Patterns of Change

5. Identifying patterns of change is necessary for making predictions about future behavior and conditions.

Students:
• use sophisticated mathematical models, such as graphs and equations of various algebraic or trigonometric functions.
• search for multiple trends when analyzing data for patterns, and identify data that do not fit the trends.

This is evident, for example, when students:
▲ use a sine pattern to model the property of a sound or electromagnetic wave.
▲ use graphs or equations to model exponential growth of money or populations.
▲ explore historical data to determine whether the growth of a parameter is linear or exponential or both.

Optimization

6. In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.

Students:
• use optimization techniques, such as linear programming, to determine optimum solutions to problems that can be solved using quantitative methods.
• analyze subjective decision making problems to explain the trade-offs that can be made to arrive at the best solution.

This is evident, for example, when students:
▲ use linear programming to figure the optimum diet for farm animals.
▲ evaluate alternative proposals for providing people with more access to mass transportation systems.

Sample Problem/Activity
Students will understand the relationships and common themes that connect mathematics, science, and technology and apply the themes to these and other areas of learning.

Sample Problem/Activity

Classroom Activity

1. Ask students to describe to one another in small groups what the word "composting" means. See if each group can develop a definition acceptable to all members of the group. Share these definitions with the entire class.
   - Does anyone's family, relatives, or neighbors compost?
   - What are the advantages and disadvantages of composting?
   - What actually goes on within material to cause it to turn to compost? How do you know?
   - Could the items in the bags used in Activity 1.2 become compost? Why or why not?
   - Does composting occur in nature without human intervention? How can we verify this?

2. Help students plan a natural decomposition field investigation such as a comparison of two logs in a local woodland—one decomposing and the other without visible signs of decomposition. Students should develop a common observation sheet to use in their investigations, as well as a systematic set of procedures to obtain samples from different locations for further study.

3. Take students to a local woodland or wet area. Have them take notes on evidence of active decomposition within the area. They should remove for study small samples of various materials (both decomposing and nondecomposed), using the procedures they developed.