

Coordinator Notes:

Module 5.2: Engineering – Environmental Engineering

This session explores the varied roles and career directions for environmental engineers.

This week's challenge requires teams to create an oil spill containment and collection device out of the materials provided. Students consider the impact of oil spills on the environment and learn about current methods for containment, clean up and removal.

This session would be a fantastic opportunity to invite along a **guest speaker** from an engineering field – this could act as a substitute to or complement the career exploration activity. Some places to enquire about guest speakers are: Engineers Australia, City Councils, Engineering firms and Universities. The engineer may be able to stay and engage in the Challenge activities and assist with testing and scoring. Ensure “Working With Children Checks” are in cleared for any session guests (systems vary in each state of Australia).

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.

Please read the Module 5 Risk Assessment before proceeding with the session

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Module 5.2: Engineering – Environmental Engineering

Overview

In this Module, students explore the role of an environmental engineer.

Students will put themselves in the shoes of an engineer in this session's challenge, to creatively solve an oil spill problem.

Content overview:

Concept / Activity	Session Duration (minutes)			
	120	90	75	45
Introduction to Environmental Engineering roles	*	*	*	*
Man Made Environmental Disasters: Oil Spills (Natural Disasters we introduced in Module 3.3)	*	*	*	*
Impact of oil spills in the ocean: birdlife, sea-life, eco-systems	*	*	*	*
Oil and Water: Immiscible liquids (liquids that don't mix) Experiment 5.2.1 (Facilitator Demonstration)	*	*	*	-
Oil and Water: Immiscible liquids (liquids that don't mix) Experiment 5.2.2	*	-	-	-
How are oil spills cleaned up, current and future methods	*	*	-	-
Pros and cons of four methods of cleaning up oil spills: booms, skimmers, in-situ burning and sorbents	*	*	*	*
Oil Spill Challenge 5.2: Design and construction of devices to clean up simulated oil spills.	*	*	*	*

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 5.2 - Master Slides 120 minute Session Duration'		Session Duration (minutes)			
Slide	Content	120	90	75	45
1	Introductory Title Slide for the Session	*	*	*	*
2	Prompt slide and video link: What is environmental engineering?	*	*	*	*
3	Prompt slide: Engineering for environmental disasters	*	*	*	*
4	Prompt slide: Discussion, man-made disasters, oil spills	*	*	*	*
5	Activity 5.2.1 Oily Water 1 – Facilitator Demonstration	*	*	*	-
6	Activity 5.2.2 Oily Water 2	*	-	-	-
7	Video: Oil spill clean-up methods	*	*	-	-
8	Video: Magnetic oil clean-up method	*	*	-	-
9	Overview slide, Booms	*	*	*	*
10	Overview slide, Skimmers	*	*	*	*
11	Overview slide, In-situ Burning	*	*	*	*
12	Overview slide, Sorbents	*	*	*	*
13	Activity 5.2.3 Absorption	*	*	*	-
14	Intro slide: Challenge 5.2 Oil Spill Challenge	*	*	*	*
15	Challenge overview	*	*	*	*
16	Challenge rules	*	*	*	*
17	Challenge Materials	*	*	*	*
18	Session references	*	*	*	*

Module 5.2 Environmental Engineering			
Lesson Plan			
120 minute session or 2 x 60 minute sessions			
High Tech: Use PowerPoint Presentation 'M5.2 - Master Slides'			
Low Tech: Print PowerPoint 'M5.2 - Reduced Slides for Printing'. Use slide notes from the ENTIRE 120 minute presentation, adapting discussion to cover omitted slides.			
Key Learning Area Environmental Science Engineering, Careers			Topic Environmental Engineering
Timing	Running Time (hh:mm)	Procedure	Materials
5 min	00:05	Lesson Introduction Welcome! Has anyone heard of an environmental engineer? Introduce environmental engineering. Watch video. Note: This is a good opportunity for an invited guest engineer to talk about their career, instead of, or as well as the notes/slides.	PowerPoint M5.2 (Slides 1-3)
5 min	00:10	Body of Lesson (Lesson 1, 2 x 60 minute sessions) Discuss environmental disasters (compare natural and man-made), introduce oil spills.	PowerPoint M5.2 (Slide 4)
10 min	00:20	Introduce and undertake Activity 5.2.1 "Oily Water 1" as a demonstration.	PowerPoint M5.2 (slide 5) Clear bottle, water, cooking oil, food colouring, Alka-Seltzer
15 min	00:35	Introduce and undertake Activity 5.2.2 "Oily Water 2". Discuss results.	PowerPoint M5.2 (slide 6) Clear bottle, water, cooking oil, food colouring, salt
5 min	00:40	Watch the videos of oil spill techniques and magnetic oil concept. If video's unable to be played, ensure the coordinator watches before the session.	PowerPoint M5.2 (slides 7-8)

5 min	00:45	Discuss videos, recap key oil spill clean-up techniques: Skimmers, Booms, In-situ Burning, Sorbents	PowerPoint M5.2 (slides 9-12)
15 min	00:60	Introduce and undertake Activity 5.2.3 "Absorption". Discuss results. (Break for 2 x 60 minute sessions)	PowerPoint M5.2 (slide 13) Plastic bottles/jars, BBQ trays, newspaper, paper towel, sponges, cloth, cotton balls, stockings, paper towel, wood shavings, straw, timer, measuring cups, water, oil Wash and reuse materials (if possible) for the Challenge.
5 min	00:05 / 01:05	(Lesson 2, 2 x 60 minute sessions) Introduce the Challenge <i>Note: Revisit oil spill clean-up methods and results from activities 5.2.2 / 5.2.3 if starting lesson 2 on a different day to ending lesson 1).</i>	PowerPoint M5.2 (slides 14-17) Planning and scoring sheets.
3 min	00:08 / 01:08	Form into groups of 2 – 4 Hand out planning sheets and show groups available materials.	Plastic bottles/jars, BBQ trays, newspaper, paper towel, sponges, cloth, cotton balls, stockings, paper towel, wood shavings, straw, timer, measuring cups, water, oil Aluminium foil, paddle pop sticks, Dagwood dog sticks, rubber bands, toothpicks, straws, hair rollers Trays or tubs for testing, brown or black oil based paint.
2 min	00:10 / 01:10	Hand out materials to groups, and additional planning sheets if needed.	
20 min	00:30 / 01:30	Plan, design and build devices. Allow students to test and re-design as they go.	
20 min	00:50 / 01:50	Official Testing	
10 min	01:00 / 02:00	Lesson Conclusion Clean up and discussion. Announce scores and winning team. Discuss the strengths of each team's designs.	

Activity 5.2.1: Oily Water 1 (Facilitator Demonstration)

Aim: To observe oil and water interacting

Materials (Facilitator demonstration):

- 1 Litre clear bottle / jar
- 3/4 cup Water
- 2 cups cooking oil (e.g. canola)
- Food colouring
- 2 Alka-Seltzer tablets
- Funnel

Procedure:

1. Pour the water into the bottle/jar. Use the funnel as needed.
2. Pour 1 cup of oil into the bottle. Use the funnel as needed.
3. Observe – does the water or the oil float to the top? It may take a few minutes for the liquids to separate.
4. Pour the remaining oil into the bottle. Use the funnel as needed.
5. Add 10 drops of food colouring. What do you see happen?
6. Break an Alka-Seltzer tablet in half and drop half into the bottle.
7. Observe and document results.
8. Add additional pieces of Alka-Seltzer to repeat.

Expected Result & Explanation:

The oil will float above the water, because oil is less dense than water. The food colouring will mix with the water, but not the oil. The water and the oil will not mix.

Water and oil are “immiscible” liquids, which means they won’t ever mix together. Water and food colouring are “miscible” liquids, which means they will mix together.

The Alka-Seltzer tablet will sink to the bottom of the bottle, and react with the water to produce carbon dioxide gas. The gas will rise in bubbles up through the water and the oil, as the gas is less dense than either liquid. When the gas bubbles reach the surface the gas escapes into the air. Any food coloured water attached to the bubbles will then sink back down through the oil.

Videos:

<https://sciencebob.com/blobs-in-a-bottle-2/>

<http://splash.abc.net.au/home#!/media/103836/make-a-lava-lamp-model-using-oil-and-water>

Extension:

Does water temperature change the reaction? Repeat with additional bottles of cold and / or warm water (max 40 degrees Celsius).

Activity 5.2.2: Oily Water 2

Aim: To observe oil and water interacting

Materials (per group):

- Clear plastic bottle or jar
- Water (to almost fill bottle / jar)
- 3 tablespoons cooking oil (e.g. canola)
- Food colouring
- Salt (approx. 3 teaspoons)

Procedure:

1. Pour the water into the bottle until it is almost full.
2. Sprinkle in a few drops of food colouring.
3. Add 3 – 5 tablespoons of oil into the bottle.
4. Sprinkle salt onto the oil bubble, until you see oil bubbles start to sink.
5. Observe and document your results.

Optional: shine a torch light on the bottle as you add the salt.

Expected result and explanation:

The food colouring will mix with the water. The oil will float in a layer above the water, as oil is less dense than water. When the salt is added to the oil, the oil will start to sink. When the salt is added, it clings to the oil, dragging it down to the bottom of the bottle. As the salt falls, it dissolves in the water, leaving the oil behind. The oil is less dense than the slightly salty water, and floats back to the top again. Adding more salt will continue the process, until no more salt can be dissolved within the water.

Water and oil are “immiscible” liquids, which means they won’t ever mix together. Water and food colouring are “miscible” liquids, which means they will mix together. Salt is soluble in water, which means it dissolves in the water.

Extensions:

- Try the experiment with two bottles, one with icy cold water and one with warm water (max 40 degrees Celsius). Is there a difference in how the oil reacts?
- What happens if you use less water, and more oil?

Video demonstration:

<https://www.youtube.com/watch?v=kXEyFPxq3GI>

Activity 5.2.3: Absorption

Aim: To observe how materials absorb liquids

Materials (per group):

- 2 x plastic bottles, jars or tubs
- Aluminium BBQ tray (or shaped foil)
- 2 sheets newspaper
- ½ cup oil mixture and ½ cup water
- 2 sponge pieces
- 2 small pieces cloth (“Chux” or similar)
- 6 cotton balls
- 30 cm Length of stocking
- 2 sheets paper towel
- 1 cup wood shavings or straw
- Timer
- 30 ml measuring cup

Procedure:

1. Place the newspaper on the table, and the aluminium tray on the newspaper. Place your jars inside the aluminium tray to contain spills.
2. Pour 30 ml of water into one jar and 30 ml oil mixture into the other.
3. Experiment with the materials to see how well they absorb oil, and how they well absorb water.
4. Time how long different materials take to absorb the liquids.
5. Record and document your observations.

Ask students:

- During your experimentation what did you notice?
- Did the materials absorb oil?
- Were some materials better at absorbing oil than others? Which ones were best?
- Did some materials soak up a lot of water too?
- Did any of the materials float?

The observations and knowledge gained in this activity will be utilised in the Challenge, to design and build oil containment and collection devices.

Expected results:

For some materials, oil and water will be absorbed at different rates (speeds). Some materials will absorb oil more readily than water, and vice versa. Some materials will float initially and then sink as they absorb water.

Challenge M5.2 – Oil Spill Challenge

Scoring:

A scoring mechanism is included so that 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 who the winning team is - so there will be no ‘losers’ or last place. Highlight the good strategies of each team. Consider asking how the students 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.

The Problem:

“Your team of environmental engineers have been called in to help with one of Australia’s worst oil spills!

Two container ships carrying oil have collided off the coast of Queensland. The accident has released thousands of tonnes of oil into the protected waters of the Great Barrier Reef.

Your team are our last hope to contain and clean up the spill before irreversible damage is done to the environment!

Design an oil containment and collection device! This can be two separate devices, or a combined device.”

Activity Notes:

- To prepare the oil for the oil spill, mix: 4 cups of vegetable oil with 2 teaspoons of non-toxic brown or black oil paint. Pour a small amount into a recycled jar for each testing station. Make additional oil as needed (ration 1 cup oil to ½ teaspoon paint).
- To prepare the testing stations, fill aluminium BBQ trays (or recycled plastic tubs) half full of water. Slowly pour up to 1/2 cup of oil on the surface of the water.
- To aid in scoring and observation of how much oil the devices remove during official testing, measure and note down how much oil mixture is added to the test station to be used for the official tests, prior to each device being tested. 100ml per device is recommended.
- Students must design an oil containment and collection device. This can be two separate devices or a joint device which performs both tasks.
- Students should work in groups of 2-4. Timing of this activity allows for scoring of a maximum of 6 teams (3 minutes per test) so ensure you leave extra time or have two to three testing stations in action at the same time if you have more teams.
- Ensure students clean up all spills or water and oil as they are serious slipping hazards. You may choose to deduct points from groups who do not follow the safety instructions.
- Invite groups to give a short explanation of their designs before the official testing. After testing, ask the group if their design worked as intended. Do they think your design could be scaled up to use in a real life oil spill?

Rules:

- The devices must not use any toxic chemicals - you're working in the protected marine environment of the Great Barrier Reef!
- The device should not collect excess water. Good separation of oil and water will result in a higher score!
- You will have 3 minutes test time for the official test of your device. The less time your device takes to clean up the spill, the more points awarded.
- The amount of oil left on the surface of the water after your test time runs out will determine the effectiveness of your device. The less oil the more points!
- You can test your device during the design and build time.

Scoring notes:

- Time taken to clean up spill: If teams take the **full 3 minutes** they should be awarded **5 points**. For every **30 seconds below the 3 minute** time limit, students should be awarded **5 extra points**.
- Amount of oil remaining: using consistent judgement throughout the competition to assess whether there is 100%, 50%, or less than half, or no oil remaining, once a team uses their device. It may not be practical to measure the amount of oil actually remaining in millilitres due to time constraints.
- If no oil remains give the team 100 points, if 50% remains 50 points, if less than 50% remains 75 points, and if 100% of the oil remains give them 5 points.

Points available:

Time taken to clean up spill	Points awarded
30 seconds	30
1 minute	25
1 minute 30 seconds	20
2 minutes	15
2 minutes 30 seconds	10
3 minutes or more (stop test at 3 minutes)	5

Amount of oil remaining after test	Points awarded
100% (no oil cleaned up)	5
50% (half of the oil cleaned up)	50
Less than 50% remaining	75
No oil remaining (all cleaned up)	100

Challenge 5.2: Score Sheet

Team Name:	
Time taken to clean-up maximum amount of oil (max 3 minutes)	Points awarded (A)
Amount of oil cleaned up	Points awarded (B)
Total Points (A) + (B) =	
Team Name:	
Time taken to clean-up maximum amount of oil (max 3 minutes)	Points awarded (A)
Amount of oil cleaned up	Points awarded (B)
Total Points (A) + (B) =	
Team Name:	
Time taken to clean-up maximum amount of oil (max 3 minutes)	Points awarded (A)
Amount of oil cleaned up	Points awarded (B)
Total Points (A) + (B) =	

Team Name:	
Time taken to clean-up maximum amount of oil (max 3 minutes)	Points awarded (A)
Amount of oil cleaned up	Points awarded (B)
Total Points (A) + (B) =	
Team Name:	
Time taken to clean-up maximum amount of oil (max 3 minutes)	Points awarded (A)
Amount of oil cleaned up	Points awarded (B)
Total Points (A) + (B) =	
Team Name:	
Time taken to clean-up maximum amount of oil (max 3 minutes)	Points awarded (A)
Amount of oil cleaned up	Points awarded (B)
Total Points (A) + (B) =	

Challenge M5.2 – Planning Sheet: Oil Spill Challenge

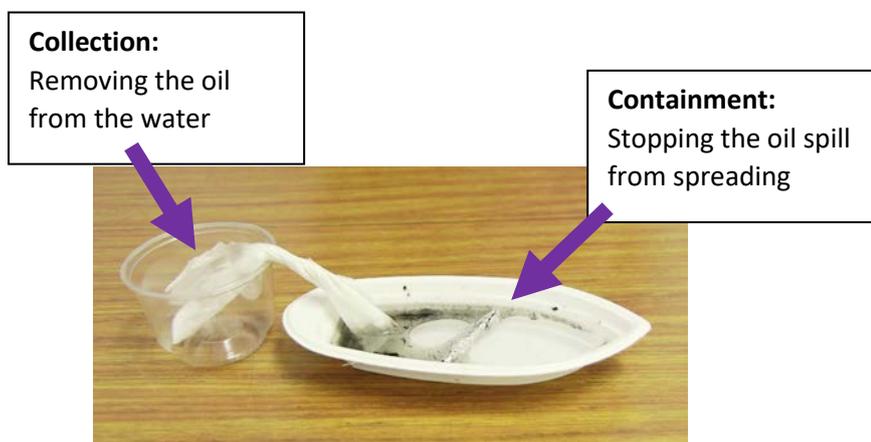
To design your device, consider:

ABSORPTION – Which materials most quickly absorb oil? Which materials absorb the least water?

MATERIALS – How many materials will you use build your device, can you minimise the amount of resources used?

CONTAINMENT & COLLECTION – Will you build one device to stop the spread of the spill, and another to collect the oil? Or will your device be all-in-one?

Take a look at the materials available, and design your device (or devices)!



Module 5.2 Environmental Engineering			
Lesson Plan			
90 minute session			
High Tech: Use PowerPoint Presentation 'M5.2 - Master Slides'. Hide slide 6.			
Low Tech: Print PowerPoint 'M5.2 - Reduced Slides for Printing'. Use slide notes from the ENTIRE 90 minute presentation, adapting discussion to cover omitted slides.			
Key Learning Area Environmental Science Engineering, Careers			Topic Environmental Engineering
Timing	Running Time (hh:mm)	Procedure	Materials
5 min	00:05	Lesson Introduction Welcome! Has anyone heard of an environmental engineer? Introduce environmental engineering. Watch video. Note: This is a good opportunity for an invited guest engineer to talk about their career, instead of, or as well as the notes/slides.	PowerPoint M5.2 (Slides 1-3)
5 min	00:10	Body of Lesson Discuss environmental disasters (compare natural and man-made), introduce oil spills.	PowerPoint M5.2 (Slide 4)
10 min	00:20	Introduce and undertake Activity 5.2.1 "Oily Water 1" as a demonstration.	PowerPoint M5.2 (slide 5) Clear bottle, water, cooking oil, food colouring, Alka-Seltzer
5 min	00:25	Watch the videos of oil spill techniques and magnetic oil concept. If video's unable to be played, ensure the coordinator watches before the session.	PowerPoint M5.2 (slides 7-8)
5 min	00:30	Discuss videos, recap key oil spill clean-up techniques: Skimmers, Booms, In-situ Burning, Sorbents	PowerPoint M5.2 (slides 9-12)

10 min	00:40	Introduce and undertake Activity 5.2.3 "Absorption". Discuss results.	PowerPoint M5.2 (slide 13) Plastic bottles/jars, BBQ trays, newspaper, paper towel, sponges, cloth, cotton balls, stockings, paper towel, wood shavings, straw, timer, measuring cups, water, oil Wash and reuse materials (if possible) for the Challenge.
5 min	00:45	Introduce the Challenge	PowerPoint M5.2 (slides 14-17) Planning and scoring sheets. Plastic bottles/jars, BBQ trays, newspaper, paper towel, sponges, cloth, cotton balls, stockings, paper towel, wood shavings, straw, timer, measuring cups, water, oil Aluminium foil, paddle pop sticks, Dagwood dog sticks, rubber bands, toothpicks, straws, hair rollers Trays or tubs for testing, brown or black oil based paint.
3 min	00:48	Form into groups of 2 – 4 Hand out planning sheets and show groups available materials.	
2 min	00:50	Hand out materials to groups.	
15 min	01:05	Plan, design and build devices. Allow students to test and re-design as they go.	
20 min	01:25	Official Testing	
5 min	01:30	Lesson Conclusion Clean up and discussion. Announce scores and winning team. Discuss the strengths of each team's designs.	

Module 5.2 Environmental Engineering Lesson Plan 75 minute session			
High Tech: Use PowerPoint Presentation 'M5.2 - Master Slides'. Hide slides 6, 7 and 8. Low Tech: Print PowerPoint 'M5.2 - Reduced Slides for Printing'. Use slide notes from the ENTIRE 75 minute presentation, adapting discussion to cover omitted slides.			
Key Learning Area Environmental Science Engineering, Careers			Topic Environmental Engineering
Timing	Running Time (hh:mm)	Procedure	Materials
5 min	00:05	Lesson Introduction Welcome! Has anyone heard of an environmental engineer? Introduce environmental engineering. Watch video. Note: This is a good opportunity for an invited guest engineer to talk about their career, instead of, or as well as the notes/slides.	PowerPoint M5.2 (Slides 1-3)
2 min	00:07	Body of Lesson Discuss environmental disasters (compare natural and man-made), introduce oil spills.	PowerPoint M5.2 (Slide 4)
10 min	00:17	Introduce and undertake Activity 5.2.1 "Oily Water 1" as a demonstration.	PowerPoint M5.2 (slide 5) Clear bottle, water, cooking oil, food colouring, Alka-Seltzer
3 min	00:20	Discuss key oil spill clean-up techniques: Skimmers, Booms, In-situ Burning, Sorbents	PowerPoint M5.2 (slides 9-12)

10 min	00:30	Introduce and undertake Activity 5.2.3 "Absorption". Discuss results.	PowerPoint M5.2 (slide 13) Plastic bottles/jars, BBQ trays, newspaper, paper towel, sponges, cloth, cotton balls, stockings, paper towel, wood shavings, straw, timer, measuring cups, water, oil Wash and reuse materials (if possible) for the Challenge.
3 min	00:33	Introduce the Challenge	PowerPoint M5.2 (slides 14-17)
2 min	00:35	Form into groups of 2 – 4 Hand out planning sheets and show groups available materials.	Planning and scoring sheets. Plastic bottles/jars, BBQ trays, newspaper, paper towel, sponges, cloth, cotton balls, stockings, paper towel, wood shavings, straw, timer, measuring cups, water, oil
2 min	00:37	Hand out materials to groups.	Aluminium foil, paddle pop sticks, Dagwood dog sticks, rubber bands, toothpicks, straws, hair rollers
13 min	00:50	Plan, design and build devices. Allow students to test and re-design as they go.	Trays or tubs for testing, brown or black oil based paint.
20 min	01:10	Official Testing	
5 min	01:15	Lesson Conclusion Clean up and discussion. Announce scores and winning team. Discuss the strengths of each team's designs.	

Module 5.2 Environmental Engineering Lesson Plan 45 minute session			
<p>High Tech: Use PowerPoint Presentation 'M5.2 - Master Slides'. Hide slides 5, 6, 7, 8 and 13.</p> <p>Low Tech: Print PowerPoint 'M5.2 - Reduced Slides for Printing'. Use slide notes from the ENTIRE 45 minute presentation, adapting discussion to cover omitted slides.</p>			
Key Learning Area Environmental Science Engineering, Careers			Topic Environmental Engineering
Timing	Running Time (hh:mm)	Procedure	Materials
5 min	00:05	Lesson Introduction Welcome! Has anyone heard of an environmental engineer? Introduce environmental engineering. Watch video. Note: This is a good opportunity for an invited guest engineer to talk about their career, instead of, or as well as the notes/slides.	PowerPoint M5.2 (Slides 1-3)
2 min	00:07	Body of Lesson Discuss environmental disasters (compare natural and man-made), introduce oil spills.	PowerPoint M5.2 (Slide 4)
3 min	00:10	Discuss key oil spill clean-up techniques: Skimmers, Booms, In-situ Burning, Sorbents	PowerPoint M5.2 (slides 9-12)
3 min	00:13	Introduce the Challenge	PowerPoint M5.2 (slides 14-17) Planning and scoring sheets.
2 min	00:15	Form into groups of 2 – 4 Hand out planning sheets and show groups available materials.	
2 min	00:17	Hand out materials to groups.	

25 min	00:42	<p>Plan, design and build devices. Allow students to test and re-design as they go. Start official tests when first group of students are ready, or, omit official testing and scoring for this session length to extend exploration and investigation time.</p>	<p>Plastic bottles/jars, BBQ trays, newspaper, paper towel, sponges, cloth, cotton balls, stockings, paper towel, wood shavings, straw, timer, measuring cups, water, oil Aluminium foil, paddle pop sticks, Dagwood dog sticks, rubber bands, toothpicks, straws, hair rollers Trays or tubs for testing, brown or black oil based paint.</p>
3 min	00:45	<p>Lesson Conclusion Clean up and discussion. Discuss the strengths of each team's designs.</p>	

Module 5.2 - References

Oil spill experiments

How to make fake oil for a spill <https://www.youtube.com/watch?v=6CCgiD16jfM>

<https://kids.imo.org/downloads/OilSpillExperiment.pdf>

<https://www.scientificamerican.com/article/sorbent-science-cleaning-oil-spills/>

Video: Steve Spangler <https://www.youtube.com/watch?v=kQI5YFDteEI>

Oil spill containment techniques:

<https://www.amsa.gov.au/marine-environment>

DNews Video: <https://www.youtube.com/watch?v=3DbSIAG3F3A>

<http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/spill-containment-methods.html>

Magnetic Oil Spill Clean Up <https://www.youtube.com/watch?v=IYM324yDH-Q>

Environmental Engineering

<https://www.engineersaustralia.org.au/>

<http://www.mybigtomorrow.com.au/careers/details/environmental-engineer>

Module 5.2- 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 1 Risk Assessment	1	Coordinator Package
All sessions	Computer, Data Projector, Screen	1	Venue
Activity 5.2.1 "Oily Water 1" 120 minute, 2 x 60 minute, 90 minute and 75 minute sessions	1 Litre clear bottle / jar (lid optional)	1	Recycled
	water	$\frac{3}{4}$ cup	Venue / supermarket
	Cooking oil (e.g. canola oil)	2 cups	supermarket
	Food colouring	10 drops	supermarket
	funnel	1	supermarket
	Alka-Seltzer tablets	2 - 3	Supermarket, pharmacy
Activity 5.2.2 "Oily Water 1" 120 minute, 2 x 60 minute, 90 minute and 75 minute sessions	1 Litre clear bottle / jar (lid optional)	1 per group	recycled
	water	Enough to almost fill bottles / jars	Venue / supermarket
	Cooking oil (e.g. canola oil)	3 tablespoons per group	supermarket
	Food colouring	3 drops per group	supermarket
	salt	Approx. 3 tea spoons per group	supermarket

Required Materials List Continues on Next Page

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

Activity	Material	Amount	Where can I find it?
Activity 5.2.3 “Absorption” All sessions (reuse materials for Challenge where practical)	Aluminium baking / BBQ trays	1 per group	supermarket
	Plastic bottles, jars or tubs	2 per group	Recycled
	newspaper	2 sheets per group	Recycled
	Cooking oil (e.g. canola oil)	½ cup per group	supermarket
	water	½ cup per group	Supermarket / venue
	Sponge pieces (approx. 5cm x 5cm)	2 pieces per group	Supermarket
	Small cloth pieces	2 pieces per group	Supermarket /recycled
	Cotton balls	6 per group	Supermarket / pharmacy
	Stocking piece (approx. 30cm length)	1 per group	Supermarket / recycled
	Paper towel	2 sheets per group	supermarket
	wood shavings or straw	1 cup per group	Hardware store, pet store
	30 ml measuring cup	1 per group	Supermarket, pharmacy, recycled
	Timer	1 per group	Watch / venue clock
Challenge 5.2 “Oil Spill” All sessions Adjust material types and quantities as needed to suit. You may add or remove items to suit your location. Allow reasonable amounts of extra items to be used.	Materials listed for Activity 5.2.3 “Absorption” (reuse where practical), plus:		
	Dagwood dog sticks	6 per group	Catering supply shop (see example links)
	Paddle pop sticks	6 per group	Craft shop, variety store
	Hair rollers	2 per group	Supermarket, variety store
	Rubber bands	10 per group	Supermarket, stationary store
	Masking tape	2 metres per group, 3 rolls per session	Supermarket, hardware store
	straws	6 per group	supermarket
	Tooth picks	6 per group	supermarket
	Aluminium BBQ trays or plastic tubs for test stations	1 per 4 students	Supermarket, hardware store, recycled
	water	Enough to half fill each test station	Supermarket / venue
	Cooking oil	At least 4 cups	supermarket
	Brown or black (non- toxic) oil based paint	At least 2 tea spoons	Supermarket, craft store, stationary store

Online shopping links: Catering stores (Dagwood dog sticks):

From \$28 for 1000 sticks (~3 cents each)

<http://www.sydneypartyshop.com.au/dagwood-dog-stick-22-5cm-1000/>