### Helpful Machines
**Preschool (ages 4-5)**

#### Overview
In this theme, students will learn and communicate about tools and machines. They will explore simple tools that they have seen adults use, discuss robots and what they do, and design a machine to make their lives simpler. Students will also experiment with a wheel and axle and an inclined plane.

#### Curriculum Connections
The following grid demonstrates how this theme’s activities address key curriculum areas for preschool students. The curriculum expectations for this activity pack were developed to complement the National Association for the Education of Young Children’s Standard 2 curriculum and the Head Start Child Development and Early Learning Framework.

#### Activity Name
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<tr>
<th>Activity Name</th>
<th>Tools</th>
<th>What Is a Robot?</th>
<th>My Machine</th>
<th>Machines Around Us</th>
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#### Language Arts

**Language Development**
Develop competence in verbal and nonverbal communication by responding to questions, communicating thoughts and experiences, and describing things and events.

**Speaking**
Use language to express ideas and needs.

**Writing**
Write on their own with support, including access to the alphabet and to printed words, about topics of current interest.

#### Mathematics

**Numeracy**
Use one-to-one counting to determine quantity.

**Sorting**
Compare objects using attributes of length, weight, and size (e.g., bigger, longer, taller, heavier).

**Order objects by size or length.**

#### Science

**Early Engineering**
Build a model or a prototype.
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<td>Explore possible solutions to a problem.</td>
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<td>Identify a problem.</td>
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#### Social and Emotional Development

**Learning Skills**

- Classify, compare, and contrast objects, events, and experiences.

**Motor Coordination**

- Demonstrate control, balance, strength, and coordination in gross-motor tasks such as dancing, running, jumping, and other types of controlled directional movement.
- Demonstrate coordination and strength of fine-motor tasks such as block play, coloring, scribbling, and attempting writing.

**Pretend and Real**

- Explore the idea of an imaginary person, place, or thing and identify why it is pretend.
- Recognize the difference between pretend or fantasy situations and reality.

**Problem Solving**

- Work to solve a problem by using a creative solution.

**Role-playing**

- Engage in pretend play and act out roles.

**Teamwork**

- Work as a member of a small group or team.

#### Social Studies

**Art**

- Represent people, places, or things through drawings, movement, and three-dimensional objects.

**Family**

- Explore social roles in the family and workplace through play.
Before You Begin

Setting the Scene

Each activity offers specific suggestions to help students think about the theme. Use the suggestions below to acknowledge prior student experience and encourage student engagement in the activities.

Introduce the key theme of Helpful Machines by:

• Making connections to students’ personal experiences by asking questions such as “What type of machines do you see in the classroom?”
• Selecting a theme-related fiction or nonfiction book to be read aloud to the class before beginning activities.
• Making a toolbox using an old shoebox. Decorate the box using paints and stickers and stencil student names on the top.
• Exploring a variety of different-size nuts and bolts to discover how they fit together.
• Building a tool board using poster board. Have students trace toy or real tools on construction paper and, with assistance from you, cut out the shapes. Glue the cutouts onto a white poster board, and attach Velcro® to the tools and their cut-out silhouettes so the tools will stay firmly on the board. Hang the board in the classroom.

Vocabulary

Explain and encourage the use of these words during the activity.

• control panel: a surface that has switches and dials and is used to control a machine
• help: to make easier by offering aid
• machine: a device that applies mechanical power to perform a task
• robot: machines that can do work for people on their own
• rocket ship: a ship powered by rockets, used to take people or things into outer space
• tool: a device that helps people complete a specific job

Extensions

Encourage further learning and reflection on this theme by:

• Making a collage from an electronics catalog. Ask students what they think different machines and devices shown in the catalog are for. Encourage creative answers.
• Sorting a collection of (safe) real or toy tools that are used for a specific task such as cooking. This can also be done with kitchen tools, such as different kinds of spoons and spatulas, or with crafting tools, such as scissors, rulers, and hole punches.
• Using DUPLO® elements to make a house of gadgets. Ask students to incorporate technology that they think would make their lives easier and help people. Ask them to explain the features of their gadget-filled house and how the gadgets make people’s lives easier.
• Role-playing as a machine. Encourage students to show the motion of a helpful machine and explain how they work.
Activity Overview:
Students will learn about tools and how they help to solve problems. They use DUPLO® elements to build a model of a real or imaginary tool and describe the tool to you or the group. Students will then name their new tool and, with assistance from you, create a label with the tool's name.

Focus:
Language Arts:
Writing
• Write on their own with support, including access to the alphabet and to printed words, about topics of current interest.

Science:
Early Engineering
• Build a model or a prototype.
• Use imagination to create a new or different version of a common object.

Other Materials Required:
• A variety of tools (toy or real if safety allows)
• Blank paper
• Writing supplies

Prompt:
Begin this activity by laying out a variety of tools for the students to look at and touch. These might be hammers, screwdrivers, or wrenches. Have students talk about what the different tools do, and work together to sort them into groups based on what they are used for, such as tools that cut, tools that connect things, and tools that measure things.

Ask questions such as:
• Have you seen a tool like this before?
• What do you think this tool does?
• Do you know what this tool is called?

Engage:
Using DUPLO elements, students should work individually to build a model of a useful tool. This can be a tool they have seen before or a new type of tool that they create for a job they would like to do.

After they have finished building their model, have students explain them to you or the group. Encourage students to act out the motion of using their tool or mimic the sound of their tool.

Ask questions such as:
• What does this tool do?
• How does it work?
• What would you use it for?
• Who might use this?
• What is its name?
• What does it sound like?
• Is it heavy or light?
Follow-up:
Expand student understanding by having students name the tool that they have created. Distribute blank paper and writing supplies. Ask students to identify the sound that the name they have given their tool starts with, and assist students in writing a label for the tool. Below the label, have students draw a picture of themselves using the tools.

Tip:
Students might find writing challenging. Encourage them to copy the shape of the first letter of the word they are writing, and help them by filling in the remaining letters and having the students identify them.
**What Is a Robot?**

**Activity Overview:**
Students will learn about what a robot is and that a robot is a machine that can do work for people on its own. Students will then use DUPLO® elements to build a model of a robot. They will then share their model with you or the group and explain what the model can do.

**Focus:**
*Science:*
  - Early Engineering
    - Use imagination to create a new or different version of a common object.

*Social and Emotional Development:*
  *Learning Skills*
    - Classify, compare, and contrast objects, events, and experiences.

*Motor Coordination*
  - Demonstrate control, balance, strength, and coordination in gross-motor tasks such as dancing, running, jumping, and other types of controlled directional movement.
  - Demonstrate coordination and strength of fine-motor tasks such as block play, coloring, scribbling, and attempting writing.

*Pretend and Real:*
  - Explore the idea of an imaginary person, place, or thing and identify why it is pretend.
  - Recognize the difference between pretend or fantasy situations and reality.

**Other Materials Required:**
  - A video clip that shows fictional robots
  - A video clip that shows real-life robots completing tasks

**Prompt:**
Begin this activity by showing students a video clip of a fictional robot from movies or television. After watching the fictional robot video clips, have students stand up and make movements and sounds like the fictional robots they saw. Explain to students that the robots in the video clip they just saw are not real. They are pretend. However, there are robots in real life.

Ask questions such as:
  - What do you think a robot is?
  - Do you know who this robot is?
  - What do you think robots are made of?
  - How do you think robots work?

Next, have students watch a video clip of real-life robots completing a task, such as automotive assembly line or bomb-disposal robots. Explain that these robots are real and they help people by doing work that would be dangerous or would take a long time for people to complete by themselves. Real robots are machines that can do work for people on their own, but they are not the same as they are in movies. Watch the real-life robot video clips, and have students stand up and make movements like the real-life robots they saw. Talk about the robots they watched.

Ask questions such as:
  - What do you think these robots are doing?
  - How do these robots look different from the ones we saw earlier?

**Tip:**
Take questions from students to ensure that they are not confused by which robots are real and which robots are pretend. Provide pictures of real manufacturing robots and robots from television and movies, and have students sort them into two piles representing “real robots” and “pretend robots.”
**What Is a Robot?**

**Engage:**
Using DUPLO elements, students should work individually to build a model of a robot. Tell students that they can build a model of a real robot from one of the videos they have seen or they can invent their own robot helpers. After they have finished building, have them give the robots names and explain how the robots help them.

Ask questions such as:
- What is your robot’s name?
- What does it do to help you?
- How does it work?
- Is this a real or an imaginary robot?

**Follow-up:**
Expand student understanding by gathering all of the student models together. Pick up each model and show it to the class, and have the student who built it tell the class if it is a real robot or an imaginary robot. Sort the models into two groups and count them as a class.

Ask questions such as:
- Is this a real or an imaginary robot?
- Which group should I place it in?
- How many real robots did our class build?
- How many imaginary robots did our class build?
Activity Overview:
Students will learn to think about how to solve an everyday problem with a machine and use DUPLO® elements to create their own machines, with encouragement to use DUPLO elements such as the rail, ladder, chassis, window, or crane in their models. The students will then share their models with you or the group and draw pictures of themselves using the machines they created.

Focus:
Language Arts:
Language Development
• Develop competence in verbal and nonverbal communication by responding to questions, communicating thoughts and experiences, and describing things and events.

Science:
Early Engineering
• Build a model or a prototype.
• Explore possible solutions to a problem.
• Identify a problem.

Social and Emotional Development:
Problem Solving
• Work to solve a problem by using a creative solution.

Teamwork
• Work as a member of a small group or team.

Social Studies:
Family
• Explore social roles in the family and workplace through play.

Other Materials Required:
• Drawing supplies
• Blank paper

Prompt:
Begin this activity by having students talk about the chores that they or their family members do around the house. Ask students to identify chores they have seen family members do or that they have done themselves and what might be difficult about these chores. Have students act out these chores to show how they are done.

Engage:
Using DUPLO elements, students should work in pairs or small groups to build a model of a machine that will help them or their parents around the house. Encourage the use of specialized DUPLO elements such as the rail, ladder, chassis, window, or crane in their models. After they have finished building their models, have students explain how they work to you or the class, and ask them why the specialized DUPLO elements are important for their machine to work.

Ask questions such as:
• What is your machine?
• What does it do?
• What is it called?
• How does it work?
• What would you use it for?
• Why is this element important for your machine to work? What can it do that no other element can do?
**My Machine**

**Follow-up:**
Expand student understanding by distributing paper and drawing supplies and asking students to draw a picture of their machine being used by themselves or by a member of their family.

Display all of the pictures and machine models. Have students look at the machines made by their peers and choose one of them as something they would like to buy to help one of their family members.

Ask questions such as:
- Which machine would you like to buy?
- Who would you like to buy this machine for?
- Why would that person like to have this machine?
Activity Overview:
Students will learn about machines that they use or see in their homes every day. They will use DUPLO® elements to build models of machines they see in their home or school and sort the group’s models based on different attributes. They will explore how many machines are in each category and write the number of machines with assistance from you.

Focus:
Language Arts:
Writing
• Write on their own with support, including access to the alphabet and to printed words, about topics of current interest.

Mathematics:
Numeracy
• Use one-to-one counting to determine quantity.
Sorting
• Compare objects using attributes of length, weight, and size (e.g., bigger, longer, taller, heavier).
• Order objects by size or length.

Social and Emotional Development:
Learning Skills
• Classify, compare, and contrast objects, events, and experiences.
Motor Coordination
• Demonstrate coordination and strength of fine-motor tasks such as block play, coloring, scribbling, and attempting writing.

Other Materials Required:
• Pictures of different household machines such as a washing machine, a hair dryer, an oven, or a lawn mower
• Writing supplies
• Blank paper

Prompt:
Begin this activity by brainstorming a list of the different machines that students have in their homes. This list might include dishwasher, washing machine, oven, television, computer, and so forth. Ask students to describe what job each machine does in the home.

Ask questions such as:
• What kinds of machines can you find in your home?
• Do you have a machine that cleans something? What does it clean? What is it called?
• Do you have a machine that cooks something? What can you cook in or on it? What is it called?
• Do you have a machine that helps you have fun? What do you do with it? What is it called?
• Do you have a machine that is used outside? What do you do with it? What is it called?

Engage:
Using DUPLO elements, students should work individually to build a model of a machine in their home that helps them or their family members complete their chores. After they have finished building their models, have students explain them to the class.

With your support, students should work together to sort the models into different categories. The models can be sorted by the type of work they do, by whom they do work for, by which room of the house they belong in, or by if they are used inside or outside. They can also be sorted based on physical characteristics of the models themselves, such as their size, their weight, or the colors used to build them.

Tip:
This can also be turned into a guessing game, where you provide clues such as “This machine takes the water out of the clothes after they have been washed.” and the students have to guess what machine it is.

Tip:
The type of models that students make will dictate the categories used to sort them.
Follow-up:
Expand student understanding by having students count the number of machines that have been sorted in each category.

Give each student a blank piece of paper and something to write with. Tell the students that they are going to be writing very important information about the groups. Count the number of models in each category as a class, and after each group is counted, show students how to write the numeral. Have students use their own materials to write the number, anywhere they like, as big or as small as they like, on their blank piece of paper.
**My Control Panel**

**Activity Overview:**
Students will learn about how people tell machines what to do. They will attach DUPLO® elements to the DUPLO baseplate to represent buttons and switches. They will describe a machine with a control panel and talk about what each button does.

**Focus:**

*Language Arts:*
  **Language Development**
  - Develop competence in verbal and nonverbal communication by responding to questions, communicating thoughts and experiences, and describing things and events.
  **Speaking**
  - Use language to express ideas and needs.

*Science:*
  **Early Engineering**
  - Use imagination to create a new or different version of a common object.

*Social and Emotional Development:*
  **Role-playing**
  - Engage in pretend play and act out roles.

*Social Studies:*
  **Art**
  - Represent people, places, or things through drawings, movement, and three-dimensional objects.

**Other Materials Required:**
- Examples of machine controls from the home such as TV remotes, video game remotes, or computer keyboards
- A large cardboard box
- Buttons from clothing
- A picture of the inside, driver’s side of a car
- A picture of the inside of a cockpit on a plane or another complicated-looking control panel

**Prompt:**
Begin this activity by displaying a large picture of the inside of a car where all students can see it. Have them guess what they are looking at. Have students think about what they have seen adults doing when sitting in the driver’s seat of a car.

Ask questions such as:
- What does the adult do when he or she is sitting there?
- What do they move?
- What buttons, pedals, switches, or knobs do they press, flick, or turn?
- What happens when they do this?
- Do you know what any of these things do?
- How does a driver steer?
- How does a driver speed up?
- How does a driver slow down?

Explain to students that every machine has different controls such as buttons, switches, and pedals and that it is through these controls that the machine is operated.

**Tip:**
If possible, take students on a tour around the school to find different machines and look at the buttons, knobs, and switches that are on them.

Other machine controls that students might be familiar with are a television remote control, the buttons on a mobile phone, buttons on a video game console, or the keyboard and mouse from a computer.
Engage:
Prepare a large cardboard box for use as an imaginary rocket ship. Cut a round window out of one side, and fold a large piece of cardboard into a wedge and attach it securely to the inside of the box. The platform created should be large enough to hold a DUPLO baseplate.

Show students a picture of the control panel on the inside of a cockpit of a plane, a space shuttle, or the Apollo Command Module. Explain that every switch, gauge, and button on the panel does a different job and that the pilot needs to know what each one does in order to safely fly the craft.

Show students the cardboard box and encourage them to imagine that the box is a rocket ship. Tell them that they are going to imagine that they will be flying that rocket ship and that they are going to make their own control for the rocket ship out of DUPLO elements. Talk about different things that they will need to do to control their rocket ship, such as blast off or land, go faster, go slower, turn left or right, or complete a loop in the air while flying.

Give each student a baseplate and an assortment of DUPLO elements. Using the elements, students should work individually to build their own control panels. They should use a DUPLO baseplate as the main building surface and attach other elements to represent the buttons, switches, and levers. After they have finished building, have students explain their control panels to you, a partner, or the class.

Follow-up:
Expand student understanding by giving each student time throughout the week to play in the rocket ship. Have the students take turns “installing” their control panel and driving the rocket ship. Students can also use imaginative play to install their control panels on other flat surfaces and pretend to operate a different kind of machine or something in the classroom.

Ask questions such as:
• What do the different switches, dials, or buttons do or control?
• How do you steer the rocket ship or make it go faster or slower?
• What does this button do?
• Are there any buttons you should only push in case of emergency?

Tip:
The cardboard box can be decorated outside to look like a rocket ship. This can be done before the activity or as a class after the activity is complete. Old buttons, computer parts, or other technical-looking pieces can be attached inside the cardboard box in and around the platform that will act as a dashboard for the control panel.

Tip:
You might want to leave the rocket ship set up in the classroom as a permanent station for students to play in.