Friction 5E Lesson Plan

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| **Teachers: Ms. Baker, Ms. Blonigen, Ms. Harty, Ms. Moore** |
| **Date:** November 19, 2015 (STEM Thursday) |
| **Subject / grade level:** 4th Grade Science, Force, Motion and Energy |
| **Materials:****Per Student:****Per Group:**1. **Carpet Squares (2)**
2. **Mats (2)**
3. **Matchbox cars (5)**
4. **Binders (5)**
5. **Lotion**
6. **Gloves (class set)**

 **Vocabulary: friction, force, push, pull** |
| **TEKS:****4.6.D design an experiment to test the effect of force on an object such as a push or a pull, gravity, friction, or magnetism** |
| **ENGAGEMENT**1. **Today we will be exploring the force of friction.**
2. **To help us better appreciate friction, we are going to see what happens in a world without friction would look like.**
3. **Watch the video from 10:00-12:00:** <https://www.youtube.com/watch?v=SgQ_1bBsdz4> **Magic School Bus Plays Ball .**
4. **Teacher asks: What is a definition of friction: (Friction is a** [**force**](http://www.physics4kids.com/files/motion_force.html) **that holds back the movement of a sliding object. Students may say that friction makes it harder for things to move. Teacher can introduce the term resistance.)**
5. **How much friction is there when you rub your hands together? Students will rub their hands together three ways:**
	1. **with just their bare hands**
	2. **with gloves on**
	3. **with lotion on their hands**

 **Probing/Eliciting Questions:**1. **How was baseball different in the world without friction?**
2. **Which provided the most friction: the lotion, the gloves, or just your hands rubbing against one another?**
3. **Can you think of something we could have put on your hands to reduce the friction even more?**
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| **EXPLORATION**·  **Students will investigate how quickly a toy car moves on three surfaces: tile, carpet square, and mat.** 1. **Teacher will pass out student hand-out and briefly explain the investigation.**
2. **Students will make a hypothesis as to which surface will allow the car to travel the furthest.**
3. **Students will rotate in groups to each of three stations: tile, carpet square and mat.**
4. **At each station the students will place their car at the top of a binder (serving as a ramp). They will carefully let go of their car.**
5. **Once the car stops, students will measure the distance from the bottom of the binder to the back wheels of the car. They will measure in centimeters.**
6. **Students will do trials at each station and record their data on their data chart.**

**Probing/Eliciting Questions:**1. **What is the variable in this experiment?**
2. **Which surface provided the most friction? the least?**
3. **Other than the surface that the car is rolling on (carpet, tile, mat) are there other variables that may have affected results?**
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| **EXPLANATION** **Students will share their results, create a graph, and draw conclusions.****Probing/Eliciting Questions:**1. **Did all the groups have the same results? Why or why not?**

**On which surface did the car roll the furthest distance? the shortest distance?****How could we have made the car roll even further?**1. What types of surfaces provide the most friction? least friction? Can you give examples? (Students should understand that surface that are rough, dry, bumpy provide the most friction while smooth, slippery, wet surfaces provide the most)
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| **ELABORATION** **Students will brainstorm other experiments they could do to learn more about friction**· **Probing/Eliciting Questions:**1. **When is friction useful? (think of when driving, playing sports and wearing cleats or gymnasts putting chalk on hands)**
2. **When would you want to reduce friction? ( think of a slip and slide, greasing a cookie/cake pan, oil on a door)**
3. **How could you do an investigation with friction in an outdoor setting?**

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| **EVALUATION*** **Students will do a card sort using images that show a surface that would provide a lot of friction and surfaces that would have little friction**

**Probing/Eliciting Questions:**1. **Which surfaces provide a great deal of friction?**
2. **Which surfaces provide little friction?**

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