Experimenting With Oil and Water

**What children do:** Children mix different liquids together and describe what happens.

### Connections to STEM

<table>
<thead>
<tr>
<th>Subject</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Science</strong></td>
<td>What do you observe when you mix oil and water?</td>
</tr>
<tr>
<td><strong>Technology</strong></td>
<td>What tools are useful for mixing liquids?</td>
</tr>
<tr>
<td><strong>Engineering</strong></td>
<td>What happens when you add dishwashing liquid to oil and water?</td>
</tr>
<tr>
<td><strong>Mathematics</strong></td>
<td>Not applicable for this activity</td>
</tr>
</tbody>
</table>

### Curriculum Content

**Focused KDIs:** 45. Observing, 47. Experimenting

### Materials

**Materials for each child and teacher**
- Nontoxic washable paints
- Vegetable oil
- Eyedropper
- Measuring spoon
- 9-ounce clear plastic cup
- Three to four 3-ounce paper cups
- Plastic tray

**Backup materials**
- Pitcher of water to refill cups
- 3-ounce cups one-quarter filled with dishwashing liquid
- Extra 9-ounce cups for mixing
- Plastic dish tub or bucket

### Before you get started

- Fill 9-ounce clear plastic cups halfway with water so each child and teacher in the group has one cup.
- Fill 3-ounce paper cups about one-quarter full of different colors of paint so each child has two to three cups.
- Fill 3-ounce paper cups about halfway full of oil so each child and teacher has one cup.
- Distribute a tray with materials to each person in the small group. Each tray should have a cup of water, several paint cups, a cup of oil, an eyedropper, and a spoon.
- Cover the table with a plastic cover or newspaper for easier cleaning.

### Beginning

- Introduce the word *mixture* by saying *Today we are going to make some mixtures or potions.* What can you tell me about mixtures or potions? Acknowledge children’s ideas about mixtures, and explain that a potion is a special type of mixture.
- Show children the materials on your tray and tell them that they will each have these materials to make their own mixtures.
- Pass out the trays of materials and say *I’m curious about what types of mixtures you’ll make.*

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Activity idea contributed by Piesesha Hartiyana, HighScope Indonesia, Jakarta, Indonesia.
Middle
• Move around the table to observe what each child is doing. Describe and imitate their actions using your own materials.
• Encourage children to talk about what they are doing and thinking as they use the materials.
• Support collaborative experimentation.
• Find opportunities to use the intentional vocabulary listed on page 57 (e.g., *I see that you are combining paint and water to make a mixture*).
• As children engage with materials, move from child to child using the scaffolding strategies on the next page.

End
• Give children a two-minute warning before the activity ends.
• Have children pour their mixtures into a plastic dish tub for easier disposal. Then ask them to put their eyedroppers into a basket, dispose of (or recycle) their cups and plastic spoons, and stack their trays.

Ideas for follow-up or related activities
• Look for opportunities to use the intentional vocabulary in different contexts, as in the following examples:
  – *I love to combine milk and chocolate syrup to make chocolate milk.*
  – *When you combine white and red paint, it makes a pink mixture.*
• Make sensory bottles by filling plastic bottles with oil and colored water. Add glitter or small beads or buttons, and then glue the tops back on the bottles.
• Conduct a large-group activity of cleaning classroom materials with soap and discuss how soap cleans grease and dirt.

Ways for families to extend this activity at home
• Share the directions for making sensory bottles with families so they can make them at home.
• Suggest that parents use food coloring as an alternative to paint.
• Let parents know how children used specific vocabulary words at school so they can help children connect home activities and school activities to concepts (e.g., *When we stir things together we make a mixture or a solution. Oil and water do not mix; they separate*).
### Activities

<table>
<thead>
<tr>
<th>Scaffolding Learning at Each Developmental Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earlier</td>
</tr>
<tr>
<td><strong>Children may</strong></td>
</tr>
<tr>
<td>• Pour paint and oil into the water and mix them together.</td>
</tr>
<tr>
<td>• Show excitement and call attention to their mixtures (e.g., Look at mine — it turned colors).</td>
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<tr>
<td><strong>Adults can</strong></td>
</tr>
<tr>
<td>• Describe what children are doing using one or two of the intention-al vocabulary words (e.g., You are making a mixture of water, paint, and oil. You noticed that the mixture changes each time you add more paint or oil).</td>
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<tr>
<td>• Draw attention to the actions of other children (e.g., I notice that Sarah is using an eyedropper to put paint into her water).</td>
</tr>
<tr>
<td>Middle</td>
</tr>
<tr>
<td><strong>Children may</strong></td>
</tr>
<tr>
<td>• Use eyedroppers to put oil and paint into the water and mix with a spoon.</td>
</tr>
<tr>
<td>• Describe their observations (e.g., The water turned blue; The oil is floating).</td>
</tr>
<tr>
<td><strong>Adults can</strong></td>
</tr>
<tr>
<td>• Use the intentional vocabulary so that children understand the words in context (e.g., I see that you are combining paint and water to create your mixture).</td>
</tr>
<tr>
<td>• Introduce a new concept using their own materials (e.g., I notice that when I stop stirring my mixture, the oil floats back to the top).</td>
</tr>
<tr>
<td>Later</td>
</tr>
<tr>
<td><strong>Children may</strong></td>
</tr>
<tr>
<td>• Stir the oil and water vigorously to try to combine the two liquids.</td>
</tr>
<tr>
<td>• Say that the oil always moves to the top of the cup when they stop mixing.</td>
</tr>
<tr>
<td><strong>Adults can</strong></td>
</tr>
<tr>
<td>• Use the vocabulary words combine and separate to describe what they observe with their materials (e.g., When I stop stirring my mixture, I notice that the paint has combined with the water but the oil separates).</td>
</tr>
<tr>
<td>• Ask children to predict what will happen when they add dishwashing liquid to their mixtures, and then talk about what they’ve observed.</td>
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**The Science Behind It: Why Oil and Water Don’t Mix**

Oil and water don’t mix for two reasons. First, the molecules in water are packed tightly together, more so than the molecules in oil. Water is denser than oil. Thus, if you take equal parts of oil with water, the oil will always float to the top because it is less dense than water.

Second, oil and water are made up of different types of molecules. Water is made up of polar molecules, which means that the molecules are positively charged on one end and negatively charged on the other end. Oil, on the other hand, is made up of nonpolar molecules, which means that they are not charged on either end. Polar molecules are attracted to each other, so the molecules of the water stick together. The molecules that make up dishwashing detergent are different than those that make up water and oil. In a detergent molecule, one end of the molecule is attracted to water while the other end is attracted to oil. If you add detergent to a water-and-oil mixture, you’ll see that they mix, because the oil and water are held together with the detergent molecules. This is called an emulsion — a mixture of two things that don’t normally mix together.
14 From Station to Fire

What children do: Children use pre-coding skills to design and describe the step-by-step directions for a path they create.

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<td>Not applicable for this activity</td>
<td>How can you apply the pre-coding skills learned in this activity when programming a robotic device? (See Activity 25.)</td>
<td>How must you adjust your path when an obstacle is placed in your way?</td>
<td>How many different directions did your fire truck follow to reach its destination?</td>
</tr>
</tbody>
</table>

Curriculum Content


Materials

Materials for each child and teacher
- Large grid with 3-inch squares (see photo on p. 68)
- 15 sticky notes of the same color with a straight arrow (↑)
- 5 sticky notes of a second color with a left-turn arrow (⇊)
- 5 sticky notes of a third color with a right-turn arrow (⇊)
- A simple drawing representing a fire station and one representing the fire (placed on opposite sides of the grid)
- Small fire truck (or other vehicle)

Backup materials
- Additional sticky notes with arrows using the same color code as listed on the left
- Small unit blocks to represent buildings or obstacles in the road

Beginning
- Using your own set of materials, begin with a story:  Woo-ooob.  Woo-ooob.  The alarm is sounding and fire truck #9 must report to a fire on the other side of town. (Place your station and fire drawing on the grid.) Help is on its way, but we need to figure out how to get the fire truck to the fire as fast as possible. First, the fire truck will drive straight for five blocks. (Place five forward arrows from the station, counting them as you place them.) Second, it has to turn left. (Place an arrow to the left.) Now which direction does it need to go? Together with the children, finish creating the path for the fire truck, using directional words and counting intentionally when placing your arrows on the grid.
- Give each child their own set of materials, and say I wonder what path your fire truck will take to get from the station to the fire.

Activity idea contributed by the Early Childhood Applied Practice Department, HighScope Educational Research Foundation, Ypsilanti, MI.
**Middle**

- Watch how children use materials. Imitate and describe their actions (e.g., *You used your straight arrows to make the path go up toward the fire*) using your own set of materials.
- Support collaborative problem solving as children work.
- Find opportunities to use the intentional vocabulary (e.g., *You used your arrows to create a route for the fire truck*).
- Midway through the activity, introduce the blocks as “buildings” children can add to their grids. Say *I wonder if your fire truck will have to reroute to get around the buildings in your city.*
- As children engage with materials, move from child to child using the scaffolding strategies on the next page.

**End**

- Give the children a two-minute warning that the activity will be ending.
- As children complete the activity, have them take the sticky notes off the grid and place them in a pile. Collect their fire trucks in a basket.
- Let children know the grids and arrows will be available in the block area.
- Have children move like a fire truck (either as a group or individually) to the next part of the daily routine.

**Ideas for follow-up or related activities**

- Draw a classroom map to use during planning or recall time. Have children place arrows to mark the path they will take to work in a specific area.
- Create an obstacle course for large-group time. Use directional arrows to show children the path they will take to complete the course.
- Use sidewalk chalk to draw a similar grid, but on a much larger scale, on playground blacktop or a similar surface. Have children draw codes/arrows for each other to create a path to follow.
- Invest in technological devices that children can use by creating similar codes (see Activity 25 on p. 100 for one example).

**Ways for families to extend this activity at home**

- Ask families to draw a map of their house. Then, throughout parts of the family’s daily routine, suggest that they help children draw arrows to their next destination (e.g., before bedtime, draw arrows from the living room to the bathroom to the bedroom).