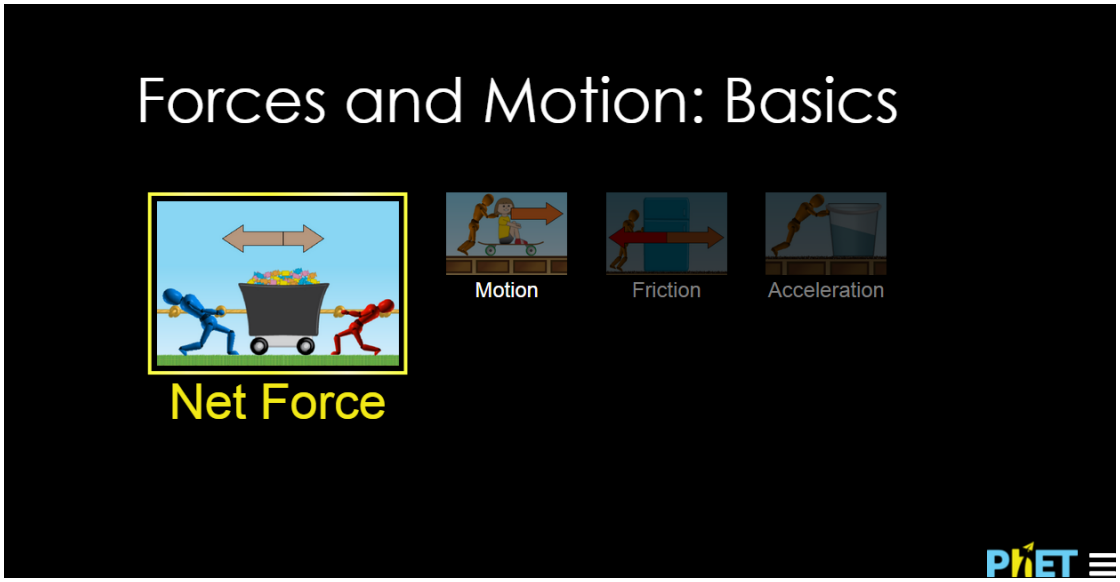
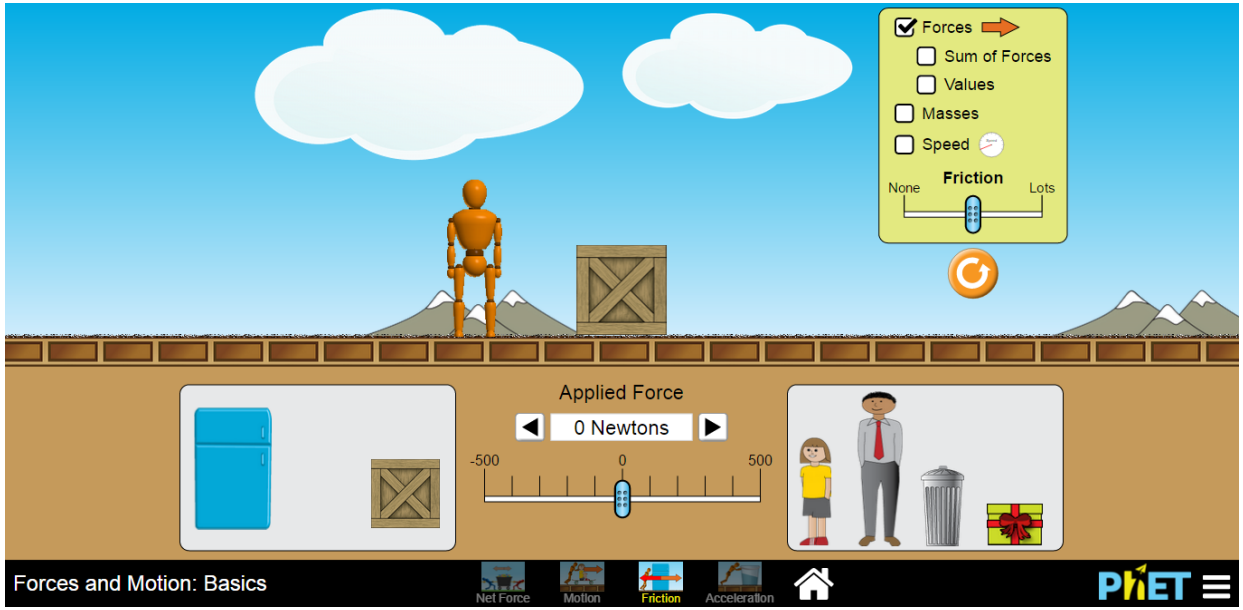
Digital Curriculum Technology Lesson Plan
Nicole Harmantzis
DUE: March 16, 2014

TOPIC	Forces and Motion: Friction
INTRODUCTION	● In this activity you will investigate how friction affects speed and motion. 1. Visit the following webiste: http://phet.colorado.edu/ 2. Select "Play with simulations" and select "Forces and Motion: Basics" 3. See the screen below: 
EXPLORATION	1. Explore the **Net Force**, **Motion, Friction,** and **Acceleration** categories. 2. Explore the **Friction** category in more detail. (as seen below).



3. Select "Masses," "Speed," and "Values" to view the changes.
4. Alternate between the crate and refrigerator.
5. Explore different combinations of masses by adding other "objects" on top of the crate or refrigerator.

Questions:

1. Under what conditions does an object start moving?

2. Under what conditions does an object stay stationary?

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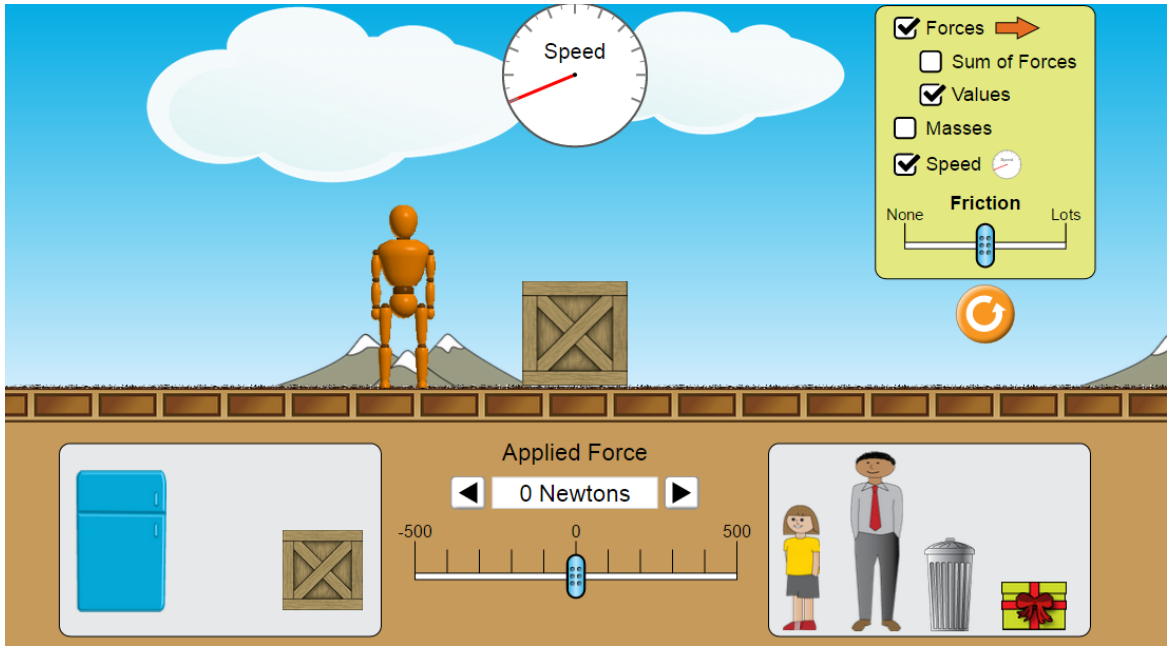
EXPLANATION

*** Use the sim and fill in the following table using the guidelines described below.**

- Select the reset button (orange circle).
- Select "Speed" and "Values"
- Have a timer available.
- Select the crate.



	Amount of friction	Applied Force (N)	Time taken to reach max speed (s)
1.	Moderate (middle)	300	
2.	Lots	300	
3.	None	300	

1. **How does the amount of friction affect the the time taken to reach maximum speed?**

2. **What was the Friction Force under the different conditions? (Lots, Moderate, None)**

*** Use the sim and fill in the following table using the guidelines described below.**

- Select the reset button (orange circle).
- Select "Speed" and "Values"
- Have a timer available.
- Select the crate.

	Amount of friction	**Applied Force**	**Time taken to reach max speed (s)**
1.	Lots	300	
2.	Lots	400	
3.	Lots	500	

	Amount of friction	Applied Force	Time taken to reach max speed (s)
1.	None	300	
2.	None	400	
3.	None	500	

	Amount of friction	Applied Force	Time taken to reach max speed (s)
1.	Moderate (middle)	300	
2.	Moderate (middle)	400	
3.	Moderate (middle)	500	

1. **How does the applied force affect the time taken to reach maximum speed?**

<table>
<tr>
<td></td>
<td>
* Use the sim and fill in the following table using the guidelines described below.
- Select the reset button (orange circle).
- Select “Speed” and “Values”
- Have a timer available.
- Select the crate.
- *Apply 500 N of force to the experiments below.*

<table>
<tr><th></th><th>Amount of friction</th><th>Mass (kg)</th><th>Time taken to reach max speed (s)</th></tr>
<tr><td></td><td>Lots</td><td>50</td><td></td></tr>
<tr><td></td><td>Lots</td><td>80</td><td></td></tr>
<tr><td></td><td>Lots</td><td>90</td><td></td></tr>
</table>

1. How does the mass affect the time taken to reach maximum speed?
</td>
</tr>
<tr>
<td>APPLY</td>
<td>
* Use the sim and fill in the following table using the guidelines described below.
- Select the reset button (orange circle).
- Select “Speed” and “Masses”.
- Have a timer available.
- Using the same amount of friction (moderate), explore the amount of time it takes to reach maximum speed for different object.

1. FIND the approximate mass of the present. EXPLAIN.
2. FIND the approximate time taken to reach maximum speed if the mass of the object was 90 kg.
</td>
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</table>

Object	Mass (kg)	Applied Force (N)	Time taken to reach max speed (s)
	40	500	3
	80	500	10
	100	500	16
	90	500	
Present		500	

Response:

Conclusion:
How does friction affect speed and motion?