The Magic Box

Math Grows Up (Patterns/Relationships)

Objective

Students will recognize, describe, create and extend repeating and arithmetic patterns.

Overview of the Lesson

Students are immersed in a variety of activities that give them experience in recognizing, describing and extending repeating and arithmetic patterns. Students begin the lesson by describing patterns they find in the classroom. As the teacher skips rope, students describe the arithmetic or numerical pattern that she is representing. Students are actively engaged in the exploration of patterns as they sing, clap, and identify patterns in the teacher’s “magic box.” They are given shapes and challenged to extend a pattern started by the teacher. Students then work at centers to further investigate patterns. They photograph patterns on the school grounds and building. Students string beads in a pattern, make creations with Tinker Toys and Lincoln Logs, and explore patterns on the computer. They read the Patchwork Quilt and make their own quilt patterns. Some eager mathemagicians make activities for their teacher’s “Magic Box.”

Materials

Teacher:
• Jump rope
• Magic Box (contents contain linking chains, plastic store bags, adding machine tape with numerical patterns printed on it, play one, five, ten, and twenty dollar bills)
• Shower curtain (grid drawn on it)
• Cut-out shapes – stars, clouds, ducks, hearts, etc. (Note, pattern blocks could also be used)

Each Student Pair:
• Envelope with the various cut-out shapes

Each Center:

Photography Center:
• Camera and film

Architecture Center:
• Lincoln Logs
• Tinker Toys

Bead Center:
• Six 20” strings
• Wooden beads of various colors

Listening Center:
• The Patchwork Quilt by Valerie Flournoy
• Tape of the story, The Patchwork Quilt
• Crayons and markers
• Unlined paper for each student
• Tape recorder

Computer Center:
• Computers
• Patternmakers (software)

Magic Box Center:
• Adding machine tape
• Crayons and markers
Procedure

Have students look around the classroom and identify any patterns they see. Students should describe the patterns and tell why they are patterns. Examples might include clothing, bulletin board displays, floor tiles, carpeting, and the calendar.

Use a jump rope to demonstrate arithmetic patterns by jumping once, then jumping two times, jumping three times, etc. Have the students describe the arithmetic pattern of adding one more jump each time.

To give further practice with patterns, review and teach the students “Miss Mary Mack”. Have students use partners to say the rhyme together and as they say the rhyme, they clap their hands together and then clap their partners’ hands.

Show the class a Magic Box. The large box with a removable lid is wrapped in brightly colored paper. Slits have been cut into the sides of the box. One slit has plastic linking chain with patterns of repeated colors. Position the chain in the slit so that only a link is showing from the outside. Select a student to pull the links slowly to see the color of each link. Have the students describe the pattern. Have them predict what the color of the next link will be. Use adding machine tape to make counting or arithmetic patterns (counting by 2’s, 5’s, and 10’s). Position the tape so that only a small portion is protruding from the slit. Students pull the tape and identify the number patterns they see. Plastic bags from different grocery stores can be tied together and positioned in the slits. Students pull on one bag and then identify patterns that emerge from the box. Use large play money and tape the money together end to end. Tape together denominations in a pattern such as two one dollar bills and a five dollar bill, two one dollar bills and a five dollar bill. Position the money in the slit so that only a portion of the first bill is showing.

Show the class a large coordinate grid made from a plastic shower curtain. If possible use magnets to hold it to the chalkboard. Make cut-outs of shapes such as star, circle, duck, heart, etc. Divide the class into pairs. Give each pair an envelope containing the same cut-out shapes. Use the shapes to make a pattern going across the grid. Have the students create the same pattern on their desks with the shapes in the envelope. Ask students to extend the pattern.

To have students further investigate patterns, rotate them through the special pattern centers already set up around the room.
Centers:

Photography Center
Use a parent volunteer to take a group of students around the school or possibly the neighboring community to photograph examples of patterns.

Architecture Center
Students use Lincoln Logs and Tinker Toys to build constructions using their knowledge of patterns.

Bead Center
Students use string and wooden beads to make repeating patterns.

Computer Center
Students use the software, Patternmakers, to make patterns and extend a given pattern.

Magic Box Center
Students use adding machine tape and other materials to make patterns for the Magic Box.

After students have had sufficient time at the centers, assemble the class and have them share what they learned. Ask the students at the Magic Box Center to share an example they made for the box for the class to describe.

Mathematically Speaking...

Patterns can be viewed as the fiber that weaves together such mathematical topics as algebra, geometry, and computational operations. Understanding patterns promotes mathematical thinking that will benefit young learners in becoming good problem solvers and abstract thinkers. Students in later elementary grades use their knowledge of patterns as they record and organize data in a table and then analyze it to discover patterns or trends. Students need to verbalize the rule that explains the pattern in a mathematical way.
Extensions & Connections

Have students examine a hundred chart and identify all of the numerical patterns they can find. Encourage students to explain the pattern in a mathematical way.

Using calculators with a constant function, have students recognize and explain the arithmetic or numerical patterns they discover. To practice skip counting by 3’s, have students press + 3 = = = = etc. Continue with other numbers. Repeated subtraction works well also as children count backwards from 100 by 5’s. (Press 100 - 5 = = = = etc. You may want to caution students to be sure to stop at 0 unless they are ready for a discussion of negative numbers.)

Resources

Patterns, Addenda Series
National Council of Teachers of Mathematics, 1993

The Patchwork Quilt by Valerie Flournoy
Dial Press, New York, New York 1985

Patternmakers software by Anytime Math Kit
Harcourt Brace Publishers
Ideas for Online Discussion

(Some ideas may apply to more than one standard of the NCTM Professional Standards for Teaching Mathematics.)

Standard 1: Worthwhile Mathematical Tasks

• In designing a mathematically significant task for students, one has to consider what the students already know and can do. How do you incorporate these important factors into the design of your learning activities for students? Share a description of a unit you created that included some unique learning centers.

Standard 3: Students’ Role in Discourse

• One of the ways to promote discourse is to carefully listen to what students are saying, and to enter into a dialogue based on their conjectures, thinking and ideas. How important is this to the teaching and learning environment? How do you include these one-on-one dialogues and keep the other students interested and involved?

Standard 5: Learning Environment

• The classroom environment should be in terms of the development of student understanding, and not just feeling good. How do you handle this delicate situation on encouraging students to reach new heights, while at the same time, dealing with student frustration at not being able to succeed in terms of “doing the problem correctly?”