams, but what about 11 or 13?

5. We have to take into account the cost of the paper, \$4 per ream. What is the cost of 1 ream, 2 reams, 3 reams, etc? We call this new quantity -- the cost of q reams-- TVC (which is an abbreviation for the economists' term Total Variable Cost). Do you agree that the formula for TVC is  $TVC = 4q$ . Plot the graph of TVC vs q on the same axes as your TR vs q graph. Label the two graphs to keep them straight.

6. Now what would be the largest order you would be willing to take? WHY?

To deal further with the Key Question we need to introduce yet another variable

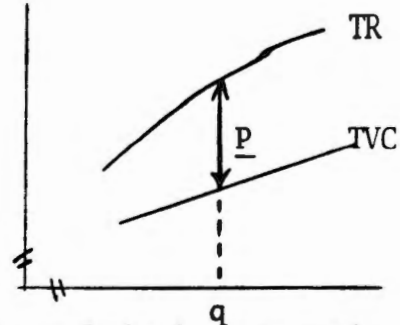
$$P = \text{Profit.}$$

Clearly the profit you make on an order of 3 reams is the \$39 you take in minus the \$12 you pay for the paper. That is

$$P = TR - TVC$$

7. Now go back to the table on the preceding page and fill in the rows labelled TVC and P. (You can ignore all quantities beyond 12.)

8. We could draw on the same set of axes as the TR and TVC graphs, the graph of P vs q. But I claim that it is really "there" in a way. To arrive a P for a particular value of q, you subtract the corresponding value of TVC from the corresponding value of TR. Do you see that the number you get is the length of the vertical line between the two graphs for that value of q (as in the picture to the right)? Calculate the profit by this graphical method for several values of q and check against the values in your table.



9. Using the TR and TVC graphs, find the quantity q that gives the greatest profit. (This can be hard on your eyes. I find that the best way to do a problem like this is to use a clear plastic ruler and, holding it perpendicular to the horizontal axis, run it back and forth until you find the place where the vertical distance between the graphs is greatest.) Check your answer against your table values.

It seems that you and your partner are probably both right and both wrong. It makes no sense to take an order of 13 reams, because you lose money on it. The best size order is 6 reams, because you make the greatest profit on it. As you take larger and larger orders between 6 and 12, you make less and less money, but you still make money. The odd thing is that your TR hits its peak at 8, but this number is not that significant.

10. Using your old trusty clear plastic ruler on the TR graph, try out the following argument for why Profit is maximized at  $q=6$ . The slope of the secant line to the TR graph between consecutive values of  $q$  (4 & 5, 5 & 6, etc) measures how fast TR is growing. The slope of the TVC graph is always 4. For values less than or equal to  $q=5$ , the TR graph is steeper than the TVC graph. So the TR graph is "pulling away" and profit is increasing. Starting at  $q=6$ , the TR graph is less steep than the TVC graph, so the two graphs are coming together, so that profit is decreasing. So, around  $q=6$  is the place to be...the profit is greatest there.

In an economics text you would find the following argument for the same phenomenon.

A customer considering an order of 5 or 6 reams is considering spending an additional \$5 for one more ream. It will cost you \$4 for this additional ream. This will increase your profit by \$1 (over what you would have gotten for 4 reams). A customer considering an order of 6 reams or 7 reams is considering spending an additional \$3 for one more ream. It will cost you an additional \$4 for this ream. This will diminish your profits by \$1. You don't want to do that unless you have to.

This notion of additional revenue for one more unit of sales is very important in economics. It is called Marginal Revenue and is defined to be:

Marginal Revenue (MR) is the increase (plus or minus) in Revenue that comes with an increase of 1 unit of sales.

11. Do you see the connection between the economists' argument and the one given about slopes of graphs in question 10?

EVALUATION

We would very much appreciate your considered answers to the following questions. Your candid reactions will help us revise and improve the Institute. Please respond in legible handwriting on separate paper, using as much space as you need. Kindly put your name at the top of every page you use.

Part I

1. As you think back on your experience of the last week, what particularly stands out for you?
2. We would like your reactions to the following components of the Institute:
  - work on natural subjects (canary, baseball/family/money, nature/culture),
  - work on own concepts
  - seminars
  - informal, out-of-class, intellectual exchange
3. We would also like your reactions to the performance of each of the staff of the Institute:

Don	Susan	Steve
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4. What did you hope for as you came to the Institute, and to what extent have your hopes been realized?
5. Has the Institute been a satisfying and/or productive experience for you? Explain.
6. Any other comments?

Part II

1. How did you hear about the Institute?
2. Think back on your decision to attend the Institute. What were the factors that were particularly effective in your decision to come? What, if any, were the factors that weighed against your coming?
3. Were your accommodations adequate?
4. Was the food service satisfactory?
5. What were your sources of financial support to attend the Institute? Please indicate approximate percentages of support, if there were several sources.
6. Any other comments on the non-academic aspects of the Institute?