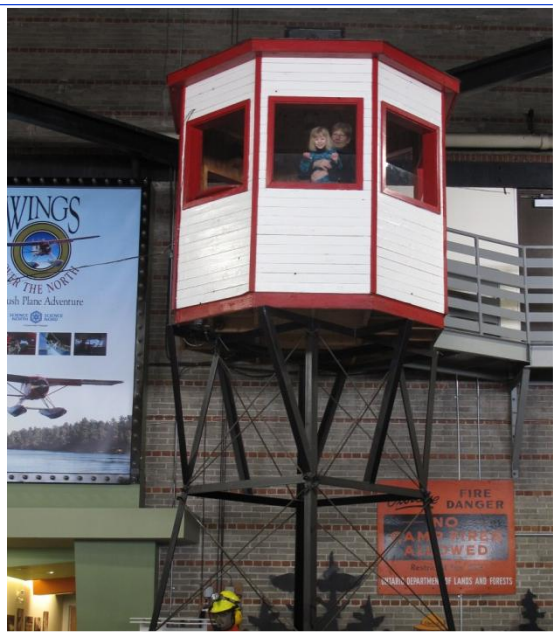
CANADIAN BUSHPLANE HERITAGE CENTRE

CBHC Grade Three Aviation Program



INTRODUCTION

At the Canadian Bushplane Heritage Centre we are passionate about our Northern Ontario heritage. We are also very excited about educating the public on our many historical aircraft exhibits as well as forests and forest firefighting exhibits. Our Education Program will allow you to engage your students and give them a personalized, relevant and exciting new take on the curriculum.

Our program is developed with teachers in mind and will allow you to build on curriculum expectations before and after the tour that all tie into the materials presented in the tour. We would love to partner with you to allow your students to discover and learn about their Northern Ontario heritage and the exciting life as a bushplane pilot or forest fire fighter. Our tour guides are retired educators, MNR workers and/or pilots who love working with kids and students. Our experts make the experience one you and your students will never forget!

Our Grade Three Tour Program focuses on forces causing movement in relation to a bushplane. Students will have a chance to climb inside, play, touch and even "fly" with their classmates in an old Saunders passenger aircraft. Students will also discover how bushplanes help fight forest fires and will get a chance to climb a fire tower to put out a forest fire on their own. We will ignite your student's imaginations and interest. Your class will learn quickly that adventure takes off at the Canadian Bushplane Heritage Centre!

For more information and preparation lessons please visit us at:
www.bushplane.com/education/lessons/gradethree

You may also speak to someone for more information or to book your school tour at
Toll Free: 1-877-287-4752
Local: 705-945-6242

OVERVIEW OF CURRICULUM EXPECTATIONS

The following is a list of expectations from the grade three curriculum that will be met by following the Canadian Bushplane Heritage Centre Grade Three Tour Program.

Big Idea: **There are several types of forces that cause movement.** **Forces cause objects to speed up, slow down or change direction through direct contact or through interaction at a distance.**	**How:** Students will discover though observation as well as discussion how a bushplane starts moving, stops moving and changes direction. A mini lesson will be given in simple terms that show how the parts of a bushplane allow it to do its job.
Overall Expectation: Investigate devices that use forces to create controlled movement.	
Specific Expectation: Investigate forces that cause an object to start moving, stop moving or change direction.	
Big Idea: **Forces cause objects to speed up, slow down or change direction through direct contact or through interaction at a distance.**	**How:** We create an environment where students experience new terminology and where they see things they have never seen before. Our expert guides allow and encourage questioning while students discover all of this new and exciting information.
Overall Expectation: Investigate devices that use forces to create controlled movement.	
Specific Expectation: Use appropriate science and technology vocabulary, including push, pull, load, distance and speed, in oral and written communication.	
Big Idea: **Forces cause objects to speed up, slow down or change direction through direct contact or through interaction at a distance.**	**How:** Students will learn about thrust which is a technical term for the push or pull created by the propeller(s) and the engine which allows for the initial start movement of the bushplane.
Overall Expectation: Demonstrate an understanding of how forces cause movement and changes in movement.	
Specific Expectation: Identify a force as a push or a pull that causes an object to move.	

Big Idea:
Forces cause objects to speed up, slow down or change direction through direct contact or through interaction at a distance.

Overall Expectation:
Demonstrate an understanding of how forces cause movement and changes in movement.

Specific Expectation:
Identify different kinds of forces (e.g., gravity – the force that pulls objects towards the earth)

How:

Students will be given a mini lesson focusing on the forces that are acting upon a bushplane in taking off, in flight and in landing. We will especially focus on the force of gravity and its relation to how a bushplane flies.

Big Idea:
Forces cause objects to speed up, slow down or change direction through direct contact or through interaction at a distance.

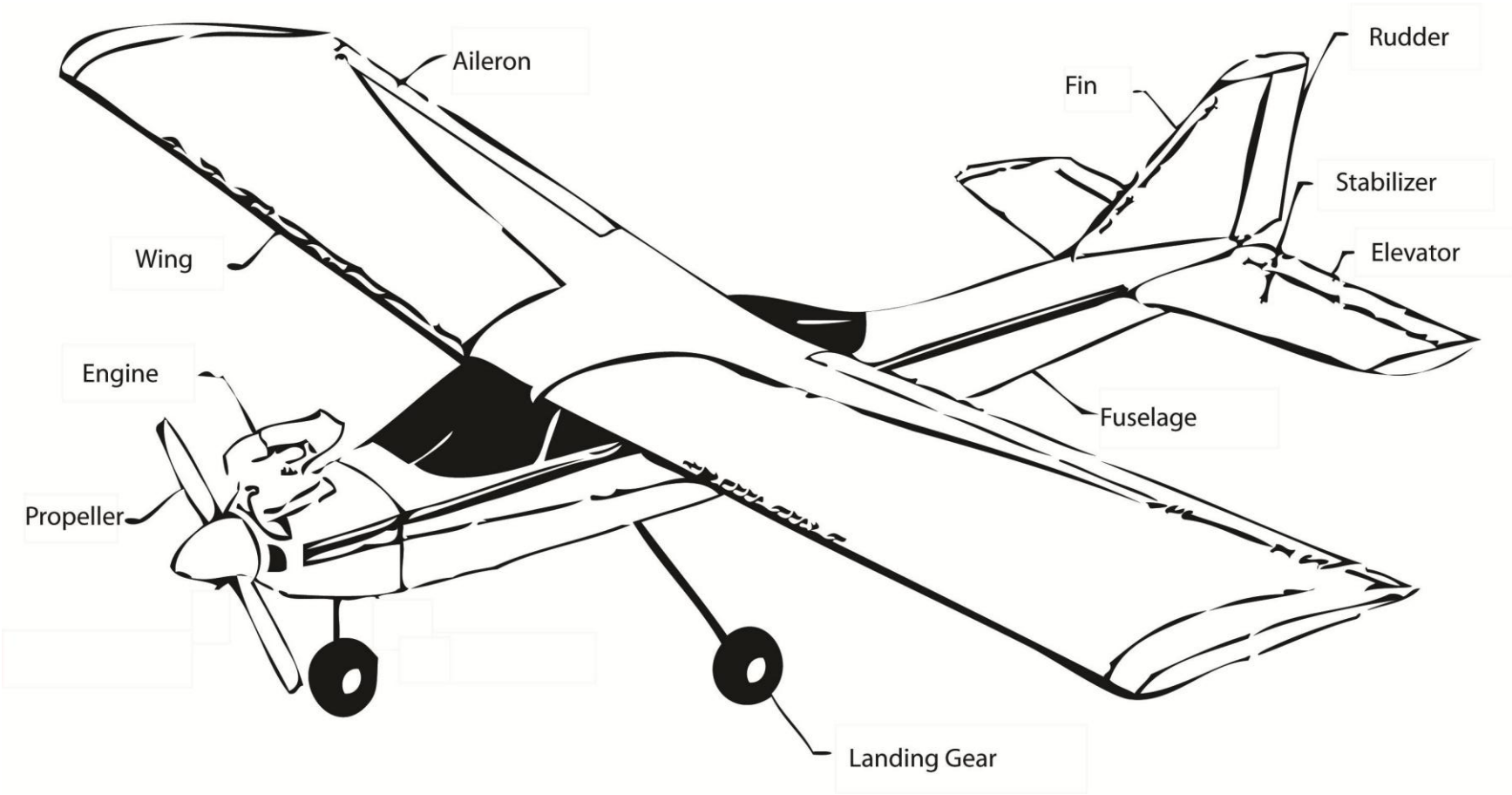
Overall Expectation:
Demonstrate an understanding of how forces cause movement and changes in movement.

Specific Expectation:
Describe how different forces (e.g., gravitational force, friction) applied to an object at rest can cause the object to start, stop, attract, repel or change direction.

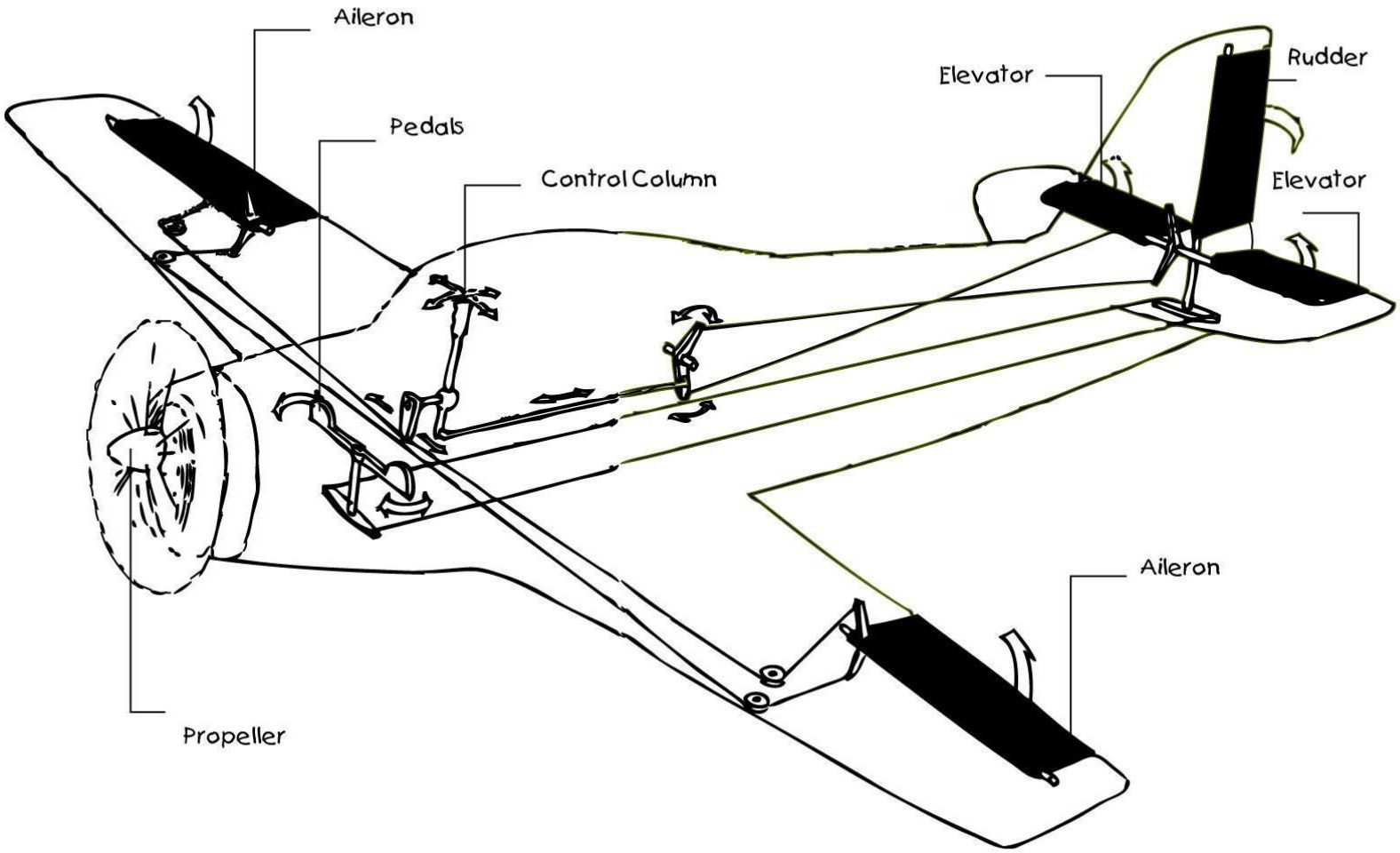
How:

Students will be given a mini lesson focusing on the forces that are acting upon a bushplane in taking off and in flight. We will especially focus on the force of gravity and its relation to how a bushplane flies. We will also look at how friction plays a role in a bushplane's ability to fly.

Aircraft Parts Diagram



Pulley & Gear System:



GRADE THREE LESSONS

Associated lessons are encouraged before and the field trip. Many students may not have been to a museum and it is helpful to establish the rules of a the Canadian Bushplane Heritage Centre as well as get them excited to come and experience all the fun adventures they are about to have. The following activities are all optional; our tours are developed to be stand-alone and pre or post lessons are not required to experience a field trip at The Canadian Bushplane Heritage Centre.

You can use one lesson or a combination of lessons to aid your students in their experience. All the resources for the activities are supplied and most of the suggested books may be lent out through our own library for up to one week. Some books are also noted to be in the Public Library for teachers to take out for longer periods of time.

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Lesson 1

OBJECTIVES:

1. Without air resistance, all objects would fall with the same acceleration, regardless of mass.
2. Gravity is the force that causes objects to fall.
3. Air resistance, a type of friction, works against gravity to decrease the acceleration of a falling object.

MATERIALS:

- An encyclopedia or a computer with Internet access should be available to students. The following materials should be provided for each group.
- A variety of object pairs, such as balls of different sizes and weights or a book and a sheet of cardboard the same length and width as the book.
- Objects, such as a feather or a sheet of paper which encounters more air resistance when dropped than the other objects.

PROCEDURE:

1. Ask your students if they predict that a heavier or larger object, if dropped from a height, will fall to Earth faster than a lighter or smaller object.

2. Tell them that Galileo Galilei (1564-1642) performed a famous experiment that they are going to replicate to see if their predictions are right or wrong. (The story goes that in order to demonstrate to Aristotelian scholars that two balls of different weights fall at the same rate, Galileo dropped a cannon ball and wooden ball from the top of the Tower of Pisa.) Have students use the Internet or an encyclopedia to find out about Galileo's experiment in which he dropped objects from the Leaning Tower of Pisa in Italy.

3. Divide the class into groups, giving each group a variety of objects to experiment with (see Materials).

4. Instruct groups to meet in order to design their own experiments. Remind them that a good experiment should have a control and introduce only one variable at a time. Give each group's chart on which to record the results of each test performed.

5. Have students experiment with the object pairs, dropping them, one at a time, while standing on a chair or desk. Other students in the group should observe closely to see whether one object reached the floor before another or both objects reached the floor at the same time. Students should carefully record their results on their charts. (Students should find that balls of different sizes and weights fall at the same rate of speed, as do a book and a sheet of cardboard the same length and width as the book.)

6. When students try dropping a feather or a sheet of paper from the same height from which they dropped the other objects, they will discover that the feather and the paper fall more slowly. Suggest that they bunch the sheet of paper up into a ball and drop it from the same height. They will find that the ball of paper reaches the floor in less time than the sheet of paper.

7. Have students meet in their groups to discuss possible reasons for these results. They should conclude that air resistance, a type of friction, is slowing down the feather and the sheet of paper.

8. Ask students what they think would happen if they performed the same experiment in a vacuum tube, which has no air in it. (The feather would fall at the same rate of speed as a ball or a brick.)

9. Each student should write a paragraph explaining the results of the experiments and drawing conclusions regarding the effects of both gravity and air resistance on the acceleration of falling objects. Encourage students to accompany their paragraphs with labeled drawings and diagrams.

Names: _____

Gravity Experiment Observation Sheet

Experiment Number	Object		Object	
Experiment 1	**Small Ball**		**Large Ball**	
	Trial One	Trial Two	Trial One	Trial Two
Experiment 2	**Book**		**Cardboard**	
	Trial One	Trial Two	Trial One	Trial Two
Experiment 3	**Large Rock**		**Small Rock**	
	Trial One	Trial Two	Trial One	Trial Two
Experiment 4	**Feather**		**Paper**	
	Trial One	Trial Two	Trial One	Trial Two
Experiment 5	**Feather**		**Balled Paper**	
	Trial One	Trial Two	Trial One	Trial Two

Lesson 2

Students Will Discover:

- Friction is a force that opposes motion or makes it difficult for an object to move across a surface.
- The amount of friction depends on the surface type and the force pressing two surfaces together.
- Everyday life provides examples of how friction both helps and hinders everything we do.

Materials:

- Several matchbox cars of the same size (three to four for every team)
- Several large, thick books, such as encyclopedias (when stacked, they should be about 30cm high)
- Large piece of foam board
- Beach towel
- Yardstick
- Masking tape
- Textbooks
- Pencils
- Chalkboard, overhead projector or chart paper
- Crayons, markers, colored pencils
- Friction Activity Sheet (one for each student)

Lesson Plan:

1. Create a learning web with your students on what stops motion. On an overhead, chalkboard or chart paper write Motion stops because . . . and draw a circle around it. Elicit students' responses and write their responses as branches off of the web. Focus student responses by providing prompts, such as: What would make a car stop? A dancer? A football? A plane? A baseball player sliding into home?

2. Tell your students that the web they have created shows examples of forces that may slow down, stop or make it hard for an object to move. Explain that these forces acting on objects and people are called friction. Refer back to the web and underline those ideas that clearly demonstrate the role that friction plays in stopping motion. Ask students in what context they have heard the word friction before. (They may offer the following contexts: friction between people in a fight or rubbing hands together.)

3. Explain to students that the amount or force of friction depends on two things: the type of surfaces that are touching (e.g., waxed kitchen floor versus rocky pavement) and the force pressing the surfaces together (e.g., pulling an empty wagon versus one filled with bricks).

4. Now divide the class into groups of four to five students. Explain to students that the following activity will help them understand how friction can be increased and decreased. Each group should receive three to four matchbox cars, foam board, a beach towel, masking tape, a yardstick, several large, thick books (that equal about a foot when stacked), two textbooks and a Friction Activity Sheet. The groups will be observing and recording how the matchbox cars move on two surfaces: a smooth surface and rough surface.

5. Read the first activity question to the class: Will the matchbox car move faster on the smooth surface or the rough surface? Then show them the two surfaces they will be testing, the plain foam board and the beach towel.

6. Next, have students create a ramp by placing a stack of books (about 30cm high) under one end of the foam board. (You may want to place a heavy object at the other end to keep the board from sliding.)

7. Students will be looking at how a surface can affect car speed. In order to gauge the results of this activity accurately, they will need to use matchbox cars that travel at about the same speed. Have students race the matchbox cars they've been given down their ramp to find two that move at generally the same speed. To do this, line up the cars at the top of the ramp and hold them back with the yardstick. Have one student hold the yardstick at each end and lift it suddenly to let the cars race down the ramp. Do this a few times to make sure the two cars you select move at about the same speed

8. Now have each group cover the left-hand side of its foam board with the beach towel, using masking tape to secure the towel to the back of the board (to keep it from slipping). Their foam boards should now have two tracks—a plain track and a towel track.

9. Before students perform their race have them complete the prediction portion of their activity sheets. Students should write one sentence indicating which surface they believe the car will travel faster on.

10. Now have the students race the two cars they chose (that were about the same speed). Using the yardstick to ensure the same start time have students race one car on the plain (smooth) track and the second on the towel (rough) track. They will need to write one to two sentences that describe how the two cars moved. Then have them determine on which surface they saw more friction.

11. Gather students together to discuss their findings and observations. Focus students' attention to the relationship between the surface type and the amount of friction there is between the car and surface, as demonstrated by the ability of the car to move across each surface. (The rougher the surface, the more friction there is.)

12. Read the second activity question to students: Will it be easier to move one or two textbooks across your desk with your pinky? Demonstrate how students will move the textbooks across their desks and have them complete the prediction section of their activity sheets. Remind students to record their observations on the activity sheet as they did in the first activity.

13. Gather students together to discuss the second activity. Ask students to share their observations. Encourage students to think about the relationship between the size/weight of an object and how easily it moves across a surface. Ask students if they needed to use more force from their pinkies to push two textbooks than just pushing one across the desk.

14. To reinforce the concepts demonstrated in the hands-on activities, on the board list the two factors that determine the amount of friction there is between two surfaces (surface type and force on a surface). Explain that friction plays many roles in our everyday lives. Sometimes we try to increase friction, while other times we try to decrease the amount of friction.

15. Use sports as a starting point to think of some examples. In some sports and recreational activities, you may want to increase or decrease the amount of friction present. Using what students have learned about surface type and force on the surface, create a T chart of sports and activities where increasing the amount of friction is helpful and those in which it is better to reduce the amount of friction. (For example: gymnasts use chalk on their hands to reduce friction between their hands and uneven bars; cleats help football players have better traction while running; bobsledders need to be light to travel faster in the Olympics; swimmers shave their arms and legs to increase their speed in races.)

16. Have students create a mini news article for a recreation or sports magazine about how friction plays a role in a sport of their choice. Students will need to include a colorful, creative picture of the sport in action and describe in a paragraph of four to six sentences how friction affects a player's performance in that sport. Have students present their articles.

Discussion Questions:

1. Explain how surface type influences the amount of friction there is.

2. Discuss the relationship between the size and weight of an object and the amount of friction that is present.

3. Analyze how friction can be both a positive and negative aspect in our everyday lives. Use examples to support your statements.

4. Sports such as soccer involve running, stopping, jumping and kicking. Discuss how friction helps players.

5. Describe a situation in which using wheels would reduce friction between a moving object and the surface over which it travels.

6. Hypothesize what your life would be like if there were no friction. Which actions would be more difficult? Which would be easier?

Name: _____

Friction Activity Sheet

Activity 1: Matchbox Cars

Will the matchbox car move faster on a smooth surface or a rough surface?

1. Prediction:

2. Observations:

a) Car moving on smooth surface (plain foam board):

b) Car moving on rough surface (beach towel):

3. Where is more friction present?

Activity 2: Moving Textbooks

Will it be easier to move one book or two across the desk with just your pinky?

1. Prediction:

2. Observations:

c) Moving one book with pinky:

d) Moving two books with pinky:

3. Where is more friction present?

Suggested Reading:

Gravity is a Mystery, Franklyn Mansfield Branley.
Collins, 2007.

- What goes up must come down. Everybody knows that. But what is it that pulls everything from rocks to rockets toward the centre of the earth? It's gravity. Nobody can say exactly what it is, but gravity is there, pulling on everything, all the time. With the help of an adventurous scientist and his fun-loving dog, you can read and find out about this mysterious force.

Forces Make Things Move, Kimberly Brubaker Bradley
Harper Collins, 2005.

- There are forces at work whenever you throw a ball, run up the stairs or push your big brother off the couch. Want to learn more about the forces around you? Read and find out! This book starts with a common childhood experience, pushing toy cars across the floor--and gradually--introduces ideas such as forces, reactions, inertia, friction and gravity.

The Magic School Bus Plays Ball: A Book About Forces, Joanna Cole
Scholastic, 1997.

- On a field trip inside a physics book, Ms. Frizzle's class plays baseball in a world without friction and learns all about friction and forces.

