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Communicating matters • Lesson 1 • Solid, liquid or gas?

**Lesson 1**

**Launch**

**Year 5**

**Lesson 1**

**Launch**

# Lesson overview

This lesson introduces the unit context and content: exploring solids, liquids and gases, the scientific theory that explains their behaviour (the particle model), and the substances that are sometimes difficult to categorise.

## Key learning goals

Students will:

* demonstrate curiosity and ask questions about substances that are difficult to classify as solid, liquid or gas.
* classify substances as solid, liquid or gas.

Students will represent their understanding as they:

* participate in class discussions about solids, liquids and gases.
* create a diagrammatic and written explanation of what’s ‘inside’ materials/substances.

## Assessment advice

In the launch phase, assessment is diagnostic

Take note of:

* student ideas about solids, liquids and gases. Can they confidently identify substances/objects that belong in one, two or all three categories? Which category do they have difficulty with? Can they identify substances/objects that are tricky to categorise?
* the vocabulary students use to describe solids, liquids and gases.
* students’ understanding of the particle model. Do they include particles in their representations of solids, liquids and gases?

## List of materials

**Whole class**

* Class science journal (digital or hard-copy)
* A large clear container or tray containing a mixture of cornflour and water mixed at a ratio of approximately 2:1 (twice as much cornflour to water)
* Demonstration copy of **Solid, liquid or gas? Resource sheet**
* A variety of texts, at a suitable level for your students, that explain science concepts in a way they can understand.  
  The following websites are trusted resources with age-appropriate videos and texts.
  + [Curious](https://www.science.org.au/curious/videos) by the Australian Academy of Science
  + [Behind The News](https://www.abc.net.au/btn) by the ABC
  + [Science](https://www.abc.net.au/education/subjects-and-topics/science) by ABC Education

**Each group**

* 40g of corn flour
* 20mls of water
* Small bowl
* Spoon for mixing
* Eight different samples of various objects/materials/substances in clear plastic containers. Each group needs the same set of samples. Samples might include:
  + some that can be easily classified as solid (stones, scissors etc.), liquid (water, oil) and gas (a small container of air)
  + some that may be more difficult to classify such as playdough (a soft solid), paper (a flexible solid), elastic bands (a stretchy solid), washing powder (a powdered or pourable solid), honey (a very viscous liquid), or a sponge (a solid interspersed with pockets of gas/air).

#### Safety note

It is important to make it clear to students that it is not safe to taste any samples as part of their observations, even if they think the sample is a foodstuff. This may need to be reiterated repeatedly throughout the sequence.

**Each student**

* Individual science journal (digital or hard-copy)
* Solid, liquid or gas? Resource sheet

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| **Lesson Routine** | **Estimated time** | **Task type** |
| Experience and empathise | 15 minutes | Whole class/Group |
| Elicit | 20 minutes | Whole class/Group/Individual |
| Anchor | 5 minutes | Whole class |
| Connect | Variable | Whole class/Group |
| Question | 15 minutes | Whole class |

# Launch

## Experience and empathise • Mystery mixture

**Optional demonstration:** Before the lesson begins, in a large clear tray or bowl, prepare a cornflour and water mixture using approximately twice as much cornflour to water. This mixture is often referred to as ‘oobleck’, but in this lesson you will simply refer to it as a ‘mystery mixture’. Oobleck behaves like a solid when force is applied, so you should be able to punch it, tap it or even walk over it. However, if you rest your fist, the point of your finger, or stand on the mixture, it will behave like a liquid, and your hand/foot will sink into it.   
Demonstrate this to students, showing them how the mixture sometimes behaves like a solid, and at other times like a liquid.

In collaborative teams, students will observe and explore the properties of a cornflour and water mixture before it is mixed (when it is still separate ingredients), during (what happens as the ingredients are being mixed), and after the ingredients have been mixed.

Provide teams with the necessary equipment to make their own mystery mixture.

Some questions they might explore are:

* Can it be stirred or poured?
* Can I bounce my eraser off it?
* Can I rest my eraser on top of it?

You might ask students to record their observations in their science journals, video record their exploration and ideas to compare their thoughts at the end of the sequence, or record the class discussion in the class science journal (or any combination of these).

## Elicit • What do students think they know?

Display the terms ‘solid’, ‘liquid’, and ‘gas’.

Students brainstorm what they know about each. Record using a Y-chart or table in the class science journal.

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Provide collaborative teams with a variety of samples in clear plastic containers that are solid, liquid, and gas. In their teams, students examine the contents of each container, as well as re-examining the cornflour and water mixture. Using the **Solid, liquid, or gas? Resource sheet** (or they might create their own), students make a claim as to whether each sample is a solid, liquid, or gas. Students working in the same team may have different ideas, so at this stage, they should record their thinking individually. Encourage students to provide reasons for their claims.

Cumulatively record claims about the nature of each sample by tallying student votes. Record the cumulative tally on a demonstration copy of the **Solid, liquid, or gas? Resource sheet** (or create your own) in the class science journal.

Discuss students’ reasoning for categorising something as a solid, liquid, or gas, and any samples they found difficult to categorise, like the oobleck. If needed, also discuss the terms ‘substance’ and ‘object’. Encourage students to refer to the ‘substance’ that the sample is made of if possible, for example, metal as opposed to scissors, or paper as opposed to a page. Note that there may be instances where students don't know the name of the material/s that make up a sample being examined, and in those instances, they can describe it as best they can.

Record any new words/phrases students use to describe solids, liquids, and gases in the Y chart in the class science journal. For example, students might describe solids as strong, firm/hard, or holdable, liquids as flowing or pourable, and gases as airy.

Using the bottom of the **Solid, liquid, or gas? Resource sheet** (or in their science journal), challenge students to represent, through drawing and description, what they think makes something solid, liquid, or gas. At this stage it is acceptable that students create a wide variety of different representations, including different representations for varying 'solids'.

Potential discussion prompts

* *What do you think makes up the substances you looked at?*
* *What do you think is ‘inside’ the substance?*
* *What might you ‘see’ if you were shrunk down to a small enough size to fit in a grain of sand, or a drop of water. What about the samples we have examined today?*

## Achor • What are particles?

Introduce the term ‘particles’ to the students: very small pieces, or atoms, that make up all substances.

Explain that, based on evidence collected over hundreds of years of investigations, scientists think that every substance is made up of particles, and it’s what these particles are doing—or how they are behaving—that determines if something is solid, liquid or gas.

Explain that in this sequence students will:

* explore solids, liquids and gases.
* explore how scientists explain the behaviour of particles, to see if they agree.
* determine if these explanations are enough to categorise every substance.
* determine if sometimes there are substances that might behave like, for example, a solid *and* a liquid, as in the case of the oobleck/mystery mixture (and other samples where students might not have agreed upon its state).

They will then communicate their ideas/understanding about these scientific explanations to others.

## Connect • What science communicators do

Discuss the purpose of science communication, and what a science communicator does:

* A common goal of science communication is to explain tricky ideas and concepts in a way that non-experts can understand.
* A science communicator is someone who designs texts: written, visual, multi-media.

Read/examine a variety of texts, at a suitable level for your students, that explain science concepts in a way they can understand. You might complete an example as a whole class, and/or utilise reading groups as an opportunity to reinforce these ideas.

Identify the features that science communicators have used in these texts, such as:

* factual information and vocabulary
* visual representations such as diagram, models and video,
* storytelling
* emotive and persuasive language
* metaphors to make connections

Discuss how students might apply the techniques employed by science communicators to convey their learning about solids, liquids and gases, to the audience they will present to in the Act phase (see [*Preparing for this sequence*](https://primaryconnections.org.au/teaching-sequences/year-5/communicating-matters/lesson-1-solid-liquid-or-gas?utm_source=docx&utm_medium=lesson_1&utm_campaign=cm) for advice about selecting this audience). Record their ideas in the class science journal.

## Question • What do we want to know?

Referring to the Y-chart or table brainstorm created earlier in the lesson, ask students to name the substances they would confidently identify as solids, liquids and gases, and some that they think people might consider trickier to categorise. Record the students’ claims on the Y-chart or a table in the class science journal.

You might provide students with sticky notes and ask them to contribute at least one idea to each category, writing their name on the back of the sticky note so they can compare their thoughts at the end of the teaching sequence.

Alternatively, you might share ideas in a class discussion, and record students’ names next to each idea as it is offered.

Ask students to ponder the following question before the next science lesson—thinking about it every time they brush their teeth: Is toothpaste a solid or a liquid?

#### Reflect on the lesson

You might:

* begin a class [word wall](file:///C:/pedagogical-tools/learning-through-inquiry-tools/using-word-wall) related to substances and classifying them as solid, liquid or gas.
* begin a class [TWLH chart](file:///C:/pedagogical-tools/learning-through-inquiry-tools/using-twlh-chart) about solids, liquids and gases.

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**Year 5**

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| To read the most recent version of this task, download associated resources, and view embedded professional learning including classroom videos and work samples, visit: [https://primaryconnections.org.au/teaching-sequences/year-5/communicating-matters/lesson-2-what-liquid](https://primaryconnections.org.au/teaching-sequences/year-5/communicating-matters/lesson-2-what-liquid?utm_source=docx&utm_medium=lesson_2&utm_campaign=cm) |

Communicating matters • Lesson 2 • What is a liquid?

**Lesson 2**

# Lesson overview

Students undertake a hands-on exploration to determine the properties of a liquid.

## Key learning goals

Students will:

* investigate to identify and name the properties that help us describe a liquid.
* apply this to determine if something is a liquid or not.

Students will represent their understanding as they:

* record observations about the behaviour of liquids in a data table.
* make and discuss claims about the properties of liquids.

## Assessment advice

In this lesson, assessment is formative.

Feedback might focus on:

* the claims students make about which samples are liquids.
  + Are they being consistent in their claims? What features are they focusing on to support their ideas?
  + Do students’ final claims about the sample match the identified properties of a liquid?

## List of materials

**Whole class**

* Class science journal (digital or hard-copy)
* A large quantity of a pourable solid such as laundry powder, flour, sugar etc.
* A volume of water for demonstration purposes. The volume of water needs to be large enough that all students will be able to see the behaviour of the water clearly
* 4 large clear plastic containers of the same size, preferably marked with standard measurements
* Demonstration copy of **Liquid observations resource sheet** (or create your own)

**Each group**

* Samples of various liquids in small, sealed transparent containers. For example: water, soft drink, cordial, honey, cooking oil, laundry liquid etc.
* Sample of at least one pourable solid in a small, sealed transparent container. For example: laundry powder, flour, sugar etc.
* Container/s to pour samples into for observation (one container is sufficient, provided it is rinsed and dried between uses)

**Each student**

* Individual science journal (digital or hard-copy)
* **Liquid observations resource sheet** (or create their own)

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| **Lesson Routine** | **Estimated time** | **Task type** |
| Reorient | 5 minutes | Whole class |
| Question | 5 minutes | Whole class |
| Investigate | 15 minutes | Group/Individual |
| Integrate | 10 minutes | Whole class |
| Inquire and Integrate | 25 minutes | Whole class |

# Inquire

## Re-orient

At the end of the previous lesson students were encouraged to ask their family members about experiences with blackouts. Discuss the different responses students might have received, focusing on how the person involved felt when the lights went

## Question • What makes something a liquid?

With students brainstorm the names of different liquids, recapping and adding to the list created in the Launch phase.

Display the samples students will be examining during the lesson.

**Pose the questions:** *Which ones are liquids? And what makes something a liquid?*

## Investigation • Testing samples

Discuss what students might do to help them make observations about the samples. For example, they might:

* turn the container upside down.
* shake it.
* use a magnifying glass to look closely at the contents.
* pour the contents into another container and note how long it takes to flow and what happens when it settles.

**Discuss:**

* how students might record the results of their investigation.
* the purpose of a data table: it allows them to record each action and its results.
* what needs to be included in the data table: what they did, what they observed during/after each action, and their claim identifying the sample as a liquid or other. You might use the **Liquid observations Resource sheet** or create your own.

If required, discuss what a scientific claim is, and discuss with students how they might reach one. Read [Facilitating evidence-based discussions](file:///C:/facilitating-evidence-based-discussions) for further information.

Allow students time to carry out the investigation in collaborative teams and record results individually. Students may have different ideas about what each sample is and whether it is a solid or liquid. Recording their findings individually provides an opportunity to discuss and share ideas with others, whilst allowing for individual expression. This also supports formative assessment.

## Integrate • Discussing claims

Share and discuss students’ results.

**V Potential discussion prompts:**

* What claim do you make about each substance?
* Is it a liquid? What evidence do you have to support that?
* Did you have any difficulties deciding if any of the substances where liquids? Which ones and why?

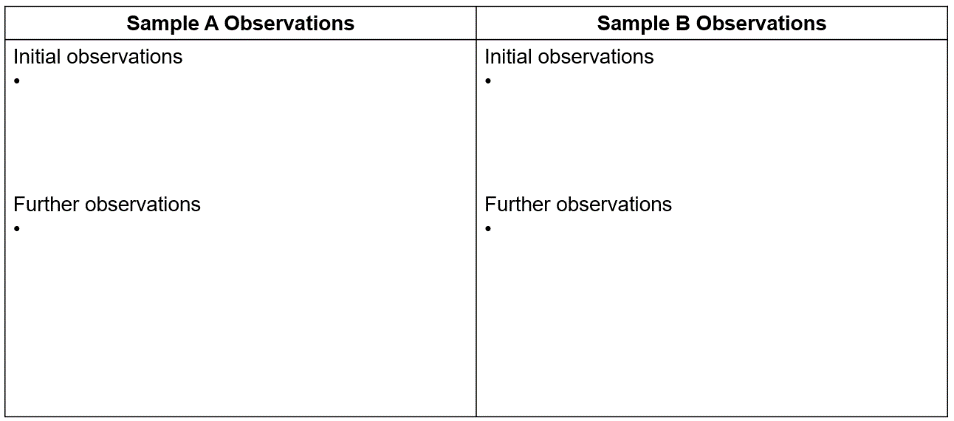
Encourage students to ask questions. Refer to the [science question starters](file:///C:/facilitating-evidence-based-discussions).

## Investigate and Integrate • More observations

Set up four large clear containers of the same size:

* one containing liquid
* one containing a pourable solid
* one empty container next to each sample (so the samples might be poured between containers)

Set up a T-chart in the class science journal to record observations about samples A and B.



Record students’ initial observations about the samples, including the shape and the amount in the containers. Ask students to make a claim identifying samples A and B as liquids or solids, and how certain they are of this.

During the following discussion you will pour the two samples back and forth between their original container and an empty one, first focusing on the amount of the sample and then the shape of the sample.

### Amount of the sample

Pour the samples back and forth between containers, asking the students to take note if the two samples are still taking up the same amount of space (yes), and if there is any way to get them to take up more space or less space without changing them somehow (no).

NOTE: Students might offer suggestions of ways to change the amount of space the sample take up that require them to be physically or chemically changed in order to increase or decrease their volume. For example, mixing them together or with other substances, or removing part of the sample. If necessary, remind students that the question specifically focused on not changing the samples in any way.

Allow them time to discuss and share ideas and observations as you demonstrate.

Potential discussion prompts

* What do you observe about the amount of space the samples take up?
* They take up the same amount of space in each container, you can’t get them to take up more/less space.
* Does the amount/size of the sample stay the same as I pour them back and forth?
* Could you say the same about both samples?

Introduce the terms:

* volume: a measurement of the amount of space something takes up.
* constant: something that stays the same.
* compressed: to reduce in size, quantity or volume via pressure.

Students discuss with a partner how they would use these terms to describe the samples. Share ideas as a class.

Present the claim that, for each sample: The volume remains constant, and cannot be compressed.

Ask students if they agree and why/why not, referring to evidence from the demonstration. Discuss until the class reaches consensus that the claim appears to be true. Record it in the class science journal, along with the supporting evidence.

### Shape of the sample

Now focusing on the shape of each sample as it is poured back and forth between containers, ask students to take note of how the samples level out each time they are poured between containers. They should notice that the liquid levels out independently, but the pourable solid will mound, and needs to be manipulated by shaking the container in order to level out.

Allow them time to discuss and share ideas and observations as you demonstrate.

**Potential discussion prompts**

* What do you observe about the shape of the sample as I pour it between containers?
* Does the shape stay the same?
* Could you say the same about both samples?
* What do I have to do to the container to make the shapes of each sample the same?
* You have to shake sample B’s container to make it level out.
* What might this tell us about which of the samples is a liquid?
* Would you now change the claim you made earlier about the samples being solid or liquid? Or feel more confident about your claim?

**Present the claim:** Liquids take the shape of the container they’re in, they level out independently, and they have a flat featureless surface when still.

**Ask students if they agree and why/why not, referring to evidence from the demonstration. Discuss until the class reaches consensus that the claims appears to be true. Record it in the class science journal, along with the supporting evidence.**

**Determine which sample** is and is not a liquid, what is similar and different when comparing the two, and what students think the sample that is not a liquid might be.

Revisit the samples examined earlier in the lesson and students’ claims about each sample, to determine if they correctly identified the liquids. Discuss if they changed any of their responses, and why they did so.

## Reflect on the lesson

You might:

* add to the class [word wall](file:///C:/pedagogical-tools/learning-through-inquiry-tools/using-word-wall) of vocabulary related to liquids and their properties.
* refer to the list created in the Launch phase, or substances students confidently categorised as liquid, and substances they weren’t sure about. Would they reclassify any based on what they have learned?
* add to the class [TWLH](file:///C:/pedagogical-tools/learning-through-inquiry-tools/using-twlh-chart), completing the H and L sections with what they have learned about liquids.
* ask students for further questions about liquids to add to the class science journal or TWLH chart. Discuss how you might investigate to find the answers to these questions. Provide students with opportunities to undertake such investigation.
* revisit the drawings and words students used in the Launch phase to describe liquids and make any additions using a different coloured pen/pencil.
* discuss how they might use science communication techniques to help other understand what they have learned. Add it to the list created in Launch phase.
* consider what questions a 'non-expert' might ask them about liquids.
* discuss how students were thinking and working like scientists during the lesson. Focus on how they made their observations and made claims supported by evidence.

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**Year 5**

**Lesson 1**

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Communicating matters • Lesson 3 • Searching for solids

**Lesson 3**

# Lesson overview

Students undertake a hands-on exploration to determine the properties of a solid.

## Key learning goals

Students will:

* investigate to identify and name the properties that help us describe a solid.
* apply these properties to determine if something is a solid or not.

Students will represent their understanding as they:

* record observations about the behaviour of solids in a data table.
* make and discuss claims about the properties of solids.

## Assessment advice

In this lesson, assessment is formative.

Feedback might focus on:

* the properties that students associate with solids. Are they describing the properties accurately? Do they use the properties to correctly identify solids?

Feedback will also be provided during the class discussion determining the properties of solids in reference to the properties of liquids. Gauge each group/students’ ideas about the properties in comparison to other groups.

## List of materials

**Whole class**

* Class science journal (digital or hard-copy)
* Demonstration copy of the **Solid science** **Resource sheet**

**Each group**

Samples for investigation including:

* pourable solids such as rice, flour, laundry powder, sand
* other solids such as soap, chalk, playdough, sponges, stones, wood, elastic bands, containers etc.
* at least one liquid such as water

**Each student**

* Individual science journal (digital or hard-copy)
* **Solid science Resource sheet** (or create their own)

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| **Lesson Routine** | **Estimated time** | **Task type** |
| Reorient | 5 minutes | Whole class |
| Question | 15 minutes | Whole class |
| Investigate | 20 minutes | Whole class/Group |
| Integrate | 20 minutes | Whole class/Group |

# Inquire

## Re-orient

Revisit the samples examined, and the ideas students had about solids, recorded on the Y-chart or table created in the Launch phase. Focus on the samples that students thought might be classified as solids. Review the vocabulary they used to describe solids and how they decided what made something a solid.

## Question • What makes something a solid?

Revise the scientific definitions of:

* materials: a substance with particular qualities or that is used for a specific purpose.
* properties: attributes of an object or material often used to into a common group.

Make explicit that materials are made of 'substances'.

Note: Students are likely to have used these terms in a scientific sense in previous chemical sciences topics.

Display a selection of samples, including a liquid, pourable solids, and other solids.

Through discussion:

* determine which sample is a liquid, referring back to the criteria from the previous lesson.
* examine each subsequent sample.
* identify the substance that makes up the sample and describe its properties.

Depending on students’ prior learning, they might use more scientifically specific terms such as brittleness, malleability, flexibility, or elasticity. However, this is not required. It is acceptable for students to describe the material/substance using everyday terms such as strong, hard, able to be bent, folded, squashed, torn, shaped, stretched etc., or any combination of scientific and everyday language.

**Pose the questions:** *What makes a substance a solid? How is a solid different to a liquid?*

Students will compare each sample to the identified liquid in order to answer these questions.

## Investigate • Testing samples

Referring to the demonstration copy of the **Solid science Resource sheet,** discuss each test listed, and how students will undertake that test. For example:

* to test if something is hard/can be scratched, students might attempt to scratch it with a sharp implement (taking note of safety considerations) or scratch it against a hard surface like concrete.
* to test if something is runny students might shake it or see if it pours.

Add any other testing ideas students have, and also discuss how these tests need to be undertaken.

Allow students time to carry out the investigation and record results in collaborative teams.

## Integrate • Discussing claims

Share and discuss findings as a class.

Encourage students to seek further information and clarification from other teams using the [science question starters](file:///C:/facilitating-evidence-based-discussions).

**Potential discussion prompts**

* Did your tests on the liquid support what we found out about the properties of liquids in the previous lesson?
* Which of the tests do you think were ‘for the solids’ and which ones were ‘for the liquids’? Why do you think that?
* Some of the tests identified can only be carried out on one state of matter. For example liquid might be classified as ‘runny’ but solids cannot be, and solids can be stretched, but liquids cannot be.
* Did all the solids have the same properties? Could they all be scratched, stretched, stirred, poured etc.?
* Which samples would you confidently identify as solids? Why?
* Which samples did you have difficulty determining what they are?
* Why did you have trouble with these samples? Would you add them to the not sure list created in the Launch phase?

Referring to the properties of liquids identified in the previous lesson as a reference, challenge students in collaborative teams to write a list of claims, or ‘rules’ (i.e. the properties) for solids. Revise the term volume if required.

Share teams’ list of claims with the class. Discuss each claim made with the objective to reaching consensus and create a list naming the properties of a solid.

Potential discussion prompts:

* Share one claim you have made about solids.
* Has anyone else made the same or a similar claim?
* What evidence supports or does not support this claim?
* Do we agree that this claim can officially be listed as a property of a solid?

If teams are not able to identify all the properties of a solid (constant volume, typically incompressible, and hold their shape—see the **Properties of a solid** professional learning embedded in the Question step of the online resource), present the missing properties as claims. Ask students if they agree or disagree with these claims and what supporting evidence from the investigation justifies their thinking.

Record the final list of properties of a solid in the class science journal.

### Reflect on the lesson

You might:

* add to the class [word wall](file:///C:/pedagogical-tools/learning-through-inquiry-tools/using-word-wall) of vocabulary related to solids and their properties.
* refer back to the list created in the Launch phase, or substances students confidently categorised as solid, and substances they weren’t sure about. Would they reclassify any based on what they have learned?
* add to the class [TWLH](file:///C:/pedagogical-tools/learning-through-inquiry-tools/using-twlh-chart), completing the H and L sections with what they have learned about solids.
* ask students for further questions about solids to add to the class science journal or TWLH chart. Discuss how you might investigate to find the answers to these questions. Provide students with opportunities to undertake such investigation.
* revisit the drawings and words students used in the Launch phase to describe solids, and make any additions using a different coloured pen/pencil.
* discuss how students might use science communication techniques to help others understand what they have learned. Add it to the list created in Launch phase.
* consider what questions a 'non-expert' might ask them about solids.
* discuss how students were thinking and working like scientists during the lesson. Focus on how they were building new knowledge based on past discoveries, in this case, comparing what they had learned about liquids to help them identify the properties of solids.

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**Year 5**

Communicating matters • Lesson 4 • What a gas?

**Lesson 1**

**Lesson 4**

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# Lesson overview

Students undertake a hands-on exploration to determine the properties of a gas.

## Key learning goals

Students will:

* Investigate to identify and name the properties that help us describe a gas.
* Apply this to determine if something is a gas or not.

Students will represent their understanding as they:

* Recording observations about the behaviour of gases using words and labelled diagrams
* Making, and discussing claims about the properties of gases.

## Assessment advice

In this lesson, assessment is formative.

Feedback might focus on:

* what teams/students think is happening as they push the cup slowly into the water in the first part of the investigation. What can they feel as they push the cup downwards? What does that tell them about what is inside the cup?

Feedback can also be provided during the class discussion determining the properties of gases (in reference to the properties of liquids and solids). Gauge each group/students’ ideas about the properties in comparison to other groups.

## List of materials

**Whole class**

* Class science journal (digital or hard copy)
* Balloons
* Demonstration copy of **Tissues in a cup Resource sheet**
* Tea light candle
* Small glass
* Long matches/lighter
* A small jug containing 1 tsp of bicarbonate of soda
* 50 ml vinegar

**Each group**

* One deep container
* Two tissues
* Water to fill the container
* One transparent plastic cup

**Each student**

* Individual science journal (digital or hard-copy)
* **Tissues in a cup Resource sheet** (or create their own)

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| **Lesson Routine** | **Estimated time** | **Task type** |
| Reorient | 5 minutes | Whole class |
| Question | 10 minutes | Whole class |
| Investigate | 15 minutes | Whole class/Group |
| Integrate | 15 minutes | Whole class |
| Investigate | 10 minutes | Whole class |
| Integrate | 20 minutes | Whole class/Group |

# Inquire

## Re-orient

Revisit the samples examined, and the ideas students had about gases, recorded on the Y-chart or table created in the Launch phase. Focus on the samples that students thought might be classified as gases. Review the vocabulary they used to describe gases and how they decided what made something a gas.

## Question • What’s in an empty cup

Allow students to examine an empty balloon, then discuss.

Potential discussion prompts

* What is it?
* Is it a solid, liquid or gas?
* What is it used for?
* How do we blow it up/inflate it?

Allow students to examine an inflated balloon, or to blow up balloons themselves, and discuss.

Potential discussion prompts

* What’s inside the balloon now? How do you know?
* Is what’s inside it a solid, liquid or gas? Why do you think that?
* Why do we tie the end of the balloon off after we’ve inflated it?

Next, show students an empty transparent cup, and ask if there is anything inside it. Turn the cup over and place it on a flat surface and ask again if there is anything inside the cup.  
  
Support students to compose a question for investigation about the cup and its contents, by prompting them to begin a question with ‘how’ or ‘what’. Some examples include:

* What’s inside an empty cup?

How can we show there is air/gas inside an empty cup?

## Investigate • Testing ideas

Students investigate to find out what’s inside the empty cup.

Using a demonstration copy of the **Tissues in a cup Resource sheet**, review and discuss the steps of Part 1 of the investigation. Students will:

1. Pack the tissue firmly into the bottom of the plastic cup.

2. Turn the cup upside down and hold the rim of the cup flat on the surface of the water.

3. Slowly push the cup straight down into the water.

4. Remove the cup from the water and examine the tissue

Students discuss their predictions and reasoning for them in their collaborative teams, and record them using the Predict, Reason, sections of the PROE chart. Students then carry out the investigation, observing what happens and recording their findings in the Observe, Explain sections of the PROE chart.

Using a demonstration copy of the **Tissues in a cup Resource sheet**, review and discuss the steps of Part 2 of the investigation. Students will:

1. Pack the tissue firmly into the bottom of the plastic cup.

2. Turn the cup upside down and hold the rim of the cup flat on the surface of the water.

3. Slowly push the cup into the water, tilting the cup as you push it down.

4. Remove the cup from the water and examine the tissue.

Students discuss their predictions and reasoning for them in their collaborative teams, and record them using the Predict, Reason, sections of the PROE chart. Students then carry out the investigation, observing what happens and recording their findings in the Observe, Explain sections of the PROE chart.

Model how to complete if necessary.

Allow students time to complete their investigation in collaborative teams. You might ask them to complete the two parts of the investigation separately, discussing and sharing results after each. Alternatively you might review and discuss both steps and allow them to complete each part without interruption, discussing and sharing results at the end. See the Integrate step of this lesson for discussion prompts.

## Integrate • Discussing claims

Share and discuss findings as a class. Encourage students to seek further information and clarification from other teams using the [science question starters](file:///C:/facilitating-evidence-based-discussions).

**Potential discussion prompts**

* What did you think would happen to the tissue when you pushed the upside-down cup into the water?
* Were your predictions correct?
* What did you observe as you pushed the cup into the water?
* Did the tissue get wet? Why do you think that happened?
* What do you think is inside the cup, apart from the tissue?
  + There is air inside the cup.
* What was happening to the air as you pushed the cup down into the water?
* What did you notice happened when you tilted the cup as you pushed it down?
  + Air bubbles escaped from the cup.
* Were you able to get the tissue wet? What did you have to do to make that happen?

## Inquire • Further investigation (demonstration)

Set up a demonstration for students to view:

1. Place the tea light into the small glass and light it using the long matches.

2. Slowly add some vinegar to the jug containing bicarbonate of soda until it bubbles and fizzes. Don’t put in so much that it comes out over the top.

3. Cover the top of the jug with your hands or a piece of paper, to trap some of the gas being produced.

4. After a few seconds remove your hands/the paper and pour the gas only—not the liquid—onto the candle. The candle will be extinguished.

## Integrate • Further discussion

Discuss what was happening in the demonstration, and what it tells us about gases.

**Potential discussion prompts**

* Why did I cover the top of the jug?
* What did I pour from the jug over the candle to make it go out?
* What does that tell you about gases?
  + That some gases can be poured. That some gases are denser—this is similar to oil sitting on top of water—two liquids. In this case it is the air sitting on top of the carbon dioxide.

Referring to the properties of liquids identified in the previous lesson as a reference, challenge students in collaborative teams to write a list of claims, or ‘rules’ (i.e. the properties) for gases. Revise the term volume if required.

Share teams’ list of claims with the class. Discuss each claim made with the objective to reaching consensus and create a list naming the properties of a gas.

Potential discussion prompts

* Share one claim you have made about gases.
* Has anyone else made the same or a similar claim?
* What evidence supports or does not support this claim?
* Do we agree that this claim can officially be listed as a property of a gas?

If teams are not able to identify all the properties of a gas (spread out to fill the space, can be confined within a container, can be compressed, can sometimes be poured—see the **Gas and its properties** professional learning embedded in this step), present the missing properties as claims. Ask students if they agree or disagree with these claims and what supporting evidence from the investigation justifies their thinking.

Record the final list of properties of a gas in the class science journal.

### Reflect on the lesson

You might:

* add to the class word wall of vocabulary related to gases and their properties.
* refer back to the list created in Lesson 1, or substances students confidently categorised as gases, and substances they weren’t sure about.
* Would they reclassify any based on what they have learned?
* add to the class TWLH, completing the H and L sections with what they have learned about gases.
* ask students for further questions about gases to add to the class science journal or TWLH chart.
* Discuss how you might investigate to find the answers to these questions. Provide students with opportunities to undertake such investigation.
* revisit the drawings and words students used in the Launch phase to describe gases, and make any additions using a different coloured pen/pencil.
* discuss how they might use science communication techniques to help others understand what they have learned. Add it to the list created in the Launch phase.
* consider what questions a 'non-expert' might ask them about gases.

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**Year 5**

Communicating matters • Lesson 5 • Hot air

**Lesson 5**

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| To read the most recent version of this task, download associated resources, and view embedded professional learning including classroom videos and work samples, visit: [https://primaryconnections.org.au/teaching-sequences/year-5/communicating-matters/lesson-5-hot-air](https://primaryconnections.org.au/teaching-sequences/year-5/communicating-matters/lesson-5-hot-air?utm_source=docx&utm_medium=lesson_5&utm_campaign=cm) |

# Lesson overview

Students plan and conduct a fair-test investigation to determine if the observable properties of a gas change with an increase in temperature.

## Key learning goals

Students will:

* identify that air is a gas and that it takes up space.
* change one variable in a fair test investigation about air.
* discuss how the volume of a gas depends on the temperature.

Students will represent their understanding as they:

* discuss, record and compare results of a fair-test investigation.

## Assessment advice

In this lesson, assessment is formative.

Feedback might focus on:

* students’ fair-testing methods. Are they changing only one variable? Are they measuring and recording data accurately?

## List of materials

**Whole class**

* Class science journal (digital or hard copy)
* Class science journal (digital or hard copy)
* Demonstration copy of **Air temperature investigation planner Resource sheet**
* Optional: Images and video clips of hot-air balloons being inflated, for example [Preparation for a hot air balloon take off (3 minute watch)](https:/www.youtube.com/watch?v=bXq4DH6zgDU)

**Each group**

* 2 x transparent plastic bottles the same size
* 2 x balloons the same size/thickness, to be fitted over the opening of the bottles
* 2 x containers deep enough to submerge the bottles
* Warm water to fill one of these container\*
* Ice and tap water to fill the other container\*

\*Alternatively, you might have communal containers filled with hot and iced water for multiple groups to use.

Note: For this investigation it is ideal for teams to each have two bottles and balloons of the same size, inflated to the same (or as close to) circumference. If enough resources cannot be organised, please allow sufficient time for the bottles/balloons to return to room temperature before submerging in water of a different temperature.

#### ****Safety note****

This activity requires the use of hot water and iced water. Consider organising extra adult supervision to support the investigation.

It is recommended that any hot water used in a classroom should be at or below 43°C.

Discuss with students the potential dangers of iced water, and why they should not hold their hands in it.

**Each student**

* Individual science journal (digital or hard-copy)
* **Air temperature investigation planner Resource sheet** (or create their own)

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| **Lesson Routine** | **Estimated time** | **Task type** |
| Reorient | 5 minutes | Whole class |
| Question | 10 minutes | Whole class |
| Investigate | 30 minutes | Whole class/Group |
| Integrate | 15 minutes | Whole class |

# Inquire

## Re-orient

Review previous learning about the properties of solids, liquids and gases, focusing on gases.

## Question • Changing properties

**Pose the question:** *Is hot air the same as cold air?* Discuss this idea by focusing on how a hot-air balloon works.

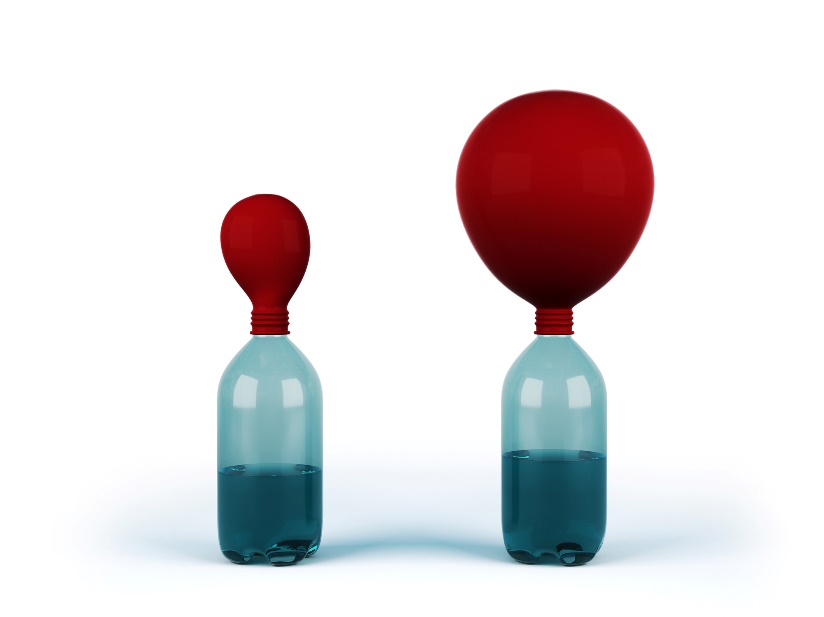
Potential discussion prompts

* What is a hot-air balloon? What does it look like? What does it do?
* How does a hot-air balloon work?
* What is in a hot-air balloon?
* If air is in a hot-air balloon, why does it go up?
* What might this tell us about what happens when we change the temperature of air?

**Optional:** View images and video clips of hot-air balloons being inflated.

## Investigate • Does air change?

Show students a transparent plastic bottle with a balloon, inflated to have an approximately 15 cm circumference, fitted over the opening.



Through questioning and discussion have students confirm that there is air inside the bottle and balloon.  
  
Potential discussion prompts

* *What is in the balloon and bottle?* 
  + The balloon and bottle both contain air.
* *What are the properties of air(/gas)?*
* *Can air move in or out of the balloon and bottle?* 
  + The balloon and bottle are a sealed space. Air cannot escape.
* *How might we change the temperature of the air inside the bottle?*

**Pose the question:***What things might affect the circumference of the balloon when we submerge this bottle in water?*

Using a variables grid, record the variables that could affect the air in the bottle and balloon. Identify that the thing to be measured during the investigation is the circumference of the balloon and place that in the centre of the grid. Brainstorm other variables in the surrounding columns/rows, such as the size of the bottle, the size of the original balloon, how much it is inflated, the temperature of the water. Sections can be added or removed as required.

Note: In some investigations it is appropriate to allow teams to select the variable they wish to change, and teams might select different variables. However, in this case, the goal of the investigation is to make the air inside the bottle expand, thus ‘blowing up’ the balloon. Changing the temperature of the water the bottle is placed into (and thus the temperature of the air inside the bottle) is what will achieve this, so all teams should investigate this same variable.

Use the question stem to write a question for investigation: What happens to (thing to be measured/ dependent variable) when we change (factor that will be changed/ independent variable). *What happens to the circumference of the balloon when we change the temperature of the water the bottle is submerged in?*

Discuss how the investigation will be conducted and data collected and recorded.

**Potential discussion prompts**

* How could we measure the circumference of the balloon?
* What temperature water might we use?
* How long will the balloon stay submerged?
* How might we record our results?
  + Labelled diagrams, photos, measurements

In collaborative teams, allow students time to complete their investigation planners, conduct the investigation and discuss and record results.

## Integrate • Discussing results

Share and discuss findings as a class.

Encourage students to seek further information and clarification from other teams using the [science question starters](file:///C:/facilitating-evidence-based-discussions).

**Potential discussion prompts**

* Did your results match your predictions? Why do you think that happened?
* What happened to the balloon when the bottle was in hot water? Cold water? Why do you think that is?
* What claim could you make about what happens to air when it is heated and cooled based on this investigation?
  + If needed, present the claim ‘air takes up more space when it is heated and less space when it is cooled’ and ask students if they would agree and why/why not.
* Could we add another ‘rule’ to the properties we found out about gas? Or more detail to an existing ‘rule’?
* Can you think of any real-life applications of this?
  + Hot-air balloons as discussed earlier, soft-drink cans exploding if left in the sun on a hot day, etc.

#### Reflect on the lesson

You might:

* add to the class word wall of vocabulary related to gases.
* add to the class TWLH chart, completing the H and L sections with what they have learned about gases.
* discuss any challenges students faced during the investigation, and how they might overcome them in the future.
* discuss safety considerations and why they are important.
* discuss how they might use science communication techniques to help other understand what they have learned. Add it to the list created in the Launch phase.
* consider what questions a 'non-expert' might ask them about heating air or other gases.

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**Year 5**

Communicating matters • Lesson 6 • Playing particles

**Lesson 6**

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| To read the most recent version of this task, download associated resources, and view embedded professional learning including classroom videos and work samples, visit: [https://primaryconnections.org.au/teaching-sequences/year-5/communicating-matters/lesson-6-playing-particles](https://primaryconnections.org.au/teaching-sequences/year-5/communicating-matters/lesson-6-playing-particles?utm_source=docx&utm_medium=lesson_6&utm_campaign=cm) |

# Lesson overview

Students participate in a role-play to explore the arrangement of particles in solids, liquids and gases (the particle model).

## Key learning goals

Students will:

* explore particle theory.
* explain the different arrangement of particles in solids, liquids and gases.

Students will represent their understanding as they:

* participate in a role-play exploring the arrangement of particles.
* create a labelled diagram showing the arrangement of particles in solids, liquids, and gases.

## Assessment advice

In this lesson, assessment is formative.

Feedback might focus on:

* students’ drawings of the particle model of solids, liquids and gases.

## List of materials

**Whole class**

* A long rope or similar, used to simulate the shape of a container to hold liquids and gases

Optional: Saved or printed images from the **Particle arrangement in solids, liquids and gases Resource sheet**, to use for student prompting if required

**Each student**

* Individual science journal (digital or hard-copy)

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| **Lesson Routine** | **Estimated time** | **Task type** |
| Reorient | 5 minutes | Whole class |
| Question | 10 minutes | Whole class |
| Investigate | 15 minutes | Whole class/Group |
| Integrate | 30 minutes | Whole class/Group/Individual |

# Inquire

## Re-orient

Revise the term particles introduced in the Launch phase. Remind students that, based on the evidence collected over hundreds of years, scientists think that all substances are made of particles, and that it is the way these particles behave that make something a solid, liquid or gas.

## Question • Thinking about particles

Encourage students to ask questions about particles in relation to solids, liquids and gases. Record the questions in the class science journal.

If required, model some examples for students. For example:

* *How big are particles?*
* *Do particles move?*
* *How are the particles in solid, liquids and gases different?*
* *How do particles in solids, liquids and gases behave?*

## Investigate • Playing particles

Guide students to role-play the behaviour or particles in a solid, a liquid, and a gas, without telling them which state of matter they are role-playing.

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| Solid | With a strong/stiff upright posture, students stand closely together in uniform rows. They hold hands tightly with the students beside/behind/in front of them (as much as is possible). Ask them to imagine that they are being pushed from one side. They need to slide in the direction they are being pushed, while maintaining their posture, proximity, contact with others and the floor. |
| Liquid | Place a rope or similar on the floor in a circular shape. Make sure the size of the circle is large enough to hold all students, but small enough that they get a sense that particles in liquid are close together and bonded—though not as close and as tightly bonded as a solid. Students stand in a non-uniform group, relatively close together, and hold hands loosely. Change the shape of the rope, making it square, triangular, freeform, etc. Students might need to move to conform to the new shape, but maintain a similar proximity with other students. |
| Gas | Students stand randomly in no particular shape, with non-uniform distances between themselves and other students. Students imagine that they are being gathered together. You might ask them to imagine a container enclosing them, or use a rope or similar to, in effect, round them up. |

These role-plays require students to be in close proximity and make physical contact with one another. Determine the structure of this activity that is appropriate for your students and context. You might like to have the whole class participate in all three role plays, or split the class into three groups, selectively grouping students who might have sensory or other issues into groups in which they would feel comfortable.

## Integrate • Drawing particles

After experiencing/observing all three role-plays, discuss with students their placement as particles, and which arrangement they think best represents solid, liquid and gas. Ask students to match their movements to the three descriptions of the properties of solids, liquids and gases that students have agreed upon in previous lessons.

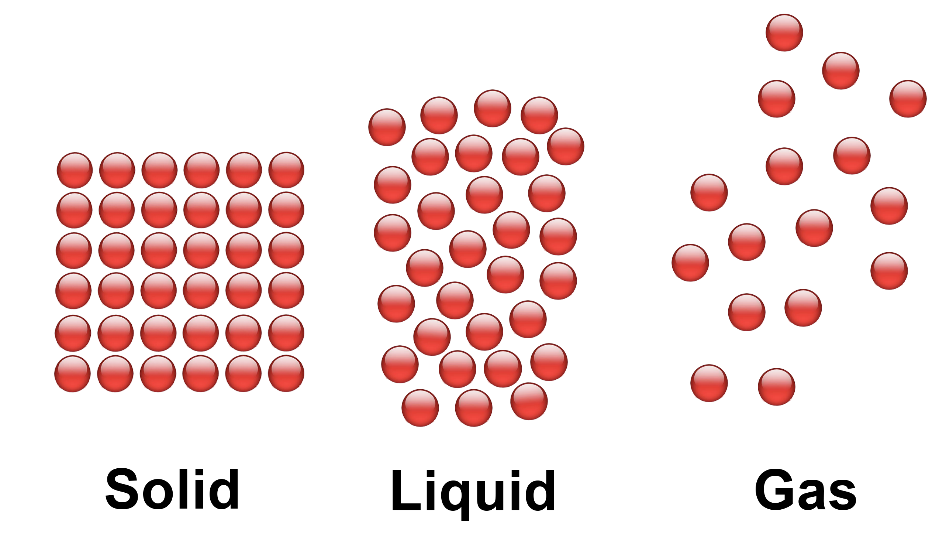
**Potential discussion prompts**

* What did you notice about the placement of particles in the first/second/third role-play?
* How close were the particles to each other?
* Did they appear connected?
* How strongly were they connected?
* How would you describe what happened when they were ‘moved’?
* Which role-play would you associate with solids/liquids/gas? Why?

In collaborative teams, ask students to compose a description of the behaviour of particles in a solid, liquid and gas. Share the descriptions as a class, and construct an agreed description that can be added to the description of properties of each in the class science journal.

Working independently, students use their previous drawings/descriptions of solids, liquids and gases completed in the Launch phase to create a new annotated diagram. Encourage them to show the arrangement of particles in solids, liquids and gases. Prompt student thinking by referring explicitly to how they were arranged as ‘particles’ in each of the role-plays.

If required, show students illustrations that show the particle model of all three states of matter. You might like to have these ready on a piece of paper or iPad, and show individual students as required, rather than showing all students.



Undertake a gallery walk to share students’ representations.

**Discuss:**

* the common features of students’ diagrams, and what they think constitutes a high-quality diagrammatic model.
* the differences between students' diagrams. This might include a discussion about the size of particles as students represented them.
* how the size of particles can differ.

Discuss the purpose of models and how they are used in science, including the benefits and limitations of using them.

Potential discussion prompts

* What do you think a scientific model is?
* Can you think of an example of a scientific model? Have you ever made one yourself?
  + Examples include using building blocks for a house, using playdough to test different shapes rolling down a hill, building a food chain to show how energy flows in the environment.

Note that the role-plays students just participated in were a type of scientific model, as are the diagram they have drawn showing the particle arrangement of solids, liquids and gases.

* Why do you think that scientists often make/use models?
  + To represent their understanding, to test ideas, to predict and explain how and why things change.
* Do you think a model can show every aspect of an idea? Why? Why not?
* What did our models of solids, liquids and gases show and not show?
  + Solid: The model showed how the particles are attracted to each other and are close together. The model didn't show us the properties of that specific substance, if it could be stretched, or bent or folded. It also didn't show us that it can not be compressed.
  + Liquid: The model showed how the particles stayed close together, but were able to flow around each other, and how they could change shape. The model didn't show us that liquids cannot be compressed.
  + Gas: The model showed us how the particles in gases are further apart and spread out to fill the space, and how they can be compressed together. The model didn't show us that they still have some attraction to each other.

**Optional:** Refer to the questions students asked about particles at the beginning of the lesson. Determine which questions have and have not been answered. Add any further student questions to the list.

#### Reflect on the lesson

You might:

* reflect on how students' representations of solids, liquids and gases have change between the Launch phase and this lesson.
* add to the class word wall of vocabulary related to solids, liquids and gases.
* add to the class TWLH, completing the H and L sections with what they have learned about particles.
* discuss what is meant by a theory in science—how particle theory is widely accepted as it has so far been supported by evidence gathered by scientists over many years.

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**Year 5**

Communicating matters • Lesson 7 • Questioning communicators

**Lesson 7**

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| To read the most recent version of this task, download associated resources, and view embedded professional learning including classroom videos and work samples, visit: [https://primaryconnections.org.au/teaching-sequences/year-5/communicating-matters/lesson-7-questioning-communicators](https://primaryconnections.org.au/teaching-sequences/year-5/communicating-matters/lesson-7-questioning-communicators?utm_source=docx&utm_medium=lesson_7&utm_campaign=cm) |

# Lesson overview

Students prepare to undertake the role of science communicators by re-examining substances, considering what questions their audience might ask about them, and preparing possible responses and further questions to ask.

## Key learning goals

Students will:

* re-examine substances and considering how to answer questions about them, with supporting evidence.
* predict the behaviour of the particles that make up difficult to categorise substances.
* consider how they are building on the work of other scientists and science communicators.

Students will represent their understanding as they:

* contribute to discussions about difficult to classify substances.
* consider ways to effectively communicate science ideas.

## Assessment advice

In this lesson, assessment is formative.

Feedback might focus on:

* The questions students ask/anticipate. Can they be answered in detail by what has been learned in this teaching sequence? Or will they require further investigation?

## List of materials

**Whole class**

* Class science journal (digital or hard copy)

**Each group**

* Samples of substances students have examined during the teaching sequence, including those that were difficult to classify

**Each student**

* Individual science journal (digital or hard-copy)

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| **Lesson Routine** | **Estimated time** | **Task type** |
| Reorient | 5 minutes | Whole class |
| Question | 10 minutes | Whole class |
| Investigate | 20 minutes | Group |
| Integrate | 30 minutes | Whole class |

# Inquire

## Re-orient

Review what has been learned so far about the properties of solids, liquids and gases.

Review the role of a science communicator and discuss again how students are going to create a text to convey the ideas they have learnt to their specific audience, and why these ideas are important.

## Question • What should we communicate?

**Pose the questions:** *What is important for people to know about solids, liquids and gases? What questions might be asked about them? How might we respond?*

## Investigate • What should we communicate?

Re-examine the samples of the substances students have looked at during the course of the sequence, including any they had difficulty categorising, including oobleck, honey, various powdered solids, carbonated drinks (soft drink, mineral water), sponges etc.

In collaborative teams, students:

* examine various substances.
* discuss/record:
  + if each substance is a solid, liquid or gas.
  + if it might be difficult to categorise and why.
  + the category they would place it in.
  + why they would place it there.
* represent what they think its particle structure might look like and why they think that.
* consider the questions they might be asked about substances, and how they might answer them.

Prompt teams' thinking with sample questions if required:

* If something can be poured, wouldn’t it be a liquid?
* Is soft drink a liquid or a gas?
* If something is soft, how can it be a solid?

Teams might also:

* revise the terms used during this teaching sequence.
* consider the amount of ‘science knowledge’ the audience may or may not already have, including the vocabulary they might use.
* consider how they might, like a science communicator, use everyday language to communicate their ideas.
* consider how these ideas are important to their audience, and why it might be important to know them.

## Integrate • Preparing to communicate: collaborating

Share teams’ ideas about the substances they re-examined as a class.

**Potential discussion prompts**

* How did you categorise some of the trickier substances?
* Why did you categorise that way?
* What do you think the particle structure would look like?
* Do you think the properties of these trickier substances could be changed? How?
* What would adding water, heat etc. do to the substances?

Teams then share the questions they think they might be asked about solids, liquids and gases, and the potential answers they have prepared. Record these in the class science journal.

Ask other teams if they might add any details to these potential answers, including considering how they might refer to particle theory in the explanations/answers.

Highlight that, by collaborating and building on each others’ work, they are behaving like scientists and science communicators who have investigated and communicated about particles before them.

**Potential discussion prompts**

* What questions do you think people will ask you about the substances?
* What responses might you give?
* How can we build upon each other’s work to be the most prepared as possible to answer these questions?
* How are we building on past scientists'/science communicators' work?

#### Reflect on the lesson

You might:

* reflect on the list of solids, liquids and gases, created throughout the teaching sequence, as well as some of the trickier substances students have encountered. How confident do they feel that substances have been categorised correctly?
* add to the class word wall of vocabulary related to solids, liquids and gases.
* add to the class TWLH, completing the H and L sections with what they have learned about particles.

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**Year 5**

Communicating matters • Lesson 8 • Communicating Science Ideas

**Lesson 8**

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| To read the most recent version of this task, download associated resources, and view embedded professional learning including classroom videos and work samples, visit: [https://primaryconnections.org.au/teaching-sequences/year-5/communicating-matters/lesson-8-communicating-science-ideas](https://primaryconnections.org.au/teaching-sequences/year-5/communicating-matters/lesson-8-communicating-science-ideas?utm_source=docx&utm_medium=lesson_8&utm_campaign=cm) |

# Lesson overview

Students consolidate their learning by creating a text to communicate the science ideas they have learned.

## Key learning goals

Students will:

* communicate scientific ideas about solids, liquids and gases in a manner appropriate for their selected audience.

Students will represent their understanding as they:

* use scientific terminology appropriately, and explaining it using appropriate techniques.
* use visual modes to support their written explanations.

## Assessment advice

In the Act phase, assessment is summative.

Students working at the achievement standard should have:

* identified solids, liquids and gases, and named the properties of each.
* demonstrated an understanding of the particle model.

They might also have:

* applied their understanding of the particle model to approximate the structure of more difficult to categorise substances.
* communicated their science understanding effectively.

Refer to the Australian Curriculum content links on the [Our design decisions tab](file:///C:/teaching-sequences/year-5/communicating-matters) for further information.

## List of materials

**Whole class**

* Class science journal (digital or hard-copy)
* A variety of texts that have been designed to communicate science ideas. The following websites are trusted resources with age-appropriate videos and texts:
  + [Curious](https://www.science.org.au/curious/videos) by the Australian Academy of Science
  + [Behind The News](https://www.abc.net.au/btn) by the ABC
  + [Science](https://www.abc.net.au/education/subjects-and-topics/science) by ABC Education

**Each student**

* Individual science journal (digital or hard-copy)
* A variety of materials to support the creation of multi-modal texts including access to a variety of digital tools

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| **Lesson Routine** | **Estimated time** | **Task type** |
| Reorient | 5 minutes | Whole class |
| Anchor and Connect | 10 minutes | Whole class |
| Design | Variable | Group |
| Communicate | Variable | Whole class/Group |

# Act

## Re-orient

Review the entries into the class science journal created over the course of the sequence.

## Anchor and connect • Examining science communications

Examine a variety of texts that have been designed to communicate science ideas. Consider the features of these texts and their intended audiences.

Potential discussion prompts

* What audience do you think this text was written for?
* What words or pictures do they use to make you think that?
* What was good about this text?
* What would be improved? How would you improve it?
* Would it be effective to try to communicate all the past weeks of our learning in a single text?
* What difficulties might we encounter doing this?
* How could we solve these problems?

## Design • Designing communications

Using the steps of the design thinking process, students apply their understanding of the properties of solids, liquids and gases and the arrangement of their particles to compose and publish a text that explains the ideas or answers questions about them.

### Define

Outline the problem in a simple manner such as:

How can we communicate a science idea so that our audience will understand it?

**Potential discussion prompts**

* Can we communicate everything we’ve learned in single text?
* Why do you think that?
* What issues might we encounter if we tried to do that?
* Who are we communicating to?
* What do we need to explain?
* What do they already know?

### Ideate

Students ideate/brainstorm ideas for topics for their text. Prompt students with questions if required:

* What is oobleck?
* What acts like a liquid, but is really a solid?
* Why did my soft drink explode in the sun?
* What do scientists say about particles?

Discuss the modes students might use to create their text, including print, voice recording, video, demonstration, text, animations, PowerPoint, poster, or any combination of these. Discuss the features of these texts, and advantages and limitations of each.

### Prototype

Allow students time to plan and compose drafts of their chosen medium before the final product. Encourage students to consider their audience at each stage and to consider how their approach could appeal to the individuals in the audience.

**Optional:** You may wish to link this learning, particularly that about multi-modal texts and their creation, to students’ learning in English.

## Communicate • Sharing communications

### Test and share

Organise for students to share their texts with the selected audience. Consider how the audience might provide feedback on students’ texts.

You might like to create a common list of criteria as a class by which the audience can evaluate the text, or support the students through a process of creating their own criteria based on their specific composition and its features.

#### Reflect on the sequence

You might:

* refer to the class science journal and TWLH chart to reflect on what has been learned over the course of the unit.
* consider the role of science communicators, and how students felt about working in that role.