MOVING ALONG

Performance Standard 12D/11B.C

Students will apply the process of technological design to explain the concepts of motion accordingly:

- *Knowledge*: Understand the introductory concepts of motion (rate, time, distance, and constant motion).
- *Application*: Apply the introductory concepts of motion to straight lines (and possibly inclined planes and circular paths).
- *Communication*: Explain actions that demonstrate the introductory concepts of motion.

Procedures

1. ***In order to know and apply concepts that describe force and motion and the principles that explain them (12D), and know and apply the concepts, principles and processes of technological design(11B),*** students should experience sufficient learning opportunities to develop the following:
   - Describe and compare constant speed using common examples.
   - Devise an investigation which can test speed using common examples.
   - Collect, display and communicate motion investigation conclusions.

   Note to teacher: This activity relates to knowledge associated with standard 12D, while addressing the performance descriptors for stage C within standard 11B. Applying scientific habits of mind noted in standard 13A are foundational to these activities. Using various technologies to estimate, measure and record data address some performance descriptors in 13B.
2. Have students review and discuss the assessment task and how the rubric will be used to evaluate their work.
3. Introduce initial concepts for motion through a modified inquiry approach: What do you know about speed? What are some examples of speed? (A car going 30 miles per hour, a toy car moving across a table at 5 inches in a second, a cheetah running across a field at 70 miles per hour, etc.) How is it measured? (There needs to be a measured distance, a measured amount of time and some way to measure both) How can we measure speed? (Let the students suggest ideas). This activity focuses on measuring motion by timing a person walking a measured distance (ex. 5-10 meters), using a stop watch. Repeat with the same walker and different walkers. Assure the students that this is not a race; each walker should take approximately the same size steps at the same rate for each trial. Determine the rate of each walker using the units of meters per second by dividing the distance by the time. Be sure to emphasize the measuring units. Students may average these rates. The distance may be altered in some of the trials, but the distance per time 'walking rate' should remain fairly constant. All data should be entered into a classroom data table.
4. Begin the design investigation to determine a way to test walkers at another speed (faster or slower). Students should brainstorm how to devise a test for this motion; they will need to create the rules (success criteria) for this "speed" test in small groups. Half of the students could work on "faster" tests, while the other half works on "slower" tests. They must determine the constant distance and the safety precautions. Use a stop watch to collect this speed (distance divided by time). Students should test their design plan. They should calculate several individual test speeds, average them and record their test speeds.
5. They should explain their design plan, present their data tables and suggest ways to make the speed test better.
6. *Help them distinguish that while these speeds may be different, they are not accelerating. (Accelerating means that they are changing their speed or direction while in motion.)
7. Evaluate each student's work using the Science Rubric as follows and add the scores to determine the performance level:
   - *Knowledge*: Definitions for motion and speed were complete and correct.
   - *Application*: Investigation design was appropriate and data tables were complete and correct.
   - *Communication*: Explanations were logical, well-organized, and well-detailed. Procedural changes that were proposed to improve the design of the investigation were logical and applicable.

Examples of Student Work not available

Time Requirements
- 2 or 3 twenty minute sessions

Resources
- Stop watch
- Appropriate measured surface for trials (hallway, playground, sidewalk, etc.)
- Science Rubric