Plant growth in processed shale

After oil shale is processed it would be sensible to return it to the ground from whence it came, but is it safe and will plants grow in it? In this lesson you will conduct an experiment to find out.

In this lesson, students will:

- Investigate the effectiveness of plant growth in processed oil shale.
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Lesson-level Content Descriptions

The Australian Curriculum: Year 5
Use and influence of science: Scientific knowledge is used to inform personal and community decisions (ACSHE217)

Elaborations:

- considering how best to ensure growth of plants
- considering how decisions are made to grow particular plants and crops depending on environmental conditions.

Science enquiry skills
Decide which variable should be changed and measured in fair tests and accurately observe, measure and record data, using digital technologies as appropriate (ACSIS087)

Elaborations:

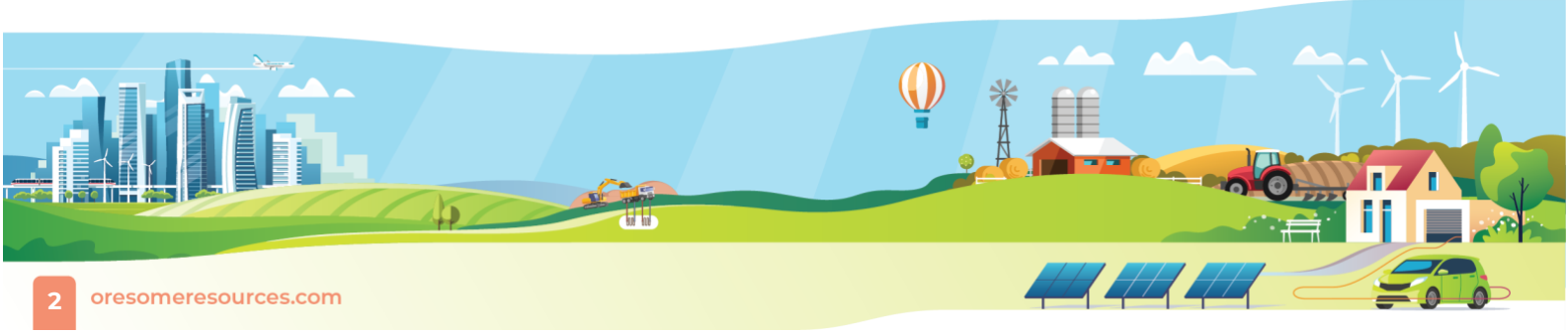
- discussing in groups how investigations can be made as fair as possible
- using the idea of an independent variable (note: this terminology does not need to be used at this stage) as something that is being investigated by changing it and measuring the effect of this change
- using familiar tools such as rulers, weighing scales and watches to measure objects and events in investigations adding information to tables, graphs and spreadsheets
- using familiar units such as grams, seconds and metres and developing the use of standard multipliers such as kilometres and millimetres.

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 (ACSIS090)

Elaborations:

- identifying similarities and differences in qualitative data in order to group items or materials
- describing simple cause-and-effect relationships as shown by trends in quantitative data.

Year 5 achievement standard
By the end of Year 5 students pose questions relating to investigations, predict what might happen when things are changed, and assist in the planning of methods to test these predictions. When carrying out investigations they use equipment in a way that improves the accuracy of their measurements and observations. They describe patterns in their results, report on their findings and reflect on the methods that they have used. Students describe how developments in science have improved our understanding of the world and have enabled people to make decisions based on scientific knowledge. They identify cause-and-effect relationships in the natural world and describe physical differences between solids, liquids and gases.



Lesson Outcomes

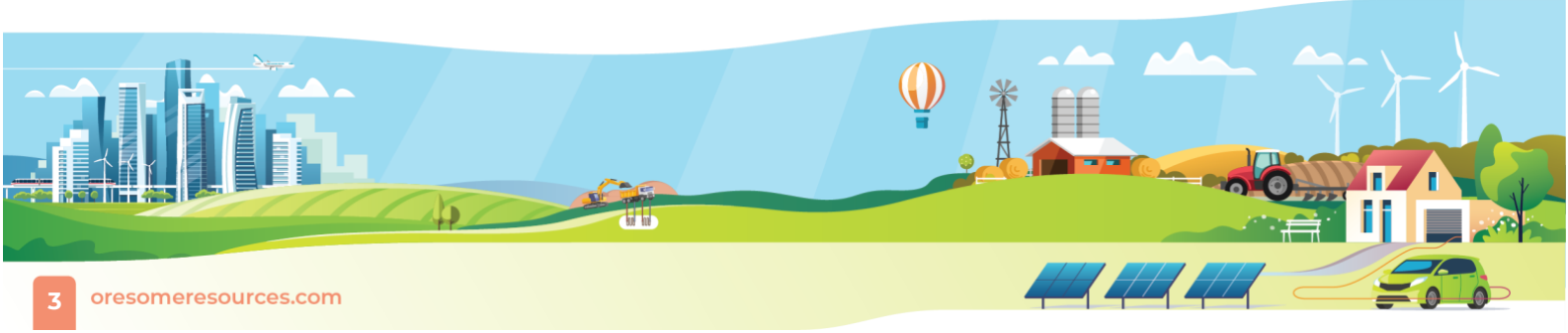
The assessment focus of this lesson is formative: The classroom activities provide an opportunity for students to generate evidence with which the teacher can establish the student's progress towards understanding the concepts that are being developed in this lesson.

Science Outcomes	Literacy Outcomes	Numeracy Outcomes
Students may/should be able to: • Control variables in an experimental investigation • Conduct experiments using three trials • Postulate reasons for experimental findings	Students may/should be able to: • Listen • Read • View • Write • Speak • Crate visual materials • Discuss scientific phenomena • Document scientific phenomena • Hypothesise about speculative ideas • Use technical terms in a scientific context	Students may/should be able to: • Measure practically • Collect data • Represent data • Interpret data • Measure using formal units • Consider uncertainty and reliability in measurement • Collect quantitative data • Analyse data • Represent data in graphical forms • Identify trends and patterns from numerical data and graphs • Analyse data statistically

Background Information

Students should have a knowledge of:

- Measurement with a ruler
- Tabulating data
- Line graphs
- Calculating averages



Preparation List

- Copy the activity Plant Growth in processed shale experiment
- Equipment:
  - 6 small flower pots
  - Plant seeds (choose a fast-growing species like beans, peas or tomatoes)
  - Potting mix (sufficient to fill three pots)
  - Processed shale (sufficient to fill three pots)
  - Fertiliser
  - Water
  - Ruler

Activity Sequence

1. Introduce the lesson by discussing the importance of controlling variables, keeping every characteristic the same in an experiment apart from the one thing that you are testing.
2. Hand out the activity *Plant Growth in processed shale experiment* and discuss.
3. Students commence the experiment, at home or at school. They will need to record results for some weeks, until they have a good set of data recorded.
4. Students address the questions at the conclusion of the experiment.

An informal QER trial of processed shale from the Colorado plant has demonstrated successful growth of vegetables and grass.

Opportunities for conducting formative assessment:
Marking written responses to the questions in the experiment.

Links to Other Learning Areas

The following suggested activities may be used to provide a link between the content of this unit and that of other learning areas, in particular those related to Mathematics, English and ICT.

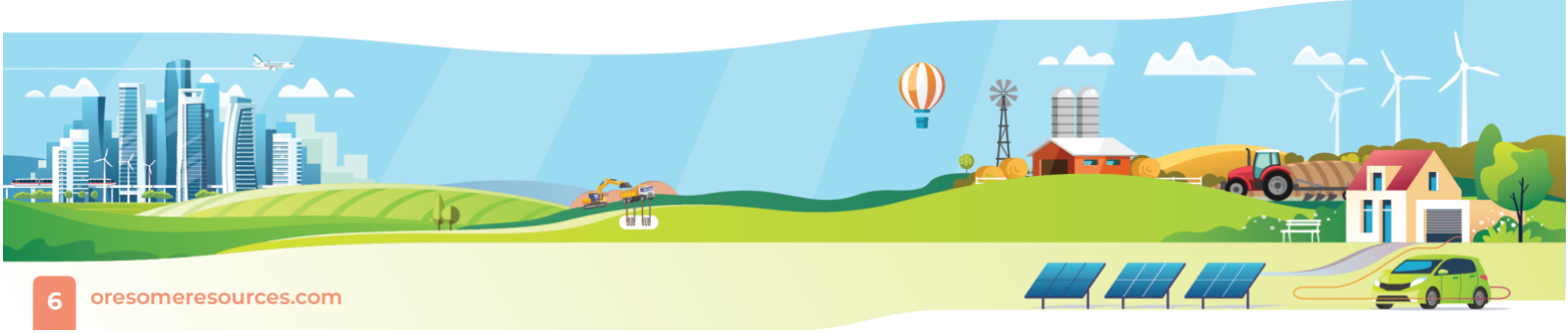
- Use spreadsheets to tabulate and graph experimental results.

Additional Resources

- http://www.qervisitorcentre.com.au – Extensive overview of QER New Fuels Development Centre, including video snippets, animations, graphs, maps and explanations relating to:
  - Australia's fuel challenge
  - QER and sustainability
  - Benefits for Australians
  - Turning oil shale into fuel

The following resources are above the level of junior primary science but may be of interest for teacher background knowledge:

- Oil Shale fact sheet
- PowerPoint Presentations
  - Paraho Process
  - Formation of Oil Shale – Parts 1 and 2
- Flow diagram: *The Paraho Process* – *Illustrative Process Flows*



Summary Preparation List

Lesson	Equipment and Resources
1	Copy the activity *Plant Growth in processed shale experiment* Equipment: • 6 small flower pots • Plant seeds (choose a fast-growing species like beans, peas or tomatoes) • Potting mix (sufficient to fill three pots) • Processed shale (sufficient to fill three pots – contact QRC or Vesna at QER to source?) • Fertiliser • Water • Ruler.