

Complex Instruction

and the

Early Childhood Classroom

submitted by

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Part Two

Working Together to Explore the World of Patterns:

An Instructional Unit

The purpose of this unit is three-fold: to begin developing social skills that will enable young children to work collaboratively, to reinforce and extend students' understanding of patterning, and to identify students' multiple intellectual abilities related to patterning concepts. Young children often enjoy repeating familiar tasks. Therefore, each of the following activities can be used more than one time, each time focusing on a different aspect of the unit. That is to say, an activity may at first be used to emphasize pattern concepts, analyzing patterns that students produce. The same activity can then be repeated one or more times to develop a social skill, such as taking turns or listening to your partner, and to emphasize the multiple abilities that students demonstrate in their work.

Developing Social Skills: Creating Interdependence

Though students may have had many group experiences (i.e. circle time, center activities...) in preschool and early kindergarten activities, work is likely to have been parallel rather than collaborative in nature. With these activities, time is taken to instruct students in how to work with one another. Learning to work collaboratively is difficult, requiring much practice and discussion. Students will work with one partner in the first activity of the unit. This partner element, in and of itself, represents a high level of uncertainty and will provide many opportunities to develop problem solving skills. In the subsequent lesson, pairs will be joined to form small groups of four students. This will allow students to immediately apply the partner social skills to a small group task while learning a related small group social norm. The activities of the unit progress in this manner, alternating partner and small group work.

Creating interdependence is the primary focus in each of these activities. But in order to best assist students in developing competence in collaborative work, one

The debriefing session following each lesson is a critical component of the unit. During the debriefing that students will begin to develop a concrete understanding of interdependence and the value of the social norms. As students discuss their work the teacher should ask each pair or group emphasizing interdependence. For example: "In what ways did you need your partner to complete the activity?; How did you help your partner?"; "How did your partner help you?" Questions related to the specific social norm, such as "How did you and your partner decide to share the materials", should also be asked.

The teacher will determine the pairs and small groups, initially pairing students who are already friendly with one another. A long term goal is for each student to have an opportunity to work with every other student in the class.

The specific social norms taught in this unit are:

- Everyone helps
- Sharing materials with your partner/group
- No one is done until everyone is done
- Discuss and decide (reaching agreement)
- Taking turns and listening to other group members
- Describing accurately

Mathematics Content: Identifying, Creating and Extending Patterns

The 1992 *California Framework for Mathematics* establishes patterning as a unifying idea in that it cannot be specifically related to any single strand of the math curriculum. The broad concept of patterning contains "essential understandings" necessary for students to develop mathematical thinking. As stated in *California's Mathematics Model Curriculum Guide Kindergarten through Grade Eight* (California

functional relationships is a powerful problem-solving tool that enables one to simplify otherwise unmanageable tasks and to make generalizations beyond the information directly available."

These curricular documents also establish the need for mathematics to be taught in a collaborative manner. The ability to work with others must be a significant part of a student's work repertoire and is very relevant to life beyond the school. "Genuine mathematical work, whether done by mathematicians, plumbers, engineers or dental hygienists, typically involves collaboration together with individual work" (California Department of Education, 1992).

Among the Essential Understandings addressed with these activities are:

- Identifying a rule that could have been used to generate a pattern enables one to extend that pattern indefinitely.
- The same patterns can emerge from a variety of settings.

Multiple Abilities:

It is assumed that students have had many opportunities to work with patterning before this cooperative unit is introduced. *Mathematics Their Way* and *Box It and Bag It* are sample math curricula which develop patterning abilities. Students by this point should feel very comfortable working with patterns. Since the content itself is familiar to students, the teacher will be better able to focus on the specific abilities that students employ as they engage in patterning activities.

The following are some of the abilities students may demonstrate:

- ability to describe a pattern accurately
- ability to describe a pattern in many different ways
- ability to analyze patterns (similarities and differences)

- ability to reproduce a pattern
- ability to try different combinations to make a pattern
- ability to make predictions
- ability to visualize a pattern

Roles:

In order to begin delegating authority to students the teacher should assign each student a specific role to play during each activity. Students will take turns with these roles (reinforcing one of the social norms), so that all students will have several opportunities to perform each role.

The roles of Materials Person and Facilitator will be used during both partner and small group activities. The roles of Reporter and Timekeeper will be added when students work in small groups. The responsibilities of each role are as follows:

Materials person—gets any materials needed for the activity.

Facilitator—calls teacher if group needs assistance.

Reporter—starts report to class telling about the groups' work.

Timekeeper—lets group know when work time is finished. (The teacher should set a model clock to the stop time during the orientation to assist timers with their responsibility.)

Brief Orientation (10 minutes or less)

The purpose of the orientation is to provide students with instruction for their group work and to highlight norms, roles, mathematical content and abilities that will help students be successful in completing each task.

During each orientation select one or two key elements to discuss with the class. Attempt to use concrete examples from student work whenever possible. Model and role play the norm, role, or abilities in a variety of ways.

Give directions for the activity using several different models if possible to do so without directly "teaching" the activity. Students will have a visual activity card while they work to remind them of the steps in completing the task.

Group Work

During the activity portion of each lesson, the teacher monitors the groups' work giving students specific feedback on their use of roles and norms, asking probing questions about patterns, or identifying students' abilities. As pairs or small groups finish, they share their work with the teacher. This is another opportunity for the teacher to ask questions and give specific feedback regarding norms, roles, patterning, and multiple abilities. If a new norm has been introduced, students will discuss their success at using the day's new behavior. They can sign their name to a class chart if they were successful with the norm (i.e. We Took Turns!).

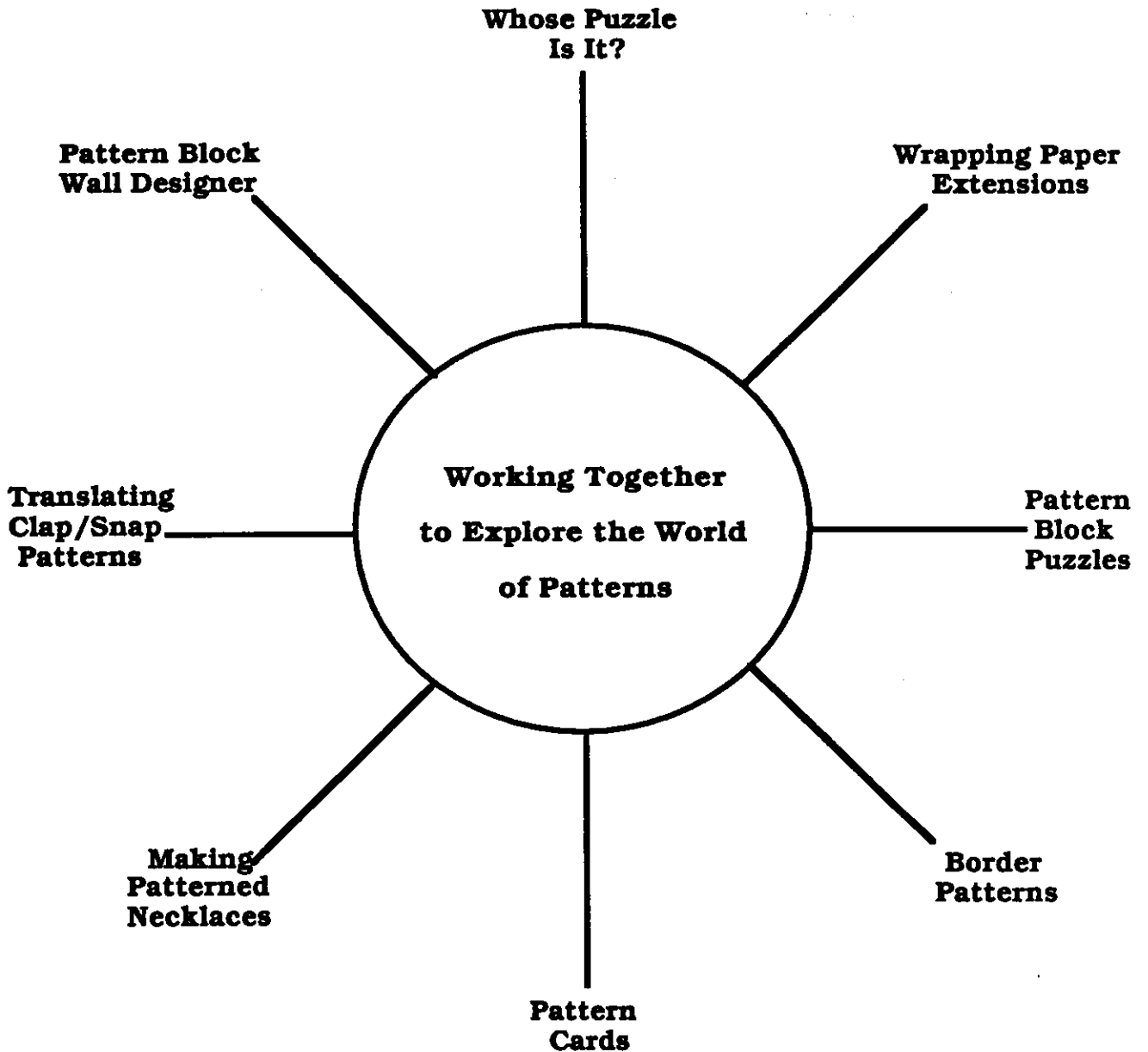
Debriefing

Each group shows their work and tells about how they worked together. In some cases, work will need to be shared by way of a "Gallery Walk" with the class touring the classroom to look at each groups work at the work tables.

intellectual abilities. If status differences have been noted, the teacher will assign

competence to individual, low status students, as appropriate.

Unit Overview



Lesson Matrix

Activity Description	Group Size	Social Norms	Materials
Introductory Activity: Whose Puzzle Is It? Each student contributes one puzzle piece to a class jigsaw puzzle.	Whole Class	Everyone helps	Jigsaw Floor Puzzle/s
Activity 1: Wrapping Paper Extensions Students combine pieces of patterned wallpaper and extend the pattern.	Pair	Sharing materials	Patterned wrapping paper (wallpaper or other patterned paper can be substituted) Construction Paper (9"x12") Markers and/or crayons Glue Sticks
Activity 2: Pattern Block Puzzles Students exchange pattern block pieces to create 4 hexagons.	Small Group	No one is done until everyone is done	Pattern Blocks (triangles, trapezoids, and parallelograms) Hexagon Patterns (see Appendix)
Activity 3: Perimeter Patterns Partners combine shapes to create a patterned border around a sheet of construction paper.	Pair	Everyone helps	Paper Shapes (i.e. calendar cutouts or die-cut shapes) Construction paper (12"x18") Glue sticks
Activity 4: Pattern Cards Students describe visual patterns and translate to clap/snap patterns.	Pair	Taking turns and listening	Deck of Pattern Cards
Activity 5: Making Patterned Necklaces Students create a patterned necklace using colored pasta. The pattern is duplicated so that each group member has a necklace to wear.	Small Group	Discuss and decide	2 types of pasta (i.e. penne pasta and salad macaroni) Food Coloring Alcohol String or Yarn White Glue
Activity 6: Translating Patterns A pattern is presented during the orientation. Each group translates the pattern into at least two other forms.	Small Group	Discuss and decide	Manipulatives (i.e. unifix cubes, pattern blocks, buttons...) Art materials (i.e. crayons, markers, colored paper, glue sticks...)
Activity 7: Pattern Block Wall Designer One student designs a wall using pattern blocks. He/she describes the wall to group until the group is able to replicate the designers wall.	Small Group	Describing accurately	Pattern Blocks File folders

Group Size: Whole class

Materials Needed: Simple jigsaw puzzle/s

Activity: Each student receives one puzzle piece. Students work to assemble puzzle.

Discussion: Who does the puzzle belong to? What do you like about working together? What is difficult? How does working with others help you?

Group Size: Pair

Social Norm: Sharing materials with your partner.

Materials Needed: Squares of wrapping paper* with repeating patterns
(approximately 4" squares) cut into 2 pieces
White construction paper (9"x12")
Colored markers and/or crayons
Glue sticks

Activity: Each student gets one of the pieces of wallpaper. Students decide how they will put the 2 pieces together and then glue them onto a sheet of construction paper. Together they work to extend the wallpaper pattern to fill the construction paper.

*Wallpaper or other patterned paper can be substituted.

Group Size: Small group

Special Norm: No one is done until everyone is done

Materials Needed: Pattern block pieces--3 trapezoids,

4 parallelograms, 7 triangles--divided between 4 zip lock bags for each group as follows:

a) 1 trapezoid, 2 parallelogram;

b) 2 trapezoids, 2 triangles;

c) 1 parallelogram, 3 triangles;

d) 1 parallelogram, 2 triangles.

Hexagon patterns--1 for each student (See Appendix)

Activity: Students work together to create 4 hexagons with their pattern block pieces. Pieces must be combined from each other's bags in order to successfully make all four hexagons. When finished, students can attempt to make the hexagons using a different combination of pieces.

Group Size: Pair

Social Norm: Everyone helps

Materials Needed: Construction paper shapes* (i.e. die-cut calendar markers) in zip lock bags (each student receives approximately 10 of a single shape—partners will have different shapes or different colors of the same shape)
Construction paper (12"x18") for each pair
Glue sticks

Activity: Students decide on a pattern which uses shapes and/or colors from each of their bags. When they agree on their pattern, partners work together to glue the shapes for their pattern around the border of the construction paper. When the border is completed, students may draw a picture of themselves working together.

Adapted from *Mathematics Their Way*.

*Substitute materials may include self-inking rubber stamps or stickers.

Group Size: Small Group

Social Norm: Discuss and decide.

Materials Needed: Zip lock bag containing one colored pasta* of one shape and color for each person. The pasta used in a group will be of 2 colors and 2 shapes (i.e. in a group of 4 distribute pasta as follows: a) blue salad macaroni, b) yellow salad macaroni, c) blue penne pasta, and d) yellow penne pasta).

String (cut and dip one end in white glue; let dry)

Activity: Group members discuss and decide on a pattern using colors and shapes from each of their bags. They string the pasta in this pattern, repeating the pattern until the string is nearly filled. The ends are tied together to make a necklace. Students reproduce their pattern to make an identical necklace for each group member. They wear their necklaces when finished.

*For each color, mix 1 tablespoon of alcohol, a few drops of food coloring, and some macaroni in a glass jar. Screw the lid on tightly and shake until all the pasta is coated. Let dry overnight on sheets of newspaper.

Adapted from *A Collection of Math Lessons from Grades 1 through 3*.

Group Size: Pair

Social Norm: Taking turns and listening to each other.

Materials Needed: 1 deck of pattern cards for each pair (see Appendix)
placed in envelope

Activity: One student draws one card from envelope and reads it to partner. Partners work together to translate the pattern into a clap/snap pattern. Students take turns reading the pattern cards until they have completed the deck.

Group Size: Small group

Social Norm: Discuss and decide.

Materials Needed: a wide variety of manipulatives (i.e. unifix cubes, pattern blocks, buttons, extra materials from previous activities...)
art materials (crayons, colored markers, glue sticks, construction paper...)

During the orientation, present a clap and snap pattern (such as snap, clap, snap, clap, snap, clap) to students. Ask students to translate the pattern into another form. Allow several students to present their patterns. Translated patterns may include: a, b, a, b, a, b...; red, blue, red, blue, red, blue...; stand, sit, stand, sit, stand, sit...

Present a new pattern to the class to translate in their groups.

Activity: Group members discuss and decide on two different representations for the pattern. They may use any materials from the materials table, physical motion, sound, etc. They will present their translations to the class during the debriefing.

Group Size: Small group

Social Norm: Describing accurately.

Materials Needed: 1 set of pattern blocks in a zip lock bag for each child
(group members should have sets that contain at least 10 blocks of the same 3 shapes.)
2 file folders for each group

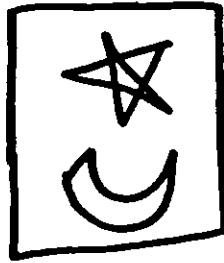
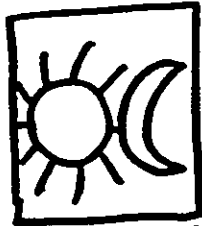
Activity: File folders are used to form a divider around on student who is the designer. The designer creates a patterned wall using pattern blocks from his/her bag and standing them upright and side by side. Once the wall is created, the designer describes the pattern block wall to his/her group. Without looking at the designer's wall, the group attempts to reproduce the pattern block wall. The designer describes the pattern in many different ways until his/her group reproduces the wall. When completed the activity is repeated with a new designer.

Adapted from *Mathematics Their Way*.

Activity Cards

The Activity Cards found on the following pages are pictographic task cards illustrating the necessary steps for each activity. They serve as a reminder to students of what they are to do. Duplicate one card on heavy cardstock for each pair or small group depending on the specific activity.

1)



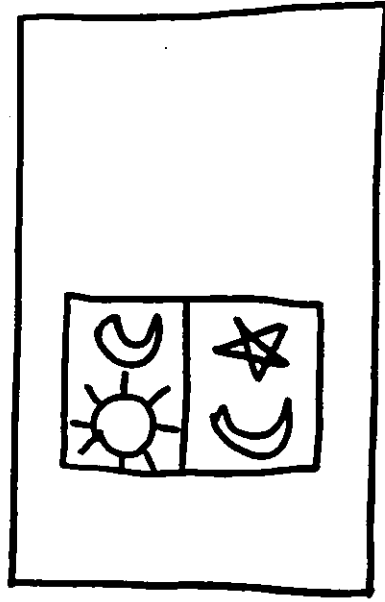
1 piece for each person.

2)

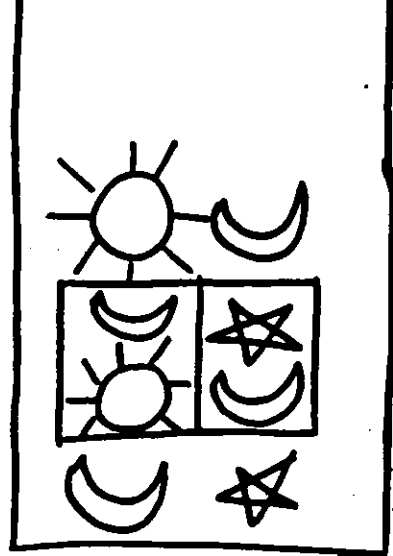


Discuss and Decide

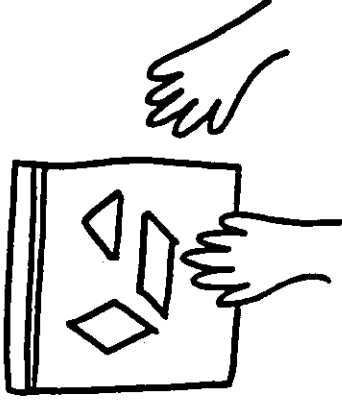
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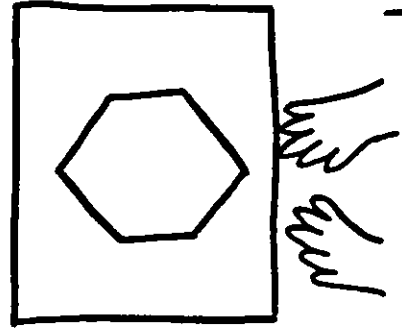


1)



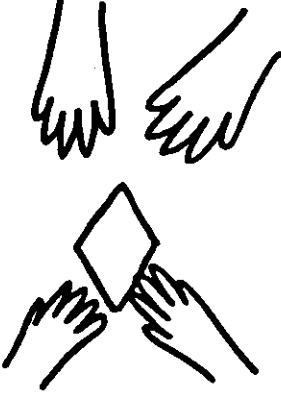
1 bag for each person.

3)



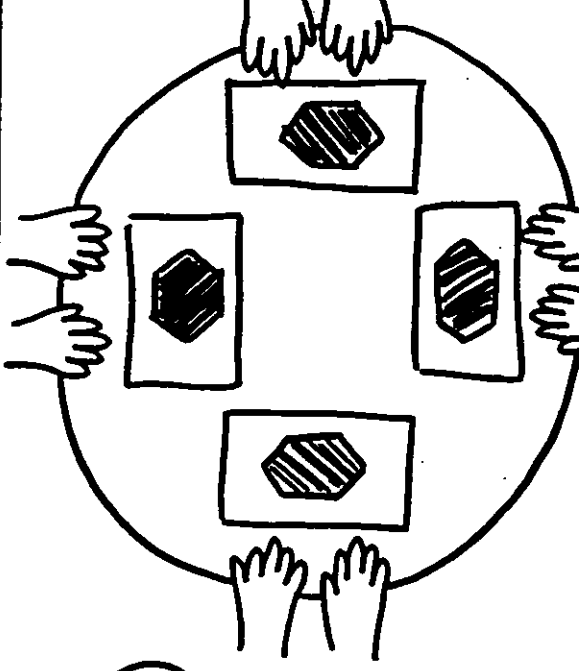
Each

2)

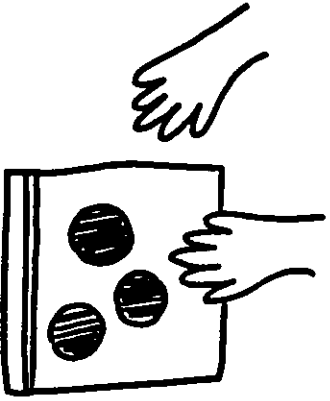


Trade pieces.

4)

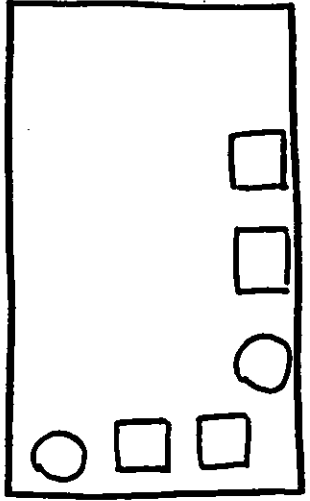


1)

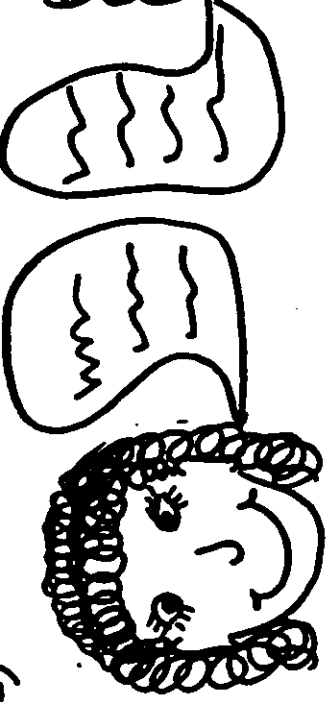


1 bag for each person.

3)

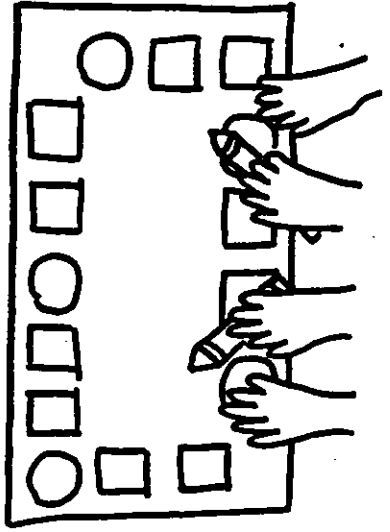


2)

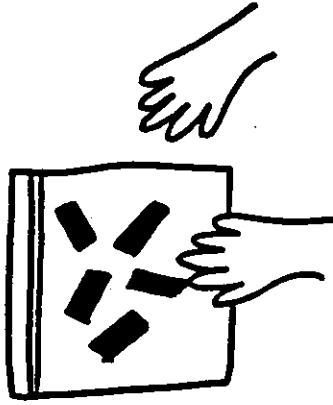


Discuss and Decide.

4)

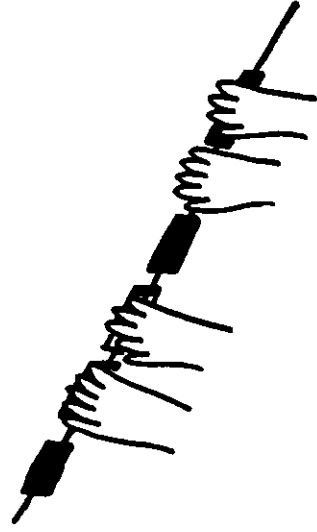


1)



1 bag for each person.

3)

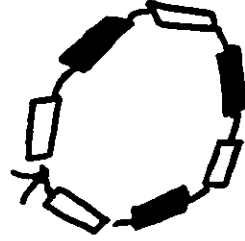
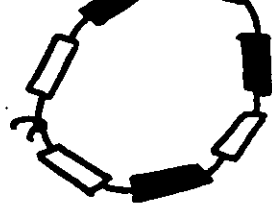


2)



Discuss and Decide

4)



1)



1 person reads card.

3)

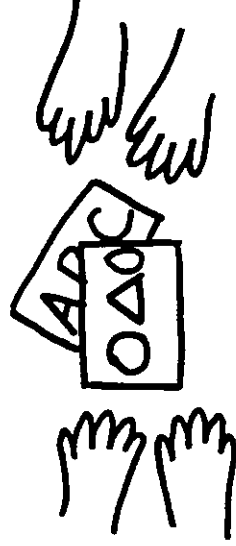


2)



Discuss and Decide

4)



1)

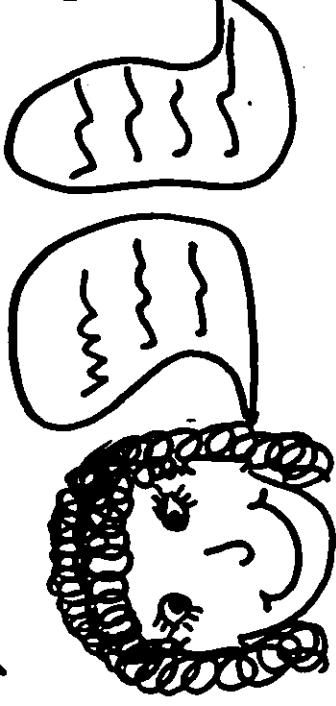


Clap and snap the pattern.

3)

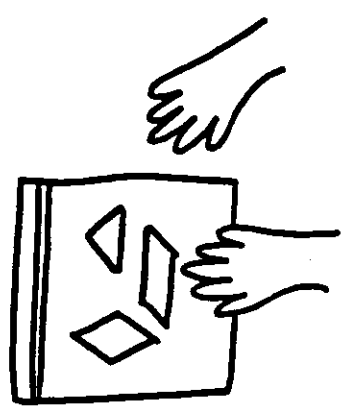


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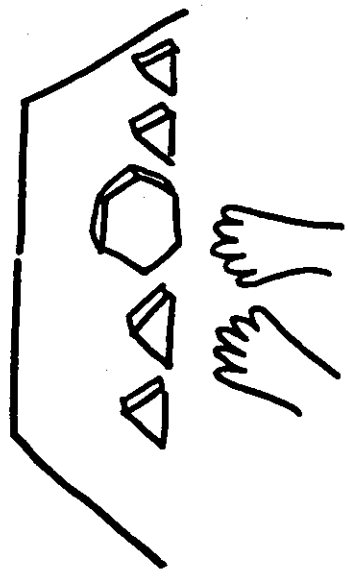
Discuss and Decid

1)



1 bag for each person.

2)

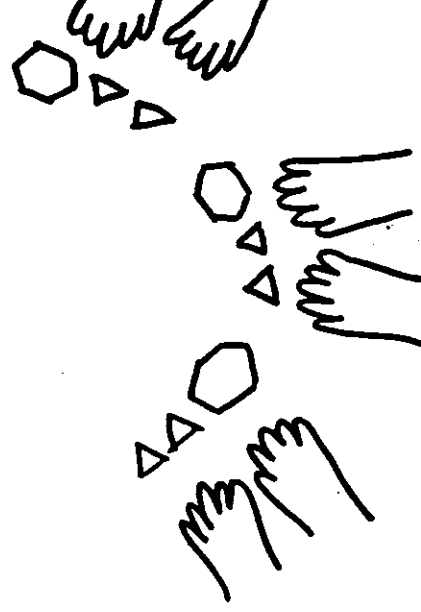


Designer makes a wa...

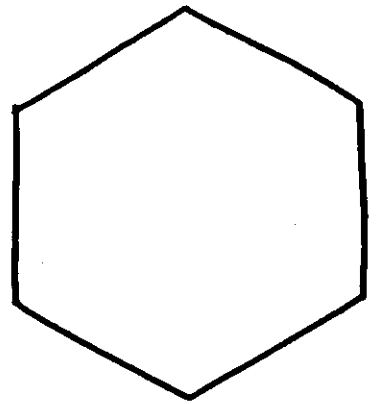
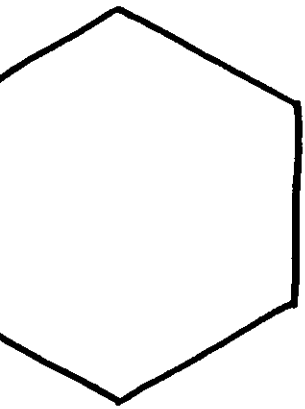
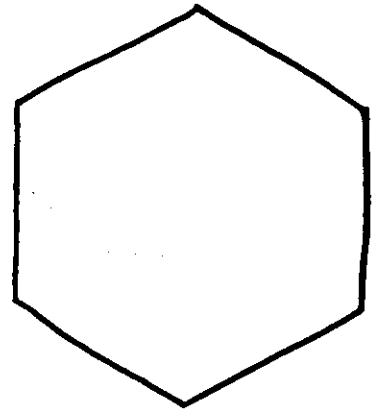
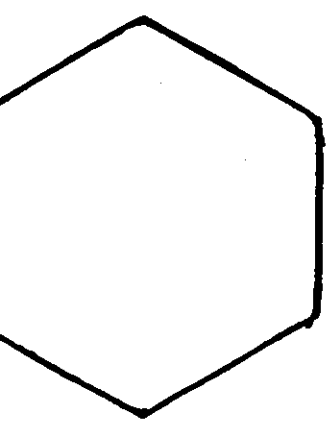
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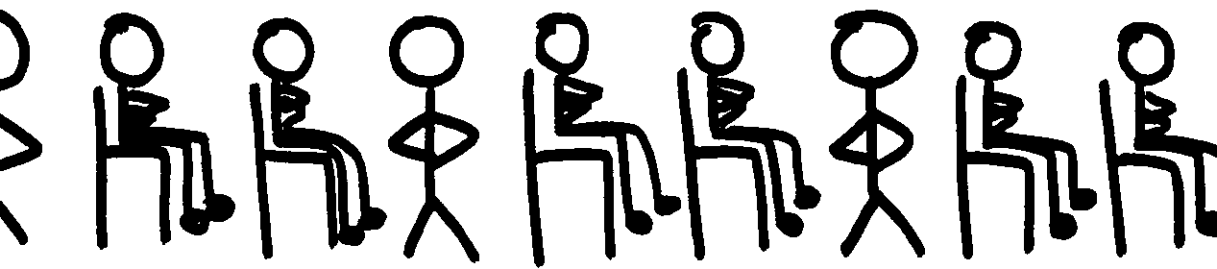
4)



These patterns are to be used for the Pattern Block Puzzles activity. Duplicate the patterns on heavy cardstock and cut into quarters. Distribute one card to each student.



Duplicate one set of the following cards for each pair of students and cut apart. You may wish to laminate cards before cutting.



| | | | | | | | | | | | | | | |

