ADOPT A COASTLINE

City of Joondalup

YEAR FOUR TO SEVEN TEACHERS GUIDE

HOW DO WAVES ERODE A BEACH? HOW DO PLANTS STOP EROSION?

Students will be able to complete investigations which demonstrate erosion.
These activities will give them the opportunity to develop their working scientific skills.

Science Inquiry Skills

Year	Content Description	Elaborations	Teaching Points
Four	**Questioning and Predicting** With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge. **ACSIS064** **Processing and Analysing Data and Information** Use a range of methods including tables and simple column graphs to represent data and to identify patterns and trends. **ACSIS068** **Processing and Analysing Data and Information** Compare results with predictions, suggesting possible reasons for findings. **ACSIS216** **Evaluating** Reflect on the investigation; including whether a test was fair or not. **ACSIS069**	• Reflecting on familiar situations to make predictions with teacher guidance. • Identifying and discussing numerical and visual patterns in data collected from students' investigations and from other sources. • Using provided graphic organisers to sort and represent information. • Discussing how well predictions matched results from an investigation and proposing reasons for findings. • Comparing, in small groups, proposed reasons for findings and explaining their reasoning. • Reflecting on investigations, identifying what went well, what was difficult or didn't work so well, and how well the investigation helped answer the question. • Discussing which aspects of the investigation helped improve fairness, and any aspects that weren't fair.	• Importance of following scientific method accurately. · How to write scientific observations: · third person; · objective; and · precise. • Making links between science ideas and science data (results). • How to evaluate an investigation: · use of equipment; · accuracy of measuring; · accuracy of method; and · how well were factors kept controlled e.g. beach height the same, wave motion, amount of seedlings, location of seedlings.

Science Inquiry Skills

Year	Content Description	Elaborations	Teaching Points
Four	**Communicating** Represent and communicate ideas and findings in a variety of ways such as diagrams, physical representations and simple reports. **ACSIS071**	• Communicating with other students carrying out similar investigations to share experiences and improve investigation skills. • Using simple explanations and arguments, reports or graphical representations to communicate ideas to other students.	• Writing scientifically: · third person; and · factual/objective, not emotive or personal.
Five	**Questioning and Predicting** With guidance, pose questions to clarify practical problems or inform a scientific investigation, and predict what the findings of an investigation might be. **ACSIS231** **Planning and Conducting** Use equipment and materials safely, identifying potential risks. ACSIS088 **Processing and Analysing Data and Information** Compare data with predictions and use as evidence in developing explanations. **ACSIS218** **Evaluating** Suggest improvements to the methods used to investigate a question or solve a problem. **ACSIS091** **Communicating** Communicate ideas, explanations and processes in a variety of ways, including multi-modal texts. **ACSIS093**	• Applying experience from similar situations in the past to predict what might happen in a new situation. • Explaining rules for safe processes and use of equipment. • Sharing ideas as to whether observations match predictions, and discussing possible reasons for predictions being incorrect. • Working collaboratively to identify where methods could be improved, including where testing was not fair and practices could be improved. • Using labelled diagrams, including cross-section representations, to communicate ideas.	As above + • Drawing scientific diagrams: · pencil; · labelled; · simple lines (not sketchy).

Science Inquiry Skills

Year	Content Description	Elaborations	Teaching Points
Six	**Planning and Conducting** Use equipment and materials safely, identifying potential risks. **ACSIS105** **Processing and Analysing Data and Information** Construct and use a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data using digital technologies as appropriate. **ACSIS107** **Processing and Analysing Data and Information** Compare data with predictions and use as evidence in developing explanations. **ACSIS221** **Evaluating** Suggest improvements to the methods used to investigate a question or solve a problem. **ACSIS108** **Communicating** Communicate ideas, explanations and processes in a variety of ways, including multi-modal texts. **ACSIS110**	• Discussing possible hazards involved in conducting investigations, and how these risks can be reduced. • Exploring how different representations can be used to show different aspects of relationships, processes or trends. • Sharing ideas as to whether observations match predictions, and discussing possible reasons for predictions being incorrect. • Discussing the difference between data and evidence. • Referring to evidence when explaining the outcomes of an investigation. • Discussing improvements to the methods used, and how these methods would improve the quality of the data obtained. • Discussing the best way to communicate science ideas and what should be considered when planning a text. • Using labelled diagrams, including cross-section representations, to communicate ideas and processes within multi-modal texts.	As above + • Safety- correct and safe use of science equipment.

Science Inquiry Skills

Year	Content Description	Elaborations	Teaching Points
Seven	**Planning and Conducting** Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed. **ACSIS125** **Processing and Analysing Data and Information** Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships, including using digital technologies as appropriate. **ACSIS129** **Processing and Analysing Data and Information** Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions. **ACSIS130** **Evaluating** Reflect on the method used to investigate a question or solve a problem, including evaluating the quality of the data collected, and identify improvements to the method. **ACSIS131**	• Working collaboratively to decide how to approach an investigation. • Learning and applying specific skills and rules relating to the safe use of scientific equipment. • Describing the trends shown in collected data. • Referring to relevant evidence when presenting conclusions drawn from an investigation. • Discussing investigation methods with others to share ideas about the quality of the inquiry process. • Identifying and considering indicators of the quality of the data when analysing results. • Suggesting improvements to inquiry methods based on experience. • Presenting the outcomes of research using effective forms of representation of data or ideas and scientific language that is appropriate for the target audience.	As above + • Improving investigations relate to: · accuracy of measurements; · consistent procedural methods; and · controlling variables.

Science Inquiry Skills

Year	Content Description	Elaborations	Teaching Points
Seven	**Communicating** Communicate ideas, findings and solutions to problems using scientific language and representations using digital technologies as appropriate. **ACSIS133**		

Understandings

Year	Content Description	Elaborations	Teaching Points
Four	**Earth and Space Sciences** Earth's surface changes over time as a result of natural processes and human activity. **ACSSU075**	• Exploring a local area that has changed as a result of natural processes, such as an eroded gully, sand dunes or river banks. • Considering the effect of events such as floods and extreme weather on the landscape, both in Australia and in the Asia region.	• Formation of sand dunes. • Forces of erosion (water, waves, wind).
Five	**No relevant curriculum content.**		
Six	**EXTENSION** **Earth and Space Sciences** Sudden geological changes or extreme weather conditions can affect Earth's surface. **ACSSU096**	• Investigating major geological events such as earthquakes, volcanic eruptions and tsunamis in Australia, the Asia region and throughout the world. • Recognising that earthquakes can cause tsunamis. • Exploring ways that scientific understanding can assist in natural disaster management to minimise both long and short-term effects.	• Tsunami: · Definition; · Cause; · affects of; · early warning system; and · recovery.
Seven	**No relevant curriculum content.**		

Geography

Year	Content Description	Elaborations	Teaching Points
Four	**Geographical Knowledge and Understanding** The types of natural vegetation and the significance of vegetation to the environment and to people. **ACHGK021**	• Exploring how vegetation produces the oxygen all land animals (including people) breathe; protects land from erosion by water or wind; retains rainfall; provides habitat for animals; shelters crops and livestock; provides shade for people; cools urban places; produces medicines, wood and fibre; and can make places appear more attractive.	As above + • Forces of erosion (water, waves, wind). • Dune stabilisation by plants: · roots; and · reduction of wind.
Five	**No relevant curriculum content.**		
Six	**No relevant curriculum content.**		
Seven	**Geographical Knowledge and Understanding / Unit 1: Water in the World** The causes, impacts and responses to an atmospheric or hydrological hazard. **ACHGK042**	• Explaining the physical causes and the temporal and spatial patterns of an atmospheric or hydrological hazard through a study of either droughts, storms, tropical cyclones or floods.	As above + • Impact of storms on beaches: · erosion; and · recovery.

Prior Learning

Students will need to be able to:

- define erosion
- name water and wind as agents of erosion
- define accretion
- understand the importance of accurate measurement in science investigations
- understand the importance of consistency scientific method.

Activities

- If you do not have a stream table you can use any shallow, but long trough. Under the bed storage containers are ideal. They need to be around one metre or longer.
- Yellow “brickie’s” sand or white play sand are all suitable. Garden soil is not suitable as it is “sticky” and has too much organic matter in it.
- Vegetable or flower seedlings are suitable for this investigation. The amount is dependent on the size of the stream table. They need to be relatively dense - about one plant every three centimetres.
- If the plants are allowed to grow for a period of time the results will be better.
- Variables - with older students it is appropriate to discuss variables or factors that are being tested and those that need to stay the same.
  - Independent variable – (this is the factor we are testing and we choose it’s parameters e.g. calm, gentle, storm) type of wave
  - Dependent variable - (this factor is the one we collect results or observations on, it reacts to the independent variable) amount of erosion
  - Controlled variables (these are every factor that needs to be kept the same so they do not interfere with the results):
    1. height of sand dune
    2. amount of water
    3. amount of sand
    4. force of wave
    5. type of seedling
    6. number of seedlings
    7. distance from beach to wave producer
- Predictions - older students can write their predictions as a cause and effect statement (hypothesis), for example:
- If the waves are bigger, then the sand dunes will be eroded more.
- If the sand dunes have vegetation, then the waves will do less damage.
- Allow students adequate time to discuss their results and why they think it occurred before they write about it. Collect ideas as a class and write notes onto the white board. Students can use these notes to write a conclusion. Scientific investigations should be:
- Written in third person (NO - I, we, us, me, our...)
- Objective- state the facts NOT I didn’t like that or I hated the smell. For example, the seedling grew taller with the addition of fertiliser than a seedling without fertiliser.
- Give students sentence starters to help them write scientifically e.g.
  1. The results showed ...
  2. As a result of the ...
  3. The evidence suggests...
- Discussion - this is a report about the findings of the investigation. It describes the result and then attempts to explain them using science ideas.

How to write a good scientific discussion

All science reports should be written in third person (No pronouns: I, We, Us, Me, Them). It is a formal way of writing; it doesn’t have any feelings in it - students should not use “I think…”

The discussion is about the results: what happened and why it happened or what you found out. It should be written in this order:

1. Describe the results. Say what happened - e.g. The seedling with fertiliser grew to 15cm, the seedling with no fertiliser grew to 7cm.
2. State whether the results support the hypothesis (or prediction). This can be written as a simple sentence: The results supported/ did not support the hypothesis.
3. Link the results to science. Try to explain the results using science ideas, e.g. The seedling with fertiliser grew taller because it had the nutrients required for growth. For plants to grow they need certain nutrients; fertiliser provides the plant with those nutrients quickly and easily.

4. Concluding sentence. Finish this section with a sentence that summarises what you have found out. “In conclusion the results show that seedlings will grow better with fertiliser.”

Here is an example of a short discussion.

“The seedling with the fertiliser grew to 15cm; the seedling without the fertiliser grew to 7cm. This supported the hypothesis ‘If a seedling is given fertilizer then it will grow taller’. Fertiliser is made of nitrogen, potassium and phosphorous. These three nutrients are needed for plant growth. When a plant grows, new cells are made. Nitrogen, potassium and phosphorous are used to make the parts of the cell; like the cell membrane. So by giving the seedling fertiliser it was able to grow taller because it had more of these important nutrients. To conclude, the results showed that the seedlings grew better with fertiliser.”

Extension:

- Explore how sea walls can help prevent erosion by building structures on the beach. Materials you could use: pop-sticks, Lego, branches/sticks, paper.
- Research how wind erosion shapes sand dunes.
- Research how catastrophic effects like tsunamis or cyclones affect the coast line.
- Research the importance of dune rehabilitation.

References

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