

five more minutes, again making sure that each person talks for only fifteen seconds. This time, however, *each person must wait three seconds after the person before has spoken before he or she may speak.*

Stage III, Reflecting—"repeating out loud to the group something of what the person before you has said."

Select a new timekeeper. Keep on discussing the same subject making sure that each person talks for only fifteen seconds and that he or she waits three seconds after the person before has spoken before he or she speaks. In addition, *everyone who speaks must begin by repeating to the group something that was said by the person who spoke immediately before.* This is called *reflecting*. The person who has spoken before has to nod his or her head to mean yes if he or she thinks this reflection is right. The new speaker may not continue until he or she correctly reflects what the person before has said.

Stage IV, Everyone contributes—"all the people in the group have to speak"

Select a new timekeeper. Keep on discussing the same subject for five more minutes. All previous rules apply, as well as a new one: *No one may speak a second time until everyone in the group has spoken.*

After each stage ask each timekeeper to report on how well their group did on the skill being practiced. The timekeeper may have other observations to make about how difficult it was and what happened. Remind the class why each skill is important.

Posttest

Select a person as observer who has not yet had a chance to play a role like timekeeper. Hold five more minutes of discussion without having to observe the rules but trying to use the skills of *conciseness, listening, reflecting, and contributions by everyone.* Observers will note down every time they see good examples of each of these behaviors. You may want to create a scoring sheet.

After the posttest, ask observers to tell what they observed. Also ask the whole class what were some of the differences between the pretest and the posttest.

Note: Unless the class has had some previous experience with discussion, you will find that they will finish discussion tasks very rapidly. You will need to have alternative questions or tasks prepared. Sample discussion tasks are given at the end of this Appendix.

IMPROVING GROUP PROCESS SKILLS

The Four-Stage Rocket may be enough to get the groupwork started. However, there are additional skills, especially for group pro-

ects, that become more important as groups attempt longer-term, more ambitious projects. One can develop lists of constructive and destructive behaviors for improving group process skills.

Constructive behaviors are ways that help to get the group's work done. A skillful group member

- Has *new ideas*
- Requests or provides information
- Explains ideas
- Puts ideas together
- Asks if everyone is ready to decide what to do.

Especially *constructive behaviors* are those that assist with the smooth operation of the group. A constructive group member

- Asks quiet group members what they think
- Listens with interest to what other people say
- Praises good ideas and suggestions
- Is willing to compromise.

Destructive behaviors are common problems that arise in groups and often result in hurt feelings and a poor group product. A destructive group member

- Talks too much
- Listens very little
- Insists on having his or her ideas accepted
- Fails to do something about the destructive behavior of others
- Criticizes people rather than their ideas
- Lets other people do all the work.

Choose a small number of these behaviors that you think are of critical importance based on what you think the group will need or problems that you have observed during discussions. It is always better if the class members can select behaviors that need work on the basis of their own experience. Explain to the class that this exercise will help them with these particular skills.

Divide the class into discussion groups after you have presented to them the set of behaviors they are going to be working on. Always use the same label to refer to the selected behaviors. Select one observer for each group who will write down every time one of these particular behaviors occurs. Draw up a scoring sheet. Take observers aside in advance and make sure they know how to observe these particular behaviors. Give the groups a discussion topic that they can work on for five or ten minutes.

FIGURE A.6: Grids for "Rainbow Logic"

Example of a Secret Grid

Column A	Column B	Column C	
Green	Yellow	Yellow	Row 3
Green	Green	Yellow	Row 2
Black	Black	Black	Row 1

Patterns Like the Ones Below are Not Allowed

Red		
	Red	
		Red

	Red	
		Red
	Red	

Note: If this seems too easy for the class, try playing with a 4×4 grid with the same rules.

Discussion

The observer for a particular round should keep track of how often people give reasons for their suggestions. The observer should also watch the character of the discussion to see if people really discussed before they came to a decision. Perhaps one person jumped in and asked the question of the grid designer before everyone in the group was heard from or before a controversy was actually resolved.

After most groups have had the chance to complete a few rounds of the exercise, the teacher should stop the action and have observers

from each group report what they have seen. Then the class may discuss how to improve the process of discussion and the process of giving reasons. Let the class proceed to give everyone else a turn at being grid designer and observer. After they have finished the final round, ask the observers to come up and form a panel to discuss whether what they heard improved discussion and giving of reasons in the group in the second part of the lesson. Alternatively, students could write about what they have learned concerning the three cooperative norms and how they fit into groupwork in their subject matter.

Preparing Students for Groupwork That Features Group Discussion

EPSTEIN'S FOUR-STAGE ROCKET

This is the original task designed by Epstein (1972) to improve discussion skills of any age group. There are some minor adaptations of the original version in the material presented.

Pretest

Explain to the class that in order to prepare for the groupwork they need to learn what it takes to have a good group discussion. Divide the class into five-person groups. Give the groups a highly interesting task to discuss. (Two sample discussion tasks are given at the end of Appendix A.) The teacher circulates, listening, observing, and taking notes on examples of good and bad discussion technique. The groups are allowed to discuss for five minutes.

Practicing the four stages

After the pretest, hold a group discussion on what makes for good discussion and what the barriers are. Tell the class that they are going to practice four skills that are necessary so that a discussion can take off like a rocket (use an illustration of a rocket with four stages) by following the instructions given below.

Stage I, Conciseness—"getting quickly to the point and not beating around the bush."

Select a timekeeper who will watch the clock and keep time for the group. Keep on discussing the subject for five minutes. The timekeeper makes sure that *each person talks for only fifteen seconds*.

Stage II, Listening—"paying attention to what is being said."

Select a new timekeeper. Keep on discussing the same subject for

Discussion

Have the students practice asking each other what they think and why they think so. Discuss with them why it is important to try and tell why. This is an important new skill.

A third rule is also important preparation for working at learning stations. Because each student is responsible for his or her own report, it is important that all the students feel responsible for making their own decisions about what to do after consulting others.

All these new behaviors ("Find out what others think," "Tell why," and "Make your own decision") should be printed on a chart and prominently displayed.

As in the previous skillbuilder there should be an observer. The two behaviors an observer can hear and see are

Finding out what others think.

Telling why.

The person who is the observer should have a simple check sheet parallel to the one for Master Designer, but with the new behaviors on it.

You are now ready to have each group play the game and take turns with the various roles. One person is the rule card holder, one is the observer, and the other three are players. After each round, other group members get to be rule card holder and observer. The new rule card holder picks up a new card from the deck, which is face down.

After the game, have the observers report how many times they saw the new behaviors on the round they scored. Ask the students to discuss whether or not it was helpful to them to get other people's opinions. See if you can pick up some good examples of student's telling "why" if they don't come up with these themselves. Have them comment on what it is like to hear opinions different from one's own and to have to consider those ideas before making up one's own mind. Ask them if they know of any other situation that is like this. Point out that they will have to do this at the learning stations.

RAINBOW LOGIC*

This is an exercise developed by the Family Math program to give the students practice in communicating their deductive thinking and spatial reasoning. Students must deduce through a series of questions

*Adapted from Stenmark, Thompson, & Cossey, *Family Math*, Lawrence Hall of Science, Copyright 1987 Regents University of California. All rights reserved.

the pattern of a 3×3 color grid. The grid is constructed using rules about the permissible ways in which squares may be placed. Within those rules the group must discuss and decide on the best questions to ask of the grid designer.

Materials

Colored paper squares for each player

4 each of each of 4 colors (more than needed for solution)

3×3 grids

Procedure

For the first round, the teacher may be the grid designer. A group can be selected to demonstrate the exercise and the rest of the class can gather round to watch. After the first round, students should take turns being the grid designer in their separate groups. Group sizes can vary from 3 to 5. The person who is the grid designer can also play the role of observer.

The grid designer prepares a secret 3×3 color grid, using 3 squares of each color.

Rule: All of the squares of the same color must be connected by at least one full side. See Figure A.6 for examples of permissible and impermissible grids.

The goal is for the players to be able to give the location of all colors on the grid after as few questions as possible. Therefore the group should *discuss and decide* before asking the gridkeeper a question. In the course of the discussion students should share the logic of their thinking. Why will this question get the maximum amount of useful information for solving the problem? During this discussion, there are two new behaviors that the students should learn:

Discuss and decide.

Give reasons for your suggestions.

Rules for asking and answering questions:

Players ask for the colors in a particular row or column (rows are horizontal, columns are vertical).

The grid designer gives the colors, *but not necessarily in order*.

Each player should use a grid and colored paper squares to keep track of clues.

Squares may be put *beside* the row or column until exact places are determined.

one will have to do his or her own report, so it will be important that everyone comes to understand and do things for themselves.

GUESS MY RULE

Objective

This is a game that Rosenholtz (1977) developed to illustrate reasoning skills. Students must deduce a central principle which accounts for all the different colored sizes and shapes that may be placed in the center of a ring. Someone holds a card, called a Rule Card, on which the central principle, such as "Only red shapes," is written. The rule card holder tells the players whether or not their choice of a playing card fits the rule.





Materials

Each group of five (three players, one rule card holder, and one observer) will need to have a set of rule cards, a large circle of yarn, and a special deck of playing cards. Each playing card displays one of four different shapes (circle, square, triangle, and diamond) in one of three sizes (large, medium, and small) and one of three colors (red, blue, and green); making up one card for each possible combination of shape, size, and color results in a deck of 36 cards. Outline the particular shape in the right size and color on the front of each card, and repeat the color on the border of the card. (It is much easier to draw the shapes on uniform card stock than it is to cut out cards in each shape, and the deck made with uniform cards is also much easier for the students to manipulate.) For each group of players you will also need to make up a set of rule cards. These are the cards with the central principle that the players must deduce. The rules are provided in Figure A.5.

Instructions to students

This reasoning game is called "Guess My Rule" and is played with this special deck of cards. As you can see, there are four different shapes in the deck: a circle, a square, a triangle, and a diamond. Each shape comes in three sizes: big, medium, and small. And each size in each shape comes in three different colors: red, blue, and green. There are many ways to sort these cards into categories. I want you each to think of a way. Here I have some rule cards that have on them different ways to sort the deck into various categories. The object of "Guess My Rule" is for you to try to reason out which rule card I am holding. We will put the playing cards in the center of the table, and you will each take turns picking one card. If the card you've picked fits my

FIGURE A.5: Rule Cards for "Guess My Rule"

- 1) Only s
- 2) Only smallest shapes
- 3) Only BIGGEST s
- 4) Only red* shapes
- 5) Only blue* s
- 6) Only red* and blue* s

* Outline these colors and shapes in the appropriate colors.

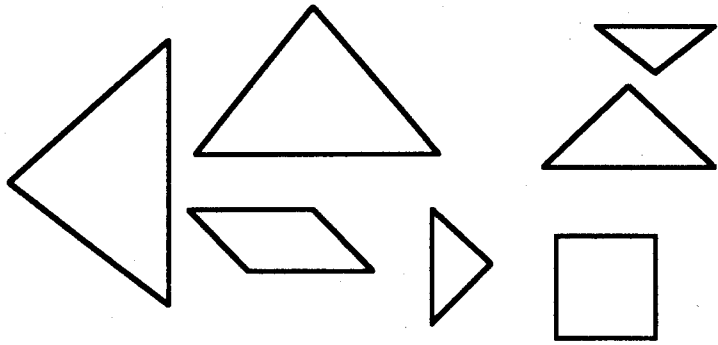
rule, I will say "yes," and you can put it in the yarn circle. If the card you've picked doesn't fit my rule, I will say "no," and you can put it outside the yarn circle. Each person can only pick one card at each turn. Once you've found a couple of cards that fit the rule you can try to reason out what my rule is, but you can only try to guess my rule when it is your turn to pick a card.

(The teacher takes one group and plays one simple round with the teacher as a rule card holder. The other students gather round to watch.)

As you can see this is a game that requires reasoning and some very careful thinking. Many of the things you will be doing at learning stations will require reasoning and thinking. When people have such a difficult problem to solve, one thing they can do is *find out what others think*.

We are going to practice finding out what others think. When it is your turn and you have an idea what the rule is, ask the two other players in your group what they think about your idea. You might say, "I think the rule is all blue shapes. Do you think that's the rule?" If they say yes or no, ask them to *tell why* they think that. After you listen to what they say or if they don't know, ask the other person the same questions. Then *make up your own mind* about what you think is the rule and ask the rule card holder.

FIGURE A.4: "Master Designer" Shapes



ture, it is very important to learn how to justify and give reasons for one's arguments as well as how to make one's thoughts clear to others. Rainbow Logic is included for this purpose. You may wish to develop your own using these as examples of how to pick out a situation that highlights and gives practice to new behaviors.

MASTER DESIGNER

Materials

This game requires a set of geometric shapes. Each player needs a complete set, but one person in each group takes the role of observer and does not require a set. A total of five persons per group is recommended, but smaller groups are acceptable. The shapes should be made out of some sturdy materials such as oaktag. The exact size of these shapes is given in Figure A.4. In addition, you will need some cardboard or other dividers that can be stood on a table. The idea is that each player can see the other members of the group over the divider but *cannot* see what the others are doing with their pieces.

Rules and discussion

One person plays the role of the master designer. This person has to instruct the other players as to how to replicate a design he or she has created with the pieces (all or part of them), but the master designer cannot do this task for them. Players cannot see what the others are doing, nor can they see the design of the master. However, group members may ask questions of the master designer. This illustrates an important new behavior:

Helping students do things for themselves

The group is dependent on the master designer for explaining how it should be done. This is the second new behavior:

Explain by telling how

In addition to verbal directions, students may use sign language to demonstrate to each other. This will help bridge any language differences you may have in your class.

When any member of the group feels that he or she has figured out the master design, the designer is asked to check the solution. If the master designer says it is correct, then that player too is to help others in the group by explaining how. This rule illustrates another important new behavior:

Everybody helps

Make up a bright chart with these three behaviors and display it prominently in the classroom.

After everyone in the group has completed the correct design, another student can take the role of the master designer. If you do not have time for everyone to take a turn, pick a variety of students to play this role—not just the natural leaders.

One student plays the role of observer for each round. The observer watches the group and checks off every time he or she sees two of the three new behaviors occur. These are

Explain by telling how

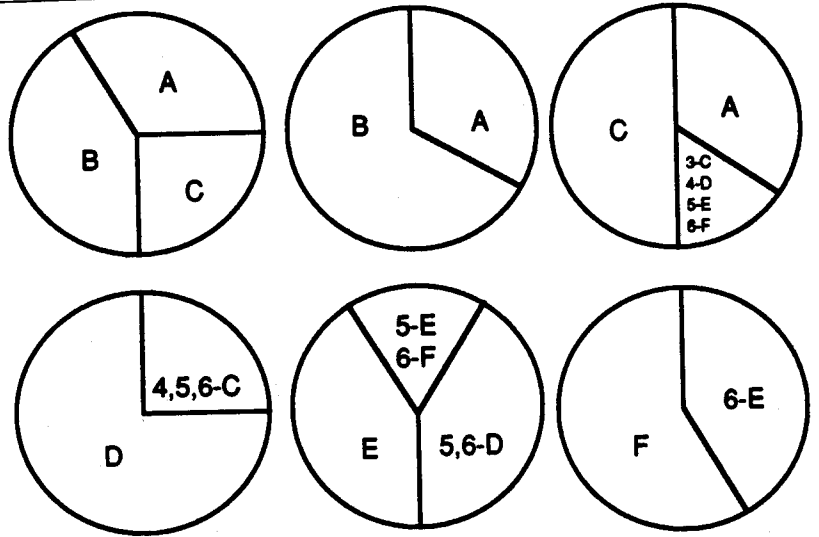
Everybody helps

Also make up a simple scoring sheet so the observer can check off new behaviors every time he or she sees them.

Since this is the first time students have ever been asked to observe, you will need to discuss how a person would know that a student is "telling how" and "helping others." It is not so important that the observer correctly record every time the behavior happens. The fact that someone is watching for and checking off behaviors helps to objectify behavior and will assist the whole group in recognizing such behaviors when they occur.

After the exercise ask each observer to report how many times he or she saw each new behavior. The observer may be able to give some good examples of what was seen. This provides an opportunity for the teacher to reinforce the new behaviors. Follow this with a discussion similar to the one described in detail for Broken Circles. Discuss how these behaviors will be useful for the curriculum. Explain that every-

FIGURE A.3: Advanced Broken Circles



finish first, "How many *other* ways of forming four circles can you discover?"

Advanced Broken Circles. This pattern is suitable for children 8–10 years old who have had some experience with Simple Broken Circles. It may also be used as a first exercise with older children, high school students, and adults.

Figure A.3 shows patterns for Advanced Broken Circles. A single set consists of fifteen pieces that will make six circles, as shown in the figure. Make one set of six circles for each small group. In Figure A.3, the placement of four pieces varies with the size of the group. For example, if you are playing with six-person groups, the piece marked 6-F goes into the F envelope and the 6-E piece goes into the E envelope, the 6-C piece into the C envelope and the 6-D piece into the D envelope. Repeat this pattern for each six-person group.

Once you have sorted a group set into the lettered envelopes, put these envelopes into a larger one. You are now ready to hand out the materials to the small groups.

Although it is fairly easy, once you are familiar with the exercise, to modify on the spot a set of six circles for groups of five or less, it is

easier to make up and label sets of varying sizes in advance. Then these can be quickly substituted when required.

Instructions for making a set of broken circles

The circles can be any size from that shown to about 20 cm. in diameter. However, all the circles within the set should be the same size. Each set of circles should be a different color. This way, each small group will be able to work with pieces that are all of the same color, and different from any other group's color. This will enable you to easily sort the pieces when you are preparing the materials for the exercise.

The easiest way to manufacture the materials for any of the exercises in this appendix is to enlarge the diagrams in the figures with a xerox machine to the desired size. Then use the enlargement to reproduce the patterns on sturdy card stock of different colors. You will want to retain the labels in the diagrams of the circles to indicate in which envelope each piece belongs.

JIGSAW PUZZLES

Pick out some simple jigsaw puzzles. Each group member has a bag with one quarter of the pieces (for a four-person group). They have to complete the puzzle without a picture of the product in front of them. They may talk, but the task cannot be completed without each individual contributing his or her share. One child may not take another's piece and do it for him or her. Hints and encouragement may be given, but all the members must do their own part.

Following this exercise, hold a discussion similar to that suggested for Broken Circles. Bring out how this will be useful during groupwork. Students will each have information and ideas that will help complete the tasks given to the group. By sharing this information and these insights with others, everyone will be able to benefit by learning more from the activity.

Preparing Students for Learning Stations with Individual Reports and Manipulable Materials

In order to work in this setting students will have to learn how to help and explain, to ask questions, and to give good answers. Master Designer and Guess My Rule are two exercises suggested for teaching new behaviors concerning helping and explaining. As the students ma-

any other members of your group, and other group members may give pieces to you. You may not place a piece in another person's puzzle; players must complete only their own puzzles. Instead, hand the piece to the other player, or place it beside the other pieces in front of him or her.

Now you may take the pieces out of your envelope and place them in front of you, colored side up. This is a group task, and you will have 10 minutes to make your circles.

Remember, the task is not finished until each of you at your table has a completed circle in front of you. When all of you have finished, raise your hands. (If one group finishes before the others, suggest that they try to discover if there are any *other* ways they could put the pieces together to form different circles.)

Discussion

When all groups have completed the task or the allotted time has ended, the teacher should help the participants to identify some of the important things that happened, analyze why they happened, and generalize to other group learning situations. The following questions can serve as a guide to the discussion:

- What do you think this game was all about?
- How do you feel about what happened in your group today?
- What things did you do in your group that helped you to be successful in solving the problem?
- What things did you do that made it harder?
- What could the groups do better in the future?

Help participants to be concrete about what they did and also abstract about the general implications of what they did and the lessons they learned for the future. In Advanced Broken Circles, one player may block the task for the rest of the group by completing his or her circle satisfactorily, but refusing to share some pieces with the others. This is analogous to a member of a cooperative learning group who tries to work alone and does not help other members.

In the discussion be sure to come back to the two key behaviors that make a group successful: *Pay attention to what other group members need. No one is done til everyone is done.* Point out when groups report these kinds of behaviors or when they decide that these behaviors will help them to do better in the future.

Directions for making and using Broken Circles are given below.

FIGURE A.1: Simplest Broken Circles

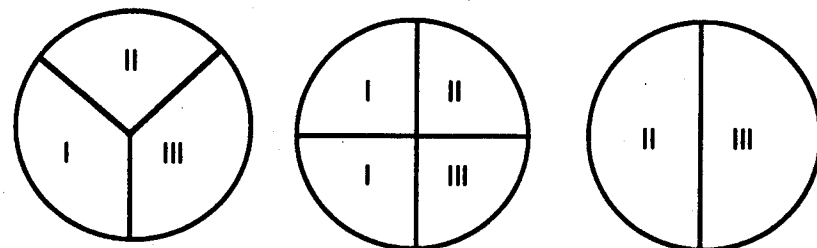
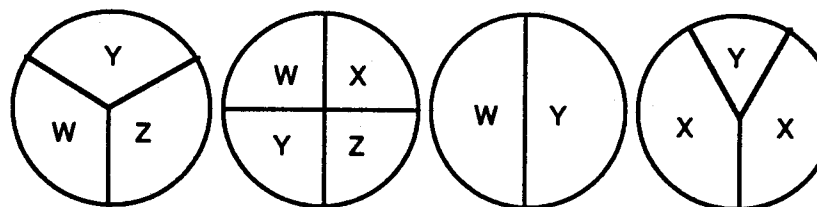


FIGURE A.2: Simple Broken Circles



Directions for three levels of difficulty are presented. You may wish to use the intermediate and advanced versions, going on to the advanced version later in the year if you feel that this particular lesson needs to be reviewed.

Patterns to use for different age students

Simplest Broken Circles. This pattern is suitable for children 5–7 years old in groups of three. Sort the pieces into three envelopes (I, II, and III, as marked in Figure A.1) and give one envelope to each player. Figure A.1 indicates one solution; in this solution each player must give up some of his or her pieces to other players. The diagram shows how pieces held by players I, II, and III can be rearranged to form three circles. Two circles composed of a half and two quarters represents an alternative solution.

Simple Broken Circles. This pattern is suitable for children 8–10 years old in groups of four. Sort the pieces into four envelopes marked W, X, Y, and Z. Figure A.2 indicates one solution. Ask the groups that

teachers, and of a classroom management system using cooperative groups that was carefully researched and implemented. Finally, these results came about as a result of extensive support for the classroom teachers by school personnel and our staff. Each teacher ideally had three sessions with a staff developer based on as many as nine systematic observations of her classroom. Without all this, the results would not have been as consistent and powerful.

What if you have no access to such a high-power approach? You can still put many of the central principles used in the curriculum of *Finding Out* and in complex instruction to work. You can put language into its proper perspective as a tool of communication in a group that is trying to learn something worthwhile. You can use talking and working together to teach concepts. You can implement the classroom management system of cooperative norms and roles. You can create classroom learning stations by adapting from recommended activities in texts; you can create activity cards (preferably in two languages) for cooperative activities that have been published or are exchanged by teachers. You can teach students how to help each other across language barriers. You can provide situations that are rich in comprehensible input and opportunities to converse with peers. You can show students how to use each other as resources so that classrooms with students who are behind grade level need not be deprived of grade-level curriculum or of higher level thinking skills.

In fifteen years of work with teachers and with classroom research, I have found nothing so gratifying as the sight of language minority students working excitedly in groups, learning how to solve difficult intellectual problems for themselves. It is my hope that you who teach such students will decide to design a setting where you too can watch young scholars talking and learning together.

APPENDIX A

Cooperative Training Exercises

Making Students Sensitive to Needs of Others in a Group

BROKEN CIRCLES

The instructions to the participants and suggested discussion given below are those of the developers of Broken Circles, Nancy and Ted Graves (Graves & Graves, 1985). Broken Circles is based on The Broken Squares game invented by Dr. Alex Bavelas (1973).

The class is divided into groups of 3–6 persons. Each person is given an envelope with different pieces of the circle. The goal is for each person to put together a complete circle. In order for this goal to be reached, there must be some exchange of pieces. Group members are not allowed to talk or to take pieces from someone else's envelope. They are allowed only to give away their pieces (one at a time).

Instructions to the participants

Each of you will be given an envelope containing two or three pieces of a puzzle, but don't open it until I say so. The object of this exercise is to put these pieces together in such a way that each member of your group ends up with a complete circle. There are a few rules to make the exercise more fun.

1. This exercise must be played in complete silence. No talking.
2. You may not point or signal to other players with your hands in any way.
3. Each player must put together his or her own circle. No one else may show a player how to do it or do it for him or her.
4. This is an exercise in giving. You may not take a piece from another player, but you may *give* your pieces, one at a time, to