

STEAM Stories Pre-K Activity Guide
New York Hall of Science
2023 – 2024 SECOND EDITION



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Introduction to the Activity Guide

ABOUT THE PROGRAM

New York Hall of Science Pre-K STEM Enrichment Program

The New York Hall of Science (NYSCI) is the city's premier interactive museum of science and technology, as well as a global leader in STEM education and a laboratory for new forms of learning. Located in Queens, the country's most diverse county, NYSCI is recognized for innovative educational programs, youth development and mentorship, teacher professional development initiatives, groundbreaking exhibitions and large-scale events that draw children and adults into hands-on STEM learning.

In September 2021, the New York Hall of Science entered into a unique museum school partnership model with the New York City Department of Education's Division of Early Childhood Education to support curriculum design, teacher professional learning, and family engagement opportunities throughout the school year for a new Pre-K Center being constructed adjacent to NYSCI.

This partnership model known as the Pre-K STEM Enrichment Program, emphasizes a whole school learning ecosystem to engage all stakeholders — children, teachers, parents/caregivers and school leaders in collaborative and multi-generational learning. The program also incorporates NYSCI's Design, Make, Play foundational pedagogical approach of designing compelling and playful experiences as an anchor for exploration, skill-building and problem solving throughout each of the program components including specialized field trips to NYSCI, professional learning workshops for teaching staff, and STEM family days for 300 families in Corona, Queens.

Another component of the program was the development of an activity guide that complemented the Pre-K for All Interdisciplinary Units of Study in combination with NYSCI's Design, Make, Play approach. NYSCI developed this STEAM Stories Pre-K Activity Guide, in close collaboration with Mosaic Pre-K Center school leaders in District 24 Queens.

On September 2022, the Mosaic Pre-K Center (Q369)

on 111th Street (NYSCI campus) opened its doors to the local Corona community for the first time. NYSCI Science Coaches collaborated with Q369 Pre-K teachers to further pilot STEAM Stories in their classrooms. NYSCI collected data regarding the lessons in the form of observations, focus groups, and teacher surveys. This second edition of STEAM Stories includes modifications and improvements based off of this feedback.

ABOUT THE ACTIVITY GUIDE

STEAM Stories Pre-K Activity Guide Framework

This activity guide will help support, extend, and enrich the foundational lessons in the NYCDOE Pre-K for All Interdisciplinary Units of Study with a focus on STEAM (Science, Technology, Engineering, Art, and Math), particularly science and engineering practices. There are also opportunities in this guide to enrich and support other Pre-K curriculum.

The activity guide consists of a pre-engineering section as well as five lesson plans with each activity enriching a foundational lesson from one of the the Pre-K for All Units of Study by: (1) highlighting engineering design thinking through literacy, (2) increasing opportunities for student-centered and play-based experiences, and (3) extending connections to the Learning Centers (multidisciplinary, interactive exploration areas in the classroom). We recommend the pre-engineering activities be conducted at the beginning of the school year in the Fall so that children have an opportunity to build fine motor skills in preparation for the lesson plans. The five lessons can be conducted as a whole group lesson or in the classroom's learning centers with small groups at a time. The lessons are broken down into three parts and are intended to be completed on multiple days. The lessons are in no particular order in this guide, so they may be implemented as you see fit.

NYSCI's Design, Make, Play Approach

Our work is guided by an approach to learning that we call *Design, Make, Play*:

- **Design** emphasizes intentionality in problem-solving and helps people see the possibilities in the world. We support interest-driven problem solving where learners actively shape the tasks they are working on.
- **Make** highlights hands-on experiences with materials, tools and processes, and nurtures the development of skills and confidence. We engage kids as creators, not consumers, of content, materials and projects.
- **Play** promotes intrinsic motivation and deep engagement. We leverage children’s natural instincts to engage playfully in STEM experiences.

When combined, these strategies support open-ended exploration, imaginative learning, deep engagement and delight — ingredients that inspire passionate learners, critical thinkers, and active citizens.

Core Framework

The core framework of each activity consists of three main components based on NYSCI’s Design-Make-Play approach:

1. Literacy-based Introduction

A read-aloud storytime book, followed by a STEAM design challenge that is motivated by the plot or characters in the story to develop student language, reasoning skills, and empathy.

2. Materials Exploration and Tinkering

A play-based approach where children explore properties of materials, how they work, and how the function of the materials can be used, combined or manipulated to solve a problem.

3. Engineering Design Thinking

(Make, Test, Reiterate) — children explore a STEAM based challenge and work together to find ways to solve the problem, test their solutions, share results with each other, and build on this knowledge to improve or modify their solutions using strategic thinking.

The activities are designed to be fun and engaging so that they introduce young learners to the engineering design process, enrich science content learning, and foster problem solving/critical thinking skills. More

importantly, these activities empower young learners as engineers or scientists and instill positive attitudes that lead to self-efficacy and a love of STEAM for years to come.

STANDARDS ALIGNMENT ACROSS THE ACTIVITY GUIDE

Pre-Engineering Activities

- PK.AL.1 *Actively engages in play as a means of exploration and learning.*
- PK.AL.3. *Approaches tasks and problems with creativity, imagination and/or willingness to try new experiences.*
- PK.AL.4. *Exhibits curiosity, interest, and willingness to learn new things and have new experiences.*
- PK.PDH.5. *Demonstrates eye-hand coordination and fine motor skills.*
- PK.CKW.2 *Responds and reacts to visual arts created by themselves and others.*

Literacy-based Introduction

- PK.ELAL.2. [PKRF.2.] *Demonstrates an emerging understanding of spoken words, syllables, and sounds (phonemes).*
- PK.ELAL.5. [PKR.1.] *Participates in discussions about a text (e.g., during whole or small group interactive read-aloud discussions, during peer sharing, within play scenarios).*
- PK.ELAL.7. [PKR.3] *Develops and answers questions about characters, major events, and pieces of information in a text.*
- PK.ELAL.11 [PKR.7.] *Describes the relationship between illustrations and the text (e.g., what person, place, thing or idea in the text an illustration depicts).*

Materials Exploration and Tinkering

- PK.AL.1 *Actively engages in play as a means of exploration and learning.*
- PDH.1 *Uses senses to assist and guide learning.*
- PK.AC.3 *Demonstrates understanding of what is observed.*
- PK.AL.4. *Exhibits curiosity, interest, and willingness to learn new things and have new experiences.*
- PK.PDH.5. *Demonstrates eye-hand coordination and fine motor skills needed to manipulate objects.*

Engineering Design Thinking (Make, Test, Reiterate)

- WSS: IV.A.3: *Makes meaning from explorations, and generates ideas and solutions based on their own observations of the natural and human-made worlds.*
- TSG: 24: *Uses scientific inquiry skills.*
- COR: CC: *Experimenting, predicting and drawing conclusions.*
- PK.SCI.10 [K-2-ETS1-1]. *Asks questions, makes observations and gathers information about a simple situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.*
- PK.SCI.11. [K-2-ETS1-2]. *Develops a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.*
- PK.AL.3. *Approaches tasks and problems with creativity, imagination and/or willingness to try new experiences.*
- PK.SCI.12. [K-2-ETS1-3.] *Analyzes data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.*
- PK.AL.5. *Demonstrates persistence.*





Pre-Engineering Activities

Fuzzy Fishing

Twisting pipe cleaners into the shape of fish makes for a fun activity to practice the twisting motion for later lessons that require connections between objects. Invite children to take short segments of pipecleaners, fold them in half, and twist the edges to make a simple fish shape, and place them into a bowl. If a sufficient number of them have been made, then they can use a small skewer to go fishing!

The skewer can be speared through the fish's loop, and lifted up to catch the fish. Alternatively, children may use a plastic tweezer to lift up the fish out of the bowl. After every fish is caught, the fish can be put back in the bowl or pond, and the process can be repeated.

At the end of the project, encourage the children to untwist the fish to return them to pipe cleaners. This will give them multiple opportunities to practice twisting and untwisting.

If you want to extend this activity, instead of fish, the children can make links in a chain. Children can work together to make a class chain with contributions from everyone.

Materials

- Pipe cleaners cut into 2 to 4 inch lengths
- Bowl
- Bamboo skewer
- Plastic tweezers (with googly eyes)

Facilitating Questions

- *What happens if you twist 2 colors of pipe cleaner together?*
- *Is it easier to grab many fish, or one at a time?*
- *What animals do the tweezers remind you of?*

PK.AL.1 Actively engages in play as a means of exploration and learning

PK.AL.3. Approaches tasks and problems with creativity, imagination and/or willingness to try new experiences

PK.AL.4. Exhibits curiosity, interest, and willingness to learn new things and have new experiences

PK.PDH.5. Demonstrates eye-hand coordination and fine motor skills



¿Qué sucede si unes 2 colores de limpiapipas?

¿Es más fácil agarrar muchos peces, o uno a la vez?

¿A qué animales te recuerdan las pinzas?

Stretchy Shapes

Children will practice gross and fine motor skills as they stretch out and place rubber bands on a grid to create shapes and designs. They will replicate shapes on a peg board, based on teacher examples or card driven challenges, or children can create their own patterns and shapes on their board as they see fit.

Stretch the rubber bands across the pegs in order to get them to hook around the pegs. By following the grid, various shapes can be easily made. Squares, triangles, and circles of various sizes can be an appropriate challenge for them to replicate. Successful replication will involve them practicing math skills as they count spaces, visually measure sizes, and think about basic coordinates.

Layering rubber bands, and exploring the various shapes that can be made on the peg board will get them to use finger and hand strength as they stretch and manipulate the rubber bands. You can extend this activity by challenging them with more complex, multiple rubber band shapes to replicate.

Materials

- Challenge cards (apps.mathlearningcenter.org/geoboard)
- Geoboards
- Variety of rubber bands

Facilitating Questions

- *Can you make a simple shape?*
- *Can you make a pattern with lines and/or colors?*
- *What size rubber bands should we use to make a large shape? A small shape?*
- *How many rubber bands will you need to make this design?*

PK.AL.1 Actively engages in play as a means of exploration and learning

PK.AL.3. Approaches tasks and problems with creativity, imagination and/or willingness to try new experiences

PK.AL.4. Exhibits curiosity, interest, and willingness to learn new things and have new experiences

PK.PDH.5. Demonstrates eye-hand coordination and fine motor skills



¿Puedes hacer una figura que se vea mas simple?

¿Puedes hacer un patrón con líneas y/o colores?

¿Qué tamaño de gomas debemos usar para hacer una figura grande? ¿Una figura pequeña?

¿Cuántas gomas necesitarás para hacer este diseño?

Confetti Crafts

Using a hole punch, children will make confetti to create a unique art project that gets students to practice their hole punching skills.

Give children strips of paper and various styles of hole punches, and allow them to explore putting fun shaped holes in the paper. They should collect the punchouts so that they can sprinkle them onto a clear sheet of self adhesive lamination paper in order to use what they made for something fun! Select a background sheet of colored paper, and stick the lamination paper and confetti to the background to finish the project.

Some children will ignore collecting the punch outs, and be more interested in just punching the holes. This is totally fine, because we want them to practice the tool use, rather than emphasizing the resulting output. They should become comfortable with the different motions needed to activate different styles of hole punches.

You can extend this learning by having them focus on where the resulting hole is, with something like making a border around a page. This will require practicing control of both the punch, and paper while using it.

If punches require too much strength, consider a thinner paper, such as tissue paper. We also recommend mini hole punch assist devices.

Materials

- Self-adhesive lamination paper, cut down to fit
- Colored printer paper (construction paper will not stick)
- Hole punches of various types
- Hole punch assists/aids
- White printer paper, cut into strips.

Facilitating Questions

- *What happens to your cut out if your punch is overlapping the edge?*
- *What's the difference between the punchout, and the resulting*



*¿Qué le sucede a su recorte si su punzón se superpone al borde?
¿Cuál es la diferencia entre el punchout y el agujero resultante?
¿Cómo coinciden sus formas?*

hole? How do their shapes match up?

- Can you tape the punchout back into the hole?

PK.AL.1 Actively engages in play as a means of exploration and learning

PK.AL.3. Approaches tasks and problems with creativity, imagination and/or willingness to try new experiences

PK.AL.4. Exhibits curiosity, interest, and willingness to learn new things and have new experiences

PK.PDH.5. Demonstrates eye-hand coordination and fine motor skills

¿Puedes pegar con cinta adhesiva el punchout en el agujero?

Dazzling Drops

Children will practice fine motor skills, color mixing, and observe properties of water in this activity by using a pipette/ dropper to transfer liquids. Prepare a variety of water color paint inside of small clear plastic cups. We recommend about a 1:6 ratio of paint to water. Cut 6"x 6" squares of wax paper and provide one for each child. Inside a tray to prevent water from escaping, place the child's sheet of wax paper waxy side up. By each station, provide a pipette to each child as well as the small cups of various colored water. Model how to use the pipette, then demonstrate how water beads up on the wax paper. Invite children to experiment with the water colors to create their own designs.

When a paper is full, paper towels or another absorbent material can be used to soak up the water to make room for more drops. Water will get under the sheet of wax paper, and cause it to wrinkle. Swap out the wax paper occasionally.

Materials

- Short, clear plastic cups
- Pipettes/ droppers
- Liquid watercolor
- Wax papers
- Trays
- Paper towels



Facilitating Questions

- Which color(s) are you going to explore?
- What happens when you put a drop of colored water onto the wax paper?
- How many water beads of color were you able to make?
- What happens when you add more than one drop?
- How big can you make a water drop?
- How can you mix colors?
- What shape or design can you make with the water drops?

PK.AL.1 Actively engages in play as a means of exploration and learning

PK.AL.3. Approaches tasks and problems with creativity, imagination and/or willingness to try new experiences

PK.AL.4. Exhibits curiosity, interest, and willingness to learn new things and have new experiences

PK.PDH.5. Demonstrates eye-hand coordination and fine motor skills

¿Qué color(es) vas a explorar?

¿Qué sucede cuando pones una gota de agua coloreada en el papel encerado?

¿Cuántas gotas de agua de colores pudiste hacer?

¿Qué sucede cuando agrega más de una gota?

¿Qué tan grande puedes hacer una gota de agua?

¿Cómo puedes mezclar colores?

¿Qué forma o diseño puedes hacer con las gotas de agua?

Clay Carrots

Children will practice developing scissor skills by repeatedly cutting playdough. The dough will be soft and pliable to let them do the motion, while also being repairable to allow repetition.

Invite children to help you cook an imaginary meal, and ask for their help in preparing as many carrot slices as possible. Present them with orange playdough that has been rolled into a carrot, or extruded to make a long tube. Demonstrate with your scissors how to cut our clay carrot into thin slices, then invite them to do the same.

Occasionally gather the sliced carrots, and squish them together to reform more carrots. You can also invite the children to help with the carrot making process. They can roll it out, or operate the extruder. You can extend this learning by giving children access to patterned edge scissors. Patterned scissors can be tougher to operate, but can be rewarding with their novelty.



Materials

- Variety of plastic safety scissors
(With flip down spring assists)
- Orange playdough
- Optional: clay extruder

Facilitating Questions

- *What can we use these carrot slices for?*
- *What other clay foods could we cut? What color would we need?*
- *Which way are the scissors easier to hold?*
- *Where should we hold what we are cutting so it's easy to cut?*

PK.AL.1 Actively engages in play as a means of exploration and learning

PK.AL.3. Approaches tasks and problems with creativity, imagination and/or willingness to try new experiences

PK.AL.4. Exhibits curiosity, interest, and willingness to learn new things and have new experiences

PK.PDH.5. Demonstrates eye-hand coordination and fine motor skills

¿Para qué podemos usar estas rodajas de zanahoria?

¿Qué otros alimentos de arcilla podríamos cortar? ¿Qué color necesitaríamos?

¿De qué manera son más fáciles de sostener las tijeras?

¿Dónde debemos sujetar lo que estamos cortando para que sea fácil de cortar?

Tape Snakes

Children will create pictures by using colorful masking tape as their medium. They can make a colorful snake, by taping out a line, and giving it a googly eye and a tongue. They can alternatively draw a letter if they are inspired, or draw a picture. Have various examples to show them possibilities, especially of what a tape or regular snake should look like.

Before starting this project, teach the class a quick dance to get them primed for the actions they will need to use a tape dispenser. Have the class dance along with you.



“Let’s pretend we are going to pull on a piece of giant tape.
Grab on to the end!”

Raise both hands above your head, and do a grabbing motion.

“Supongamos que vamos a tirar de un trozo de cinta gigante.
¡Agárrense hasta el final!”

Levanta ambas manos por encima de tu cabeza y haz un movimiento de agarre.

“Pull down! Oh no, it’s too strong!”

Slowly bring your hands straight down.

Give a straining motion to emphasize the difficulty.

“¡Jalar hacia abajo!! ¡Oh no, es demasiado fuerte!”

Lentamente lleva tus manos hacia abajo. Dé un movimiento de enderezamiento para enfatizar la dificultad.

“Okay, let’s try again. Grab a new piece!”

Raise both hands above your head, and do a grabbing motion.

“Está bien, intentémoslo de nuevo. ¡Agarra una nueva pieza!”

Levanta ambas manos por encima de tu cabeza y haz un movimiento de agarre.

“This time, let’s do it to the side!

Down and to the side! Much easier”

Lower your hands down halfway, then swing them to the side.

“¡Esta vez, hagámoslo hacia un lado!

¡Abajo y al costado! Más fácil”

Baje las manos hasta la mitad y luego gírelas hacia un lado.

Repeat the motion in order to emphasize and allow them to kinesthetically absorb the difference between the two motions. This will help them internalize the advice and instructions when operating the real tape dispensers.

Part of the challenge is also pulling the tape off of the dispensers. Some children might need help holding the

dispenser while they pull, depending on the strength of the tape. There is also the challenge of keeping the tape from sticking to itself. If this is a problem, encourage children to use shorter pieces of tape, and to keep trying. Have a place handy to stick down waste pieces of tape if the child is struggling to remove tape from themselves.

Once they have finished creating their design, they can stick googly eyes to their project, or use a marker to add details. You can extend this lesson by having children use their tape to practice repairing rips or cuts in paper, or by introducing more advanced dispensers, like hand held dispensers with colorful Scotch tape. For more of a challenge, have children try to rip masking tape without a dispenser at all, or cut masking tape using a scissor once they have practiced this tool as well.



Materials

- Examples of tape and regular snakes
- Variety of masking tape (optional: different colors)
- Masking tape dispensers
- Washi tape
- Googly eyes
- Markers
- Scissor

Facilitating Questions

- *Can you give your snake a pattern of color?*
- *What's the shortest piece of tape you can make?*

PK.AL.1 Actively engages in play as a means of exploration and learning

PK.AL.3. Approaches tasks and problems with creativity, imagination and/or willingness to try new experiences

PK.AL.4. Exhibits curiosity, interest, and willingness to learn new things and have new experiences

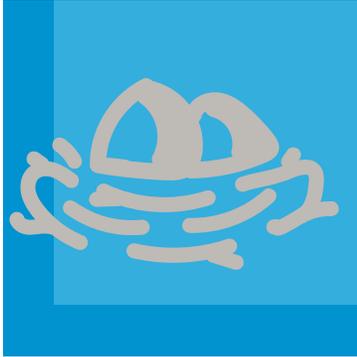
PK.PDH.5. Demonstrates eye-hand coordination and fine motor skills

¿Puedes darle a tu serpiente un patrón de color?

¿Cuál es el trozo de cinta más corto que puedes hacer?

Lesson 1

Bird's Nest Design Challenge



NYCDOE
Pre-K for All Unit of Study
Where We Live, Unit 4
Enrichment Activity for
Foundational Lesson 2

Summary

After reading the storybook, *The Best Nest* by P.D Eastman, children will understand that birds build and live in different kinds of nests made of various items that they find around them. Children will design and build their own nests using natural and recycled materials, then test their design by doing an egg drop from a designated height.

Learning Objectives

- Identify where birds live.
- Describe the different materials that nests can be made from.
- Explore materials to see what kind of items birds may use to design a nest.
- Build a bird nest that can safely hold an egg and prevent it from cracking when doing a drop test.

Key Vocabulary

Home / Hogar

Environment / Ambiente / Entorno

Safe / Seguro(a)

Egg / Huevo

Drop / Soltar

Neighborhood / Vecindario

Build / Construir

Twigs / Ramitas

Tweezer / Pinzas

Nest / Nido

Gravity / Gravedad

Force / Fuerza

Heavy / Pesada(o)

Cushion / Almohada

Design / Diseño

Test / Prueba

Predict / Predecir



Materials

- Storybook: *The Best Nest* by P.D. Eastman
- 2 Bird plushies (“Mr. & Mrs. Bird”)
- Plastic/fiber berry baskets
- Natural materials such as twigs, branches, leaves, acorns, hay
- Pipe-cleaners
- Fillable plastic eggs
- Optional: Snack or sandwich size resealable storage bags
- Yarn
- Felt
- Large tweezers with googly eyes
- Cotton balls
- Small marbles, coins, paperclips, and/or small toy figures (to fit inside of plastic eggs)
- Bird nest book such as *Nests* by Sharon Beals

Note:
 You can substitute, add, or subtract materials as you see fit and available.

¿Dónde tú vives?
¿Dónde viven las abejas?
¿Dónde viven los peces?
¿Dónde crees que viven las pájaros?



¿Por qué crees que los pájaros hacen nidos?
¿Qué hay dentro de los huevos?
¿Cuáles fueron algunas de las cosas que los pájaros recogieron de su entorno y vecindario para construir su nido?

Prep Before the Lesson

- Pre-collect natural materials such as twigs, branches, leaves, acorns, etc. or alternatively, plan for an opportunity to do a nature walk with the children to collect these items for the class.
- Pre-cut strings of yarn and felt pieces into a variety of smaller sizes (1 – 5 inches).
- Select examples of a variety of nests from a book such as *Nests* by Sharon Beals or downloading online images. We recommend laminating the photos and taping them onto the table for children to reference.
- Setup a testing area for the egg drop test. Make sure the height for testing is clearly delineated and accessible to children.

Part 1. Literacy-based Introduction

A. Introduce the concept of a home by eliciting prior knowledge and having children share their experiences. Ask children:

- *Where do you live?*
- *Where do bees live?*
- *Where do fish live?*
- *Where do you think birds live?*

Read *The Best Nest*, by P.D Eastman. Have the children sing along for the last chorus of the song written in the book.

Book Summary: Mr. and Mrs. Bird search for another location to build a new nest out of a variety of materials. They find a location in the local chapel only to learn that the church bell is extremely loud and destroys the new nest. They return back to their original home realizing that it was perfect all along.

B. Have a discussion with children to review what happened in the story.

- *Why do you think birds make nests?*
- *What's inside of the eggs?*
- *What were some of the things that the birds gathered from their environment and neighborhood to build their nest?*

*¿Dónde crees que podemos encontrar algunos de estos artículos?
¿Qué significa seguro para usted?*



*¿Cómo se siente el material?
¿Cómo describirías el material?
¿Qué materiales podrías usar para el nido?
¿Qué te gusta de ese material?*

- *Where do you think we can find some of these items?*
- *What does safe mean to you?*

Use this opportunity to introduce important parts of a home that help keep us sheltered and safe from the elements such as a roof, walls, etc.

Part 2. Materials Exploration and Tinkering

A. If possible, plan for an opportunity to do a nature walk with the children to collect natural materials such as twigs, branches, leaves, acorns, etc. for the class. Have the children pretend they are Mr. and Mrs. Bird scanning the neighborhood for items that would make a great bird nest, just like in the book! For an additional challenge, have children practice their fine motor skills by pretending to have bird beaks and using large tweezers to pick up the items. Alternatively, pre-collect the natural materials for the lesson.

B. Invite children to sort the natural materials collected. They can pretend they are Mr. and Mrs. Bird and organize the materials in different ways (likes with likes, what is hard, what feels soft, etc.). Encourage the children to make connections with other materials around the classroom that share similar properties (ex. pencils are like twigs, etc.).

C. Distribute a small sampling of additional materials such as a cotton ball, felt, pipe-cleaner, berry basket section, and piece of yarn for children to explore alongside the natural items. Encourage exploration like breaking sticks, building stick piles as high as possible, wrapping felt fabric around things, unfurling cotton balls, folding/ bending/ twisting pipe-cleaners, and weaving yarn through a berry basket piece, etc.

- *What does the material feel like?*
- *How would you describe the material?*
- *What material(s) could you use for the nest?*
- *What do you like about that material?*

D. Distribute one plastic egg per child as well as items such as marbles, coins, paperclips, or small toy figures to choose from. Invite children to open up the plastic egg and fill it up with the items of their choice. Have them compare and



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*¿Qué/cuántas cosas pusiste dentro de tu huevo?
¿Tu huevo se siente pesado o liviano?*

contrast with each other. Optional: Distribute a snack or sandwich resealable bag and have children place their filled plastic egg inside, then seal to decrease possible messiness of spilled items.

- *What/how many items did you put inside of your egg?*
- *Does your egg feel heavy or light?*

Part 3. Engineering Design Thinking (Make, Test, Reiterate)

A. Introduce the engineering challenge that relates to the story with the following prompt:

El Sr. y la Sra. Pájaro están visitando Nueva York para poner sus huevos. ¿Puedes construirle un nido para mantener sus huevos seguros si se caen de un árbol?

Mr. and Mrs. Bird are visiting New York to lay their eggs. Can you build a nest for them to keep their eggs safe if they fall from a tree?

Let children know that they will be able to test how strong their nest is by dropping their nest with the plastic egg inside from a certain height. Point out the testing area and the designated height for the egg drop test.

*¿Quién vive en el nido?
¿Qué crees que significa un nido fuerte o seguro?*

- *Who lives in the nest?*
- *What do you think a strong or safe nest means?*

Review what it means to drop something with an object first. Explain to the children that the force of gravity makes things fall when you drop them. A force is a push or pull. The heavier something is, the more force it has. Demonstrate what happens when you drop a plastic egg with a few marbles or coins to the ground without a nest. Invite children to share what a strong and safe bird nest means to them.

*¿Qué pasó con el huevo cuando cayó al suelo?
Si el huevo se rompe, ¿crees que tu nido es fuerte y seguro?
Si el huevo sale rodando del nido, ¿crees que el nido es fuerte y seguro?
¿Cuál es el objetivo de nuestro desafío de diseño?*

- *What happened to the egg when it fell to the floor?*
- *If the egg cracks, do you think your nest is strong and safe?*
- *If the egg rolls out of the nest, do you think the nest is strong and safe?*
- *What is the goal of our design challenge?*

B. Invite children to take a close look at some real nest photos for inspiration. Have them compare and contrast.

¿De qué material está hecho cada nido?
 ¿En qué se diferencian los nidos?
 ¿En qué se parecen los nidos?
 ¿Crees que los nidos son seguros y fuertes para los huevos? ¿Por qué?
 ¿Cuál es tu favorito? ¿Por qué?

¿Qué material crees que hará que el nido sea seguro y fuerte?
 ¿Por qué?
 ¿Cómo vas a colocar o unir piezas?
 ¿Adónde irá el huevo?
 ¿Crees que el huevo se romperá cuando pruebes el nido? ¿Por qué o por qué no?
 ¿Cómo puede asegurarse de que el huevo sea seguro?

¿Tu nido mantuvo el huevo a salvo? ¿Cómo lo sabes?
 ¿Se salió rodando el huevo del nido o se rompió? Si fue así, ¿por qué crees que eso sucedió?
 ¿Qué cambiarías de tu nido para hacerlo mejor?



- What material is each nest made out of?
- How are the nests different?
- How are the nests similar?
- Do you think the nests are safe and strong for the eggs? Why?
- Which one is your favorite? Why?

C. Allow children to select their materials of choice and start building their nests. Some children may need help using the scissors and tape. Provide assistance as needed.

- What material do you think will make the nest safe and strong? Why?
- How are you going to place or attach parts?
- Where will the egg go?
- Do you think the egg will crack when you test your nest? Why or why not?
- How can you make sure the egg is safe?

D. Allow the children to decide what and how much of what to place inside of their plastic egg (marbles, coins, miniature toy figures, paperclips, etc.). When the children are ready to test their nests, make sure they securely place their plastic egg inside.

- Did your nest keep the egg safe? How do you know?
- Did the egg roll out of the nest or crack at all? If it did, why do you think that is?
- What would you change about your nest to make it better?

TIP: For more playful engagement, invite children to build a tree, house, or structure in the block area that will determine the height of the egg drop test! Add photos of real trees, houses, and structures to the block area for children to reference.

If time permits, encourage children to make improvements and then test again.

Extend the Learning for the Main Activity

- Invite children to test their nests from lower or taller heights or fill up their plastic egg with more or less items.
- Challenge children to fit more than one plastic egg or other objects such as two eggs or marbles inside their nest design.

What's Happening?

A force is a push or pull. The force of gravity causes objects to fall. In the Bird's Nest design challenge, children incorporate their problem solving and engineering skills. They choose and test which materials will work best to decrease the force of impact and protect their egg. Soft materials such as cotton balls, yarn, and felt can help cushion and protect the egg.

In addition to exploring the science concepts around force and gravity, children will explore how birds create nests to provide shelter and protection. Bird nests can be very different depending on the species and environment that they live in. Birds use various materials in their environment to make their nests such as twigs, branches, leaves, grass, mud and even human made items (plastic, string, paper, fabric, etc.). Nests can be found in different types of habitats, however, not all birds build nests. Some create holes in the ground or nestle in spaces between rocks, inside a tree, or on building ledges.

LITERACY-BASED INTRODUCTION

PK.ELAL.2. [PKRF.2.] Demonstrates an emerging understanding of spoken words, syllables, and sounds (phonemes).

PK.ELAL.5. [PKR.1.] Participates in discussions about a text (e.g., during whole or small group interactive read-aloud discussions, during peer sharing, within play scenarios).

PK.ELAL.7. [PKR.3] Develops and answers questions about characters, major events, and pieces of information in a text.

PK.ELAL.11 [PKR.7.] Describes the relationship between illustrations and the text (e.g., what person, place, thing or idea in the text an illustration depicts).

MATERIALS EXPLORATION AND TINKERING

PK.AL.1 Actively engages in play as a means of exploration and learning.

PDH.1 Uses senses to assist and guide learning.

PK.AC.3 Demonstrates understanding of what is observed.

PK.AL.4. Exhibits curiosity, interest, and willingness to learn new things and have new experiences.

PK.PDH.5. Demonstrates eye-hand coordination and fine motor skills needed to manipulate objects.

ENGINEERING DESIGN THINKING (MAKE, TEST, REITERATE)

WSS: IV.A.3: Makes meaning from explorations, and generates ideas and solutions based on their own observations of the natural and human-made worlds.

TSG: 24: Uses scientific inquiry skills.

COR: CC: Experimenting, predicting and drawing conclusions.

PK.SCI.10 [K-2-ETS1-1]. Asks questions, makes observations and gathers information about a simple situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

PK.SCI.11. [K-2-ETS1-2]. Develops a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Lesson 1

Learning Center Connections

Dramatic Play

Add bird puppets and bird plush toys or bird stuffed animals, even bird costumes for children to role-play stories.

Materials

- Bird costumes
- Bird puppets, bird plushies, or bird stuffed animals

Facilitating Questions

- *How do some birds move or fly?*
- *Can you create a story with these bird props/toys?*
- *Who are the characters in your story?*
- *What do the characters do in your story? Why?*

PK.CKW.5 Participates in a variety of dramatic play activities to represent fantasy and real life experiences.



- *¿Cómo se mueven o vuelan los pájaros?*
- *¿Puedes crear una historia con estos accesorios/juguetes para pájaros?*
- *¿Quiénes son los personajes de tu historia?*
- *¿Qué hacen los personajes en tu historia? ¿Por qué?*

Library

Put out more books with pictures of different birds and their homes as inspiration for children's nest designs.

Materials

- *The Best Nest* storybook (fiction)
- Book of real nests (non-fiction)
- Bird plushies or puppets

Facilitating Questions

- *What materials is each nest made out of?*
- *Which nest is your favorite and why?*
- *Have you seen a real nest before?*
- *What kind of real nests have you seen before?*
- *What material would you want to use for your own nest design?*

PK.ELAL.5. [PKR.1.] Participates in discussions about a text (e.g., during whole or small group interactive read-aloud discussions, during peer sharing, within play scenarios).

PK.ELAL.9 [PKR.5] Interacts with a variety of genres (e.g., storybooks, poems, songs).



- *¿De qué materiales está hecho cada nido?*
- *¿Cuál nido es tu favorito y por qué?*
- *¿Has visto un nido real antes?*
- *¿Qué tipo de nidos reales has visto antes?*
- *¿Qué material le gustaría usar para su propio diseño de nido?*

Music and Movement

Put out some musical instruments and sing along and dance to the song in the Best Nest storybook.

Materials

- Variety of instruments such as maracas
- Bell for the bell in *The Best Nest* storybook

Facilitating Questions

- *Do you hear any sounds that you recognize?*
- *What instruments have you seen, heard, or played before?*
- *Does the music repeat?*
- *Can you play, sing, and dance to the song faster/slower/louder/softer?*

PK.ARTS.1. [DA:Cr1-3.PK] *Creates Dance*



- *¿Oyes algún sonido que reconozcas?*
- *¿Qué instrumentos has visto, oído o tocado antes?*
- *¿Se repite la música?*
- *¿Puedes tocar, cantar y bailar la canción más rápido/más lento/más fuerte/más suave?*

Computer and Technology

Have children search for different kinds of nests that various birds make from different environments and neighborhoods. Children can compare and contrast the nests and their particular features.

Materials

- iPads or tablets
- Computers

Facilitating Questions

- *Where is each bird from?*
- *What can those birds find around them that they can use for making a nest?*
- *What are the nests made out of?*
- *How are the nests similar?*
- *How are the nests different?*

PK.SOC.5 *Demonstrates knowledge of the relationship between people, places, and regions.*



- *¿De dónde es cada pájaro?*
- *¿Qué pueden encontrar esos pájaros a su alrededor que puedan usar para hacer un nido?*
- *¿De qué están hechos los nidos?*
- *¿En qué se parecen los nidos?*
- *¿En qué se diferencian los nidos?*

Math Center

Provide balance scales for children to compare the weight of sensory eggs versus plastic eggs filled with various materials of their choice. Children can add different materials into plastic eggs to compare the weight of what's lighter and what's heavier. Model how to use the scale as needed.

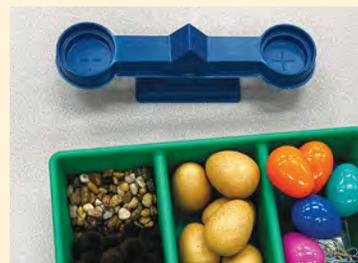
Materials

- Balance scale
- Plastic eggs
- Pom poms
- Sensory eggs
- Pebbles

Facilitating Questions

- *What did you put inside the plastic egg?*
- *How many items fit inside the plastic egg?*
- *Which egg is heavier?*
- *Which egg is lighter?*
- *How do you know?*

PK.MATH.3. [NY-PK.CC.3.] Understands the relationship between numbers and quantities to 10, connects counting to cardinality places, and regions.



¿Qué pusiste dentro del huevo de plástico?
¿Cuántos artículos caben dentro del huevo de plástico?
¿Qué huevo es más pesado?
¿Qué huevo es más ligero?
¿Cómo lo sabes?

Writing

Invite children to write a letter or draw a picture for Mr. and Mrs. Bird about how they are making the nest ready for them to come visit. Children can include the types of materials they used to build their own nest design. Help them label the parts.

Materials

- Pencils or markers
- White paper

Facilitating Questions

- *What do you want to tell Mr. and Mrs. Bird about the nest you designed and built?*



¿Qué quieres decirle al Sr. Y la Sra. Pájaro sobre el nido que diseñaste y construiste?

- What materials did you use for your nest design?
- Was your nest design safe when you tested it?
- Did you change anything about your nest after testing it?
- Can you draw and label your nest for Mr. and Mrs. Bird?

PK.ELAL.24. [PKSL.6] Expresses thoughts, feelings, and ideas (e.g., role-playing, music, drawing, art work, building, writing).

PK.ELAL.16. [PKW.4.] Creates a response to a text, author, or personal experience (e.g. dramatization, art work, or poem)

- ¿Qué materiales usaste para el diseño del nido?
- ¿El diseño de tu nido era seguro cuando lo probaste?
- ¿Cambiate algo de tu nido después de probarlo?
- ¿Puedes dibujar y etiquetar tu nido para el Sr. y la Sra. Bird?

Art

Have books and pictures of different kinds of birds, preferably laminated. Have the children draw, color, and label birds or anything else that has relates to birds or nests.

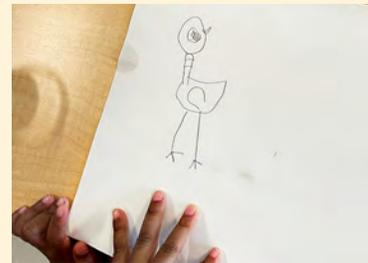
Materials

- Markers, crayons, or coloring pencils
- White paper
- Visual bird books and/or labeled photos of different kinds of birds

Facilitating Questions

- How are the birds similar?
- How are the birds different?
- What colors are the birds?
- What kind of bird do you think this is?
- Have you seen this type of bird before?
- What birds have you seen before?
- How do they look?
- What bird would you like to draw?
- Do you want to make up your own bird?

PK.CKW.2 Responds and reacts to visual arts created by themselves and others.



- ¿En qué se parecen los pájaros?
- ¿En qué se diferencian los pájaros?
- ¿De qué colores son los pájaros?
- ¿Qué tipo de pájaro crees que es este?
- ¿Habías visto este tipo de pájaro antes?
- ¿Qué pájaro has visto antes?
- ¿Cómo se ven?
- ¿Qué parajo te gustaría dibujar?
- ¿Quieres inventarte tu propio pájaro?

Block Play

Add pictures of trees and houses to the block area. Invite children to build their own tree, house, or structure with blocks. They can use their structure's height as a reference for the nest egg drop test.

Materials

- Blocks
- Pictures of labeled trees
- Pictures of houses and structures

Facilitating Questions

- *What are some parts of a tree?*
- *What blocks are you going to use for each part?*
- *How tall can you make your tree?*
- *Where should we put the nests for testing?*

PK.AC.2 Demonstrates that they are building background knowledge.

PK.AL.1 Actively engages in play as a means of exploration and learning.



¿Cuáles son algunas de las partes del árbol?

¿Qué bloques vas a usar para cada parte?

¿Qué tan alto puedes hacer tu árbol?

¿Dónde debemos poner los nidos para probarlos?

Sensory: Sand Table

Prep the sand table by burying items such as twigs, branches, leaves, acorns, yarn, or pom poms. Attach stick-on googly eyes to a few tweezers so children can pretend these are bird beaks. In a set of small resealable bags, place a googly eyed tweezer and a magnifying glass.

Hold up and model how to use the tweezer and allow children to practice using the tweezer. Invite children to conduct a scavenger hunt in the sand table by pretending the tweezers are a bird beak which they can use to find materials in the environment similar to Mr. and Mrs. Bird in the *Best Nest* storybook. Children can collect the items they find inside the resealable bag and observe them more closely with a magnifying glass.



Materials

- Tweezers with googly eyes
- Pom poms
- Yarn
- Natural materials: twigs, branches, leaves, acorns
- Small resealable bags to collect materials
- Magnifying glasses

Facilitating Questions

- *What material did you find and collect in the sand?*
- *What material was the easiest to grab with the tweezers?*
- *What material was the hardest to grab with the tweezers?*
- *What material would be good for making a nest? Why?*

PK.AL.1. Actively engages in play as a means of exploration and learning
PK.PDH.5. Demonstrates eye-hand coordination and fine motor skills

¿Qué materiales encontraste y recolectaste en la arena?
¿Qué material fue el más fácil de agarrar con el pico de la pinza?
¿Qué material fue el más difícil de agarrar con el pico de la pinza?
¿Qué material sería bueno para hacer un nido? ¿Por qué?

Outdoors/Playground

Go on a nature walk around the school or nearby park. Encourage children to look for items that birds may use to build their nests. Have them also observe where birds can possibly build their nests. Allow children to collect a few samples to bring back to class for their own nests (i.e. leaves, flowers, roots, bark and twigs.)

Facilitating Questions

- *How do you think a bird can pick up this item?*
- *What do you see around here that would be great for your nest design? Why?*
- *Do you think these materials will help make your nest strong and safe enough for an egg drop test?*

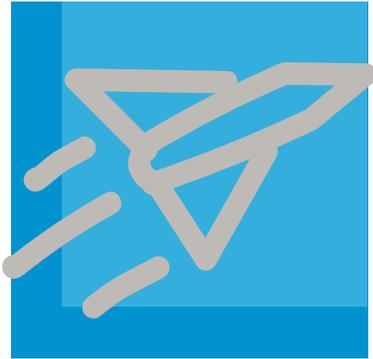
PK.SCI.5. [P-LS1-2.] Participates in investigations to determine how familiar plants and/or animals use their external parts to help them survive in the environment



¿Cómo crees que un pájaro puede recoger este objeto?
¿Qué ves por aquí que sería genial para el diseño de tu nido? ¿Por qué?
¿Crees que estos materiales ayudarán a que tu nido sea lo suficientemente fuerte y seguro para una prueba de caída?

Lesson 2

Mousetronaut Design Challenge



NYCDOE
Pre-K for All Unit of Study
Transportation, Unit 5
Enrichment Activity for
Foundational Lesson 2

Summary

After reading the storybook, *Roaring Rockets* by Tony Mitton and Ant Parker, children will learn that rockets are a form of air transportation into outer space. Children will design and build a stomp-powered rocket that will safely launch a mouse character from the story into target zones.

Learning Objectives

- Identify the three modes of transportation (land, water, air).
- Identify safety features for different modes of transportation.
- Learn that rockets are a form of air transportation into space.
- Identify the three main parts of a rocket.
- Build a stomp rocket model that:
 - > Includes three main rocket parts;
 - > Can safely and securely hold a passenger;
 - > Can successfully launch.

Key Vocabulary

Transportation / Transporte

Rocket / Cohete

Body / Cuerpo

Nose / Nariz

Fins / Aletas

Launch / Lanzar

Landing / Aterrizaje

Safe / Seguro

Force / Fuerza

Motion / Movimiento

Design / Diseño

Predict / Predecir

Test / Probar

Astronaut / Astronauta

Outer Space / Espacio Exterior

Planet / Planeta

Moon / Luna

Flag / Bandera



Materials

- Storybook: *Roaring Rockets* by Tony Mitton and Ant Parker
- Mouse, chick, hare plushies or puppets
- Stomp Rocket Original Ultra Launcher Kit
- Pipe insulation foam tubes ($\frac{1}{2}$ inch wide from homedepot.com)
- Tissue paper
- Variety of nose cones (Paper cone cups, Styrofoam cones, Aluminum foil sheets)
- Variety of mouse attachments (Condiment cups (2 – 4 oz.) with lids, Hole-puncher, Pipe-cleaners, Rubberbands, String)
- Variety of tape (Masking tape, Duck tape, Shiny mylar tape)
- Variety of fins (Construction paper, Foam sheets)
- For flag making (Index cards, Wood wheels and axle dowels, Markers, crayons, or coloring pencils)
- Small toy mice
- Scissors
- Space stickers
- Laminated space targets (planets, moon, etc.); Recommended: *The Planets: Photograph from the Archives of NASA* book by Nirmala Nataraj



Prep Before the Lesson

- Pre-cut the pipe insulation tubing into 6-inch pieces.
- Children can seal it with tape, stuff it with a piece of tissue paper, or place an airtight nose cone on top of one side of the tube during building later.
- Cut triangle shaped fins out of foam or construction paper. Try to include a variety of sizes. Alternatively, children can do this step when building their rockets, depending on their fine motor skills. We highly recommend children practice their scissor cutting skills beforehand (see *Pre-Engineering Activities*).
- Print and laminate space targets such as planets, the moon, etc. We recommend the NASA website image gallery or *The Planets: Photograph from the Archives of NASA* book by Nirmala Nataraj
- Setup the Stomp Rocket launch pad by placing it in an area that is clear from obstacles with open floor space. Tape it down securely and position the launch tube in the desired direction and angle. Tape down the laminated targets along the floor or wall. Test beforehand to ensure you have enough distance for launching. We recommend you make the testing area part of the math center so that children can talk about distance and compare frequency of landings.
- Pre-make a flag with index card, wheel and axle so that you can model how to plant it on a landing spot like in the story.
- Pre hole-punch a few holes into the condiment cups. Weave some pipe-cleaners and/or rubberbands through the holes to make a few examples of possible attachments for children.

Part 1. Literacy-based Introduction

A. Gather children for storytime. Before you read the story, ask children some questions to introduce the topic and elicit prior knowledge.

- *Has anyone heard of the word transportation?*
- *What do you think it means?*
- *How did you get to school today?*
- *What are other modes of transportation on land?*
- *What are some modes of transportation on water?*

*¿Alguien ha oído hablar de la palabra transporte?
 ¿Qué crees que significa?
 ¿Cómo llegaste a la escuela hoy?
 ¿Cuáles son otros modos de transporte en tierra?
 ¿Cuáles son otros algunos modos de transporte en el agua?*

- ¿Cuáles son algunos modos de transporte en el aire?
- ¿Qué tipo de cosas te mantienen a salvo en estos diferentes modos de transporte?
- ¿Qué modo de transporte va por el aire, pero más allá del cielo hacia el espacio exterior?



- ¿Cómo llamamos a los científicos que vuelan cohetes?
- ¿Qué animales están volando el cohete en la historia?
- ¿Qué llevan los astronautas dentro del cohete?
- ¿Qué ayuda al cohete volar al espacio exterior?
- ¿Por qué los astronautas usaban cinturones de seguridad?
- ¿Adónde iban los astronautas?
- ¿Qué dejaron los astronautas en la luna?
- ¿Dónde aterrizaron los astronautas cuando regresaron a la Tierra?
- ¿Quién los rescató?

- ¿Cuáles son las diferentes partes de un cohete?
- ¿Dónde aterrizó el cohete?
- ¿Cómo se movió el cohete?
- ¿Qué sucede si piso suavemente el lanzacohetes?
- ¿Qué pasa si piso fuerte el lanzacohetes?
- ¿Dónde plantaron los animales astronautas su bandera en la historia?

- What are some modes of transportation in the air?
- What kinds of things keep you safe on these different modes of transportation?
- What mode of transportation goes in the air, but beyond the sky into outer space?

B. Tell children that you will be reading a story about rockets! Introduce children to some friends from the story. Reveal a mouse, a chick, and a hare plush or puppet. Read *Roaring Rockets* by Tony Mitton and Ant Parker.

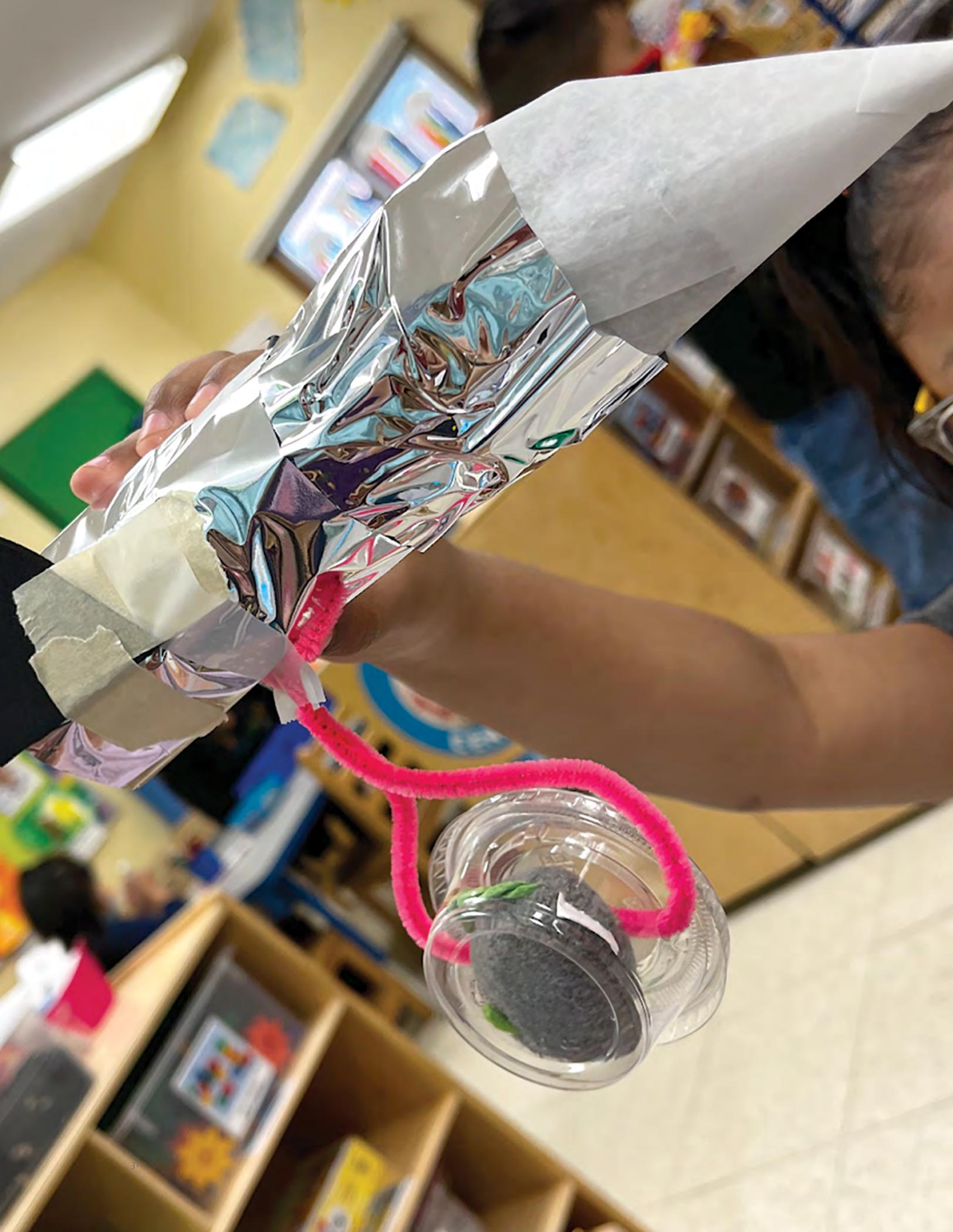
Book Summary: A crew of animal astronauts are preparing to launch their roaring rocket to the moon. Children will learn how rockets function and how astronauts prepare for a space mission.

C. Have a discussion with children about the story.

- What do we call scientists who fly rockets?
- What animals are flying the rocket in the story?
- What do the astronauts carry with them inside the rocket?
- What helps the rocket fly into outer space?
- Why did the astronauts wear seat belts?
- Where were the astronauts going?
- What did the astronauts leave on the moon?
- Where did the astronauts land when they came back to Earth?
- Who rescued them?

D. Show children a model rocket from the Stomp Rocket kit. Review and point to the three main parts of a rocket: The nose, the body, and the fins. Bring the model rocket to the launch pad and demonstrate how to launch it. Practice a count down together and stomp on the launcher for children to see. Place your pre-made flag onto the landing spot. Bring their attention to the laminated space targets in the classroom.

- What are the different parts of a rocket?
- Where did the rocket land?
- How did the rocket move?
- What happens if I stomp on the rocket launcher softly?
- What happens if I stomp on the rocket launcher real hard?
- Where did the animal astronauts plant their flag in the story?





¿Qué tipo de banderas has visto antes?
 ¿Dónde los has visto?
 ¿Cuál es la bandera de tu país?
 ¿Qué te gustaría poner en tu propia bandera espacial? ¿Por qué?
 ¿Qué bandera plantaron los personajes del cuento?

Part 2. Materials Exploration and Tinkering

A. Introduce children to a small sample of the available materials for the activity so they become familiar with the names of the items. Invite them to explore and play with the materials freely. Give them plenty of time to practice using scissors, tape, pipe-cleaners, rubberbands, and string.

B. Provide one toy mouse to each student so they can play with it and get a sense of its weight and size. Ask children to name their toy mousetronaut. Invite children to make an astronaut suit for their toy mouse out of any craft materials available.

C. The mousetronaut will need a flag to plant during its rocket landing! Invite children to design, draw, and color their own flags to plant on their rocket landing spots just like in the story. Distribute index cards, wood wheels, axle dowels, and coloring pencils, crayons, or markers. You may show examples of a variety of flags for children to see.

- What kind of flags have you seen before?
- Where have you seen them?
- What is your country's flag?
- What would you want to put on your own space flag? Why?
- What flag did the characters plant in the story?

Part 3. Engineering Design Thinking (Make, Test, Reiterate)

A. Review the *Roaring Rockets* story with the children then introduce the engineering challenge that relates to the story with the following prompt:

Los animales astronautas se están preparando para su próxima aventura. ¿Puedes diseñar un cohete que pueda lanzar con seguridad un ratón-astronauta al espacio exterior?

The animal astronauts are getting ready for their next adventure. Can you design a rocket that can safely launch a mousetronaut into outer space?

Ask children to brainstorm what astronauts can do to stay safe inside of a rocket when it launches. Refer to the book for some ideas. Apply these ideas to the design challenge and



- ¿Qué material(es) podrías usar para el cuerpo del cohete?
- ¿Qué material(es) podrías usar para la punta del cohete?
- ¿Qué material(es) podría usar para las aletas?
- ¿Qué materiales podrías usar para mantener seguro al mousetronaut en el cohete?
- ¿Quieres cubrir el cuerpo de tu cohete con algo?
- ¿Dónde se supone que pongas la nariz del cono para que el cohete quepa en el lanzador?
- ¿Cómo puedes conectar tus materiales entre sí?
- ¿Qué tamaño de aleta vas a usar?
¿Cuánto?
- ¿Quieres hacer tus propias aletas con una forma y tamaño diferente?
- ¿Cómo vas a sujetar el ratón-astronauta a tu cohete de forma segura?
- ¿Cómo se mantienen seguros los astronautas reales en un cohete?

review what it means for the mouse to launch “safely” when they test their rockets.

B. Hold up the model stomp rocket and ask children to point out and identify the three main parts of a rocket: the nose, the body, and the fins. After reviewing the parts, restate the design challenge prompt to remind them of the task and show them the toy mouse. They will need to design a rocket with the three main parts as well as make it safe enough to carry the mousetronaut.

C. Allow children to select their materials of choice and start building their rockets. Remind them that they need to attach their mousetronaut onto their rocket. Some children may need some help using the scissors and tape. Provide assistance where needed.

- *What material(s) could you use for the body of the rocket?*
- *What material(s) could you use for the nose of the rocket?*
- *What material(s) could you use for the fins?*
- *What materials could you use to keep the mousetronaut secure onto the rocket?*
- *Do you want to cover your rocket’s body with anything?*
- *Where should you put the nose cone so that the rocket can still fit onto the launcher?*
- *How can you connect your materials together?*
- *What size fin are you going to use? How many?*
- *Do you want to make your own fins with a different shape and size?*
- *How are you going to attach the mousetronaut to your rocket safely?*
- *How do real astronauts stay safe in a rocket?*

ROCKET BUILDING TIP: The 6-inch foam insulation tube works well as the main body of the rocket as long as the hole on one end is either sealed with tape, stuffed with a piece of tissue paper, or has an airtight nose cone on top. This will create the air pressure needed to launch the rocket when the stomp rocket launcher is inserted into the open end. If there are holes on the top of the rocket body tube, it will not launch.

D. Provide a variety of space stickers and markers for children to decorate their rockets.

¿Puede ayudarme a contar hacia atrás para despegar desde 5? A partir del 10?

¿Dónde aterrizó tu cohete?

¿Alguien más aterrizó allí también?

¿Puedes contar cuántos aterrizaron en cada planeta, luna u objetivo?

¿Qué le pasó a tu ratón-ronauta?

¿Estaba el ratón-ronauta a salvo y en el cohete?

¿Qué puedes hacer/añadir para que tu cohete llegue más lejos?

¿Qué puedes hacer/agregar para que tu ratón-ronauta sea más seguro?

E. Once children are ready to test their rocket, review how to stomp on the launcher. Assist children with putting their rockets onto the Stomp Rocket launcher. Invite children to help countdown to blast off together. Once each child launches their rocket, have them plant their flag at the landing spot.

- *Can you help me count down for lift off from 5? From 10?*
- *Where did your rocket land?*
- *Did anyone else land there as well?*
- *Can you count how many landed on each planet, moon, or target?*
- *What happened to your mousetronaut?*
- *Was the mousetronaut safe and on the rocket?*
- *What can you do/add to make your rocket go farther?*
- *What can you do/add to make your mousetronaut safer?*

F. If time permits, encourage children to make improvements and then test again. They can also draw, label, and describe their rocket on white paper at the writing center.

Extend the Learning

- Design a machine or vehicle that can be used for transportation once astronauts land on another planet or moon.
- Design a parachute for the mousetronaut to land safely back on Earth.



What's Happening?

Transportation is the act of moving someone or something from one place to another. There are different modes of transportation used to move over land, water, and air. This activity focuses on how rockets are used to move through the air into outer space. The three main parts of a rocket are the body, nose cone, and fins. The body tube is hollow and the air pressure released from the Stomp Rocket launcher is the force that will push the model rocket forward. A force is a push or a pull. Fins help provide stability during flight so that it maintains its direction. Children can experiment with the shape, size, and placement of the fins on their rockets to test which placement provides the best stability. The sealed end and a nose cone helps prevent air from escaping, improves aerodynamics by reducing the air resistance on the rocket so it can move more easily through the air.

In addition, children must determine how they will keep their mousetronaut safely on the rocket. Safety is very important in transportation vehicles. Some examples of safety features are seat belts, airbags, car seats, helmets, life jackets, flotation devices, and even parachutes. Many of these apply to astronauts, particularly their space suits including helmets to help them breathe in outer space. The rockets also have seat belts and handles to get around in space's microgravity.

In order for the rockets to move, they must be pushed by the compressed air within the Stomp Rocket launcher. When you stomp on the launcher box, air pushes through the tube and fills the body of the rocket until the rocket pops off and propels forward towards a target. The harder the children stomp on the launcher, the more force is transferred to their rocket to propel it forward.

LITERACY-BASED INTRODUCTION

PK.ELAL.2. [PKRF.2.] Demonstrates an emerging understanding of spoken words, syllables, and sounds (phonemes).

PK.ELAL.5. [PKR.1.] Participates in discussions about a text (e.g., during whole or small group interactive read-aloud discussions, during peer sharing, within play scenarios).

PK.ELAL.7. [PKR.3] Develops and answers questions about characters, major events, and pieces of information in a text.

PK.ELAL.11 [PKR.7.] Describes the relationship between illustrations and the text (e.g., what person, place, thing or idea in the text an illustration depicts).

MATERIALS EXPLORATION AND TINKERING

PK.AL.1 Actively engages in play as a means of exploration and learning.

PDH.1 Uses senses to assist and guide learning.

PK.AC.3 Demonstrates understanding of what is observed.

PK.AL.4. Exhibits curiosity, interest, and willingness to learn new things and have new experiences.

PK.PDH.5. Demonstrates eye-hand coordination and fine motor skills needed to manipulate objects.

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WSS: IV.A.3: Makes meaning from explorations, and generates ideas and solutions based on their own observations of the natural and human-made worlds.

TSG: 24: Uses scientific inquiry skills.

COR: CC: Experimenting, predicting and drawing conclusions.

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PK.AL.3. Approaches tasks and problems with creativity, imagination and/or willingness to try new experiences.

PK.SCI.12. [K-2-ETS1-3.] Analyzes data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

PK.AL.5. Demonstrates persistence.

PK.SCI.11. [K-2-ETS1-2]. Develops a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Lesson 2

Learning Center Connections

Sensory: Sand Table

Bury or place some space toys inside the sand table. Invite children to play with the space toys in the sand table in order to engage in space exploration just like in the story.

Materials

- Space toys and figures

Facilitating Questions

- *Can you show me the types of things that the astronauts from the story did during their space mission to the moon, using the toys?*
- *What kind of space exploration would you want to do?*
- *What are you discovering?*

PK.AL.1. Actively engages in play as a means of exploration and learning



- *¿Puedes mostrarme el tipo de cosas que hicieron los astronautas de la historia durante su misión espacial hacia la luna usando los juguetes?*
- *¿Qué tipo de exploración espacial te gustaría hacer?*
- *¿Qué estás descubriendo?*

Writing

Invite children to draw, label, and describe their rocket project on a white piece of paper in order to review the main parts of a rocket as well as their design thinking.

Materials

- White paper
- Pencils, colored pencils, crayons, or markers
- Children's rocket projects

Facilitating Questions

- *What are the three main parts of your rocket?*
- *How did/will you attach your mousetronaut?*
- *How did/will your your design keep your mousetronaut safe?*
- *What do you predict will happen when you test your rocket or what happened when you tested your rocket?*
- *Where do you predict your rocket will land or where did your rocket land?*

PK.ELAL.14 [PKW.2.] Uses a combination of drawing, dictating, oral expression, and/or emergent writing to name a familiar topic and supply information in child-centered, authentic, play-based learning



- *¿Cuáles son las tres partes principales de tu cohete?*
- *¿Cómo adjuntastes tu ratón-astronauta?*
- *¿Cómo su diseño mantuvo seguro a su ratón-tronauta?*
- *¿Qué predice que sucederá cuando pruebe su cohete o qué sucedió cuando probó su cohete?*
- *¿Dónde predice que aterrizará su cohete o dónde aterrizó su cohete?*

Math

We recommend you make the Stomp Rocket testing area part of the math center so that children can talk about distance and compare frequency of landings.

Print and laminate space targets such as planets, the moon, etc. Setup the Stomp Rocket launch pad by placing it in an area that is safe to launch. Securely tape it down and position the launch tube in the desired direction and angle. Tape down the laminated targets along the floor or wall. Test the setup beforehand.

Materials

- Stomp Rocket Launcher
- Laminated Space Targets
- Masking or Duct Tape
- Space Stickers

Facilitating Questions

- *Can you help me count down for lift off from 05? From 10? From 20?*
- *How far did your rocket go?*
- *Where did most of the class rocket designs land on?*
- *Where did the least number of rockets land? How do you know?*
- *Can you count how many landed on each planet or moon?*

PK.MATH.3. [NY-PK.CC.3.] Understands the relationship between numbers and quantities to 10, connects counting to cardinality



*¿Puedes ayudarme a contar hacia atrás para despegar desde 5?
¿A partir del 10? A partir del 20?
¿Cuán lejos llegó tu cohete?
¿Dónde aterrizaron la mayoría de los diseños de cohetes de clase?
¿Dónde cayó la menor cantidad de cohetes?
¿Cómo lo sabes?
¿Puedes contar cuántos aterrizaron en cada planeta o la luna?*

Dramatic Play

Invite children to dress up like an astronaut. Children can pretend they are one of the characters from the story to role-play, re-enact, or retell the storybook in order for them to engage in imaginative play as well as build comprehension, vocabulary, and story sequencing.

Materials

- Astronaut helmet and vest
- Toy rockets



Facilitating Questions

- Can you tell me about your space mission Mr. Mouse, Chick or Hare?
- Why do astronauts wear helmets?
- What else do they wear?
- How else are astronauts kept safe in outer space?

PK.AL.1. Actively engages in play as a means of exploration and learning
PK.CKW.5 Participates in a variety of dramatic play activities to represent fantasy and real life experiences.

- ¿Puedes hablarme de su misión espacial Sr. Mouse, Chick o Hare?
- ¿Por qué los astronautas usan cascos?
- ¿Qué más llevan?
- ¿De qué otra manera se mantienen seguros los astronautas en el espacio exterior?

Library

Put out more transportation books from the author series for children to conduct picture walks and read to each other in order to elicit background knowledge, build reading comprehension, vocabulary, and story sequencing.

Materials

- Transportation (*Amazing Machines*) book series by Tony Mitton and Ant Parker
- Rocket and transportation toys

Facilitating Questions

- What is this book about?
- What do you like most about it?
- What is happening in the pictures?
- What do you predict will happen next?
- What do these books have in common?
- Have you been in any of these amazing machines before?
- Which ones?

PK.ELAL.5. [PKR.1.] Participates in discussions about a text (e.g., during whole or small group interactive read-aloud discussions, during peer sharing, within play scenarios).

PK.ELAL.6. [PKR.2.] Retells stories or share information from a text

PK.ELAL.11 [PKR.7.] Describes the relationship between illustrations and the text (e.g., what person, place, thing or idea in the text an illustration depicts)

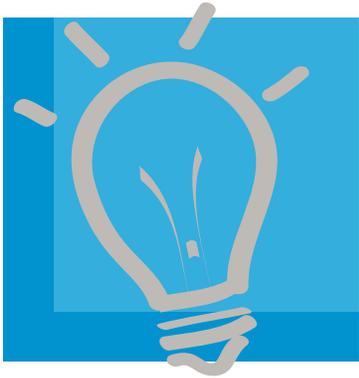
PK.ELAL.7. [PKR.3] Develops and answers questions about characters, major events, and pieces of information in a text.



- ¿De qué se trata este libro?
- ¿Qué es lo que te gusta sobre el mismo?
- ¿Qué está pasando en las imágenes?
- ¿Qué predices que sucederá después?
- ¿Qué tienen estos libros en común?
- ¿Has estado en alguna de estas increíbles máquinas antes?
- ¿Cuáles?

Lesson 3

Blackout Design Challenge



NYCDOE
Pre-K for All Unit of Study
Light, Unit 6
Enrichment Activity for
Foundational Lesson 1

Summary

After reading *Blackout* by John Rocco, children will explore different ways that light can be used to illuminate things, or be blocked to create shadows. Children will explore objects that are transparent, translucent, and opaque for shadow making. As a response to the book, children will design and build a shadow puppet that can tell a story.

Learning Objectives

- Identify what household items need electricity.
- Distinguish between battery powered and outlet powered electric objects.
- Understand that shadows take the shape of whatever causes them, but their size depends on the distance from the light source.
- Distinguish between transparency, translucency, and opacity in regards to an object's ability to block light.
- Build an object to cast a shadow in a desired shape, and use it to tell a story.

Key Vocabulary

Power (Electricity) / **Energía** (Electricidad)

Light / **Luz**

Shadow / **Sombra**

Filter / **Filtro**

Electric outlet / **Enchufe**

Transparent / **Transparente**

Translucent / **Translucido/a**

Opaque / **Opaco/a**

Rainbow / **Arcoíris**



Materials

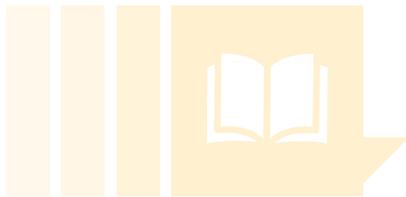
- Storybook: *Blackout* by John Rocco
- Light bulb plush
- Flashlights (single LED with focusing capabilities)
- Batteries for flashlights
- Battery powered LED tea lights
- White tablecloth/large blank wall
- A few transparent, translucent, and opaque objects
- Glue dots
- Household object worksheet
- Shadow hand puppet worksheet
- All About Light* by Lisa Trutkoff Trumbauer
- Tape
- Scissor
- Hole punchers
- Dark construction paper
- Craft foam sheets
- Various styles of night light examples
- Popsicle sticks
- Chalk
- Optional: Light box and picture frame matte holders (See appendix for DIY instructions)
- Optional: Small pop-up tent



Prep Before the Lesson

- We recommend you read *All About Light* by Lisa Trutkoff Trumbauer prior to this activity. This book is an introduction to light. It covers concepts such as light is energy, the sources of light, and effects of light.
- Procure flashlights that are single LED with focusing capabilities for best results. Incandescent and multiple LED flashlights result in blurrier shadows and will not be as crisp. Make sure the flashlights have batteries and work beforehand.
- Gather some recycled materials that are transparent (see through) such as clear plastic packaging, cellophane, or Zip Lock baggies. Gather some objects that are translucent (partially see through) such as colorful cellophane candy wrappers, tissue paper, or sheer fabric. Gather some objects that are opaque (not see through) such as cardboard paper tubes, boxes, or wood. Interesting shapes are a bonus!
- Pre-make a simple shadow puppet using a piece of black construction paper attached to a popsicle stick.
- Pre-cut colored cellophanes into triangles of various angles and sizes.
- All worksheets are included in the Appendix of this activity guide. Photocopy and laminate as needed. We recommend you cut out the household object worksheet images prior to the lesson to save time.
- Gather a few examples of night lights.
- We recommend you set up the pop-up tent to give the students a dark space to explore their night lights. Find an ample space for this structure to live in the classroom out of the way of foot traffic.
- Prepare a shadow play area in the classroom for testing. Use a white wall or tightly hang a white drop cloth on the wall. Be sure to lower the blinds and shut some of the lights during testing.
- When setting up the shadow play testing area, consider adding more items for experimentation. For example, you can use a clear acrylic stand with cutouts (*see Appendix*) for children to explore. Before class, use aluminum foil to carefully cut out shapes and securely place the foil in the standee. Consider taping the standee closed so the foil does not shift. This will give children another avenue of exploration

¿Te gusta la oscuridad o prefieres la luz? ¿Por qué?
 ¿Duermes con la luz prendida de noche?
 ¿Las luces, o algo más no funcionaba cuando intentaste encenderlas? ¿Por que crees eso?
 ¿Alguna vez has llegado a usar un interruptor de luz? ¿Que pasó?



as they can see the use of negative space to cast the opposite of shadows — light projected in a shape.

Part 1. Literacy-based Introduction

A. Before reading the story, ask children to share their experiences with light and their feelings about being in the dark. Do they sleep with a light on? A night light? Or even the hall light on and the door open a crack? Allow the students to talk about their relationship with darkness when they try and sleep. Each student may have a different ritual!

If they have night lights, ask them to talk about what theirs looks like, or ahead of time, ask them to bring pictures of their night light, or even bring it in. There are many kinds of night lights, with lots of different designs. Show them a few kinds of night lights to the class to demonstrate how different ones operate. If you have set up a pop-up tent, invite children to explore the night lights during center or free choice time.

- *Do you like the darkness or do you prefer the light? Why?*
- *Do you sleep with a night light?*
- *Have the lights, or something else not worked when you tried turning them on? Why do you think?*
- *Have you ever gotten to use a lightswitch before? What happened?*

B. Tell children that you will be reading a book about a true story that happened in New York when all the lights in the city went out! Read *Blackout* by John Rocco.

Book Summary: The story features a NYC family during an electric power outage. In the blackout, the lack of tech devices and distractions leads to a renewal of family connections. With the help of candles and flashlights, the family bonds and even the neighborhood has a block party.

C. During the story, on each page, have children identify light sources, shadows, and what is casting the shadow. Demonstrate a simple shadow hand puppet, and ask the students what they think shadows are. See Appendix for inspiration. You can stop and explore the light and shadow more thoroughly on a second or third readthrough by catching more details each time.



¿Dónde está la fuente de luz en esta página?
¿Dónde están las sombras?
¿Qué tipo de sombras ves?
¿Qué está haciendo la sombra?
¿Las sombras tienen siempre la misma forma y tamaño que el objeto que las hace?
¿Por qué piensas eso?

¿Puedes “encender” este artículo?
¿Este artículo necesita electricidad para funcionar?

¿Cuáles de estos elementos funcionan si no hay energía de un tomacorriente?



- *Where is the light source on this page?*
- *Where are the shadows?*
- *What kind of shadows do you see?*
- *What is making the shadow?*
- *Are the shadows always the same shape and size as the object making them?*
- *Why do you think so?*

D. After the story, introduce an activity to sort household objects that require electricity to work. Show children the worksheet of pictures of various household objects (see Appendix). Invite children to sort the objects into things that are electric and things that are not electric.

- *Can you turn this item “on”?*
- *Does this item need electricity to work?*

E. After sorting electrical things, sort them further by things that are battery powered, plug in, a stationary appliance, or operated by a light switch. Have them recall those objects in the story whether or not they worked during the blackout.

- *Which of these items work if there was no power at all from an electric outlet?*

Part 2. Materials Exploration and Tinkering

A. Review flashlight safety with the students, and once they understand the expected behaviors, allow them to explore how the flashlights cast shadows and illuminate things in the shadow play testing area. Consider dimming the lights in the room during this exploration.

B. Introduce children to transparent, translucent, and opaque by encouraging them to experiment with a variety of objects using their flashlights in the shadow play area. Challenge children to sort items into groups: Transparent, translucent and opaque. Give children flashlights to test these qualities with. Have them shine the light on an object to see if the light goes through.

C. Encourage the children to observe the translucent, transparent, and opaque objects with a light table at a Sensory



*¿Las sombras del sol son claras o borrosas?
¿Puedes hacer que tu sombra solar sea más grande?*

Learning Center (See Appendix for how to build your own light box). Invite the children to also explore translucent color gels with a light box and observe what happens when you layer them together.

D. Have children predict what happens when you punch holes into paper that they shine a flashlight to. Review how to use some shaped hole punchers and invite the children to punch their own holes on construction paper then explore at the shadow play area. See the Pre-Engineering section for more practice with hole-punching skills.

E. If possible, take the class outside during a sunny day to explore their own shadows. Have them figure out how to position themselves to cast their own shadow and block the sunlight. Bring chalk and invite students to trace their shadow in the sunlight.

- *Are the shadows from the sun sharp or blurry?*
- *Can you make your sun shadow bigger?*

Add objects like the stands with cutouts out for the students to explore with. As they shine the light through holes, they will see the shadows, or projections as they explore. The flashlights also have different settings that can affect how the shadows look. You get nice crisp shadows on the dim and round setting, but blurry shadows on the bright and focused setting.

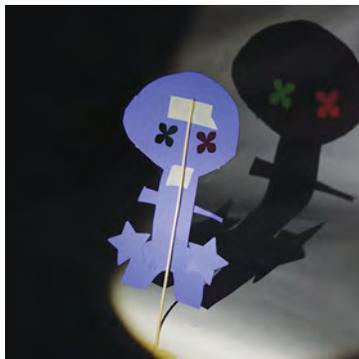
Part 3. Engineering Design Thinking (Make, Test, Reiterate)

A. Introduce the engineering challenge that relates to the story with the following prompt:

Durante la historia de Blackout, los niños vieron a sus padres haciendo sombras. Ellos también quieren hacer algunos, pero les resulta difícil crear las formas con las manos. ¿Puedes ayudar a hacer títeres de sombras divertidos con otros materiales?

During the Blackout story, the children saw their parents making shadows. They want to make some too but find it hard to create the shapes with their hands. Can you help make a fun shadow puppet out of other materials instead?

*¿Qué colores viste en el programa?
¿Pueden nuestros títeres de
sombra proyectar colores?
¿Qué formas viste?*



*¿Proyecta una sombra en la forma
de tu personaje?
¿Puedes hacer que se mueva?
¿Puedes hacer la sombra más
grande?*

Revisit the story and encourage students to help you point out all of the shadows in the story.

B. Review with the children the concepts of transparent, translucent, and opaque materials. Show examples of each, and see if they can recall a few on their own, like glass, plastic, or cardboard. As a class, watch an example shadow puppet show.

- *What colors did you see in the show?*
- *Can our shadow puppets cast colors?*
- *What shapes did you see?*

C. Ask children what kind of shadow puppets they want to make. Making a character to tell a story with is a good starting point. Provide scissors and scrap paper for them to practice their cutting skills, then distribute dark construction paper when they are ready to design and create their actual shadow puppet. If they need templates or examples of shadow puppets, see the Appendix.

D. To make their puppet more dynamic, encourage the students to add more to their puppet. For example, they can make hole punches to add shapes, eyes, and designs to their puppet. They can also incorporate translucent pieces, or colored cellophane into their designs if they want color. They can add articulation and motion to their puppet using pipe cleaners or brads/brass fasteners as joints in the holes when overlapping two pieces of their puppet paper parts. See the Math Learning Center section for more ideas on making moving shadow puppets.

E. Have the children attach a popsicle stick to their puppets using tape or gluedots, in order to hold up their puppet. Once your puppet is assembled, invite children to the shadow play area to test their shadow puppet designs. Have them experiment with where to hold the shadow puppet in relation to the flashlight (closer and farther).

- *Does it cast a shadow in the shape of your character?*
- *Can you make it move?*
- *Can you make the shadow bigger?*

F. Encourage students to tell a story with their shadow puppet.

Extend the Learning

Invite children to continue to explore light and color.

1. Have an electrician come into the class to talk about how we keep the lights on in our home.
2. Design and build other shadow puppets to create props for their story or recreate the storyline from the *Blackout* book.
3. Can animals light up? Read *The Very Lonely Firefly* by Eric Carle.
4. Explore light further by using flashlights or color LED circuits and long exposure photography to try and draw shapes or letters in the air then project a photo of the image.



What's Happening?

In this activity, children explore light and shadows. When light is emitted from a light source, it travels in a straight line until it hits something. We see things because the light from the light source bounces off something, into our eyes. If the light is blocked along the way to a surface, then it will create a shadow.

A shadow is created when an object blocks the light from passing through it. Opaque objects reflect, or absorb all light resulting in a shadow. Translucent objects will let some of the light through, but not all (things like tissue or wax paper). Usually you cannot see things clearly through a translucent object. A transparent object lets light easily pass through it, like glass or clear plastic. In some cases, like the colored cellophane, it only lets light through if it is a specific color.

Colored shadows are possible with filters, which only let light of certain colors pass through. White light contains every color (and is how we get rainbows from white light) and filters will take away every color of light except for the color of the filter. We can make other colors by combining various different colors of light!

When we block the light with something to cast a shadow, the size of the shadow is determined by how close to the light source it is. The closer to the light source, the bigger the shadow. Because of this, we can make dramatic changes in size to the shadow by changing the position of both the light and the puppet.

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PK.AL.5. Demonstrates persistence.

Lesson 3

Learning Center Connections

Dramatic Play

Incorporate costumes with light up elements such as headlights for children to experience and role play working in dark places.

Materials

- Various Occupational Costumes
- Flashlights
- Miners Helmet, Headlamp, or other costumes that have an element of light e.g. Optician, Doctors, Electricians

Facilitating Questions

- *Who wears these kinds of uniforms?*
- *How can they see?*
- *Do you know anyone with these types of jobs?*
- *In Blackout there are a few people working at night. How can they see?*

PK.CKW.5 Participates in a variety of dramatic play activities to represent fantasy and real life experiences.

PK.AL.1 Actively engages in play as a means of exploration and learning

PK.AC.2. Demonstrates they are building background knowledge



¿Quiénes usan este tipo de uniformes?

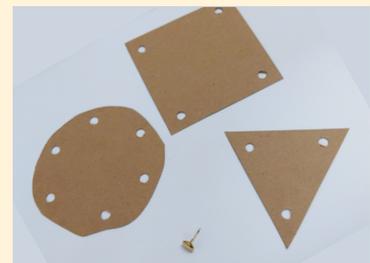
¿Cómo pueden ver?

¿Conoces a alguien con este tipo de trabajo?

En la historia Blackout hay algunas personas trabajando de noche. ¿Cómo puedes hacer sombras pequeñas?

Math

Pre-cut shapes such as circles, triangles, and squares out of chipboard or cardstock and hole punch 3 – 4 corners or sides. Provide pre-cut chipboard shapes and brads/brass fasteners and invite children to create their own articulated shape shadow puppets. Focus on the action of “spreading the wings” of the brads for them to get material literacy, and fine motor skill practice. Review the shapes with children. Model how to attach pieces by overlapping holes, placing brads through them, and spreading the wings. Provide a puppet example if necessary. Invite children to test their shadow puppets at the shadow wall. Allow children to experiment with changing the size of shadows by moving the puppets closer or farther in



front of the light source. Try also having children move the light source while the puppet is stationary.

Materials

- Chipboard or cardstock
- Scissors
- Holepuncher
- Brads/Brass fastener
- Flashlights
- Stickers
- Markers
- Popsicle sticks
- Glue Dots
- Laminated Shadow Hand Puppet Worksheet
- Premade shadow puppet example

Facilitating Questions

- *What shapes do you see?*
- *How many sides does the shape have?*
- *How can you make your shadow puppet move?*
- *What happens when you move your light closer or farther away from your puppet in the shadow play area*
- *In the story Blackout, the shadows appear in different sizes. How can you make large shadows? Small shadows?*

PK.MATH.15. [NY-PK.G.4.] Creates and builds shapes from components (e.g., sticks, blocks, clay)

PK.MATH.13. [NY-PK.G.2.] Names shapes regardless of size

PK.MATH.10. [NY-PK.MD.1.] Identifies measurable attributes of objects, such as length or weight, and describes them using appropriate vocabulary



*¿Qué formas/figuras ves?
¿Cuántos lados tiene la figura?
¿Cómo puedes hacer que tu marioneta de sombras se mueva?
¿Qué sucede cuando mueves la luz más cerca o más lejos de tu marioneta en el área de juego de sombras?*

En la historia Blackout, las sombras aparecen en diferentes tamaños. ¿Cómo puedes hacer sombras grandes? ¿Pequeñas sombras?

Art

Provide rainbow making materials, such as prisms, CD-ROMs, and diffraction gratings with flashlights. Hold up each item and introduce them to the children so they become familiar with the names.



Diffraction Gratings are pieces of plastic that have very fine etchings or scratches on their surface that help bend or refract light to create rainbows. Note: Depending on the light source, a full rainbow may not appear as some lights only have a partial spectrum. Never look directly at the sun with diffraction gratings.

Invite children to explore light using the rainbow making materials provided. Have children recognize the similarity of rainbows regardless of source, and ask them to recreate the rainbows using coloring supplies.

Materials

- Colored Cellophane, light gels, or color filters
- Diffraction gratings, prisms, and CD ROMs, or other rainbow making materials
- Flashlights
- Colored paper
- Markers, crayons, or colored pencils.

Facilitating Questions

- *What happens when you shine the flashlight on the object?*
- *What do you see?*
- *What colors will you need to draw a rainbow?*
- *What is the order of the colors of the rainbow?*

PK.ARTS.16. [VA:Cr1-3.PK] *Creates Visual Arts*

PK.ARTS.18. [VA:Re7-9.PK] *Responds to Visual Arts*

¿Qué pasa cuando apuntas la linterna sobre el objeto?

¿Qué ves?

¿Qué colores necesitarás para dibujar un arcoíris?

¿Cuál es el orden de los colores del arcoíris?

Library

Feature Blackout alongside *All About Light* by Lisa Trumbauer.

Materials

- *Blackout* storybook
- Lightbulb plushie
- *All About Light* book



Facilitating Questions

- *What is this book about?*
- *What do you like most about it?*
- *What is happening in the pictures?*
- *What do you predict will happen next?*
- *What do these books have in common?*

PK.ELAL.5. [PKR.1.] *Participates in discussions about a text (e.g., during whole or small group interactive read-aloud discussions, during peer sharing, within play scenarios).*

PK.ELAL.6. [PKR.2.] *Retells stories or share information from a text*

PK.ELAL.11 [PKR.7.] *Describes the relationship between illustrations and the text (e.g., what person, place, thing or idea in the text an illustration depicts)*

PK.ELAL.7. [PKR.3] *Develops and answers questions about characters, major events, and pieces of information in a text.*

- *¿De qué se trata este libro?*
- *¿Qué es lo que más te gusta?*
- *¿Qué está pasando en las imágenes?*
- *¿Qué predices que sucederá después?*
- *¿Qué tienen estos libros en común?*

Writing

Invite children to write or draw a plan for what they would do if the electricity goes out in NYC!

Materials

- Paper
- Pencils

Facilitating Questions

- *What would be the first thing you would do after the power goes out?*
- *Where would you find your emergency flashlight?*
- *What things would you do to pass the time without power?*

PK.ELAL.14 [PKW.2.] *Uses a combination of drawing, dictating, oral expression, and/or emergent writing to name a familiar topic and supply information in child-centered, authentic, play-based learning*

PK.ELAL.16. [PKW.4.] *Creates a response to a text, author, or personal experience (e.g. dramatization, art work, or poem)*



- *¿Qué sería lo primero que harías después que se vaya la luz?*
- *¿Dónde encuentras tu linterna de emergencia?*
- *¿Qué cosas harías para pasar el tiempo sin luz?*

Blocks

Add LED Tea lights to the block center. Invite children to create a city like in *Blackout* and use the tea lights into their block creations.

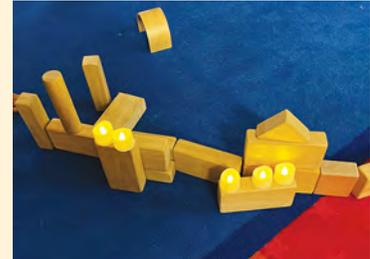
Materials

- Blocks
- LED tealight candles

Facilitating Questions

- *Can you design a city, village, castle, etc. out of the blocks?*
- *Can you think of ways to light up your block structures?*
- *Where did you put the tea lights? Why?*

PK.PDH.5. Demonstrates eye-hand coordination and fine motor skills
PK.MATH.15. [NY-PK.G.4.] Creates and builds shapes from components (e.g., sticks, blocks, clay)



¿Creés que puedes diseñar una ciudad, un pueblo, un castillo, etc. fuera de los bloques?
¿Se te ocurren maneras de como poder iluminar tus estructuras de bloques?
¿Dónde pusiste las velas de té?
¿Por qué?

Outdoors/Playground

Use the sun to cast shadows. Bring a variety of objects outside, and hold them up. Have children trace shadows using chalk. The best options of objects to bring are ones with interesting or unique profiles. Challenge children with objects with misleading shadows, such as a cardboard shape on its edge, where the shadow would only be a line.

Test what happens if you raise or lower an object from the ground. Have children observe what happens to the shadow as it gets closer to the Sun. Attach objects to a pole to get even more height, to help preserve the object's distinct shadow, and to reduce strain from holding objects up high.

Materials

- A pole to hold things high in the air
- Chalk
- Assortment of shapes and objects



Facilitating Questions

- Do the outlines look like our object?
- Do these shadows get bigger or smaller when we move?

PK.SCI.9. [P-PS3-1.] Participates in an investigation to determine the effect of sunlight on Earth's surface.

¿Se parecen los contornos a nuestro objeto?
¿Estas sombras se hacen más grandes o más pequeñas cuando nos movemos?

Sensory Center

Pre-build the Do-It-Yourself Light Box (see Appendix) for the Sensory Center. There are also instructions for how to prepare the hand held colored gels for light box experimentation.

Invite the children to explore light and color with the DIY light box. They can use color gels as well as a variety of translucent, transparent, and opaque objects. They can also control the light box colors with the remote control to see how it affects the gel colors.

Materials

- DIY light box (see Appendix)
- Colored cellophane, or light gels
- Picture frame matte holders
- A few transparent, translucent, and opaque objects

Facilitating Questions

- What objects did you experiment with?
- What did you notice?
- What happened when you mixed colors?

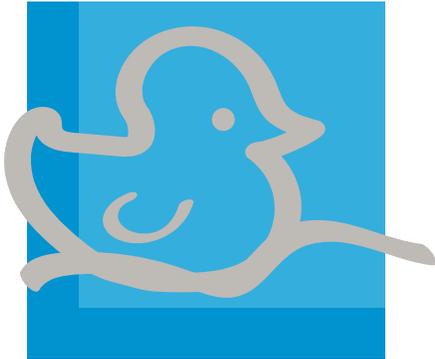
PK.AL.1. Actively engages in play as a means of exploration and learning



¿Con qué objetos experimentaste?
¿Qué notaste?
¿Qué pasa cuando mezclas colores?

Lesson 4

Bath Toy Design Challenge



NYCDOE
*PreK for All Unit of Study:
Water, Unit 7
Enrichment Activity for
Foundational Lesson 3*

Summary

After reading the storybook *Pigeon Needs A Bath* by Mo Willems, children will explore the properties of water with various materials. They will design and build a bath toy that will either float, sink, or remain partially submerged underwater. After making predictions, children will test and make observations about their bath toy to determine if they have met their selected criteria.

Learning Objectives

- Observe and describe some properties of water.
- Predict, sort, and test objects to determine whether they sink or float.
- Design and build a bath toy that has specific properties of their choice (sinks, floats, or remain partially submerged underwater).
- Make observations about their bath toys, and describe their components and properties.

Key Vocabulary

Water / Agua

Force / Fuerza

Gravity / Gravedad

Buoyancy / Flotabilidad

Sink / Hundir

Float / Flotar

Wet / Mojado

Absorb / Absorber

Pigeon / Paloma

Toy boat / Bote de juguete

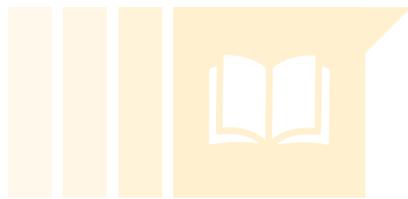


Materials

- Storybook: *Pigeon Needs A Bath* by Mo Willems
- Pigeon plush
- Mama Pigeon letter (see Appendix)
- Rubber duckie or float toy
- Submarine or sink toy
- Bin/tub of water for testing
- Quart soup containers for testing
- Aluminum foil
- Shells
- Cups
- Small bottles or jugs with lids
- Pipecleaners
- Popsicle sticks
- Pebbles or small rocks
- Waterproof/resistant adhesive dots
- Velcro dots
- Plastic spoons
- Straws
- Colorful duct tape
- Clothespins
- Foam shapes
- Beads with eyes
- Pipettes
- Sponges
- Paper towel
- Bath toy examples (Include both toys that sink and toys that float)

Note: You can substitute, add, or subtract materials as you see fit and available.

¿Alguien se bañó esta mañana?
¿Cuándo fue la última vez que te
bañaste?
¿Por qué necesitamos bañarnos?



¿Qué pasó cuando Pigeon
finalmente se metió en la tina?
¿Tienes algún juguete de baño con
el que te guste jugar?
¿Qué hace que un juguete de baño
sea divertido?

¿Qué significa cuando algo “flota”?
¿Qué significa cuando algo se
“hunde”?
¿Te gustaría diseñar un juguete
flotante? ¿Por qué?
¿Te gustaría diseñar un juguete que
se hunda? ¿Por qué?

Prep Before the Lesson

- Instructor should create a few examples of bath toy designs.
- Pre-fill tubs and quart soup containers with water for testing.
- Pre-cut sponges into smaller pieces.
- Print out Mama Pigeon’s letter and place it in an envelope labeled for the class (see Appendix).

Part 1. Literacy-based Introduction

A. Gather children for storytime. Before you read the story, ask children:

- *Did anyone take a bath this morning?*
- *When was the last time you took a bath?*
- *Why do we need to take baths?*

B. Tell children that you will be reading a story about a pigeon who thinks he does not need a bath.

Book Summary: Pigeon is dirty and needs a bath, but absolutely refuses to! He has all kinds of excuses — the water is too hot, too cold, too wet, too high, too low, he has too many toys and not enough toys — but finally the Pigeon gets in the bath. In a twist of events, he has so much fun getting clean that he doesn’t want to get back out!

C. While you read the story, use the Pigeon plush to bring it to life with movements and voices from the character. Have a discussion with children to review what happened in the story.

- *What happened when Pigeon finally got into the tub?*
- *Do you have any bath toys you like to play with?*
- *What makes a bath toy fun?*

D. Bring out a tub of water, and demonstrate a bath toy that floats and one that sinks.

- *What does it mean when something “floats”?*
- *What does it mean when something “sinks”?*
- *Would you like to design a floating toy? Why?*
- *Would you like to design a sinking toy? Why?*

Explain to the children that a force is a push or pull. The force of gravity pushes objects down to the bottom of the

container, making them sink. The force of the water pushes the object up to the surface of the water, making them float. This is called buoyancy. Have the children repeat the vocabulary word.

Part 2. Materials Exploration and Tinkering

A. Introduce children to the materials for the activity so they become familiar with the names of the items. Invite them to freely explore the materials and think about their properties. Have them sort the materials in different ways (heavy, light, has air inside, can hold water, good for attaching and connecting, etc.) and predict whether or not they will float or sink. Distribute quart soup containers with water for children to test their predictions.

*¿Cómo se siente el material?
¿Cómo describirías el material?
¿Crees que flotará o se hundirá?
¿Cómo se puede transferir/mover
agua entre dos materiales?*

- *What does the material feel like?*
- *How would you describe the material?*
- *Do you predict it will float or sink?*
- *How can you transfer/move water between two materials?*

B. Invite the children to practice their fine motor skills with materials that can help connect objects such as tape, pipe-cleaners, and clothespins. Revisit the Pre-engineering Activity section and encourage the children to practice ripping tape and twisting pipecleaners. They can also explore the properties of water and practice filling up objects with water by using pipettes/droppers to transfer drops onto wax paper (see Pre-engineering Activity section). Turn their attention to the air inside the pipette/dropper as well as how much water is coming inside and outside of it when they gently squeeze and release.

C. Setup a sensory/water table center and math center with the suggested materials and prompts in the Learning Center Connections section for children to explore properties of water and materials.



Part 3. Engineering Design Thinking (Make, Test, Reiterate)

A. After reading the book, have someone come forward holding Mama Pigeon's letter, and read it to the children. Note: Both English and Spanish letter versions are in the Appendix.

• *Dear Friends,*

Mama Pigeon here. I really need your help. You see, my little baby Pigeon is... well, filthy... and smelly. Clearly, it is time for him to take his bath!

Pigeon just does not want to take a bath. I think the right water toys might change his mind. Perhaps something super fun... Can all of you future engineers help me? Can we convince Pigeon to take a bath by designing a fun bath toy for him to play with in the water?

*Looking forward to your ideas,
Mama Pigeon*

Restate the engineering challenge that relates to the story with the following prompt:

¿Puedes diseñar un juguete divertido de baño que haga que Pigeon se emocione al bañarse?

Can you design a fun bath toy that gets Pigeon excited to take a bath?

¿Qué idea de juguete de baño tienes?

¿Qué materiales quieres usar?

¿Se puede elegir más de un material?

¿Cómo los juntarás?

¿Puedes pegar algunos elementos juntos?

¿Qué tipo de juguete estás haciendo?

¿Tu juguete se hundirá o flotará?

B. After children have had time to explore the materials and water properties, start encouraging them to work on their bath toy design. Hand out pieces of duct tape and clothespins to help them connect pieces together.

- *What bath toy idea do you have?*
- *What material(s) do you want to use?*
- *Can you pick more than one material?*
- *How will you put them together?*
- *Can you tape a few items together?*
- *What kind of toy are you making?*
- *Will your toy sink, or float?*

C. If children need additional prompting, instructors can start attaching materials together alongside them as a way to model building.





¿Qué hiciste?
 ¿Se hundió?
 ¿Flota?
 ¿Qué querías que hiciera?
 ¿Crees que convencerá a Pigeon
 para que se bañe?
 ¿Qué cambios puedes hacer para
 que sea aún mejor?



D. As children begin to build, the instructor can help children with the scissors or cutting pieces of tape. Instructors can also call attention to what each child is doing to help encourage collaborative thinking.

E. As children work, encourage them to test their toys in the bigger tub of water.

- *What did you make?*
- *Does it sink?*
- *Does it float?*
- *What did you want it to do?*
- *Do you think it will convince Pigeon to take a bath?*
- *What changes can you make for it to be even better?*

F. Instructors should frequently check-in with children about their bath toy goal so that they can support children in their reiteration.

G. Once children are done creating their bath toys, place the toys on a table with paper towels or rack to dry.

Extend the Learning

Announce a Bath Toy Olympics and allow the children to modify or create a bath toy for a variety of tests:

- How long or short amounts of time it can stay floating or sinking with a timer.
- How fast or far it can float from one end of a long bin to another using a fan.
- How many coins or marbles the bath toy can hold before sinking.
- Who can design a bath toy that “flinks” (stays under the water but does not sink completely).
- Have children rewrite, draw, or retell the end of the story to show how their bath toy helped motivate Pigeon to take a bath.
- Have children write, tell, or draw a new story describing the adventures of their new bath toy with new characters.
- Have children share and present a step-by-step description to their classmates of how they came up with their toy idea, designed it, tested it, and modified it.

What's Happening?

One of the many properties of any object is buoyancy, or the ability of an object to sink or to float. Combining objects that sink and float together to create something like the bath toy in this activity will have an effect on the buoyancy of the whole object. Buoyancy is the upward force on an object that is produced by the liquid or gas surrounding that object, like water. When the downward force of gravity is stronger than the upward force of the water, an object in that water will sink. When the upward force of water is stronger than the downward force of gravity, an object in that water will float.

LITERACY-BASED INTRODUCTION

PK.ELAL.2. [PKRF.2.] Demonstrates an emerging understanding of spoken words, syllables, and sounds (phonemes).

PK.ELAL.5. [PKR.1.] Participates in discussions about a text (e.g., during whole or small group interactive read-aloud discussions, during peer sharing, within play scenarios).

PK.ELAL.7. [PKR.3] Develops and answers questions about characters, major events, and pieces of information in a text.

PK.ELAL.11 [PKR.7.] Describes the relationship between illustrations and the text (e.g., what person, place, thing or idea in the text an illustration depicts).

MATERIALS EXPLORATION AND TINKERING

PK.AL.1 Actively engages in play as a means of exploration and learning.

PDH.1 Uses senses to assist and guide learning.

PK.AC.3 Demonstrates understanding of what is observed.

PK.AL.4. Exhibits curiosity, interest, and willingness to learn new things and have new experiences.

PK.PDH.5. Demonstrates eye-hand coordination and fine motor skills needed to manipulate objects.

ENGINEERING DESIGN THINKING (MAKE, TEST, REITERATE)

WSS: IVA.3: Makes meaning from explorations, and generates ideas and solutions based on their own observations of the natural and human-made worlds.

TSG: 24: Uses scientific inquiry skills.

COR: CC: Experimenting, predicting and drawing conclusions.

PK.SCI.10 [K-2-ETS1-1]. Asks questions, makes observations and gathers information about a simple situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

PK.SCI.11. [K-2-ETS1-2]. Develops a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

PK.AL.3. Approaches tasks and problems with creativity, imagination and/or willingness to try new experiences.

PK.SCI.12. [K-2-ETS1-3.] Analyzes data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

PK.AL.5. Demonstrates persistence.

Lesson 4

Learning Center Connections

Dramatic Play

Prepare a bathtub container with a baby doll or rubber duckies and sponges. Invite children to pretend to give dolls a bath and role-play what happened in the story. This activity develops fine motor and self-help skills, as well as a child's sense of grooming and hygiene.

Materials

- Baby Doll or Rubber Duckies
- Bathtub container
- Sponges

Facilitating Questions

- *What were some of the things that Pigeon was saying in the story about taking a bath?*
- *How did Pigeon act in the story?*
- *How would you give the baby doll or rubber duckie a bath with the sponge?*

PK.CKW.5 Participates in a variety of dramatic play activities to represent fantasy and real life experiences.



- *¿Cuáles fueron algunas de las cosas que dijo Pigeon en la historia sobre tomar un baño?*
- *¿Cómo actuó Pigeon en la historia?*
- *¿Cómo le darías un baño a la muñeca o al patito de goma con la esponja?*

Sensory Center (Water Table)

Add a variety of water play objects to the water table center. You can add items such as sponges, pipettes, funnels, measuring cups, syringes, test tubes, water bottles, etc. You can also add floating and sinking toys as well as the waterproof *Pigeon Needs A Bath* book. Invite children to practice fine motor skills as well as explore water properties by engaging in water play.

Materials

- Water Table
- Waterproof Pigeon book
- Pigeon Rubber Duckie
- Water play items such as pipettes, measuring cups, syringes,



- funnels, test tubes, water bottles, sponges
- Float/Sinking Toys

Facilitating Questions

- *How did you use the object with the water?*
- *How can you transfer/move water from one object into another?*
- *How can you fill up and empty the object with water?*
- *Which objects float and sink?*
- *What object(s) did you use for water play?*
- *Which was your favorite object and why?*
- *What did you learn about the object or water?*

PK.AL.1. Actively engages in play as a means of exploration and learning

- *¿Cómo usaste el objeto con el agua?*
- *¿Cómo puedes transferir/mover agua de un objeto a otro?*
- *¿Cómo puedes llenar y vaciar el objeto con agua?*
- *¿Qué objeto o objetos flotan y que objeto se hunden?*
- *¿Qué objeto o objetos usaste para jugar con agua?*
- *¿Cuál fue tu objeto favorito y por qué?*
- *¿Qué aprendiste sobre el objeto o el agua?*

Writing

Invite children to write or draw a response letter to Mama Pigeon talking about their bath toy designs. They can draw and label their bath toy. They can also talk about or draw whether it floats or sinks as well as why it will motivate Pigeon to take a bath.

Materials

- White Paper
- Markers, Colored Pencils, Crayons, Pencils

Facilitating Questions

- *What did Mama Pigeon ask us to help with?*
- *What would you tell Mama Pigeon in response to her letter?*
- *Can you describe or draw the bath toy that you made for Pigeon?*
- *Can you describe or draw if it floats or sinks?*
- *Can you tell Mama Pigeon why do you think your bath toy will motivate Pigeon to take a bath?*

PK.ELAL.24. [PKSL.6] Expresses thoughts, feelings, and ideas (e.g., role-playing, music, drawing, art work, building, writing).

PK.ELAL.16. [PKW.4.] Creates a response to a text, author, or personal experience (e.g. dramatization, art work, or poem)



- *¿Con qué nos pidió mamá Pigeon que la ayudáramos?*
- *¿Qué le dirías a mamá Pigeon de respuesta a su carta?*
- *¿Puedes describir o dibujar el juguete de baño que hiciste para Pigeon?*
- *¿Puedes describir o dibujar si flota o se hunde?*
- *¿Puedes decirle a mamá Pigeon por qué crees que tu juguete de baño motivará a Pigeon a bañarse?*

Block Area

Place a Pigeon plush and sponges in the block area. Encourage children to build a bathtub or shower using blocks. Children can use the sponges to give Pigeon a bath and re-create the story narrative or make their own ending.

Materials

- Blocks
- Pigeon Plush
- Sponges

Facilitating Questions

- *Can you build a bathtub for Pigeon?*
- *How big will you make the bathtub?*
- *What shape will the bathtub be?*
- *How many blocks did you use to make the bathtub?*
- *What were some of the things that Pigeon was saying in the story about taking a bath?*
- *How did Pigeon act in the story?*
- *How would you give Pigeon a bath with the sponge?*

PK.CKW.5 Participates in a variety of dramatic play activities to represent fantasy and real life experiences.

PK.MATH.15. [NY-PK.G.4.] Creates and builds shapes from components (e.g., sticks, blocks, clay)

PK.MATH.13. [NY-PK.G.2.] Names shapes regardless of size

PK.MATH.10. [NY-PK.MD.1.] Identifies measurable attributes of objects, such as length or weight, and describes them using appropriate vocabulary



¿Puedes construir una bañera para Pigeon?

¿Qué tan grande haras la bañera?

¿Qué forma tendrá la bañera?

¿Cuántos bloques usaste para hacer la bañera?

¿Cuáles fueron algunas de las cosas que dijo Pigeon en la historia acerca de tomar un baño?

¿Cómo actuó Pigeon en la historia?

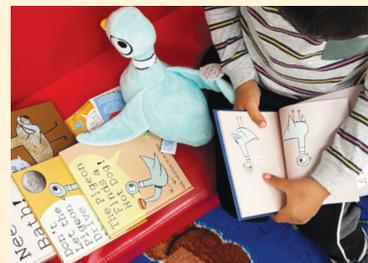
¿Cómo le darías un baño a Pigeon con la esponja?

Library

Put out more books from the Mo Willems “Pigeon” collection, and a Pigeon plush toy for children to read or do picture walks.

Materials

- Pigeon Series Books
- Pigeon Plush



Facilitating Questions

- *What is this book about?*
- *What do you like most about it?*
- *What is happening in the pictures?*
- *What do you predict will happen next?*
- *What do these books have in common?*
- *Which is your favorite book?*

PK.ELAL.5. [PKR.1.] Participates in discussions about a text (e.g., during whole or small group interactive read-aloud discussions, during peer sharing, within play scenarios).

- *¿De qué se trata este libro?*
- *¿Qué es lo más que gustó?*
- *¿Qué está pasando en las imágenes?*
- *¿Qué predices que sucederá?*
- *¿Qué tienen estos dos libros en común?*
- *¿Cuál es tu libro favorito?*

Math

Prepare a small tub of water, a balance scale, and a variety of materials for children to explore such as toy boats, a sinking toy, pebbles, marbles, paperclips, and foam shapes. Encourage children to fill up the boats with various materials and see how that impacts the boat's buoyancy. Model how to use the balance scale together to compare heavy versus light objects.

Materials

- Tub of water
- Toy boats
- Sinking toy
- Balance scale
- Pebbles
- Marbles
- Paperclips
- Foam shapes

Facilitating Questions

- *Which object do you think is heavier? Lighter?*
- *How can you use the balance scale to figure out which object is heavier or lighter?*
- *What happens when you put an object on one side of the balance scale?*



- *¿Qué objeto crees que es más pesado? ¿Encendedor?*
- *¿Cómo puedes usar la balanza para determinar qué objeto es más pesado o más liviano?*
- *¿Qué sucede cuando pones un objeto en un lado de la balanza?*

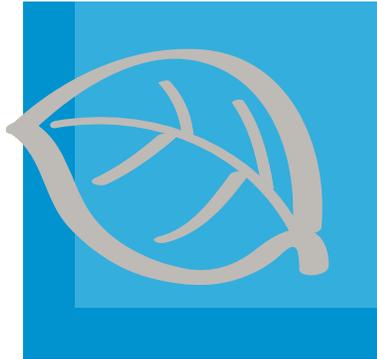
- *What happens when you put the object on the water?*
- *What happens when you put the boat on the water?*
- *How many objects can you put on the boat in order for it to sink?*
- *Can you sort the objects and make two piles? One for sinking and one for floating objects?*

PK.MATH.10. [NY-PK.MD.1.] Identifies measurable attributes of objects, such as length or weight, and describes them using appropriate vocabulary

- *¿Qué pasa cuando pones el objeto en el agua?*
- *¿Qué pasa cuando pones el bote en el agua?*
- *¿Cuántos objetos puedes poner en el bote para que se hunda?*
- *¿Puedes clasificar los objetos y hacer dos montones? ¿Uno para hundirse y otro para objetos flotantes?*

Lesson 5

Dynamic Dyes Design Challenge



NYCDOE
 Pre-K for All Unit of Study:
 Plants, Unit 8
 Enrichment Activity for
 Foundational Lesson 4

Summary

After reading the storybook, *Pete the Cat: I Love My White Shoes* by Eric Litwin, James Dean, and Kimberly Dean, children will understand that fruits are plants and that they can be used to produce natural, colorful dyes. They will use the same fruits and natural materials from the story to make their own natural dyes in order to design colorful socks for Pete the Cat.

Learning Objectives

- Describe how plants are important and can be used for different purposes.
- Identify fruits as plants and describe them as edible (plants can be food).
- Observe that some plants like fruits produce color dyes.
- Explore natural materials to see what colors they produce.
- Predict and identify which colors are produced by three natural materials.
- Properly use tools to mash fruits and transfer liquids.

Key Vocabulary

Prediction / Predicción	Blueberry / Strawberry / Arándano / Fresa
Dye / Tinte	Soil / Tierra
Color / Color	Pipette / Dropper / Pipeta / Cuentagotas
Red / Blue / Brown / Rojo / Azul / Marrón	Pinch / Pellizco / Pizca
Mash / Machacar / Mezclar	Cat / Gato
Plant / Planta	White Shoes / Zapatos Blancos
Food / Comida	Sock / Media / Calcetín
Fruit / Fruta	Strain / Colar



Materials

- Pete the Cat: I Love My White Shoes* Book (English/ Spanish)
- Pete the Cat Plushie
- Pete the Cat paper crowns
- Kettle or Pitcher with warm water
- Plastic Bowls
- Spoons
- Fresh or Frozen Blueberries
- Fresh or Frozen Strawberries
- Soil Pellets
- Potato Mashers (child-sized preferred)
- White Felt pre-cut into the shape of a sock OR white baby socks, (1) per child
- Pipettes/Droppers
- Strainers
- Table Top Dry Rack
- Paper Towels/Napkins
- Paper Plates
- Play Dough (red, blue, brown)
- Strawberry plant picture (see Appendix)
- Blueberry plant picture (see Appendix)
- Crayons, Markers, or Colored Pencils
- Other Pete the Cat books
- Pete the Cat Toy Figures
- Red, blue, and brown water soluble paint
- Cups
- Scissors



Prep Before the Lesson

- If you are using frozen fruit you should thaw them out about half an hour before the activity.
- Remove any skin off of the soil pellets prior to the main activity.
- Heat up the water kettle in an outlet away from the children, about 10 – 15 minutes before the main activity. Only an adult should handle the kettle at all times.
- Print and laminate the strawberry and blueberry plant pictures for storytime. These can also eventually be placed in the art center.
- Label the top edge of each paper plate with each child's name.

Part 1. Literacy-based Introduction

A. Gather the children for storytime. Before you read the story, ask the children some questions to introduce the topic and elicit prior knowledge.

- *What are plants?*
- *Have you seen any plants? Where?*
- *How would you describe plants?*
- *Why do you think plants are important?*
- *Have you ever eaten a plant?*
- *Have you ever eaten a fruit?*
- *What is your favorite fruit?*

If you've already introduced the plant unit previously, you may ask a few more content questions.

- *What are the parts of a plant?*
- *What do plants need to live?*

B. Tell the children that you will be reading a story that talks about some plants that they might have eaten before. Introduce the children to your friend, Pete the Cat, and hold the plush for them to see. Read *Pete the Cat: I Love my White Shoes* by Eric Litwin. Invite the children to sing along in the chorus: "I love my ___ shoes. I love my ___ shoes. I love my ___ shoes..." Note: There are several sing alongs online that can help children practice the melody of the song.

¿Qué son las plantas?
 ¿Has visto alguna planta?
 ¿Dónde?
 ¿Cómo describirías las plantas?
 ¿Por qué crees que las plantas son importantes?
 ¿Alguna vez has comido una planta?
 ¿Alguna vez has comido una fruta?
 ¿Cuál es tu fruta favorita?

¿Cuáles son las partes de una planta?
 ¿Qué necesitan las plantas para vivir?

Book Summary: Pete the Cat goes walking along, excited to wear his brand-new white shoes. Along the way, his shoes change from white to red to blue to brown to wet as he steps in piles of strawberries, blueberries, and other big messes. But no matter what color his shoes are, Pete keeps going with the flow.

C. Have a discussion with the children about the story.

- *What colored Pete's shoes red/blue/brown in the story?*
- *Have you ever tasted strawberries/blueberries? What did they taste like?*
- *Have you ever eaten a plant before?*
- *Where do strawberries and blueberries come from?*

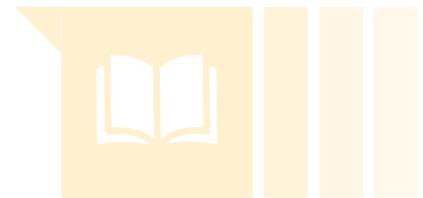
D. Show the children a picture of a real strawberry and blueberry plant (see Appendix for examples).

- *What are the parts of these plants?*
- *What color are the leaves?*
- *What colors are the flowers?*
- *Where are the fruits in the picture?*
- *Do you think you can use fruits like strawberries and blueberries for something other than eating? Hint: Think about the story! Let's find out...*

Part 2. Materials Exploration and Tinkering

A. Mashing play dough!

Invite children to make small play dough balls to represent the different things that Pete stepped on in the story. They can use red play dough for strawberries in one bowl, blue for blueberries in another bowl, and brown for the mud in a third bowl. Introduce the potato masher as a tool that will be used to mash or squish the materials. Model the movement of mashing with your hands first and a sing along: "mash, mash, mash, and twist." After children practice with their hands first, distribute a masher to each child. Invite them to pretend that the masher is Pete's feet stepping on the different things from the story! Allow children to practice mashing the play dough and talk about the story. You may also want to include potato



¿De qué color eran los zapatos de Pete rojo/azul/marrón en la historia?

¿Alguna vez has probado fresas/arándanos? ¿A qué sabían?

¿Alguna vez has comido una planta antes?

¿De dónde vienen las fresas y los arándanos?

¿Cuáles son las partes de estas plantas?

¿De qué color son las hojas?

¿De qué colores son las flores?

¿Dónde están las frutas en la imagen?

¿Crees que puedes usar frutas como fresas y arándanos para algo más que comer? Pista:

¡Piensa en la historia! Vamos a averiguar...



mashers, bowls, and play dough of different colors in the dramatic play/kitchen center for children to practice there as well.

B. Pete's Footprints

Prepare 3 paper plates, one with a little bit of red paint, another with blue paint, and the third with brown paint. Provide some white paper and little Pete toy figures (or other toy figures with feet/shoes) for the children. Invite them to "step" onto the paint with the toys, then "walk" across the paper to make some tracks of the colors they stepped in! Uh oh, they can wash off Pete's messy shoes in the next activity!

C. Washing Off Pete's Footprints

Give the children two cups, one filled halfway with water and one without. Introduce the pipette as a tool that will be used to clean the Pete toy figures feet with water. Model how to use a pipette with a little bit of water. Pinch and squeeze the top, then dip it into the liquid, release the pinch for it to suck up the liquid, remove the pipette from the liquid, and finally squeeze the liquid out. Give each child a pipette and ask them to practice pinching and squeezing the top in the cup of water, then transfer it into the empty cup. Allow them to explore the pipette then use it to rinse the toy figures over the empty cup until the paint of their feet is gone. You may also want to include pipettes in the sensory/ water table center for children to practice there as well.

D. Introduce three natural materials to the children: strawberry, blueberry, and soil. Allow them to touch each material with their finger and describe what it is, how it feels, and how it smells. Have children make predictions about which color the materials will make. Do not mix the materials.

- *How does the fruit feel when you touch it?*
- *What color dye do you think this fruit will make?*
- *How does the soil feel?*
- *What color do you think the soil will make?*
- *What do these materials smell like?*
- *Have you ever used any of these materials before? For what?*

¿Cómo se siente la fruta cuando la tocas?

¿Qué color de tinte crees que hará esta fruta?

¿Cómo se siente la tierra?

¿De qué color crees que pondrá la tierra?

¿A qué huelen los materiales?

¿Habías usado antes alguno de estos materiales? ¿Para qué?

Part 3. Engineering Design Thinking (Make, Test, Reiterate)

Introduce the engineering challenge that relates to the story with the following prompt:

Pete the cat arma sus zapatos, pero no tiene calcetines (medias) y sus pies están fríos. ¿Puedes diseñar calcetines (medias) coloridos para mantener calientes los pies de Pete?

Pete the Cat loves his shoes, but he has no socks and his feet are cold. Can you design colorful socks to keep Pete's feet warm?

Explain to the children that they will be dying the socks with natural materials like the book. Dying means to color or stain.

Review the three natural material dyes that Pete stepped in throughout the story. Reminder: Be sure to heat up the water kettle in an outlet away from the children, about 10 – 15 minutes before this activity. Let it cool to warm water. Only an adult should handle the kettle at all times.

A. Making socks for Pete!

Give each child some white felt and a marker. Invite children to make a sock for Pete by drawing an outline of a sock on the white felt. Hand out some plastic scissors and have students cut out their socks. If they need more practice, encourage them to draw more sock outlines and cut them out. They can use their best sock cut out in the design challenge. Make sure each child has a paper plate with their name on it. Set the plate with the sock aside for later.

- *What color is Pete's sock, right now?*
- *What does the sock feel like?*

B. The teacher can create groups of three and assign one natural material to each member of the group. Give each child a bowl and a spoon and ask them to put 1 tablespoon (2 teaspoons) of fruit or one soil pellet into their bowl. One child should have strawberries, the second should have blueberries, and the third should have the soil pellet.

C. The teacher will go around to each table to add a small amount of warm water to each child's container. This will help

*¿De qué color es el calcetín (media) de Pete ahora mismo?
¿Cómo se siente el calcetín (media)?*

*¿Qué ingrediente estás usando?
¿Cómo crees que quedará en tu
pieza de tela?
¿Qué sucede cuando trituras las
frutas?
¿A qué huele?
¿Nuestros resultados de colores son
iguales a los de la historia?
¿Cual es diferente?*

extract the dye from the ingredients, as well as help children during the mashing process. Only an adult should handle the kettle, be very careful. Children can fan air or help blow over the water in the bowl to help speed up the cooling process.

D. The children will use their potato masher to mash their ingredients until they begin to see the liquid dye. Engage children in conversations as they explore the ingredients and tools.

- *What ingredient are you using?*
- *How do you think it will look on your piece of fabric?*
- *What is happening when you mash the fruits?*
- *What does it smell like?*
- *Are our color results the same as the story?*
- *Which one is different?*

E. Once they are done mashing, present the children with a strainer. Help children pour the mashed up fruit bowl ingredients on top of the strainer and into a fresh bowl. Then bring back the felt sock and put it on top of a paper plate.



*¿Para qué crees que sirve esta
herramienta coladora?
¿Qué ves que pasa cuando pones
tu puré de frutas encima del
colador?*

- *What do you think this strainer tool is used for?*
- *What do you see is happening when we put your mashed up fruit on top of the strainer?*



Mateo

¿Qué pasó con el calcetín blanco?
¿Por qué el calcetín cambió de color?
¿Algún color que hiciste que te sorprendió?
¿Puedes hacer algún modelo?



F. Reintroduce the pipettes and ask children to drip dye onto their sock. Each child is to share the color dye that they made with members of the group so that they have access to the three colors if they chose to use them for their sock designs (red, purple, and brown). Encourage children to get creative and make patterns if they'd like. Show a few examples if needed.

- *What happened to the white sock?*
- *Why did the sock change colors?*
- *Did any color you made surprise you?*
- *Can you make any patterns?*

Children should notice that the blueberry is not creating a blue dye like the book suggests. It creates more of a purple dye. Invite children to create a new song chorus: *"I love my purple socks. I love my purple socks. I love my purple socks..."*

G. Have children observe each other's sock design and identify the colors they see. Discuss with children what they would do differently. If time and supplies permit, children can mix and mash more than one ingredient in a separate bowl and try again.

H. Upon completion of the activity, give each child a Pete the Cat crown to wear as a fun reward. Leave the wet socks to air dry on a table top dry rack.

Extend the Learning

- Create other colored natural dyes. Try ingredients such as fresh spinach (green dye), turmeric (yellow dye), and butterfly pea flower tea (blue dye). Have the children make predictions first, then mash and dye another sock for Pete.
- Draw and cut a large shape of a cat to put it on the board. Tape some of the children's dry sock designs to the cat's feet and around the board to show off each child's work.
- Try this activity with different white fabrics and compare the results.
- Invite a guitar player and sing Pete's song together as a class.
- Set up an experiment where you use different materials to wash the socks (water, soap and water, etc.) then compare and contrast the results to pick the best cleaner.

What's Happening?

Plants are living things that are all around us in the form of trees, flowers, grass, etc. Most of the plants we know and eat are made up of seeds, roots, stems, leaves, flowers, and fruits. Plants are important as they provide us with air, medicine, and food. Plants can also help us make natural dyes that we use for clothes, cosmetics and more. In this activity, children explore how to make natural pigments from plants, how to mix pigments to create new colors, and how to transfer pigments onto a new material.

LITERACY-BASED INTRODUCTION

PK.ELAL.2. [PKRF.2.] Demonstrates an emerging understanding of spoken words, syllables, and sounds (phonemes).

PK.ELAL.5. [PKR.1.] Participates in discussions about a text (e.g., during whole or small group interactive read-aloud discussions, during peer sharing, within play scenarios).

PK.ELAL.7. [PKR.3.] Develops and answers questions about characters, major events, and pieces of information in a text.

PK.ELAL.11 [PKR.7.] Describes the relationship between illustrations and the text (e.g., what person, place, thing or idea in the text an illustration depicts).

MATERIALS EXPLORATION AND TINKERING

PK.AL.1 Actively engages in play as a means of exploration and learning.

PDH.1 Uses senses to assist and guide learning.

PK.AC.3 Demonstrates understanding of what is observed.

PK.AL.4. Exhibits curiosity, interest, and willingness to learn new things and have new experiences.

PK.PDH.5. Demonstrates eye-hand coordination and fine motor skills needed to manipulate objects.

ENGINEERING DESIGN THINKING (MAKE, TEST, REITERATE)

WSS: IV.A.3: Makes meaning from explorations, and generates ideas and solutions based on their own observations of the natural and human-made worlds.

TSG: 24: Uses scientific inquiry skills.

COR: CC: Experimenting, predicting and drawing conclusions.

PK.SCI.10 [K-2-ETS1-1]. Asks questions, makes observations and gathers information about a simple situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

PK.SCI.11. [K-2-ETS1-2]. Develops a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

PK.AL.3. Approaches tasks and problems with creativity, imagination and/or willingness to try new experiences.

PK.SCI.12. [K-2-ETS1-3.] Analyzes data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

PK.AL.5. Demonstrates persistence.

Lesson 5

Learning Center Connections

Sensory: Water Table

Give children pipettes and ask them to squirt water from one container to another at the water table in order to practice their fine motor skills for the main science activity.

Materials

- Pipettes
- Water containers

Facilitating Questions

- *Can you show me how to use the pipette?*
- *How can you fill up the container using the pipette?*
- *How many squirts would it take?*
- *How can you use something like a pipette at home?*

PK.AL.1. Actively engages in play as a means of exploration and learning
PK.PDH.5. Demonstrates eye-hand coordination and fine motor skills needed to manipulate objects



¿Puedes mostrarme como usar la pipeta?
¿Cómo puedes llenar el recipiente usando la pipeta?
¿Cuántos churros tomaría?
¿Cómo puedes usar algo como una pipeta en casa?

Sensory: Sand Table

Give children potato mashers and ask them to mash and make patterns on the sand in order to practice their fine motor skills for the main science activity. Let the children explore with the strainers in the sand as well.

Materials

- Potato mashers
- Sand toys
- Strainers
- Cups



Facilitating Questions

- *What happens when you push down on the sand with the masher?*
- *How else can you use the masher?*
- *How can you make some patterns and designs?*
- *What happens when you pour sand on top of the strainer?*

PK.AL.1. Actively engages in play as a means of exploration and learning
PK.PDH.5. Demonstrates eye-hand coordination and fine motor skills needed to manipulate objects

- *¿Qué pasa cuando empujas la arena con el machacador?*
- *¿De qué otra manera puedes usar el machacador?*
- *¿Cómo puedes hacer algunos patrones y diseños?*
- *¿Qué sucede cuando echas arena encima del colador?*

Dramatic Play

Invite children to use the masher to mash up play dough in a bowl, pretending they are making mashed potatoes. This activity also helps children practice their fine motor skills for the main science activity. Add Pete the Cat figures or plushies for children to role-play, re-enact, or retell the storybook in order for children to engage in imaginative play as well as build comprehension, vocabulary, and story sequencing.

Materials

- Play dough
- Mashers
- Bowls
- Pete the cat toys or plush

Facilitating Questions

- *How do you mash things in your own culture?*
- *Can Pete the Cat figure tell me the story of his white shoes?*

PK.SOC.2. Demonstrates awareness and appreciation of their own culture and other cultures.

PK.CKW.5 Participates in a variety of dramatic play activities to represent fantasy and real life experiences.

PK.PDH.5. Demonstrates eye-hand coordination and fine motor skills needed to manipulate objects



- *¿Cómo mezclas las cosas en tu propia cultura?*
- *¿Puede Pete, el gato, contarme la historia de sus zapatos blancos?*

Art

Provide strawberry and blueberry plants reference sheets for children to review the parts.

Invite children to draw, color and label their own strawberry or blueberry plant in order for children to remember that one reason plants are important is because they give us food.

Materials

- Strawberry/blueberry plant reference sheets and white paper
- Colored pencils, crayons, or markers

Facilitating Questions

- *Why do you think plants are important?*
- *What did you notice about this picture?*
- *What are the parts of a strawberry or blueberry plant?*
- *What do plants need to live?*

PK.ARTS.18. [VA:Re7-9.PK] Responds to Visual Arts

PK.AL.3. Approaches tasks and problems with creativity, imagination and/or willingness to try new experiences

PK.AC.2. Demonstrates they are building background knowledge



¿Por qué crees que las plantas son importantes?

¿Qué notaste en esta foto?

¿Cuáles son las partes de una planta de fresa o arándano?

¿Qué necesitan las plantas para vivir?

Library

Put out more books from the Pete the Cat collection as well as a Pete plush toy for children to read or do picture walks.

Materials

- Pete the Cat book series
- Pete the Cat plush or figures

Facilitating Questions

- *What is this book about?*
- *What do you like most about it?*
- *What is happening in the pictures?*
- *What do you predict will happen next?*



¿De qué se trata este libro?

¿Qué es lo más que gustó?

¿Qué está pasando en las imágenes?

¿Qué predices que sucederá?

- What do these books have in common?
- Which is your favorite book?

PK.ELAL.5. [PKR.1.] Participates in discussions about a text (e.g., during whole or small group interactive read-aloud discussions, during peer sharing, within play scenarios).

PK.ELAL.6. [PKR.2.] Retells stories or share information from a text

PK.ELAL.11 [PKR.7.] Describes the relationship between illustrations and the text (e.g., what person, place, thing or idea in the text an illustration depicts)

PK.ELAL.7. [PKR.3] Develops and answers questions about characters, major events, and pieces of information in a text.

¿Qué tienen estos dos libros en común?
¿Cuál es tu libro favorito?

Writing

Invite children to write a letter or create a drawing for Pete the Cat about a time something happened to them and they didn't get mad.

Materials

- White paper
- Pencils, colored pencils, crayons, or markers
- Pete the Cat plush

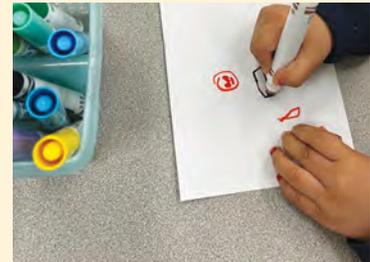
Facilitating Questions

- Have you ever been mad? Why?
- What was something that happened where you did not get mad? Why?

PK.ELAL.14 [PKW.2.] Uses a combination of drawing, dictating, oral expression, and/or emergent writing to name a familiar topic and supply information in child-centered, authentic, play-based learning

PK.ELAL.16. [PKW.4.] Creates a response to a text, author, or personal experience (e.g. dramatization, art work, or poem)

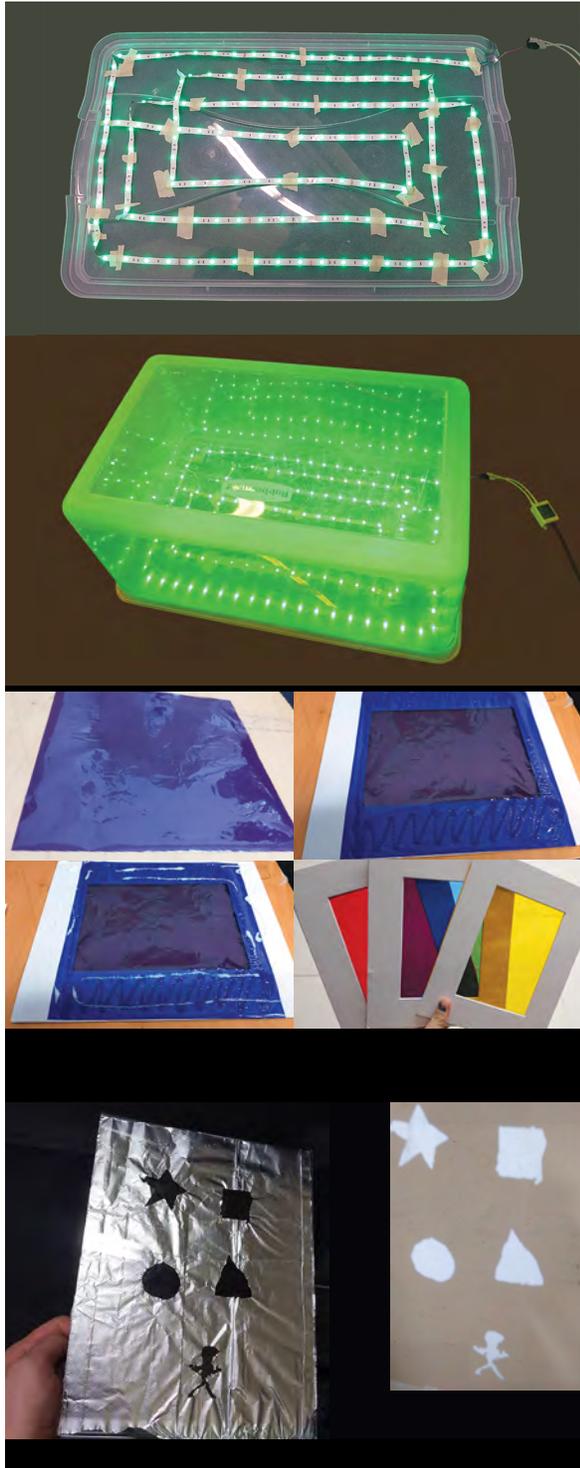
PK.ELAL.24. [PKSL.6] Expresses thoughts, feelings, and ideas (e.g., role-playing, music, drawing, artwork, building, writing).



¿Alguna vez has estado enojado(a)?
¿Qué fue algo que sucedió donde no te enojaste? ¿Por qué?

Appendix

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Making Materials for Blackout Design Challenge

< Making the DIY Light Table

Light tables can be purchased, but making one yourself is very simple and cost effective. Get a flat bottomed, transparent storage container of your desired size and depth. Order an RGB LED lightstrip (between 10 and 15 ft), and tape or stick the strip to the lid of the box. Putting them on the lid allows for much more seamless connection of the wire. Then, turn the storage container upside down, to have the kids use the bottom of the storage container as the working surface. Many RGB LED strips will come with remotes to change the color, or to turn on flashing or rainbow effects. Allow kids to explore the table having different colors!

Some LED strips can get hot! They won't melt the plastic, but avoid touching the LED for a minute after turning them off.

Some LED strips can be cut. Be aware that cutting requires splitting power for each run of lights. Instead of cutting, try running the lights in a spiral, by folding the strip on corners to get proper turns.

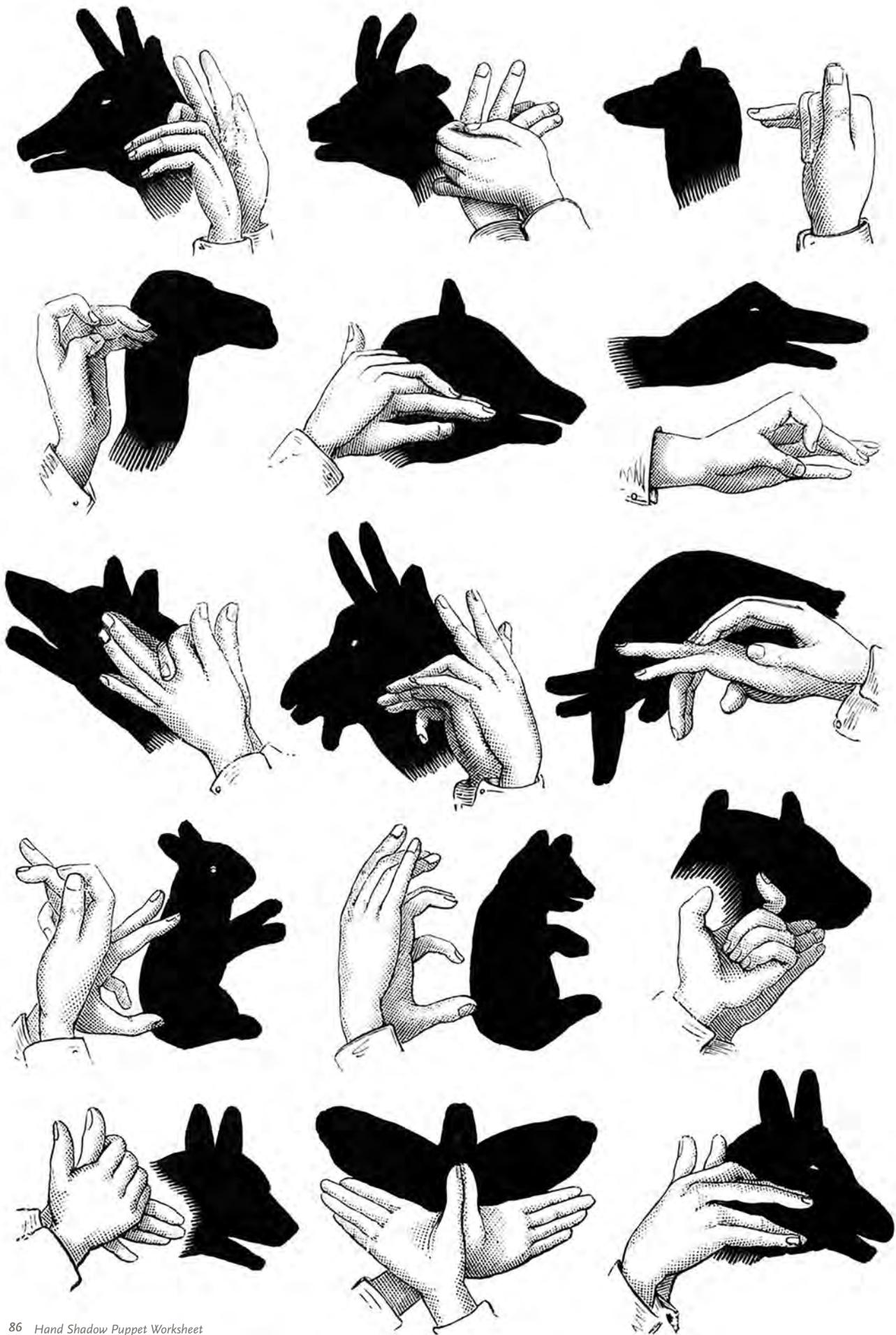
< Making the handheld color gels and filters

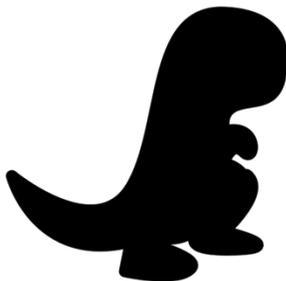
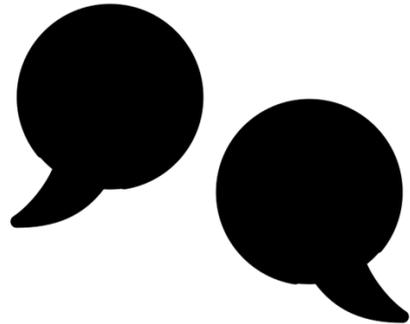
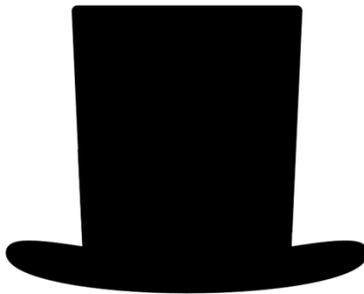
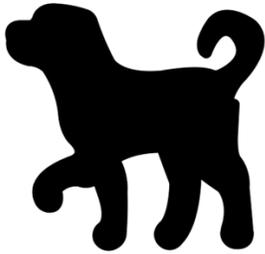
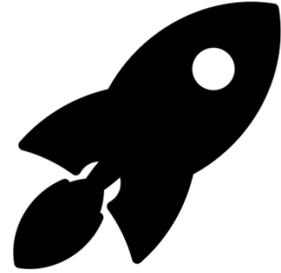
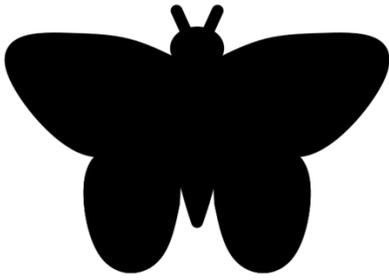
Filters are transparent substances that only allow certain color or wavelengths of light through them. A sheet of red plastic is a filter, and is red, because only red light can pass through it. Other wavelengths will be blocked (absorbed), meaning that if you look through the filter, everything not reflecting red wavelengths will be dark. Some filters can let more than one wavelength of light through.

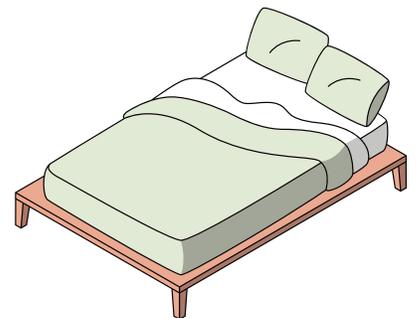
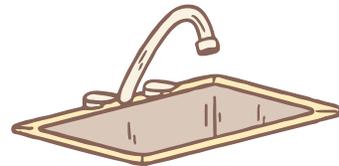
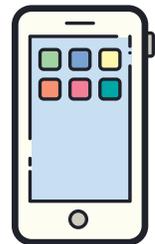
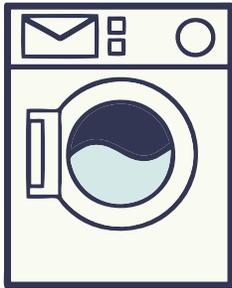
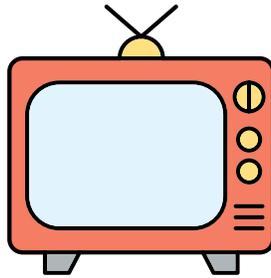
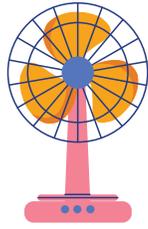
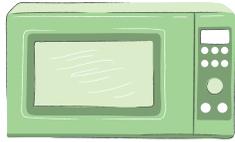
Making colored light filters is fairly simple. Colored plastic, called 'gels' can be ordered, or as a cheaper option, you can use colored cellophane. Typically these will come rolled, or especially in the case of cellophane, will curl easily and not stay flat. To combat this, and to also make the colored filters easier to hold by children, use picture frame mats. Sandwich and glue the colored plastic between 2 framing mats so that they are nice and sturdy.

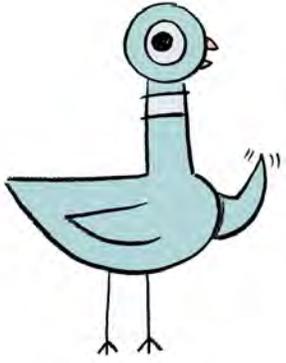
< Acrylic stand shadow cutout example

A sheet of foil (or other completely opaque material) with shapes cut out in an acrylic stand. Use acrylic stands that protect the foil on both sides, allowing children to play with it without ripping or wrinkling the foil. Taping the sides to keep the stand closed can help prevent the shapes from shifting.







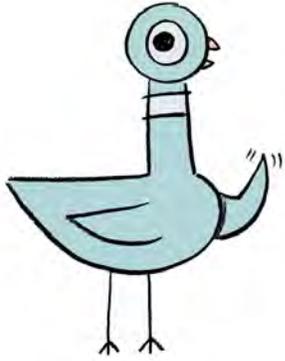


Queridos amigos,

Mamá Paloma aquí. En serio necesito tu ayuda. Verás, mi pequeño paloma bebé es... este, sucio... y huele mal. ¡Claramente, es hora de que se bañe!

La paloma simplemente no quiere bañarse. Creo que los juguetes acuáticos adecuados podrían hacerle cambiar de opinión. Tal vez algo súper divertido... ¿Todos ustedes, futuros ingenieros, pueden ayudarme? ¿Podemos convencer a la paloma de que se bañe diseñando un divertido juguete de baño para que juegue en el agua?

*Esperando sus ideas,
Mamá paloma*



Dear Friends,

Mama Pigeon here. I really need your help. You see, my little baby Pigeon is... well, filthy... and smelly. Clearly, it is time for him to take his bath!

Pigeon just does not want to take a bath. I think the right water toys might change his mind. Perhaps something super fun... Can all of you future engineers help me? Can we convince Pigeon to take a bath by designing a fun bath toy for him to play with in the water?

*Looking forward to your ideas,
Mama Pigeon*



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