Educators' Guide

DEAR EARLY CHILDHOOD EDUCATORS:

The research is clear that the best practice in early childhood education is to break away from passive instruction and worksheets and to encourage more play and investigation. This kind of learning early in life builds skills and interests that serve children throughout their school years and later in life.

In partnership with Boston Children's Museum, National Grid is excited to provide you with this Tinker Kit, which will inspire you to use everyday materials—scissors, paper, egg cartons, pipe cleaners—to help young children develop the muscles in their hands, practice their fine motor skills, and explore materials to understand how they work. Being curious about things, asking questions, and exploring various solutions are all part of the fun of learning. Tinkering allows children the opportunity to solve problems and practice independent thinking. These are the skills they need to be successful in life.

An active community partner that prides itself in being "here with, and here for," its customers, National Grid believes in the importance of developing the future workforce. The leaders of tomorrow must develop and maintain a sense of curiosity and inquisitiveness that will help them solve key challenges like the energy challenges that employees across the company are currently working to address. National Grid is very supportive of education, particularly in the fields of science, technology, engineering, and math, and understands that early education is a key building block for long-term success.

The Tinker Kit is a resource that will increase the capacity of caregivers and educators in museums, libraries and early childhood settings to support the optimal development of all children through intentional family-engagement activities and early learning opportunities. Enjoy it, and thank you for your commitment to the children and families of Massachusetts.

Carole Charnow

President and CEO
Boston Children's Museum

Marcy Reed

President
National Grid Massachusetts

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Why tinker?

Have you sat down to tinker lately? If not, it's time to start! Before you read any further, find some items you'd like to tinker with. Make a space for yourself, spread out the materials, and give yourself time to mess around, feel creative, and have some fun!

People are natural tinkerers. It is in our nature to explore and create things. Maybe you consider yourself a "tinkerer" or a "maker," or maybe not. But all of us create. Have you ever played around with a recipe? That's tinkering! Have you ever fixed something that was broken? Or made a gift for a friend? These activities are tinkering, too! And making. Think about the sense of accomplishment you had when you were done. It felt good, right? Now think about sharing those experiences and good feelings with the children and families you work with.

> ***"All life is an experiment. The more you make the better."***
>
> —Ralph Waldo Emerson

Encouraging children to tinker gives them the skills to be creative problem solvers out in the world. Tinkerers make great discoveries, small and large. Tinkerers are inspired by a problem they identify and want to solve. These problems range from everyday and personal dilemmas ("I'm hungry but only have a few ingredients. What can I make?") to complex and global challenges ("Oil spills are difficult to clean up. I want to design a new way to fix them."). Children who are encouraged from an early age to tinker and solve their own problems develop a different way of thinking about the world. They understand experimentation, testing and failing. And a child who tinkers

- Does not give up easily when a challenge gets difficult
- Thinks creatively
- Is self-sufficient
- Can fix things that have broken
- Is a creative problem solver across a range of issues

Do these sound like traits you would love the children you work with to develop? If so, let's get tinkering!

Wait a Minute!

IS IT TINKERING, MAKING, OR ENGINEERING?

In this guide, we use the terms tinkering and making interchangeably, but it is worth looking at what these terms mean and how they relate to STEM, and in particular to engineering.

Tinkering is the playful relative of the more serious activity of engineering. Engineering starts with a problem to be solved: "We need a bridge" or "We need a house to live in." Tinkering starts with much simpler questions: "What can I do with this?" or "How does this work?"

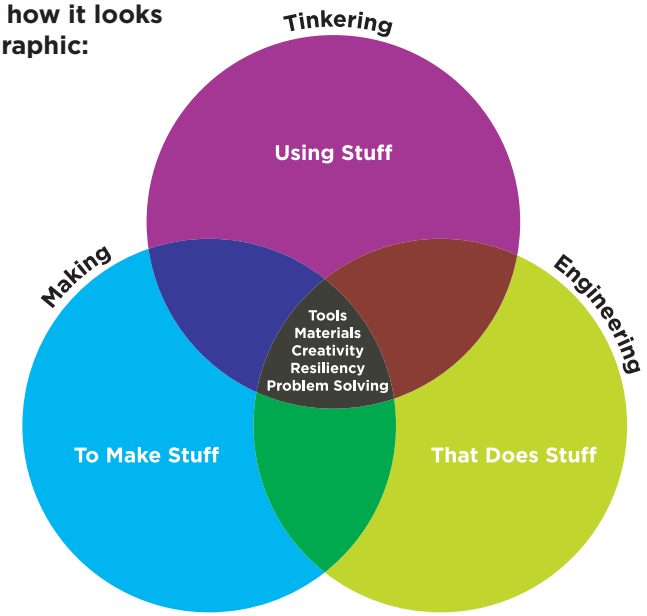
And then there is the term making. Tinkering and making are often used interchangeably, but making lies somewhere in between tinkering and engineering. Here is how we define these terms:

TINKERING is using stuff.

MAKING is using stuff to make stuff (that sometimes does stuff, but sometimes is just cool).

ENGINEERING is using stuff to make stuff that does stuff.

And here is how it looks in a fancy graphic:



When children tinker, they are learning about the properties of materials and the capabilities of tools. They are developing their fine motor skills as well. Tinkering often leads to making something, and it is absolutely the foundation to more complex making, technology and engineering. Learning how to manipulate tools, understand the properties of materials, and identify unique solutions to problems is at the core of all of making and engineering. And helping children develop these skills through tinkering is the best place to start.

One example of a maker space is in the Peabody Essex Museum in Salem, Massachusetts. The museum's website explains, "The Maker Lounge is dedicated to creativity and innovation through hands-on exploration with technology, materials and ideas. It builds on PEM's tradition of bringing together new and inspiring objects from around the world and celebrating creative expression through human ingenuity."

tinkering skills

TINKERING, MAKING, ENGINEERING—these all fall under the same category of creatively using tools and materials. In each instance, when children tinker, the key point is not what they are making, but the skills they are developing or the skills they are practicing to make it. It is not necessarily important that children grow up knowing how to design and make a birdhouse (though the birds would certainly appreciate it). But when they make things, children practice a whole host of skills that will set them up for success later in life, because these skills are transferable across a range of disciplines and circumstances.

These process skills, or "skills of doing," are important to children of every age. As children mature, they grow more sophisticated in their use of these skills and can apply them to more complex problems. While children use many skills when they tinker and make, some of the most common are these:

- **Developing fine motor coordination:** developing muscles in fingers, hands, wrists and forearms for manual dexterity. Daily activities—like getting dressed, eating, and writing—require control of small muscles in the hands. This skill starts when babies reach for an adult finger to grasp.
- **Using tools:** thoughtfully manipulating a range of tools to accomplish a task. This includes understanding how different tools can be used for different tasks and knowing how to choose the best tool for a given situation.
- **Problem solving:** brainstorming solutions, trying them out, and learning from any mistakes.
- **Collaborating:** working in partnership with other people to investigate a phenomenon, accomplish a task, or explore a question.
- **Experimenting:** engaging in simple investigations that include making predictions, gathering and understanding data, recognizing simple patterns and relationships, and drawing conclusions.
- **Thinking creatively:** developing multiple or unexpected solutions to a problem.
- **Observing:** learning about the world by using all the senses—hearing, seeing, smelling, touching, and tasting.
- **Comparing:** using observation skills to notice and describe similarities and differences between objects.
- **Relating to prior and/or current experience:** recalling past experiences and understanding and applying them in a new situation; applying new understanding and/or experience in different situations.
- **Communicating:** sharing ideas, discoveries, questions, and problems with others.
- **Persevering (also known as resiliency or stick-to-itiveness):** working through failure or difficult obstacles to achieve a goal. (More on this one later.)

> ***Learning takes place best when young children are engaged and enjoying themselves.***
>
> —Kathy Hirsh-Pasek, *A Mandate for Playful Learning in Preschool*

These are critical (and very useful) skills for children to develop, and this list is just the beginning. Tinkering can even help children practice planning ahead, following instructions, and more. And all these skills are not unique to tinkering or making; they are used in almost every facet of life.

CHILD DEVELOPMENT: STAGES RELATING TO TINKERING AND TOOL USE

Physical Development	Social/Emotional Development	Cognitive Development	Communication
2–3 years			
Manipulate small objects with increased control; string large beads; hold crayon with thumb and fingers; draw a circle; run; jump; stand on one leg; kick a ball.	Explore everything.	Learn through exploration; respond to simple directions; group objects by category; stack items in order of size; observe and imitate more complex adult actions.	Point to common objects when they are named; name objects based on their description; respond to "what" and "where" questions.
3–4 years			
Push, pull, and steer toys; build a tall tower of blocks; drive pegs into holes; run around; balance; throw and catch a ball.	Follow a series of simple directions.	Understand concepts like grouping and matching; organize materials on their own; actively seek information through "why" and "how" questions; learn both by observing and listening to adults' explanations.	Understand size comparisons such as big and bigger; understand relationships expressed by "if . . . then" or "because" sentences; follow a series of two to four related directions.
4–5 years			
Use scissors; cut on a line continuously; copy squares and crosses; walk backward; jump on one foot; turn a somersault.	Develop friendships; work with others to accomplish a task.	Point to and name many colors; understand order and process; draw, name, and describe pictures; count to 5.	Ask "when," "how," and "why" questions; understand comparisons like big, bigger, biggest; understand sequencing of events when clearly explained.

What does tinker

Tinkering is an active process—it is all about doing, discovering, creating. This level of creativity and activity can help shift the relationship that children have with learning, as they view learning as engaging and enjoyable. Tinkering encourages children to use their hands, senses, tools, and skills to investigate, understand, and even change their world. It builds children's capacity and enthusiasm about using their own ingenuity to create, to use tools, and to make. So what do tinkering activities look like?

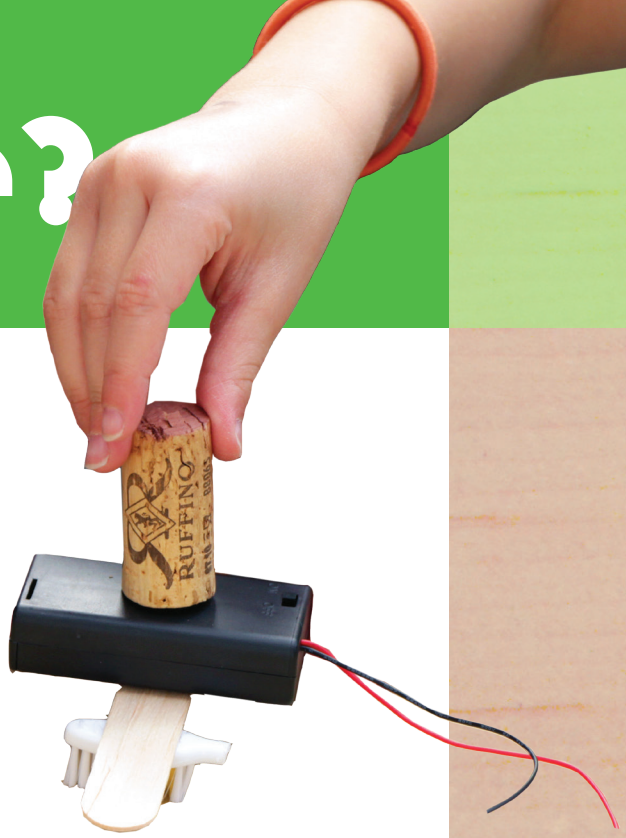
- **Tinkering requires tools.** However, children often have little exposure to tools, even simple ones. Children should be introduced to a range of tools and interesting materials at an early age, earlier than six, and should continue to be offered more complex tools and challenges to develop their capacity as scientific thinkers and doers.

- **Tinkering requires support.** Children benefit greatly from enthusiastic teachers who not only share with them how to use tools and materials, but also help them discover just how much they are capable of. But here is the hard part: It is as important to know when to step away as it is to know when to step in and help. If you are ever unsure of which to do, it is usually better to let children figure something out on their own than for you to do it for them. Stepping in too soon can stop children's creativity in its tracks. If children are focused, there is no need to interrupt. If they are clearly struggling, then you should step in, but be thoughtfully intrusive.

- **Tinkering requires space and time.** Children need room to tinker—literally and figuratively. They need physical space to build in, but they also need the emotional and intellectual "space" to try things out, occasionally fail, and try again, because . . .

- **Tinkering requires resiliency.** Tinkering teaches children how to succeed. We hear a lot about the disparities in children's lives—the income gap, the digital divide, learning gaps—all things that require more: more money, more resources, more infrastructure, and more time. But an ever-increasing divide (and one that cuts across all incomes) is a deficiency that requires not more of us adults, but less . . . and that is a growing gap in resiliency, what used to be called stick-to-itiveness and is sometimes called perseverance or grit. This is the willingness to keep trying despite setbacks, and although it may be the most important skill, it is taught the least. This is not a skill that you have or don't have—rather, it is a skill that can be learned and developed.

iNg Look Like?



Giving children the chance to tinker helps them practice this skill of resiliency, because we rarely get it right the first time when we tinker. We often fail in the beginning. But failing is not always a bad thing; it is often an opportunity. When children learn to work through obstacles, they fear failure a little less. They learn and grow from it and understand that the path to success is almost always populated by obstacles along the way that challenge their resolve and skill.

Thomas Edison, when asked if he felt like a failure the thousands of times he tried to create a light bulb, responded by saying, "If I find 10,000 ways something won't work, I haven't failed. I am not discouraged, because every wrong attempt discarded is another step forward." This quote is often cited (and has likely evolved since he said it), but the message is still powerful.

> ***"I've missed more than nine thousand shots in my career. I've lost almost three hundred games. Twenty-six times I've been trusted to take the game-winning shot and missed. I've failed over and over and over again in my life. And that is why I succeed."***
>
> —Michael Jordan, Professional Basketball Player

This is the heart of not just making and tinkering, but so much of life: Every maker, every engineer, every scientist tries and fails . . . and tries again. It is the only path to real success. If children are not allowed to learn how to fail, what will they do when they encounter the inevitable obstacles in their lives? With no history of failing, they are more likely to give up than to continue on. But a child who learns how to learn from failed attempts is a child who grows up to be a resilient adult. And there are few better opportunities to learn resiliency than tinkering.

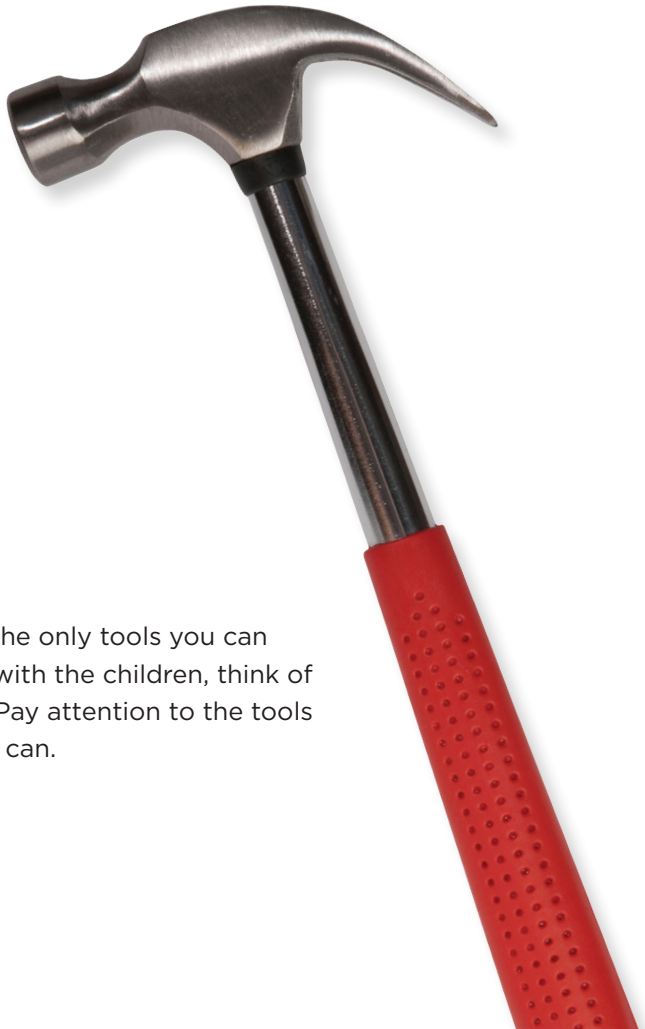
tools of the trade

Put simply, a tool is an object that helps you accomplish a goal. Hammers and saws are tools, of course, but so is a stick if you use it to pry something up. A pen is a tool used to help create a message in writing. Rulers, clocks, computers, glue guns, and even the glasses you wear are all tools that help you accomplish goals. And your hands are your first (and most useful) tools. Tools help us get things done.

Think about an everyday pair of scissors — a common tool that every young child struggles to master, but eventually learns to use with practice. We take them for granted, but when they were first introduced in 1761, they were, quite literally, cutting-edge technology.

This kit was carefully stocked with tools that serve as a great starting point for young children. Some of these tools are building blocks to others—using these simple tools gets children ready to use more complex tools. Some may not even seem like tools at all. Goggles, for instance, are safety tools used to accomplish a very important goal: protecting children' eyes. Here are some of the tools included in this kit:

- Clothespins
- Crayons
- Goggles
- Hammer
- Measuring tape
- Paper clips
- Pliers
- Rubber bands
- Scissors
- Screwdrivers
- String
- Toothpicks
- Tweezers



These are not, as you might imagine, the only tools you can use with this kit. As you are tinkering with the children, think of other tools that you might introduce. Pay attention to the tools that they ask for—and get them if you can.

> ***The first rule of tinkering is to save all the parts.***
>
> —Paul Ehrlich, German scientist

tool safety

An important skill for children to practice is safety. With tool use comes a little risk. It is imperative for children to engage in some risk taking, but it should be sensible risk taking, with safety precautions preventing any actual harm. Introduce the most dangerous tools to children before they use them for the first time; this includes screwdrivers, pliers, hammers, glue guns, and scissors. Model for them the safe way to use these tools, and emphasize these safe practices. Monitor the children's use of the tools, and call attention to any unsafe use as a learning opportunity for every child in the group. And always encourage children to use safety equipment, like the goggles, whenever they are using other tools.

How to use the tin

The Tinker Kit is a great foundation for engaging children in creative thinking, problem solving, and tool use. But it is just the beginning. The materials and tools in this kit will get you rolling, but you will really take off when you introduce your own additional materials and tools. Tinkering is about open-ended creativity, and in that regard, almost any materials and tools can be used to engage children to create.

The best location for tinkering is on the floor or on low tables where it's OK to be somewhat noisy. There is no special space requirements, but good natural light would be ideal. Labeled storage containers are a must for your tinkering materials. They can help you organize your resources and keep the tools together. Labeled containers also encourage students to help clean up and keep the area neat and organized.

This kit focuses on six basic skills: keeping things together, taking things apart, moving things, making a mark, mixing things up, and building things. There are four activities for each skill area. These activities are also ideal for parents to take home and practice with their children.

HERE IS A BASIC OUTLINE FOR TEACHING THE ACTIVITIES IN THE TINKER KIT:

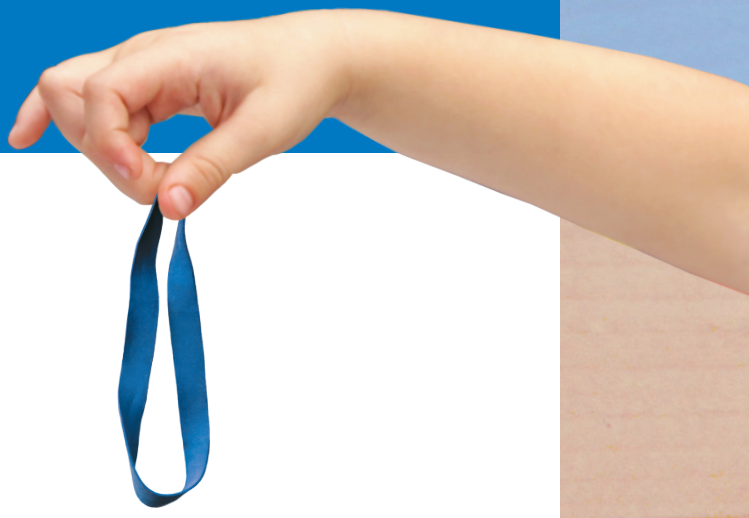
- **Start with a quick introduction to the activity**, and ground it in experiences the children have had or things they have wondered about. For example, if you are building bridges, ask them about real bridges they have seen. If the activity is about using tools like hammers and screwdrivers, ask them if they have ever used a tool before, or hold up a screw and ask them what tool they might use to screw it into a piece of wood.

- **Understand the children's capacity to use tools.** Smaller hands might struggle with some tools, but in general, children will surprise you with what they are capable of doing. Try to know something about the abilities of the children you are working with, and tailor the activities to fit them.

- **Make time for reflection during every activity.** Complex activities may require two reflection periods: one in the middle of the activity (a sort of check-in, where children talk to one another about what they have tried and learned and then return to the activity) and a second reflection at the end of the session as a wrap-up, which you should do for every activity. Reflection time allows children to make sense of what they tried and learned and to think about how it might apply to other parts of their lives.

- **Build in cleanup time.** Tinkering requires lots of tools and materials; having children help clean up not only makes it easier on you, but also teaches children responsibility and the important skill of organization.

ker kit



> ***“The cure for boredom is curiosity. There is no cure for curiosity.”***
>
> — Anonymous

HERE ARE A FEW ADDITIONAL TIPS FOR USING THE TINKER KIT:

- Tinkering is the perfect time to talk with children about what they are doing. Keep your questions open-ended and full of “juicy words.” You might ask, for example, “What can these materials do?” or “What do you notice about these materials?” Words like structure, under, over, wobbly, unattached, or evidence are all rich, descriptive vocabulary words that preschoolers will relate to their tinkering.

- With every activity, educators are encouraged to engage their children in reflecting on and documenting their tinkering. Why do this? Documentation and reflection are used as a mechanism for collaboration among colleagues, as a way for both children and adults to look back on and think about their learning, and to communicate their learning to others (other children, caregivers, and the wider community). Reflection is as simple as asking children, “Tell us about what you did. Was there anything challenging about that? What did you discover?” Educators can document the tinkering by taking photos, videotaping the activity, or displaying what children make. Sharing the documentation with the children, their parents or caregivers, and other educators helps everyone understand better and evaluate what the children are learning. To learn more about reflection and documentation, see http://www.wheelock.edu/about/centers-and-institutes/documentation-studio.

- Before you formally roll out your tinkering activities, you may want to do an audit of the materials that are already available to you. The kit includes some materials, but not enough for a large group of children or for multiple tinkering sessions. Feel free to add materials of your own, to collect new materials from families, or to purchase them at a retail store.

Activities

Each of the activities is designed to meet one or more of the requirements of the Massachusetts Pre-K STE Standards. Massachusetts has been in the forefront of developing early childhood standards for STEM. These standards are meant to be integrated with young children's play. (See What's Next? Resources for Taking It Further - Massachusetts Pre-K STE Standards)

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Keep it together

Screws, nails, glue, tape, dowels, string, staples, and more—a wide range of different materials and techniques are used to hold things together. It's a good thing these different ways of connecting things exist. But which connecting technique is best? Would a screw work to keep two pieces of fabric together? Would string be very effective at keeping a car intact? Not so much. Connecting materials together is a fundamental challenge in most making and engineering activities, and tinkering early on with these ways of joining materials will help children build a conceptual foundation that will enable them to tackle more complex challenges when they are older. The following activities provide a great introduction to some of the different ways we can keep things together.

Keep it together

Make a Train

Children practice their fine motor, math, and critical-thinking skills while connecting objects to make the longest "train" they can. Tip: Do the "What Keeps Things Together" activity first.

SETUP

- Set up the table with the assorted objects to connect. Set up *The Little Engine That Could* book nearby for children to look through and use as a reference.

DO IT!

- Read *The Little Engine That Could*, and talk about how the engine pulls the cars. Use a classroom train set to let the children experiment with connecting cars together and talk about how the engine pulls them along.
- Next, have the children explore the materials on the table to see which objects they can connect to one another. Have them focus on connecting just a few objects to start; younger children can simply bend pipe cleaners and loop them through one another.
- Talk with the children throughout the process of exploring and making their object "trains." See how many "cars" they can connect together. Can the group work together to connect all of their cars?
- Add the element of measuring. See how long the children can make their trains before they break apart while being pulled. Encourage the children to mix and match connectors and materials to see if they can make their trains longer and stronger.

DO MORE OF IT!

- Experiment with the idea of attaching objects by making paper, paper clip, or rubber band chains. Allow younger children to practice their fine motor skills by attaching paper clips into a chain. For older children, see how many different ways they can use the paper clips to make a chain. Suggest making rubber band chains. Ask, "Who can figure out how to loop the rubber bands into a chain?"

REFLECTION AND DOCUMENTATION

- Have each child show her "train" and demonstrate how it works. What did the children learn about different kinds of connectors? Are there other connecting materials they'd like to try out?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- With your child, explore your home, yard, or neighborhood for other types of connecting materials and objects to pull. See what different combinations you and your child can come up with! Have your child pull the train over different surfaces: smooth kitchen floor, bumpy rug, rough gravel or dirt ground. How does the train hold up? What can your child do to make it stronger?

READ IT!

The Little Engine That Could by Watty Piper

MATERIALS

- Assorted objects that can be connected to one another, such as pipe cleaners, paper clips, rubber bands, and paper strips
- Measuring tapes
- *The Little Engine That Could* by Watty Piper

LEARNING GUIDELINES

Technology & Engineering #25. Explore and identify simple machines such as ramps, gears, wheels, pulleys, and levers through play experiences.

Keep it together

Peel and Stick

Children practice their fine motor and planning skills while having fun creating sticker art.

SETUP

- Set up the table with the stickers, tape, paper, and other materials. The stickers can be cut apart and lightly stuck to a table or chair edge. Hold the crayons and additional stickers aside for the extended activity.

DO IT!

- Start the children off with one blank piece of paper and a sheet of stickers. Based on their skill level, let them work with just pulling the stickers off the backing and sticking them on their blank sheet, or encourage them to create patterns. Ask them, "How many different kinds of patterns can you invent using the different colored rectangle and circle stickers? What different kinds of patterns can you come up with if you add in the tape pieces?"

- Have the children experiment with adhering the stickers to the other surfaces and peeling them off. You can ask, "What do the stickers stick to the best? What happens when you try to pull them off? Is there anything stuck to the sticker once you pull it off? Try sticking the stickers to each other. Can you pull them apart?" For fine motor development, peeling the stickers off can be even more challenging than adhering them.

DO MORE OF IT!

- Put the themed stickers and crayons out on the table, and have the children each pick a sheet of colored paper. Ask them to create a story picture by using some stickers and their own drawing. Offer to help with the writing if they would like their characters to say anything. As they work, ask them about their stories: "What is the frog doing in the pond? Do you have flowers like this at home? Tell me about the color you picked for the sky!"

REFLECTION AND DOCUMENTATION

- Have the children show one of their sticker papers to the group or talk about what they discovered when they were trying out the stickers on the different surfaces. Did they get more comfortable working with the stickers during the activity? What else would they like to do with the stickers?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Create opportunities for your child to make sticker art in all kinds of settings. This is a great activity to do while riding in the car, waiting in the pediatrician's office, or sitting at the kitchen table while you're cooking dinner. You can also collect themed stickers related to family activities and outings. For example, if you take a trip to the zoo, purchase some animal stickers so your child can think about and process the experience afterward in her own way.

READ IT!

- *Press Here* by Hervé Tullet

MATERIALS

- Assorted colorful stickers in various themes: such as shapes, foods, and animals
- Colorful tape: painter's, paper, patterned, washi
- Assorted paper: construction, copy, recycled
- Assorted other surfaces to practice sticking and peeling: glass container, metal box, sandpaper, furry and silky cloth, wood scraps
- Crayons

LEARNING GUIDELINES

Inquiry Skills #3. Identify and use simple tools appropriately to extend observations.

Keep it together

String It Along

Children explore the properties of connecting materials, such as string, yarn, and shoelaces, while they work on their fine motor and problem-solving skills by wrapping, weaving, and tying.

SETUP

- Set up the table with a plate for each child and many lengths of the connecting materials. Hold the Play-Doh, sticks, and beads aside for a more advanced activity.

DO IT!

- Talk with the children about all the things that we can do with string. See how long a list the group comes up with: tie things up (packages), tie things together (shoes), hold things up (belts), hang things (clotheslines), string things (bead necklaces). Let the children share examples of how string is used at home. Let them explore and play with the string: stretch it, pull on it, wrap it, bunch it up. **Safety note!** Don't let the children tie the string around anyone's body, especially around the neck or head.

- Try a paper plate weaving activity: Give each child a 1–2-inch piece of yarn or string and a paper plate. You can precut notches in the plates, or let the children make their own cuts all around the edges of the plate. Begin the weaving by tying a knot (or show the children who are ready how to make a simple knot), and start the string off at one of the notches. Let the children crisscross and weave in as simple or complex a design as they would like. Note: Crisscrossing the yarn is the precursor to learning to tie and make knots—a very important skill to practice!

DO MORE OF IT!

- As an extension activity, the children can make stick and yarn sculptures, using a Play-Doh ball on a paper plate as a base. Have the children pick out a few sticks and insert them into the Play-Doh. Then they can begin the process of wrapping, draping, weaving, and crisscrossing their yarn or string around the sticks. Younger children may start off with just two sticks in their Play-Doh and work on wrapping the yarn loosely around them. Older children may want to string some of the beads or find other materials, such as feathers, to weave into their creation.

REFLECTION AND DOCUMENTATION

- Have each child show one creation to the class and talk about the process of making it. What did the children have to really work at to accomplish? Did they learn anything new or try something that they'd like to do again?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Try creating a large-scale "web" at home by taking a cardboard box and cutting off the top and bottom pieces so you are left with a deep cardboard frame. Punch holes throughout the cardboard (a job for grown-ups), and invite your child to weave yarn or string from one side of the cardboard to the other. Provide different types and colors of string, yarn, caution tape, or ribbon, and suggest that your child add decorations and other materials, such as feathers, ribbon, and buttons into this great big 3-D web!

READ IT!

- *Extra Yarn* by Mac Barnett

MATERIALS

- Assorted stringlike connecting materials: string, yarn, shoelaces, narrow ribbon
- Scissors
- Paper or Styrofoam plates
- Play-Doh or air-dry clay
- Popsicle or natural wood sticks
- Large beads

LEARNING GUIDELINES

Technology & Engineering #24. Demonstrate and explain the safe and proper use of tools and materials.

Keep it together

What Keeps Things Together?

Children practice their fine motor gripping and manipulation skills while they explore tools that are used to hold things together. (Don't forget that glue and tape are tools, too!)

SETUP

- Set up the table with the tools and assorted materials to be picked up or held together. You can remind the children that their fingers are their first tools!

DO IT!

- Talk with the youngest children about what "holding something together" means. This can refer to simply picking something up (using your fingers as the tool) or actually attaching objects to one another with glue or tape. Have the children explore this on their own, using the materials and tools on the table. Ask them questions to assist their exploration, such as "How many ways can you use your hands to pick up the cotton ball?" or "How can you keep two cotton balls together?"

- Talk with the older children about the more advanced tools, such as pliers, tongs, and clothespins.

- All ages can create "trials" to test out their ideas and then share their results with the group. You can track the results in a list or graph on a newsprint chart or the board to see the variety of tactics the children have tried.

DO MORE OF IT!

- Let the children tinker with the materials and come up with their own ways of holding things together. Invite them to create art or decorations.

REFLECTION AND DOCUMENTATION

- Ask each child to show one of her creations to the group and describe or demonstrate what the holding tool is and how it is holding the materials. Have the children talk about their experience with "keeping things together." Did anything frustrate them? Surprise them? Do they have a favorite holding tool? What else would they like to try that they didn't get to use today?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Have your child walk around your home, yard, or neighborhood with her favorite holding tool (tongs, wire, clothespins) and see what she can pick up. Are there some objects that your child can't grasp? Why does she think that is?

READ IT!

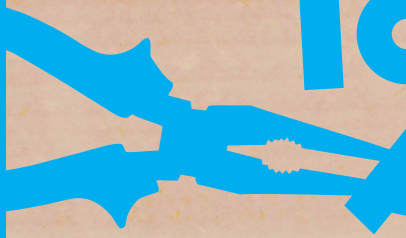
- *The Clothespin* by Miley Smiley

MATERIALS

- Glue sticks
- Tape
- Pliers
- Tongs
- Clothespins
- String
- Wire
- Assorted materials to put together, such as paper clips, cotton balls, paper

LEARNING GUIDELINES

Inquiry Skills #2. Make predictions about changes in materials or objects based on past experience.



Take Things Apart

We have all looked at a piece of machinery and wondered, “How the heck does that thing work?” Did you ever want to take something apart and get a good look at what makes it tick? Doing so is both fascinating and enlightening. Taking things apart not only teaches us about how things work, but it can demystify the inner workings of devices and encourage us to fix things ourselves when they cease working. This is the heart of tinkering: acting on our curiosity and seeing what we can figure out. The following activities provide children with the chance to take things apart, mess around, and really tinker with tools and materials.

Take Things Apart

Cut It Up!

Children practice their scissors skills while using their imaginations and creativity to explore a wide range of cutting activities.

SETUP

- Set up the table with a pair of scissors for each child and all of the other materials ready to be used in the appropriate sequence. Depending on the children's cutting skills, you can start with the simplest cutting activities or more difficult ones.

DO IT!

- The youngest children can start by rolling out Play-Doh "snakes" to practice their snipping. It's fine if the children are holding the scissors "wrong" until they get the satisfaction of cutting the dough and understand the concept of what the scissors can do. Once they have accomplished this, show them the right way to hold the scissors (thumb in the top hole, pointer in the lower hole, middle finger resting just below the rim of the lower hole to support the scissors).

- Next, hold a thin strip of paper tightly, and let the children cut "feather strokes" and snip until they can cut all the way through. Move up to wider strips, which will take more snips to make the full cut.

- Once the children have mastered cutting the paper strips on their own, let them practice cutting on lines. Start with a straight line drawn on blank paper. Progress up to curvy lines and geometric shapes with corners to turn. Throughout this process, support the children's progress by saying things like "Take your time! Scissors are tricky!" or "Wow, you're a good cutter!" Encourage the children to try cutting different shapes. Applaud every effort, even if the edges are rough.

DO MORE OF IT!

- Once they have mastered the basic cutting skills, the children can use their imaginations to make all kinds of paper-cut art. Start with the basic concept of folding paper in half, drawing half a box, cutting on those lines, and unfolding the paper to get the whole box.

REFLECTION AND DOCUMENTATION

- Have the children talk about their experience using scissors and cutting, no matter what level of skill they have achieved. What part of the activity did they really enjoy? Did they learn something new? What kind of cutting project would they like to try next? Have the children create a collaborative art work by putting all their cut paper together in one large cut-paper art installation.

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Making paper cutouts at home is a great way for children to participate in decorating for birthdays, holidays, or other special occasions. Encourage them to add layers and textures to their cutouts with sequins, buttons, ribbon, or glitter. Paper chains are easily made by linking strips of colorful paper and securing them with tape or glue.

READ IT!

- *My First Book of Cutting* (Kumon Workbooks)

MATERIALS

- Child-safe scissors (be sure to include left-hand scissors if needed)
- Play-Doh
- Blank paper: whole sheets and precut strips
- Markers
- Preprinted paper with lines to cut on and basic geometric shapes
- Assorted paper (colored, wrapping, tissue, origami)

LEARNING GUIDELINES

Technology & Engineering #24. Demonstrate and explain the safe and proper use of tools and materials.

Take Things Apart

Take It Out

Children practice the fine motor skills of pulling, prying, using levers, and unscrewing to remove objects from base materials, such as wood and Styrofoam.

SETUP

- Set up the table with the tools and all the materials. You can prepare the blocks ahead of time by inserting the nails, golf tees, and so on into the base materials.

DO IT!

- Talk with the children about different ways to "take something out," such as pulling, prying, using a lever, and unscrewing. Show them the different tools and ask, "Does anyone know what these are called or how they are used?" Invite the children to share their knowledge before you jump in and show them how the tools work. Safety note! Make sure you explain and demonstrate tool safety techniques to the children.

- Let the children practice using the tools, objects, and blocks. Younger children can practice using their fingers to push golf tees into blocks of Play-Doh or sponges and pull them out again. Remember, the harder the base material is, and the more tightly the object is secured in it, the more the children will get to work their hand muscles! Older children can practice using the screwdrivers or cat's claw to pry nails out of the wood blocks. You can ask questions such as "Which screwdriver works best to pry a nail out of the block? Which screwdriver is better for getting a screw out? Why?" Show the children a jar with a screw lid, and have them try screwing it on and off. Which direction does it go for on? For off?

DO MORE OF IT!

- Ask the children to use their fingers to pull screws out of the wood. Now have them use the screwdrivers. Do they notice a difference in how this works? Talk about how tools can make work easier. Can they think of some examples of this from their own lives, such as using a can opener instead of trying to open a can by hand?

- Have the children work with a partner, taking turns to create "things to take out" activities for each other. Encourage them to use their imaginations and look around the room for other materials and props to extend this activity.

REFLECTION AND DOCUMENTATION

- Have the children talk about the tools they used and what they used them for. Which tools were they most comfortable using? Least comfortable? What tools or materials at home would they like to try using?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Hunt around for tools your family uses. Let the children take the lead to show the grown-ups what can be done with them.

READ IT!

- *Tools Rule* by Aaron Meshen

MATERIALS

- Safety goggles
- Assorted simple tools, such as a hammer, flat and Phillips head screwdrivers, pliers, tongs, small cat's claw (pry bar), small claw hammer
- Base materials: blocks of soft wood (balsa or basswood) or harder wood (pine), Styrofoam, shoeboxes, sponges, Play-Doh
- Jars with screw lids
- Assorted items that can be pushed or pounded into the base material, such as nails, screws, golf tees, toothpicks, paper clips

LEARNING GUIDELINES

Technology & Engineering #25. Explore and identify simple machines such as ramps, gears, wheels, pulleys, and levers through play experiences.

Take Things Apart

Tweeze It

Children practice their pincer skills as a precursor to writing and mark making by picking objects up and pulling them apart using tweezers, tongs, and pliers.

SETUP

- Set up the table with the tools, materials, and containers, and provide a paper plate for each child to work on.

DO IT!

- Show the children all of the different pincer tools, and see if they can name them. You can also ask, "Do you have some of these tools at home? What does your family use them for?"

- Have the children practice their pincer skills by filling a wide-top container with pom-poms and then giving each child a sorting container and tool of her choice. Let the children pick up and sort the pom-poms into their sorting container. You can encourage the children to create their own games: for example, arrange the pom-poms from largest to smallest or separate them by color. A more challenging version of this game can be played using a mix of dried beans.

- Next, let the children explore the tools to pull things apart. The youngest children can use their hands or big tongs to pull apart cotton balls. Let the older children try out all of the tools on whichever items they would like. You can make suggestions, such as "See how many pieces you can pull the Styrofoam apart into. How small can you make the pieces?"

DO MORE OF IT!

- Have the children go on a nature walk and collect lots of different objects. Bring them back to the classroom, and let the children create their own trials to see which items can be taken apart with the pincer tools or their hands. It's OK if the children collect items that can't be taken apart. This is a great opportunity for them to try out their new skills, making guesses and learning from trial and error. Things to look for that would be exciting to take apart include milkweed pods, dried seedpods, and flowers with many parts.

- While the children are doing the activity, have them sort the objects into categories of things that can be taken apart and things that can't. At the end, see if they can come up with common characteristics for each group.

REFLECTION AND DOCUMENTATION

- Have the children talk about the tools they used and what they used them for. Did some tools work better for picking up or pulling apart certain objects? Which were they? Which pincer tools were the children's favorite?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Help your child explore your home, yard, or neighborhood for objects that can be "tweezed" apart. When your child has a good collection and has pulled as much apart as she would like, have her create collages with the pieces. This is also a good group activity, combining the experience of a collecting adventure, working on pincer skills, and creating art!

READ IT!

- *100th Day Worries* by Margery Cuyler

MATERIALS

- Assorted pincer tools: tweezers, tongs, spring-loaded pliers, and clothespins
- Assorted items to pick up or pull apart with pincer tools, such as cotton balls, pom-poms, beans, seed pods, Styrofoam packing peanuts, and uncooked past
- Wide-top containers to fill with activity pieces
- Sorting containers, such as egg cartons, ice cube trays, and muffin tins
- Paper plates for individual workstations

LEARNING GUIDELINES

Technology & Engineering #25. Explore and identify simple machines such as ramps, gears, wheels, pulleys, and levers through play experiences.

Take Things Apart

Use Your Tools

Children practice the fine motor skills of gripping, grasping, tearing, and pounding while exploring the engineering concepts of using tools to take things apart.

SETUP

- Set up the table with the tools and assorted materials to take apart or smash.

DO IT!

- Talk with the children about how taking something apart or smashing it down changes its shape or separates it into pieces. Show them the different tools, and ask, "Does anyone know what this is called or how it is used?" Invite the children to share their knowledge before you jump in with answers.

- Let the children practice using the pounding tools by setting up objects to pound into the blocks or taking them outside to pound golf tees into the dirt. Safety note! Make sure you explain and demonstrate tool safety techniques to the children. The youngest children can use their hands or small mallets to smash right into the Play-Doh. Note: A trick for keeping a nail steady and fingers safe is to hold the nail in place with a comb while hammering; the child can hold the comb while they practice their hammering technique.

- Next, let the children explore taking things apart. The youngest children can use their hands to pull the Play-Doh or cotton balls apart. Older children can try out the screwdrivers to break apart dirt outside and then smash it up into fine dust with the hammers.

DO MORE OF IT!

- Let the children continue to work with the materials and tools. Make suggestions to deepen their exploration. For example, you might ask, "How can you take this sponge apart? If you drive enough nails into the wood, will it split?"

- Have the children work with a partner, taking turns to create things for the other to take apart. For example, one child could make a paper clip chain for her partner

REFLECTION AND DOCUMENTATION

- Have the children talk about their experience taking things apart and pounding. Which activity did they enjoy the most? Which was their favorite tool or object for pounding? Did they discover something interesting to take apart?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- The fall is a great time to find pumpkins and other squashes to use in a hammering activity. Put out a large pumpkin or squash, lots of long golf tees, and a hammer. Let your child pound as many golf tees as she wants into the pumpkin. After a day or two, let her pull all the tees out of the pumpkin using a small pair of pliers. This is a great activity for building hand muscles and practicing fine motor skills.

READ IT!

- *Fix It/A Reparar* by Georgie Birkett

MATERIALS

- Safety goggles
- Assorted simple tools for breaking apart and pounding, such as hammers, rubber or wooden mallets, and flat-head screwdrivers
- Solid surfaces to pound objects into, such as Styrofoam, pine, balsa, or basswood blocks; shoeboxes, sponges, hard-packed dirt outside, and Play-Doh
- Assorted items that can be pushed or pounded into solid blocks, such as plastic-cap roofing nails, golf tees, and toothpicks
- Assorted items that can be taken apart or smashed with hands or tools, such as cotton balls, paper clips, paper, pinecones, and Play-Doh

LEARNING GUIDELINES

Technology & Engineering #25. Explore and identify simple machines such as ramps, gears, wheels, pulleys, and levers through play experiences.

Move it!

When children first learn to move things, they start with their own bodies: they roll around, jump up and down, and so on. Then they learn that they can move other things: they use their hands, their feet, their breath to explore how they can reorder the world just as they would like. Finally, they learn that there are tools that can help them move things that would otherwise be difficult. Learning how to use these tools and their own bodies to manipulate materials is an important part of tinkering and making. The following activities provide a great introduction for children to some of the different ways we move and manipulate things in the world around us.

Move it!

Balls and Ramps

Children explore tools used for making things roll while practicing their engineering skills by creating ramps and tracks for balls and other items.

SETUP

- Set up the blocks in one area of the floor, the flat surfaces as a collection nearby, and the rolling objects in a bin. Keep the textured materials aside for the extended activity.

DO IT!

- Introduce the activity by naming and showing the children the different materials. Ask them, "Have any of you ever slid down a slide? We are going to make slides, which are also called ramps, for these objects to roll down."

- Let the children explore the materials as they like; they may choose to work alone or in pairs or groups. This is an open-ended exploration activity, which you can support with questions such as "What can you do with the blocks and materials to make a ramp? Can you use the cardboard? The books? Do your objects roll or slide? Can you make the objects roll faster or slower by changing the ramp design?" The children can also experiment with the crown molding pieces to create a narrow, grooved track. "What is the difference between rolling objects down a flat surface versus the molding? Which objects roll in a straight line? Which wiggle or fall off the ramps?"

DO MORE OF IT!

- See if the children can change the direction of their rolling objects. "Can you make the Ping-Pong ball roll up instead of down by adding a wedge block to the bottom? Does another type of ball work better? Can you make the marble turn in another direction by changing the direction of the tracks, or does it just roll off?" If the children get stuck, show them how they can add a wall at the bottom that will force the marble to turn down a perpendicular track.

- Experiment with different textured surfaces by covering the ramps with cloth, sandpaper, or another material. Ask, "Can all of the objects still roll down the ramp? Do any of them slow down or stop? Why do some objects move differently down this ramp?"

REFLECTION AND DOCUMENTATION

- Have the children pick out one of their ramp designs, tell which objects they rolled down it, and explain what they discovered. What other objects would they like to try rolling? What other materials would they like to try for ramps?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Your child can explore your home, yard, or neighborhood for all kinds of ramp construction materials. Encourage your child to create a series of ramps and see how far an object will roll or how long it will stay on its track.

READ IT!

- *Roll, Slope, and Slide* by Michael Dahl

MATERIALS

- Blocks: flat and wedge-shaped
- Assorted flat surfaces: cardboard, baking trays, large books
- Assorted objects that can roll: marbles, Ping-Pong balls, golf balls, small toy cars
- Assorted textured materials to cover the ramps, such as cloth or sandpaper
- Crown molding cut into lengths of blocks. These will be used as ramps.

LEARNING GUIDELINES

The Physical Sciences #20. Investigate and describe or demonstrate various ways that objects can move.

Move it!

Obstacle Course

Children discover what their bodies can do and practice their gross motor skills as they work their way through an obstacle course.

SETUP

- For indoor play, set up an obstacle course using as many props as will fit your space. For outdoor play, set up a similar course making use of outdoor equipment and natural obstacles.

DO IT!

- Ask the children if they've ever played in an obstacle course. What did their hands do? What did their feet do? What did they move using their bodies? While you are discussing their experiences, they can stand up and show how they wriggled, turned, pushed, or pulled.
- One grown-up can demonstrate how to go through the obstacle course and then let the children try it one by one. Encourage them by using vocabulary words; for example, "Go around the cones and under the limbo stick; kick the ball, swing the hula hoops, and push or carry the boxes to the table by the window." Safety note! Obstacle courses can have some dangerous parts; make sure that you have tested all of the equipment so you know it will work properly. Also, this activity is intended as a full-body exploration of movement, so make sure you keep it fun and noncompetitive.
- Ask, "What are your hands doing? What are your feet doing?" Help children become aware of their hands moving the cones or their feet kicking the ball.

DO MORE OF IT!

- Let the children set up their own obstacle courses, and have them pretend to be the "teacher" as they show their classmates how to go through them. Remind them to describe and show each step using phrases such as "First, you climb over the step stool. Then you balance on the long wooden block on the floor." Make sure you monitor their setups so there is nothing unsafe in the course.

REFLECTION AND DOCUMENTATION

- Have each child talk about her experience using her body to interact with the obstacles and props. What movements did her body make? Have the children take turns calling out, "I kicked the ball with my feet! I moved the cones with my hands!"

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Expand this activity at home by creating an obstacle course around your home, yard, or neighborhood. Children can search for objects that they would like to include and can help set up the course. Go through the obstacle course along with your child, and encourage her to shout out as she goes: "I can climb up this step stool using my legs and feet! I can carry this ball and drop it into the net with my hands!" Safety note! Make sure everything your child sets up is appropriate to use and is safe.

READ IT!

- *Walking through the Jungle* by Stella Blackstone

MATERIALS

- Boxes of assorted sizes, from shoeboxes to large packing boxes
- Hula-Hoops
- Cones or big plastic bottles
- Balls
- Limbo sticks
- Yoga mats

LEARNING GUIDELINES

Shapes & Spatial Sense #11. Explore and identify space, direction, movement, relative position, and size using body movement and concrete objects.

Move it!

Pom-Pom Race

Children explore the properties of air and wind to learn how air can move things, while they practice their fine motor and blowing skills having a pom-pom race.

SETUP

- For indoor play, assemble all the materials. For outdoor play, go outside together on a windy day and bring the assorted objects in a container.

DO IT!

- For indoor play, ask the children to blow on their hands and wave them in the air. Ask them, "What do you feel? Blow hard, and then blow gently. Wave hard, and then wave gently. Does that change what you feel?" Talk about what air is. "Can you see air? Can you hold it?" Let them experiment with blowing on the different objects. Ask, "What happens to the object when you blow on it? Does a feather respond to your breath the same way a rock does?" They can also try blowing on the same objects with the straws. Talk with the children about how air becomes wind when you blow it and about how wind can push things.

- For outdoor play, let the children feel the wind on their hands and bodies, and ask them if they can see the wind. Ask them, "How do you know it's blowing? What does it do to objects and the people around you? What does it do to the trees? To flags? To electric wires? How do you know which direction it's blowing?" Ask them to listen to the wind. "Does it make a sound?" Then let the children experiment with the assorted objects by dropping them onto the ground. Ask them to describe what they see. Ask, "Which of the objects float? Which fall to the ground? Why do you think that is?"

DO MORE OF IT!

- Make a pom-pom race game by sticking painter's tape on the floor or on a tabletop to create a track. The track can be wider for younger children and narrower for older children. Set the children up with straws and pom-poms at the start of the track, and see how fast they can blow their pom-poms to the finish line and how far they can blow them in each round. For more challenges, try other kinds of objects, such as a cork or a paper ball.

REFLECTION AND DOCUMENTATION

- Have the children talk about their experience feeling, making, and using the wind to push objects. Did anything surprise them? What part of this activity did they really enjoy doing? Are there other kinds of experiments they would like to do with wind?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Expand this activity at home by lining up floating toys in a bathtub or a sink. You can use floating bath toys, or you can make your own boats out of tinfoil. Have your child use a straw to blow the toy across the water. Do this a few times, blowing harder and more gently. Ask your child what happens when she blows on the toy. See if she notices if the toy moves, stays still, falls over, or goes faster. Your child can also experiment with changing the shape of the tinfoil boat to help it catch more wind or not tip over as easily.

READ IT!

- *Face the Wind* by Vicki Cobb

MATERIALS

- Assorted objects to blow on: feathers, corks, paper, salt, rocks
- Painter's tape
- Pom-poms in different sizes
- Straws
- Measuring tapes

LEARNING GUIDELINES

Earth & Space Sciences
#6. Explore and discuss what air is or does.

Move it!

Straw Rockets

Children explore the properties of air and wind to see how air can move things, while they practice their direction-following skills and make rockets.

SETUP

- Set out the materials on a table.

DO IT!

- Demonstrate how to make the rocket. Begin by rolling a paper rectangle loosely around the straw and taping the paper at the top and bottom so it stays together. Then make a cone out of a paper circle, secure it with tape, and attach it to the end of the paper cylinder with two more pieces of tape. This is the nose of the rocket. Place the paper rocket on one end of the straw, and blow through the other end. The rocket should take off!

- Let the children do as much of the material preparation and rocket assembly as possible. Younger children may only be able to help with the rolling or taping; older children may be able to cut, wrap, and tape.

DO MORE OF IT!

- Once the children have mastered the process of making their rockets, introduce an assortment of tubes that can act as rocket launchers. Let the children figure out what size paper they'll need to wrap around them and what size to make the cones. When they're finished, they can even take the rockets outside to test their results. You can ask questions such as "Which tubes are the easiest to use? Which fly the farthest? Why do you think that is?"

- Next, the children can experiment with different weights of paper, or they can tape triangle-shaped fins to the tail of the rocket. How do these changes affect the flight of their rockets? You can ask, "Do the rockets fly better indoors or outside? Why do you think that is?"

REFLECTION AND DOCUMENTATION

- Have each child show one of his rockets to the class and talk about the process of making it. Did anything surprise the children about this activity? What part did they particularly enjoy? Are there any other kinds of materials they would like to try out, or any other types of "flying machines" they would like to make?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Read the book *Hedgie Blasts Off* to your child, and talk about the rocket Hedgie rides in. How is it the same or different from the Straw Rocket? Let your child use his imagination to design his own fleet of rockets with construction paper, tape, and markers. These rockets don't have to be able to fly; this activity is based on making a personal, creative connection to the things your child has learned.

READ IT!

- *Hedgie Blasts Off* by Jan Brett

MATERIALS

- Straws
- Assorted tubes
- Rectangular pieces of multipurpose paper, half the length of the straw and about 3 inches wide
- Circular pieces of multipurpose paper for the nose of the rocket, about 1.5 inches in diameter, with one slit cut from the edge to the center
- Different weights of paper; construction, tissue, cardstock
- Clear tape
- Scissors

LEARNING GUIDELINES

Earth & Space Sciences
#6. Explore and discuss what air is or does.

Make a Mark

Measure twice, cut once. The missing part of this adage goes right in the middle: “Mark carefully.” Fine motor skills are some of the most important skills required to make and engineer things. With younger children especially, working on these fine motor skills is a critical step toward using more interesting tools and materials. The following activities help children work on the fine motor skills that they will need later when they are using more complex tools to make awesome stuff.

Make a Mark

Crayon Rubbings

Children practice their fine motor, creative, and critical-thinking skills while discovering what happens when crayon is rubbed on paper over a variety of surfaces and textured materials.

SETUP

- Set up the table with the crayons, paper, and a selection of objects to rub over.

DO IT!

- Have each child pick a crayon and a piece of paper, and let him experiment with rubbing the crayon over the paper. Let the children compare rubbing with the side of the crayon with creating more linear marks with the tip. Once they are comfortable with the technique, have them select an object to put under their paper. Help them figure out how to anchor the object so it doesn't slide around when they start their crayon rubbing.

- Encourage the children to make markings with the other objects. If they seem stuck, ask them questions to lead them to find their own solutions. Ask, for example, "Can you hold the crayon differently or press more heavily or lightly? Does one type of paper work better than another?"

DO MORE OF IT!

- Have the children experiment with all the objects to create other kinds of surfaces to make rubbings over: bunch up a rubber band, make shapes such as circles out of the pipe cleaners, or link the paper clips. The children can also try using different kinds of paper or other flat materials for the rubbing surface. How does aluminum foil work? Cloth? Newspaper?

REFLECTION AND DOCUMENTATION

- Have each child show one of his rubbings and talk about his exploration process. Which object did he start with? How easy or difficult was it to get the object to stay anchored under the paper? Do they have a favorite object that they used? Is there something else they would have liked to try that wasn't in the kit today?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- With your child, look around the house or yard for other kinds of objects to use for rubbings. Note: You can make your own paperless crayons by peeling the paper off regular crayons.

READ IT!

- *The Crayon Box That Talked* by Shane Derolf

MATERIALS

- Paperless crayons
- Assorted paper for crayon rubbing
- Assorted objects to rub over, such as pipe cleaners, paper clips, and string

LEARNING GUIDELINES

The Physical Sciences #18. Manipulate a wide variety of familiar and unfamiliar objects to observe, describe, and compare their properties using appropriate language.

Make a Mark

Make an Impression

Children practice their fine motor, hand-eye, creative, and critical-thinking skills while discovering the kinds of impressions they can make when different types of "tools" are pushed into or scratched across a variety of surfaces.

SETUP

- Set up the table with an assortment of the tools at one end (hammers, pliers, screwdrivers) and materials to make "impressions" in at the other.
- Safety note! Model how to wear safety goggles and explain why it's important to wear them when working with tools such as hammers.
- Review each of the tools, including its name, what it's used for, and how to hold it. Give the children an opportunity to hold, handle, and manipulate each one.

DO IT!

- For younger children, start with a simple activity. Give each child a lump of Play-Doh, and instruct the children to make all kinds of impressions using their fingers. Let them experiment with using one finger, more than one finger, the sides and tips of their fingers, and their fists to come up with different impressions.
- The next step for the younger children could be to pick from the objects and squish, poke, press, or mash them into their Play-Doh. Older children will also enjoy doing this activity. You can ask all of the children questions such as "How easy or hard it is to push the pipe cleaner into the Play-Doh, and what kinds of shapes or patterns does it make?" For example, pushing a cotton ball into the Play-Doh could create a "feathery" pattern, while poking a toothpick in will create a skinny hole.
- Children will especially enjoy using the hammer (a "real" tool) to smash or poke holes in the Play-Doh. Safety note! Make sure they are using the tools correctly, so they don't hurt their fingers.

DO MORE OF IT!

- Encourage the children to investigate scratching. "How many ways can you use a paperclip to scratch into paper, Styrofoam, or wood? Do you get different results?"

REFLECTION AND DOCUMENTATION

- Have each child demonstrate how she created one of her impressions and talk about her exploration process. Which objects did the children start with? How easy or difficult was it to make an impression? What do the children like about their impressions?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Have your child color a piece of paper completely with crayons and then color over the whole sheet with black crayon. Finally, have your child choose a sharp tool, such as an unfolded paper clip, and lightly scratch into the black crayon to reveal the colors underneath. She can make a whole new drawing using this method of "revealing" what is under the black crayon surface.

READ IT!

- *Dinosaur Tracks* by Kathleen Weidner Zoehfeld

MATERIALS

- Hammer
- Pliers
- Screwdrivers
- Construction paper (can be cut into halves or quarters or left whole)
- Cotton balls
- Golf tees
- Paper clips
- Pipe cleaners
- Play-Doh
- Styrofoam or balsa or basswood
- Toothpicks
- Wire
- Goggles

LEARNING GUIDELINES

Technology & Engineering #24. Demonstrate and explain the safe and proper use of tools and materials.

Make a Mark

Printing and Stamping

Children have an opportunity to experience sensory stimulation and to practice their fine motor, creative, and critical-thinking skills while exploring how to use ink or paint with a variety of objects to make prints on different surfaces.

SETUP

- Set up the table with inkpads, small flat dishes of paint, and enough varied materials so children can make different choices throughout the activity.

DO IT!

- Give each child a piece of paper, and have the children pick an object and either an ink pad or a paint dish. Have them experiment with dipping their object and creating a print on their paper. Let them thoroughly explore all of the different things they can do with their first object to make a print. For example, children can hold a cotton ball lightly, dip it quickly, and then press it lightly on the paper; they can saturate the cotton ball and push it firmly onto the paper; or they can saturate the cotton ball, squeeze out the excess paint into the bowl, and then make an imprint.

- Younger children can start by using their fingers to make prints. Once they are comfortable handling the ink or paint on a simple surface, let them select an object to experiment with. All ages can continue to explore objects and printing and stamping.

DO MORE OF IT!

- Encourage the exploration by asking questions, such as "Can you dip a pipe cleaner into the paint and make a print onto a cotton ball? Can you roll the miniature car across the ink pad and make "tire tracks" on the paper? Does dipping the car lightly into the paint work better? Try bunching up a rubber band; can you print with that?"

- Try using different kinds of paper or other flat materials for the printing surface. Ask, "How does aluminum foil work? Cloth? Newspaper? Plain white paper? Cardboard? Do some surfaces take the paint or ink better than others? Why do you think that is?"

REFLECTION AND DOCUMENTATION

- Have each child show one of his prints and talk about his exploration process. Which object did the children start with for their printmaking? How easy or difficult was it to get the ink or paint to stay on the object? Which object was their favorite to use? Is there something else they would like to try?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- With your child, look around your home or yard for other kinds of objects to use for printmaking and other surfaces to print onto. Experiment with other types of paint, such as finger paint, crushed berries or colorful flowers, oil, or vinegar.

- Create a family mural. Start with a large sheet of newsprint, and decide as a group how to divide up the sections. Then each person can make prints of their own design. You can "sign" your names by doing hand stamps as well!

READ IT!

- *The Dot* by Peter Reynolds

MATERIALS

- Construction paper (can be cut into halves or quarters or left whole)
- Cotton balls
- Ink pads
- Miniature cars
- Paint (in small, flat, open bowls)
- Ping-Pong balls
- Pipe cleaners
- Rubber bands
- Shoelaces
- Sponges
- Straws
- String

LEARNING GUIDELINES

Inquiry Skills #2. Make predictions about changes in materials or objects based on past experience.

Make a Mark

What Can You Mark?

Children practice their fine motor, gripping, and writing skills while exploring crayons and how they mark on a variety of surfaces.

SETUP

- Set up the table with a mix of crayons and materials for children to explore.

DO IT!

- Have each child choose a crayon and one piece of paper. Let the children begin by marking on the paper. Encourage them to try different pressures (light, heavy), different parts of the crayon (side, flat end, tip), different methods of marking (drawing lines, squiggles, or zigzags; "pecking" dots; rubbing whole areas), and different ways of holding the crayon (gripping with full fist, holding like a pencil). For the younger children, the goal for this activity may be to practice handling and using the crayon in different ways.

- For older children, this activity can be expanded by encouraging them to use the crayon to try to mark on other materials. Ask the children, "Why do you think you can make a crayon mark on some materials but not others? Does it make a difference how you hold the crayon or how hard you push down (or how lightly)? Try marking on the tissue paper; what happens if you push down too hard?"

DO MORE OF IT!

- Have the children suggest other materials to use, and let them try them out.

- Have the children try making marks on materials that are the same colors as their crayons. Ask them, "Does this work? Can you see the mark you made? Does it depend on the material or on how you use the crayon?"

REFLECTION AND DOCUMENTATION

- Have the children show a sample of their work and describe their process of exploration and discovery. What parts of the activity were challenging? Surprising? Is there something they didn't get to try, or other materials they would like to use?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Have your child explore your home, yard, or other environment to find materials to mark. These could include wood, plexiglass, glass, cloth, metal, stone, or tile.

- Expand out to other marking tools: markers, paint, chalk. Let your child try marking a variety of surfaces with these tools.

READ IT!

- *Harold and the Purple Crayon* by Crockett Johnson

MATERIALS

- Paperless crayons
- Assorted materials for marking, such as construction paper, tissue paper, and Styrofoam

LEARNING GUIDELINES

Inquiry Skills #1. Ask and seek out answers to questions about objects and events with the assistance of interested adults.

Mix it up

Experimenting and thinking creatively are cornerstone skills for making and engineering. When children have the freedom to conduct open investigations, they begin to understand that problems can have multiple solutions—an understanding that bolsters both problem solving and perseverance skills. Giving children the chance to mess about, mix things up, and see what the results are gets them in the tinkerer mind-set and helps them develop into makers. In the following activities, children mix things up, mess about, and get those tinkering juices flowing.

Mix it Up

Making Soup

Children familiarize themselves with concepts of measurement while using their creativity and comparison skills to create mixtures of pretend soup.

SETUP

- Set out a toy pot or bowl for each child, and put the soup "ingredients" (materials) in open-top containers so they are easy to see and remove. The construction paper and scissors can remain on the table.

DO IT!

- Talk with the children about measuring and mixing ingredients to make their soup. Do they help their caregivers cook at home? Have they ever used a measuring cup or spoon? Show them the cups and spoons, and describe how to use them. Point out the numbers on the cups, and talk about what they mean. Let the children start the activity by experimenting with just putting objects into the cups to see how many make a half cup or a full cup.

* Next, have them think about their soups. What ingredients would they like to use? How many servings would they like to create? For example, if they are going to serve four people a soup of Ping-Pong balls and screws, how many of each item would they like their guests to have? This is a great opportunity to use the concept of comparison. Have the children compare how many Ping-Pong balls and how many screws can fit into a whole cup and discuss why that is. How are the ingredients similar? How are they different?

- Younger children can just put the items into the measuring cups and then drop or dump them into their pots. Encourage them to mix up the ingredients with tongs, frozen treat sticks, or spoons so they start to understand how the different shapes and weights of objects affect how they behave when stirred.

DO MORE OF IT!

- If the children are having trouble deciding what ingredients to include, make suggestions by asking, "Can you make a pointy soup?" This could include nails, screws, golf tees, and toothpicks. Or ask, "Can you make a paper soup?" This could include construction paper and tissue paper.

REFLECTION AND DOCUMENTATION

- Ask the children to talk about their experience making their soup and why they chose their ingredients. Did they come up with any ideas for fitting more ingredients into the soup pot?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Help your child look around your house, yard, or neighborhood for other types of soup ingredients. Create themes and look for ingredients to make a nature soup, for example, or a blue soup. Have your child invite her friends or stuffed animals for a soup dinner party and dress up with the theme in mind.

READ IT!

- *Stone Soup* by Marcia Brown

MATERIALS

- Pretend soup pots
- Pretend soup bowls
- Props for stirring and cooking, such as tongs, frozen treat sticks, and wooden spoons
- A variety of objects that can be used as props for soup "ingredients," such as Ping-Pong balls, paper clips, rubber bands, and tissue paper
- Measuring cups
- Measuring spoons
- Construction paper
- Scissors

LEARNING GUIDELINES

Measurement #14. Use nonstandard units to measure length, weight, and amount of content in familiar objects.

Mix it Up

Measure Up!

Children familiarize themselves with concepts of measurement and number sense while learning to use measuring tools.

SETUP

- Set up the table with containers of objects, crayons or markers, and enough measuring tools for partners to share

DO IT!

- Talk with the children about measuring and the measuring tools on the table. Show them how the flexible tape can be used to measure different-shaped objects. Safety note! Show the children how to use the retractable measuring tape safely so they don't cut their fingers or have it snap back suddenly. Make sure you practice with younger children the first time they use it.

- Help the children begin to visualize the concepts of numbers and quantity by having them choose a set of objects to line up next on the table. Introduce the concepts of more and fewer, bigger and smaller, by asking questions such as "Whose object is the longest? Whose is the shortest? Who has more objects? Who has fewer?" For younger children, doing this lots of times with a variety of objects to compare can be the whole activity.

DO MORE OF IT!

- Have each child lie down on a body-sized piece of paper. With younger children, you can trace their outline. With older children, let them trace another child's outline. The outline can be just the outside contours of their body. Let them choose a measuring tape, a yardstick, or a ruler to measure their body outlines.

- Younger children can "measure" different parts of their bodies with the objects. You can have them try this by lining up the straws so they equal their leg, or ask, "How many cotton balls fit around your hand?" The older children can work with the measuring tools to measure their outlines. Encourage them to figure out which areas are more easily measured by the retractable measuring tape and which the flexible tape is best for. You can also create a class chart showing different measurements and making comparisons.

REFLECTION AND DOCUMENTATION

- Ask the children to talk about their experience measuring. "Which measuring tool worked best for you? What were the longest and shortest things that you measured?"

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Help your child find all of the measuring tools you have at home and use them to measure objects in your house, yard, or neighborhood.

- Create a measurement scavenger hunt. Pick one small object, and ask your child to find things that are longer, shorter, or the same size. Make sure to include 3-D objects that your child can measure around!

READ IT!

- *Actual Size* by Steve Jenkins

MATERIALS

- Measuring tools, such as retractable and flexible measuring tapes, rulers, and yardsticks
- A variety of objects that can be measured, such as cotton balls, crayons, miniature cars, and paper clips
- Crayons or markers
- Body-sized pieces of paper (cut large pieces from a paper roll, or tape newsprint sheets together)

LEARNING GUIDELINES

Measurement #14. Use nonstandard units to measure length, weight, and amount of content in familiar objects.

Mix it Up

Mystery Bag!

Children familiarize themselves with the physical characteristics of tools while working on their sensory recognition skills, using their sense of touch to identify and understand objects.

SETUP

- Create the Mystery Bags by putting three or four different objects in each bag. Make sure there is a mix of tools and non-tool items.

DO IT!

- Have the children put one hand in the bag, feel around, and name two things that they feel. If they don't recognize the objects by just feeling them, have them share their sensory observations. To describe a pipe cleaner, for example, a child might say, "I feel a furry texture around a skinny bendable inside." Once the children have identified everything they can, they can empty out their bags and talk about and use each of the items. Talk with them about what the objects are, what they do, and what their characteristics are. Support their observations with questions such as "Why do you think the pliers have such a pointy nose? How does a rubber band hold things together?" Let the children try out the tools; for example, have them stretch out the rubber band to pull straws together into a bundle.

DO MORE OF IT!

- Have the children put the objects back into their bags and then try again to identify each one, having become familiar with the items from the previous exercise. If there are some objects they still can't identify, let them describe them out loud again and really concentrate on what they saw and felt and what they feel now. Other children can help out with this step if needed.

- Provide one group of children with a new assortment of tools and non-tool items, which they can put into bags for their classmates to identify. Let them be the "teachers" and lead the exercise with good questions and clues.

REFLECTION AND DOCUMENTATION

- Have the children talk about their experience with the Mystery Bags. Were there certain items that everyone had trouble identifying? Some that were super easy? Why do they think that is? What were the characteristics and uses of the different tools?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- With your child, explore your home, yard, or neighborhood for other types of tools and non-tool items to put into a Mystery Bag. Have your child play this game with friends, family members, or caregivers and take turns being the "teacher" and the "explorer." Try it out with themes, for example items related to someone's hobby or work. Note: you can also use a shoebox with a hole in the top for the container.

READ IT!

- *The Mitten* by Jan Brett

MATERIALS

- Cloth bags with drawstrings, recycled gift bags, or lunch-sized brown paper bags (one per child

- Assorted tools and other objects to put in the Mystery Bags, such as cotton balls, clothespins, paper clips, and rubber bands

LEARNING GUIDELINES

Technology and Engineering #24. Demonstrate and explain the safe and proper use of tools and materials.

Mix it Up

Shape It Up!

Children practice their early writing and scissors skills by tracing, drawing, and cutting out familiar shapes.

SETUP

- Set up the table with the stencils, paper, scissors, tape, and crayons or markers. Make sure the children are seated around the table with enough room to move their arms comfortably while tracing. Set up the Color Zoo book nearby for children to look through and use as a reference.

DO IT!

- Let younger children begin the activity by picking a shape to hold. Just handling the object is an important step in learning about shapes. If they are ready to trace, let them choose a geometric shape. Let older children try to draw the shapes freehand and then cut them out.

- Cutting proficiency will vary. The youngest children may simply make little "feathering" snips at the edges while you hold the paper, while the oldest may be able to cut out a complex shape. You can support their efforts by saying things like "Take your time, scissors are tricky!" and "Wow, you're a good cutter!"

- Be sure to name each shape as you talk with the children. You can ask, for example, "Is anyone working on a big circle? How about a little circle? Can anyone draw a triangle?"

DO MORE OF IT!

- As the children are finishing their shapes, you can read aloud or show them the pictures in Color Zoo. Talk about how they can combine shapes to form new shapes—even animals, cars, or houses! Ask if anyone can combine their triangles to make a square or put two small triangles on a circle to make a cat's face.

REFLECTION AND DOCUMENTATION

- Have the children show some of their finished shapes to the group and talk about the process of creating them. What was their favorite shape to cut out? Did they invent a new shape? Was the activity fun or surprising? What was difficult about it?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Let your child look around your home for all kinds of objects to trace, such as books, jar lids, and jewelry. See what kinds of art he can create with his shapes. Let him glue shapes together to form abstract art!

READ IT!

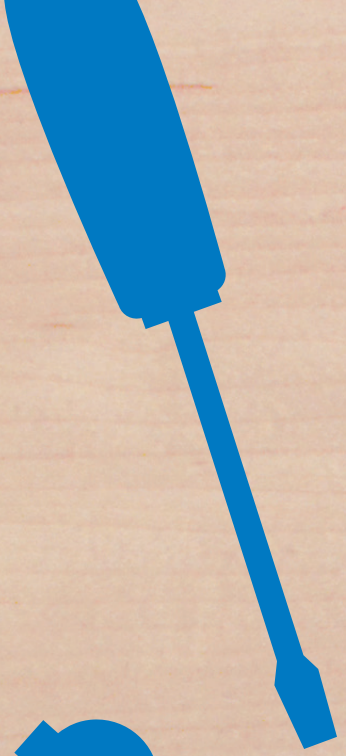
- *Round is Tortilla* by Roseann Thong

MATERIALS

- Paper stencils: cut out a circle, square, triangle, rectangle, oval, and diamond from cardstock, paper plates, or clean Styrofoam produce trays
- Paper for drawing and cutting
- Child-safe scissors
- Tape
- Crayons or markers
- Color Zoo by Lois Ehlert (for use during the activity)

LEARNING GUIDELINES

Shapes & Spatial Sense #10. Investigate and identify materials of various shapes, using appropriate language.



Build it!

To build things, children need to understand the best tools to use for a given challenge, the most appropriate materials to select, and the strongest connecting techniques. They are asked to solve a series of problems, get creative, and work together. Building things challenges children to think, observe, and persevere. And maybe most importantly, building things is satisfying and fun. The following activities challenge children to build things and use all of the tinkering skills they have been developing.

Build it!

Bridges

As they design and build bridges, children have an opportunity to practice their engineering skills through hands-on experimentation with materials and weights.

SETUP

- Set up the table with 6 paper strips and a container for each pair of children.

DO IT!

- Talk with the children about bridges they have seen or driven over. Can they remember what they look like? What shapes they've seen in them? Do they have a favorite bridge?
- Give each pair of children a few paper strips and invite them to construct a bridge that will go over the top of their container. Younger children can use the tape to help anchor their bridge. Let the older children work out how to use just the paper to make a stable support.
- When the children have constructed their bridges, they can experiment with different weights to see how much their bridge can support. If the bridge collapses after placing a weight on it, suggest that the children experiment with other kinds of weights or try rebuilding their bridge. You can ask, "Why do you think the bridge collapsed? What could you do differently?" If the children are having trouble creating their bridges, suggest modifications such as folding, crumpling, or tearing their paper.

DO MORE OF IT!

- Make suggestions that extend the activity. For example, ask, "Can you build a bridge with an arch or railings?"
- Use building materials of all types, such as blocks, boxes, or recycled items, to encourage the children to explore different kinds of bridge building. How many ways can they build supports, and how many types of bridges can they build across them?

REFLECTION AND DOCUMENTATION

- Encourage the children to talk about their bridge-building experience. Did anything surprise them? Frustrate them? Did they try more than one style of paper design or experiment with different weights?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Take this activity home by experimenting with many types of paper (newspaper, wrapping paper, construction paper), using a variety of household items to try out as weights (corks, small toys, buttons, straws), and using larger or smaller containers, rocks, or pieces of wood for the bridge to cross.

READ IT!

- *The Three Little Javelinas* by Susan Lowell

MATERIALS

- Paper, 8½ x 11-inch sheets cut into thirds lengthwise.
- Scissors
- Tape
- Empty storage containers or small buckets that are less than 8 inches across the top
- Small weights such as plastic animals, washers, pennies, or bottle caps

LEARNING GUIDELINES

The Physical Sciences #22. Experiment with a variety of objects to determine when the objects can stand and ways that objects can be balanced.

Build it!

Funstruction

Children have an opportunity to practice their creative problem-solving and engineering skills while using their imaginations to build 3-D sculptures out of six familiar materials.

SETUP

- Set up the table with a paper plate base for each child and the project materials in easy-to-reach containers. Divide the Play-Doh into portions ahead of time.

DO IT!

- Have the children freely explore the materials, suggesting that they use the pipe cleaners, straws, etc., to build a structure with the Play-Doh as a base. These are fun, familiar materials being "repurposed" for new uses, an excellent way to promote children to think unconventionally and exercise their creative problem-solving skills.

- Younger children can start off by simply poking the straws into the Play-Doh on their plates. As a next step, suggest that they work on pushing pipe cleaners through the straws or dropping toothpicks into the straws.

- Older children can work with the pipe cleaners, rubber bands, and paper clips from their Play-Doh base to see how they can attach them, use them to hold items together, and build up a 3-D structure.

DO MORE OF IT!

- Have the children work as partners to see what new ideas they can come up with together. Can they find a way to attach their two individual structures?

- Encourage the children to fully explore different ways to work with their materials. Ask, "Can you change the shape of the Play-Doh, paper clips, pipe cleaners, or toothpicks to create new shapes and structures? What can you do if you break your toothpicks into smaller pieces? Can you try just bending them without fully breaking them? Can you roll the Play-Doh into a snake and create a line of structures sticking up from that base?"

REFLECTION AND DOCUMENTATION

- Encourage the children to talk about their structures and their building experience. Did anything surprise them? Frustrate them? Did they think of a new way to use or change their materials?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Adapt this activity by looking for new ways to use everyday materials. Think of how common items can be reused or repurposed. For example, old shirts can be cut up and used as disposable cleaning rags; individual socks can become hand puppets by drawing faces on them with magic markers; old baby wipe containers or tissue boxes can be decorated and used to sort and store mail.

READ IT!

- *Perfect Square* by Michael Hall

MATERIALS

- Paper plates, one to serve as an activity base for each child
- Play-Doh (enough for each child to have 1/3–1/2 can)
- Pipe cleaners
- Straws
- Paper clips
- Toothpicks
- Small rubber bands

LEARNING GUIDELINES

Technology and Engineering #23. Explore and describe a wide variety of natural and man-made materials through sensory experiences.

Build it!

Neighborhood

Children have the opportunity to practice their cutting, folding, and gluing skills while they explore how to design and build familiar neighborhood structures, such as a house, school, or fire station.

SETUP

- Set up the table or a flat, stable surface (such as the floor) as the foundation on which children will build. At each child's place, have a sheet of construction paper, a glue stick, and a pair of scissors. Cover the table or floor with newspaper or plastic if you need to protect it.

DO IT!

- For the youngest children, supply precut paper squares and rectangles. Demonstrate how to bend and fold the paper. Let them explore and practice folding paper into different shapes. Look to see if some of the shapes could be used perpendicular to the table or floor and attached to the flat surface to begin building something. Let them explore attaching one folded paper to another to create a "building."

- For older children, demonstrate the technique, and then let them cut and fold the paper themselves. Encourage them to create their own designs by manipulating the paper in many ways; ask them questions such as "How big a folded base do you need for the wall to stay up? Can you make a two-story building? Can you use one strip of paper to make a walls or a roof?"

DO MORE OF IT!

- Encourage the children to experiment with all of the materials to create other kinds of structures or to add to the ones they are working on. Ask, "Can the tissue paper become part of your structure? How could you use paper clips or wire to help support the building? Where could the straws be added? How could you use tape instead of glue?"

REFLECTION AND DOCUMENTATION

- Have the children talk about their exploration process. Which type of building did they start with? How easy or difficult was it to get the paper folded and anchored to the base? What other materials did they incorporate, and how well did they work? Is there something else they'd like to try that wasn't in the activity today?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Your child can create her own set of buildings on a piece of recycled poster board, foam core board, or heavy cardboard and then add roads, sidewalks, or paths drawn with markers or delineated with tape. She can incorporate little people, animals, or cars to make her setup into a busy little neighborhood!

- Go for a "collecting" trip around your home, neighborhood, or park. See what kinds of materials your child can find to add to her creation, such as dried plants for little trees, gravel for giant rocks, or scraps of cloth to decorate the buildings.

READ IT!

- *Building a House* by Byron Barton

MATERIALS

- Painter's tape
- Construction paper (can be cut in half or left whole)
- Glue sticks
- Measuring tape or ruler
- Paper clips
- Rubber bands
- Scissors
- Straws
- Tissue paper

LEARNING GUIDELINES

Technology & Engineering #25. Explore and identify simple machines such as ramps, gears, wheels, pulleys, and levers through play experiences.

Build it!

Recycle Art

Children use their fine motor, building, and design skills to construct 3-D sculptures from recycled household materials.

SETUP

- Set up the table with the paper, containers of materials, glue sticks, and scissors. Give each child a paper plate or piece of cardboard to build his sculpture on.

DO IT!

- Invite the children to explore and handle the materials as they choose what to use. Younger children may spend the entire time just playing with the materials. This is an important learning experience by itself! Help the children get started by asking questions such as "Which material would you like to start with? How will you attach it to the base?"

- Encourage different ways to handle the materials. Ask, "Can you try scrunching, tearing, or folding your paper instead of cutting it? Can you make your paper into a tent? An arch? A fan?" See if the children can build up and out. "Could you use the felt to make your project taller? How could you add cork or buttons to make your project wider?"

DO MORE OF IT!

- Introduce the hole punch as another tool; the children may want to punch holes to weave the yarn or ribbon through for hanging their finished project. See if they can also find a use for the punched-out paper.

REFLECTION AND DOCUMENTATION

- Ask the children to talk about their sculpture and their experience building it. Was there a material they especially liked using? Is there any special significance to the individual pieces? Were the children surprised by anything they discovered? Is there another material they would like to try that wasn't included in the activity?

TAKE IT HOME: SUGGESTIONS FOR FAMILIES

- Help your child look at home for all kinds of recycled objects to use in future art projects. Set aside an old shoebox or cardboard carton as an art box for storing interesting items for later use. Projects can also be kept and added to over time, as your child enjoys the ongoing adventure of looking for usable materials and finding new ways to attach them to his sculpture.

READ IT!

- *Michael Recycle* by Ellie Bethel

MATERIALS

- Base materials to build from: cardboard, paper plates, paper towel tubes
- Assorted types of paper: construction paper, wrapping paper, and wallpaper
- Assorted materials to glue, layer, and build with: stiff ribbon, bottle caps, corks, buttons, felt, tinfoil
- Sticking materials: glue sticks, contact paper, or stickers
- Scissors
- Hole punch
- Yarn, string, or narrow ribbon

LEARNING GUIDELINES

Technology & Engineering #24. Demonstrate and explain the safe and proper use of tools and materials.

What's Next?

RESOURCES FOR TAKING IT FURTHER

tinker kit contents

- Aluminum foil
- Painters tape
- Clothespins
- Construction paper
- Cotton balls
- Crayons, paperless
- Flash drive that includes The Tinker Kit Educators' Guide, activities, a family tip sheet, and videos
- Glue stick
- Goggles
- Golf tees
- Hammer
- Ink pad
- Measuring tape
- Miniature car
- Paper clips
- Ping-Pong balls
- Pipe cleaners
- Play-Doh
- Pliers
- Rubber bands
- Scissors
- Screwdrivers
  - flat-head
  - Phillips head
- Screws and nails
- Shoelace
- Sponges
- Stickers
- Straws
- String
- Tissue paper
- Toothpicks
- Tweezers
- Wire

If you need to purchase additional materials, check out your local dollar store or other inexpensive retail outlet. The following websites also carry most of the items listed above.

www.lakeshorelearning.com

www.orientaltrading.com

www.amazon.com

What's Next?

suggested readings

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WGBH
www.peepandthebigwideworld.com
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Massachusetts Pre-K STE Standards

To simplify connecting one standard to each activity in the Tinker Guidebook, we used the Massachusetts Guidelines for Preschool Learning Experiences (the green book). However, you can click on the "Crosswalk" document below to see how these standards align with the newly adopted Massachusetts Pre-K STE Standards.

Crosswalk between Draft Massachusetts Pre-K Science, Technology and Engineering Standards and Guidelines for Preschool Learning Activities
http://www.mass.gov/edu/docs/eec/2014/20140307-crosswalk4prek-ste-standards.pdf

http://www.eec.state.ma.us/docs1/curriculum/20030401_preschool_early_learning_guidelines.pdf

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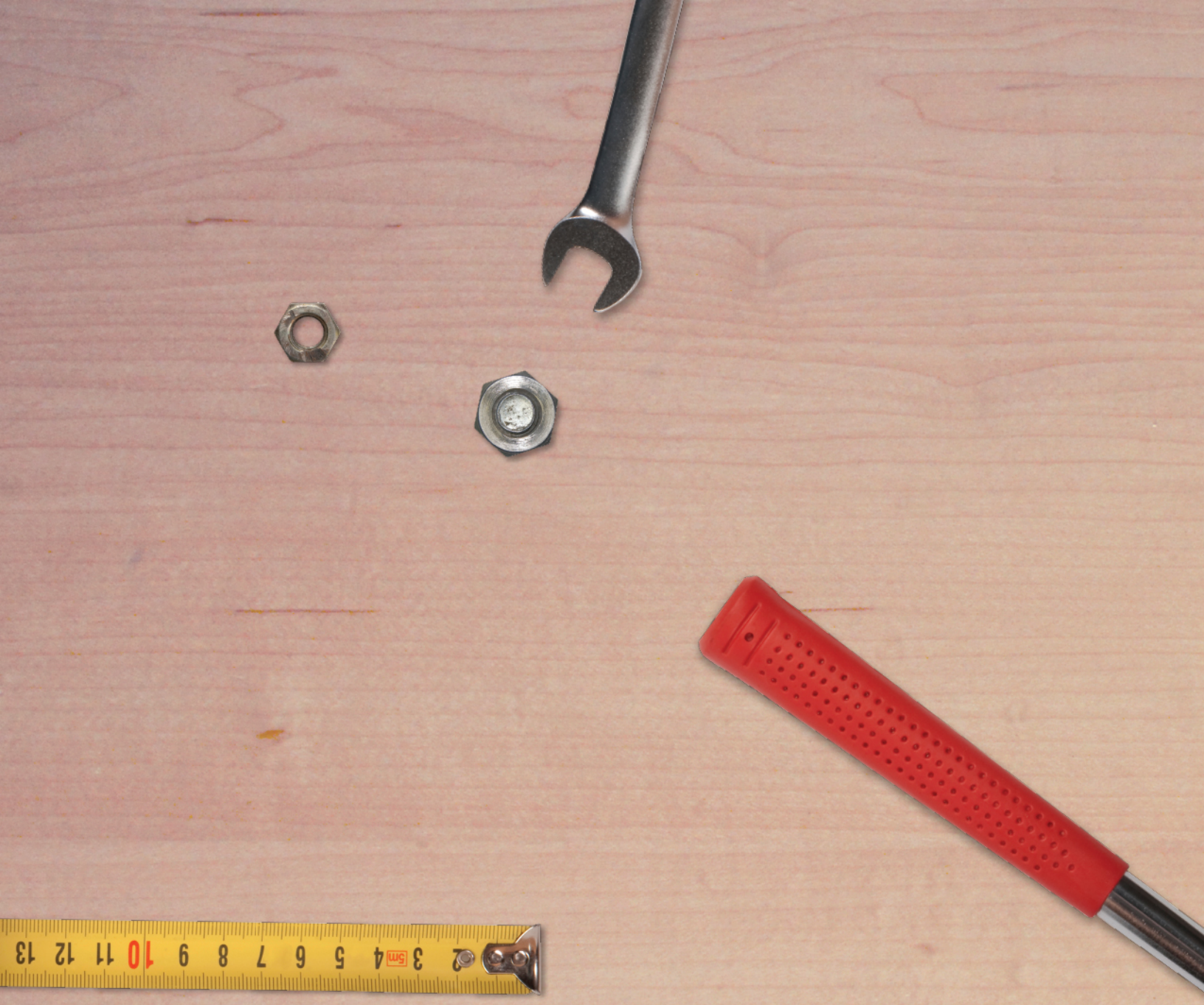

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