

Day	Content Standard Covered	Lesson Plan	Student Evidence of Learning	Notes and reflection
1	2.5.A. - Describe the basic characteristics of motion (position, direction, speed, reference point)	<p>Pre-test</p> <p>Journal Notes on new vocabulary words. Draw model of classroom and discuss reference point, position and motion on map of room.</p> <p>Game of Tubes - describe game rules using new vocabulary. Use popsicle sticks to have certain kids be the reference point, position, tube holders, timer etc...</p> <p>Calculate speed and compare classes.</p>	<p>Written journal notes</p> <p>Homework worksheet - Position and Motion</p> <p>Flashcards assigned - position, direction, speed, reference point, displacement</p>	<p>Students catch on quick to vocabulary words. Important to emphasize motion is actually changing a position. Can't change position with distance and direction information.</p> <p>Trick! - tell student only partial directions when giving their position based on reference point. Student will invariably ask, "wait... how far?" or "wait... which direction?" thus emphasizing that position involves both distance and direction.</p>
2	2.5.F - Explain the relationship between speed, velocity, acceleration, force, mass and momentum	<p>Bell ringer: calculate average speed of a motorcycle</p> <p>Game of Tubes - find speed of class, boys and girls and compare the graphs of speed.</p> <p>Use graph to tell a story about something moving through time and space. Students come up with their own story based on parameters on graph.</p> <p>Challenge: make own graph and write story</p>	<p>Journal notes and practice graphing speed and calculating speed.</p> <p>Flashcards assigned - acceleration and velocity</p> <p>Have students hold hands up like they are</p>	<p>Used the game of tubes to come up with speed graphs for average speed. Should discuss more the difference between instantaneous speed and constant speed? The golf ball would speed up, slow down and stop and what does that look like on the graph? I video taped the whole class doing one round of the game and replayed it to talk about Velocity and acceleration.</p> <p>Did not have time for students to come up with their own story about a</p>

			<p>driving a car to show</p> <p>Students come up with their own story based on parameters on graph.</p> <p>Challenge: make own graph and write story</p>	graph...
3	<p>2.5.F. Explain the relationship between speed, velocity, acceleration, force, mass and momentum.</p> <p>Define and discuss Inertia.</p>	<p>Bell ringer: write down definition of Inertia from textbook page 58.</p> <p>Discuss things that have Inertia.</p> <p>Watch BMX motorcycle pulling tablecloth from set dining room table.</p> <p>Show demo with different mass objects on table and pull sheet. Why did the heavy objects remain still? What happened to the lighter objects?</p> <p>Do Lab with cup, pennies and playing card to let kids experience inertia. More mass = more inertia.</p> <p>Watch momentum video.</p> <p>Have kids work with lab groups to come up</p>	<p>Journal notes on Inertia and Momentum. In lab groups students come up with the definition for momentum together and present to the class.</p>	<p>Introduce Newton's First law of Motion today.</p> <p>Show how a the coins and the table setting are objects that are at rest. And then show that objects in motion, like a car crash, stay in motion.</p> <p>Will drive the above point home tomorrow when we talk about momentum.</p>

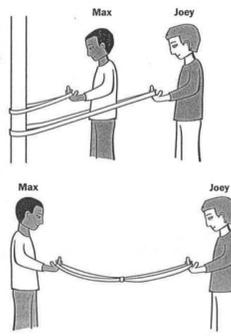
		with a definition for momentum. Write on sticky note and present to class.		
4	2.5.F. Explain the relationship between speed, velocity, acceleration, force, mass and momentum. Define and discuss Momentum.	Discuss homework answers to review for quiz. Take quiz on Motion Vocabulary. Explain Momentum lab and have student complete lab sheet. If time, have students race to see who can get ball in bucket first. Using a ping pong ball and then a golf ball.	Vocabulary quiz score. Completed lab sheet with distances of different numbers of marbles. Students write conclusion statements on their own.	
5	Define and discuss Momentum. 2.5.E. explain Newton's Laws of Motion	Journal and discussion activity using "Mythbusters - car crash force" Final momentum lab tying in knowledge to a car crash and the force applied. Play game of Tubes but change the mass of the ball so that they use a ping pong ball. Students experience how mass changes momentum.	Journal notes. Momentum lab final question incorporates knowledge of Momentum and Newton's laws.	More think/pair/share to have students predict whether the collision will look like the red car or the yellow car. Use popsicle sticks to ask the final two questions in the Momentum lab so students are held accountable for their answers.
6 - 8	2.5.B. Identify variables that affect the motion of an object	Wear "May the Mass times acceleration be with you" T-shirt. Wear on may the 4th! :) 7 Lab stations. 5 of the 7 involve PhET lab simulations. 1 station investigates friction and	Journal activities and notes.	Each station is too long. There are too many variety of topics. The vocab words for this week didn't include balanced force and unbalanced force! Shorten the stations. Less directions.

	<p>2.5.C. - define force 2.5.D. - Explain different types of Force 2.5.E. - Explain Newton's Laws of Motion</p> <p>Essential Vocabulary: gravity, air resistance, balanced force, unbalanced force, friction, net force, mass, Newton's Laws of Motion</p>	<p>1 station investigates gravity, air resistance</p> <p>Station 1: Motion. This lab introduced the idea that it takes more Force to move more massive objects.</p> <p>Station 2: Friction. What affects the Force of Friction? What is Static Friction?</p> <p>Station 3: Friction and Net Force. What is the Sum of Forces?</p> <p>Station 4: Newton's Second Law. Calculate acceleration when the Force and mass is known. $F=ma$.</p> <p>Station 5: Gravity. Why do all objects fall at the same rate? Can the force of Gravity be different on different objects?</p> <p>Station 6: Gravity. What two qualities affect the Force of gravity? - mass and distance.</p> <p>Station 7: balanced and unbalanced Forces. What is a net force? Newton's First Law.</p>		<p>Clearer instructions on what to put in journals.</p>
9	<p>2.5.D. - explain different types of Forces. Noncontact forces and Gravity</p> <p>Essential</p>	<p>Play "Gravity" by John Mayer as kids walk in.</p> <p>Take quiz on Vocabulary: Inertia, Momentum, Force, Contact Force, Noncontact Force, gravity, mass, weight, friction</p> <p>Skill check quiz on concepts and newton's Laws of Motion</p>	<p>Lab worksheets</p> <p>Quiz results</p>	<p>Ipad quiz is great! Except some ipads have a hard time connecting to the internet and it takes forever. For simple quizzes that I want students to get feedback right away, I should use paper quizzes. Only use the ipads for longer tests perhaps?</p>

	<p>Vocabulary: mass, gravity, balanced force, unbalanced force, acceleration, velocity, Newton's Laws of Motion</p>	<p>Discuss Why objects fall at the same speed as long as there is no air resistance.</p> <p>Watch Veritasium Video: https://www.youtube.com/watch?v=aRhkQTQxm4w</p> <p>Discuss how objects orbit Earth. All objects that have mass also have gravity. Use basketball and tennis ball to demonstrate.</p> <p>Watch Veritasium Video: https://www.youtube.com/watch?v=iQOHRKKNNLQ&src_vid=aRhkQTQxm4w&annotation_id=annotation_854801&feature=iv</p> <p>Draw different velocities of objects to demonstrate how the perfect speed is needed to remain in Earth's orbit.</p> <p>Lab: https://www.teachengineering.org/activities/view/cub_mars_lesson04_activity1</p>		<p>The actual lab takes about 15 minutes for the students to complete. It takes about 15 minutes to go over the concepts beforehand. The Veritasium videos are great and relevant. IT was fun to have the kids demonstrate the distance of the moon from the Earth using a marble and a tennis ball.. They all assumed there is no gravity in space! This is a great way to reinforce the concepts that gravity depends on mass and distance between objects.</p> <p>Bring up Centripetal Force for this lab!!!</p>
10	<p>2.5.E. - Explain Newton's Laws of Motion.</p> <p>Essential Vocabulary:</p>	<p>Discuss Net Force using students and rolling demo cart to show how Net Force is calculated. Make sure to include the idea of forces adding together, canceling each other out, balanced and unbalanced forces.</p>	<p>Answers in basket.</p> <p>Journal notes that are balanced and</p>	<p>A lot of students got the first answer wrong. They quickly caught on. Sum of Forces is a trick because they assume they should add. Need to emphasize that it is adding but with a negative Force acting in the opposite</p>

	Balanced and unbalanced Force, Net Force	<p>Show video of apollo 11 launch. Discuss how Newton's Laws of Motion are represented in each stage of journey. Also discuss when there is a balanced force and an unbalanced force.</p> <p>https://www.youtube.com/watch?v=8VvfTY-tVz</p>	<p>unbalanced.</p> <p>Homework assignment practices Net Force and Balanced vs. Unbalanced.</p>	<p>direction!</p> <p>Multiple rounds of the game gave me opportunities to put two forces on the same side, two forces of the same strength but in opposition and to talk about when an object is in motion it will stay in motion.</p> <p>Students practiced with balanced and unbalanced forces by holding up a card with a B or a U on it. Should I have students walk to a different part of the room? Do a hand gesture that is balanced or unbalanced instead of the cards?</p> <p>I said orbiting bodies are a balanced force! But they are not. Centripetal force is holding something in orbit! Need to try and clear this up tomorrow.</p>
11	2.5.E. - Explain Newton's Laws of Motion.	<p>Astronaut floating thought experiment: if an astronaut's lifeline to the space station is suddenly cut and he only has a wrench... how can he get back to the space station?</p> <ul style="list-style-type: none"> - Newton's Third Law of Motion <p>Target Lab: Newton's First Law of Motion, Inertia</p> <p>https://docs.google.com/document/d/1MwERWmVAw2QIToV_PqXbgEukANXVV15YVeGK10-jD4s/edit</p>	Lab sheets in groups	Too little time at the end of the lab to wrap-up the discussion. Need to make sure that there is time to connect Newton's first law with Inertia

12	<p>6.2.A. - Identify and describe the importance of various physical scientists and their discoveries such as...Newton.</p> <p>6.3.A. - Describe examples of scientific knowledge changing human understanding of the natural world.</p> <p>6.3.B. - Describe and explain the features of science that make it a human endeavor and</p>	<p>Read passage from <u>An Astronaut's Guide to Life on Earth</u> by Chris Hadfield. Read first five paragraphs of introduction to book. Relate our ability to travel in space to the work of Sir Isaac Newton.</p> <p>Sir Isaac Newton Bio: <u>HISTORY presents Teaching Physical Science. BIO Isaac Newton: The Gravity of Genius</u>. Discuss Newton's life and how he made his discoveries. Bring up personal attributes of Newton and hurt him and helped him be successful.</p>	Movie Guide	<p>Stop movie and important moments and discuss movie. Skip over time 18:55 to 23:00 - this part of the movie goes deeply into Newton's obsession with Theology and is unnecessary to get the point across.</p> <p>Stop to discuss how he got discouraged when people criticized his work.</p> <p>Discuss how he was bullied as a child and how his early life was really hard (premature birth, no father, absent mother)</p>

	an ongoing process.			
13	2.5.E. - Explain Newton's Laws of Motion.	<p>Quiz on Lesson 3 Vocab.</p> <p>Bullet Thought Experiment. If a bullet is fired from a gun level to the ground and a bullet is dropped at the same time and the same height? Which will touch the ground first? https://www.youtube.com/watch?v=2tiOmp1BE8Y&index=1&list=PLOdnh5J_7ly7KerFi9J_HX0nPLndzo_F7</p> <p>Discuss possible answers. Demonstrate with tennis balls. Watch video.</p>	Quiz grades	<p>Students were very confused on force pair. Did a lot of teaching while taking quiz. The example question is a good one except for the fact that we haven't talked about buoyancy! Hm... need to remove buoyancy from the lesson then. OR.... bring it up within this lesson? More mass makes boat sink further in water.</p> <p>Kids did really really well on this quiz. I helped them out a lot though. The practice question at the beginning of class was really helpful for review and to let them know what the quiz was going to look like. I let them keep the example question on their desk while they took the test.</p>
14	2.5.E. - Explain Newton's Laws of Motion.	 <p>Newton's third Law of motion: Rubberband finger strength thought experiment.</p> <p>1. If Joey is pulling twice as hard as Max, how much force will the rubber band stretch with?</p> <p>a. Separately?</p>	<p>Journal notes</p> <p>Page 80 practice questions 1 - 12 (omit #8)</p>	<p>Focus on the fact that the Forces are equal. It is hard to pull exactly 1 or 2 Newtons and know if you are doing this accurately. The students should be surprised to realize that the Force is exactly the same no matter who is doing the pulling because Forces are always equal and opposite.</p> <p>Derek's incorrect laws are pretty good but be very specific about how to make the false sentence true.</p>

		<p>b. When the rubber band is tied together?</p> <p>Show Derek's three INCORRECT laws of motion https://www.youtube.com/watch?v=Yf0BN0kq7OU Discuss real laws of motion</p> <p>Newton's Second Law https://www.youtube.com/watch?v=TQxeutcYP6I https://www.youtube.com/watch?v=9zso7ChaQXQ#t=18.144032</p>		<p>Change one word in this sentence to make it true etc. Discuss what forces are necessary to cause change in the First incorrect law.</p>
15	2.5.E. - Explain Newton's Laws of Motion.	<p>Show tops demonstration. Discuss why it can stay up when spinning but falls down when not spinning. Inertia!! It wants to move in a straight line but the centripetal force keeps in traveling in a circle.</p> <p>Lab stations: 1. Centripetal force lab http://www.stevespanglerscience.com/lab/experiments/spinning-penny/ 2. Plastic tops 3. Race track interactive http://www.physicsclassroom.com/Physics-Inte</p>	Homework assignment	<p>A lot of students didn't complete their homework. I had them finish it before they could participate in the stations.</p> <p>The race track interactive was awesome. Really drove the point home that centripetal force is a center-seeking force. Many kids were very focused and worked hard to win the game.</p> <p>Kahoots for the definitions was fun.</p>

		ractices/Circular-and-Satellite-Motion/Race-Track/Race-Track-Interactive Review for Vocab quiz with kahootz		
16		Rotating stations for homework answers. Vocab Quiz on all three lessons. Graded quiz right away.		1-3 period: we just talked the answers out and it was really boring and the kids were not into it. 4 and 6 period: I made little stations for each question and the kids had to go to each station and check their answer and write in the correct one if they got it wrong. I think this activity could work really well if I set up the whole assignment like that and the first round, they had to just try and answer the question and the second round they could go around and check their answers with the explanation on the inside of the folder. Instant feedback is Key.
17		Kahootz review for Newton's Laws of Motion Take Final Concept Test! Review answers		See reflection paper for analysis of Pre and Post test results. The test was hard for most students. Most likely because we didn't practice this type of test question format.