

# Developments in Business Simulation & Experiential Exercises, Volume 11, 1984

## PROBLEM SOLVING: AN EXERCISE ON LEARNING, COACHING, AND OPERANT CONDITIONING

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### ABSTRACT

This paper presents an experiential exercise designed to put into practice individual and small group behavioral aspects of learning, coaching, and operant conditioning. After attempting to solve a hard problem individually, a series of meetings are held with coaches utilizing different styles of coaching. The effect of the different styles of coaching upon the success of problemsolving, as well as the problems encountered in operationalizing the different styles of coaching are the point of the exercise.

### INTRODUCTION

**Purpose:** To demonstrate concepts of learning and problem solving, including operant conditioning and vicarious learning, and to experience the process of coaching under difficult circumstances.

**Advance Preparation:** The participants should have a basic understanding of the concepts of learning and coaching.

**Group Size:** The exercise is formulated to be done in a group of six, preferably with a group with which there has been prior experiential exercise experience.

**Time required:** Approximately 90 minutes.

**Special materials:** Instruction sheet for each participant, problem solving sheet for each participant, role sheet for each of the three coaches in each group.

**Related topics:** Group dynamics, self-evaluation, perception.

### PROCEDURE

#### Step 1 - Instructions

This step requires 5 minutes. The instruction sheet (Appendix I) is read, and each group of six is randomly divided into three coaches and three problem solvers. The methodology of the exercise, including an individual problem solving step and three meetings with different coaches, is outlined.

#### Step 2 - Individual Problem Solving

This step requires 15 minutes. Working alone, each individual is to solve a problem, such as the multiplication problem shown on the problem sheet (Appendix II). Additionally, each individual answers questions relating to self-confidence, and the evaluation of the abilities of their group members.

#### Step 3 - Coaching

This step requires 30 to 45 minutes. According to the schedule established on the instruction sheet (Appendix I), three successive meetings are held between problem solvers and coaches. Each problem solver gets to experience three

different styles of coaching: positive operant conditioning, negative operant conditioning, and vicarious learning. The instruction sheets for the coaches are given in Appendix III.

#### Step 4 - Discussion

This step requires approximately 25 minutes, and involves a briefing of the results, and a discussion of their significance.

### NOTES TO INSTRUCTORS

This exercise has shown to be extremely useful in providing participants with a feeling for the pros and cons of positive and negative operant conditioning. Previous reading about operant conditioning is helpful in setting up the exercise. The coaching roles can provide extremely useful experience, particularly in those situations where the coach was not able to solve the problem by himself or herself during Step 2 of the exercise. The discussion portion of the exercise usually results in illuminating comments about the operational aspects of operant conditioning and coaching. Interesting outcomes usually result from comparison of the results expected by the participants listed on the questions in Step 2, and the actual results obtained. Significant differences are usually found on individual and group expectations, and these results lead to interesting discussions about the foundations of perceptions of group members, and leadership in the group. A copy of results from a recent application of this exercise is presented in Appendix IV. The answer to Problem 1 is  $2i978 \times 4\ 87912$ , and the answer to Problem 2 is  $9567 + 1085 = 10652$ . The source of the problems was Fixx, Games For the Super-Intelligent, Doubleday, 1972. It is not a requirement of this exercise that the average student be able to solve the problem selected. Indeed, hard problems which cannot be solved in the time allotted for Step 2 are preferable, allowing for continuing problem solving during Step 3.

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## APPENDIX I

### COACHING AND PROBLEM SOLVING

**Instructions and Schedule:**

Each individual in your class group will be assigned the activity of coach or problem solver. During the exercise, the problem solver will meet with various coaches according to the following schedule:

	Coach	Problem Solver
Meeting #1	A	1
	B	2
	C	3
Meeting #2	A	2
	B	3
	C	1
Meeting #3	A	3
	B	1
	C	2

The instructor will assign individual duties, meeting place, and the length of time for each meeting. Please note the list of individual assignments below, as the instructor announces them for your group.

Your Group \_\_\_\_\_

Coaches: A \_\_\_\_\_  
 B \_\_\_\_\_  
 C \_\_\_\_\_

Problem Solver: 1 \_\_\_\_\_  
 2 \_\_\_\_\_  
 3 \_\_\_\_\_

Problem Solvers are to continue with the solution of the problems, but in the presence of the coaches. If you solve the first problem, go on to the second.

Coaches will be given their instructions on a separate sheet of paper.

## APPENDIX II

Your Group \_\_\_\_\_  
 Your Name \_\_\_\_\_

### PROBLEM SOLVING

- a. Referring to the problem below, supply a digit for each letter so that the equation is correct. There is only one set of digits that will work. A given letter always represent the same digit:

$$\begin{array}{r}
 A \ B \ C \ D \ E \\
 \phantom{A \ B \ C \ D \ E} \times 4 \\
 \hline
 E \ D \ C \ B \ A
 \end{array}$$

- b. Do you think that you can solve this problem within 15 minutes?  
       \_\_\_\_\_ Yes       \_\_\_\_\_ No

Which members of your work group do you think can solve this problem within 15 minutes? List them by name. \_\_\_\_\_

If you could select one person from your work group to help you with the solution of this problem, which group member would it be? List the name of the one Person. \_\_\_\_\_

- c. Workspace and solution.

- d. If you finish the first problem, here is another problem which is to be solved following the same rules given in part a.

$$\begin{array}{r}
 S \ E \ N \ D \\
 + M \ O \ R \ E \\
 \hline
 M \ O \ N \ E \ Y
 \end{array}$$

- e. Workspace and solution.

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## APPENDIX III

### COACH A

Your coaching style is to be centered on positive operant conditioning. Reinforce attempts at solving the problem with kind words contingent upon accomplishment. Give intermittent praise and encouragement, feedback on performance, etc. to shape behavior.

One of the other coaches will be using negative operant conditioning, centering upon punishment, to shape behavior. Your coaching style should provide a marked contrast in the environment which the problem solver encounters while trying to solve the problem.

Do not reveal your instructions to any of the problem solvers that you coach! Be evasive if they want to know what you are up to.

Until the instructor calls time, spend a few moments thinking how you will implement positive operant conditioning. After each meeting with a problem solver, reflect upon the kinds of problems and difficulties you encountered in this role. After the completion of the exercise, a general discussion of specific experiences will be held.

If you are not sure of exactly how to solve the problem, do the best that you can to create an atmosphere of reward and positiveness.

### COACH B

Your coaching style is to be centered on negative operant conditioning. Use as punishment unkind words based upon lack of accomplishment. Try to shape behavior by criticism, and telling what isn't being done right. Even if you are not sure how to solve the problem, create an atmosphere of punishment as best as you can.

One of the other coaches will be using positive operant conditioning, centering upon reward, to shape behavior. Your coaching style should provide a marked contrast in the environment in which the problem solver operates.

Do not reveal your instructions to any of the problem solvers that you coach! Be evasive if they want to know what you are up to.

Until the instructor calls time, spend a few moments thinking how you will implement negative operant conditioning. After each meeting with problem solver, reflect upon the kinds of problems and difficulties that you encountered in this role. After the completion of the exercise, a general discussion of specific experiences will be held.

### COACH C

Your coaching style is to be based upon vicarious learning. Have your assigned problem solver listen to you as you solve or recite the solution of a similar problem. You will be given extra copies of the sample problem to share with the problem solver, but do not let the problem solver see your answer sheet, since the vicarious learning is to be based totally upon oral, not visual instruction. Once again, read or recite the demonstration of the solution of the sample problem to the problem solver as often as the time you have together allows. If you do not understand exactly how to solve the problem, do the best that you can in relaying information to the problem solver. If you encounter someone who has solved the first problem, still go through with your training, since your information may be helpful in solving the second problem.

Until the instructor calls time, spend a few moments reading the solution to the sample problem, and thinking how you will implement vicarious learning. After each meeting with a problem solver, reflect upon the kinds of problems and difficulties that you encountered in this role. After the completion of the exercise, a general discussion of specific experiences will be held.

Sample Problem:      A B

$$\begin{array}{r} \phantom{0} \\ \phantom{0} \\ \hline C \quad C \quad B \end{array} \begin{array}{l} \\ \\ \times 5 \\ \\ \hline \phantom{0} \\ \phantom{0} \\ B \end{array}$$

Solution: a) Since B multiplied by 5 results in a B in the answer, B must be either 0, 1, or 5, since these are the only possibilities which can result in this outcome.

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- b) If B was a 0, then  $5 \times 0 = 0$ , with no carryover to the next part of the multiplication~ Therefore,  $5A$  would have to equal  $CC$ . There is no value of  $A$  which when multiplied by 5 gives a result whose two digits are the same. Therefore, B cannot be 0.
- c) If B was 5, then  $5 \times 5 = 25$ ; hence a 2 is carried over to the next part of the multiplication. Therefore,  $5A + 2$  would have to equal  $CC$ . The value of 4 for  $A$  would create the result of  $(5 \times 4) + 2 = 22$ , which gives a result whose two digits are the same.
- d) If B was 3, then  $5 \times 3 = 15$ ; hence a 1 is carried over to the next part of the multiplication. Therefore,  $5A + 1$  would have to equal  $CC$ . The value of 2 for  $A$  would create the result of  $5(2) + 1 = 11$ , which gives a result whose two digits are the same.
- e) Therefore, this sample problem could have two possible solutions, which are:
- $$\begin{array}{r} 45 \\ \times 5 \\ \hline 225 \end{array} \quad \text{and} \quad \begin{array}{r} 23 \\ \times 5 \\ \hline 115 \end{array}$$

However, the problems in the exercise have only one solution!

### APPENDIX IV

#### PROBLEM SOLVING

##### Exercise Results

<u>Group</u>	<u>Member</u>	<u>Can You Solve?</u>	<u>Did You Solve?</u>	<u>Who In Your Group Can Solve?</u>	<u>Who In Your Group Would Be Helpful To Solve?</u>
1	A	Yes	No	C, D, F	D
	B	Yes	No	D, F	F
	C	Yes	Yes	A, D, F	F
	D	No	No	C	C
	E	No	No	D, F	F
	F	<u>Yes</u>	<u>Yes</u>	<u>B, C, D, E</u>	<u>B</u>
		4 Yes	2 Yes	A-1, B-1, C-3,	B-i, C-i,
		2 No	4 No	D-4, E-i, F-4	D-1, F-3
2	A	No	No	C	C
	B	No	No	A, C	C
	C	Yes	Yes	A, F	A
	D	Yes	No	A	A
	E	Yes	Yes, 1&2	A, B, C, D, F	F
	F	=	=	=	=
		3 Yes	2 Yes	A-4, B-i, C-3,	A-2, C-3,
		2 No	3 No	D-1, F-2	F-1
3	A	Yes	No	C, D, F	F
	B	Yes	No	A, C, D, E, F	C
	C	Yes	Yes, 1&2	A, F	A
	D	No	Yes	C, F	C
	E	No	No	A, C, F	C
	F	=	=	=	=
		3 Yes	2 Yes	A-3, C-4, D-2	A-i, C-3,
		2 No	3 No	E-i, F-5	F-i