



Forces and Motion

Curriculum Planning Template – Somerville Early Education

Trajectory for Thematic Inquiry: Planning from the Big Idea

Consult ELA Pacing & Curriculum Guides, Big Idea Guides, & Building Blocks Math Pacing Guide

Big Idea(s):

Force is required to put an object in motion.

Things move with pushes and pulls.

Things change speed.

Things can change direction

Project Approach: Working with Big Ideas

(Picturing the Project Approach 2017, Sylvia Chard, Yvonne, Kogan, Carmen Castillo)

- Phase 1: Beginning the Project
- Phase 2: Developing the Project
- Phase 3: Concluding the Project

Scientific Thinking: Preschoolers are natural investigators who are curious about how things work. Children learn science through exploring with hands-on materials, observing, and talking about and recording what they are seeing and doing. The preschool program allows children to discover things through everyday experiences. This inquiry-based approach supports new learning and scientific understanding.

- Investigate, explores and observes
- Engages in discussion and raises questions
- Makes predictions

Approach to Learning: Preschoolers are curious and have a sense of wonder about the world around them. They are excited about exploration, play, and learning. As preschoolers develop, their confidence increases and they become independent and collaborative learners. Interesting activities promote creativity, problem solving, and persistence.

- Demonstrates initiatives, curiosity, and takes learning risks
- Perseveres in challenging situations
- Demonstrates creativity in thinking and use of materials
- Seeks multiple solutions to a question, task, or problem
- Explores and cares for materials and environment

Questions you might ask children:

What makes things move? (EQ #1)

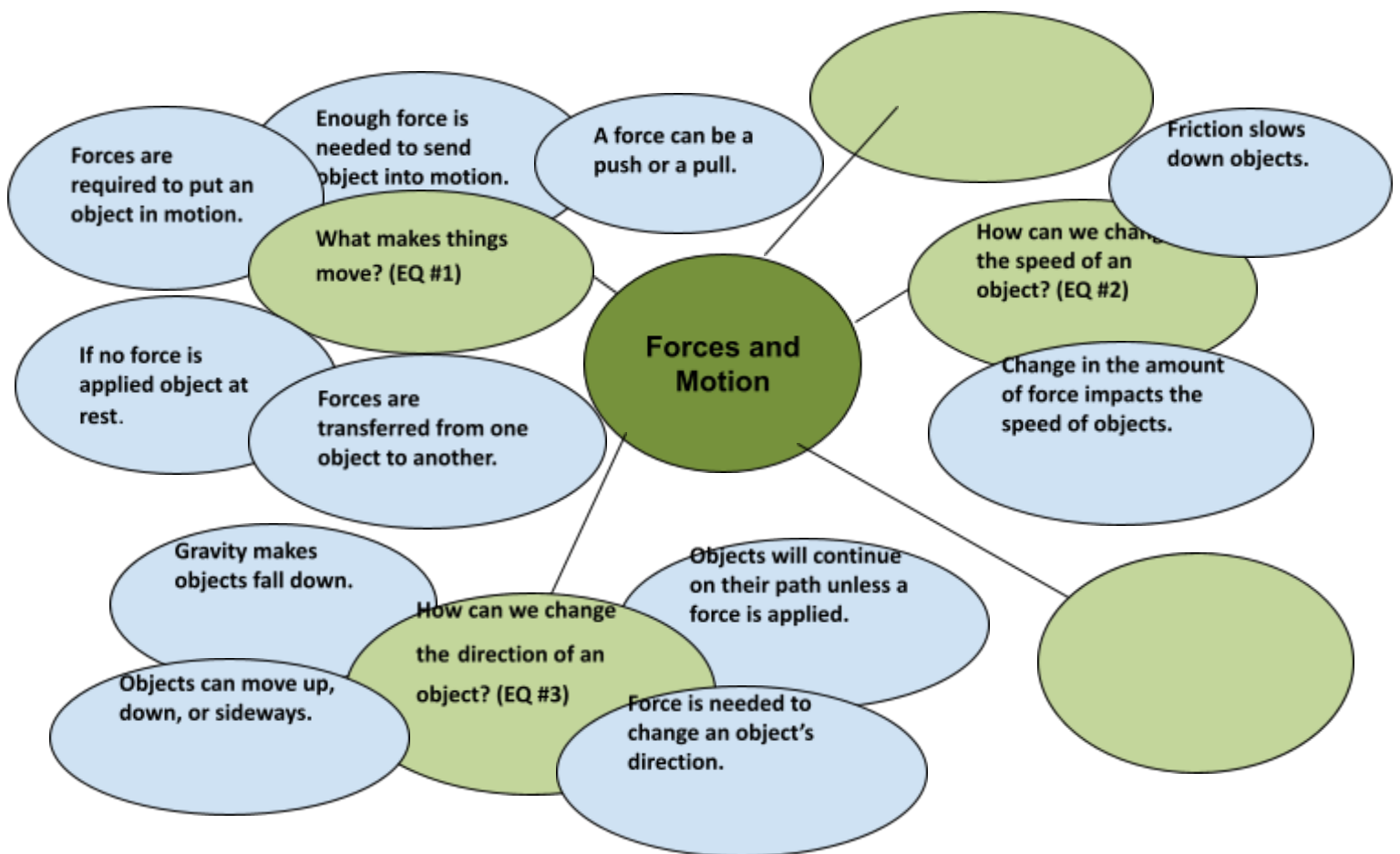
- How is it moving? What is needed to make something move?
- How can we get a heavy object to move?
- Why are some things still (at rest)?
- What happens if a moving object bumps another object?

How can we change the speed of an object? (EQ #2)

- What makes an object move faster/slower?
- How do objects move differently on different surfaces?
- What can we change to make an object move faster/slower/stop?

How can we change the direction of an object? (EQ #3)

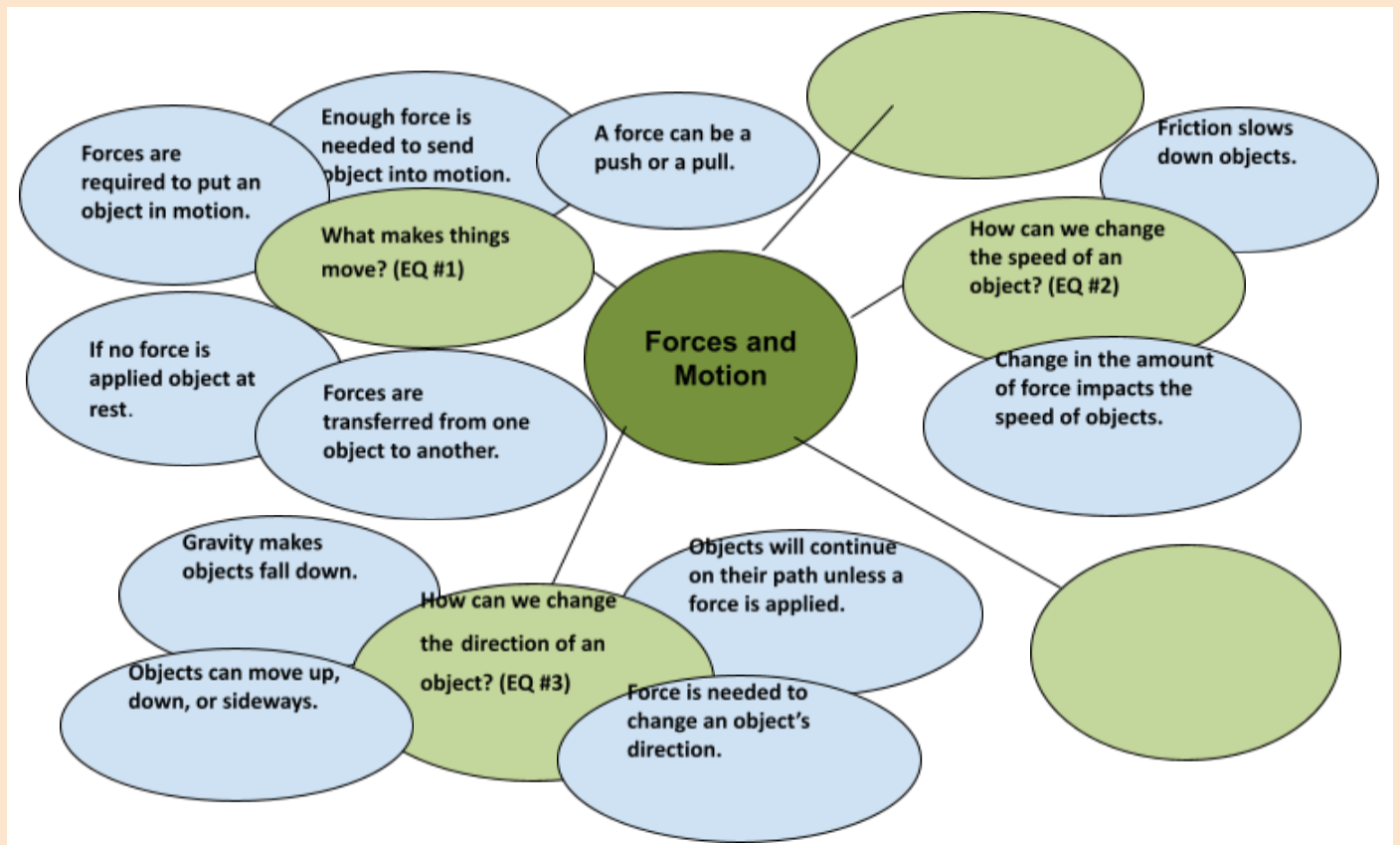
- Why do objects fall down? Can they fall up?
- What directions do objects move?
- How can we change the direction an object is moving?



A TRAJECTORY OF INQUIRY

Phase 1 – Beginning a Project: Starting Out And Setting The Stage

Sample Teacher Brainstorm/Planning Web - Add your own ideas!



Create a new web with children once a direction has been defined

Surface prior knowledge. Set the Stage:

- Discussion - Some objects move and some are very still. What things have you seen move? How do they move? (EQ #1)
- Movement Scavenger Hunt – What do we see moving? How do they move?

Generate curiosity: Pose questions, read a high interest book, take a field trip

- Movement Scavenger Hunt – What is still? How can we get it to move? (EQ #1)
- Types of Movement Center – explore and record (EQ #1)
- Read – Motion: Push and Pull, Fast and Slow (EQ #1)
- Push or Pull Sort (EQ #1)
- Science Talk Show children photos of something in motion – What do you think will happen next? What makes an object move? (EQ #1)

Make connections to children's lives: We have observed things that move around our school. What moves at your home? How do they move? Draw a picture (with your family) of things that move at home.

PHASE 1 – Beginning a Project -Defining A Possible Investigation or Direction:

Generate KW (Know, Want to know) Chart: What do we know or think we know about how things move?

- Revisit lists from the Movement Scavenger Hunt and the Types of Movement Center. Generate a list of words to describe how things move (roll, slide, fly, etc.) (EQ #1)

***Children may notice that things change speed and direction. Use questions and noticings from EQ #2 and EQ #3 at any point during the children’s discoveries.*

Expand Children’s Thinking

So, now that we Know some information and have some ideas about how things move, what should we investigate?

It seems that you are curious about _____?

Brainstorm a list of all the things the children Want know about _____.

Possible Activities:

- Web children’s ideas and interests
- Plan investigations with the children and based on their questions and ideas
- See activities in Curriculum
- Add other activities that speak to children’s interests and questions – such as, experimenting with swinging and sliding.
- Self-exploration with materials

PHASE 2 – Developing a Project- Exploring And Learning More:

Continue to add to the knowledge base, add activities and experiences, field trips, find experts, plan class books, family engagement, etc.

POSSIBLE FIELD SITES:

- Auto/Wood Shop (High School)
- Bowling Alley
- Playground/Gym (Blue Blocks w/prompt)
- Neighborhood Playgrounds
- DPW Trucks
- Science Museum
- Airport
- District Mail Center
- Home Depot

POSSIBLE EXPERTS:

- Parents
- DPW workers
- Jason Behrens
- Science Museum/Tufts Engineering Outreach
- High school students/teachers
- Beautiful Stuff

Continue to add to knowledge base, add activities and experiences, field trip, find experts, plan class books, family engagement, etc.

Possible Projects (Use one of the following ideas, or co-create an emergent project with your children):

- Make Me Move Challenge (EQ #1)
- Domino Effect Challenge (EQ #1)
- Fast, faster, fastest / Slow, slower, slowest – designing an experiment to test speeds (EQ #2)
- Road Design – Designing and testing different road surfaces - texture, friction, incline (EQ #2)
 - Science Talk – What did you notice about the roads?
 - Science Talk - How did the road type and incline change how the cars moved?
 - How could you use this information to design a slide?

- Playground Physics (EQ #2)
- Drop It (EQ #3)
- Down and Up Marble Challenge (EQ #3)
- Curvy Tracks/Curvy Roads (EQ #3)
- Around It Goes (EQ #3)
- Child/Teacher developed activities that follow children’s questions & interests
- Art projects – make a model and then test
 - Kites
 - Wind socks
 - Ramps/marble runs with Beautiful Stuff
- Using pulleys and lifts appropriately
- Taking what we observe in the real world and recreating it in the classroom
- Explore the slide with different fabrics (different friction)
- Slide a range of different items (block, car, ice cube, etc.) down a wide board set up as a ramp
- Experiment with the wind and blowing
- Paint by rolling (pushing) cars – wheels as brushes

Possible Culminating / Integrating Activities

- Design a mini golf course
- Explore and build a specific movement tool – bike, skateboard, stroller, etc.
- Design a roller coaster
- Design a marble run
- Design a Rube Goldberg machine
- Design a Sled that will go fast and far
- Design a road

EXTENSIONS/COMPLETION *(Phase 3 – Concluding & Preparing to Share a Project)*

Ideas for Sharing Learning/Work:

- Class Books – Movement Scavenger hunt
- Class Book – Push and Pull
- Revisiting Photos and adding text
- Creating a Picture & Word Wall
- Creating a Documentation Space
- Displaying Charts – Questions, Learning, Knowledge

- Developing one of the culminating projects and making a video or inviting families or peers to see it in action.

Possible Extensions:

- Explore motion with sensory and art materials (crossing over into ‘properties of matter’) – flowing, dripping, etc.
 - Sand with gutter piece
 - Water through tubes or gutters
 - Paint dripping


Content and Room Areas	Activities Connected to Big Idea
Blocks	Props/Provocations: <ul style="list-style-type: none">● Add cars, balls, spools, etc.● Add long boards or strips of cardboard for children to use as ramp pieces● Add gutter pieces, hot wheel tracks, etc.● Add clip boards, graph paper, and pencils to draw up plans and/or record designs and discoveries● Add marble run toys

Dramatic Play	<p>Generate play props and themes with children:</p> <ul style="list-style-type: none"> ● Build a doll playground using boxes and recycled materials ● Build a candy factory - with ways to move things from one spot to another (conveyor belt, slides, ramps) ● Build ways to move an egg from the refrigerator to the stove
Art	<p>Group and Individual Projects</p> <ul style="list-style-type: none"> ● Use beautiful stuff to create ramps and slide, or things that swing ● Ramp painting - create a ramp covered in paper (inside a box) and roll balls or cars in paint and then down the ramp. ● Marble paint in a box or tin. What do you need to do to get the marble to move? To change the direction. ● Push or pull various tools through paint or playdough to make designs and patterns ● Meditation garden – push or pull rake through sand tray
Sensory	<p>Sensory Table:</p> <ul style="list-style-type: none"> ● Provide small ramps (wood moldings) and small cars for open ended exploration ● Provide items to move by blowing or dropping into the table ● Provide sliding experiments – on a large board with different materials
Mathematical Thinking	<ul style="list-style-type: none"> ● Connect discussions about angles (from your shape work) with angles on ramps. What type of triangle makes the fastest ramp, the slowest ramp. ● Use balance scales. How many cubes do you need to move (lift) a block (or a variety of items) off the table? ● How many books can you pull in a crate? Make predictions, test, and record results. ● Use comparative language to talk about speed, force, and amounts, and discuss how these ideas are measured. i.e. “Which is faster, a plane that flies at 500 miles an hour, or a car that drives at 50 miles an hour?” “Which is stronger, a person who can lift 100 pounds, or a bear that can lift 1000 pounds?” <ul style="list-style-type: none"> ○ Extend these ideas by learning about some of the “extremes” of the animal kingdom: strongest bite, fastest swimmer, heaviest lifter, etc. ○ Compare to humans using graphs.

Science, Technology and Engineering

Build and Test:

- Build a ramp and roll materials such as blocks, balls, toy vehicles, or recyclables down your ramp. Use materials that are different shapes, sizes, and that have different textures. What can you learn about motion, speed and friction by testing different objects on your ramp?
 - Extend this activity by covering your ramp in different materials, such as sandpaper, bubble wrap, and aluminum foil. Does anything change?
- Create a catapult out of spoons, rubber bands and popsicle sticks. Launch pom-poms or marshmallows with your catapults. Be sure to take plenty of time to build, test, and make changes to your designs. How can you design catapults to do different things, such as launch very high straight into the air, launch a long distance, or score your projectile into a basket or bowl.



Library/ Read Aloud

Books:

- **Motion: Push and Pull, Fast and Slow** – Darlene Still
- **Roll, Slope and Slide: A Book About Ramps** – Michael Dahl
- **Give it a Push! Give it a Pull!** – Jennifer Boothroyd
- **Push and Pull** – Patricia Murphy
- **I Fall Down** – Vicki Cobb
- **Move It! Motion, Forces and You** – Adrienne Mason
- **Rollercoaster** – Marla Frazee
- **Forces Make Things Move** – Kimberly Bradley
- **Victor Diego Seahawk’s Big Red Wagon – (BB)** – T. Moncure

Balanced Literacy

Vocabulary

Force	Motion	Simple Machines
Push Pull Friction Gravity Energy	Speed Acceleration Rest Direction: Up, Down, Sideways Comparison: Faster, Slower, More, Less	Wheel Axle Pulley Lever Inclined Plane Screw Wedge

<p>Oral language and Concept Development</p>	<ul style="list-style-type: none"> ● Add a forces and motion survey or question to your Morning Meeting message. ● Share ideas and build understanding about forces, motion, simple machines and other physics concepts during whole and small groups. ● Create opportunities for group project planning. Encourage children to share ideas, ask questions, and make comments. ● Review relevant vocabulary. Create vocabulary word cards and make them available in the writing center. ● Use CROWD Strategies during read alouds.
<p>Fine Motor, Drawing, and Writing</p>	<ul style="list-style-type: none"> ● Use clipboards, graph paper and pencils to draw and label designs for ramps ● Provide materials for observational drawings of the Types of Movement Activity. ● Provide word cards (with photos) to label drawings (i.e. – roll, bounce, stretch, hop, fly, fall, etc.). Add words as children need ● Provide word cards for ‘push’ and ‘pull’ ● Create class books ● Integrate writing into your Science Center, or wherever this curriculum lives.
<p>Expressive and Writing Language</p>	<p>Book Study: Forces and Motion</p> <ul style="list-style-type: none"> ● Read books from the list above that discuss force, motion, and simple physics. What language do we use to describe motions and forces? Investigate the use of opposites, such as push/pull and up/down, as well as the use of comparative language, such as faster/slower. ● Have children draw scenes that show force or motion and caption the scene using vocabulary terms. I.e. “The ball rolls slowly down the hill” or “My teacher pushes me high on the swings.” <p>STSA (StoryTelling/Story Acting)</p> <ul style="list-style-type: none"> ● Act out some of the ways people use pushes, pulls and other forces in our daily lives. What things are safe to push and pull? What things are unsafe? ● Choose a class favorite book on force and motion and act it out.
<p>Phonological and Phonemic Awareness</p>	<p>Songs and Poems</p> <ul style="list-style-type: none"> ● Make song and poem charts and engage in choral reading. <p>Word Building and Writing:</p> <ul style="list-style-type: none"> ● Use magnetic letters, letter tiles, or write letters on bottle caps for word games or to assemble the names of simple machines or physics concepts your class is interested in.

**Differentiation
and Extensions**

- Use pictures, visuals, and concrete items as much as possible
- Take pictures of children demonstrating and label with words
- Use a range of materials in a range of sizes, suitable for your classroom.
- Follow the children’s lead – what else do they wonder? What else do they want to test out and explore?