STEMpact

Title: Hot Wheels **Grade 3**

STEM Content	Standards	Assessed in the Lesson
Science (Next Generation Science Standard)	PS2.A – Forces and Motion	
Technology (International Standards for Technology in Educ.)		
Engineering (Next Generation Science Standard)	3-PS2-1 – Plan and conduct an investigation	
Mathematics (Common Core State Standard)	-Metric measurement -Using data to find averages	

Essential Learning Objectives:

Understand that:

- More potential energy (in this case in the form of a higher ramp) will allow for more kinetic energy, which will then allow a car to roll a farther distance
- While designing and conducting an experiment, a scientist must keep all of the conditions the same between tests
- Only one variable (independent) should be changed at a time

Know:	Do:
• The definition of potential and kinetic energy • The meaning of the word variables	• Measure the distance a car travels in centimeters • Design an experiment with their team • Average multiple data points

Acceptable Evidence:

What would you have to observe to believe that the students have mastered the objective? What product or activity would provide proof that the students can use this knowledge and these skills to show that they understand?

Acceptable Evidence (Rubrics to be written?):

Students will be able to:

- Collectively assist in designing an experiment
- Cooperatively conduct the experiment the class creates
- Gather data on the data sheet
- Average the data
- Analyze data to determine which car traveled the farthest on average
- Identify the independent variable in the experiment

The Lesson/Unit Focus:

The Challenge:

What is the sentence or question that sums up the specific learning challenge students will undertake?

Can the class design and implement an experiment that will determine which of the four provided Hot Wheels cars rolls the farthest?

Summative Assessment Criteria and Scoring Guide: (Criteria match the "acceptable evidence" listed above.): What is the language that best describes the expected evidence that meets the learning expectation (3-Meeting)? What language describes evidence that surpasses the expectations (4)? What language describes evidence that has not met the expectations (1-Basic, 2-Approaching)?

Criteria	1-Basic	2-Approaching	3-Meeting	4-Surpassing
Can students implement the agreed upon experiment with their group?	Students were not able to create a model that would test their Hot Wheels cars, or required a lot of teacher assistance.	Students were able to create a model that would test their Hot Wheels cars using some of the agreed upon parameters.	Students were able to create a model that would test their Hot Wheels cars using most of the agreed upon parameters.	Students were able to create a model that would test their Hot Wheels cars using all of the agreed upon parameters.
Can students gather data and analyze (average) data to determine the outcome of the experiment?	Students tested only one of their two assigned cars, and were not able to find the average of their data points.	Students tested each of their two assigned cars, and found the average of three data points with teacher assistance needed.	Students properly tested each of their two assigned cars, and found the average of three data points.	Students properly tested each of their two assigned cars, and found the average of three data points and were able to test a third car.

Planning for Implementation:

Pre-Assessment:
What pre-assessment questions and/or probes will offer insight into what students already know about the unit content and what background knowledge will be needed? Describe pre-assessment.

This lesson is designed to be a culminating activity for a unit on forces and motion. This would not be the first time students have used the Hot Wheels tracks and cars. Before being ready for this lesson, I'd need to make sure that in previous lessons, students understood the relationship between potential and kinetic energy, and have demonstrated the ability to piece together the Hot Wheels tracks. I'd do that though observation and an exit slip.

Lesson Plan
What instructional strategies will be used? What best practices will be integrated? How will essential learning objectives be met and acceptable evidence be generated? Describe the sequence of events.

-I'd start by reviewing potential and kinetic energy, as well as finding averages, referring back to previous lessons.
-After reviewing, I'd give students their challenge for the day: that they need to design and test an experiment that would allow them to determine which of four Hot Wheels cars (each a different color) travels the farthest.
-As a whole group, I'd allow students to come up with the testing parameters that all groups will agree to. For example: number of track pieces, the height of the ramp, how they'd release the car, how they'd measure the distance it traveled.
-I'd then introduce the term "Variables". All the parts of the experiment they just agreed upon are variables – anything that can potentially change in an experiment. We'd then discuss the independent variable (car) and talk about why a good scientist only changes one variable in an experiment.
-After the experiment parameters have been agreed upon, students will gather materials, construct their track, and begin testing their cars.
-While measuring, data will be gathered, recorded, then averaged
-Class results will be compared, and the farthest traveling car will be determined
-A debrief will follow the lesson to discuss STEM connections

Formative Assessment:
What is the learning that will need to be "checked" during the lesson to be sure students have a secure understanding of important content. Describe assessment.

-Each student will have his or her own data sheet. They will need to individually record and average their data.
-I'll be informally assessing throughout the experiment phase to ensure directions are being followed and to clarify misconceptions.

Student Engagement What can be planned to help make this unit relevant to all students? -All students are responsible for participating in the construction of the track, and testing their cars. They are also individually responsible for measuring the distance the car traveled, and averaging the data they collect. What supports will be offered so all students will be successful? -Students can get support from their teammates during the experiment phase of the lesson; I'll also be patrolling the classroom to provide support throughout. What are ways to validate and recognize STEM capable learning? -After the lesson (possibly the next day) we will debrief and discuss the related science, math, technology and engineering concepts.
STEM Careers What career paths can be connected? -road engineers, race car drivers / designers, Hot Wheels engineers What career resources can be shared? -The Hot Wheels Kit comes with links to videos, one of them shows real life drivers and engineers demonstrating a real-world version of a similar

Time and Materials: How much time is needed for quality engagement, deep learning, secure experience? What materials are required and will enhance learning? -This lesson will require a minimum of an hour to implement. Materials necessary -Hot Wheels Kit (cars, tracks, connector pieces), -textbooks (for raising one side of the track) -calculators for averaging data -recording sheet -pencils
Resources: What resources are available? What resources are needed? What resources will enhance learning? -The Hot Wheels Kit comes with links to videos, the resources needed would be the above-mentioned Hot Wheels kit
Possibilities for Further STEM Connections: -Career connections can be implemented -Allowing more freedom in the design of the experiment

Student Reflections (after implementation):

Student Self-Reflection (suggested questions)

1. I used the following practices (engineering, math) and cross-cutting concepts…
2. I contributed in the following way(s)…
3. I learned the following new information….
4. Based on this experience, I would like to deepen my knowledge and/or improve my skills in the following areas…

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