FORCES OF NATURE

Developed by: Lynn Glover

Unit Summary: The community of Britton will have a new swimming pool in the spring of 2003. The second phase of the project is to install a waterslide for one area of the pool. The role of the 5th grade Science class is to create a model waterslide for the pool. Teams of students will build a model slide, write an abstract about the slide, and present the team project in the form of a Power Point to the Britton Pool Committee.

Enduring Understandings:
Students will understand that physical laws of motion govern our world.

Essential Questions:

1. How do the laws of motion affect our daily lives on earth?
2. What variables can you manipulate to affect the movement of objects?

Knowledge and Skills:

1. Every object in the universe has mass and therefore gives rise to a gravitational force on every other object.
2. Identify forces in specific situations that require objects to interact, change direction or stop.
3. Speed is a measurement of how far something travels in a certain time.
4. Apply the formula for speed S=d/t to determine speed of objects.
5. Velocity is a description of both speed and direction.
6. Inertia is the tendency of an object to stay at rest or in a motion until a force acts on it.

Performance Tasks, Projects: (EQ = Essential Questions; K&S = Knowledge and Skills)

EQ 1: The community of Britton will have a new swimming pool in the spring of 2003. The 2nd phase of the project will add a waterslide to the pool.

Students will interpret the laws of motion in order to apply them to the design of their project – the waterslide.

Students will journal how "my day" is affected by the laws of motion.

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EQ 2: While creating a design, students will demonstrate their ability to manipulate the variables.
They will have a conferencing day with Principal and high school physics students.
K&S 1: Quiz
K&S 2,3,4,6: Quizzes, "Speeding Along" Lab Experiment
K&S 5,6: Quiz, Labs: (Investigating Force to Move Objects, Experimenting with Balloon Rockets)

Learning Experiences:
Text book:
Scott Foresman Science

"SPEEDING MARBLE" LAB EXPERIMENT

Materials: wooden board, 3 books of equal thickness, meter stick, piece of masking tape, marble, clock with second hand, Handheld

Procedure:

- Place 1 book on an uncarpeted floor and lean the wooden board against the book to form a ramp.
- Use the meter stick to measure 300 cm from the top of the board to a spot on the floor in line with the ramp. Mark this spot with a piece of tape.
- Hold the marble at the top of the ramp and then release the marble and begin timing. Stop timing when it passes the piece of tape.
- Using the handheld, calculate the average speed of the marble in centimeters per second by dividing 300 cm by the number of seconds you timed.
- Record your data on the handheld in the Sheet Togo Application.
- Repeat the procedure 3 times.
- Find the average speed of the marble.
- Repeat the procedure using a ramp made with a stack of 2 books, and then 3 books, repeating 3 times and then finding the average.
- Record your data in "Sheet Togo". When you Hot Sync, you will be able to create a graph to include with your paragraph answering the following question: How did the average speed of the marble change as the angle of the ramp changed? Why?

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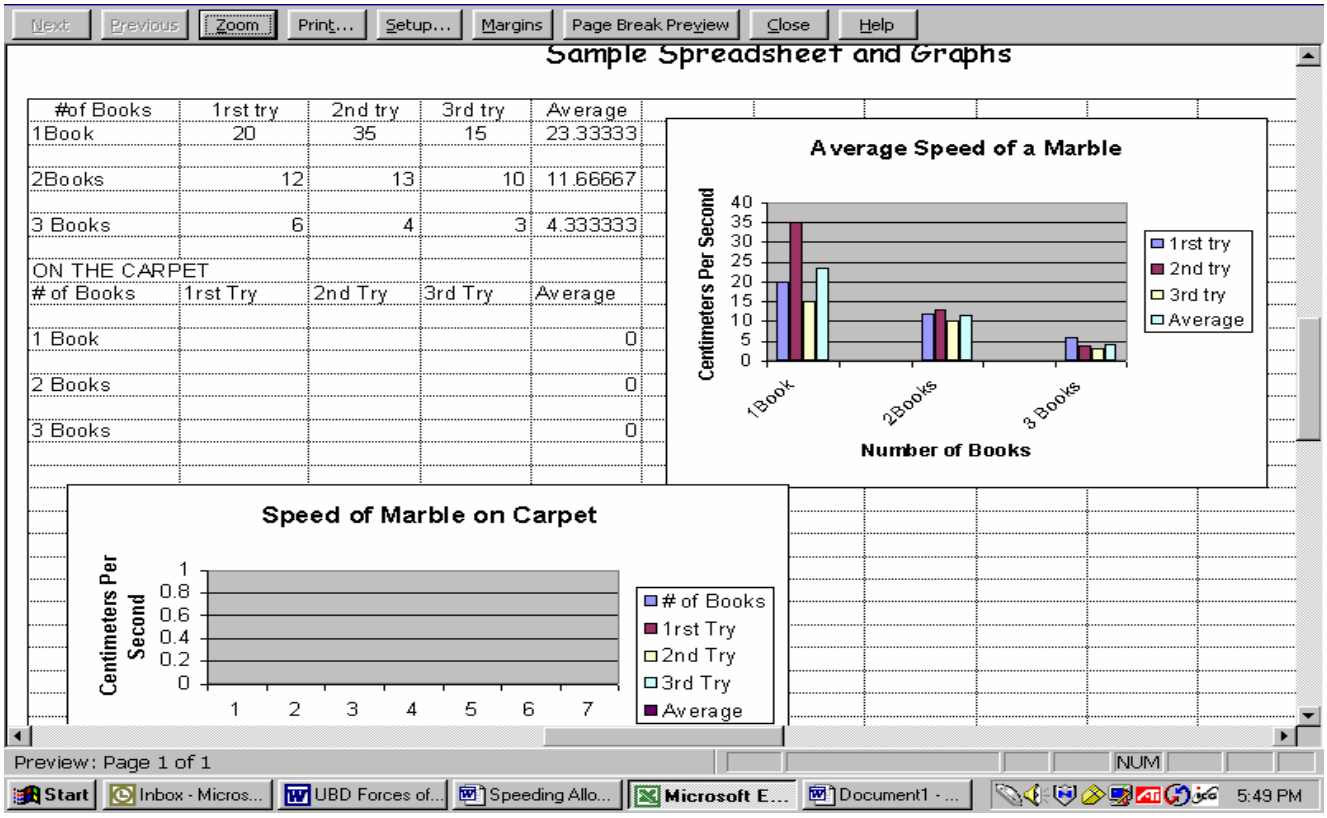
Investigate:
How might changing the amount of friction affect the speed of the marble? Develop a plan to answer that question and try it. Create a graph of your results.

When you set your spreadsheet up, follow the same format as the spreadsheet below. You data will be different than this made up on data.
Use the same headings in row 1.
You will use the same headings in Column A and Column G. Do the experiment and record you data. Make a chart to display your data. Make a copy to include with your paragraph.



<u>Time Frame:</u>
"Measuring Motion" January 27 – February 6, 2003
"What Affects Motion" February 6 – 10, 2003
"Gravity and Motion" February 11 – 17, 2003
"Friction and Motion" February 18 – 22, 2003
"Potential and Kinetic Energy" February 24, 25, 2003
February 26, 27, 28 : Finish models, make power points, and write Abstracts.
Present to Pool committee :

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Special Learning Experiences:

Safety Recommendations for pool waterslides:

Information given by: Helms & Associates
Consulting Engineers * Land Surveyors
Aberdeen, South Dakota 57402

Taken from Section 13152 – SPECIALTY CONSTRUCTION SECTION – SWIMMING POOL

Part 1 General

B. The Great Lakes-Upper Mississippi River Board of State Sanitary Engineers' "Recommended Standards for Swimming Pool Design and Operation," 1982 edition shall be used. Supplemental Standards shall include the "American National Standard for Public Swimming Pools," ANSI/NSPI 1991.

2.20 WATER FLUME SLIDE FEATURE ALTERNATE BID #1)

B. Flume Slide length shall be measured based on the centerline of the flume. Flume length to be 150'0". The flume slide will be designed and constructed for removal of the final 10-feet of the slide to accommodate swim meet activities. Removal of slide portion shall be easily accomplished with standard tools and no more than two persons required for removal. No jacks, hoists, or other special equipment shall be required for removal.

G. The fiberglass flume dimensions will be a minimum of 36" width inside barrel and a minimum depth of 22' on all straights. Outside to outside of sections shall be a nominal 48". All curves shall be 225-degree profile design.

18.4.2 Flumes

18.4.2.1 Position – A flume shall be perpendicular to the plunge pool wall for a distance of at least 10 feet (3 m) from the exit end of the flume.

18.4.2.2 Clearances – The distance between the side of a flume terminus and a plunge pool side wall shall be at least 4 feet (1.2 m). The distance between sides of adjacent flume terminuses shall be at least 6 feet (1.8 m). The distance between a flume exit end and the opposite side of the plunge pool, excluding steps, shall be at least 20 feet (6.1 m).

18.4.2.3 Elevation – A flume shall terminate at a depth between 6 inches (15 cm) below the plunge pool operating water surface level and 2 inches (5 cm) above the water surface level. The

flume shall not exceed a one-in-ten slope for a distance of at least 10 feet (3.0 m) from its exit end.

18.4.2.4 Design – The design of the flume shall minimize abrupt contact with the slide and prevent people from being airborne.