

Teaching Notes for Dragon Lesson Plan 5C: Comparing Difference Curriculum Level 5

Overview

Achievement Objectives

S5-1: ... comparing sample distributions visually, using measures of centre, spread, and proportion ...

Purpose

This lesson illustrates how sampling can be used to investigate whether there is a difference between two populations. This lesson can be taught in conjunction with the other Statistics Learning Centre lessons covering other big ideas of statistics introduced at curriculum level 5.

Specific Learning Outcomes

- Compare sample distributions visually.
- Make a judgement about a difference between two populations based on samples.
- Make sensible statements about the information with supporting evidence.

Outline

- Robust shelters [Full class, 5 min]
- Investigative question and planning - [Groups, 10-15 min]
- Analysis - [Groups, 15-20 min]
- Results and conclusions - [Groups, 10 min]
- Discussion - [Full class, 10 min]

Required Resource Materials

- Two or more class packs of dragon cards (more cards are better)
- Some way for students to record their results

Key Vocabulary

Box and whisker plot, inference, interquartile box, lower quartile, median, population, sample, tends to, upper quartile

Teacher Notes

Timings are approximate.

The statistics strand of the New Zealand mathematics curriculum is made up of three threads: Statistical Investigation, Statistical Literacy and Probability at all curriculum levels. This lesson is a part of the Statistical Investigation thread. The Statistical Enquiry Cycle underlies that thread. While it is used to structure this lesson it is not the main focus of the lesson. The focus of the lesson is to show students that sampling can be used to find out whether there is a difference between two populations. In this case the two populations are female dragons and male dragons.

Robust shelters

A statistical investigation is more than just the analysis. It is important to have a context, which will give the investigation its purpose. This will inform the statistical questions to ask, the appropriate analyses and give meaning to the conclusions. The story is intended to provide context and purpose. It is an important part of the lesson.

Investigative question and planning

Students should already have been introduced to the concept of sampling for inference. By asking students to plan their analysis they will encounter some of the issues involved. These issues include:

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- Choosing a sample size
- Determining how to take the sample
- How to compare the two samples
- What difference in the samples is evidence of a difference in the population

Timing and having a consistent class plan is likely to require compromise from the individual group plans. Compromising due to practical considerations is common in statistical analyses.

If the class plan does not include comparing bar charts and comparing box plots of the two samples, add these.

Analysis

It is easiest to compare bar charts if they are aligned vertically. This allows students to see whether one group of dragons appears to be left or right shifted compared to the other. It is important to leave gaps for missing values.

Aligning the box plots to the bar charts can also be useful.

Results and conclusions

There are two parts to recording results. The first part is to report what the samples show. This generally involves the Obvious, Specify and Evidence parts of the OSEM framework. The second part is making a call about whether the samples do or do not show evidence of a difference between the two populations. This generally involves the Meaning part of the OSEM framework.

At curriculum level 5 there are no particular rules to teach students about making a judgement. It is fine for different students to make different judgements based on the same sample if the result is not clear.

Discussion

Before looking at results from the different groups it is important to emphasise that in a normal statistical analysis judgement must be made based on only one sample. Comparing results from different samples is a part of the lesson not the statistical analysis. It will allow students to get an appreciation that there is an element of chance to the evidence from sampling when comparing two populations.

It can be useful to have visuals of the student's graphs as they report their conclusions. That lets the other students judge whether each sample shows enough evidence of a difference between the populations.

Note that for each sample there are only two judgements: either there is enough evidence to conclude that there is likely to be a difference in the population or there is not enough evidence (or no evidence). Still there is a grey area between clearly enough evidence and clearly not enough evidence. A sample can look like there might be a difference but not show enough evidence to conclude that there is. Students are not being judged by how well they can 'make a call' in that grey area. There are statistical analyses they will learn later that will help to reduce that grey area but it cannot be removed entirely.

Further activities and resources are provided on <http://shop.StatsLC.com>

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