

Instructional Support Strategies/Resources

Patterns, Functions, and Algebra

- 2.3.1 Recognize, describe, and create repeating and increasing patterns using objects, number charts, and charts.
- 2.3.1 [Record results of patterns created using manipulatives, pictures, and numeric representations and describe how they are extended.](#)
- 2.3.1 Use numbers, patterns, and their extensions to solve problems. **I/S**

Content Connection

Third grade students must be able to identify, describe, repeat, and create patterns with numbers and shapes. Analyzing and extending patterns establishes the foundation of algebraic thinking, is an integral part of learning multiplication and division facts, and teaches students to reason. Provide students multiple opportunities to identify, describe, repeat, extend, and create patterns using a variety of materials including numbers and shapes. Teach students to identify patterns that occur naturally in their environment. As students are encouraged to see patterns around them, they will find repeating characteristics in everything. Encourage students to explain their thinking in words and in writing. Challenge students to predict the next parts of patterns and to generalize about patterns. Identifying patterns enables students to find order and predictability in math and the world around them. It helps them to make sense of it all.

Instructional Strategies

1. **Skip Count with a Hundreds Chart**
Have students record specific skip-count patterns on their own charts by coloring the numbers on the chart. Have students discuss the patterns, noting which count makes columns or diagonal patterns. Direct students to study the chart quietly for a few moments and look for patterns then share them with their neighbor and then the class. Typically, children will see patterns in the rows and columns. For

example, the first column has all numbers that end in 0; all the numbers in the bottom row start with 9. Children seldom look for diagonal patterns. You can prompt them to look for different patterns by asking them to describe a pattern you see. Say, “I see a pattern in the numbers that have both digits the same, does anyone else see that pattern? Is it a pattern?” Talk about other patterns, such as odd and even numbers, numbers with a 6 in the ones place, and numbers for which the two digits add to 10. As you talk about these ideas, write them on the board.

- a. Odd numbers
- b. Even numbers
- c. Numbers with both digits the same
- d. Numbers with a 6 in them
- e. Numbers who digits add to 10

Distribute recording sheets with 0-99 charts on them. Have pairs select a pattern to follow and color in the numbers on their charts. Together, they should write a description of the pattern they chose and colored. Have them share their findings with the class.

2. Have students work independently or in groups of two or three to extend patterns with common materials like buttons, colored blocks, Unifix cubes or any items you can gather easily. For each set of materials, draw two or three complete repetitions of a pattern on strips of tag board. The students’ tasks include using the actual materials to copy the patterns shown and extending the pattern as far as they wish. Make 10 to 15 different patterns strips for each set of materials. With six to eight sets, your entire class can work at the same time in small groups, with different patterns and different materials.
3. Repeating pattern elements can be numbered 1, 2, 1, 2 or a, b, a, b, and so on. Provide students with a pattern to extend. Before students begin to extend the pattern, have them predict exactly what the 15th element will be or the 27th element will be. Require students to provide a reason for their prediction, preferably in writing. Students should then extend the patterns and check their prediction. Have students try to figure out why their predictions were right *and* wrong. The idea is to apply reasoning, if students “just guessed” correctly, encourage them to find a way to predict using information they know about the first part of the pattern.

4. Have students extend a growing number pattern you provide. Have them draw the pattern and make a table showing how many items are needed to make each step of the pattern. The objective is to teach students predict the number of items required for the tenth or fifteenth step of the pattern. Students should explain their predictions.

5. Show students five or six numbers from a number pattern. Have them identify and discuss the rule for the pattern and continue it for several more numbers. The difficulty of the task depends on the number pattern and the familiarity of students with searching for patterns. Here is a short list of patterns.

- 1, 2, 1, 2, 1, 2...a simple alternating scheme
- 1, 2, 2, 3, 3, 3...each digit repeats according to its value
- 5, 1, 5, 2, 5, 3...the counting sequence interspersed with 5's
- 1, 2, 4, 8, 16...double the previous number
- 2, 2, 4, 6, 10...add the preceding two numbers

These patterns can be varied by the teacher or by students. The possibilities are endless.

6. Pose the question, “Suppose you build a tower of Unifix cubes that is 99 cubes tall. Then suppose you paint every square (each face of the cubes) on all four sides of the tower, as well as the top (Do not paint the bottom cube.) How many squares do you have to paint? What is the relationship between the height of the tower and the number of squares to paint?” Think about how to solve the problem without continuing the pattern. Look for the functional relationship. Represent the function with a formula and graph enough of the pairs of numbers to describe the pattern made by the points.

(Burns. M. 2000. *About teaching mathematics*. pg. 115.)

Connection to Children’s Literature

Who Sank the Boat by Allen

Why Mosquitoes Buzz in People’s Ears by Aardema

The Secret Birthday Message by Carle

Dots, Spots, Speckles, and Stripes by Hoban

The Case of the Backyard Treasure by Rocklin

Math Potatoes by Tang
More or Less a Mess by Keenen