Agri Leaders Wanted

\ EDUCATION IN AGRICULTURE

Teaching and Learning Plan
NCEA LEVEL 2 MATHS AND STATISTICS AS 91264

SHEEP THRILLS FOR RAMBO

Contents

Introduction

Learning to be assessed using AS91264: Use statistical methods to make an inference.

This unit of work gives Level 7 students the opportunity to apply statistical methods in an authentic context that is of considerable economic importance to New Zealand. The unit is based on an actual database of birth and growth data from a large flock of sheep. However it could well be adapted to apply a cattle-farming database.

The teaching programme will need to include an introduction to the agricultural context, which will be unfamiliar to many students. New Zealand Young Farmers have field officers who visit schools and can speak to groups of students about sheep and cattle rearing and about the importance of the primary industries to New Zealand. Schools are strongly recommended to take advantage of the opportunities they provide.

Before students are introduced to the Sheep Growth Dataset and the accompanying Level 2 assessment task, they should be exposed to multiple opportunities to grow and consolidate their understanding of Level 2 statistical inference techniques and the statistical enquiry cycle in a variety of contexts.

The sheep growth database is comprised of birth data from two separate flocks (totalling 970 lambs). The goal of the investigation is to maximise productivity. The students choose a variable that is likely to influence productivity and, by posing and investigating a suitable comparative question, try to answer it using statistical methods. For example, a student might compare two rams to determine which is most productive.

Achievement standard

AS91264 (2.9): Use statistical methods to make an inference (4 credits, internal).
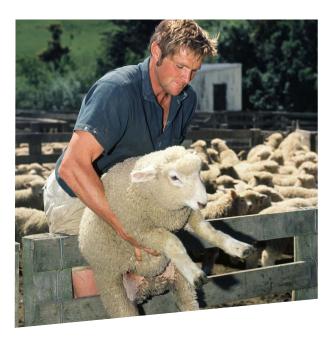
The conditions of assessment for this achievement standard stipulate: It is intended that students have access to a set of population data from which they are to pose a comparative question and then take random samples to analyse in order to answer that question. The population data set must be sufficiently large enough to show a need to sample.

Overview

This achievement standard is about using a sample to 'make a call' about a larger population. In the example of sheep breeding, the student might look at a sample of offspring sired by a particular ram and compare an average of their weights to that of a sample of offspring sired by another ram. A student might ask, 'Can we say that one particular ram produces heavier lambs than the other?'

The students also need to demonstrate an understanding of sample variation. Every sample of lamb weight taken from the offspring of a particular ram will be slightly different from another. These samples give a rough picture of what might be the weight of all the offspring of the ram. The size of a sample however can be a factor in how accurate the data is for the population. For example, if the average weights for samples that include 10 lambs is compared to the average weights for samples that include 30 lambs, the averages for the samples with 10 would be much more varied.

Achievement objectives

Level 7 – Statistics

In a range of meaningful contexts, students will be engaged in thinking mathematically and statistically. They will solve problems and model situations that require them to:

Carry out investigations of phenomena, using the statistical enquiry cycle:

- using existing data sets that require random sampling techniques
- evaluating the choice of sampling and data collection methods used
- using relevant contextual knowledge, exploratory data analysis, and statistical inference.

In a range of meaningful contexts, students will be engaged in thinking mathematically and statistically. They will solve problems and model situations that require them to:

Make inferences from surveys:

- making informal predictions, interpolations, and extrapolations
- using sample statistics to make point estimates of population parameters
- recognising the effect of sample size on the variability of an estimate.

Background

The Sheep Growth Dataset was supplied by Beef and Lamb New Zealand (B+LNZ) and genetics from the Sheep Improvement Ltd (SIL) database, which is used by New Zealand ram breeders.

Sheep farmers who join a Sheep Improvement Ltd (SIL) bureau are provided with recording equipment (either electronic-handheld data collectors or manual recording sheets) and are supported to collect relevant and accurate data.

The data collected includes information on lambs born to particular flocks. Data collected includes:

- the identity and age of the sire (father) and the dam (mother)
- time of birth
- singleton or one of a multiple birth
- measured weights at weaning and at six months.

Prior knowledge

Farmers need to know which rams are the most productive – which produced the biggest lambs or the most offspring?

Heavier lambs command higher prices.

The weight of the lambs is more important than the number of pregnancies achieved.

The goal is to have as many heavy lambs as possible.

Further information on sheep breeding is available from NZ Beef and Lamb.

Leading questions:

- Do younger sires produce larger lambs?
- Were the lambs born in one flock larger than those born in another?
- Did Ram A or Ram B produce heavier (or more) lambs?

Teaching and learning plan

The teaching sequence for this unit of work has three phases:

Phase 1 (3–4 weeks)

Students refresh prior learning and develop the Level 7 understandings that will be assessed by achievement standard AS91264 – Use statistical methods to make an inference. They should do this in a variety of contexts other than sheep production.

The following is a suggested outline:

Introduction:

- Sample to population inference
- Statistical Enquiry Cycle (PPDAC):
  - Posing a comparison question about medians
  - Sampling: Sampling variation and sample size

    CensusAtSchool

    AUT Department of Statistics
- Effects of sample size on sampling variability
- Effects of spread in the population on sampling variability
- How to take a sample using Excel
- Summarising and describing distributions:
  - Shape, centre, spread and unusual.
    CensusAtSchool
- Informal confidence intervals for the population median
- Sample to population inference and 'making the call' at Level 2
  CensusAtSchool

Phase 2 (1-2 weeks)

Set a formative assessment task for learners to work through and use this as a vehicle to check their understanding of the key ideas and to provide specific feedback. The context for this task should be relevant and meaningful to the learners. Support should be provided for students during this practice phase, which provides an opportunity to identify and address any misconceptions or areas of weakness.

Phase 3 (1–2 weeks)

Students are introduced to the context of sheep breeding. Arrange a farm visit, or if there are time constraints, invite a New Zealand Young Farmer's field officer as a guest speaker to discuss sheep breeding and answer students' questions. Young Farmers field officers can be contacted by phone on 0800 6993 4636 or email: info@youngfarmers. co.nz for support.

Students work with the data set to:

- clarify what the variables represent
- decide the purpose for their investigative question
- select the variables they choose to work with
- pose an appropriate investigative comparison question.

Students complete and submit the assessment task.