



Anchoring Phenomenon

Objects do not move on their own.



Lesson Concept

Observe, record, and share data about what causes motion.



Investigative Phenomenon

Game balls do not move on their own.



Standards

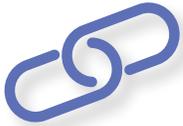
Refer to Appendix K.1 for NGSS, CCSS (ELA), and California ELD Standards.

K.1 Exploration Box



Driving Question

How do balls move in games like soccer?



Storyline Link

The anchoring phenomenon is “Objects do not move on their own.” This lesson introduces students to a real-world context for how pushes and pulls are used to make objects (balls) move in soccer and other games. In this first lesson, the anchoring phenomenon (motionless ball) is used to generate ideas and ask questions about ways to move a soccer ball. (SEP) Students’ prior knowledge about how balls are made to move in soccer is accessed through discussion and a video of a soccer game. (DCI) (CCC)

Once the motionless ball is moved, then the investigative activity uses the motionless objects in the exploration box to figure out different methods for moving or stopping objects. (DCI, SEP) Movement or stopping of any object (effect) has a cause that can be described as a push or pull. (CCC) This learning experience offers opportunities for you to support student use of words describing a push or a pull that causes movement or stopping of movement. (Embedded vocabulary)

Understanding the investigative phenomenon “Game balls do not move on their own” will lead to understanding the anchoring phenomenon “Objects do not move on their own.” The objects in the box are moved or stopped by pushes or pulls, leading to understanding both the motion and the academic words used to describe the force. The lesson concludes with a class assessment opportunity by completing the “What do we know about moving objects such as soccer balls?” in their kindergarten science notebook (or the Class Notebook). (DCI)

This leads to the investigative problem presented in the next lesson, where the coach describes the problem of figuring out a way to move soccer equipment to the field in one trip. Students generate questions to understand the problem and design a solution.

Throughout the lesson, a flag (▶) denotes formative assessment opportunities where you may change instruction in response to students’ level of understanding and making sense of phenomena.



Time

35 minutes

| | |
|------------|--------------------|
| 5 minutes | Engage |
| 15 minutes | Explore |
| 10 minutes | Explain |
| 5 minutes | Elaborate/Evaluate |

K.1 Exploration Box



Materials

Whole Class

- A soccer ball to display for Engage
- K.1.C1: Class Notebook
- K.1.R1: Students Playing Soccer
- K.1.R2: Soccer Equipment
- Zipper sandwich bags
- Index cards
- FC Barcelona video (<https://www.youtube.com/watch?v=CvblAaEgKjc>)
- Soccer supplies: soccer balls, ball bag, cones, water jug, chairs, snacks

Group

- Box or basket that contains various objects and materials to push and/or pull (one box per group)
- Objects: wooden blocks, wooden train cars, balls, counter bears, cars, soup cans, paper clips, pipe cleaners, rubber bands, straws, grooved ruler

Individual

- Kindergarten science notebook

Advance Preparation

1. This learning sequence can be done with additional support for classroom routines at the beginning of the kindergarten year by using the **K.1.C1: Class Notebook** as a guide to what could be in your class notebook. As the year continues, more of the notebooking can be done in student individual notebooks increasing literacy/reading connections. Later in the year, students will not need the model.
2. Set up pages in your class notebook, entitled Pushes and Pull. Use **K.1.C1: Class Notebook** as a guide.
3. Place all the objects in a box or basket (one per group).



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An Example of an Exploration Box

K.1 Exploration Box

4. Prepare zipper sandwich bags with a label on an index card for each item the students will use in the basket/box of items. This will be used for a class word wall.
5. Take one set of objects out of the box and place each object in a zipper bag with a card that labels the name of the object. Place all the objects with their labels on a pocket chart or taped to the wall for student reference.
6. This lesson may need to be repeated for multiple days in order to solidify terms and motions with students such as moving an object by pushing or pulling and stopping an object by pushing or pulling. This learning sequence is designed for midyear in kindergarten after students have been able to link charted words with actions.
7. Review the [FC Barcelona](https://www.youtube.com/watch?v=CvblAaEgKjc) video (<https://www.youtube.com/watch?v=CvblAaEgKjc>)

K.1 Exploration Box



Procedure

Engage (5 minutes)

Observe a motionless ball, ask questions, and make predictions about what causes a ball to move.

TEACHER NOTE

Kindergarten students ask questions in the moment. They are not good at remembering those questions and sharing them at the end of an investigation. You should be prepared to collect questions you hear students asking as you check in with groups. Chart some of the observations made and new questions to explore on the **K.1.C1: Class Notebook** at the end of each lesson. As the lessons progress and students see their questions in writing, they will begin to remember and ask their own questions about the sequence of investigations.

1. Engage students in naming the games they play on the playground or at a park with their friends or family. How do they play? What do they like about playing? Does anyone play on a team? List the games on page 1 of the **K.1.C1: Class Notebook**.

TEACHER NOTE

The **K.1.C1: Class Notebook** is used throughout the learning sequence to model writing and understanding of concepts of print. The entries are used as a text for reading as well as a source for information developed by the class. If the sequence is done later in the kindergarten year, more of the entries could be included in an individual student notebook.

2. Soccer is a game that children play around the world. Show the [FC Barcelona](#) video to remind students about the game of soccer. Place a soccer ball in the middle of the circle of students and ask students to tell the ball to move on the count of 3. Try this twice and see what happens.
3. Share ideas about actions that might make the soccer ball move. Record on the **K.1.C1: Class Notebook** ideas generated by students. Chart responses e.g. *Can I kick the ball? Can I hit with my hand? Can I blow on the ball? Can I pull the ball?*



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K.1 Exploration Box

4. Use the charted actions and ask students to decide which method they want to try first to move the ball. Select individual students to try out the methods and record the result on the **K.1.C1: Class Notebook**.

TEACHER NOTE

During step 4, use a think-aloud to model thinking about pushes and pulls. This think-aloud helps the students think on their own in step 7b and 7c and verbalize the results of the pushes and pulls in step 12.

5. Lead a discussion that identifies whether each method was a push or a pull. Record push or pull next to each method tried on the **K.1.C1: Class Notebook**.

Explore (15 minutes)

Plan and carry out an investigation and observe how objects move when pushed or pulled.

6. Display **K.1.R1: Students Playing Soccer** or take pictures at one of the kindergarteners' soccer games to display. Students discuss with a partner what they noticed about how the players move the ball. Ask partners to share different ways in which the ball was moved.
7. We noticed the soccer ball was moved in several ways. Now we are going to figure out how smaller objects can be moved.
 - a. Show the class a box of objects and explain that they will get a chance to test the different objects. Their goal is to cause the object to move without the object leaving the box.
 - b. Ask partners to face each other knee-to-knee, using student-to-student discourse to talk about ideas of how to cause the objects to move.
 - c. Ask partners to share ideas with the larger group while you chart the ideas on the **K.1.C1: Class Notebook** page titled Exploration Box.

TEACHER NOTE

Refer to Steps 4 and 5 in Advance Preparation to introduce the cards and materials for this part of the investigation. This will support the development of student language as well as concepts of print for communicating ideas, e.g. left to right, words versus letters, whole thoughts as sentences. Include words about the objects they will be using such as: *train cars, balls, bears, cars, paper clips, pipe cleaners, soup cans, rubber bands, straws, ruler*. See the pictures on page K.1.8 for examples.

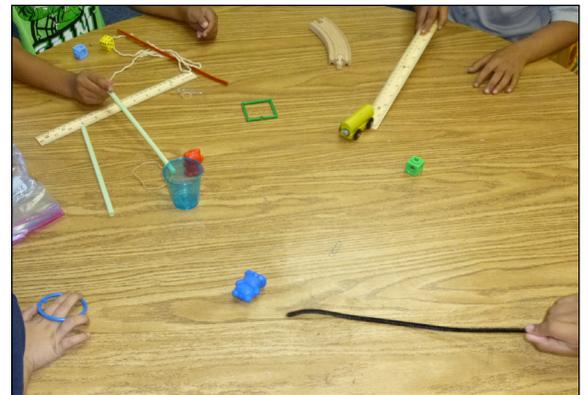
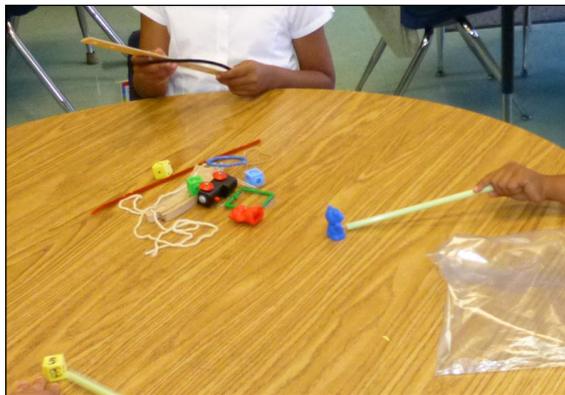
8. Place each type of material from the exploration box on the pocket chart or front board ledge. Ask students which materials in the pocket chart they can match to the word on the 3-by-5 card with the name of the materials. (This is an opportunity for advanced readers to match or others to match beginning sounds).

K.1 Exploration Box

9. Ask students to predict how each object might be moved. Record ideas on the **K.1.C1: Class Notebook** with a picture of the object and how to move the object. Leave space for results.
10. Place one box of objects on each table for a group of 2 to 4 students, and instruct students to explore how they can cause the objects to move.
 - a. While walking around and observing what students are trying, ask students if their predictions were accurate or if they have new predictions about how to move the objects.
 - b. Possible questions: “How can you move the object? Which way did the object move? Can you move the object another way? What caused the movement? Do all objects push or pull the same? Are some objects pushing or pulling differently? Can you use two objects to move one object? How is a pull different from a push?”



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TEACHER NOTE

As students are exploring, walk around and listen for prior knowledge of predictions, the position of objects, cause and effect (CCC), and vocabulary words such as *push*, *pull*, *cause*, and *effect*. Watch for the ways in which students observe and describe causes or patterns of how different pushes or pulls affect the movement of the ball. Listen to how the students explain their observations in order to build on their vocabulary for the next exploration. Use the words *push*, *pull*, *cause*, and *effect* to expand language for students who do not yet use the words. The labeled zipper bags/or word wall with objects also supports language for English Learners or students building schema.

K.1 Exploration Box

Explain (10 minutes)

Analyze and interpret observations about the effects of a push or pull on movement.

11. Ask students to return to the meeting area and be ready to use objects from their table to explain what they did to cause the object to move. Ask partners to pair share knee-to-knee (student-to-student discourse) of how they moved the objects. After practicing with a partner, ask partners to choose one or two moves to share with the whole group.
12. Return to the **K.1.C1: Class Notebook** and record next to the predictions made in Step 9 a statement about how the objects were actually moved. Add any new ideas suggested by the students.
13. Create a page in the **K.1.C1 Class Notebook** called "What causes movement?". Use the object cards that you had placed in the pocket chart and move them over to the page in the **K.1.C1: Class Notebook**.

- a. Ask students to name an object that can be pushed. Ask them to explain how they pushed the object. Suggest the following sentence frame to communicate and demonstrate what they did:

I pushed ____ by ____.

Use a combination of pictures and words to record their explanations. For example, use arrows to show the direction the object moved.

- b. Ask students to name an object that can be pulled. Ask them to explain how they pulled the object. Suggest the following sentence frame to communicate and demonstrate what they did:

I pulled ____ by ____.

Continue to chart.

- c. Ask students to say how they stopped an object from moving:

I stopped ____ by pulling or pushing the opposite direction.

Chart ideas for stopping under the appropriate push or pull column.

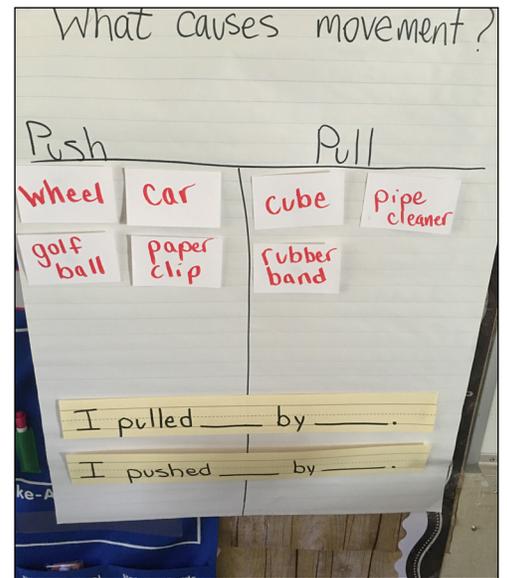


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K.1 Exploration Box

TEACHER NOTE

The sentence frames are intended to be suggested by you only if students need scaffolds. Simpler sentence frames can be used if needed by a class. Kindergarteners are interacting with written text in the form of objects and pictures.

14. Ask students to review all the objects that can be moved or stopped by pushing. Ask students to choral read all the objects that can be moved or stopped by pulling. Lead a discussion of which objects could be moved or stopped by either pulling or pushing.

TEACHER NOTE

Throughout the learning sequence, adapt for different abilities in reading charts by using individual readers, partner readers, or choral reading led by you.

15. Ask the students to talk to a partner knee-to-knee about what causes something to move. Share ideas with the whole class. Chart ideas on the **K.1.C1: Class Notebook**.

TEACHER NOTE

The experience of understanding cause and effect will depend on the prior discussion in the class. Build on charted student responses to identify what causes something to move. Facilitate student responses to build understanding that there is a cause for all movement or stopping movement. The causes include either a push or a pull.

16. Develop a class definition for a push and a pull. Ask students to think about what we do when we push. Write more than one idea on the chart and ask students to place a small sticky note by the one they agree with. Compare the number of sticky notes and decide which has more and which has less. Continue the same process for a pull. Rewrite final selections on a new notebook page.
17. Select a title from the Literacy Links on page K.1.10 to read aloud at this point in the lesson. Any of the titles are appropriate now that students have some experience with the academic vocabulary.
18. ► Have students return to tables and take out their kindergarten science notebook or a piece of paper. Ask students to pick an object they either pushed or pulled. Have them use pictures, words, and arrows to show what they did (cause) and what happened to the object (effect).

K.1 Exploration Box

TEACHER NOTE

▶ Drawing the picture in step 18 provides both additional practice and an opportunity for embedded assessment of the connections students are making between the action and the words of push and pull. This activity can be done at a choice center for as long as students indicate an interest in sorting the cards. Record observations of student's ability to distinguish between both the two words and the actions. This activity further supports English Learners in speaking and listening. The activity can also be adapted for extended learners by placing words on the cards rather than pictures of the objects.

Elaborate/Evaluate (15 minutes)

Construct an explanation about the cause of the movement of a motionless soccer ball.

19. ▶ Display the **K.1.C1: Class Notebook** and bring the students back to the meeting area with the soccer ball in the center. Ask, "Think about the way you moved the things in the box. What do we know about moving objects such as soccer balls? What did we figure out about how a motionless soccer ball is made to move?" Chart student ideas and record what they figured out about the movement of motionless objects (anchoring phenomenon) in the **K.1.C1: Class Notebook**.
20. Display the materials used in a soccer game (cones, balls, net, banner) or show **K.1.R2: Soccer Equipment** and explain that the coach has a problem. The coach needs help to figure out how to move all these objects to the field in one trip. What do we need to know to figure this out? Students generate a list of questions of things they need to know to solve the problem. Chart student questions on the **K.1.C1: Class Notebook**.
21. Tomorrow, we will work on the problem of getting materials to the field.

Literacy Links

It would be appropriate to have students interact with text to extend their understanding of pulls. These selections can be read aloud at any time after this lesson because students have experienced pushes and pulls. Suggested books include:

Fiction:

- *The Gigantic Turnip* by Alessio Tolstoy and Niamh Sharkey
- *Grandma Lena's Big Ol' Turnip* by Denia Lewis Hester and Jackie Unvanovic
- *The Enormous Potato* by Aubrey Davis and Dušan Petričić
- *The Giant Carrot* by Jan Peck and Barry Root
- *The Giant Cabbage: An Alaska Folktale* by Chérie B. Stihler and Jeremiah Trammell
- *The Gigantic Sweet Potato* by Dianne De Las Casas and Marita Gentry
- *The Turnip* by Jan Brett

K.1 Exploration Box

Nonfiction:

- *And Everyone Shouted "Pull"* by Claire Llewellyn and Simone Abel

References

Brett, J. (2015). *The Turnip*. New York: Putnam Juvenile.

Casas, D. D., & Gentry, M. (2010). *The Gigantic Sweet Potato*. Gretna, LA: Pelican Publishing Company.

Davis, A., & Petričić, D. (2018). *The Enormous Potato*. Winnipeg, MB: National Network for Equitable Library Service.

FC Barcelona. (2016, December 29). Search Avatar image 0:17 / 2:35 [HIGHLIGHTS] LALIGA PROMISES: FC Barcelona (Infantil B) – Real Madrid 2–0. Retrieved from <https://www.youtube.com/watch?v=CvblAaEgKjc>

Hester, D. L., & Urbanovic, J. (2015). *Grandma Lena's Big Ol' Turnip*. New York, NY: Albert Whitman Prairie Books.

Llewellyn, C., & Abel, S. (2005). *And Everyone Shouted, "Pull!": A first look at forces and motion*. Minneapolis, MN: Picture Window Books.

Peck, J., & Root, B. (1998). *The Giant Carrot*. New York: Dial Books for Young Readers.

Stihler, C. B., & Trammell, J. (2003). *The Giant Cabbage: An Alaska folktale*. Seattle, WA: Sasquatch Books.

Tolstoy, A. N., & Sharkey, N. (2019). *The Gigantic Turnip*. Cambridge, MA: Barefoot Books.

Toolbox Table of Contents

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| K.1.R2 | <u>Soccer Equipment</u> | K.1.18 |

Class Notebook

Pushes and Pulls

Games We Play

How can we move the ball?

Exploration Box

| Object | How to Move | Results |
|--------|-------------|---------|
| | | |

What causes movement?

| Pushes | Pulls |
|--------|-------|
| | |

Class Notebook (continued)

What causes something to move?

Definitions

Pushes

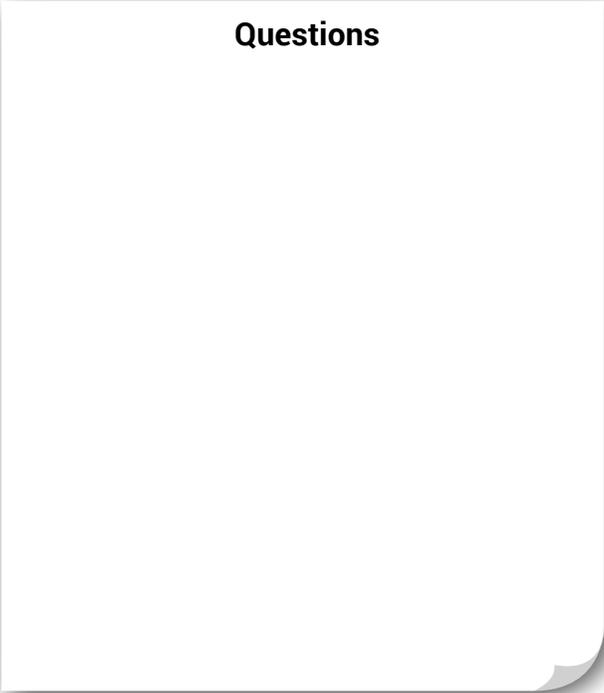
Pulls

How do we get a motionless object to move?

How can the coach move all these projects to the field in one rip?

Class Notebook (continued)

Questions



Students Playing Soccer



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Students Playing Soccer (continued)



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Soccer Equipment

Soccer Balls



Image by IStock.com/[gemenacom](#)

Soccer Net



Image by IStock.com/[Ljupco](#)

Cones



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Flags



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Water Jug, Food, and Umbrella



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Appendix K.1

Exploration Box

Next Generation Science Standards (NGSS)

This lesson is building toward:

| PERFORMANCE EXPECTATIONS (PE) | |
|-------------------------------|---|
| K-PS2-1 | Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. <i>[Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.] [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.]</i> |

NGSS Lead States. 2013. Next Generation Science Standards: For States, By States. Washington, DC: The National Academies Press.

| SCIENCE AND ENGINEERING PRACTICES (SEP) |
|---|
| Analyzing and Interpreting Data |
| <ul style="list-style-type: none">Record information (observations, thoughts, and ideas).Use and share pictures, drawings, and/or writings of observations. |
| Planning and Carrying Out an Investigation |
| <ul style="list-style-type: none">With guidance, plan and conduct an investigation in collaboration with peers.Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons. |
| Constructing Explanations and Designing Solutions |
| <ul style="list-style-type: none">Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. |
| Obtaining, Evaluating, and Communicating Information |
| <ul style="list-style-type: none">Communicate information or design ideas and/or solutions with others in oral and/or written forms using models, drawings, writing, or numbers that provide detail about scientific ideas, practices, and or/design ideas.Obtain information using various texts, text features (e.g., heading, tables of contents, glossaries, electronic menus, icons) and other media that will be useful in answering a scientific question and/or supporting a scientific claim. |

| DISCIPLINARY CORE IDEAS (DCI) |
|---|
| PS2.A Forces and Motion |
| <ul style="list-style-type: none">Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. |
| ETS1.A: Defining and Delimiting an Engineering Problem |
| <ul style="list-style-type: none">Asking questions, making observations, and gathering information are helpful in thinking about problems. |

Appendix K.1

CROSCUTTING CONCEPTS (CCC)

Cause and Effect

- Events have causes that generate observable patterns.

Patterns

- Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

"Disciplinary Core Ideas, Science and Engineering Practices, and Crosscutting Concepts" are reproduced verbatim from A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. DOI: <https://doi.org/10.17226/13165>. National Research Council; Division of Behavioral and Social Sciences and Education; Board on Science Education; Committee on a Conceptual Framework for New K–12 Science Education Standards. National Academies Press, Washington, DC. This material may be reproduced for noncommercial purposes and used by other parties with this attribution. If the original material is altered in any way, the attribution must state that the material is adapted from the original. All other rights reserved.

Common Core State Standards (CCSS)

CCSS ELA READING

CCSS.ELA-LITERACY.R1.K.1

With prompting and support, ask and answer questions about key details in a text.

ELA SPEAKING AND LISTENING

CCSS.ELA-LITERACY.SL.K.3

Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

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California English Language Development (ELD) Standards

CA ELD

Part I.K. 5 Listening actively and asking questions about what was heard

EMERGING

P1.K.5 Demonstrate active listening to read-alouds and oral presentations by asking and answering yes-no and wh-questions with oral sentence frames and substantial prompting and support.

EXPANDING

P1.K.5 Demonstrate active listening to read-alouds and oral presentations by asking and answering questions with oral sentence frames and occasional prompting and support.

BRIDGING

P1.K.5 Demonstrate active listening to read-alouds and oral presentations by asking and answering detailed questions with minimal prompting and light support.

In addition to the standard above, you may find that you touch on the following standards in this lesson as well:

P1.K.1 Exchanging information and ideas via oral communication and conversations

P1.K.2 Interacting with written English (print and multimedia)

P1.K.12 Selecting and applying varied and precise vocabulary and other language resources

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