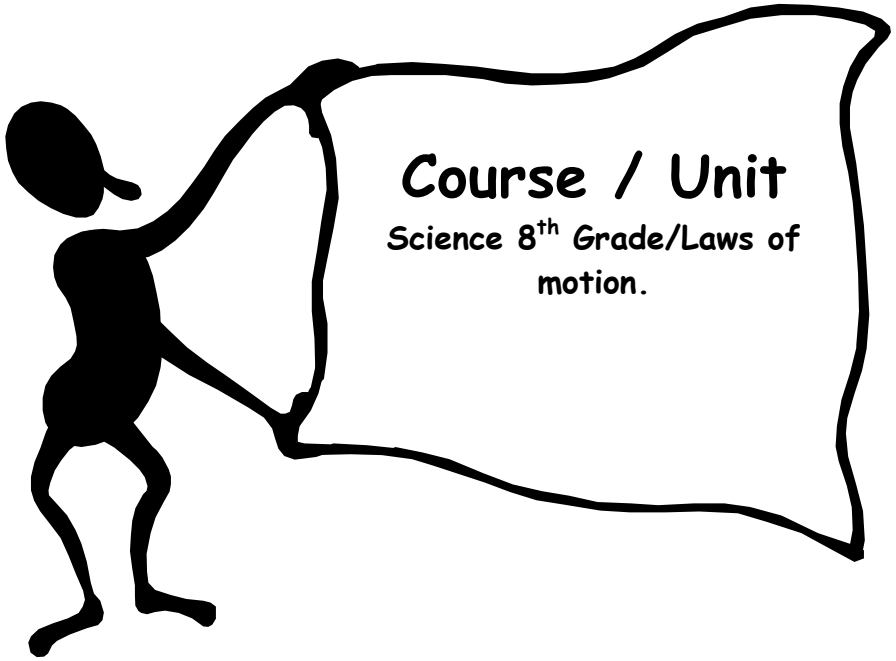
Backwards Design Unit Planning

New York City Department of Education
Magnet Program District 25 & 28

School Name

IS 237
Rachel Carson Magnet school of Arts.

Backwards Design Unit Planning



Essential Question:
What moves you?

Suggested Time Frame: 2 weeks

Theme: Arts

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Graphic Overview of Unit

Suggested Time Frame:

Essential Question:

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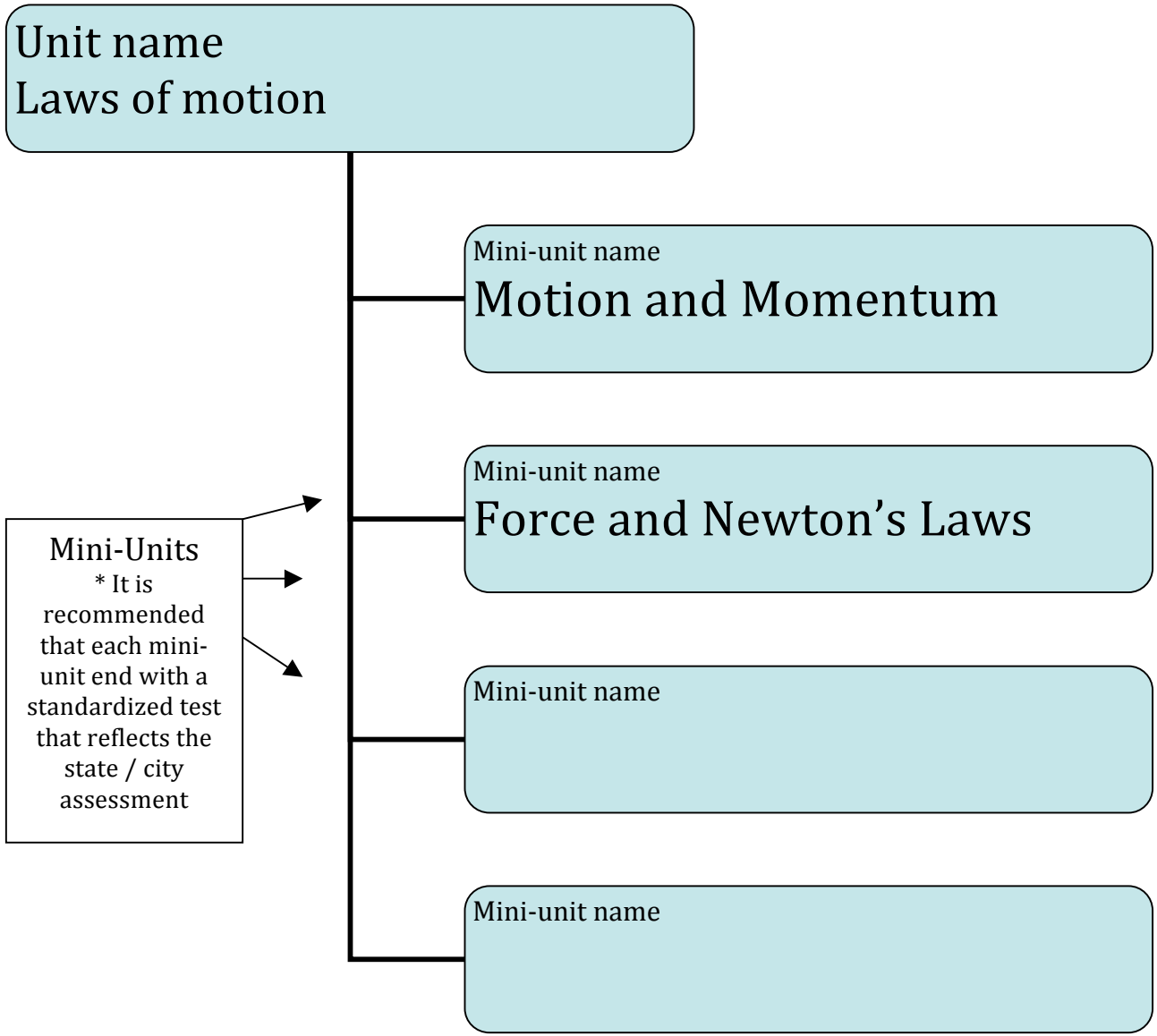

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Unit's Culminating Project: (briefly explain in 2-3 sentences):
Students will be designing and constructing a working model of a car that is fast, attractive and safe. After that, students will create a commercial to sell their car to the car company executives.

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<table>
<tr><th colspan="2">Stage 1- Desired Results</th></tr>
<tr><td colspan="2"><u>Standards-Based Learning Goals:</u>
PS 5.1a, 5.1b, 5.1c, 5.1d, 5.1e. PS 5.2b</td></tr>
<tr><th colspan="2">Concepts</th></tr>
<tr><td>Big Ideas for this Unit

• Interactions
• Relationships
• Change</td><td>Magnet School Theme:
Arts

How does the Big Idea in your unit connect to your theme?
• The knowledge of interactions is essential for the designing of structures – Designing cars, buildings, and bridges are a form of art.</td></tr>
<tr><td>Enduring Understandings
Students will understand that…..
• Imbalance results in change.
• Big interactions produce large changes.
• Every action has an equal and opposite reaction.</td><td>Overarching Essential Question: (this question should connect to your school theme)

What moves you?

(Alternative: How do we use the Laws of Motion in the art of design?)</td></tr>
</table>

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Content and Skills	
Content **Students will know…** **Speed, average speed, instantaneous speed, velocity, acceleration, mass, inertia, momentum, law of conservation of momentum.** **Force, unbalanced forces, net force, balanced forces, Newton's first law of motion, friction, Newton's second law of motion, weight, center of mass.**	**Skills** **Students will be able to…** • **Use the following measurement tools:** 1. **Metric ruler** 2. **Triple beam balance** 3. **Stopwatch** 4. **Spring scale** • **Use appropriate units for measured or calculated values.** • **Identify cause and effect relationships.** • **Solve equations.** • **Construct a distance-time graph.** • **Recognize and analyze patterns and trends.**

Stage 2- Summative Assessment Evidence **If students understand, know and are able to do the items in Stage 1, they should be able to show their understanding by completing an authentic task found in the world beyond the classroom.**
➢ Design the Culminating/Summative Task: ➢ Please note: The Essential Question and the Grasp are interconnected. The GRASP is a way for students to demonstrate their knowledge and understanding

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unit by answer of the Essential Question. Or you can say, they are answering the essential question through their GRASP.

G- (Goal) Demonstrate an understanding of Laws of Motion by designing an attractive, fast car that is safe. Also, create a commercial to sell the car.

R- (Role) Car Designer/ Commercial Artist.

A- (Audience) Car company executives.

S- (situation)
Imagine that you are a car designer. How can you create an attractive, fast car that is safe? When a car crashes, the passengers have inertia that can keep them moving. How can you protect the passengers from stops caused by sudden, head-on impacts?

P- (purpose and product)
You will create a working model of a fast, attractive car that is safe. Also, create a commercial to market and sell your car.

S- (standards for performance)
Your car should clearly demonstrate a clear understanding of laws of motion.

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Student Task

In the space below, write the task exactly as students will see it.
You should give this task to them on the first day of the unit. This way they know where they are going.

A car company is looking for a new brand of future cars. The company is holding a contest to choose a model car from various designers. Your job as a car designer is to design a fast, attractive car that is safe. Your car should follow laws of motion. In order for your model car to win the contest, you are going to sell your model to the company executives.

To successfully create your task you must do the following:

1. Design a fast, attractive car that is safe.

2. Construct a working model of the car that you designed in step 1.

3. Create a multimedia commercial to sell your car.

Task 1

Design

1. Sketch the design for your car.
2. List the materials you will need. Remember your car has to move smoothly.
3. Describe the requirements the car has to meet to be a safe car. How would you test those requirements? Use Laws of motion to describe the function of a safety device in your car.
4. List the design considerations that would make your car fast? Use Laws of motion to justify this consideration.

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Task 2

Construct

1. Gather the materials to construct the model car.
2. Assemble the parts to make the model.
3. Test your model car.
4. Make some changes in the design if you have to improve the performance or safety of the car.

Task3

Create a commercial

1. Using multimedia tools like camcorder, camera, and computer etc., create a commercial.
2. Your commercial should focus on the speed, safety and attractive features of the car.

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Rubric for Culminating Project (To be developed with students)

Understanding (60%)	Product (20%)	Presentation (20%)
4 = High level of understanding that includes • Laws of motion. • Inertia • Gravity • Friction	4 = Car is scientifically correct and includes the following: • Creative design • Smooth ride • Attractive features • Safety features	4 = Commercial includes the following: • Safety features • • Engaging the audience.
3 =	**3 =**	**3 =**
2 =	2 =	**2 =**

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1=	**1=**	**1=**

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Unit's Essential Question:

Mini-Unit Title (each mini-unit is approx 1 week long)	**Big ideas of the mini-unit /** concept statement (macro) What is the big idea of this mini-unit?	**Key Content /Knowledge** (Important Content to Know about, vocabulary, the specifics) (Micro)	***Skills*** What should the students be able to do? (rule of thumb - skills are verbs – knowledge is a noun*)*	**List of Topical / Content Based Questions** (make sure to amend the essential question so that it becomes topical for this mini-unit)	**Mini-Unit Assessment** (must be aligned to the NYS / NYC exams. It can be a test or a quiz - i.e.: DBQ Essay; 10 multiple choice questions; or 3 constructed response questions)	**Scaffolding towards the culminating project** (what can be done during this mini-unit to develop the stage 2 culminating assessment (grasp)
Motion and Momentum	• **Interactions** • **Relationships** • **Change**	**Speed, average speed, instantaneous speed, Velocity, acceleration, mass, inertia, momentum, law of conservation of momentum.**	• **Using the measurement tools like Metric ruler, Stopwatch** • **Use appropriate units for measured or calculated values.** • **Identify cause and effect relationships.** • **Solve equations.** • **Construct a distance-time graph.**	**How can you describe the motion of an object?** **What causes an object to move?** **What are the factors that determine the motions of objects after they collide?**	**Using formula to calculate speed.** **Reading a Distance-Time graph.** **Constructing a Distance-Time graph.** **Calculating accelerating from a Speed-Time graph.**	**How do you determine the speed of your model car?** **What are the measurements tools that you need to find the speed of the car?** **What concepts would you consider to design a safe car?**

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			• Recognize and analyze patterns and trends.		How is acceleration calculated using velocity-time formula?	
Force and Newton's Laws	• Interactions • Relationships • Change	Force, unbalanced forces, net force, balanced forces, Newton's first law of motion, friction, Newton's second law of motion, weight, center of mass.	Students will be able to… • Use Triple Beam Balance and spring scale. • Use appropriate units for measured or calculated values. • Identify cause and effect relationships. • Solve equations. • Recognize and analyze patterns and trends.	What is Newton's first law of motion? How does friction affects motion? What is Newton's Second Law of motion? Why is the direction of force important? What is the relationship between the forces that objects exert	Observe the force diagram to find balanced forces, unbalanced forces, net force, the direction in which the object would move. Use the F=ma formula to find the unknown quantity.	

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				on each other?		

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A Week at a Glance – Copy as Necessary

-

WHERE is the student going and what is expected HOOK with needed skills to experience and explore Opportunity to REVISE and RETHINK their understanding	Allow students to EVALUATE work and implications TAILOR work to student needs Be ORGANIZED to maximize engagement

Monday	Tuesday	Wednesday	Thursday	Friday
Content Focus: Motion Hook: What is your average walking speed? Daily Assessment: Calculate speed using distance-Time formula.	Content Focus: Acceleration Hook: What makes a car a "fast car"? Daily Assessment: Graph an accelerated motion.	Content Focus: Mass and Inertia Hook: Which has more mass? A cube of wood or a same size cube of iron. Daily Assessment: Use a Triple Beam Balance to find the mass.	Content Focus: Momentum Hook: Two identical balls, move directly toward each other with equal speeds. How will the balls move if they collide and stick together? Daily Assessment: Use the law of conservation of momentum to solve equations.	Content Focus: Force Hook: How can you change the direction of an object traveling in straight line? Daily Assessment: Find the net force acting a body.

Weekly Assessment (must be aligned to the NYS / NYC exams):

What have the students produced that scaffolds towards the units culminating assessment?
(for example if the unit's culminating assessment is a newspaper – perhaps the students have written an article)

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Content Focus: Friction Hook: Why is it easier to roll an object on wheels than to slide it? Daily Assessment: Compare and contrast static, Sliding and rolling friction.	Content Focus: Newton's second law of motion. Hook: How hard do you have to hit the baseball to score a home run? Daily Assessment: Find the unknown quantity by using F=ma formula.	Content Focus: Newton's third law of motion Hook: How do rockets move? Daily Assessment: Explain why you move forward and a boat moves backward when you jump from a boat to a pier.	Content Focus: Racing rockets. Hook: How do you make a rocket go faster? Daily Assessment: Racing balloons lab.	Content Focus: Hook: Daily Assessment:

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Unit Resources

Books:

Websites:

Teacher Materials:

Other: