**NZQA**

**Approved**

Achievement standard: 90949 Version 3

Standard title: Investigate life processes and environmental factors that affect them

Level: 1

Credits: 4

Resource title: Te matua ngahere

Resource reference: Science VP-1.10 v2

Vocational pathway: Primary Industries

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| Quality assurance status | These materials have been quality assured by NZQA.  NZQA Approved number A-A-02-2015-90949-02-7295 |
| Authenticity of evidence | Assessors/educators must manage authenticity for any assessment from a public source, because learners may have access to the assessment schedule or exemplar material.  Using this assessment resource without modification may mean that learners’ work is not authentic. Assessors/ educators may need to change figures, measurements or data sources or set a different context or topic to be investigated or a different text to read or perform. |

Vocational Pathway Assessment Resource

Achievement standard: 90949

Standard title: Investigate life processes and environmental factors that affect them

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Resource reference: Science VP-1.10 v2

Vocational pathway: Primary Industries

Learner instructions

# Introduction

This assessment activity requires you to investigate the life processes of growth (as germination) of radiata pine seeds, reproduction (asexual by propagation) of a pine tree, and the environmental factors that affect them.

You are going to be assessed on how comprehensively you investigate these life processes and two environmental factors that affect them. You will use observations, or findings, and biological ideas to make significant links between the structure, function and environmental factors that affect plant seed germination and the propagation, including the implications for the growing plant.

The following instructions provide you with a way to structure your work so you can demonstrate what you have learnt and achieve success in this standard.

Assessor/educator note: It is expected that the assessor/educator will read the learner instructions and modify them if necessary to suit their learners.

# Task

Kaingaroa Forest is one of the crown jewels of international forestry and is one of the oldest and largest softwood pine plantations in the world. The first plantings were at Waiotapu in the early 1900s and much of the total 189,000 ha forest is now growing its third crop of pine trees. Entrepreneurs realised that, as exotic trees could be grown quickly, they were an attractive investment. Some two dozen companies purchased large areas of land and planted mainly radiata pine (*Pinus radiata*). The majority of the forest is on land leased from the Crown and local iwi.

## Investigation – Germination

Investigate the effects of temperature on the germination of pine seeds:

* Use the materials provided to select a range of temperatures to plant pine seeds and, after an appropriate time, record the percentage of the seeds that have germinated.
* Collect a germinated pine seed and use it to make a drawing of the seed. Label and describe the key structural features. Explain how the structures function in terms of germination and growth.
* Use your findings to explain how the process of germination is affected by temperature.
* Use biological ideas to make significant links between the structure, function and temperature related to the germination and growth of pine seeds. Include an implication for the growing plant in the discussion. Making significant links may involve explaining, elaborating, applying, justifying, relating, evaluating, comparing and contrasting, or analysing.

## Investigation – Reproduction

Investigate the effects of hormone levels on the successful propagation of pine cuttings:

* Apply the hormone powder at different application levels to the pine cuttings and plant them using the resources provided.
* Observe and record the health and growth of the cuttings.
* Use a propagated cutting to make a drawing. Label and describe the key structural features that allow pine to reproduce asexually from a cutting. Explain how the structures function in terms of asexual reproduction.
* Use your findings to explain how the process of asexual reproduction is affected by hormone application levels.
* Use biological ideas to make significant links between the structure, function and environmental factors related to the reproduction of the pine cutting. Include an implication for the growing plant in the discussion. Making significant links may involve explaining, elaborating, applying, justifying, relating, evaluating, comparing and contrasting, or analysing.

# Resources

You will need appropriate equipment, including:

* computer
* library and information technology
* radiata pine tree seeds and cuttings
* temperature controlled environments
* hormone powder
* growing medium and pottles or a suitable outdoor area to propagate pine cuttings.

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Assessor/Educator guidelines

# Introduction

The following guidelines are supplied to enable assessors/educators to carry out valid and consistent assessment using this internal assessment resource.

As with all assessment resources, education providers will need to follow their own quality control processes. Assessors/educators must manage authenticity for any assessment from a public source, because learners may have access to the assessment schedule or exemplar material. Using this assessment resource without modification may mean that learners' work is not authentic. The assessor/educator may need to change figures, measurements or data sources or set a different context or topic. Assessors/educators need to consider the local context in which learning is taking place and its relevance for learners.

Assessors/educators need to be very familiar with the outcome being assessed by the achievement standard. The achievement criteria and the explanatory notes contain information, definitions, and requirements that are crucial when interpreting the standard and assessing learners against it.

# Context/setting

This activity requires learners to comprehensively investigate the two life processes of growth (as germination) and reproduction (asexual, as propagation) of a pine plant, and environmental factors that affect them.

Learners are required to:

* use a germinated pine seed to create a drawing and discuss how the structures of the seed function in terms of germination and growth
* investigate the effects of temperature on the germination of pine seeds
* propagate a pine plant from a cutting, create a drawing, and discuss how the structures function in terms of asexual reproduction
* investigate the effects of hormone levels on the successful propagation of pine cuttings
* use observations or findings, and biological ideas to explain and make significant links between the structure, function and environmental factors related to growth and reproduction in radiata pine.

# Conditions

Learners may work together to gather information, but will need to demonstrate individual competence in meeting the criteria of the standard.

# Resource requirements

* Computer
* Library and information technology
* Radiata pine tree seeds and cuttings
* Temperature controlled environments
* Hormone powder
* Growing medium and pottles or a suitable outdoor area to propagate pine cuttings.

# Additional information

None.

# Assessment schedule: Science 90949 – Te matua ngahere

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| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| The learner investigates two life processes and environmental factors that affect them by:   * describing observations or findings about the structure, function and at least one environmental factor related to the life processes of growth (as germination) and reproduction (asexual, as propagation of cuttings) in radiata pine   For example:   * drawing and describing at least two structural features of a germinating pine seed and their function * identifying the environmental factor of temperature and describing effect on the germination * drawing and describing at least two structural features of the tree cutting * describing at least two of the structural features of a pine cutting and their function * identifying the environmental factor of hormone levels and describing the effect on successful propagation.   *The above expected learner responses are indicative only and relate to just part of what is required.* | The learner investigates, in depth, two life processes and environmental factors that affect them by:   * describing observations or findings about the structure, function and at least one environmental factor related to life processes of growth (as germination) and reproduction (asexual, as propagation of cuttings) in radiata pine * using observations or findings and biological ideas to give reasons how or why the structure, function and an environmental factor is related to one of these life processes   For example:   * drawing and describing at least two structural features of a germinating pine seed, and their function * identifying the environmental factor of temperature and describing its effect on germination * drawing and describing at least two structural features of a pine cutting, and their function * identifying the environmental factor of hormone levels and describing the effect on successful propagation * giving reasons to explain how or why the structure of the pine seed, functioning of the parts, germination and growth are affected by temperature * giving reasons to explain how or why the structure of the tree cutting, functioning of the parts and propagation are affected by hormone levels.   The above expected learner responses are indicative only and relate to just part of what is required. | The learner investigates, comprehensively, life processes and environmental factors that affect them by:   * describing observations or findings about the structure, function and at least one environmental factor related to life processes of growth (as germination) and reproduction (asexual, as propagation) in radiata pine * using observations or findings and biological ideas to give reasons how or why the structure, function and an environmental factor is related to one of these life processes, including implications for the pine plant * using observations or findings and biological ideas to make significant links between the structure, function and environmental factors related to one of these life processes including implications for the tree plant   For example:   * drawing and describing at least two structural features of a germinating pine seed, and their function * identifying the environmental factor of temperature and describing its effect on germination * drawing and describing at least two structural features of a pine cutting, and their function * identifying the environmental factor of hormone levels and describing the effect on successful propagation * giving reasons to explain how or why the structure of the pine seed, functioning of the parts and propagation are affected by temperature * giving reasons to explain how and why the structure of the pine cutting, functioning of the parts and propagation are affected by hormone and nutrient levels * making significant links between the structure, function and temperature related to germination and growth, and the implications for the pine plant * making significant links between the structure, function and hormone levels related to propagation and the implications for the pine plant. Making significant links may involve explaining, elaborating, applying, justifying, relating, evaluating, comparing and contrasting or analysing.   *The above expected learner responses are indicative only and relate to just part of what is required.* |

Final grades will be decided using professional judgement based on an examination of the evidence provided against the criteria in the Achievement Standard. Judgements should be holistic, rather than based on a checklist approach.