Ready, Set, GO!

Major Topic and SOL Motion
Science SOL 4.2
Math SOL 4.9 b, c; 4.11 a, c

Length of Unit 8-10 days

Major Understanding

- Recognize forces that cause changes in motion

Essential Questions

- How can you design a vehicle using the K'nex blocks that will travel the greatest distance?
- Why did some of our models travel farther than others?
- How will friction affect the distance traveled by the car?
- What changes can be made to the car to improve your results?

Student Objectives

- Plan and conduct investigation
- Identify forces that promote and oppose motion
- Create a simple model
- Interpret data
- Measure linear distance in metric units
- Determine how design changes affects the outcome of the experiment
- Explain role of engineer in our everyday lives

Bloom's Taxonomy Skills	**21st Century Learning Skills**
• Creating • Evaluating • Analyzing • Applying • Understanding • Remembering	• Critical thinking • Problem Solving • Communication • Creativity and innovation • Collaboration • Information and media • Contextual learning

Assessment Evidence

Performance Tasks

- Describe the job of one type of engineer
- Create a model of a vehicle and explain the purpose of each part

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- Observe the vehicle and record data in the experimental setting
- Make changes to vehicle to improve performance
- Identify forces that affect motion of car
- Record measurements of experimental data

Other Evidence

- Pre-assessment and post assessment
- Model vehicles
- Data records and graphs

Technology

Computer
Projector
Go motion!

- Digital camers
- Kidspiration

Supplies/Materials

Book
Toy cars, trucks, motorcycles, some in good shape, some with broken parts, missing wheels, bent wheels
K'nex pieces
Cars
Meter sticks
Stop Watches
Cars
sandpaper

5E Lesson Plan

Lesson 1:

Engage: Teacher will read a book about engineering to students. (suggested reading: Rocks, Jeans, and Busy Machines An Engineering Kids Storybook by Alane & Raymundo Rivera)
Kidspiration: KWL chart about motion
Teacher will bring in a variety vehicles and place them around for the students to observe. Some will be broken, different shapes, types, etc.

Explore: Discuss the differences in the vehicles and make a list of their observations.

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Explain: Find connections between observations of the vehicles and what components seemed to "help" them move better

Elaborate: Focus on the design of the best and worst moving vehicles. Hypothesize how the design/structure of the cars affected the car positively or negatively. Research forces that may affect how an object moves.

Evaluate: Students will make a list of their personal conclusions about why the toy vehicles performed differently. These will stay in their science notebook for future reflection.

Lesson 2:

Engage: K'nex blocks will be placed in each group's area. Students will explore how to connect the pieces and play with them as they become comfortable working with them. Address any problems the students are having with working the blocks.

Explore: We will discuss the job of an engineer and some processes they may go through as they are designing a new prototype. What would an engineer need to do if they were trying to design a car of the future? Use a technical drawing to create a model car using the K'nex pieces.

Explain: Talk about the materials they have been given. Think back to what they learned from the designs of the vehicles that we observed in the activity yesterday

Elaborate: Challenge the students to design a model car that will go the greatest distance.

Evaluate: Have each group submit a sketch of their design and tell why they feel like this design will meet these demands

Lesson 3:

Engage: Video clip on fast cars from site such as United Streaming, YouTube, etc. Relate to research. Explain that we will be having a contest and the winners will be recognized.

Explore: Students will revisit sketches of models from previous activity and decide whether to make changes or their model as it is.

Explain: Discuss the process they have gone through so far as an engineer would. Why has each step been important? Develop a systematic plan for testing each model. Discuss the steps-logical order? Need to record data-how? How can we communicate and display data?

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Elaborate: Students will build models with their group. We have decided as a class the best procedure for conduction our experiment that will be a fair test. We will discuss which data we will need to measure, how to measure it, and how to record it. The teacher will demonstrate the Go Motion device and how it could be used for the experiment.

Evaluate: Models will be tested to see which model goes the furthest. They will measure the distance traveled by their vehicle.

Lesson 4:

Engage: Set up race car theme in classroom. Checkered flags……

Explore: Groups will present their prototype to the class and explain the reasons they engineered their cars as they did. Engineers' pictures will be taken with their prototype.

Explain: Discuss how we will test the cars so that the experiment is fair to each group. Demonstrate the Go Motion measurement tool and how it can be used to determine factors in our experiment.

Elaborate: Conduct the experiment according to the class plans. Record data/measurements. Use centimeters to record measured distance and convert to meters using our math skills.

Evaluate: Enter data for each group into a table. Discuss findings and why we think some cars performed better than others.

Lesson 5:

Engage: Engineers make improvements to their work.

Explore: What could you change about your model to better meet the demands of the experiment?

Explain: Students will discuss with their group and make changes to their models. They will tell the class what changes they made and why the feel that their model will work better now.

Elaborate: Re-test each model following the same procedure from the first test. Record new results and find the difference (subtract to find the difference)

Evaluate: Did the change the group made positively affect the outcome of the experiment? Why or why not?

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Lesson 6:

Engage: What made the cars eventually come to a stop? Why don't moving objects continue to move indefinitely?

Explore: How is it (friction) used in our everyday lives? What are some surfaces that might increase friction? Use Kidspiration to make KWL Chart

Explain: Friction. How does it work? What do they learn? How could we use friction to slow the motion of our cars?

Elaborate: Use the model car to test what happens when a strip of sandpaper or similar object is added to the track. How does this affect the motion of the car and the distance it travels?

Evaluate: Students will document the changes that they observed when adding friction to their experiment.

Lesson 7:

Engage: "Awards Day"!!!!!

Each group will receive a prize for their model:

- Fastest Car
- Best distance car
- Prettiest Car
- Most Thoughtful design
- Most improved
- Anything else to be sure that each student is recognized

Explain: The teacher will explain why each group go their award and give the data in a Power point to back it up. Pictures will be included of the engineering team.

Evaluate: Students will take a post assessment on their engineering skills.

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