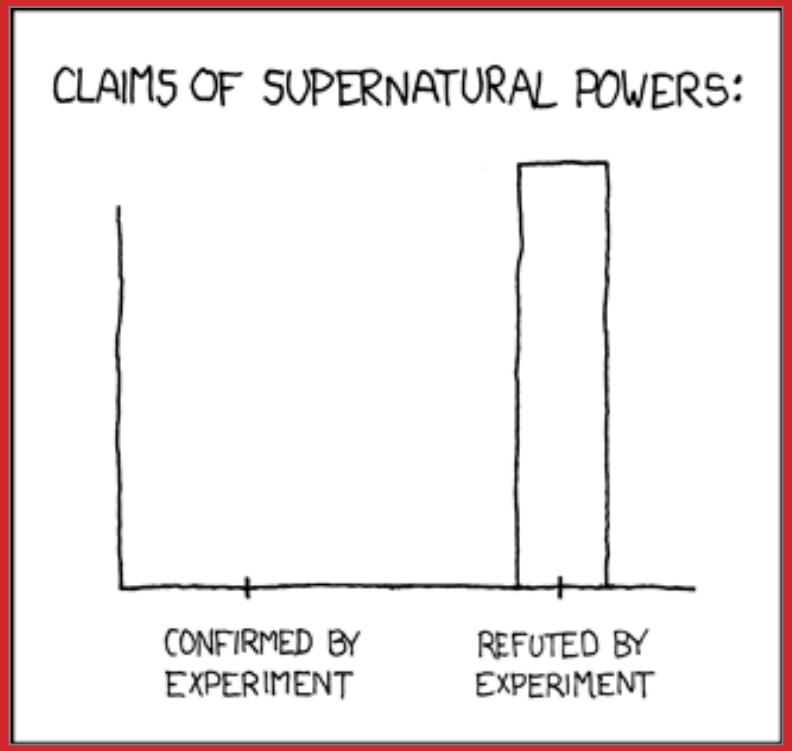
CONDUCTING AND ASSESSING EXPERIMENTS FOR 3.11



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FOCUS FOR WORKSHOP

- Informed contextual knowledge
- Experimental design principles
- Exploratory data analysis
- Reporting experiments
- Assessing experiments

INFORMED CONTEXTUAL KNOWLEDGE

INFORMED CONTEXTUAL KNOWLEDGE

- Develop understanding of why an experiment is needed
- Understand context to design experiment
- See themselves as being able to contribute to what is known about the world and people
- Student driven – students need to time to research the context and inform themselves
- Find information to form an expectation for their experiment/investigation

IDEAS FOR CONTEXTS: TKI EXEMPLARS

Maybe time to get a new haircut?

Does hairstyle affect age estimates?

IDEAS FOR CONTEXTS: NEWSPAPER ARTICLES

Straight beer glasses make you drink slower - study

EXPAND

NZ Herald, 1 September 2012

If you want to cut down on your drinking without sacrificing nights out, the answer could be straight forward. Research shows that beer is drunk much more slowly from a straight-sided glass than from a curved one. In fact, it takes almost twice as long to enjoy a glassful.

The finding means those who want to enjoy a night out without suffering a hangover the next day may do well to avoid the curved beer glasses that are often used in bars. Social drinkers taking part in the Bristol University study were given a glass of beer or one of lemonade and told to drink it while they watched a nature documentary. The beer served in a curved glass was finished in almost half the time, the journal PLoS ONE reports.

In later tests, the men and women, aged 18 to 40, were shown pictures of pairs of glasses and asked whether they were more or less than half full. They tended to get the answer wrong, judging them to be fuller than they actually were. Those shown the curved glasses, which hold much more liquid at the top than at the bottom, did particularly badly.

The researchers said pub-goers might find it more difficult to judge how much they have drunk if their glass is much wider at the top than at the bottom, leading to them downing their lager more quickly. If this is the case, something as simple as marking the half-way point on curved glasses could have substantial public health benefits and help prevent binge-drinking.

The researchers said: "Drinking time is slowed by almost 60 per cent when an alcoholic beverage is presented in a straight glass compared with a curved glass. Clearly, many other factors will influence drinking rate, including social context. However, even a modest reduction in drinking rate, when achieved over a large number of individuals, might lead to a substantial reduction in alcohol-related harm."

Interestingly, the type of glass used did not affect how quickly the lemonade was drunk - perhaps because we have less reason to pace ourselves with a soft drink.

-DAILY MAIL

Maybe not exactly this context!

IDEAS FOR CONTEXTS: MYTHS

Swearing helps you withstand pain better!

Maybe not exactly this context!

IDEAS FOR CONTEXTS: PSYCHOLOGY

For sale – was ~~$800 000~~
now only $300 000

IDEAS FOR CONTEXTS: INTERESTING TOPICS

Why is our uniform so boring?

Link to science: dark colours retain heat

GUIDING THE DEVELOPMENT OF AN INVESTIGATION

<table>
<tr><td colspan="2">Example:
• Investigation into running techniques - what can you do to run faster?</td></tr>
<tr><td>Informed contextual knowledge:
• Students need to research around what can make people run faster – are there things that can be changed?</td><td>Response variable:
• Provided as “how fast someone runs”
• Students need to clearly define this e.g. how many seconds it takes someone to run 100 metres</td></tr>
<tr><td>Treatment variable (something they will change):
• Student has to research this to find meaningful factor
• Students decides to investigate running with shoes or without shoes
• Shoes are defined as sports shoes/sneakers</td><td>• Research into this area would suggest that running without shoes might help you run faster (barefoot running)
• What I know about the world is that in running competitions people wear shoes</td></tr>
</table>

What are some other possibilities for experiments for this context?

SOME IDEAS FROM OTHER TEACHERS

Treatment variable	Reasoning
Competition - running against someone vs running alone	Running against someone will make you run faster to try win
Nose breathing vs mouth breathing	Nose breathing increases O2 intake so should give a better result
Caffeine before you go running such as an energy drink.	Expect runners to more alert and run faster. Stimulant effect.
Difference in surface when running (treadmill vs grass) or concrete vs grass	More traction on concrete so should be faster on concrete compared to grass.
weight	the larger a person the slower they will run.

What's wrong with this one?

Not an intervention

EXPERIMENTAL DESIGN PRINCIPLES

- Focus on comparison of two independent groups for the overall design of the experiment
- Use random allocation to groups
- The treatment (explanatory variable) needs to involve changing something
- The response variable needs to be numerical
- Need an appreciation for other sources of variation in the response variable and account for this where possible

EXPERIMENTAL DESIGN PRINCIPLES

Control what you can, through random allocation balance what you can not ☺

Learn through taking part in experiments – which we will do now!

FUTURE EMPLOYEE?

Sarah can be described as selfish, stubborn, critical, reliable, industrious and intelligent.

Rate this person on a scale of 1 to 10 in terms of suitability for being a teacher

1 = completely unsuitable
10 = completely suitable

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UNPACKING THE DESIGN OF THE EXPERIMENT

Red

FUTURE EMPLOYEE?

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Rate this person on a scale of 1 to 10 in terms of suitability for being a teacher

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Black

FUTURE EMPLOYEE?

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Rate this person on a scale of 1 to 10 in terms of suitability for being a teacher

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Use the guidelines to try to describe aspects of the design used for this experiment.

UNPACKING THE DESIGN OF THE EXPERIMENT

Random allocation to two groups	Defining treatment and response variables
How was this done?	What were they?
Considering other sources of variation	Procedures used to carry out the experiment
What might these be?	How was this done?

UNPACKING THE DESIGN OF THE EXPERIMENT – KEY IDEAS

Random allocation to two groups	Defining treatment and response variables
Total number of cards = number of participants (half red and half black) Cards shuffled so card received was through random process Workshop teachers experimental units Each teacher in only one group – two independent groups	Treatment variable is order of adjectives (6 in total – three "positive" and three "negative") : negative then positive, positive then negative (by reversing order). Response variable is rating of suitability of person as teacher, on a rating system of 1 to 10 (1 being completely unsuitable)
Considering other sources of variation	**Procedures used to carry out the experiment**
Gender bias – Emma is a female teacher – this could affect ratings of her suitability The adjectives used could mean different things for different people Reading speed and comprehension Age of participants – could influence views of what makes a suitable teacher	Groups did not know which treatment they had received (or what the treatment/experiment was) Groups did not see the experiment for the other group Same time given for reading the description and making the rating

EXPLORATORY DATA ANALYSIS

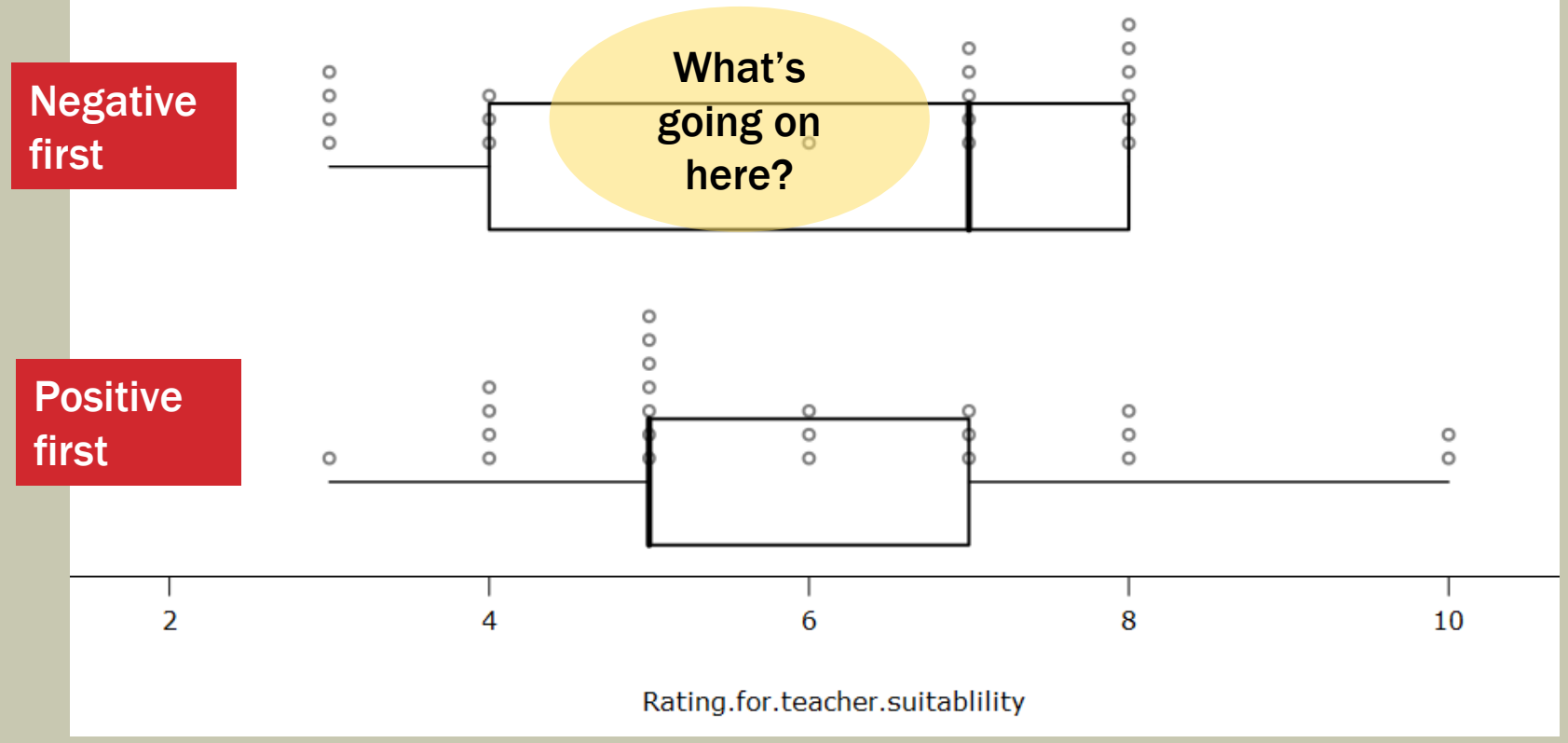
- The data for this investigation has come from an experiment with a certain group of participants or objects
- There needs to be a clear understanding that this is a different type of investigation than those students may have encountered before that have involved random samples from populations or practical investigations involving bivariate data or chance/probability

EXPLORATORY DATA ANALYSIS

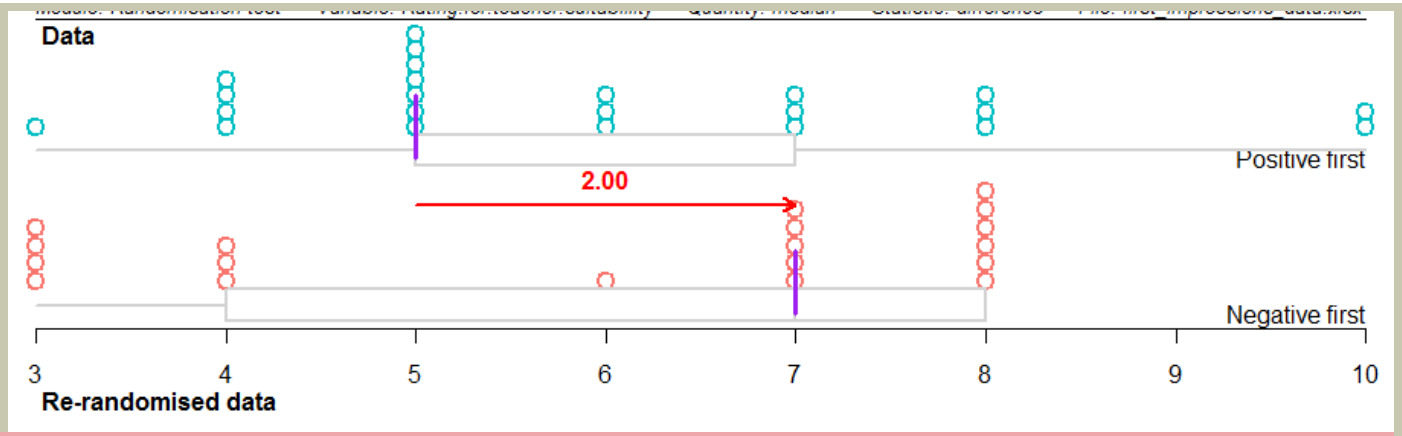
- The focus on exploring the data obtained through the experiment is on what it can tell us (or what it cannot tell us!) about the response variable and what we attempted to change/manipulate with the experiment
- Just like with sample to population inference ideas, students need to build up images of what they would expect to see in terms of variation between and within the two groups – it is not just about the proportion obtained from the randomisation test! (see teaching through experiment example)

DATA FOR OUR EXPERIMENT (FROM OTHER TEACHERS)

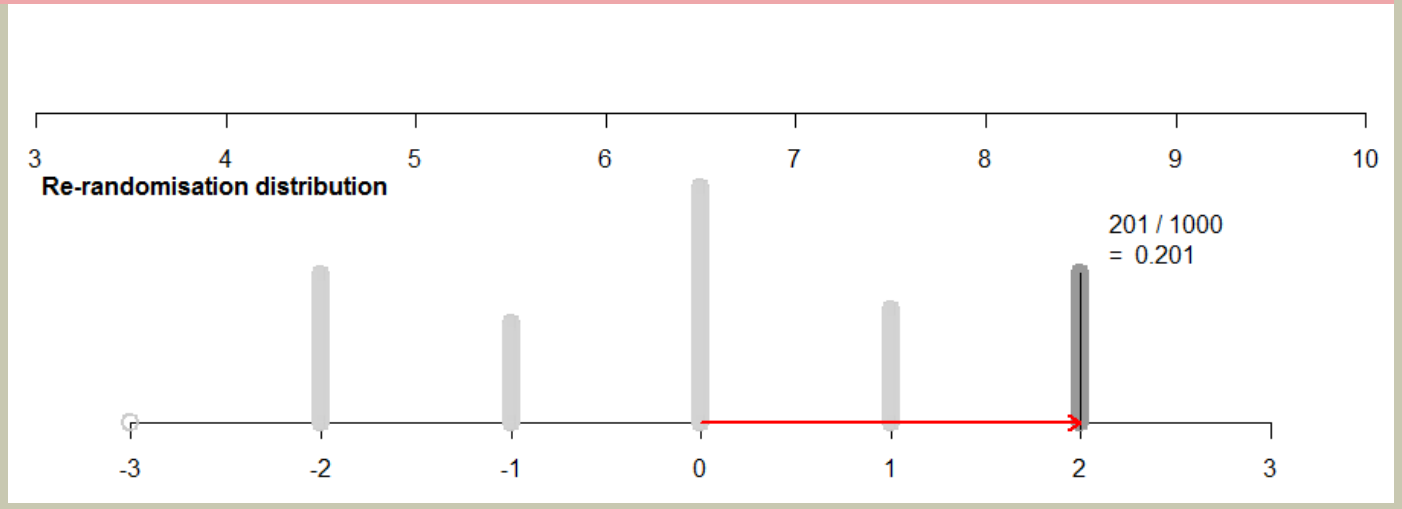
Can you explain certain features of the data?
How does chance play a part in the features of the data?



DATA FOR OUR EXPERIMENT FROM SOME OTHER TEACHERS



Randomisation test output using medians



REPORTING EXPERIMENTS

- There should be a separation at level 8 for statistical investigations between the statistical enquiry cycle and the writing of the report about the investigation
- We want students to be presenting a report about what they did (in the past tense) so they are engaging in the kind of reporting that happens in the real world about investigations

REPORTING EXPERIMENTS

- The use of media reports and press releases can be interesting examples of reporting of studies/experiments
- Simple reports from journal articles (or even the abstract/summary) can model the style of reporting

What do we want students to write in their report? Let's start with the introduction.

What is author of this report doing in each paragraph?

REPORTING EXPERIMENTS

Primacy Effects on Impression Formation
First impressions are considered very important. It is very common to hear people talk about the importance of giving a good first impression because that very first moment in which we meet someone new, we are showing them the kind of person we are most likely to be. Whether we are meeting our possible love interest or our new boss for the first time, the first impression formed by them will probably dictate our likelihood of getting what we need from them. Then, how are personality impressions formed? Do first impressions have a much greater impact on the judger than subsequent impressions?

Explaining the context and the background behind the experiment – linking it to the real world.

REPORTING EXPERIMENTS

How first impressions are formed has been a subject of interest by many researchers in the area of psychology. Past research in this subject suggests that primacy effects exist in impression formation (e.g. Jones & Goethals, 1972; Anderson & Hubert, 1963; Stewart, 1965). Asch's experiments on formations of personality impression suggested .. when adjectives with more positive meaning were given first followed by words with less positive meaning, the participants tended to rate that person more positively; but when the order was reversed, participants tended to judge that person less positively (Asch, 1946).

Referencing research about studies/experiments done in this area and what they found.

REPORTING EXPERIMENTS

The present study sought to investigate the effects of order on impression formation by using the same words from one of Asch's 1946 study. Similar results obtained by Asch and others were expected on the study, that is, the first words presented would have more impact then subsequent adjectives on rating likeableness of that person.

Giving an expectation for what they hoped to find in their experiment.

REPORTING EXPERIMENTS

The full report for a similar experiment to ours (although not quite the same design or analysis methods):

http://psych.fullerton.edu/mbirnbaum/psych466/ykl/report.htm

REPORTING EXPERIMENTS

- Context, reasoning, linking, justifying is present through all parts of the report, not just the conclusion/discussion

Introduction	Method
Background Problem Expectation	Design type Design details Procedural details
Results	**Discussion**
Dot and box plots and summary stats Descriptive statements Randomisation test	Interpretation randomisation test Answer to problem Extended discussion

ASSESSING EXPERIMENTS

Group work

Plan (basic) and carry out experiment

The plan that the group develops does not need to be fully justified and explained – this will come in when the individuals of each group write up their own report

Individual work

Write up report of whole investigation

ASSESSING EXPERIMENTS

- You will need to plan for enough time to assess as well as teach the topic
- You will also need willing participants (and teachers) for your experiment if using people
- You need to think carefully about the teaching and learning programme for this standard
- What approach? All in one go (approach A)? In chunks (approach B)? Another approach?

ASSESSING EXPERIMENTS

- Managing “open book” conditions
- Students complete a formative assessment task(s) which needs to fully written up using their own words (but with help/guidance)
- They could then use this as reference during the investigation
- This could serve as the evidence they are ready to begin the assessment

ASSESSING EXPERIMENTS

- To reduce the amount of “copy and paste” statements into their report make it clear from the beginning the statements are based on context and specific data in front of them not general statements that could be applied to any data or experiment
- “If I can take the statement from this report and use it for another investigation, it is not specific/contextual enough”

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Text-speak may strain your brain!

http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10825637