



Tea-Composition

Suggested Lesson Plans
Stage 5 Science



Lesson plan format for lesson 1

Class: Stage 5	Date: Lesson plan 1	Time: Start: _____ Finish: _____
Key Learning Area: Science	Lesson topic: Climate change facts	
Syllabus outcome(s): - ES3 People use scientific knowledge to evaluate claims, explanations or predictions in relation to interactions involving the atmosphere, biosphere, hydrosphere and lithosphere -	Indicators of learning for this lesson: <i>By the end of this lesson, the students will be able to:</i> - ES3 c. evaluate scientific evidence of some current issues affecting society that are the result of human activity on global systems -	
Any safety issues to be considered:	Resources: Why people don't believe in climate science: https://youtu.be/y2euBvdP28c Climate change facts: https://youtu.be/uvqU_L5PZtk https://youtu.be/1abN9E-Ojrc https://youtu.be/ffjlyms1BX4 https://youtu.be/W7a-Hs9UxYo	

Lesson sequence for lesson 1

Lesson content / indicators of learning (what is taught):	Timing (mins)	Teaching strategies / learning experiences (how it is taught):	Resources and organisation:
INTRODUCTION			
Climate change affects us and future generations.	10 mins	Students view one of the clips on climate change facts.	See resources.
DEVELOPMENT			
There are a number of factors affecting climate change.	30 mins	Students choose one factor from the clip (or are allocated) to explore as an individual or as a small group. Students present their findings in a variety of forms.	
CLOSURE			
People don't believe in climate change for a variety of reasons.	10 mins	Students view https://youtu.be/y2euBvdP28c Teacher leads discussion as to why climate change is not always believed.	

Lesson plan for lesson 2

Class: Stage 5	Date: Lesson plan 2	Time: Start: _____ Finish: _____
Key Learning Area: Science	Lesson topic: The cycles of life	
Syllabus outcome(s):	<p>Indicators of learning for this lesson:</p> <p><u>By the end of this lesson, the students will be able to:</u></p> <ul style="list-style-type: none"> - CW3 Chemical reactions involve rearranging atoms to form new substances; during a chemical reaction mass is not created or destroyed. - 	
Any safety issues to be considered:	<p>Resources:</p> <p>Nitrogen and carbon cycle diagrams with 'gaps' www.biologyjunction.com/Cycles Worksheet.pdf · PDF file https://www.tes.com/teaching-resource/carbon-cycle-6064123 http://vro.agriculture.vic.gov.au/dpi/vro/vrosite.nsf/pages/soilhealth_organic_carbon-cycle http://epa.gov/climatestudents/basics/today/carbon dioxide.html (then go to the 'snapshot') https://www.esrl.noaa.gov/gmd/infodata/lesson_plans/The%20Nitrogen%20Cycle.pdf</p>	

Lesson sequence for lesson 2

Lesson content / indicators of learning (what is taught):	Timing (mins)	Teaching strategies / learning experiences (how it is taught):	Resources and organisation:
INTRODUCTION			
Teacher aids students to recall previous lessons (Stage 4) on cycles in nature.	15 mins	Students complete diagrams outlining nitrogen and carbon cycles.	
DEVELOPMENT			
Teacher quizzes students as to the need for carbon and nitrogen – carbon is needed for such things as petrochemicals and nitrogen is need for the building up of proteins.	10 mins	Students record notes on the composition of substances.	
Teacher poses the question ‘what are the differences / similarities between nitrogen, ammonium, nitrates and nitrites?’	10 mins	Students brainstorm ideas / Google the terms. Complete worksheet.	https://www.esrl.noaa.gov/gmd/infodata/lesson_plans/ See module #20/21 The Nitrogen Cycle PDF file
Teacher poses the question ‘What does carbon make up on Earth?’	5 mins	Students brainstorm ideas / Google the terms. Complete worksheets.	
Teacher outlines previous tea bag experiments and draws out the differences between red and green tea.	10 mins	Students view photographs of tea bags after their three months in the ground and calculate the differences in mass after ‘planting’. Calculate this as a percentage. Introduce and discuss the Tea-Composition project and its purpose, that the rate of	

		decomposition of tea can be used as an indicator of the soil health (how efficiently the carbon and nitrogen are being cycled, for example). Why is this something scientists would want to monitor?	
CLOSURE			
Green tea represents those things that can break down readily, while the red tea represents those things that are high in fibre.	10 mins	Students brainstorm ideas relating to the different teas and their rate of decomposition. Compare their results to those listed elsewhere. Students may think tea will take longer to decompose in healthier soils, it is important to address and correct this misconception at this stage.	

Lesson plan format for lesson 3

Class: Stage 5	Date: Lesson plan 3	Time: Start: _____ Finish: _____
Key Learning Area: Science	Lesson topic: Cycles and us!	
Syllabus outcome(s):	<p>Indicators of learning for this lesson:</p> <p><u>By the end of this lesson, the students will be able to:</u></p> <ul style="list-style-type: none"> - LW2 Conserving and maintaining the quality and sustainability of the environment requires scientific understanding of interactions within, the cycling of matter and the flow of energy through ecosystems. - - 	
Any safety issues to be considered:	<p>Resources:</p> <p>https://www.superteacherworksheets.com/food-chains/food-web-worksheet_WQRQM.pdf?up=1466611200</p> <p>https://www.tes.com/teaching-resource/food-chains-and-food-webs-6077033</p> <p>https://fuse.education.vic.gov.au/Resource/LandingPage?ObjectId=be8723ac-cb9f-464e-848f-07992f05c6b4&SearchScope=All</p> <p>http://mypages.iit.edu/~smile/bi9115.html</p> <p>Soil samples from various areas.</p>	

Lesson sequence for lesson 3

Lesson content / indicators of learning (what is taught):	Timing (mins)	Teaching strategies / learning experiences (how it is taught):	Resources and organisation:
INTRODUCTION			
<p>Food webs and food chains help us examine ecosystems.</p> <p>Ecosystems vary with the environment and organisms present.</p> <p>Students often have trouble interpreting food chains, particularly where the diagram uses arrows to represent energy exchange. Students may see the arrows as referring to a flow of matter (stuff) up a food chain. This is a problem as matter is recycled in an ecosystem but energy is not.</p>	10 mins 15 mins	<p>Teacher introduces that ecosystems consist of communities of interdependent organisms and abiotic components of the environment</p> <p>Students complete one of the work programs (fuse resources) and / or view the PowerPoint.</p> <p>Students complete the exercise on soil as an ecosystem. Teacher guides discussion as to the differences between the various soil ecosystems and the factors that affect them.</p>	<p>https://www.tes.com/teaching-resource/food-chains-and-food-webs-6077033</p> <p>https://fuse.education.vic.gov.au/Resource/LandingPage?ObjectId=be8723ac-cb9f-464e-848f-07992f05c6b4&SearchScope=All</p> <p>http://mypages.iit.edu/~smile/bi9115.html</p>

DEVELOPMENT			
Tea-Composition project – students choose locations in which to plant tea bags. The sites should be readily accessible so the students can periodically check that the tea bags have not been disturbed.	40 mins	<p>Students recall what they learnt about the Tea-Composition project in the previous lesson. Teacher discusses with the students where the tea bags should be buried. Students conduct tests to determine the soil type(s) present at these locations.</p> <p>Students should take a handful of soil, remove leaves, etc. and wet the soil with water a little at a time and knead it to an even consistency. Students can be advised to handle the soil like playdough. The sample should be moist and held together and not sticking to your hand. This is called a bolus (mud pie). Work the bolus for about 5 minutes in your hand, listening to what happens.</p> <ol style="list-style-type: none"> 1. Squeeze (push) the bolus through your thumb and first finger to make a ribbon and notice what happens. 	<p>If the soil won't form a ball or a ribbon and the grains stick to your hand/fingers, it is <u>sandy</u>, and NOT good for growing vegetables, but suitable for some native plants.</p> <p>If the soil makes a spongy ball (you can't feel any sand) and the ribbon breaks at 2.5cm, it is <u>loamy</u>. This soil could be good for growing some types of vegetables.</p> <p>If the ball is compact and very smooth, holds a lot of water and feels like plasticine, it is <u>clayey</u>. This soil is probably not good for vegetables as the soil is too sticky and roots cannot absorb sufficient water.</p> <p>Discuss that some soils will have a mixture of textures – e.g. sandy loams, loamy clays, etc so students may feel different components of their soil, but for these purposes, we are looking for the dominant component.</p> 

CLOSURE			
Students recall the important factors in the cycles and relate this to soil health and microbial activity.	10 mins	Students discuss what they think will happen throughout the experiment – which location appeared to have the healthiest soil, and thus in which of the locations will the tea bags decompose the fastest?	

Lesson plan format for lesson 4

Class: Stage 5	Date: Lesson plan 4	Time: Start: _____ Finish: _____
Key Learning Area: Science	Lesson topic: The times, they are a' changing	
Syllabus outcome(s):	Indicators of learning for this lesson:	
<ul style="list-style-type: none"> - LW2 Conserving and maintaining the quality and sustainability of the environment requires scientific understanding of interactions within, the cycling of matter and the flow of energy through ecosystems. - - 	<p><i>By the end of this lesson, the students will be able to:</i></p> <ul style="list-style-type: none"> - LW2 d. analyse how changes in some biotic and abiotic components of an ecosystem affect populations and/or communities  - LW2 e. assess ways that Aboriginal and Torres Strait Islander peoples' cultural practices and knowledge of the environment contribute to the conservation and management of sustainable ecosystems  - LW2 f. evaluate some examples in ecosystems, of strategies used to balance conserving, protecting and maintaining the quality and sustainability of the environment with human activities and needs  	
Any safety issues to be considered:	Resources:	
<p>Mustard powder – use PPE such as safety glasses and gloves.</p> <p>Be aware of possible irritation from compost and worm farms especially for asthmatics. Exclude if necessary.</p>	<p>http://www.powershow.com/view/73d22-YzQxY/Population_Ecology_population_regulation_powerpoint_ppt_presentation</p> <p>http://games.bellmuseum.umn.edu/prairie/</p> <p>http://www.vanderbilt.edu/cso/Oh_deer.pdf</p> <p>Agar plates that have been inoculated from different soils around the school.</p>	

Lesson sequence for lesson 4

Lesson content / indicators of learning (what is taught):	Timing (mins)	Teaching strategies / learning experiences (how it is taught):	Resources and organisation:
INTRODUCTION			
Populations are dynamic by nature and respond to a variety of biotic and abiotic factors.	10 mins	<p>Teacher introduces the concept of populations in ecosystems being dynamic.</p> <p>Students view the PowerPoint presentation and possibly carry out one simulation game.</p>	http://www.powershow.com/view/73d22-YzQxY/Population_Ecology_population_regulation_powerpoint_ppt_presentation http://games.bellmuseum.umn.edu/prairie/ http://www.vanderbilt.edu/cso/Oh_deer.pdf
DEVELOPMENT			
Soils vary in their populations depending on biotic and abiotic factors	20 mins	<p>Student 'plant' tea bags as per instructions in the locations they have chosen.</p> <p>Students analyse agar plates prepared for each area for number of bacterial colonies.</p> <p>Do a 'worm count'. Collate information in tables.</p>	<p>Tea-Composition kit from the University of Sydney: tea bags, trowels, marker pens. Electronic scales 0.01g</p> <p>Students pour 1.5 litres of water mixed with 2 tablespoons of mustard powder. The mustard irritates the worms' skin but does not cause them any harm.</p> <p>Safety glasses, gloves</p> <p>https://www.learner.org/jnorth/tm/worm/WormHunt.html</p>
	15mins	Measure organic matter in soil: 1. Place a small sample of soil onto a white tile or	

<p>Indigenous Australians managed the landscape using a variety of methods. Their effect was positive.</p>	<p>sheet of OHP acetate. 2. Add several drops of hydrogen peroxide and observe any bubbles. The presence of bubbles indicates organic matter. Students may need to stir the sample with a paddle pop stick to promote the reaction.</p> <p>Students view one or more of the YouTube videos and complete notes on the effects of Indigenous Australians.</p>	 <p>https://www.youtube.com/watch?v=lnq6QbypMEq https://www.youtube.com/watch?v=t0vdHR9VU8E https://www.youtube.com/watch?v=sfRjHTqn7mc https://www.youtube.com/watch?v=mwUyaeWxJhA</p>
CLOSURE		
<p>Current practices in ecosystem management (with specific reference to soils) differ from those of Indigenous people.</p>	<p>15 mins</p>	<p>Students begin work on posters or video presentations showing the differences and similarities between Indigenous and modern ecosystem management systems. Students must make explicit links in their presentation to the Tea-Composition project – why is it important to monitor the health of soils? Discuss the role of soils in ecosystems.</p> <p>Butchers paper, pens, markers, Publisher, PowerPoint or design software.</p>

Lesson plan for lesson 5

Class: Stage 5	Date: Lesson plan 5	Time: Start: _____ Finish: _____
Key Learning Area: Science	Lesson topic: The times, they are a' changing II	
Syllabus outcome(s):	<p>Indicators of learning for this lesson:</p> <p><i>By the end of this lesson, the students will be able to:</i></p> <ul style="list-style-type: none"> - LW2 Conserving and maintaining the quality and sustainability of the environment requires scientific understanding of interactions within, the cycling of matter and the flow of energy through ecosystems - - 	
Any safety issues to be considered:	<p>Resources:</p> <p>See Stage 5 lesson 4</p>	

Lesson sequence for lesson 5

Lesson content / indicators of learning (what is taught):	Timing (mins)	Teaching strategies / learning experiences (how it is taught):	Resources and organisation:
INTRODUCTION			
Current practices in ecosystem management differ from those of Indigenous people.	40 mins	Students continue work on posters or video presentations showing the differences and similarities between Indigenous and modern ecosystem management systems. Students can also consider some explicit links with what they know about climate change and the managed versus unmanaged burial site decomposition rates from the tea bag practical.	Butchers paper, pens, markers, Publisher, PowerPoint or design software.
DEVELOPMENT AND CLOSURE			
	20 mins	Students present their poster or video presentations to the class and are peer assessed.	

Suggested assessment task

Students can be asked to present their findings from the Tea-Composition project as a poster or perhaps a video/photo blog that may take the form of a news report, documentary, a song and film clip, or any other creative video presentation that would appeal to the audience. The assessment task proposed below will allow your school to address this for Stage 5.

- **Stage 5 syllabus link:** LW2 Conserving and maintaining the quality and sustainability of the environment requires scientific understanding of interactions within, the cycling of matter and the flow of energy through ecosystems.

Task title: How can we ensure soil security?

Students could present their poster or video/photo blogs (in their chosen format) in a symposium format with a judging panel, or to the class during a lesson. The presentations will be both teacher- and peer-reviewed. To ensure each task is unique, perhaps each group could focus on a different agricultural practice that impacts soil health, e.g. till versus no till, crop rotation, use of legumes as alternate crops, or comparing managed and unmanaged soils (so the task is directly related to the Tea-Composition project).

Introduction – overview of human impact on the environment (e.g. climate change), humans' impact on soil as a specific example. If soil is not managed and used in a sustainable way, its future security is uncertain and this will have wide-reaching negative effects. How does this contrast with Indigenous land management practices?

Body – discussion about why it is important to measure and monitor soil quality, and how the students were able to do this throughout the Tea Bag Index project. Students present their methodology and their data about soil properties and health in this section, including a comparison between the managed and unmanaged soils. They must also make explicit reference to their specific agricultural practice that impacts upon soil health.

Conclusion – what did the students learn about the soil in their local environment? What combination of practices leads to the healthiest soil? (ideally looking for aspects such as no till, crop rotation and use of legumes to return nutrients to the soil)

Implications – does the soil in the students' local environment need to be better managed? How can Australia's soil security be ensured in the future? Can we utilise Indigenous land management practices to improve the management of Australia's soil? Students can also consider some explicit links with what they learned about climate change and the managed versus unmanaged burial site decomposition rates from the tea bag practical.

Evaluation

Suggested self and peer evaluation form

In rating yourself and your peers, use a one-to-five point scale where:

5 = best work possible, on task and self-motivated, a group player

4 = pretty good work, some reminders needed

3 = ok work, would be better with more effort or focus

2 = not great, off task a lot and not really helping with the group. Needs more effort

1 = Major distraction to the group, others had to do your part

Names (begin with your own)	Participated in group discussions or meetings	Helped keep the group focussed on the task	Contributed useful ideas	Quantity of work done	Quality of work done		Total scores

Suggested self and peer evaluation form (continued)

Strength(s) of the group:

Weakness(es) of the group:

Ways you resolved conflicts:

What could you have done better during this group project?

Additional comments:

