USING PUZZLES

People who have learned to organize their ideas into sequences or chains of logic can usually reason their way effectively through confused or complicated situations in the business of living.

—*IFTDO NEWS*, newsletter of the International Federation of Training and Development Organizations, July 1983.

In Chapter 6 we learned how to work with games and simulations. In Chapter 7 we studied the exercise and how to work with it. In this chapter we shall explore puzzles and how to work with them in the training situation. We shall conclude our chapter with a general discussion of experiential learning, thus integrating the skill-oriented material contained in Chapters 6, 7, and 8.

Puzzles, another useful tool for the trainer, may be used for various purposes, such as to:

- ☐ Stimulate curiosity and creativity
- ☐ Encourage a broad-gauged, free-flowing approach to problem solving (right-brain thinking)
- ☐ Encourage a logical approach to problem solving (left-brain thinking), whenever appropriate
- ☐ Serve as an icebreaker, i.e., to "loosen up" participants
- ☐ Serve as an opener, i.e., to introduce subjects such as career planning, assertiveness, risk-taking, perception, and following instructions properly.
- ☐ Provide fun, excitement, a change of pace, new experiences
- ☐ Point up that learning need not be dull, dreary, totally didactic
- ☐ Provide for participant involvement (with puzzles everyone "plays")

We will first present a number of puzzles, indicate how to introduce them to a group, and point up the purposes of each of them in the training situation.

Secondly, we will take a global view of puzzles, relating them to current ideas about left/right brain thinking.

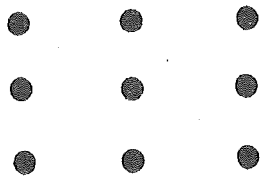
An Assortment of Puzzles

These puzzles serve various substantive purposes, and they come in various formats, i.e., they may be presented visually (via a handout or a flipchart or a blackboard), orally, or physically (via toothpicks, matchsticks, coins).

Nine-Dot Puzzle

This is probably the oldest and most widely used puzzle in training.

Presentation format: The figure may be posted on flipchart/blackboard with oral instructions or it may be given to participants as a handout, complete with written instructions, as in Figure 8-1. Since it is an "old" puzzle, ask those who have seen it before to "disqualify" themselves. Quite often, however, even those who have experienced the puzzle previously have since forgotten its solution.



Instructions: Place the pencil on one of the dots and draw *four* straight lines through all of the remaining dots, without lifting the pencil from the paper or retracing any of the lines you have drawn.

Figure 8-1. The classic Nine-Dot Puzzle as presented to participants.

After several minutes, ask if anyone has the solution. If someone has it, have that person come forward and provide the answer to the group. (A large "display" copy of the puzzle should have been drawn on the flip-chart/blackboard by the trainer as the group worked on the puzzle.) If no one has the answer, provide it yourself. The correct answer is given in Figure 8-2.

Processing: Now ask: "What does this solution tell us?" Some answers are that it teaches us the need to go beyond the boundaries when solving a problem; the need to overcome tunnel vision; and the need to take some new approaches or risks.

Now ask: "Can anyone do it with *three* lines?" This is a request for a still more novel solution and few, if anyone, will figure it out. In any case, here are *two* three-line solutions.

1. Fold the bottom part of the paper so that the bottom line of dots half-covers the middle line of dots. The *overlap* will produce the result shown in Figure 8-3A. Now connect the dots or circles with the three lines as shown in Figure 8-3B.
2. Draw the lines vertically so they slant a bit. Somewhere "out in infinity" they should meet and (hypothetically) permit the three-line result shown in Figure 8-4.

Now ask: "Can anyone do it with *one* line?" Here we are encouraging the group to use its creativity which we hope has been stimulated by the prior challenges. At this point the group may come up with solutions such as the following (if necessary provide one or two possibilities yourself to stimulate their thinking):

1. Just use a paint roller or wide paint brush and make a single, fast downward sweep. (Whoosh!)
2. Connect the lines as in Figure 8-5. (No one said the line had to be straight!)

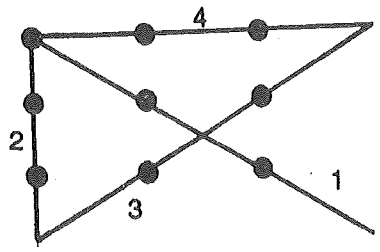


Figure 8-2. Solution to the Nine-Dot Puzzle.

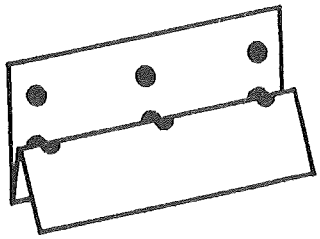


Figure 8-3A. Fold the bottom part of the paper so that the bottom line of dots half-covers the middle line of dots.

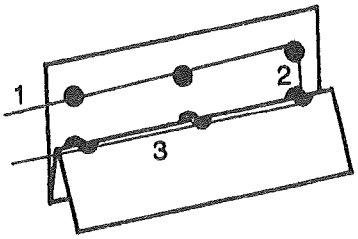


Figure 8-3B. One solution to the Nine-Dot Puzzle using three lines.

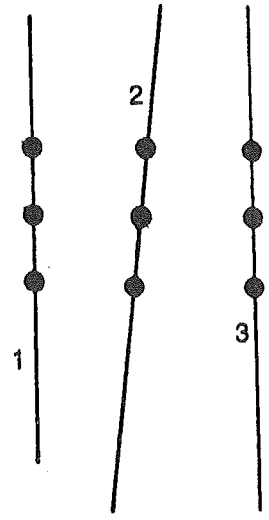


Figure 8-4. One way to solve the Nine-Dot Puzzle with three lines: The lines meet "in infinity."

Figure 8-5. A one-line solution to the Nine-Dot Puzzle: The dots are connected with a curved line.

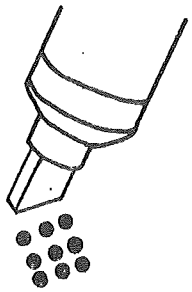


Figure 8-6. A second one-line solution to the Nine-Dot Puzzle: The dots are moved close together so they can be covered by one stroke of a felt-tip pen.

Figure 8-7. Another one-line solution to the Nine-Dot Puzzle: The dots are stacked vertically and one line is drawn through them.

3. Move the nine dots very close together as in Figure 8-6 so that they can be covered in one downward sweep with a felt tip pen. (No one said the dots were stationary and could not be moved.)
4. Stack the nine dots, one on top of the other, and draw a line through them as in Figure 8-7 (!).
5. Make a *double* fold of the paper, and then draw a line through the overlapping lines of dots with a felt tip pen as in Figure 8-8.
6. Move the last line of dots into the middle line and move both of those lines into the first line. Then draw a line through the nine dots, as in Figure 8-9.

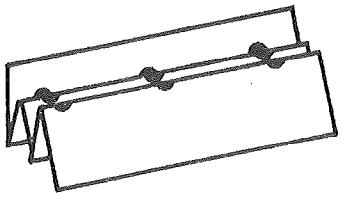


Figure 8-8. A one-line solution to the Nine-Dot Puzzle: If the paper is folded *twice*, the nine dots overlap and one line can be drawn through them with a felt-tip pen.

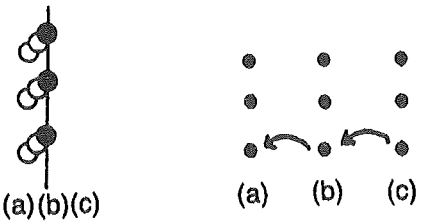


Figure 8-9. By moving the dots in vertical line C to line B, and by moving lines B and C to A, we can then cover the nine dots with a single line drawn vertically.

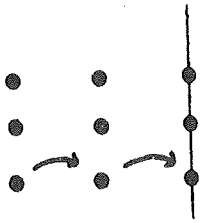


Figure 8-10. A one-line solution to the Nine-Dot Puzzle: A line is drawn through one row of dots and the other two rows are moved onto the line.

one line one line one line
one line one line one line
one line one line one line

Figure 8-11. The word "one line" is superimposed on each of the nine dots.

7. Draw a line through three dots and then move the other two rows of dots *onto* the drawn line as in Figure 8-10.
8. Write "one line" through each dot as in Figure 8-11. (The question was "Can you do it with one line?")

6. Move the last line of dots into the middle line and move both of those lines into the first line. Then draw a line through the nine dots, as in figure 8-9.

There are several practical applications of the nine-dot puzzle, such as to:

- ☐ Point up the need for taking a broad, "free-form" approach to problem solving. Don't hem yourself in by imagined restrictions, regulations, "can't do's," "should not's," etc.
- ☐ Unleash one's creativity by stretching the imagination.
- ☐ Overcome tendencies to lock oneself in career planning: "I'll never pass the math test." "I'll never pass the graduate school entrance exam." "They'll never take a woman (or a black person or a 50-year-old person) for the job."
- ☐ Overcome prejudices and stereotyping: Just as we screen out other possibilities in problem solving by making faulty assumptions (i.e., that we can't go beyond the boundaries), so, too, in assessing people we may prejudge/misjudge them. In other words, let's not limit our potential to understand what they are really like and what they might do.
- ☐ To demonstrate in assertiveness training that there are often other options besides the usual timid, nonproductive approach of "backing off."
- ☐ To encourage risk-taking: "Why stick with the tried and true?" "Why not break out?" "Who is the loser if I always do the conventional thing?"

Cake Cutting Puzzle

Presentation format: Draw an aerial view of a cake on the flipchart as shown in Figure 8-12. Tell the group: "A woman had baked a cake for her party to be attended by eight guests. Her (and your) task is to produce eight pieces of cake with only three cuts of the knife."

Figure 8-12. Can you produce eight pieces of cake with only three cuts of the knife?

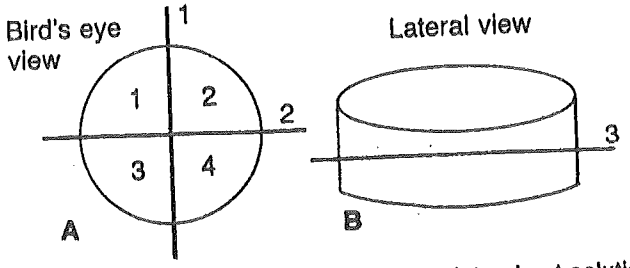


Figure 8-13. The Cake Cutting Puzzle lateral cut solution: (A) Right angle intersecting cuts produce four pieces; (B) a lateral cut produces eight pieces.

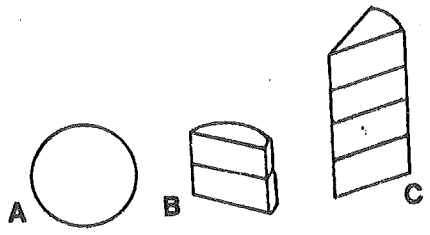


Figure 8-14. The Cake Cutting Puzzle stacking method solution: (A) a vertical cut down the middle produces two pieces; (B) stacking the two pieces and cutting them vertically produces four pieces; (C) a final stacking and cutting of the pieces produces eight pieces.

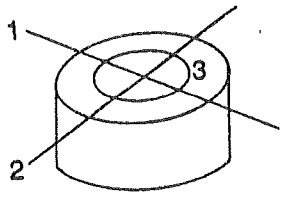


Figure 8-15. The Cake Cutting Puzzle circular cut solution: Two vertical cuts and then a center circular cut are made to produce eight pieces.

Possible Solutions:

1. The Lateral Cut Method: First make two cuts as in Figure 8-13A, which will produce four pieces. Now cut the cake laterally as in Figure 8-13B to give eight pieces, all of equal size.
2. The Stacking Method: Start with one cut across the center and stack the two pieces. Make a vertical cut, producing four pieces, and stack them. Make a final vertical cut, and you have eight pieces, all equal at that. (See Figure 8-14).
3. Center Cut Method: Make two vertical cuts at perpendicular angles, and then a circular cut as in Figure 8-15.

   Note: No one said the pieces had to be equal or the cuts made via a straight line. Remember this is *her* party with *her* guests, and she can cut the cake any way she wishes!

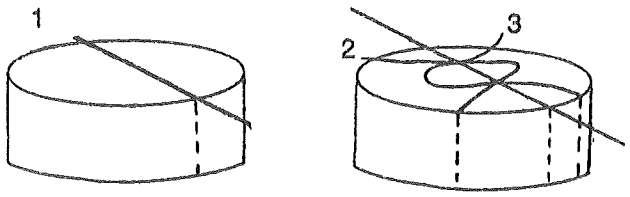


Figure 8-16. A solution to the Cake Cutting Puzzle that uses two curved lines and a center straight cut to produce eight, albeit unequal, pieces.

4. The Disgustingly Sneaky Method: Make one straight cut and two curved ones as shown in Figure 8-16 to produce eight unequal pieces.

Processing: Ask: "What does the puzzle tell us?" Some answers are: "There may be more options than we think; let's stretch our imaginations and we can produce solutions that are varied and unique."

The puzzle may be used to stimulate thinking about problem solving, creative approaches, alternative seeking, etc.

The Garage Window Puzzle

Presentation format: Instructions are given orally since the group has to visualize a garage window. Tell them: "A homeowner had a single garage window which let in only a limited amount of light. He decided to double the amount of light which came in and to do this without changing the height or width of the window. So he measured the window, up and across, as a good carpenter should. It measured 15 inches by 15 inches. He now made four cuts around the window. He had succeeded—twice as much light now came in. He took new measurements and the window was still 15 inches high and 15 inches wide! How come?"

Solution: The window took the form shown in Figure 8-17.

Processing: Ask: "What does this tell us about communication/perception?" Then provide this answer: "You had a picture in your head of a conventional square window; the picture I had was the same square window, but 'tilted' to stand on one point. We had different pictures of windows because our experiences, our worlds, are different. Hence our perceptions are different. So if we try to communicate without 'matching up' or exchanging perceptions, we'll be in deep trouble. Remember, meanings are in people and people are different, so meanings must be shared to ensure understanding of one another's meanings."

The Dollar Bill Quiz

Presentation format: Ask orally: "Can you tell me how many 'one's' there are printed on a dollar bill? No, *not* counting the serial number. This should be easy since all of us use it every day."

Solution: There are 8 "ones" in numbered fashion and 8 more spelled out for a *total* of 16.

Processing: Ask: "Why should it be hard to know the answer when we use and glance at a one dollar bill almost daily?" Answer: "We have a screening mechanism in our heads (selective attention or perceptual choice) that helps us screen out the unnecessary, the unimportant, the details, the trivia. This allows us to get our jobs done properly. If we had to pay attention to all the stimuli that comes at us all of the time, we'd never get through the day. Imagine driving to work and noting precisely each tree, each person and his/her clothing, each house, each store, etc. Of course, this screening device can work the other way, too. It may cause us to overlook pertinent, vital details. For example, we may forget to call George and Mary to our meeting, and they may get pretty mad at us. So we have to be on guard to avoid screening out necessary detail. We can do this via checklists, memos or notes to self, calendar notations, reminders from one's secretary, and so on."

Geometric Figures

Various puzzles challenge us to design geometrical figures such as squares or triangles by using toothpicks or matches.

Presentation format: Pass out a bundle of 24 toothpicks (matches or nails would do, too). Draw on the flip-

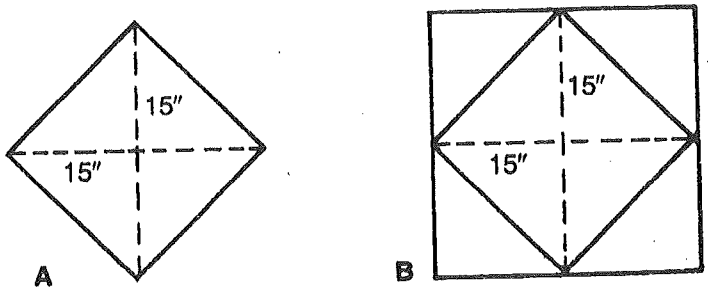


Figure 8-17. The Garage Window Puzzle solution: (A) The window before the cuts are made; (B) the window after the cuts are made.

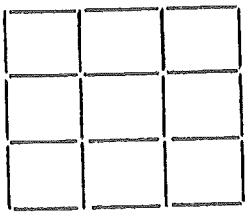


Figure 8-18. A diagram of the figure made of 24 toothpicks used in a geometric puzzle.

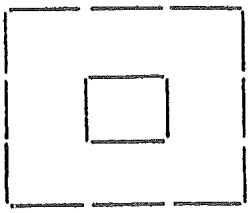


Figure 8-19. Eight toothpicks are removed from the figure, leaving two squares. The solution to the geometric puzzle.

chart the figure illustrated in Figure 8-18; it represents 12 toothpicks down and 12 toothpicks across. The toothpicks are touching each other. Assign this task orally: "Can you make two squares by removing (not moving) eight toothpicks?"

The answer is shown in Figure 8-19.

Presentation format: Pass out a bundle of nine toothpicks. Draw the three triangles on a flipchart as shown in Figure 8-20. Now ask participants to move three toothpicks and come up with five triangles.

Solution:

1. The right triangle is broken up and the three toothpicks are placed as shown by the dotted lines in Figure 8-21.
2. In the second solution (Figure 8-22) the right triangle is moved to the top of the other two triangles as shown. The fifth triangle is the entire configuration.

Processing: Both of these toothpick problems are typical of many puzzles. We know there is a solution, generally simple, but yet it is elusive. Why? Some might say because it takes a kind of imaginative approach, which is hard to achieve in a "strange" field. After all, how much time do we ordinarily spend moving matchsticks or toothpicks around? But there still is a principle for us which applies to our own fields: To be creative or at least to create new applications does not mean we have to be

Figure 8-20. A diagram of the arrangement of the three triangles for the geometric puzzle.

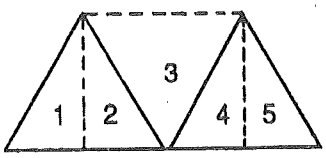


Figure 8-21. A solution to the geometric puzzle involving the three triangles: Five triangles are created by placing the toothpicks from the right triangle in the positions shown.

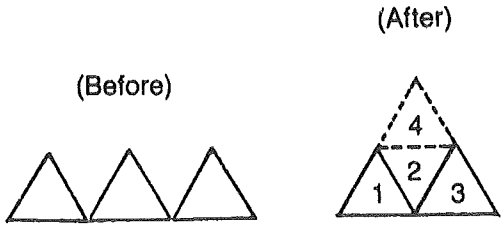


Figure 8-22. A second solution to the triangle puzzle: The right triangle is placed on top of the other two triangles.

an Edison, a Kittering, or a Bill Lear. But it does mean that we have to reassess and reprogram our modes of attack, back off and start again, search for another alternative, explore many possible avenues, be patient, and, most important, we must ask ourselves: "Are we going at this conventionally or are we rising above our conventional approach? Are we settling for a conventional, 'tried and true' solution when what we may really need is a bold, new one ('right brain' thinking)?"

Solution:

1. The right triangle is broken up and the three toothpicks are placed as shown by the dotted lines in Figure 8-21.

How Many Squares?

Presentation format: Make reference to your subject matter (typically a problem of some sort) and say: "Here's a fun task related to it. Total the number of squares that you see and we'll compare scores." Pass out the sheets with the squares, as shown in Figure 8-23. Al-

low several minutes for the task and then post scores to the flipchart as you receive them. Sample:

No. of Squares	Frequency
16	𝍸
17	𝍸 |
18	𝍸 𝍸 |
20	𝍸
24	||

Solution: The "correct" answer is 35 squares. See Figure 8-24.

Uses of the puzzle: This puzzle has several uses or learnings. (You may think of some others than those we provide.) They are:

1. *Be tolerant of different opinions.* Every answer is O.K. No one is really wrong for one's answer is what one happens to see. So if in the course of everyday events people come up with different answers, it's not because they're ignorant, malicious, or stubborn. Rather, they see what they are able (programmed) to see.
2. *Creativity.* In problem solving we should not be content with the "obvious" answer. Typically, we need to keep digging and probing lest we only come up with minimum possibilities.
3. *Planning and problem solving.* Any problem is a puzzle with overlapping pieces. Some parts (squares) are portions of other parts which makes for difficulties in sorting out the pieces. Planning is problem solving in that it is a matter of recognizing how all the (apparently unrelated) parts fit together.

Everyday Things

Presentation format: Pass out the sheet "Everyday Things," shown in Figure 8-25. Ask your participants to "decode" these abbreviations of very familiar things. Allow about 5 minutes for the task.

Uses of the puzzle: It can be used as a "fun thing" to start any session or, possibly, to provide some fun and stimulation if people seem to be showing signs of fatigue. It can also be used in a more profound way. Point out that in problem solving/creative thinking we may get "hemmed in" by overlooking the obvious or commonplace when it appears in another form. *Question:* Are we

How many squares do you see?

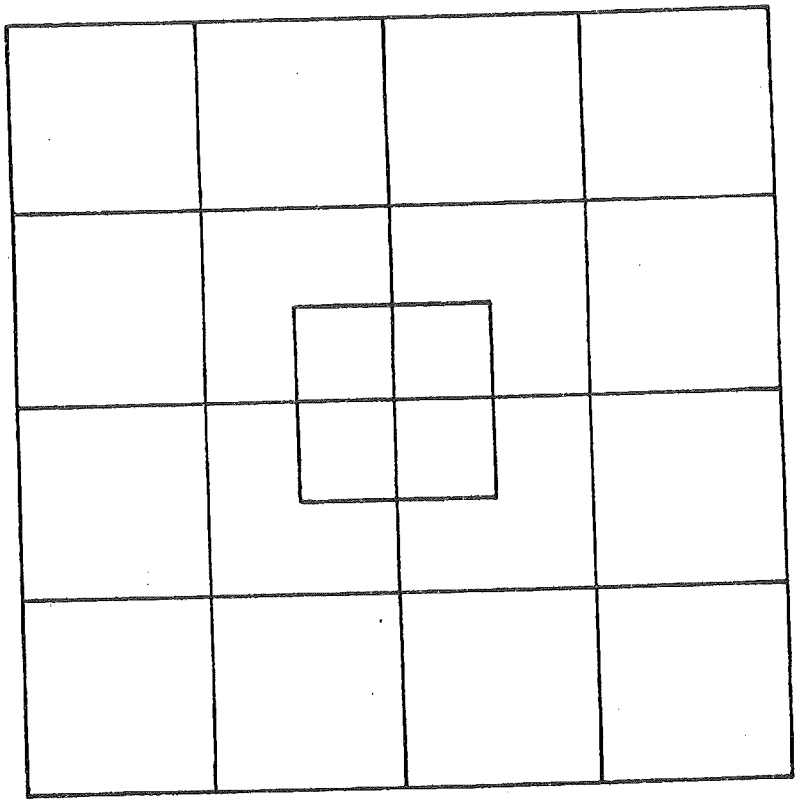
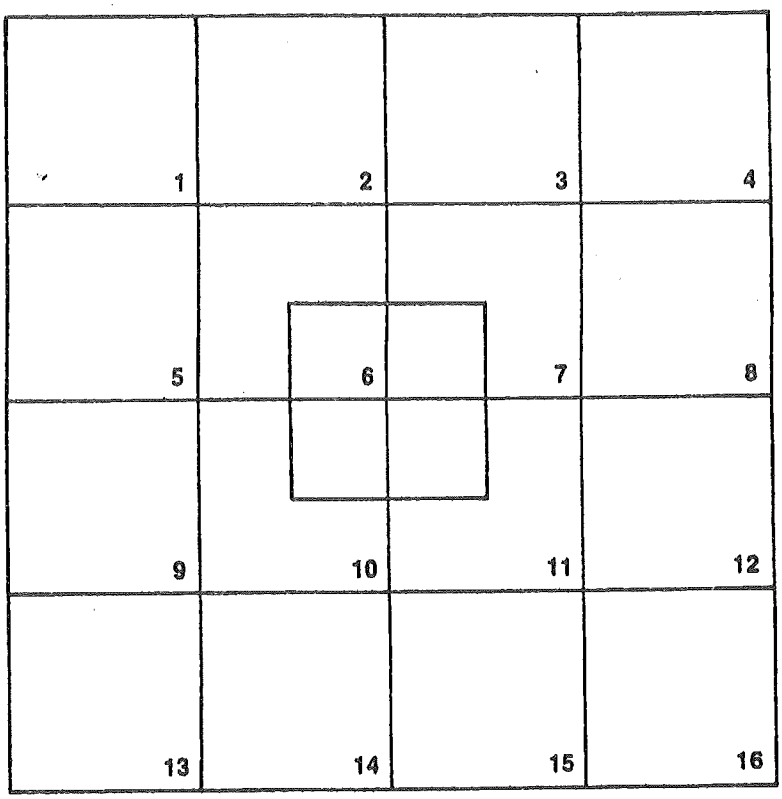


Figure 8-23. Multiple square puzzle.



16—All the 1-in. squares.
1—The entire figure is a square.
4—The 4 small squares in the center of the figure.
1—The 4 small squares combined make a single square.
4—There are 4 easy-to-spot groups of 1-in. squares which form 4-in. squares: top left (1, 2, 5, 6); top right (3, 4, 7, 8); lower left (9, 10, 13, 14); lower right (11, 12, 15, 16).
5—There are 5 other groupings of 4-in. squares: (5, 6, 9, 10); (2, 3, 6, 7); (6, 7, 10, 11); (10, 11, 14, 15); (7, 8, 11, 12).
4—There are 4 groups of 9 squares which form 3-in. squares:
(1, 2, 3; 5, 6, 7; 9, 10, 11);
(5, 6, 7; 9, 10, 11; 13, 14, 15);
(2, 3, 4; 6, 7, 8; 10, 11, 12);
(6, 7, 8; 10, 11, 12; 14, 15, 16).

35—Total no. of squares

Figure 8-24. Thirty-five squares answer sheet.

Everyday Things—What are they?

7 = D. in the W.
32 = D.F. at which W.F.
26 = L. of the A.
54 = P.C. in a D. plus J.
11 = P. on a F.T.
8 = H. in a W.D.
3 = B.M.—S.H.T.R.
64 = S. on a C.B.
3 = L. on a T.L.
100 = S. in the U.S.S.
8 = S. on a S.S.
6 = N. on a D.
7 = C. in the S.
16 = P. in a C.G.
18 = H. on a G.C.
4 = B. on a B.D.

76 = T. led the B.P.
110 = C. close B.

Source: Unknown

Figure 8-25. Abbreviations for *Everyday Things.*

Everyday Things—Answer Sheet

7 = days in the week
32 = degrees Fahrenheit at which water freezes
26 = letters of the alphabet
54 = playing cards in a deck plus Joker
11 = players on a football team
8 = hours in a work day
3 = blind mice—see how they run
64 = squares on a chess board
3 = lights (or lamps) on a traffic light
100 = senators in the U.S. Senate
8 = sides on a stop sign
6 = numbers on a die (as in dice)
7 = colors in the spectrum
16 = pawns in a chess game
18 = holes on a golf course
4 = bases on a ball diamond

76 = trombones led the big parade
110 = clarinets close behind

Source: Unknown

Figure 8-26. Answer sheet for *Everyday Things—What Are They?*

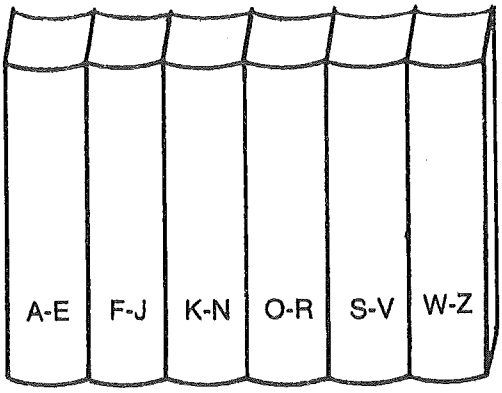
"overprogrammed" with the "tried and true" so that we can't strike out in a new direction? *Note:* In football the mark of an effective quarterback is his ability to "read" new defensive formations and adjust his lines of attack accordingly. Similarly, say in product development or marketing, if conditions have changed, adjustments and new approaches are necessary. A principle worth remembering is this: If you're not getting what you want, quit doing what you're doing! The answers to the puzzle are given in Figure 8-26.

Pun Fun

Presentation format: Pass out the sheet "Check Your I.Q. (Imagination Quotient)" found in Appendix 25. Read off each item on the sheet and secure group responses. Pass out the answer sheet after completing the 22 items.

Use of the puzzle: To "warm up" a participant group about to begin a brainstorming or other problem solving activity, i.e., to get them in a play-oriented, creative mood.

THE ENCYCLOPEDIA ATTACK



A six-volume encylopedia set, which belonged to entymologist Gwen Brown, was attacked by a voracious beetle. The beetle's trip/feast began on page 1 of the first book (A-E) and continued through the last page of the last volume (W-Z).

When Gwen discovered the damage the beetle (bookworm?) had accomplished, she was dismayed. At the same time she, as a scientist, was curious to know how many inches the bug had traversed from the starting to the finishing point. She made her measurements quickly since all six volumes were of the same dimensions:

Thickness of total pages in each book—2½ inches
Thickness of each cover—1/10 inch

Question: What was the length of the journey of our book-biting bug, measured in inches?

Figure 8-27. Instruction sheet for The Encyclopedia Attack puzzle.

The Encyclopedia Attack

Presentation format: Pass out an instruction sheet with the data and drawing, as shown in Figure 8-27.

Solution: Eleven inches. Note that the beetle began his journey on page 1 of the *first* book which is on the *right* side of the book as it rests on the shelf. He finished eating on the last page of the last book which is on the left side of the book. So he ate through *all* of the pages of the *middle four* books, which totals ten inches ($4'' \times 2\frac{1}{2}'' = 10''$). The beetle also ate through *all* the covers of the *middle four* books (eight covers), the *right* cover of the *first* book (one cover), and the *left* cover of the *last* book (one cover); or a total of ten covers, equal to ten tenths or one inch. Ten inches of pages plus one inch of covers equals eleven inches in all.

Processing: Ask: "What is significant about this puzzle? What can we learn from it?" Some answers are: It points up the need for carefulness in interpreting instructions; sometimes one has to look at the instruction from more than one angle to really understand it; also, one must avoid "traps" such as oversimplification in assuming all that there is to the problem is to add a few figures together.

I have told groups who worked on this puzzle that it is a hard puzzle for today's culture; no one reads books anymore because of T.V., so how should one know where page 1 of a book is?

The Farmer's Will

Presentation format: Give the group the following problem, either orally or in writing:

A farmer, who had three sons died. His will stipulated that his 17 cows be divided as follows: one-half to the oldest son, one-third to the middle son and one-ninth to the youngest. Since the sons knew enough about arithmetic to recognize that the 17 cows could not be divided as stipulated, they discussed the problem and finally hit on the idea of seeking help from The Wise Old Man On The Mountain.

So they presented the old man with their dilemma. He listened carefully, was silent a long time, and then said, "Come back in 17 days and I will have a solution for you." They returned at the designated time and The Wise Old Man On The Mountain gave them this solution: "I will lend you one of my cows. Now make your division of your cows." They did, and they found that 18 broke down readily into 9 (one half), 6 (one third), and 2 (one ninth), as the will had required.

The Wise Old Man asked, "Are you satisfied?"

They replied, "Oh, yes. You are very wise."

So the Wise Old Man said: "Since you are satisfied, you don't need my cow any more. I, therefore, will take it back. Please note that nine plus six plus two equals seventeen." They left pleased, but a little perplexed as to the arcane arithmetic the Wise Old Man had employed.

Processing: Ask: "What is going on here? What does the story tell us?" Answer: The three sons thought they had an insoluble problem. Using their conventional problem-solving approaches, they were correct in that assessment. But what was needed was an *unconventional* approach. This was provided by The Wise Old Man who stepped back, looked at the problem in new, more creative and more global terms, and gave it a new framework (the eighteenth cow). So there's nothing really arcane about the arithmetic. Just good right-brain (creative) thinking. Could it be that the farmer expected his sons to do some right-brain thinking?

The Hotel Refund

Presentation format: Present the following data orally or in writing:

Three itinerant farmers bedded down for the night in a motel in a small town, all three in the same room. The desk clerk, a part-time worker, asked for $30.00 which they paid without question. Later that evening, the regular desk clerk discovered that the three farmers had been overcharged. He called his teen-age son over and said, "Our day clerk made a mistake on the rate for Room 42. He overcharged them five bucks. Here's five singles. Split it among those three travelers."

This, understandably, was a tough arithmetic problem for the teenager. But being a sharp kid, he simply gave them each a dollar and pocketed the other two dollar bills. As the boy walked back to the motel office he thought about the new rate the men had received. It was now $9.00 each ($30 divided by 3 = $10, and $10 − $1 = $9). But, he thought to himself: "Three times nine dollars equals twenty-seven dollars, and I've got two bucks, which only totals twenty-nine dollars. Where is the other buck?"

Processing: Ask: "What's going on here?" Answer: The teenager is simply trying to resolve too much at once. He is simultaneously (and unnecessarily) looking at the problem from *two* standpoints: i.e., what the farmers paid for their motel room and what monies are circulating outside their room. What our teenager should do is to engage in very logical left-brain thinking; that is, just deal with three clear-cut realities: The three farmers paid $27, the hotel collected or netted $25 ($30 less the returned 5 singles), and the teenager now has two unexpected bucks in his pocket. In these terms, there is no problem at all for the boy. But if he persists on focusing on and intermingling two unrelated issues, one of which is really irrelevant, he will be eternally confused. Moral: Try to define a problem in its simplest, most coherent, and uncluttered terms; don't use right-brain thinking (creative approaches) on a left-brain (logical) problem.

Bookkeepers, who necessarily engage in a lot of left brain thinking, would immediately see that there is no missing dollar. They would simply look at the *expenditures* involved: the $27 ($25 in the hotel till and $2 in the boy's pocket). And the initial outlay—$30—of the lodgers now looks like this: the hotel racked up $25, the farmers had the rebate of $3 and the teenager had a self-administered tip of $2. Why the confusion? Our bookkeepers would point out that the trouble arose because the lad added an *asset* ($2) to an *expense* ($27) instead of the other asset ($25)!

Both of these problems, i.e., the division of the 17 cows and the $5 refund, have appeared in many formats and in many places. They are classic cases of "good" puzzles. In fact, they are so good that in one sense they can't be answered: Where is the missing dollar? Were the 17 cows divided fairly?

One writer, Robert H. Long, director, Advanced Studies, Bank Administration Institute, Park Ridge, Illinois, has analyzed these two stories in terms of problem-solving principles and left-brain, right-brain thinking.[1] He asserts that poor problem solving is often a result of "one-sided" thinking, whereas coordinated, two-hemisphere (left and right brain) thinking could easily resolve things. He sees both puzzles as illustrations of how problem formulation, language and logic can cause problems rather than generate solutions. Long's analysis of the puzzles is this: "Combining these parts of different situational viewpoints creates a verbal illusion—and an unresolvable problem—as long as these two viewpoints remain in the same problem statement."

Here is a final personal incident to illustrate the power of creative, right-brain thinking in a simple problem in the office. I asked the typist to provide "bullets" to a manuscript. Bullets are black dots placed before key words or sentences to highlight them; e.g.,

- Communication
- Motivation
- Innovation

The typist said this was difficult to do with her word processor. She asked if "dashes" would do. I said O.K.

Several days later a manuscript appeared in the office from an outside author, with nice big, round, black bul

lets. They were used in several places. I happened to notice, however, that one set of bullets had not been "filled in" and were just o's:

o Communication
o Motivation
o Innovation

The author had come up with a creative solution to the bullet typing problem: regular o's were typed and then filled in with a thick-pointed black-ink pen!

I then asked several other expert typists if they could make nice, large bullets if they had to. None could. (They could, of course use periods to form small bullets.) In each case I showed them the manuscript with the black o's and then the "plain" o's. Their jaws dropped.

Question: Are we doing enough to train people to use right-brain thinking?

Summary Chart. Table 8-1 sums up the significance and uses of the previously presented puzzles.

Puzzles for Fun

The previous paragraphs have discussed the use of puzzles in relation to the subject matter being treated. It may also be desirable, at times, to introduce puzzles as a

Table 8-1
A Summary of Puzzle Uses

Puzzle	Uses in the Training Situation
Nine dots Cutting the Cake	Learnings: In problem solving • Go outside the boundaries • Take some risks • Take new approaches • Avoid "tunnel vision" • Avoid setting artificial limits In creative thinking • Stretch the imagination • Use the right brain In career planning • Overcome tendencies to set up unrealistic limits, restraints, barriers In dealing with prejudice • Overcome tendencies to stereotype, limit, or narrowly define others In assertiveness training • Look for new options as opposed to staying "frozen" in a given nonproductive position
The Garage Window	Perception: When we are not "on the same wavelength" with others, we make assumptions that are not likely to be valid, hence the need to share perceptions for effective communication
Dollar Bill Quiz	Perception: The screening mechanism in our heads can eliminate unnecessary detail; it may also screen out important information
Geometric Puzzles (using toothpicks or matches)	Learnings: • Look for new approaches • Use the right brain to solve problems creatively rather than conventionally
How Many Squares?	Learnings: • Respect the opinions of others • Planning entails understanding many overlapping parts • Problem solving requires persistence, looking beyond the obvious
Pun Fun ("Check Your I.Q.")	Uses: • To warm up the group • To provoke curiosity
The Encyclopedia Attack	Learnings: • Follow instructions carefully • Avoid making faulty assumptions or oversimplifying
The Farmer's Will	Learning: Creative, right-brain approaches to a problem are important
The Hotel Refund	Learnings: • There are times when logical, left-brain thinking is appropriate • Define a problem clearly and simply, and avoid extraneous considerations
Everyday Things	Learnings: • Shows need to overcome tendencies to be limited by our "programming" • Demonstrates the need to adjust to new conditions

change of pace, a relaxer, attention stimulator, etc., without any direct integration with a topic at all. Thus the puzzles need not be learning tools, but rather "fun things." Some puzzles of the fun type follow.

Bowling Pin Puzzle

Tell participants: "Ten bowling pins are set up in conventional bowling array." (Post the configuration shown in Figure 8-28A on the flipchart.) "Your task is to move three pins and thereby produce a totally reverse effect; that is, the first pin should be on top and the four pins on the bottom."

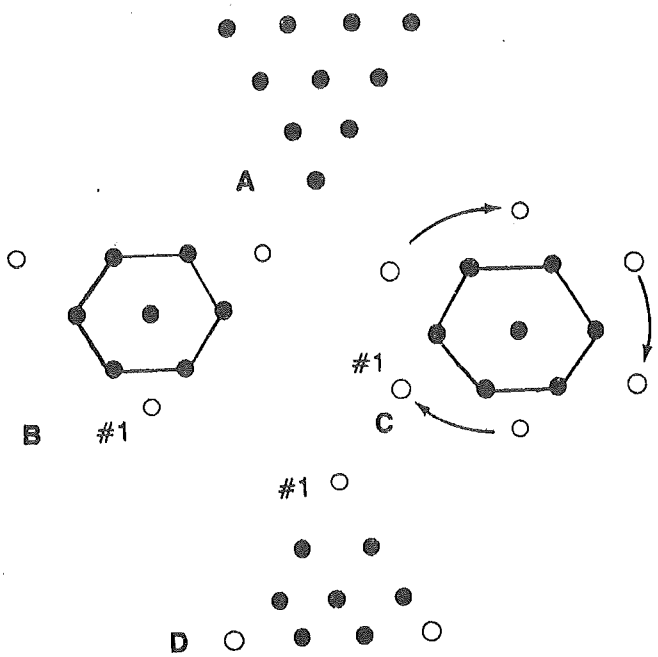


Figure 8-28. The Bowling Pin Puzzle: (A) This diagram of the configuration is drawn for the participants; (B) a line enclosing or linking seven of the pins is drawn; (C) the three pins are rearranged; (D) the final solution—the configuration is reversed.

The answer may be given out later in the day if no one comes up with the solution immediately.

Solution: Draw a ring hooking up or enclosing the seven pins as shown in Figure 8-28B. Then move pin number one to the line immediately above and place it on the left; move another pin from the top line to form a new row of four as shown in 8-28C. Finally move the far-left pin in the original row of four to the number one position as shown in 8-28C. (The line of three pins was not touched.)

This is a very straightforward puzzle that only requires the use of logical thinking and spatial visualization to achieve the correct solution.

Six Figure Puzzle

If you wish to provide a more "sneaky" puzzle, draw the following figure and tell participants: "Make this figure into a six by adding one line."

IX

Solution:

1. Add an "S" as shown:

SIX

Note: No one said the line had to be a straight one or that only Roman numerals were involved. (Why limit yourself by setting up a particular frame of reference?)

2. In this approach add the line as shown:

IXI

Then count all the lines and *segments* thereof. The left line equals one line; the X, counting its segments equals four lines (!); and the line on the right is one line, again. So we have made the figure "IX" into six.

Experiential Learning

When your training activities provide participants with the opportunity to *experience* their learning rather than to be told what they are to learn, you are providing experiential learning. Helpful synonyms for such learning are "discovery learning," "experience-based learning," "action learning" and "interactive learning."

The significant differences between experiential and traditional classroom learning can be summarized with the aid of Table 8-2.

We can understand experiential learning better if we look at adult learners and the things that they don't need or want and which, thus, are quite likely to turn them off:

- ☐ Sitting and listening (one-way communication)
- ☐ Note taking
- ☐ High formality
- ☐ Isolation from peers (They want interaction)
- ☐ Tests, grades
- ☐ Overload of theory
- ☐ Homework (unless it contributes to learning goals and could not be structured in any other way)
- ☐ Evening sessions (unless there is a reason for them, e.g., as in the T-group or the Managerial Grid® or

Table 8-2

Traditional Versus Experiential Learning

Element	Traditional Learning	Experiential Learning
Learning unit	The Individual	The Group and the individual
Learning emphasis	Content	Content and process
Nature of learner involvement	Cognitive (intellectual)	Cognitive and affective (self-knowledge)
Role of participant	Listening, memorizing, passing exams, passive rather than active	Involvement, participation, interaction—highly active
Role of course conductor	Teacher/instructor/ lecturer/presenter/ evaluator	Resource person/ facilitator/trainer; at times a participant too
Responsibility of course conductor	Primarily to provide one-way communication devices (lectures, films, slide talks, panel discussions)	To create conditions for participant experiences from which learning will result
Climate for learning	Formal, inhibiting, status-emphasizing	Informal, relaxed, encouraging, status-reducing
A major concern of course conductor	To come up with "better" questions to ask the class	To find ways to stimulate group members to think of deeper questions and better approaches to finding answers
Responsibility for learning outcome	Instructor/presenter ("If the student hasn't learned, the teacher hasn't taught.")	Participants are responsible for their own learning, for their own behavior
Person whose needs are satisfied most	The Presenter	The Participant
Possibility of transfer of learning to job	Typically low or uncertain	Moderate to high degree for most participants

there is a "trade-off" for recreation time in the afternoon)
- ☐ A lot of reading
- ☐ Being talked down to
- ☐ Gimmicks (they can very easily sort out the "cutesy" from the vital)

In short, they want a learning experience, not a classroom experience.

Objectives

In more specific terms, experiential learning has these objectives:[2]

Affective objectives—Creating changes in one's feelings, attitudes, values from an intense or profound training situation/experience/event is a typical goal.

Empathic objectives—Learning how it feels to be in another's shoes is another goal. For example, being pushed in a wheelchair in a crowded shopping center can help one to realize the unconscious cruelty, patronizing attitudes, and even revulsion with which society treats the handicapped.

Interactive objectives—Learning can also take place at cognitive levels to learn cognitive skills such as interviewing, listening, counseling, debriefing, etc. And with proper structuring by the trainer, participants may experience/perceive the interactions from the view of both parties, e.g., listener-speaker, coach-subordinate, salesperson-customer. *Note:* These cognitive skills typically require affective learning, too, in support of the cognitive.

Higher-level cognitive skills—Evaluation and synthesis skills can also be practiced and learned; feedback to the learner can make certain that the skill will be effective in the real world.

Unlearning objectives—Since many of us carry around such psychological impediments as prejudices, stereotypes, phobias, and the like, it is all to the good if we have the opportunity to "unlearn" them. For example, a good simulation game can help males to divest themselves of male chauvinism; or meek persons can have their confidence built via a series of role-playing opportunities involving returning a damaged article to a store and, in time, doing it in a real store.

Forms

Experiental learning assumes a number of forms, but can be divided into two major types:

1. Learning primarily from one's experience:
   - ☐ T-group
   - ☐ Managerial grid®

- ☐ Team building
- ☐ Encounter groups
- ☐ Instruments
- ☐ Simulations and simulation games
- ☐ Diary or Journal keeping
- ☐ Transactional analysis programs
- ☐ Stress management programs
- ☐ Career planning programs
- ☐ Values clarification programs
- ☐ Assertiveness training programs
- ☐ Time management programs (not the lecture-type course)
- ☐ Conflict management programs
- ☐ Role Plays (Live, real, or current cases)

2. Learning from structured or trainer-prepared experiences:
   - ☐ Icebreakers
   - ☐ Puzzles
   - ☐ Games
   - ☐ Exercises
   - ☐ Role plays ("canned" or trainer-provided cases)

Obviously, the learning experiences in the first list are likely to be more profound than those in the second. On the other hand, not all trainers may have the skill, inclination, or management support to conduct such training activities and would probably utilize those in the second list.

Although this discussion relates to training events of a formal or planned sort, we know, of course, that participants also may learn from informal or unplanned events, too. This requires the trainer to be alert for the introduction or highlighting of significant "live data" should it arise. For example, in a training session I was conducting where several participants knew one another, a group member complimented another participant on her ability to operate her office (a real estate office) on a team basis with high communication, high cooperation, etc. I asked the recipient of the praise how she felt about the compliment. Her enthusiastic response: "It makes me feel good, real good. I'll communicate this feedback to my staff and we'll all work hard to keep things (the team-type operation) that way."

Designing Experiential Learning

To design such activities (programs, courses) properly, the trainer must pay attention to: the key parameters, basic principles, and various "do's and don't's" of such design. The paragraphs that follow develop these points in detail and reflect the perceptive ideas of Dr. John Jones,[3] a leading exponent and practitioner of experiential learning and co-editor of the many books on structured experiences for experiential learning published by University Associates Publishers, San Diego.

Major parameters in designing experiential learning. Nine parameters or guidepoints, per Dr. Jones, are paramount and can be used as a checklist in planning an experiential training program.

The psychological contract. What degree of involvement do the participants expect? Ideally, their expectations and those of the trainer should be mutual.

The length and timing of the event. Is there enough time to work with the group so that the necessary trust will develop?

The location and physical facilities. Are facilities flexible enough for the program? Is the trainer flexible enough for the program? Is the trainer flexible enough to adjust to "problem-type" facilities? Will there be interruptions, spectators, etc., and how are they to be dealt with?

Familiarity of participants with one another. Should initial tension be expected? Will their past interpersonal history bear on the design or its execution?

Participants' training experience. Have they engaged in prior interactive learning?

Staff size. How much interaction do I need in the design and is the availability of staff a limiting factor?

Size of participant group. Do I recognize that the larger the group the more structure I will have to provide? What if a smaller-size group than expected shows up? What logistical contingencies should I anticipate?

Access to materials and other aids. What A/V and reproduction support do I have?

Follow-through opportunity. Can participants be brought back? If they are brought back, how will this influence the design?

Basic principles in designing experiential learning. In addition to understanding and utilizing the parameters basic to experiential learning, the trainer also must engage in a variety of mental processes, per Dr. John Jones, to design his/her programs. He provides us with ten principles:

Investment/involvement. Since in a sense all learning is experiential, it follows that participants should be occupied and challenged all the time.

Sequencing. Build from prior activities and toward ensuing ones.

Content. Keep all activities related to the job situation. Participants expect activities marked by realism, credibility, practicality, etc.

Processing Don't generate more data than can be analyzed by the group. Remember, the big pay off is from "the talk through." So plan carefully for the discussion period.

Pacing. Keep things lively and moving, but be sensitive to possible fatigue effects. (The afternoon recreation period with an evening session is one way to deal with

this concern.) Going too fast will jeopardize learning.

Goals. Keep things goal-directed throughout the program.

Voluntariness. Since experiential learning is intended to encourage introspection, it inevitably requires disclosure of one's feelings, attitudes, perceptions, values, etc. Giving and receiving feedback may also be entailed. Yet participation must be voluntary in nature. The trainer's zeal to "help" should not permit this principle to be abandoned.

Norms (or expectations). Although it is the trainer's job to encourage sensitivity, participation, experimentation, openness, it must be done only as the participants' "comfort level" allows.

Data. Something is always going on, so data is always present. In fact, there may be more there than one can deal with. So we don't need a lot of gimmicks to manufacture data. Dr. Jones' advice is to publish and focus what is being left unsaid.

Flexibility. Be prepared to change the basic design as the program evolves.

Points to include. Some "do's" in experiential design according to Dr. John Jones are:

- ☐ Find out what you have to work with (people, norms, expectations, facilities).
- ☐ Explore what design elements are and are not "negotiable." (The major source or motivator for negotiation about design change is participants' anxiety, says Jones. This includes fear of what could happen or fear of confronting what actually did.) In general, changes in design should be made only if there is group consensus to do so, for different individuals inevitably will hold different views on what should or did take place.
- ☐ Set clear objectives (and "weld them onto your eyeballs").
- ☐ Plan for contingencies. (Murphy's Law has not been repealed.)
- ☐ Build in "maintenance" for the group and for individual participants—people need to talk about what's going on or anxiety builds up.
- ☐ Establish a "home base." (People need a space to go back to, to talk to someone else about what they learned.)
- ☐ Stress application throughout. (Fun and games are great, but only as they direct learning to the back-home situation.)
- ☐ Walk a colleague through your design—if you can't pass this test, you're in trouble.
- ☐ Provide a general road map; e.g., tell people the coverage extends to 4 rather than 40 topics.
- ☐ Plan to participate yourself. (In fact, the best trainer is one who can become accepted as a member of the group. This phenomenon will occur if the trainer's behavior indicates that the trainer is there to learn, too.)

Actions to avoid. Some "don't's" in experiential design, per Dr. John Jones, are these:

- ☐ Expect the group to be able to design as a group. (So don't let them plan Wednesday night's work if they have never planned before. *Realism* is the operative word.)
- ☐ Overstructure things (e.g., providing excessive detail or procedures).
- ☐ Cover more than people can absorb.
- ☐ Establish participant-trainer distance (e.g., via eating separately, conferring with other trainers so frequently that one sets oneself apart from the group).
- ☐ Take care of people. (You should let people stand up for themselves, exercise their rights, etc.)
- ☐ Use the same design twice. (You should learn from the prior one and revise it accordingly.)
- ☐ Overuse favorite techniques. (Don't be "Johnny One Note.")
- ☐ Use noncumulative units. (Models should correlate with each other.)
- ☐ Include material you don't like (e.g., don't select non-preferred models which you then are certain to shoot down.)
- ☐ Short-change time for the vital discussion/integration phase.

Skill Pointers On Processing

It has been pointed out that processing is the pay-off aspect of experiential learning. Basic skill pointers relative to this are the need for planning, alloting enough time, and keeping things job-related. Added key elements for effective processing are:

- ☐ To decide whether activities will be processed by individuals, small groups, the total group, or some combination of these.
- ☐ Tell participants what to zero in on.
- ☐ Decide who collects the data: the trainer, the participants, observers from the group, outside observers, or some combination of these sources.
- ☐ Decide on formats such as video tape; instruments; oral reports, with or without flipcharts, by individuals, small groups, or the total group.
- ☐ Decide on the role of the trainer(s) in the process.
- ☐ Process at appropriate points during an activity as well as at the end.

Typically, we think of our processing/debriefing of the training experience in terms of reporting back solutions, conclusions, learnings, and so on. But other approaches/aids to processing may also be appropriate, per trainer/consultant Sivasailam Thiagarajan:[4]

- ☐ *Emotional ventilation.* Allow people to let off steam about their experience in the exercise, role play, game, etc. By getting the emotions out, more objective analysis is possible.
- ☐ *Role dropping.* If participants were in particular roles in an exercise or role play, allow time to have them discuss their roles fully as a prelude to the return to the "real world."
- ☐ *Insight sharing.* Have participants exchange perceptions of the experience to serve as the basis for a set of generalizations for discussion.
- ☐ *Hypothesis generating.* Ask participants to focus on cause-effect relationships to provide principles for extended exploration of the topic under review.
- ☐ *Reality check.* Provide a focus as to how closely attuned the experience was to the real world.
- ☐ *Real-world transfer.* To ensure a maximum return from the experience, zero in on how it can be transferred or applied to the work place.
- ☐ *Second thoughts.* After the experiential activity, ask: Would you do things the same way, given another opportunity?
- ☐ *What-ifs.* Ask: If we were to change X, Y, or Z, how would that affect your application of the principles involved?
- ☐ *Formative suggestions.* Secure suggestions to modify (change, improve, expand, reduce) one or more aspects of the training experience. *Note:* a cornerstone of experiential learning is that the "lesson plan" is in no way engraved in stone. Rather, it should be perceived as a dynamic, flexible, versatile learning device which constantly seeks amendment.

Good questions to ask in processing are these, according to Paul Gustavson, manager, organization development, Zilog Inc.:[3]

- ☐ What was the purpose?
- ☐ How did we do against the objectives?
- ☐ What did we learn from the activity?
- ☐ What did we learn about the learning process?
- ☐ What did we learn about our group process?
- ☐ What did we learn about others?
- ☐ What did we do well?
- ☐ What were our areas for improvement?
- ☐ What can we apply to the job?
- ☐ How is this similar to the back-home setting?
- ☐ How is this different from the back-home setting?
- ☐ What changes would you suggest as a result of this?
- ☐ What is your action plan (e.g. objectives, specific steps, time frame, social support, plan for evaluation)?
- ☐ Is this something we can work on? If so, how?
- ☐ Is this something others can work on? If so, how?
- ☐ Why did we do what we did?
- ☐ Why do things seem the way they do?

Ordinarily, we think of the debriefing/processing as something we should do *after* the training experience ends. But as Sivasailam Thiagarajan suggests, it can occur helpfully at other points, too:

- ☐ *Before the experiential activity.* Ask participants to think back on their prior experience(s) related to what is about to take place. This affords an opportunity for comparative insight, using the earlier experience as a "baseline."
- ☐ *During the experience.* With a lengthy activity, it may be helpful to secure mid-point or other interim "readings" or reactions as to what is occurring.
- ☐ *Emergency debriefing.* If things have gone haywire for one reason or another, stop the action. This may be necessary because instructions were not clear, teams may be getting too hostile, people may feel uncomfortable with the thrust of the action, and so on. By providing a debriefing to learn of the cause for the difficulty, tensions can be reduced and "play" resumed.
- ☐ *Delayed briefings.* At times it may be wise to avoid the usual post-activity debriefing. If people need to "cool down" and return to the real world, a coffee break or lunch preceding the processing may be highly appropriate. Or, in some cases, it may even be desirable to carry it over to the next day to get a more "detached" view of the experience.

A final point. If you don't provide formally for the processing of the experience, the participants will do it on their own. And the obvious likelihood is that it will be done in ways, speaking psychologically, which are not what you, as trainer, would hope for.

Key Points

1. Puzzles can provide interest, novelty, and fun; encourage a mind-set oriented toward problem solving and creativity; and involve all participants to a high degree.
2. Experiential learning, which includes learning from unstructured as well as structured experiences, involves the group as well as the individual, stresses process as well as content, reaches both cognitive and affective domains, is active rather than passive, and emphasizes participant rather than instructor responsibility for outcomes.
3. In designing an experiential learning activity, the trainer should consider participant expectations about involvement; length and timing of the experience; adequacy of facilities; participants' prior

training experience as well as their familiarity with one another; size of the group and training staff; and use of aids/materials.

4. Design principles for experiential learning include continual participant involvement; keeping things moving; logical sequencing of activities, concern with realism; avoidance of over-generating data; processing what is generated; voluntary participation; and being prepared to redesign things, if indicated.
5. It is a good idea to subject planned experiential learning activities to a discussion with colleagues and a "dry run," too, if practicable.
6. Processing, the pay off phase of experiential learning, requires concern with such issues as deciding what will be processed and who collects the data, formats for data collection, the trainer's role in the process, and relating the data to actual back-home concerns.

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2. Thiagarajan, S., "Experiential Learning Packages," *National Society for Performance Improvement Journal* (September 1979), p. 14.
3. Presented at the 1980 Annual Conference of the American Society for Training and Development, Anaheim, California.
4. Thiagarajan, Sivasailam, "Debriefing," *Performance and Instruction* (June/July 1986), p. 45.

Recommended Reading

Cooper, Cary L., and Harrison, Kenneth, "Designing and Facilitating Experiential Group Activities: Variables and Issues," in *The 1976 Annual Handbook for Group Facilitators,* Pfeiffer, J. William, and Jones, John E. (Eds.), University Associates Inc., San Diego, 1976, pp. 157–168.

To design and implement experiential training, these variables need to be considered: *initial* variables (learning objectives, learning environment, group structure, training staff); *emergent* variables (management of differences, depth of intervention); and *evaluative* variables (presentation of self, feedback, supportive climate, goal clarity, structure and procedure).

Gibb, Peter, "The Facilitative Trainer," *Training and Development Journal,* July 1982, pp. 14–19.

This presents a tripartite model for program responsibility: (1) leader (traditional trainer) has authority and responsibility; (2) leader and group share responsibility (facilitative trainer); (3) group has authority and responsibility (facilitator). Shows how the facilitative trainer, combining the styles of the other two, functions. The facilitative trainer utilizes participant expectations, secures participant feedback, uses active listening techniques, and communicates in a congruent way.

Marks, Stephen E., and Davis, William L., "The Experiential Learning Model and Its Application to Large Groups," in *The 1975 Annual Handbook for Group Facilitators,* Jones, John E., and Pfeiffer, J. William (Eds.), University Associates, Inc., San Diego, 1975, pp. 161–166.

This compares the experiential with the didactic and therapeutic models, and presents hazards to be avoided when using the experiential model, advantages, rationale for use, and role of facilitator.

Middleman, Ruth R., "The Concept of Structure in Experiential Learning," in *The 1972 Annual Handbook for Group Facilitators,* Pfeiffer, J. William, and Jones, John E. (Eds.), University Associates Publishers, La Jolla, California, pp. 203–210

This discusses the role and importance of structure, e.g., certain experiential learning may use very little (the T-Group) whereas other forms may have quite a bit (such as The NASA Exercise); cites advantages of the structured training experience, e.g., deemphasis on personality of trainer, "psychological safety."

Pfeiffer, J. William, and Jones, John E., "Design Considerations In Laboratory Education," in *The 1973 Annual Handbook For Group Facilitators,* University Associates Publishers, LaJolla, California, 1973, pp. 177–194.

This treats major design parameters to be considered (length of event, number of participants, familiarity of participants with one another); use of particular methods; major considerations in design (sequencing, content, processing); sequencing in personal growth and leadership development programs; acquiring the requisite professional skills to design laboratories.

Pfeiffer, J. William, and Jones, John E., "Introduction To The Structured Experiences Section" in *The 1979 Annual Handbook For Group Facilitators,* University Associates Inc., San Diego, 1979, pp. 3–6.