

Science in the early years: Exploring mixtures

Activity description

This activity is suitable for preschoolers to investigate the behaviour of two common household products (oil and water). The emphasis is on supporting children to develop their inquiry skills to describe what they observe when trying to mix these liquids. Preschoolers should be given the opportunity to communicate (describe and explain) their observations. The activity can be extended to Foundation, Year 1 and Year 2 students who should be encouraged to predict what will happen, communicate (explain) why some of the liquids used do not mix, as well as to describe the changes they observe when mixing materials. All children can complete an extension activity by adding detergent to explore the effect it has.

In small groups, children are provided with guidance to *predict* what might happen when trying to mix two liquids, *observe* what happens, *check* back to their prediction and *record* what they have found out. They will then think about what they can change and try out their ideas to make the oil and water stay mixed (e.g. change the amounts of each material; shake it more).

Children can *communicate* (share) what they did and what they observed with other groups of children.

Children should be prompted to summarise their observations, that is, some liquids do not mix (oil and water); adding more oil or water doesn't make any difference; shaking the jar for longer doesn't make any difference; and the oil and water do not stay mixed.

Links to the EYLF

Outcome 4

Children are confident and involved learners.

Key components

Children develop dispositions for learning curiosity, cooperation, confidence, creativity, commitment, enthusiasm, persistence, imagination and reflexivity.

Children develop a range of skills and processes such as problem-solving, enquiry, experimentation, hypothesising, researching and investigating.



Link to the Australian Curriculum (Foundation to Year 2)

	Foundation	Year 1	Year 2
Science Understandings	Chemical sciences Objects are made of materials that have observable properties (ACSSU003)		
Science Inquiry Skills	Questioning and predicting Pose and respond to questions about familiar objects and events (ACSIS014)	Questioning and predicting Pose and respond to questions, and make predictions about familiar objects and events (ACSIS024)	Questioning and predicting Pose and respond to questions, and make predictions about familiar objects and events (ACSIS037)
	Planning and conducting Participate in guided investigations and make observations using the senses (ACSIS011)	Planning and conducting Participate in guided investigations to explore and answer questions (ACSIS025)	Planning and conducting Participate in guided investigations to explore and answer questions (ACSIS038)
	Processing and analysing data and information Engage in discussions about observations and represent ideas (ACSIS233)	Processing and analysing data and information Use a range of methods to sort information, including drawings and provided tables and through discussion, compare observations with predictions (ACSIS027)	Processing and analysing data and information Use a range of methods to sort information, including drawings and provided tables and through discussion, compare observations with predictions (ACSIS040)
		Evaluating Compare observations with those of others (ACSIS213)	Evaluating Compare observations with those of others (ACSIS041)
	Communicating Share observations and ideas (ACSIS012)	Communicating Represent and communicate observations and ideas in a variety of ways (ACSIS029)	Communicating Represent and communicate observations and ideas in a variety of ways (ACSIS042)

Source: <https://www.australiancurriculum.edu.au/f-10-curriculum/learning-f-2>

Notes about mixtures

When exploring mixtures such as solutions (e.g. dissolving substances in water), one study described children's learning when they were given bottles, buckets, pumps and a number of substances: vinegar, bicarbonate soda and leaves to grind (Fleer, 2009). It was found that providing the materials alone for children to play with independently did not result in the formation of science concepts, highlighting the need for an educator to support and scaffold the activities.

The chemistry of mixtures

Oil and water do not mix. This is because oil molecules are attracted to other oil molecules much more than they are attracted to water; and similarly, water molecules are much more attracted to other water molecules than to oil. Because they do not mix, oil and water are described as 'immiscible'. In this case, the oil and water remain separate from each other, and are seen as two different layers. The oil does not dissolve in the water.



The reason the oil floats on top of the water (and not the other way around) is that oil is less dense than water. 'Density' is explored in the activity [floating and sinking](#).

Substances that do mix are described as 'miscible', for example, cordial mixes with water, or salt dissolves in hot water.

Washing-up detergent is an example of an emulsifier. An emulsifier is a substance that stabilises a mix of liquids that normally don't mix. The emulsifier stops the liquids from separating out again. When a detergent is added to the washing up water, it helps to create very small oil droplets which are coated with detergent. This coating makes them much more attracted to water and helps them to remain mixed and not separate. The mixture formed is a type of colloid called an emulsion. This is why adding detergent to the washing up water helps remove oily substances from dirty dishes: the oil is lifted off the greasy dishes as the colloid forms.

There are three main types of mixtures:

- Solutions: one substance dissolved in another. An example is when sugar dissolves in a cup of water. The sugar totally dissolves and is evenly dispersed throughout the cup of water.
- Suspensions: a mixture of small particles of a solid distributed in a liquid. An example of this is when fine sand is added to water in a jar, and the jar is shaken, the sand particles are suspended in the liquid immediately after

shaking. The sand particles disperse through water when shaken making the suspension look cloudy, but if left to settle, the sand settles at the bottom and the water becomes clear again.

- Colloids: a mixture where tiny particles of one substance are distributed through another substance, but unlike a suspension, they stay suspended and do not settle to the bottom of a container over time. Particles in a colloid are usually much smaller than the particles in a suspension. Colloids look cloudy or milky. Milk itself is a colloid: it is cloudy and is a mixture of small globules of fat and protein suspended in water.

What to provide?

- Jars with lids.
- Small squeeze bottles.
- Vegetable oil (in labelled squeeze bottles).
- A jug of water.
- Waterproof wear for the children (optional).
- Food colouring (optional).

Learning intention

- To be able to describe and explain what is observed in an experiment (EYLF)
- To understand that not all liquids mix (EYLF)
- To predict what will happen and be able to describe and explain what is observed in an experiment (F–2)
- To understand that not all liquids mix (F–2)

Success criteria

- I can describe and explain what is observed accurately (EYLF)
- I know that not all liquids mix (EYLF)
- I can predict what might happen then explain and describe what I observe accurately (F–2)
- I can explain why oil and water do not mix (F–2)

What to do?

Organise children to work in small groups so they can share their observations and cooperate to carry out the tests.

What do you think will happen when you put some water in the jar and then add some oil?

(SIS: Questioning and predicting)

Listen to the children's predictions.

Responses to look for: 'They will mix together', 'The oil will float on the water.'

See 'Notes about mixtures'.

Children add the water and oil to the jar to see what happens: do their predictions match their observations?

What happened when you added the oil? Is that what you thought would happen?

(SIS: Planning and conducting)

Affirm all correct observations (the oil floated on the top; the water and oil didn't mix).

Responses to look for: Children might be surprised that the water and oil didn't mix.

Ask children what they could do to try and mix the oil and water together.

What could you do to try and mix the oil and water?

(SIS: Planning and conducting)

Affirm all correct observations (put the lid on then shake the jar).

Ask children to try this (make sure the lid is secure).

After they shake the jar, let the jar rest on the table for a few minutes (until the oil and water separate again).

Did your idea work?

(SIS: Evaluating)

Affirm all correct observations (yes, they mixed together, but not for long).

Responses to look for: Children might be surprised that the water and oil mixed at first, then separated out again.

Ask children to think about what they could change and then get them to try again.

What could you do to make the oil and water mix last/dissolve?

(SIS: Planning and conducting; Evaluating)

Responses to look for: Children might suggest using more or less of water/oil; shake the jar for longer.

Ask children to try their idea.

After they shake the jar for the second time, let the jar rest on the table for a few minutes (until the oil and water separate again).

What happened this time?

(SIS: Processing and analysing data and information)

Responses to look for: Children might be surprised that making a change did not result in a different outcome.

At the end of the activity, ask:

So can oil and water be mixed even when you try different ways to make them mix together?

(SIS: Processing and analysing data and information; Communicating)

Responses to look for: No, they always end up separate again.

If some children are still uncertain, they can repeat the tests to confirm their observations (completing this additional step also will support persistence).

What to record?

Provide the opportunity for groups to come together and to hear about each other's ideas and describe what happened. Take notes of the key ideas and understandings the children demonstrated.

What comes next?

Extend the learning by having children add food colouring to the oil and water, and observe what happens.

References

Fleer, M. (2009). Supporting scientific conceptual consciousness or learning in 'a roundabout way' in play-based contexts. *International Journal of Science Education*, 31(8), 1069–1089.

