

Coordinator Notes: Module 2.1 Water – Wonderful Water

This Module explores the science and properties of water!

- Students learn about the three states of matter (solid, liquid and gas).
- Students learn that all things are made from matter, and matter is made from atoms.
- Students learn a water molecule is made of atoms.
- They go on to learn about the properties of cohesion, surface tension and adhesion, through a number of visually exciting experiments.
- Students will utilise knowledge gained in the Water Transport challenge.

Session Length:

This Module can be presented in different session durations per your needs.

Lesson plans are provided for:

- A 120 minute session, or, 2 x 60 minute sessions
- 45 minute, 75 minute, and 90 minute sessions

Technology:

PowerPoint: If you do not have access to a data projector and cannot display the PowerPoint presentation, we recommend that you print the most important slides before the session, and either enlarge them onto cardboard to use in place of slides, or create a booklet that students can share in small groups.

The most important slides have been included as a 'Reduced Slides' PowerPoint file, and an easily printable pdf version of these slides is also provided. If you choose this option, we recommend that you still read and use the slide notes included in the full PowerPoint for the session.

The session can be conducted without slides all together, but they offer visual aid in explanation of scientific concepts. We recommend at the very least that instructions for each experiment are printed for the students.

Videos links: The suggested links to online videos within the session can be helpful with explanation. Notes have been included in the slides if there is an essential component to a video which the facilitator should discuss or demonstrate, if the video cannot be played.

Video files: A video file for each Module has been provided to aid explanation and instruction for some experiments and challenges. It is recommended coordinators view video files prior to delivering sessions, if the experiments and challenge activities are unfamiliar.

Please read the Module 2 Risk Assessment before proceeding with the session

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Module 2.1 Water – Wonderful Water: Overview

Begin the session by noting that in Module 1, we explored the science around AIR. In this Module, we will explore the science around WATER! Discuss and **explore WATER** with the group, encouraging students to share what they already know, notice and wonder.

Encourage students to use the scientific method (introduced in Module 1) to form hypotheses for their experiments in Module 2.

Content overview:

Concept / Activity	Session Duration (minutes)			
	120	90	75	45
States of Matter Introduce the concept that all things are made of matter. Discuss the three States of Matter (solid, liquid, gas) with students.	*	*	-	-
Matter & Atoms Discuss the concept that all things are made of matter, and all matter is made up of tiny building blocks called atoms.	*	*	-	-
Atoms and the States of Matter Introduce the concept that atoms behave differently as matter changes states from solid through to a gas.	*	*	-	-
Molecules Discuss that atoms join together in groups to form molecules. A water molecule is made of both hydrogen and oxygen atoms.	*	*	-	-
Experiment 2.1.1 Wobbly Water This experiment explores surface tension	*	*	*	-
Experiment 2.1.4 Sink or Float This experiment explores surface tension	*	-	-	-
Cohesion and Surface Tension Begin to explore the properties of surface tension and cohesion, attraction between molecules of the same substances.	*	*	*	-
Experiment 2.1.2 Rainbow Milk This experiment explores surface tension	*	*	*	-
Cohesion Expand on the concept of cohesion. Introduce the concept of water moving through plants due to the force/pull of cohesion.	*	-	-	-
Experiment 2.1.3 Celery Transport This experiment explores cohesion	*	-	-	-
Experiment 2.1.5 Wicking Water This experiment explores adhesion	*	*	-	-
Adhesion Introduce the concept of adhesion, attraction between molecules of different substances.	*	*	*	-
Water Transport Challenge Explore cohesion, surface tension and adhesion.	*	*	*	*

Slides:

PowerPoint Slides are available to support the delivery of this module. Slides explain concepts visually, and include short, engaging videos relevant to the topic.

A full list of slides and recommended inclusions for each session duration are provided in the table below. Appropriate slides are also noted in lesson plans for each duration.

PowerPoint Presentation: 'M 2.1 - Master Slides 120 minute Session Duration'		Session Duration (minutes)			
Slide	Content	120	90	75	45
1	Introductory title page for Module 2.1	*	*	*	*
2	Prompt for discussion about WATER	*	*	*	*
3	Water facts and fiction	*	*	*	*
4	Introduces the three states of matter, solid, liquid, gas	*	*	-	-
5	Introduces the concept of matter consisting of atoms	*	*	-	-
6	Introduces the concept atoms are tiny, and behave differently in solid, liquid and gas state of matter	*	*	-	-
7	Introduces molecules, atoms combining in groups. Shows oxygen and hydrogen molecules combining into water.	*	*	-	-
8	Outlines experiment E2.1.1 'Wobbly Water'	*	*	*	-
9	Outlines experiment E2.1.4 'Sink or Float'	*	-	-	-
10	Introduces the concepts of forces between water molecules. Discusses cohesion and surface tension.	*	*	*	-
11	Prompts discussion that all liquids have forces between their molecules, not just water.	*	*	*	-
12	Outlines experiment E2.1.2 'Rainbow Milk'	*	*	*	-
13	Revisits cohesion.	*	-	-	-
14	Explores cohesion in plants (celery).	*	-	-	-
15	Outlines experiment E2.1.3 'Celery Transport'	*	-	-	-
16	Outlines experiment E2.1.5 'Wicking Water'	*	*	-	-
17	Introduces the concept of adhesion.	*	*	-	-
18	Explores adhesion, introduces concept of meniscus.	*	-	-	-
19	Title page introducing the Water Transport Challenge.	*	*	*	*
20	Outline of Challenge storyline.	*	*	*	*
21	Outline of Challenge activity and scoring.	*	*	*	*

22	Video link to water travelling on a string demonstration	*	*	*	*
23	Video link to 'anti-gravity water' demonstration	*	*	*	*
24	Outline of Challenge Rules	*	*	*	*
25	Outline of additional Challenge Rules	*	*	*	*
26	Schematic of Challenge set up	*	*	*	*
27	References	*	*	*	*
28	Video link to water on a coin demonstration	-	-	-	*

<p align="center">Module 2.1 Water – Wonderful Water</p> <p align="center">Lesson Plan</p> <p align="center">120 minute session or 2 x 60 minute sessions</p>			
<p>High Tech: Use PowerPoint Presentation ‘M2.1 - Master Slides 120 minute Session Duration’</p> <p>Low Tech: Print PowerPoint ‘M2.1 - Reduced Slides for Printing’. Use slide notes from the ENTIRE 120 minute presentation, adapting discussion to cover omitted slides.</p>			
<p>Key Learning Area Chemistry, Physical World</p>			<p>Topics Water properties, States of Matter, Atoms, Molecules</p>
Timing	Running Time (hh:mm)	Procedure	Materials
5 min	00:05	<p>Lesson Introduction</p> <p>Welcome, water brainstorm Fact or fiction game</p>	PowerPoint M2.1 (slides 1-3)
5 min	00:10	<p>Body of Lesson (Lesson 1, 2 x 60 minute sessions)</p> <p>Explore the States of Matter, discuss concept that everything is matter!</p>	PowerPoint M2.1 (slide 4) Optional: pieces of ice, cup/bottle of water, kettle
5 min	00:15	Introduce concept of atoms, and molecules.	PowerPoint M2.1 (slide 5-7), Optional: Molecular modelling kit
10 min	00:25	Discuss hypothesis, conduct Experiment 2.1.1 Wobbly Water and discuss results	PowerPoint M2.1 (slide 8) Water, cups, pipettes/straws, coins, shallow bowls/jars, paper towel
5 min	00:30	Discuss hypothesis, conduct Experiment 2.1.4 Sink or Float and discuss results	PowerPoint M2.1 (slide 9), Water, cups, paperclips, foil
5 min	00:35	Introduce concepts of Surface Tension and Cohesion	PowerPoint M2.1 (slide 10,11)

10 min	00:45	Discuss hypothesis, conduct Experiment 2.1.2 Rainbow Milk and discuss results	PowerPoint M2.1 (slide 12), Milk, bowls/plates/cups, liquid soap, cotton tips, food colouring
5 min	00:50	Revisit and discuss cohesion	PowerPoint M2.1 (slide 13)
10 min	01:00	Discuss hypothesis, conduct Experiment 2.1.3 Celery Transport. Note: This experiment may be taken home, or, be kept in the learning space for review of results (max 1 week later). The session coordinator may also choose to pre-prepare this experiment, up to 1 week prior to the session. (Break for 2 x 60 minute sessions) (Lesson 2, 2 x 60 minute sessions)	PowerPoint M2.1 (slides 14-15) water, cups, celery, food colouring, scissors
5 min	00:05/ 01:05	Review Celery Transport experiment results (if conducted the week prior / at home)	PowerPoint M2.1 (slide 14-15)
10 min	00:15/ 01:15	Discuss hypothesis, conduct Experiment 2.1.5 Wicking Water	PowerPoint M2.1 (slide 16) Paper towel, water, cups,
5 min	00:20/ 01:20	Introduce concept of adhesion, discuss the term meniscus	PowerPoint M2.1 (slide 17-18)
5 min	00:25/ 01:25	Introduce challenge, storyboard, and activities.	PowerPoint M2.1 (slide 19-21)
5 min	00:30/ 01:30	Watch: water on string and anti-gravity water videos. (If videos are unable to be played, coordinator should demonstrate how each activity works. Coordinator should watch the videos prior to the session).	PowerPoint M2.1 (slide 22-23) Water bottle, mesh, cups, water, rubber band, string.
5 min	00:35/ 01:35	Explain the Challenge rules.	PowerPoint M2.1 (slide 24-25)

<p>10 min</p>	<p>00:45/ 01:45</p>	<p>Form groups and encourage students to build and test the water on string and anti-gravity water activities.</p>	<p>PowerPoint M2.1 (slide 26), Water, plastic bottles, scissors, string, tape, mesh, rubber bands, cups, straws, eye droppers /pipettes, 20c coins, towels, measuring cups</p>
<p>10 min</p>	<p>00:55/ 01:55</p>	<p>Support groups to undertake the challenge</p>	
<p>5 min</p>	<p>00:55/ 02:00 END</p>	<p>Lesson Conclusion Clean up. Discussion about the session, which water transport method was most effective, ideas for other ways to transport water.</p>	

Module 2.1 – Wonderful Water: Experiments

Experiment E2.1.1: Wobbly Water (Water on a Coin)

Aim: To observe the properties of liquid water

Equipment (per group):

- 1-2 cups of water
- 1 small shallow bowl / jar
- 2 pipettes / straws
- 2 or more coins
- Paper towel

Procedure:

1. Form a group of 2 to 3 students.
2. Slowly fill the shallow bowl / jar right to the top with water.
3. Take turns to add additional drops of water to the ‘full’ bowl / jar using a pipette or straw.
4. Observe how many drops will fit in. Look closely at the edge of the bowl / jar at eye level. What can you see as more drops are added?
5. Now take turns to add drops of water onto a coin, using the pipette / straw. How many drops can fit on a coin?
6. What do you see?

Expected result:

The jar/bowl will appear full. However, you will be able to add more water droplets. The water surface will bulge (curve) upwards as drops are added, until a tipping point is reached and the water finally spills over the edge.

Water droplets placed on the coin will join together, to form a larger droplet, and the droplet will expand out to the rim of the coin. The water surface will bulge (curve) upwards as drops are added, until a tipping point is reached and the water finally spills over the edge.

Explanation:

The water molecules on the surface of the water have water molecules below them, and next to them as neighbours. Water molecules want to stick to other water molecules, and they hold on tightly to their neighbours below and next to them. When molecules ‘stick’ or “bond” together, we call this force of attraction COHESION. Because there are no water molecules above them, only air, the water surface acts like it has a thin ‘skin’. We call this SURFACE TENSION.

As you add more drops onto the coin (or into the jar/bowl), the force of gravity (pulling downwards) becomes stronger than the force of attraction among the water molecules at the surface. This causes the water to spill over the edge of the coin/jar.

Notes:

- ***Encourage students to hold the pipette / straw close to the surface of the water. Dropping from a height can break the surface tension and shorten the experiment.***
- ***Encourage drops to be added slowly / one at a time.***
- ***To repeat the experiment, first ensure the rim of the bowl/jar/coin is dry. Water droplets on the rim can cause early spillage to occur / break surface tension.***

****Note: This experiment is included in the Module 2 Video****

This experiment is utilised in the Water Transport Challenge.

Experiment E2.1.2: Rainbow Milk

Aim: To observe the effect of soap on the surface tension of milk.

Equipment (per group):

- 1 shallow bowl or plate
- 1/2 cup of full cream milk
- Drops of food colouring
- 1 small cup / bowl
- 1 blob of dishwashing liquid/soap (1 Tbsp.)
- 1 cotton tip

Procedure:

1. Form into groups of 2 to 3 students.
2. Fill a shallow bowl/plate with enough milk to cover the bottom.
3. Scatter a few drops of different coloured food colouring across the surface of the milk.
4. Place a blob of dishwashing liquid/soap in a small cup / bowl.
5. Dip a cotton tip in dishwashing liquid/soap. Then, place the dipped cotton tip into the milk and observe what happens.
6. Repeat step 5 to view the effect again.

Expected Result:

The colours swirl and zoom around when the soap is added.

Explanation:

Milk is made mostly of water, but it also contains vitamins, proteins and suspended fat droplets. Milk stays together as one liquid, because of cohesion and surface tension between the milk molecules. The surface tension acts like a thin skin.

When you add the soap, it breaks the surface tension (skin) of the milk in one spot. The pull of the surface tension from the milk at the edge of the bowl/plate then causes the milk in the centre to move toward the edge, taking the colours along with it. The colours will keep moving until the soap stops affecting the surface tension of the milk.

Explanation adapted from:

<http://www.csiro.au/en/Education/DIY-science/Chemistry/Amazing-detergent>

Notes:

- ***Be aware of potential sensitivities to soap and or / allergies to milk.***
- ***UHT Milk can be used for this experiment.***

****Note: This experiment is included in the Module 2 Video****

Experiment 2.1.3: Celery Transport

NOTE: *This experiment takes more than 2 hours to see the results. The experiment may be taken home, or, be kept in the learning space for review of results (max 1 week later). The session coordinator may also choose to pre-prepare this experiment, the night before or up to 1 week prior to the session, and demonstrate results to the group.*

Aim: To observe the movement of water through a plant.

Equipment (per group):

- 1 short celery stalk, with leaves attached
- 1/2 cup water
- 1 cup
- Drops of food colouring
- Scissors

Procedure:

1. Form into groups of 2 to 3 students.
2. Fill a cup with water and add a few drops of food colouring.
3. Observe the end of a piece of celery, can you see the xylem tubes?
4. Place the base of the celery into the coloured water
5. Leave near a window till the following session (max 1 week) later.
6. Observe the results.
7. Cut the stem in half with scissors to observe the cross-section.

Expected Result:

The celery leaves and parts of the stem should appear slightly coloured. The intensity depends on how long the celery soaked in the water, and the amount of food colouring used. If you look at the base of the celery, or cut the stem, you should see coloured dots of a more intense colour – these are the celery plant’s ‘xylem’ tubes, which transport water.

Explanation:

Water moves through plants from their roots to their leaves. Water within the celery stalks evaporates into the air through the leaves, and cohesion and adhesion forces pull the coloured water up through the stem of the celery. This process requires no energy from the plant, it simply occurs due to the power of cohesive and adhesive forces between the water molecules and xylem tubes.

Cohesion: The attraction force between molecules of the same substance.

Adhesion: The attraction force between molecules of the different substances.

Notes:

- *The celery ideally should to be left near a window so the sun can aid evaporation*
- *Be aware of potential allergies to celery. This experiment can also be undertaken with cut flowers. (Be aware of potential allergies to flowers).*

****Note:** This experiment is included in the Module 2 Video**

Experiment E2.1.4: Sink or Float

Aim: To observe surface tension in a cup of water

Equipment (per group):

- 1 cup of water
- 1 Paperclip
- 2cm x 2cm piece aluminium foil

Procedure:

1. Form a group of 2 to 3 students.
2. Fill a cup with water.
3. Place a paperclip flat and gently on the surface of the water.
4. Observe. What do you see?
5. Place the paperclip gently on the water surface in a different way. What do you see?
6. Tear off a piece of aluminium foil (up to 2cm in width / length). Place it gently on the surface of the water.
7. Observe. What do you see?
8. Place the foil gently on the water surface in a different way. What do you see?

Expected Result:

A flat paperclip will float on the surface of the water when gently placed. If you drop the paperclip into the water, the paperclip will sink.

Similarly, a flat piece of aluminium foil will float on the surface of the water when gently placed. If you drop the foil into the water, it will sink.

Explanation:

Water molecules want to stick to other water molecules, and they hold on tightly to their neighbours below and next to them. When molecules 'stick' or "bond" together, we call this **COHESION**. The water molecules on the surface of the water have water molecules below them, and next to them as neighbours. Because there are no water molecules above them, only air, the water surface acts like it has a thin 'skin'. We call this **Surface Tension**.

You can think of surface tension a bit like a thin film on top of the water (like a spider web, or thin trampoline mat). When a weight/object lands on the water surface, it bends down. If the force (pressure) from the weight is more than the strength of the surface tension of the water molecules, the object will break through the surface and sink.

Notes:

- *The paper clip needs to be placed very gently. If you place the paperclip on a piece of paper towel, or tissue, slightly larger than the paperclip, the paper towel will slowly sink, leaving the paperclip to float.*
- *A second paperclip can be used as a 'hook' to slowly lower and place the paperclip.*

Experiment E2.1.5: Wicking Water

Aim: To observe movement of water through paper.

Equipment (per student):

- 1 piece paper towel
- 1/2 cup water
- 2 cups
- Drop of food colouring

Procedure:

1. Half fill one cup with water and add a few drops of food colouring.
2. Twist or fold a piece of paper towel into a tight roll.
3. Fold the roll in half.
4. Place one end of the twisted paper towel into the coloured water.
5. Place the other end into the second, empty cup.
6. Observe the results.

Expected Result:

The paper towel rope (or wick) will start getting wet. You will notice the coloured water rising up out of the cup, soaking higher and higher up the paper towel. After a few minutes, you will notice that the empty cup is starting to fill with water.

If you leave the experiment set up, the second glass will keep filling until there is an even amount of water in each glass.

Explanation:

This process is called 'capillary action', or 'wicking'. The water moves along the tiny gaps in the fibre of the paper towels. This process is possible due to the cohesive and adhesive forces between the water molecules and the paper towel fibres. This process can also be seen in plants, where moisture travels through the roots into the rest of the plant.

Cohesion: The attraction force between molecules of the same substance.

Adhesion: The attraction force between molecules of the different substances.

Notes:

- ***Students may like to set this experiment up at the start of the session, and observe results mid-way and at the end of the session.***
- ***This experiment can be undertaken with different paper types. Student may like to compare the time taken for water to wick through paper towel compared to newspaper.***
- ***This experiment can be undertaken in series, with cups of different coloured water wicking into the same empty cup, to observe colour mixing.***
- ***This experiment can be paused, and partially wet paper towel moved into a cup of a different coloured water, to observe a rainbow travelling up the paper towel.***

****Note: This experiment is included in the Module 2 Video****

Challenge M2.1 – Water Transport Challenge

Coordinator Notes

Scoring:

A scoring mechanism is included, so the element of ‘competition’ may challenge all students to participate to their fullest. You may remove the scoring system all together if it does not work with your group of students.

When scoring it is important to only announce the greatest volume of water transports and / or the highest number of drops stored on a coin - so there will be no ‘losers’ or last place. It is important to highlight the good teamwork and strategies of each group.

Consider asking students how they might approach the task differently if asked to do it again, or how they might teach the same things they learned during the club to a younger student.

**** If you choose not to use a scoring system modify the slides that reference a ‘score’****

Activity Notes

- If this challenge is completed inside, ensure a towel (or newspaper) is placed under each station to catch drips / spills.
- Watching the online videos (water travelling on a string, anti-gravity water, and water on a coin) is recommended, to ensure students are aware of how to perform each water “trick”. For a low tech option, or if videos are unable to be shown, the coordinator should watch the videos prior to the session, and demonstrate each trick to the students when introducing the challenge activity.
- The distance between the dam and the town stations does not have to be a large, 1 to 2 metres is recommended. You may like to set up multiple dam / town stations.
- Have the same amount of water in each dam 500 millilitres volume for dams and holding tanks (2 cups) is suggested.
- Spilt water must be cleaned up straight away. Encourage students to keep the area safe and puddle free.
- Encourage students to work together as a team and take turns participating at each activity.
- Allocate one point for each millilitre of water transported to the town.
- Allocate one point for each drop of water stored on a coin. Encourage students to fill one coin at a time. If a coin overflows, no points are scored for that coin.
- Tips for transporting water with a straw: One way to move water with a straw is by putting the straw in the water and placing your thumb on top of the straw. While your thumb blocks the top end of the straw, the water will stay in the straw. To suck up more water, put the straw as deep into the water as possible (you can even tilt the container so the straw is submerged even more).
- Encourage students to work at their own pace. Focus on participating and achieving the water transport tricks, rather than transporting the most water.

Rules

Dam

The dam is high up in the mountains! You must first transport the water from the dam into your water vessel (cup) using only a piece of string and tape.

Road to Town

Travelling to the town is dangerous, so the water in the water vessel must be transferred into a special transport container (bottle) using only a straw.

With the water in the transport container, you can now start your journey to the town, however, the container has no lid... and must be transported to the town upside down! You have a rubber band, a plastic card and a piece of mesh to assist you. The plastic card must not leave the dam area.

If water is spilt and it does not land on a towel, it must be cleaned up immediately! The road to the town must remain dry!

Town

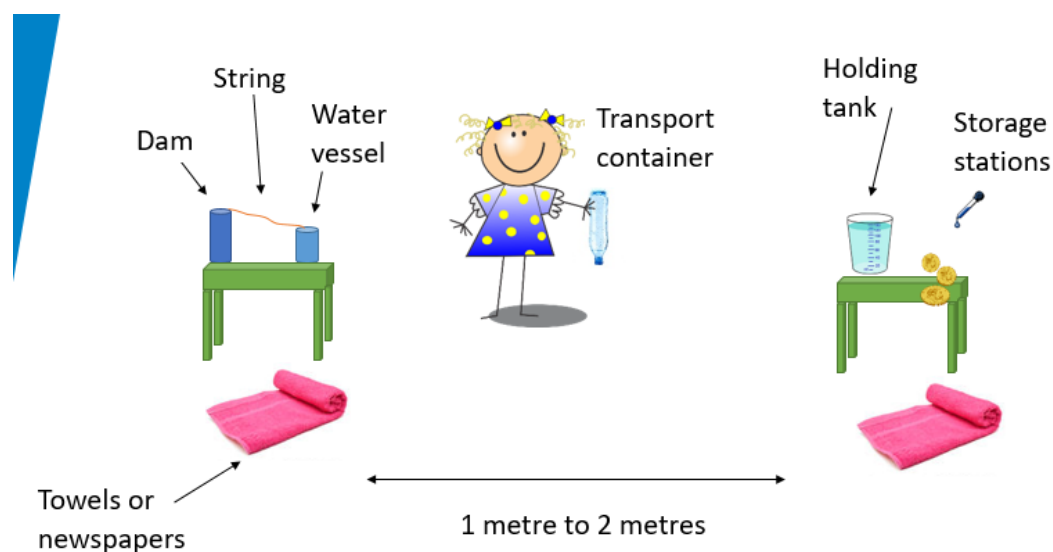
You have made it back to town! Pour your water into a measuring cup (the holding tank!), and ask a supervisor to record how much you were able to transport to town.

Now that you have recorded how much water you transported to town, the water must be stored!

The more water drops you can place onto the storage stations (20c coins) the further the water supply will reach across the town.

Transfer as many drops onto the three coins as you can, without the water overflowing. Transfer to one coin at a time. A supervisor or a student from another team will need to watch the storage process, to help count how many drops you store on each coin.

Challenge Set Up:



Score Sheet: M 2.1 – Water Transport Challenge

Notes:

- 1 point is scored for each millilitre of water transported to the town's holding tank
- 1 point is scored for each water drop stored on storage station (coin)
- To determine final score, add together the points from the holding tank and storage stations
- No points are scored for a storage station that overflows. Points can be scored for the remaining stations (unless they also overflow!)

Team or Individual Name				
Volume of Water Transported to Town (ml) (A)	Number of water drops on storage station 1 (B)	Number of water drops on storage station 2 (C)	Number of water drops on storage station 3 (D)	Total Points (A+B+C+D)
Team or Individual Name				
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<p align="center">Module 2.1 Water – Wonderful Water</p> <p align="center">Lesson Plan</p> <p align="center">90 minute session</p>			
<p>High Tech: Adapt PowerPoint Presentation ‘M2.1 - Master Slides’, hide slides: 9, 13, 14, 15, and 18</p> <p>Low Tech: Print PowerPoint ‘M2.1 - Reduced Slides for Printing’. Use slide notes for the ENTIRE 90 minute presentation, adapting discussion to cover omitted slides.</p>			
<p>Key Learning Area Chemistry, Physical World</p>			<p>Topics Water properties, States of Matter, Atoms, Molecules</p>
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5 min	00:10	<p>Body of Lesson</p> <p>Explore the States of Matter, discuss concept that everything is matter!</p>	PowerPoint M2.1 (slide 4) Optional: pieces of ice, cup/bottle of water, kettle
5 min	00:15	Introduce concept of atoms, and molecules.	PowerPoint M2.1 (slide 5-7), Optional: Molecular modelling kit
10 min	00:25	Discuss hypothesis, conduct Experiment 2.1.1 Wobbly Water and discuss results	PowerPoint M2.1 (slide 8) Water, cups, pipettes/straws, coins, shallow bowls/jars, paper towel
5 min	00:30	Introduce concepts of Surface Tension and Cohesion	PowerPoint M2.1 (slide 10,11)
10 min	00:40	Discuss hypothesis, conduct Experiment 2.1.2 Rainbow Milk and discuss results	PowerPoint M2.1 (slide 12), Milk, bowls/plates/cups, liquid soap, cotton tips, food colouring

10 min	00:50	Discuss hypothesis, conduct Experiment 2.1.5 Wicking Water	PowerPoint M2.1 (slide 16) Paper towel, water, cups,
2 min	00:52	Introduce concept of adhesion	PowerPoint M2.1 (slide 17)
3 min	00:55	Introduce challenge, storyboard, and activities.	PowerPoint M2.1 (slide 19-21)
5 min	01:00	Watch: water on string and anti-gravity water videos. (If videos are unable to be played, coordinator should demonstrate how each activity works. Coordinator should watch the videos prior to the session).	PowerPoint M2.1 (slide 22-23) Water bottle, mesh, cups, water, rubber band, string.
5 min	01:05	Explain the Challenge rules.	PowerPoint M2.1 (slide 24-25)
10 min	01:15	Form groups and encourage students to build and test the water on string and anti-gravity water activities.	PowerPoint M2.1 (slide 26), Water, plastic bottles, scissors, string, tape, mesh, rubber bands, cups, straws, eye droppers /pipettes, 20c coins, towels, measuring cups
10 min	01:25	Support groups to undertake the challenge	
5 min	01:30 END	Lesson Conclusion Clean up. Discussion about the session, which water transport method was most effective, ideas for other ways to transport water.	

<p align="center">Module 2.1 Water – Wonderful Water</p> <p align="center">Lesson Plan</p> <p align="center">75 minute session</p>			
<p>High Tech: Adapt PowerPoint Presentation ‘M2.1 - Master Slides’, hide slides: 4, 5, 6, 7, 9, 13, 14, 15, and 18</p> <p>Low Tech: Print PowerPoint ‘M2.1 - Reduced Slides for Printing’. Use slide notes for the ENTIRE 75 minute presentation, adapting discussion to cover omitted slides.</p>			
<p>Key Learning Area Chemistry, Physical World</p>			<p>Topics Water properties, States of Matter, Atoms, Molecules</p>
Timing	Running Time (hh:mm)	Procedure	Materials
5 min	00:05	<p>Lesson Introduction</p> <p>Welcome, water brainstorm Fact or fiction game</p>	PowerPoint M2.1 (slides 1-3)
10 min	00:15	<p>Body of Lesson</p> <p>Discuss hypothesis, conduct Experiment 2.1.1 Wobbly Water and discuss results</p>	PowerPoint M2.1 (slide 8) Water, cups, pipettes/straws, coins, shallow bowls/jars, paper towel
5 min	00:20	Introduce concepts of Surface Tension and Cohesion	PowerPoint M2.1 (slide 10,11)
10 min	00:30	Discuss hypothesis, conduct Experiment 2.1.2 Rainbow Milk and discuss results	PowerPoint M2.1 (slide 12), Milk, bowls/plates/cups, liquid soap, cotton tips, food colouring
2 min	00:32	Introduce concept of adhesion	PowerPoint M2.1 (slide 17)
3 min	00:35	Introduce challenge, storyboard, and activities.	PowerPoint M2.1 (slide 19-21)

10 min	00:45	Watch: water on string and anti-gravity water videos. (If videos are unable to be played, coordinator should demonstrate how each activity works. Coordinator should watch the videos prior to the session).	PowerPoint M2.1 (slide 22-23) Water bottle, mesh, cups, water, rubber band, string.
5 min	00:50	Explain the Challenge rules.	PowerPoint M2.1 (slide 24-25)
10 min	01:00	Form groups and encourage students to build and test the water on string and anti-gravity water activities.	PowerPoint M2.1 (slide 26), Water, plastic bottles, scissors, string, tape, mesh, rubber bands, cups, straws, eye droppers /pipettes, 20c coins, towels, measuring cups
10 min	01:10	Support groups to undertake the challenge	
5 min	01:15 END	Lesson Conclusion Clean up. Discussion about the session, which water transport method was most effective, ideas for other ways to transport water.	

<p style="text-align: center;">Module 2.1 Water – Wonderful Water</p> <p style="text-align: center;">Lesson Plan</p> <p style="text-align: center;">45 minute session</p>			
<p>High Tech: Adapt PowerPoint Presentation ‘M2.1 - Master Slides’, hide slides: 4 to 18. Low Tech: Print PowerPoint ‘M2.1 - Reduced Slides for Printing’. Use slide notes for the ENTIRE 45 minute presentation, adapting discussion to cover omitted slides.</p>			
<p>Key Learning Area Chemistry, Physical World</p>			<p>Topics Water properties, States of Matter, Atoms, Molecules</p>
Timing	Running Time (hh:mm)	Procedure	Materials
5 min	00:05	<p>Lesson Introduction</p> <p>Welcome, water brainstorm Fact or fiction game</p>	PowerPoint M2.1 (slides 1-3)
2 min	00:07	<p>Body of Lesson</p> <p>Introduce challenge, storyboard, and activities.</p>	PowerPoint M2.1 (slide 19-21)
8min	00:15	<p>Watch: water on string, water on a coin, and anti-gravity water videos. (If videos are unable to be played, coordinator should demonstrate how each activity works. Coordinator should watch the videos prior to the session).</p>	<p>PowerPoint M2.1 (slides 22, 23 and 28). Water bottle, mesh, cups, water, rubber band, string.</p>
5 min	00:20	<p>Explain the Challenge rules.</p>	PowerPoint M2.1 (slide 24-25)
10 min	00:30	<p>Form groups and encourage students to build and test the water on string and anti-gravity water activities.</p>	<p>PowerPoint M2.1 (slide 26), Water, plastic bottles, scissors, string, tape, mesh, rubber bands, cups, straws, eye droppers /pipettes, 20c coins, towels, measuring cups</p>
10 min	00:40	<p>Support groups to undertake the challenge</p>	

5 min	00:45 END	Lesson Conclusion Clean up. Discussion about the session, which water transport method was most effective, ideas for other ways to transport water.	
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Module 2.1 - References:

Anti-gravity water:

<https://www.stevespanglerscience.com/lab/experiments/water-screen/>

Water travelling on a string:

<https://pbskids.org/zoom/printables/activities/pdfs/wateronastring.pdf>

Water on a coin:

<https://www.questacon.edu.au/outreach/programs/science-circus/activities/count-the-drops>

Wicking Water:

<http://www.sciencekids.co.nz/experiments/escapingwater.html>

Rainbow Milk:

<http://splash.abc.net.au/home#!/media/2191105/rainbow-milk-experiment>

Properties of Water & Water Facts:

<http://splash.abc.net.au/home#!/media/103352/the-surface-tension-of-water>

<https://water.usgs.gov/edu/waterproperties.html>

<https://www.kidsdiscover.com/teacherresources/water-buoyancy-cohesion-adhesion/>

<http://blueplanet.nsw.edu.au/water-facts/.aspx>

Module 2.1 - Required Materials

- Pens, pencils and writing paper are generally required every session.
- Students may like to bring a note pad to record their observations and ideas.
- A group usually refers to 2 - 4 students.

Activity	Material	Amount	Where can I find it?
All sessions	PowerPoint Slides* (digital, or printed)	1 per coordinator	Coordinator Package
All sessions	Printed PowerPoint* Slide Notes	1 per coordinator	Coordinator Package
All sessions	Printed Lesson Plan	1 per coordinator	Coordinator Package
All sessions	Printed Module 2 Risk Assessment	1	Coordinator Package
All sessions	Computer, Data Projector, Screen	1	Venue
Water Transport Challenge (All session durations)	String	1 metre per group	Supermarket, hardware store
	250ml Plastic cups (for water vessels and holding tanks)	2-3 per group	Supermarket
	500ml Measuring cups (for dams)	2 to 4	Supermarket
	250ml Measuring cups for scoring	2 to 4	Supermarket, homewares store
	600ml plastic water bottle (for water transport)	1 per group	Recycled, or supermarket
	Straws (for water transport)	2 per group	Supermarket
	Mesh (for water transport)	5cm x 5cm piece per group	Recycled, or supermarket (often used to hold fruit)
	Rubber bands	2 – 3 per group	Supermarket
	Towels / newspaper	3 – 4 per session	Supermarket or recycled
	Pipettes (straws could also be used)	2 per group	Pharmacy
	20 cent coins	3 per group	Supermarket, bank, donations
Water	Approx. 500ml per group	Supermarket or venue	

Required materials list continues on next 2 pages

* PowerPoint Slides have been provided as a Master Slide Set for Module 2.1, for a 120 minute (or 2 x 60 minute) session duration. Hide/ omit slides as noted in lesson plans for sessions of shorter durations.

Activity	Material	Amount	Where can I find it?
Experiment 2.1.1 'Wobbly Water' (120 minute session, 2 x 60 minute sessions, 90 minute & 75 minute session)	Water	Approx. 1 cup, 250ml per group	Venue, supermarket
	Small shallow bowl / jar	1 per group	Supermarket, homewares store or recycled
	Pipettes / straws	2 per group	Pharmacy or supermarket
	Coins	2 per group	Supermarket, bank, donations
	Paper towel	1 long roll for session	supermarket
Experiment 2.1.4 'Sink or Float' (120 minute session, 2 x 60 minute sessions)	Water	Approx. 1 cup, 250ml per group	Venue, supermarket
	Paper towel	1 long roll for session	supermarket
	Cups	1 per group	Supermarket, homewares store or recycled
	Paperclips	2 per group	Supermarket, stationary shop
	Aluminium foil	5cm x 5cm piece per group	Supermarket
Experiment 2.1.3 'Celery Transport' (120 minute session, 2 x 60 minute sessions)	Celery stalks (with leaves on)	1 per group	Supermarket
	Water	Approx. 100ml, or ½ cup per group	Venue, supermarket
	Cups	1 per group	Supermarket, homewares store or recycled
	Food colouring	1-3 x 50ml bottles	Supermarket
	Scissors	2 – 3 pairs	Supermarket, stationary shop
Experiment 2.1.2 'Rainbow Milk' (120 minute session, 2 x 60 minute sessions, 90 minute & 75 minute session)	Small shallow bowl / jar (for milk)	1 per group	Supermarket, homewares store or recycled
	Full cream milk (UHT)	Approx. 100ml, or ½ cup per group	Supermarket
	Food colouring	3 x 50ml bottles	Supermarket
	1 small cup / bowl (for dishwashing liquid)	1 per group	Supermarket, homewares store or recycled
	Dishwashing liquid or liquid soap	Approx. 30 ml per group	Supermarket
	Cotton tips	2 – 3 per group	Supermarket, pharmacy

Activity	Material	Amount	Where can I find it?
Experiment 2.1.5 'Wicking Water' (120 minute session, 2 x 60 minute sessions, 90 minute session)	Water	Approx. 1 cup, 250ml per student	Venue, supermarket
	Cups	2 per student	Supermarket, homewares store or recycled
	Food colouring	3 x 50ml bottles	supermarket
	Paper towel	1 long roll for session	supermarket

Note:

Some listed materials, for example cups, jars, bowls, pipettes, and coins, can be re-used for multiple experiments, or, used in both an experiment and the Challenge.

Review the experiments you plan to include, and the required materials for efficiencies, prior to sourcing materials for your session.