NEWTON'S LAWS AND SEAT BELTS

Performance Standard 12D/11B.F

Students will apply the processes of technological design to incorporate the impact of force on motion accordingly:

- *Knowledge*: Understand Newton's Laws of Motion and its associated terms.
- *Application*: Apply the Laws of Motion to personal experience with seat belts while riding in a car or bus.
- *Communication*: Explain the motion of objects in terms of Newton's Laws of Motion.

Procedures

1. **In order to know and apply concepts that describe force and motion and the principles that explain them (12D) and the concepts, principles and processes of technological design (11B),** students should experience sufficient learning opportunities to develop the following:
   - Research applicable resources which explain motion, mass, distance, acceleration, inertia, direct and inverse proportions, Newton's experimentation, seat belts, etc.
   - Formulate proposals in which can model or test Newton's Laws of Motion in common, personal experiences.
   - Record anecdotal observations from personal tests of Newton's Laws.
   - Communicate patterns of effects of the Laws of Motion from experience and in role-playing scenarios.

   Note to teacher: This activity relates to knowledge associated with standard 12 D, while addressing the performance descriptors for stage F within standard 11B.
2. Have students review and discuss the assessment task and how the rubric will be used to evaluate their work.
3. Begin investigation of Newton's Laws of Motion with a modified 'Think Aloud' strategy. The teacher should read aloud from a textbook chapter about motion, pausing to allow the teacher's personal questions about the statements, captions, graphs, text features, etc. A student should record the teacher's questions, allowing ample space between questions for additional notes, comments or questions. Students should suggest how they could test each of the relationships of mass and acceleration in personal situations such as riding in a car, bus or playground carousel, restraint while wearing a seat belt, etc. A "What Happens When" worksheet is provided for initial student consideration or the 'Tendency to Test Mr. Newton's Laws' work sheet may be used to begin the process of planning an investigation. Students should present their findings from testing the laws of motion for classroom discussion.
4. Require students to submit a final one-page report on the generalizations of the findings from the testing of Newton's Laws.
5. Evaluate each student's work using the Science Rubric as follows and add the scores to determine the performance level:
   - *Knowledge*: Generalizations from tests of Newton's Laws and associated terms were complete and correct.
   - *Application*: The testing process for the laws were imaginative, thorough and accurate.
   - *Communication*: The findings from personal investigations were well-organized, and communicated the required elements clearly and effectively.

Examples of Student Work not available

Time Requirements	**Resources**
One to two class periods	Science Rubric

TENDENCY TO TEST MR. NEWTON'S LAWS

Design a way to test Newton's Three Laws of Motion. You should use natural, everyday circumstances. You may use toys, skates or other everyday materials or equipment.

First, brainstorm ideas for these principles:

When an object is at rest, it tends to remain at rest

When an object is in motion, it tends to remain in motion at the same speed and direction.

Greater force is needed for a greater mass

Greater force is needed for a greater acceleration.

For every action, there is an equal and opposite reaction.

Then decide on the best idea. What makes it the best idea?

Sketch out the investigation steps

Record your anecdotal observations

Analyze your observations

What are your findings about Mr. Newton's Laws?

What are other ideas for testing the laws?

What happens when……

	What happens to me?	What happens to others?	What are some other ways to test the laws?
I am riding in a car or bus without my seat belt buckled (oh, no!!), and • It comes to a stop quickly. • It makes a right or left turn. • It is moving forward or backward.			
I am riding in a car or bus with my seat beat buckled, and • It comes to a stop quickly. • It makes a right or left turn. • It is moving forward or backward.			
I am pushing a grocery cart as I am walking down the aisles at the store at basically constant speed, but I am adding groceries to it.			
The bowling ball, softball and golf ball will accelerate different if they are launched with the same force.			
You and a friend are skating together and • You are facing each other and you push each other equally. • She pushes you and you don't push back.			