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ANALYZING EXPERIENTIAL EXERCISES: USING THE SCIENTIFIC METHOD FOR PROBLEM SOLVING

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ABSTRACT

This paper presents the scientific method in six steps and recommends that students use it as a structured framework for analyzing experiential exercises. It is argued that managers should think and behave as scientists. As such, they must understand cause-effect relationships, as specified in process models, in order to explain and predict the outcomes of their decisions. A definition of process model is offered, and an example conversion of a content model into a process model is presented. Using process models to explain activities, communications, and consequences of experiential exercises forces students to learn both the components and the applications of the models. An outline format is suggested as a tool for facilitating both students' and instructors' tasks concerning exercise analyses.

INTRODUCTION

Wouldn't it be great if we could explain and predict human behavior as well as physical phenomena? We could argue about that. Maybe such predictability would make life boring since it would eliminate ambiguity and uncertainty and the consequent excitement. Maybe physical phenomena aren't so predictable anyhow. After all, think of weather forecasting. Nevertheless, success in business depends on managers' abilities to solve problems and make decisions. Without exception, decision making is about predicting consequences of courses of action; and, for managers, many of these actions concern human behavior.

The purpose of this paper is to present the scientific method as an approach to solving management problems. Specifically, the focus is on analyzing experiential exercises: helping students understand the behaviors and interactions that occur in role plays or other experiences in class. More importantly, though, this approach can help people generalize from classroom experiences to "real-life" problems. Even more importantly, a scientific approach can help us generalize from one real-life experience to another; and can give us guidance as to when we should generalize.

Mark Twain (1992) offered advice about not generalizing. He cautioned, "We should be careful to get out of an experience only the wisdom that is in it -- and stop there; lest we be like the cat that sits down on the hot stove lid. She will never sit down on a hot stove lid again -- and that is well; but also, she will never sit down on a cold one any more."

THE MANAGER AS A SCIENTIST

"Eli Goldratt's ten-year-old crusade to change manufacturing from an art to a science is bearing fruit." (p. v)

"Science is simply the method we use to try and postulate a minimum set of assumptions that can explain...the existence of many phenomena of nature." (p. i)

we can postulate a very small number of assumptions and utilize them to explain a very large spectrum of industrial phenomena. You the reader can...call it common sense....If you do, you basically have taken science from the ivory tower of academia and put it where it belongs, within the reach of every one of us and made it applicable to what we see around us." (p. ii)

"I view science as nothing more than an understanding of the way the world is and it is that way. At any given time our scientific knowledge is simply the current state of the art of our understanding. I do not believe in absolute truths. I fear such beliefs because they block the search for better understanding. Whenever we think we have final answers, progress, science, and better understanding ceases." (p. iii)

THE SCIENTIFIC METHOD

Having presented the theme of looking at the manager as a scientist, it seems appropriate to discuss the scientific method. Ten scientists will express 10 different versions of "the" scientific method. Most students whom I've asked in the past several years agree that the scientific method begins with the definition of a problem, includes statements of hypotheses and data collection, and ends with explanation of results. Many non-

scientists forget to include theory, or a conceptual model, as the source of the hypotheses. To scientists, this is the most important step. It is impossible to generate hypotheses without some idea of how the conditions of interest might be related. Figure 1 portrays one rendition of the scientific method in the context of management functions. The top row of Figure 1, above the

line, represents the planning function. The bottom row, below the dashed line, shows implementation and control functions. While scientists can usually ignore the implementation and control of their findings, managers have no such luxury concerning their decisions. This paper focuses on the planning, or decision making, function in the top row of Figure 1.
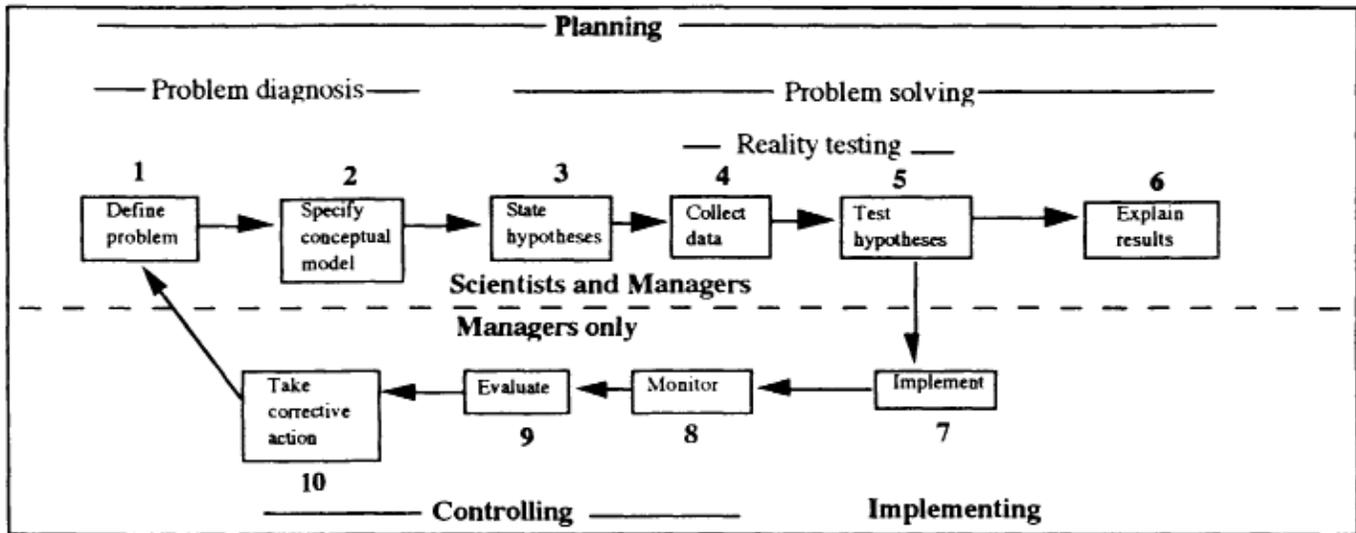

Figure 1
The Scientific Method and Management

A PROBLEM SOLVING FRAMEWORK FOR ANALYZING EXERCISES

An exercise analysis is a crucial part of each exercise. Its intent is to make participants focus on the observer aspect of "participant / observer" and use their scientific abilities as in "manager as a scientist" in thinking about what really happened in the exercise. Many of these abilities relate to those of a scientific detective like Sherlock Holmes, whose legendary gift for making deductions from observations and knowledge frequently astounded his associates. Sherlock's deductions might have seemed like guesswork, especially when some of the information seemed to be absent. But Sherlock never guessed.

Step 1: Defining the Problem

The first step in Figure 1, defining the problem, is probably the most ambiguous. Problems are recognized as unfavorable values of at least one of three important system consequences: productivity, satisfaction, and learning. Ultimately, these dashed

consequences influence the financial outcomes of a business and show up in income statements and balance sheets. Thus, the first step for problem solvers is to determine what kind of problem(s) are causing the unfavorable values of productivity, satisfaction, or learning.

Step 2: Abstracting the Problem - -Choosing or Developing a Process Model

The second step for problem solvers is to choose a number of conceptual models (theories) that relate to the problem they defined. Seldom is one single model sufficient to address any problem; and seldom is there only one problem in any business situation. In choosing models, problem solvers must understand the problems enough to identify the cause - effect relationships underlying the problems. They must reason abstractly from the specific problem at hand to the general concepts that can apply to all similar problems. They must then reason out the cause - effect relationships of the problem in terms of independent, mediating, moderating, and dependent variables. (I spend as

much class time as necessary to define the functions of these types of variables.)

Since I feel most comfortable with models of organizational behavior (OB), this paper focuses on OB problems. One limitation in this field is that most OB models are content models. A content model defines the relevant concepts but does not explicitly specify cause - effect relationships. Content models have no independent or dependent variables. Therefore, content models can not be used for explaining or predicting phenomena --only for describing them. Most models of leadership, power, and conflict are content models

Fortunately, most content models contain <u>implicit</u> cause - effect relationships. For example, something good (a favorable value of a dependent variable) is supposed to happen if a leader uses an appropriate style (the "correct" value of an independent variable). Thus, most content models can be converted to process models that can contain <u>explicit</u> cause - effect relationships. A definition of a process model can be adapted from Kerlinger (1973). *A process model is a set of interrelated concepts (variables) that gives a systematic view of phenomena (dependent variables) by specifying relationships among the concepts. its purposes are to explain and predict the phenomena, to suggest ways (interventions) to change the phenomena, and to predict consequences of these changes (new values of the dependent variables that result from the new values of the independent variables).*

Converting from a content model to a process model requires specifications of the relationships implied in the content model. The following example shows how normative decision theory (NDT), a content model, can be converted into a process model with explicit cause - effect relationships. (Here, it is assumed that you are familiar with NDT.) This conversion can be accomplished for every content model with implicit causes and consequences.

In the original formulation of NDT, Vroom and Yetton proposed that the appropriateness of each of the six decision-making styles (leadership styles, Al to GII) depends on the situation facing the leader. They identified three situational criteria concerning quality of the decision (Q), commitment of subordinates (C), and urgency of time (T). Later, development of subordinates (D) was added to this list of situational criteria. Implicitly, one can reason that outcomes are likely to be more effective when the appropriate style is used than when an inappropriate style is used. Effectiveness can be defined in terms of the productivity, satisfaction, and learning of subordinates. This thinking leads to two propositions:

1. The situation facing the leader moderates the relationship between leadership style and appropriateness of style.

2. The more appropriate the leadership style, the more effective the outcome (productivity, satisfaction, and learning).

The following model, which the propositions yield, can be called a general process model of leadership (Figure 2).
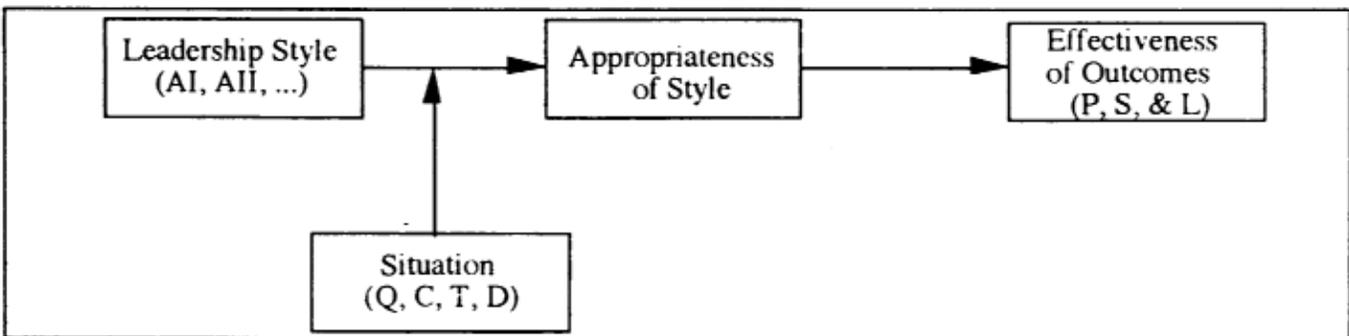

Figure 2
General Process Model of Leadership.

The following graph in Figure 3 shows appropriateness of style as three different functions of leadership style. Notice that the type of function (the slope of the line) depends on the situation facing the

leader (the criteria). This is what the first proposition means by the situation moderating the style-appropriateness relationship. Notice also that the six styles are ordered in terms of increasing

amounts of power shared by the leader. This convenient fact enables us to consider "leadership style as an ordinally increasing variable that can be used to label the horizontal axis.
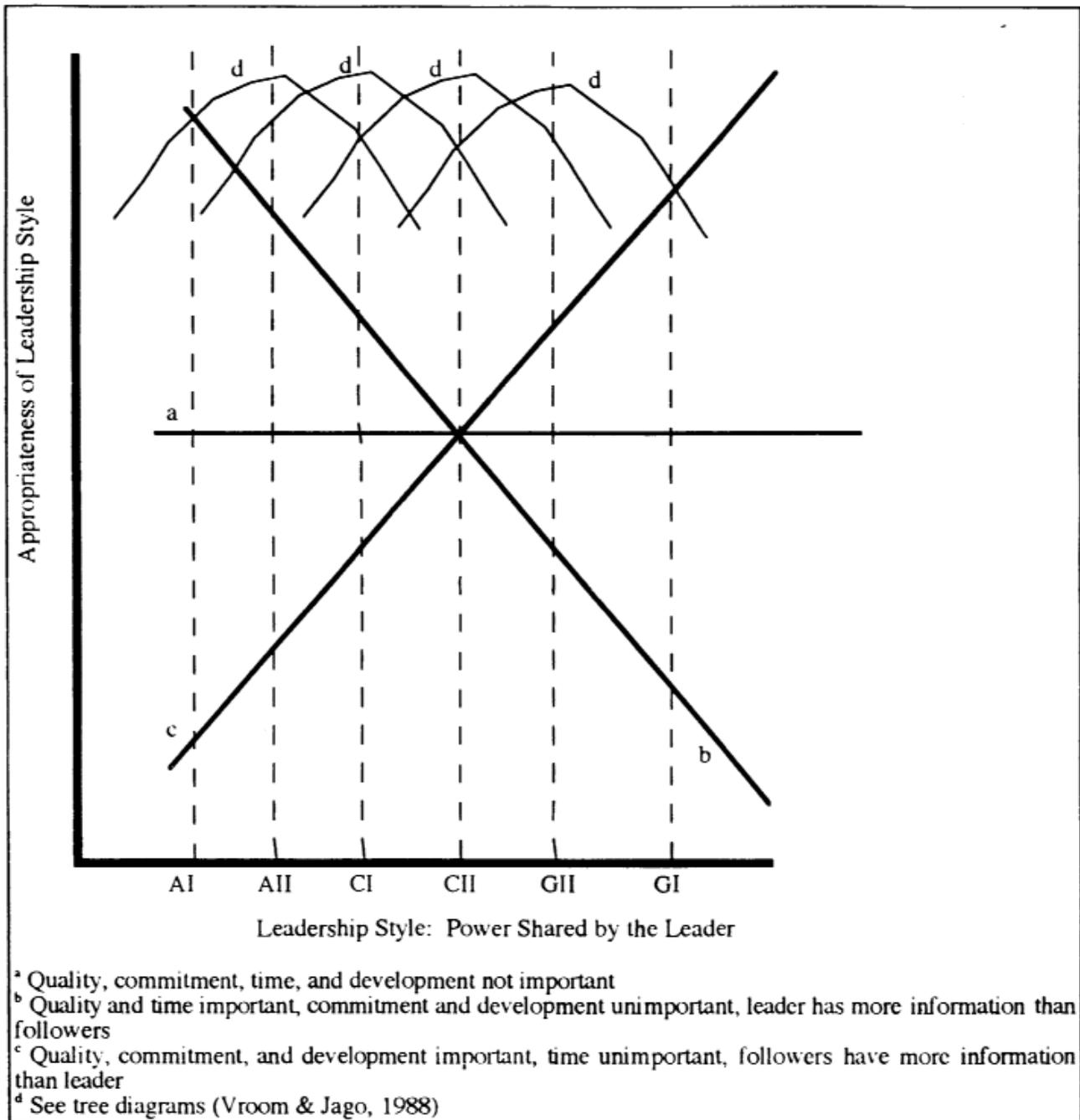

Figure 3
Appropriateness of Style as a Function of Power Shared: Normative Decision Theory (NDT)

This graph shows that, when all four situational criteria are unimportant, it doesn't matter which style the leader uses. All styles are equally appropriate, as shown by the horizontal line. The graph also shows that style A! is the most

appropriate style when quality is important and the leader has more expertise than the followers, commitment is unimportant, time is important, and development is unimportant. GI is the least appropriate style under those conditions. In contrast, for the opposite conditions, GI is the most appropriate style and A! is the least appropriate. A limitation of the graph is that it is unclear which style is most appropriate for situations not exactly specified by the three lines on the graph. For example, what if both time and commitment are important? Consequently, Vroom and Yetton introduced the familiar decision trees that are useful for helping leaders match their styles with the existing situations.

Step 3: Stating Hypotheses

Once the process model has been chosen, converted, or developed, the hypotheses are straightforward because they are specified in the model. This procedure for generating hypotheses is central to the scientific method. Figure 3 suggests three hypotheses.

H1: If Q, C, T, and D are unimportant, there is no relationship between leadership style and appropriateness of style.

H2: If Q, C, and D are important, T is unimportant, and followers have more expertise than the leader, then appropriateness of style is positively related to power shared by the leader.

H3: If Q and T are important, C and D are unimportant, and the leader has more expertise than followers, then appropriateness of style is negatively related to power shared by the leader.

A fourth hypothesis, generated from Figure 2, connects appropriateness of style to three relevant consequences: productivity, satisfaction, and learning. It is noteworthy that the General Process Model of Leadership stops there. There are other models that relate productivity, satisfaction, and learning to more urgent or important outcomes such as profits (or good grades), low work avoidance behaviors, and long-term growth of the group or organization.

Students often mistakenly attempt to extend their reasoning beyond the stated models. For example, they might be tempted to draw conclusions about the cohesiveness of a group or the motivation of an individual, Although these outcomes might indeed

occur, they are outside the scope of the stated model and must be addressed by other models. I caution students not to do any more thinking once they have chosen and described the model. At that point, all their thinking has been done and their task becomes plugging in the values of the variables from their data into the "formula" and turning the crank, just as in eighth grade algebra.

Steps 4 and 5: Collecting Data and Testing the Hypotheses

Considering the current focus on exercise analyses, this step is the actual performance of the exercise. I believe that the best exercises are role plays coupled with instruments for measuring concrete outcomes that can be tabulated on a blackboard or flip chart. To the extent that these instruments measure learning from the exercise, this preference is consistent with ABSEL's emerging emphasis on assessment of students' learning.

For example, there are several exercises that involve groups of participants in simple production tasks, such as making origami paper products. Groups are led by peers who have been trained in the task, and have also been secretly' assigned different leadership styles (for example, A!, AII, etc.). After these leaders train their followers during a brief "training period," the groups make products for a specified period of "production time." The output is then judged for quality and quantity, and followers' satisfaction and commitment are measured. Typically, the instructor tabulates all these data for the participants, plots graphs of them against leadership style, and draws conclusions about consequences of different leadership styles. However, if instructors stop there, they leave participants without a way to generalize their learning to future relevant situations and without a framework to help them remember their learning. These two goals are, presumably, the major justifications for experiential exercises.

Step 6: Explaining the Data (Dependent Variables)

This step is sometimes called the exercise analysis. Students must use one or more conceptual models to explain the emergent system: why activities and communications occurred the way they did in the exercise. Or, more accurately, why the dependent variables had the values they did in the exercise. This step is clarified in the outline below.

OUTLINE FOR EXERCISE ANALYSES

I require students to follow this outline format exactly. It itemizes steps 1 through 6 of the scientific method presented in Figure 1. The parts are weighted as shown.

I. (10%) Definition of Problem (Every exercise includes at least two types of problem.
The primary problem is to learn something. The secondary problem usually relates to some kind of task participants must undertake in order to accomplish this learning.)
   A. Learning objectives of the exercise. (The learning objectives of every exercise are stated in the supplementary Course Notes that students purchase.)
   B. Task requirements of the exercise. (This entails a brief description of the required activities and communications -- The "Required System.")

II. (10%) Description of Relevant Model(s)
(Choosing a model can be tricky. For the first few exercises, I tell students which model(s) to use.
Later, they choose the models.)
   A. Description of Model "A"
     1. Define the independent, mediating, moderating, and dependent variables.
     2. Describe the interrelationships among all the variables.
     3. <u>Draw graphs</u> that show all the moderated or complex relationships (if any).
   B., C., etc. (Do steps 1, 2, and 3 for other models as necessary.)

III. (10%) Hypotheses
   A. State the hypotheses generated by Model A.
   B., C., etc. (State hypotheses from other models as necessary.)

IV. (10%) Data -- Describe the "Emergent System". (This is a brief description of the activities, communications, and consequences that actually occurred in the exercise. These outcomes might or might not be the same as the task requirements stated in Part I above.)
   A. Activities and communications: Who did what? Who talked and who did not? Who listened? Be specific about group members' names.
   B. Productivity: What was accomplished?
   C. Satisfaction: What were your feelings? What do you think were the feelings of others, judging from what they said and their body language.

   D. Learning: To what extent were the learning objectives achieved? What did you learn that you didn't know before doing the exercise?

V. (10%) Tests of Hypotheses
   A. To what extent were the hypotheses from Model A confirmed or disconfirmed?
   B., C., etc. (Same for the other models as necessary.)
VI. (40%) Explanation of Results – the dependent variables (<u>Use the models described in Part II above</u> to explain why the activities, communications, and consequences of the emergent system occurred as they did.)
   • Activities and communications: Why did specific people do and say what they did?
   • Productivity: Why were things accomplished or not accomplished?
   • Satisfaction: Why did you (and others as far as you could tell) feel the way you did?
   • Learning: Why were the learning objectives achieved, or not achieved? If you think a learning objective was not achieved, then think again -harder. One of the themes of the course is that you are responsible for your own learning, so you are responsible for making the exercises effective. In other words, don't say that a learning objective was not met. It's mostly your responsibility to make sure that all learning objectives are met. If the role play didn't do it for you, then review your notes on the briefing and especially the debriefing, ask others, and review the associated readings.
   A. Model A.
     1. State the values of the independent and moderating (if any) variables as they occurred in your exercise. (These variables are called "exogenous" variables because they are the outside causes and are not caused by any other variables in the model.)
     2. State the consequent values of the mediating (if any) and dependent variables as they occurred in your exercise. (These variables are called "endogenous" variables because they are caused by other variables in the model.)
     3. <u>Repeat the graphs</u> in Part II above to:
       a. show the cause - effect relationships among all the variables in Model "A".
       b. show the values of all the variables in Model "A" as they occurred in your exercise.
       c. show how the values of each causal (exogenous) variable led to the values of each outcome (endogenous) variable.

4. Recommendations using Model "A"

a. State how the independent or moderating (exogenous) variables of Model "A" could have been changed in your exercise so that the values of the dependent variables would have been more favorable than they were.

5. Predictions using Model "A"

a. Predict the new values of the mediating and dependent (endogenous) variables of Model "A" that would occur if the exogenous variables were changed according to your recommendations. B., C., etc. (Do steps 1 through *5* above for other models as necessary.)

VII. (10%) Applications of the Learning Discuss how you will apply the learning from the exercise to your current or future interpersonal relationships and/or job. Discuss specific activities and communications that you have done and said, are doing and saying, and/or will do and say in your current job and in other current or future relationships.

TIPS FOR A GOOD EXERCISE ANALYSIS

- Show that you've thought about the exercise and the related material (learning objectives, models, issues).
- Show that you've read the associated materials, listened to class discussions, and understood the debriefing.
- Don't try to do any of the above "off the top of your head." In every exercise, there are issues, things to explain, and learning objectives that might not be not obvious. Refer to the stated objectives, the textbook, the Course Notes, and your notes on the exercise debriefing. Then, think about what happened before doing your analysis.
- Don't waste time and space reiterating the rules and procedures.

TIMING

One frequent question concerns the time sequence of learning the models and doing the related exercises. Sometimes my students learn the models before doing the exercises, sometimes afterwards. The advantages and disadvantages of each of these approaches depend on whether I want them to be thinking about the models while they do the exercise, or thinking about the exercise while they learn the models. Usually I like to have people thinking about the models while they do the exercises. After all, the learning objectives are to learn the models, not the exercises. For example, sometimes the discussion following a survival exercise

involves arguments about the validit of the expert's rankings or about survival in general. These arguments are irrelevant to the learning objectives of the exercise, which are to contrast individual with group decision making and to set the foundation for learning about leadership.

Participants who have studied models of group cohesiveness and effectiveness before doing a survival exercise tend to focus on the group issues and ignore the irrelevant survival issues.

Another reason for presenting the conceptual material before doing a related exercise is to give participants an opportunity to apply, or fail to apply, the concepts to their experiences. An example of students' apparent difficulty in applying their book learning almost always occurs in an intergroup role play that pairs groups of "designers" with other groups of "manufacturers." During the previous week, we have covered process models that explain and predict intergroup coordination and its favorable consequences. We have talked about three levels of interdependence (pooled, serial, and reciprocal), and we have discussed several action steps for improving intergroup coordination. Do participants actually do these things in the role play? Only about ten percent of the time! "Are we just memorizing meaningless words?" I ask them. This is not all bad, though, because it gives me a chance to talk about satisficing, adaptability, relevance, and transferability of our learning. Regardless of the timing of concepts vs. experiences, students must learn the models before they can analyze an exercise.

REFERENCES

References will be provided by the author on request.