THOMPSON RIVERS UNIVERSITY | Education & Social Work

Bachelor of Education (Elementary) & Bachelor of Education (Secondary) STEM Unit Plan Template

Unit Title:	Newton's Laws of Motion	Number of Lessons	4	Time (in weeks):	1
Name:	Danica Davidson	Subject(s):	Science	Grade(s):	6/7

Rationale

This unit focuses on building a foundational understanding of Newton's Three Laws of Motion since these laws are the basic principles that govern forces and motion which are present in physics and the real-world. By engaging in hands-on experiments students will develop a stronger understanding of how these forces influence the movement of objects around them.

Overview:

Newton's Laws of Motion Unit is focused on introducing and implementing Newton's laws of motion through inquiry, hands-on experiments, and real-world exploration.

CORE COMPETENCIES

Communication	Thinking	Personal & Social
Communicating o During the activities students will focus on intent and purpose through individual and collaborative communication.	Critical and Reflective Thinking o During the experiments students will be analyzing, designing, and investigating Newton's Three Laws of Motion through various activities. o The teacher will be asking student questions to further promote critical and reflective thinking about Newtons Laws.	Positive Personal and Cultural Identity o By engaging and participating in the activities students are given the chance to recognize personal values and choices through exploration of Newton's Laws.

BIG IDEAS

(multiple subject areas for integrated unit)

Subject Name	Subject Name	Subject Name
Science: • Newton's three laws of motion describe the relationship between force and motion. This unit helps students identify and understand the properties of Newtons laws. By teaching each law individually before doing a project students can better understand how each law affects forces and motion.		

LEARNING STANDARDS

Curricular Competencies	Content
Questioning & Predicting • Demonstrate a sustained curiosity about a scientific topic. or problem of personal interest • Make observations in familiar or unfamiliar contexts. • Make predictions about the findings of their inquiry • Formulate alternative "If…then…" hypotheses based on their questions Planning and Conducting • Choose appropriate data to collect to answer their questions • Observe, measure, and record data, using appropriate tools, including digital technologies • Collaboratively plan a range of investigation types, including field work and experiments, to answer their questions or solve problems they have identified	• Newtons Three Laws of Motion • Effects of balanced and unbalanced forces in daily physical activities

Processing and analyzing data and information • Experience and interpret the local environment • Construct and use a variety of methods, including tables, graphs, and digital technologies, as appropriate, to represent patterns or relationships in data • Compare data with predictions and develop explanations for results • Demonstrate an openness to new ideas and consideration of alternatives Evaluating • Demonstrate an understanding and appreciation of evidence Applying & Innovating • Contribute to care for self, others, and community through personal or collaborative approaches • Co-operatively design projects Communicating • Communicate ideas, explanations, and processes in a variety of ways	

Prerequisite Concepts and Skills:

- Effects of balanced and unbalanced forces in daily physical activities
- Know how to measure with a ruler
- Know how to make predictions
- Know how to analyze results between different trials
- Draw conclusions from collected data
- Know how to record data

Teacher Preparation Required:

Lesson #	Teacher Preparation Required (See Unit Plan Sample)
Lesson 1	Newtons First Law • Put together a mystery bag with matching items • Print off 24 "Inertia Activity" Worksheets • Prep index cards with string • Display/Put out the materials for the experiment • Bring a wheely chair if there isn't one in the classroom • Set up the "Stop and Go Challenge" course using cones to make two lines

	outside
Lesson 2	Newtons Second Law • Gather materials (balloons, tape, string, scissors, straws, etc) • Print off 24 "Balloon Rocket" Experiment Booklets • Try the experiment beforehand • Prep the "Tug-O-War with a Twist" outside the classroom • Gather enough poster paper for 4-5 groups of 4 • Find either a small ball, or another item of the same size • Set up the video "Balloon Rocket Experiment by Hungry SciANNtist"
Lesson 3	Newtons Third Law • Try the experiment beforehand • Gather the materials (balloons, and cups) • Print off 24 copies of the "Jumping Cup Experiment" booklet
Lesson 4	Build and Race a Popsicle Car • Gather the materials • Print off the "Build A Popsicle Car" Experiment Booklet • Cut the straws into two separate sizes, one long, and two small

Cross-Curricular Connections:

Mathematics:

During the experiments students are engaging in measurement, so to extend this into math students can take their measurements and compare them to find the difference between their answers.

English:

During this unit the teacher can give students a creative prompt related to Newton's Laws, for example "You are shrunk and to get somewhere you need to ride your popsicle car. Explain your ride using Newtons Laws."

Aboriginal Connections/ First Peoples Principles of Learning:

Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place)

Throughout this unit students are engaging in experiments, with a focus on connecting real-world experiences to curricular content.

Learning involves recognizing the consequences of one's actions.

Throughout this unit students may not achieve their desirable outcomes, however students need to recognize that it is better for students to fail then to succeed all of the time.

Universal Design for Learning (UDL)

- Use text alternatives like captions or voice recognition for spoken language.
- Activate prior knowledge by asking students what they already know
- Chunk information into smaller, manageable parts for better retention.
- Offer flexibility in timing, pacing, and physical response requirements.
- Provide alternative ways for students to interact with the content, for example students can draw their answers.
- Allow students to express their learning through different media, such as text, speech, drawing.
- Incorporate assistive technology like spell checkers, grammar tools.
- Sentence starters and guided questions for students who need verbal or written support.
- Offer checklists and guided notes to support organization and self-monitoring.
- Create purposeful, authentic learning experiences.
- Use prompts to reinforce goals and keep students on track
- Use prompts, checklists, and rubrics to encourage self-monitoring and goal setting (ex. Have students share their thoughts about the lesson activities after each lesson)
- Provide models and strategies for managing frustration and emotions such as fidget tools or outdoor movement breaks.
- Model calm problem-solving strategies and adaptability when it comes to understanding and implementing Newton's Laws of Motion

Differentiated Instructions (DI)

- For ESL students upload the worksheets and instructions to google classroom so they can translate the assignment into their language.
- For all students play the videos twice so that everyone has an idea about what the video is about.
- For anxious students fold the assignments into smaller parts to reduce anxiety about the number of questions.
- Redirect student attention when the class is going off task.
- Keep students engaged through mini brain breaks.
- For students who are on IEP's offer them the chance to work in a way that suits them. This could be offering sound-canceling headphones, allowing them to work in other places in the classroom, or hallway.

Overview of Lessons:

Lesson 1

Name &Time (Minutes Allotted):	Newtons First Law: What Factors Affect Inertia? (30-45 min)
Learning Standards: Curricular Competencies	Questioning & Predicting • Make observations aimed at identifying their own questions about the natural world • Make predictions about the findings of their inquiry

	• Demonstrate a sustained curiosity about a scientific topic or problem of personal interest • Make observations in familiar or unfamiliar contexts Planning & Conducting • With support, plan appropriate investigations to answer their questions or solve problems they have identified Processing and Analyzing Data and Informational • Experience and interpret the local environment • Compare data with predictions and develop explanations for results • Demonstrate an openness to new ideas and consideration of alternatives Evaluating • Identify possible sources of error • Demonstrate an understanding and appreciation of evidence • Consider social, ethical, and environmental implications of the findings from their own and others' investigations Applying and Innovating • Contribute to care for self, others, community, and world through personal or collaborative approaches • Transfer and apply learning to new situations • Generate and introduce new or refined ideas when problem solving Communicating • Communicate ideas, explanations, and processes in a variety of ways • Communicate ideas, findings, and solutions to problems, using scientific language, representations, and digital technologies as appropriate
Learning Standards: Content	• Newtons Three Laws of Motion • Effects of balanced and unbalanced forces in daily physical activities
Instructional Objectives	• Students will be able to identify Newtons First Law • Students will be able to explain and implement Newton's First Law
Assessment:	• Through participation in class discussions • Completion of "What Factors Affect Inertia?" Worksheet • Exit Tickets • Observation and conversation with students about their thought processes.

Teaching Strategies:	• Set Clear Behavioural Expectations at the beginning and throughout the lesson • Encourage all students to participate • Use Attention Grabbers when necessary (5-0 Countdown) • Keep students engaged through mini breaks during the lesson • Walk around and mingle with the students to keep them on task and ask them about their thinking. • Don't talk over the students, wait until students are fully engaged.
Materials:	• Access to an open space • Wheely chair • "What Factors Affect Inertia?" Worksheet • Plastic cups • Prepared paper with string • Wooden blocks • Bag filled with matching objects used to make groups • Cones
Lesson Activities:	
Introduction/Hook:	*The "Stop and Go" Challenge (3-5 min)* • The teacher will lead the students outside or to an open space. • Once outside the students will stand in a straight line. • The teacher will discuss the rules and have a student repeat: o "When I say go you will run at a steady pace in a straight line until I shout "Stop" o "When I say stop you must try to stop immediately." • The students will follow the teacher's instruction. • From where the students stopped the teacher will ask students to run back until the teacher says stop. • Once the students are back the teacher will ask: o "Did you stop immediately?" • The students will most likely respond by saying they kept moving a little. • Afterward everyone will head back to the classroom.

Body:	*Explain and Introduce Newtons First Law (5-10 min)* • The teacher will ask a student to recap the activity they did outside, and why they think they didn't stop right away. • The teacher will state what the first law is: o "Objects will stay stopped or in constant motion until acted upon by an outside force." • The teacher will then explain how the activity they did reflects Newton's first law: o "Your body wanted to keep moving (inertia), your muscles and friction with the ground represents the stopping force." *Demonstrate Newton's First Law with the "Chair Pull Experiment" (5-7 min)* • The teacher will ask for two student volunteers, one to sit on the wheely chair, the other to represent the external force. Once the volunteer sits on the chair asks the teacher will ask the student for permission to push them. • The teacher will ask the second volunteer to stand across from them and once everyone's ready the teacher will gently push the student sitting forward and ask the students: o "What will happen if I don't stop _____ (student name)?" o Students will respond as a class saying that _____ would keep moving. • The teacher will tell the second volunteer to gently catch the moving student. • The teacher will ask students what the second student represents before explaining with scientific terms: o " _____(student name) applies external force to _____ (student name) who represents the object in motion." • The teacher will ask the standing student to push the sitting student back as the class states Newton's First Law: o "Objects will stay stopped or in constant motion until acted upon by an outside force."

	• The teacher will applaud the volunteers before having them return to their table groups. *Do the "What Factor Affects Inertia? Activity" (20-35 min)* • The teacher will use a group randomizer technique to split the class into groups of four or five. • Once the groups are formed students will head to a table and wait for instructions. • The teacher will set clear behavioural expectations and rules before bringing out the materials. • The teacher will ask one student from each group to grab the number of cups, stringed paper, and wood blocks for the people in their group and head back to their desks. • The teacher will have a student hand out the worksheets to everyone. • Once all the materials and worksheets are handed out the teacher will explain the activity. • While the students are engaging with the activity the teacher will walk around, re-direct off task behaviours and ask students to explain their thinking and ask questions to encourage scientific thinking: o "Do you think the same thing would happen if the cups were different sizes? o "Does the speed you pull the strings matter? o "Is gravity at play?"
Closure:	*Exit Ticket (3-5 min)* • Have students write down and explain a real-world example on ticket, and hand it in to the teacher.

Lesson 2

Name &Time (Minutes Allotted):	Newtons Second Law Balloon Rocket Experiment (30-45 min)
Learning Standards: Curricular Competencies	Questioning & Predicting • Make observations aimed at identifying their own questions about the natural world • Make predictions about the findings of their inquiry

	• Demonstrate a sustained curiosity about a scientific topic or problem of personal interest • Make observations in familiar or unfamiliar contexts Planning & Conducting • With support, plan appropriate investigations to answer their questions or solve problems they have identified Processing and Analyzing Data and Informational • Experience and interpret the local environment • Compare data with predictions and develop explanations for results • Demonstrate an openness to new ideas and consideration of alternatives Processing and Analyzing Data and Informational • Experience and interpret the local environment • Compare data with predictions and develop explanations for results • Demonstrate an openness to new ideas and consideration of alternatives Evaluating • Identify possible sources of error • Demonstrate an understanding and appreciation of evidence • Consider social, ethical, and environmental implications of the findings from their own and others' investigations Applying and Innovating • Contribute to care for self, others, community, and world through personal or collaborative approaches • Transfer and apply learning to new situations • Generate and introduce new or refined ideas when problem solving Communicating • Communicate ideas, explanations, and processes in a variety of ways • Communicate ideas, findings, and solutions to problems, using scientific language, representations, and digital technologies as appropriate
Learning Standards: Content	• Newton's Three Laws of Motion • Effects of balanced and unbalanced forces in daily physical activities
Instructional Objectives	• Students will be able to identify Newtons' Second Law

	• Students will be able to explain and implement Newton's Second Law
Assessment:	• Graffiti Wall • Participation in the Balloon Rocket Experiment • Basketball Discussion • Observation and conversation with students about their thought processes.
Teaching Strategies:	• Set Clear Behavioural Expectations at the beginning and throughout the lesson • Encourage all students to participate • Use Attention Grabbers when necessary (5-0 Countdown) • Keep students engaged through mini breaks during the lesson • Walk around and mingle with the students to keep them on task and ask them about their thinking. • Don't talk over the students, wait until students are fully engaged.
Materials:	• Balloons of different sizes • Tape • Straws • String • Ruler • Scissors • Rope • Small ball • Poster paper • Projector • Computer • "Balloon Rocket" Experiment Booklet • : "Balloon Rocket Experiment by Hungry SciANNtist" o https://youtu.be/NXk0EAC8jAQ?si=YORjHTIqjysOeO7U
Lesson Activities:	
Introduction/Hook:	*Tug-O-War with a Twist (3-5 min)* • The teacher will have students go outside, or an open space and set clear expectations. • The teacher will evenly split the students in half. • One half will go to one side, and the other will go to the other. • Students pick up the rope. • When the teacher says go, the students will attempt to pull the other side toward them.

	• While the students are doing this the teacher, or a random student, will be told to join the other side. • After the game is won the class will head back inside and return to their seats.

Body:	*Introduce Newton's Second Law of Motion Through Discussion about "Tug-O-War with a Twist" (5-10 min)*
	
	• The teacher will ask students what they think about the activity and how it could be related to Newton's Laws. Some questions to prompt discussion could be:
	  o "Did you notice anything?"
	  o When someone joined the other side was it difficult for your side to win? Why do you think that is?
	• After some class discussion the teacher will state the second law:
	  o "Only an unbalanced force causes acceleration."
	  o The second law of motion is represented in the formula F(force)=m(mass)a(acceleration) F=ma. This law explains how objects move when an outside force acts on it.
	
	Graffiti Wall (5 min)
	
	• The teacher will give each table a piece of poster paper and ask students to write/draw as many real-world examples of Newton's Second Law.
	• As the students work on their posters the teacher will walk around and ask students to explain how the examples represent Newtons Second Law.
	• After five minutes the teacher will ask each table to pick one of their examples and explain how they are connected.
	
	Balloon Rocket Experiment (30-40 min)
	
	• Watch the video: "Balloon Rocket Experiment by Hungry SciANNtist"
	  o https://youtu.be/NXk0EAC8jAQ?si=YORjHTIqjysOeO7U
	
	• The teacher will split the students into groups of two or three using random grouping.
	
	• When students are in their groups the teacher will ask for some volunteers to hand out the booklets.
	
	• Once everyone has the booklets the teacher will go over it with the class.

	• The teacher will set clear behavioural expectations and rules before having one student from each pair come and get their supplies. • Once the students have their materials the teacher will tell them when they can begin. • While the students are experimenting, the teacher will walk around, re-direct off task behaviour, and ask students about their experiments.
Closure:	*"What if?" Basketball Discussion (5 min)* • The teacher will use an attention grabber. • The teacher will have students return to their desks • Once students are at their desks the teacher will gently throw a ball to a student and ask one of these questions: o What if gravity didn't exist—how would Newton's Second Law change? o What would happen if cars had no mass—how would force affect them? o How does Newton's Second Law help in sports? o What was your prediction? Did it happen or not? Why?

Lesson 3

Name &Time (Minutes Allotted):	Newtons Third Law the Jumping Cup Experiment (30-45 min)
Learning Standards: Curricular Competencies	Questioning & Predicting • Make observations aimed at identifying their own questions about the natural world • Make predictions about the findings of their inquiry • Demonstrate a sustained curiosity about a scientific topic or problem of personal interest • Make observations in familiar or unfamiliar contexts Planning & Conducting • With support, plan appropriate investigations to answer their questions or solve problems they have identified Processing and Analyzing Data and Informational • Experience and interpret the local environment • Compare data with predictions and develop explanations for results

	• Demonstrate an openness to new ideas and consideration of alternatives Processing and Analyzing Data and Informational • Experience and interpret the local environment • Compare data with predictions and develop explanations for results • Demonstrate an openness to new ideas and consideration of alternatives Evaluating • Identify possible sources of error • Demonstrate an understanding and appreciation of evidence • Consider social, ethical, and environmental implications of the findings from their own and others' investigations Applying and Innovating • Contribute to care for self, others, community, and world through personal or collaborative approaches • Transfer and apply learning to new situations • Generate and introduce new or refined ideas when problem solving Communicating • Communicate ideas, explanations, and processes in a variety of ways • Communicate ideas, findings, and solutions to problems, using scientific language, representations, and digital technologies as appropriate
Learning Standards: Content	• Newton's Three Laws of Motion • Effects of balanced and unbalanced forces in daily physical activities
Instructional Objectives	• Students will be able to identify Newtons' Third Law • Students will be able to explain and implement Newton's Third Law
Assessment:	• Class discussions • Observation and conversation with students about their thought processes. • Completion of the "Jumping Cup Experiment booklet"
Teaching Strategies:	• Set Clear Behavioural Expectations at the beginning and throughout the lesson • Encourage all students to participate • Use Attention Grabbers when necessary (5-0 Countdown) • Keep students engaged through mini breaks during the lesson

	• Walk around and mingle with the students to keep them on task and ask them about their thinking. • Don't talk over the students, wait until students are fully engaged.
Materials:	• Balloons • Plastic Cups • "Jumping Cup Experiment Booklet"
Lesson Activities:	
Introduction/Hook:	*High-Five Challenge (3-5 min)* • Set clear behavioural expectations • The teacher will ask students to stand up and spread themselves around the classroom. • When the teacher says "High-Five" students will have three minutes to walk around and give their classmates soft high-fives. • After the three minutes are up students will have two minutes' to walk around and give each other harder, but not too hard, high fives.
Body:	*Introduce Newton's Third Law Through Discussion about the "High-Five Challenge" (5-10 min)* • The teacher will tell students to return to their desks. • The teacher will ask students: o "Between the soft and hard high fives, you gave to each other did you feel an equal force back?" o "If so, why do you think that is?" • After hearing students' responses, the teacher will state the third law and ask students a question: o "Every force has an equal and opposite reaction force." o "Now that you know what the third law is how did our high-five challenge reflect it?" • After hearing student responses, the teacher will explain how the activity reflects the third law: o "By pushing on your friend's hand, you act as the force." o "While your friend's hand pushes back with the same force." o "Meaning that the harder you push, the harder the reaction force."

	• With this in mind the teacher will get students to repeat the activity while remaining respectful to each other. *Jumping Cup Experiment (30-40 min)* • The teacher will have students return to their tables and split the class into groups of two or three. • Once at their tables the teacher will ask for a volunteer to hand out the booklets. • When everyone has a booklet, the teacher will go over it with the class. • The teacher will ask students if they need a demonstration or not. • Before beginning the experiment, the teacher will set clear behavioural expectations and have a student repeat. • The teacher will get a student from each group to come up and grab their supplies. • While students are participating in the experiment the teacher will walk around, re-direct off task behaviours and ask students about their predictions and process.
Closure:	*Exit Ticket (3-5 min)* • After cleaning up the teacher will put "Give two examples of real-life events where we see action-reaction forces like this?" on the board. • Students will spend three to five minutes writing their exit tickets and handing them in.

Lesson 4

Name &Time (Minutes Allotted):	Build and Race A Popsicle Car
Learning Standards: Curricular Competencies	Questioning & Predicting • Demonstrate a sustained curiosity about a scientific topic. or problem of personal interest • Make observations in familiar or unfamiliar contexts. • Make predictions about the findings of their inquiry

	• Formulate alternative "If…then…" hypotheses based on their questions Planning and Conducting • Choose appropriate data to collect to answer their questions • Observe, measure, and record data, using appropriate tools, including digital technologies • Collaboratively plan a range of investigation types, including field work and experiments, to answer their questions or solve problems they have identified Processing and analyzing data and information • Experience and interpret the local environment • Construct and use a variety of methods, including tables, graphs, and digital technologies, as appropriate, to represent patterns or relationships in data • Compare data with predictions and develop explanations for results • Demonstrate an openness to new ideas and consideration of alternatives Evaluating • Demonstrate an understanding and appreciation of evidence Applying & Innovating • Contribute to care for self, others, and community through personal or collaborative approaches • Co-operatively design projects Communicating • Communicate ideas, explanations, and processes in a variety of ways
Learning Standards: Content	• Newton's Three Laws of Motion • Effects of balanced and unbalanced forces in daily physical activities
Instructional Objectives	• Students will be able to identify Newton's Three Laws of Motion • Through trial-and-error students will be able to demonstrate their understanding about the Laws of Motion.
Assessment:	• Newton's Three Laws of Motion Kahoot

	• Observations of student participation in the building of their own cars and boats activity. • Observation and conversation with students about their thought processes. • Written reflections and completion of Build a Car booklet
Teaching Strategies:	• Set Clear Behavioural Expectations at the beginning and throughout the lesson • Encourage all students to participate • Use Attention Grabbers when necessary (5-0 Countdown) • Keep students engaged through mini breaks during the lesson • Walk around and mingle with the students to keep them on task and ask them about their thinking. • Don't talk over the students, wait until students are fully engaged.
Materials:	• Newton's Three Laws of Motion Kahoot! • Build a Car Experiment Booklet • 4 Popsicle Sticks per person • 2 Dowel Rods • 10 Med/8 Sml/ 1 Lg Rubber band • 2 Straw (one long and two small) • 4 Bottle Lids • Markers • Stickers
Lesson Activities:	
Introduction/Hook:	*Newton's Three Law of Motion Kahoot It! (3-5 min)* • Before putting on the Kahoot the Teacher will set clear expectations and rules about appropriate nicknames and the activity itself. • The teacher will put up the Kahoot and reveal the pin • Students are allowed to play individually or with a partner • Once all students are in the game the teacher will start the quiz.
Body:	*Recap Newton's Three Laws of Motion and Connect them to Building a Car (7-10 min)*

	• The teacher will ask students to individually state Newton's Laws and ask them for examples from their lessons or real-life.
	  o "Newton's First Law states: Objects will stay stopped or in constant motion until acted upon by an outside force."
	  o Students will either talk about "Stop and Go Challenge", "Chair Pull Experiment" or the "Inertia Activity"
	  o The teacher will ask students to explain why and how those activities represent Newton's First law.
	
	  o "Newton's Second Law states: Only an unbalanced force causes acceleration"
	  o Students will either talk about "Tug-O-War with a Twist", "Balloon Rocket Experiment", the gallery walk or whatever they think of that's related.
	
	  o "Newton's Third Law states: Every force has an equal and opposite reaction force."
	  o Students will discuss the "High-Five Challenge", and "Jumping Cups Experiment"
	
	Build a Car Demonstration (7-10 min)
	
	• The teacher will hand out the instructions to the students.
	
	• Once all students have the instructions the teacher will follow the steps and build a car.
	
	• During the demonstration the teacher can have the students tell the teacher what to do.
	  o The teacher can also ask students questions like: "What part of the car do the popsicle sticks represent? What is the primary function of the rubber band?" or any other questions that come to mind.
	
	Build a Car (20-35 min)
	
	• Students will raise their hands if they have any questions about the instructions.
	
	• The teacher will ask for a couple volunteers to hand out the materials.
	
	• Once students have their materials the students will begin their car's construction.

	• While students are constructing their cars if they need any assistance or have questions they will raise their hands and wait for the teacher to help them. • The teacher will walk around asking students about their thinking processes and assisting any students who may need it. *Race Your Cars (5 min)* • The teacher will use an attention grabber and ask students if they feel comfortable racing their cars. • If students choose to race the remainder of the students would measure and compare the length between the racers. • Depending on the students there could be a competition for 4th, 3rd,2nd, and 1st and the teacher can offer prizes.
Closure:	*Exit Ticket (3-5 min)* • The teacher will give students a ticket and ask them to summarize each of the three laws in their own words and give a real-world example of one of the laws.

Resources:

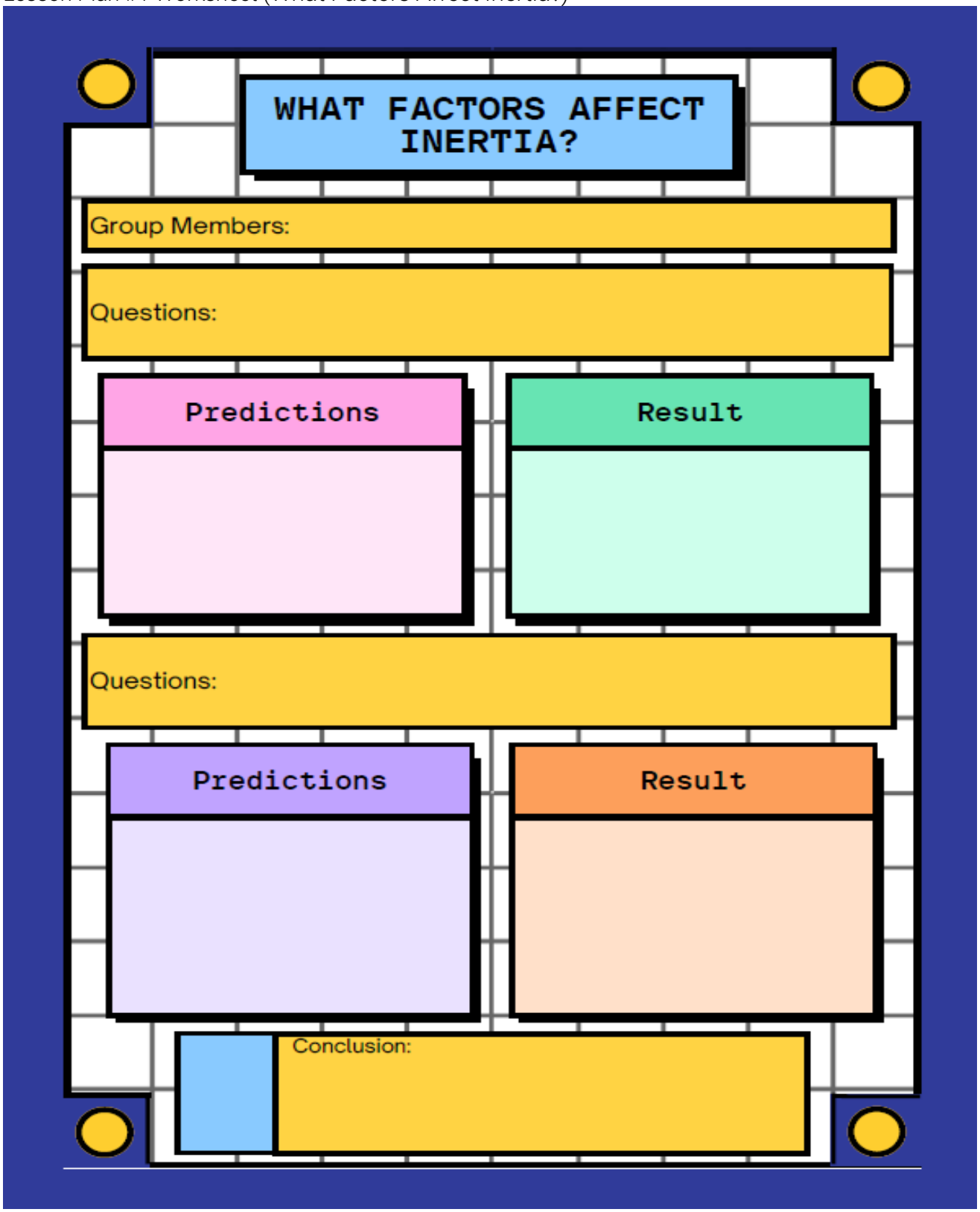
- "What Factors Affect Inertia?" Worksheet (LP1)
- "Balloon Rocket Experiment Booklet" (LP2)
- "Jumping Cup Experiment Booklet" (LP3)
- "Balloon Rocket Experiment by Hungry SciANNtist" (LP3)
  - https://youtu.be/NXk0EAC8jAQ?si=YORjHTIqjysOeO7U
- Kahoot! (LP4)
- Build a Car Experiment Booklet

Extensions to Unit:

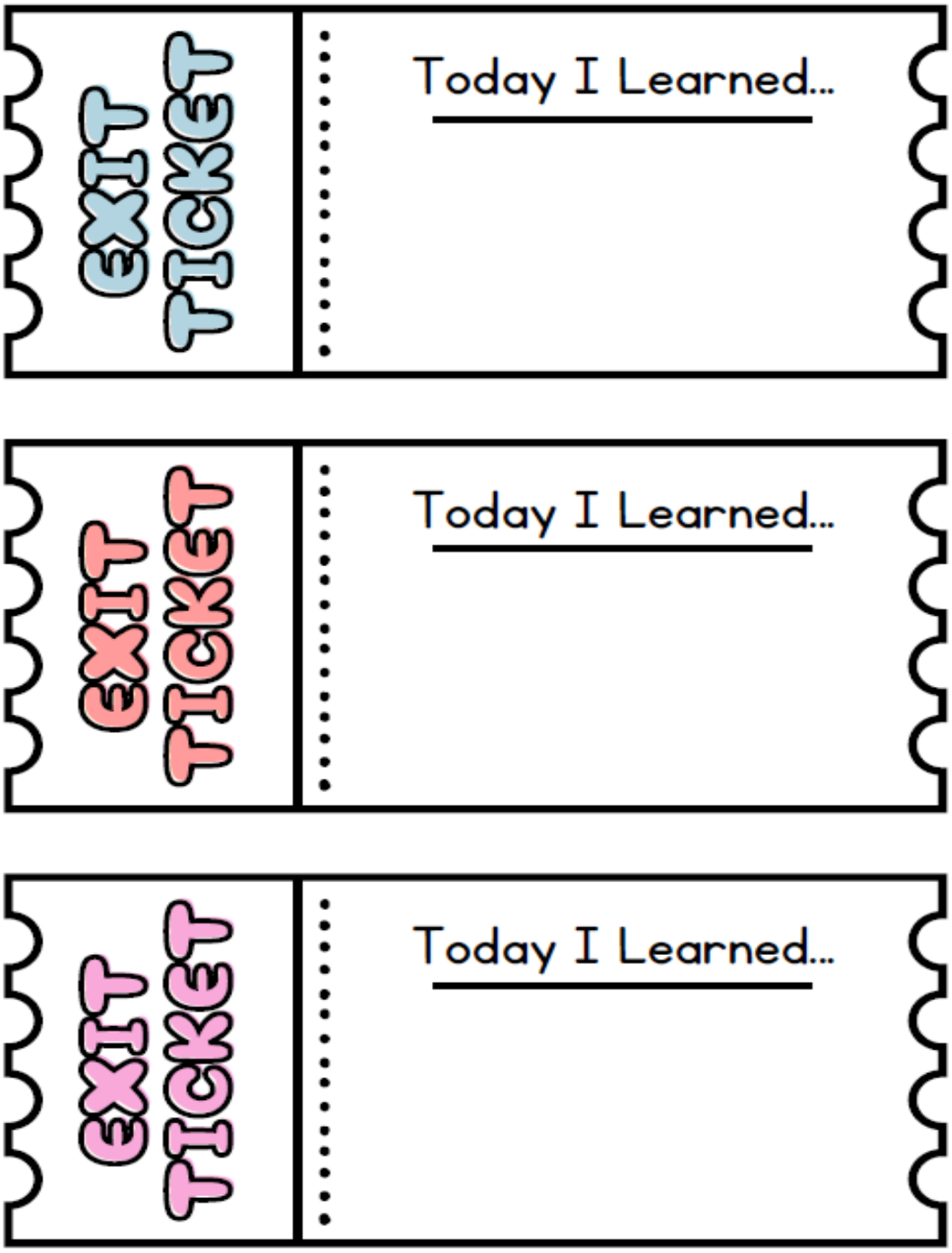
This unit can extend into sports science through exploring how Newton's Laws are used in sports like soccer, skateboarding, basketball, etc. This can also be extended into other experiments, like an egg-drop challenge, building popsicle boats, and redesigning their popsicle car. Another way to extend this unit would be to do a virtual tour about real world jobs that use Newtons Laws.

Reflections and Revisions

Lesson Plan #1 Worksheet (What Factors Affect Inertia?)



Exit Tickets



Name:_____ Date:_____

Balloon Rocket Experiment

Materials:

- Balloons
- String
- Chairs
- Tape
- Scissors
- Ruler
- Straws

Instructions:

1. Position two chairs a strings length from one another.
2. Use the ruler to cut the straw so its 10 cm long
3. Blow up the balloon, **DO NOT TIE THE BOTTOM**
4. Tape the straw to the top of the balloon.
5. Insert the free end of the string through the straw.
6. Let the Balloon Go!
7. Record your observations.

Prediction:

What do you think will happen when the balloon is released?

_____

_____

_____

_____

If you use a bigger balloon will it travel farther or faster?

_____

_____

_____

_____

_____

Trial	Size of Balloon (sml / med/ lrg)	Distance Travelled (cm)	Time Taken (sec)	Speed= Distance divided by time (cm/s)
1				
2				
3				

Analysis & Conclusion:

1. What happened to the balloon when you let it go?

_____

_____

2. Did a bigger balloon move farther or faster than a smaller one? Why?

_____

_____

_____

_____

3. How does this experiment show Newton's Second Law (F = ma)?

_____

_____

_____

4. What would happen if we added weight to the balloon?

_____

_____

_____

Name: _____ Date: _____

Jumping Cup Experiment

Materials:

- Cups
- Balloon
- Ruler

Instructions:

1. Write your predictions
2. Place one cup on the table.
3. Hang the balloon in the cup leaving the mouth outside of the cup.
4. Place the second cup on top.
5. Blow into the balloon.
6. Observe and record how high the cup goes.

Predictions:

1. What do you think will happen when the balloon releases air between the two cups?

_____

_____

_____

2. If you were to blow in more air would the top cup go higher, stay the same or lower?

_____

_____

_____

Observations:

Trial	Amount of Air (breaths)	Height (cm)
1		
2		
3		

Analysis & Conclusion:

1. Identify the Action and Reaction Forces:

Action: _____

Reaction_____

2. How does this experiment demonstrate Newton's Third Law?

_____

_____

_____

3. What did you learn about Newton's Third Law?

_____

_____

_____

Name:_____ **Date:_____**

Popsicle Car

Materials:

- 4 Bottle Caps
- 4 Popsicle Sticks
- 2 Dowel Rods
- 10 Med/8 Sml/ 1 Lg Rubber band
- 2 Straws
- Ruler
- Markers/Stickers

Predictions:

How long do you think your car will travel?

_____

_____

Would a rectangle or a triangular car go faster? Why?

_____

_____

_____

Instructions Pt.1:

1. Connect the popsicle sticks at the corners with medium rubber bands to make a square frame. Slide the two medium rubber bands onto the last stick before you attach it (they will hang loosely you'll use them later.

2. Slide the stick opposite the one with the loose bands down towards the center (like a ladder). The open end is your rear.

3. Attach the larger straw under the rear popsicle stick of the frame with medium rubber bands. Attach the other two small straws to the frame at the open end: In front of the middle popsicle stick.

4. Wrap a medium rubber band around the perimeter of two bottle lids they should just fit

Instructions Pt2 :

5. Wind a smaller band tight around a dowel rod 1/4 from the end, then slide a lid on and use another band to keep it secure.

6. Slide the clean end of the rod through your rear straws and secure a lid on the other side with more small bands.

7. Assume your front axle like you did the rear. Make sure no wheels are touching the frame.

8. Tie one end of the large rubber band tightly to the rear axle and the other to the front popsicle stick.

9. Roll the back axle (dowel rod) toward you so the rubber band wraps around it multiple times. Set down the vehicle and let it go!

Observation:

Trial	Distance Traveled (cm)
1	
2	
3	

Results & Analysis:

Which of Newton's Laws did you observe the most during this experiment?

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_____

How does this experiment relate to real-life vehicles like bikes, skateboards, or cars?

_____

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