THOMPSON RIVERS UNIVERSITY | Education & Social Work

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

Unit Title:	Force and Motion	Number of Lessons	6	Time (in weeks):	
Name:	Kyra Doehle	Subject(s):	Science, ELA, ADST	Grade(s):	Kindergarten

Rationale

I am teaching this unit because understanding force and motion is foundational for young learners, as it fosters scientific reasoning and inquiry skills. The unit integrates hands-on, play-based learning that engages students in exploring key concepts such as pushes and pulls and how physical factors influence movement. Through interactive activities, students not only cultivate curiosity about the physical world but also develop critical communication, collaboration, and critical thinking skills. This unit supports various curricular competencies in science, ELA, and ADST, helping students build a comprehensive understanding of movement, which is essential for their cognitive development and future learning in STEM fields.

Overview:

Lesson 1: What is Force?

In this lesson, students will explore the concepts of push and pull through hands-on activities with toy cars, balls, and wagons. They will learn to identify and demonstrate these concepts while engaging in play-based learning.

Lesson 2: Rolling and Sliding

Students will compare how different shapes and surfaces affect the movement of objects. They will distinguish between rolling and sliding through exploration stations with various objects, ramps, and collaborative learning activities.

Lesson 3: Heavy vs. Light

This lesson focuses on comparing how the weight and size of objects affect their movement. Students will engage in hands-on exploration to observe and discuss the differences in how heavy and light objects are pushed and pulled.

Lesson 4: Building a Ramp

Students will experiment with ramp incline to understand how the height of a ramp affects the speed and distance of rolling objects. They will design and test their own ramps, observing the results and discussing their findings.

Lesson 5: Measuring How Far It Goes!

In this lesson, students will measure the distance objects travel using non-standard units, such as blocks or crayons. They will compare distances to determine which objects travel farther and practice using appropriate vocabulary.

Lesson 6: Force and Motion Olympics

Students will apply their understanding of force and motion by completing various challenges that involve pushing and pulling objects. They will participate in different stations, demonstrating their skills and reflecting on their learning experiences.

CORE COMPETENCIES

Communication	Thinking	Personal & Social
● Communicating *In familiar settings, I communicate with peers and adults.* ● Collaborating *I contribute during group activities with peers and share roles and responsibilities to achieve goals.*	● Critical thinking *I can gather and combine new evidence with what I already know to develop reasoned conclusions, judgments, or plans.* ● Creative thinking *I can get new ideas or build on or combine other people's ideas to create new things within the constraints of a form, a problem, or materials.*	● Social responsibility *I can interact with others and the environment respectfully and thoughtfully.*

BIG IDEAS

(multiple subject areas for integrated unit)

Subject Name: Science K	Subject Name: ELA K	Subject Name: A.D.S.T. K
The motion of objects depends on their properties.	Curiosity and wonder lead us to new discoveries about ourselves and the world around us.	Skills can be developed through play.

LEARNING STANDARDS

Curricular Competencies	Content
Science - Make exploratory observations using their senses - Safely manipulate materials - Make simple measurements using non-standard units - Observe objects and events in familiar contexts - Demonstrate curiosity and a sense of wonder about the world - Transfer and apply learning to new situations - Share observations and ideas orally	Science - Effects of pushes/pulls on movement - How things move - Effects of size, shape, and material on movement
ADST - Develop their skills and add new ones through play and collaborative work - Generate ideas from their experience	ADST - no specific content for K-3

- Add to others' ideas - Use trial and error to make changes, solve problems, or incorporate new ideas from self or others	
ELA - Exchange ideas and perspectives to build shared understanding - Use sources of information and prior knowledge to make meaning	ELA - Metacognitive strategies - Oral language strategies

Prerequisite Concepts and Skills:

- Ability to connect personal experiences to new learning
- Fine and gross motor skills
- Good oral language skills
- Basic metacognitive skills
- Basic cause-and-effect reasoning
- Simple concepts of movement
- Basic spatial awareness
- Observation skills
- Ability to participate in group activities and follow instructions

Teacher Preparation Required:

Lesson #	Teacher Preparation Required
Lesson 1	- Setup a clear spot for exploration - Prepare a mystery box with a toy car and a ball
Lesson 2	- Prepare ramps and sorting trays - Setup exploration stations
Lesson 3	- Gather objects of different weights - Setup exploration stations
Lesson 4	- Setup ramps at different heights - Prepare materials for ramp-building stations
Lesson 5	- Clear a space for rolling or pushing objects - Prepare nonstandard measuring units and mark starting lines
Lesson 6	- Set up challenge stations - Prepare medal or ribbon extension activities if using them

Cross-Curricular Connections:

This unit is cross-curricular, integrating science with ADST, ELA, and math. Activities such as designing and testing ramps, measuring distances, and sorting objects by weight, support ELA learning by encouraging students to describe their observations and engage in discussions. These hands-on activities also strengthen math skills through non-standard measurements and comparisons of size, weight, and distance, while fostering problem-solving and engineering thinking within the ADST framework.

Aboriginal Connections/ First Peoples Principles of Learning:

This unit closely connects to the FPPL **"Learning involves patience and time."** Throughout the unit students are given space and time to engage in hands-on exploration and repeated processes, such as testing ramps, building structures, and observing the effects of force and motion. These activities emphasize that understanding develops gradually through experimentation, reflection, and collaboration. By fostering an appreciation for the process of learning rather than focusing solely on

immediate outcomes, the unit encourages students to embrace patience as they build their knowledge and skills.

This unit closely connects to the Grandfather Teaching of **Respect.** Through hands-on exploration and collaborative learning, students develop respect for the materials they use, their peers' ideas, and the process of discovery. The unit encourages patience, listening, and valuing different perspectives, reinforcing the importance of respecting both the learning journey and the natural forces at play in the world around them.

Universal Design for Learning (UDL)

Multiple Means of Engagement:

- Offers varied ways for students to connect with the concept of force and motion (e.g., through hands-on activities like rolling cars, pushing and pulling objects, and experimenting with ramps, along with visual demonstrations, and verbal explanations).
- Allows for flexible groupings (e.g., small group work or partner activities during stations to cater to different social preferences and learning styles).
- Provides choices within lessons (e.g., different objects to experiment with, such as ramps, balls, and toy cars, giving students the autonomy to explore forces in their own way).

Multiple Means of Representation:

- Presents information in diverse formats (e.g., visual charts, demonstrations, and hands-on activities) to support various learning styles and language needs.
- Uses visuals like phsyical examples of pushes, pulls, rolls, and slides to help students better understand the concepts of force and motion.
- Simplifies and scaffolds language in discussions to accommodate diverse literacy levels and ensure clarity in explaining scientific concepts.

Multiple Means of Expression:

- Provides different ways for students to express their learning (e.g., verbal reflections, drawings of motion experiments, and demonstrating their understanding through movement).
- Offers opportunities for oral, visual, and kinesthetic expression, allowing students to share their learning in a way that feels most comfortable and engaging to them.

Differentiated Instruction (DI):

Student D:

- Demonstrate the task at each station with him again when he is at the station
- Use a first..then visual if needed
- Use noise-cancelling headphones if needed

Student B:

- Provide alternate tasks to the hands-on stations like worksheets where they interact with the same concepts just in a less stimulating and distracting activity. (this is an option for any student who may need it)

Student J:

- Establish boundaries in the classroom for each station and be clear with the expectations at each station.
- Be sure to offer positive reinforcement when on task

Overview of Lessons:

Lesson 1

Name &Time (Minutes Allotted):	What is Force?

Learning Standards: Curricular Competencies	Science: - Make exploratory observations using their senses - Demonstrate curiosity and a sense of wonder about the world - Share observations and ideas orally ADST: - Develop their skills and add new ones through play and collaborative work ELA: - Exchange ideas and perspectives to build shared understanding
Learning Standards: Content	Science: - Effects of pushes/pulls on movement
Instructional Objectives	SWBAT identify and demonstrate the concepts of push and pull by exploring how objects move through hands-on activities.
Assessment:	Observation: Watch students interact with objects, noting their ability to correctly use the terms "push" and "pull" during play. Conversation: Ask guiding questions (e.g., "What did you do to make the car move?") to evaluate understanding.
Teaching Strategies:	Play-Based Learning Experiential Learning Direct Instruction
Materials:	Toy cars or small vehicles Lightweight wagons or sleds Balls (various sizes) Blocks Clear space for exploration
Lesson Activities:	
Introduction/Hook:	Mystery Box Activity: ● Place a toy car and a ball in a box or bag. Ask, “What do you think is inside? What do we do to make things like this move?” ● Let students guess, then reveal the items. ● Explain: "Today, we're going to discover how we can make things move by pushing or pulling!" Demonstration: ● Show a toy car. Push it gently and ask, “What happened? What did I do?” ● Then, attach a string to the car and pull it, asking the same question. ● Introduce the words "push" and "pull" and write them on chart paper.
Body:	Exploration Stations: ● Divide the class into small groups. Set up stations where students: ○ Push toy cars down a small ramp or flat surface. ○ Pull wagons with blocks inside. ○ Roll balls across the floor or between partners.

	● Encourage exploration: “What happens when you push hard? What happens when you pull gently?” Discussion and Vocabulary Use: ● Rotate among the groups, prompting students to describe their actions using "push" and "pull." ● On the chart paper, add simple drawings next to the words for visual learners.
Closure:	Class Reflection: ● Gather students in a circle and review the activity. ● Ask: ○ “What is a push? Can someone show me?” ○ “What is a pull? Can you give an example?” ○ “Can you think of something in your house that moves using a push or pull?” ● Record student examples for future reference.

Lesson 2

Name &Time (Minutes Allotted):	Rolling and Sliding
Learning Standards: Curricular Competencies	Science: - Make exploratory observations using their senses - Share observations and ideas orally ADST: - Use trial and error to make changes, solve problems, or incorporate new ideas from self or others
Learning Standards: Content	Science: - How things move - Effects of size, shape, and material on movement
Instructional Objectives	SWBAT identify and compare how different shapes and surfaces affect the movement of objects, distinguishing between rolling and sliding.
Assessment:	Observation: Monitor students’ ability to sort objects into “rolling” or “sliding” categories during activities. Conversations: Ask students to explain why certain objects roll or slide.
Teaching Strategies:	Inquiry-Based Learning Collaborative Learning
Materials:	Objects that roll (balls, toy cars, round containers) Objects that slide (blocks, flat-bottomed toys, books) Ramps made of different materials (wood, plastic, carpet, cardboard) Chart paper and markers Sorting trays or labelled bins
Lesson Activities:	
Introduction/Hook:	Mystery Challenge: ● Show students a ball and a block. Ask, “What do you think will happen if I put these on a ramp? Which one will go faster? Why?”

	● Let students share their predictions. ● Explain: “Today, we’re going to explore how different shapes and surfaces affect how things move.” Demonstration: ● Place the ball on a ramp and let it roll. Then place the block on the same ramp and observe it sliding or staying still. ● Introduce the terms "rolling" and "sliding", adding these words to a visual chart with simple illustrations.
Body:	Exploration Stations: ● Station 1: Shape Matters: ○ Provide a variety of objects (balls, blocks, toy cars) and a ramp. ○ Students test each object and sort it into categories: "Rolls" or "Slides." ○ Encourage them to explain their reasoning: “Why do you think this rolls/slides?” ● Station 2: Surface Experiment: ○ Set up ramps with different materials (wood, plastic, carpet, etc.). ○ Students test one object (e.g., a ball) on each surface and observe how far or fast it moves. ○ Prompt discussion: “Which surface helps the ball roll farthest? Why?” ● Station 3: Free Play: ○ Offer a variety of ramps and objects for students to explore on their own. ○ Encourage them to share interesting findings with their peers.
Closure:	Group Discussion: ○ After stations, gather the class and ask: ■ “What did you notice about shapes? Which ones roll? Which ones slide?” ■ “What happened on different surfaces? Which was the fastest? Why?” Closure: Chart Activity: ○ Work as a class to create a large T-chart labelled “Rolls” and “Slides.” ○ Invite students to contribute their findings by placing a picture or name of an object in the correct column. ○ Discuss patterns: “What do the rolling objects have in common? What about sliding objects?”

	○ End with an action-based review: Hold up an object and ask students to shout, “Rolls!” or “Slides!”

Lesson 3

Name &Time (Minutes Allotted):	Heavy vs. Light
Learning Standards: Curricular Competencies	Science: - Make exploratory observations using their senses - Safely manipulate materials - Share observations and ideas orally ELA: - Use sources of information and prior knowledge to make meaning - Exchange idea and perspectives to build shared understanding
Learning Standards: Content	Science: - Effects of size, shape, and material on movement ELA: - Metacognitive strategies
Instructional Objectives	SWBAT compare how the weight and size of objects affect their movement when pushed or pulled, and explain their observations.
Assessment:	Observation: Monitor students' ability to compare the movement of heavy vs. light objects. Conversations: Engage students in discussions about their observations (e.g., “Why was the bigger object harder to move?”).
Teaching Strategies:	Hands-on Exploration Guided Inquiry
Materials:	A variety of heavy and light objects (e.g., small balls, large balls, toy cars, blocks of different weights) Toy wagons or containers to move objects Ramps (optional) Chart paper and markers for group reflection
Lesson Activities:	
Introduction/Hook:	Weight Guessing Game: ● Show students two objects (e.g., a small ball and a heavy block). Ask, “Which one do you think is heavier? Which one will be harder to push?” ● Let students guess, then let a few volunteers lift or push each object to test their predictions. ● Explain: “Today, we’re going to find out how heavy and light objects move differently when we push or pull them.”
Body:	Exploration Stations: ● Station 1: Push and Compare: ○ Provide a range of heavy and light objects. Students push each object across the floor and describe what they notice. ○ Prompt them with questions like, “Which is easier to push? Why?” ● Station 2: Pulling Power:

	○ Using toy wagons or containers, have students load one heavy and one light object and pull them across the floor. ○ Encourage them to observe differences: "Was it harder to pull the wagon with the heavy object?" ● Station 3: Ramp Testing (optional): ○ Let students test heavy and light objects on a ramp. Observe whether the objects roll or slide faster or slower based on their weight. ○ Discuss: "Did the weight change how the object moved down the ramp?"
Closure:	Group Discussion: ○ After exploring, gather students to share findings: ■ "What did you notice about heavy and light objects?" ■ "Which was easier to push or pull? Why?" Sorting Activity: ○ Provide a set of objects and have the class work together to sort them into "Heavy" and "Light" categories on a large chart. ○ Discuss patterns: "What do the heavy objects have in common? What about the light ones?"

Lesson 4

Name &Time (Minutes Allotted):	Building a Ramp
Learning Standards: Curricular Competencies	Science: - Make simple measurements using non-standard units ADST: - Develop their skills and add new ones through play and collaborative work
Learning Standards: Content	Science: - Effects of size, shape, and material on movement ELA: - Metacognitive strategies
Instructional Objectives	SWBAT experiment with ramp incline and describe how the height of a ramp affects the speed and distance of a rolling object.
Assessment:	Observation: Watch students test different ramp heights and note their ability to describe changes in speed and distance. Conversations: Ask students questions such as, "What happened when the ramp was higher?"
Teaching Strategies:	Hands-on Exploration Prediction and Testing
Materials:	Blocks, books, or other items to adjust ramp height Ramps made from sturdy materials (e.g., cardboard, wood, plastic) Toy cars or small balls

	Tape to mark starting and stopping points Non-standard measurement tools (blocks, crayons, paper strips)
Lesson Activities:	
Introduction/Hook:	Rolling Race: ● Set up two ramps of different heights and roll a toy car or ball down each. ● Ask: "Which one went faster? Why do you think that happened?" ● Explain: "Today, we're going to be ramp builders! We'll test different ramp heights to see how they change how far and fast things roll."
Body:	Exploration Stations: ● Station 1: Ramp Height Experiment: ○ Students build ramps using blocks or books to create different heights (low, medium, high). ○ Roll a ball or car down each ramp and observe how far it goes. ○ Mark stopping points with tape and measure using non-standard units (e.g., "The ball went 8 blocks far!"). ○ Record results on a simple chart or drawing. ● Station 2: Speed Test: ○ Students predict which ramp height will make the ball or car go fastest, then test their predictions. ○ Discuss: "What did you notice about the speed at different heights?" ● Station 3: Free Play: ○ Provide materials for students to create their own ramps and experiment with height and surfaces.
Closure:	Group Discussion: ○ After station work, gather students to share findings. ○ Ask: ■ "What happened when the ramp was higher?" ■ "Which ramp made the ball go the farthest? Why do you think that is?" Class Chart: ○ Work together to create a chart summarizing the results of different ramp heights (e.g., "Low ramp = short distance; High ramp = long distance"). ○ Add simple drawings to make the chart accessible. Reflection:

	○ Ask each student to share one thing they learned or found interesting. ○ End with a fun challenge: "If you could build the tallest ramp in the world, what do you think would happen to the ball?"

Lesson 5

Name &Time (Minutes Allotted):	Measuring How Far It Goes!
Learning Standards: Curricular Competencies	Science: - Make simple measurements using non-standard units - Share observations and ideas orally - Transfer and apply learning to new situations ADST: - Use trial and error to make changes, solve problems, or incorporate new ideas from self or others ELA: - Exchange ideas and perspectives to build shared understanding
Learning Standards: Content	Science: - Effects of pushes/pull on movement - Effects of size, shape, and material on movement
Instructional Objectives	SWBAT measure the distance objects travel using non-standard units (blocks or crayons) and compare distances to describe which object travels further, using vocabulary such as longer or shorter.
Assessment:	Observation: Watch students measure distances using blocks or crayons, noting if they use the vocabulary ("longer," "shorter") correctly and if they can identify which objects travelled farther. Conversations: Ask students questions like, "Which object travelled farther? Why do you think that happened?" and "How did using blocks or crayons help you measure the distance?"
Teaching Strategies:	Hands-on Learning Kinesthetic Learning
Materials:	Toy cars, balls, blocks, or other small objects Crayons or blocks for measuring Tape to mark the starting and finishing lines A space for rolling or pushing objects (e.g., a hallway or a smooth surface)
Lesson Activities:	
Introduction/Hook:	Action Demonstration: ● Show students a toy car and a ball. ● Push or roll each object across the floor, stopping after a set distance. ● Ask: "How can we measure how far these objects travel? What can we use to measure?" ● Introduce the idea of using non-standard units like blocks or crayons to measure distance. Exciting Challenge:

	● Tell students: "Today, we're going to become distance experts! You'll measure how far objects roll or slide using blocks or crayons."
Body:	Obstacle Setup: 1. Prepare an open space where students can roll or push objects, making sure it's clear where they'll start and where they'll stop. 2. Mark a starting line with tape and allow students to choose different objects to measure (balls, toy cars, etc.). 3. Set up the space so students can measure distances from the starting line to where the object stops. Activity: 1. Measurement Practice: ○ Give students their own blocks or crayons for measuring. ○ Have them roll or push objects and measure how far they travel by laying out blocks or crayons in a line. ○ Ask them to compare: "Which object travelled farther? How do you know?" ○ Encourage students to use terms like "longer" and "shorter" when discussing their measurements. 2. Experimentation: ○ If a student finishes quickly, allow them to try measuring different objects or push/roll objects from different starting points (e.g., a higher spot to see if the object travels farther). Problem-Solving Discussions: 1. Move around the room, engaging students in discussions: ○ "How did you decide where to stop your measurements?" ○ "Why do you think this object travelled farther than the other?" ○ "What can we do if the object doesn't travel far enough?"
Closure:	Reflection Circle: ● Gather students to share their experiences: ○ "Which object travelled the farthest? Why?" ○ "What did you learn about using blocks or crayons to measure?" ● Record the students' thoughts to reflect on their learning.

Lesson 6

Name &Time (Minutes Allotted):	Force and Motion Olympics
Learning Standards: Curricular Competencies	Science: - Observe objects and events in familiar contexts - Transfer and apply learning to new situations - Safely manipulate materials ADST: - Develop their skills and add new ones through play and collaborative work ELA: - Use sources of information and prior knowledge to make meaning
Learning Standards: Content	Science: - Effects of pushes/pulls on movement (how things move) - Effects of size, shape, and material on movement ELA: - Metacognitive strategies
Instructional Objectives	SWBAT apply their understanding of force and motion to complete various challenges, demonstrating their ability to use push and pull actions to achieve specific goals.
Assessment:	Observation: Watch how students use push and pull actions during the various stations, noting their ability to demonstrate control and accuracy. Conversations: Ask students questions like, "How did you push or pull the object to reach the target?" and "Which force helped you the most in this challenge?"
Teaching Strategies:	Hands-on Learning Repetition
Materials:	Toy cars, balls, or small wagons Ramps (various inclines) Cones or markers to set up targets and boundaries Tunnels or boxes for objects to pass through Tape or chalk to mark distances or boundaries Optional: Ribbons, medals, or stickers for winners and participants (could be an extension activity to create their own)
Lesson Activities:	
Introduction/Hook:	Olympic Challenge Announcement: ○ Gather the class and introduce the Force and Motion Olympics. ○ Say: "Today, we're going to test our force and motion knowledge with some fun challenges! You'll get to roll, push, and pull objects through different stations, and see how far your skills can take you!" Action Demonstration: ○ Set up a demonstration of each station (e.g., the Longest Roll or Target Practice).

	○ Demonstrate the actions needed for each challenge, showing how pushing and pulling will help move objects to the finish line or target.
Body:	Station Setup: 1. Longest Roll: ○ Set up a ramp for students to roll a ball or toy car down. Measure how far it goes. 2. Target Practice: ○ Set up a target, such as a small box or cone, and have students aim their objects toward it using controlled pushes. 3. Ramp It Up!: ○ Have students test different ramps (varying inclines) and measure how far objects roll on each. 4. Obstacle Course: ○ Create an obstacle course with cones, tunnels, or small barriers that students must push or pull their objects through. Activity: 1. Station Rotation: ○ Divide students into small groups, with each group rotating through the stations. ○ At each station, students will: ■ Apply push or pull to move their objects (balls, cars, or wagons). ■ Measure or evaluate how well they completed each challenge. ○ Encourage friendly competition: "Let's see who can make their car go the farthest!" 2. Problem-Solving at Stations: ○ Walk around and observe the students as they engage in each challenge. ○ Ask guiding questions like: ■ "What did you do to make the object go farther?" ■ "How did you adjust your push to hit the target?" ■ "What happens if you push too hard or too soft?" ○ Help students refine their techniques as needed.
Closure:	Reflection Circle: ○ After completing the stations, gather the students to share their thoughts:

	■ "Which challenge did you enjoy the most? Why?" ■ "What did you learn about pushing and pulling objects?" ■ "Was there a station where you improved your skills? How did you do it?" ○ Record key ideas from their reflections.

Resources:

- Kindergarten Physics Teacher Guide (from BCTF resource page)
- What Makes Things Move Inquiry Lessons (from BCECTA resources)

Extensions to Unit:

- Worksheets for if the hands-on stations get to be too over stimulating (on canva)
- Build a vehicle: design the vehicle with wheels and axles and test how it moves using a push or pull
- Motion Mazes: create mazes for marbles on paper plates, controlling the motion using the tilt of the plate
- Marble Paint: create artwork using marbles and paint using tilting to create motion and force inspired artwork
- Take inquiry experiments outside to test different objects or see the forces of push and pull on the playground
- Add more math skills by:
    - having students predict and then measure how far an object will move in varying circumstances.
    - recording and graphing the distances of objects moving down ramps or across different surfaces.

Reflections and Revisions