TRANSFORM STATISTICS
Teaching Resources for Applying Numeracy and Statistics for Objective Research Methods
A 2-year Education Partnership Fund collaboration between the Universities of Birmingham and Nottingham

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AdvanceHE Teaching and Learning Conference 2019
Wednesday 3rd July 2019
Northumbria University
Different Universities, different disciplines - SAME challenges!

Lack of enthusiasm and confidence, lack of resources, learning a subject students (arguably) never signed up for, teaching outside area of expertise...

To create and disseminate a rich collection of online resources to support teaching and learning of statistics across disciplines, from foundation to postgraduate level.

Foster a network of academic staff teaching statistics and stimulate future collaborations in teaching and learning.
Our Approach

Find out what staff and students need

Provide it to them

Disseminate resources and findings

- Student survey on statistics learning experience at UoB and UoN
- Student Focus Groups (x 5 UoB, x 5 UoN)
- Staff Workshops (UoB, UoN)

- Enhance and expand an existing online resource:
  - Statistics: An Intuitive Introduction (SII)
  - Enrich with new video media covering key concepts

- Use and evaluate SII in different modules across multiple disciplines at UoB and UoN
2 workshops in March 2018

**Barriers:** anxiety, perceived relevance, “bad at maths”

**Motivations:** academic need, statistical literacy

**Teaching challenging concepts:** relevant examples, underlying logic, tools and resources

**Learning resources:** apps, videos, data simulations, active learning, repository of good resources
Key Findings from the Student Questionnaire

Is a specific statistics or research skills module offered as part of your course?

Response
- I don't know
- No, but I would not take it or do not feel it is needed
- No, but I would take one if offered
- Yes, and I have already taken it
- Yes, and I plan to take it in the future
- Yes, but I do not intend to take it

Nottingham: 334
Birmingham: 171

Men: 160
Women: 345

PGR: 58
PGT: 42
UG: 405
How do you feel about the effectiveness of the statistics training you've received so far?

PGR students were much less likely to say that they had had sufficient stats training (25%) than PGT (54%) or UG (52%) students.

Students in medicine, vet & psychology were least likely to agree that statistics training was at least fairly effective.

GLM: $P = 0.006$
Which words do you associate with statistics in the context of your University studies?

Useful and relevant…

…but difficult and confusing
Which words do you associate with statistics in the context of your University studies?

Men are more positive than women
Geographers most negative?

GLM:
Subject: $P = 0.001$
Gender: $P < 0.001$
Which words do you associate with statistics in the context of your University studies?

- Postgraduates more positive than undergraduates

GLM: $P = 0.001$
How well do you feel you understand the following concepts?

- Most students know the basics
How well do you feel you understand the following concepts?

- Engineers & Physical Scientists most familiar with advanced concepts

Mean +/- SEM

GLM
Subject: P < 0.001
Subject x Gender: P = 0.026
Which of the following learning resources did you use when you last studied statistics?

- Lectures and handouts most commonly used
- Videos and web-pages more commonly used than textbooks
Which of the following learning resources did you use when you last studied statistics?

- Psychology & Arts/Social Science students most likely to use on-line resources

GLM: P = 0.001
Postgraduates are more likely than undergraduates to think video & online resources are useful.

Free-text mentions:
- YouTube: 37
- Wikipedia/Google: 15
- eBooks: 10
- Khan Academy: 8

GLM: P = 0.003
What, if anything, do you think would improve the training you have received so far?

- Common themes:
  - MORE!
  - Better teaching
  - More real-life examples or relevance to subject
  - More hands-on, small-group teaching
  - More/better resources
  - More exercises, tests, practicals
  - More theory and maths
- Virtual learning environment used in several Schools in Nottingham.
- Can be self-guided or complement other teaching.
- [https://www.nottingham.ac.uk/toolkits/play_10967](https://www.nottingham.ac.uk/toolkits/play_10967)

Exercise 1, Step 3
Silly question again! Once more, it could be anything. Let us suppose that it is -1. Let us also suppose that the third number is 8 and the fourth is 0.

What is the fifth number?
Creating Concise Video Content for Teaching Stats

What is a p-value?

Null vs. Alternative Hypotheses

Chi Square Test: Part I and II

Effect Size vs. Significance

Fixed vs. Random Effects

Z Score

https://www.youtube.com/playlist?list=PLpRE0Zu_k-BxfDzBNePCcfD5xlRuRFMT12
Video Evaluation Focus Group Participants

- Total 70 students.
- Almost all were arts & social science students.
- \(\frac{3}{4}\) were female.
- \(\frac{1}{3}\) were year 2 Undergraduates.
- \(\frac{1}{2}\) scored themselves as stats beginners, \(\frac{1}{2}\) as intermediates.
A Positive Response Across all Videos

- Majority of students found them interesting and enjoyable, & would watch them to the end.

- They like brief to-the-point videos (8 min max).

- Presenters' explanations were clear and sufficient.

- Majority of students found the videos good for beginners: a smaller proportion felt them suitable for those with advanced knowledge.

- Videos were good for revision.
Room for Improvement

- A brief introduction and “signposting” of content.

- More colourful/dynamic graphics throughout, both to hold viewer attention, and illustrate complex concepts better.

- Tell viewer even more clearly: "why I should care“ (relevance).

- Choose a single simple illustrative example or theme.

- Use humour with care....(divides students)

- Incorporate more questions/exercises to the viewer that help them reflect on what they are learning.
# Teaching Statistics to Non-Specialists Conference

**27th June 2019, UoB**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker</th>
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<tbody>
<tr>
<td>9:30</td>
<td>Arrival, registration &amp; refreshments</td>
<td>Transform Project team</td>
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<tr>
<td>10:00-10:50</td>
<td>Welcome and Keynote session I: <strong>Teaching Statistics to Non-Specialists</strong> - What can we learn from the social scientists?</td>
<td>Meena Kotecha (London School of Economics)</td>
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<tr>
<td>10:50-11:10</td>
<td>Transform Statistics Project</td>
<td>Tom Reader, Lindsey Leach</td>
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<td>11:10-11:30</td>
<td>Morning tea/coffee available</td>
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<tr>
<td>11:30-11:50</td>
<td>From statistophobia to statistophilia: teaching politics and international relations students to love numbers</td>
<td>Helen Williams</td>
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<tr>
<td>11:50-12:10</td>
<td>Teaching statistics to elective and non-elective students: strategies for inclusive learning and skills retention</td>
<td>Nigel de Noronha</td>
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<tr>
<td>12:10-12:20</td>
<td>Lightning talks x 2</td>
<td>David Sirl, Martin Ottmann</td>
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<td>12:20-13:10</td>
<td>Networking Lunch</td>
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<td>13:10-14:00</td>
<td>Keynote session II: <strong>The drive for the lightbulb moment</strong></td>
<td>Zahra Abdulla (Kings College London)</td>
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<tr>
<td>14:00-14:20</td>
<td>An active learning approach to statistics</td>
<td>Christopher Brignell</td>
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<td>14:20-14:40</td>
<td>Afternoon tea/coffee available</td>
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<tr>
<td>14:40-15.00</td>
<td>Teaching R to Non-Specialists</td>
<td>Bodo Winter</td>
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<td>15.00-15:20</td>
<td>How to turn your question into an equation - and make sense of the answer</td>
<td>Elizabeth Liddle</td>
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<td>15:20-15:40</td>
<td>Teaching Statistics Intuitively, Transparently and with Immediate Applications</td>
<td>Mircea Scrob</td>
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<td>15:40</td>
<td>Closing remarks (finish by 16:00)</td>
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Acknowledgements

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- Alison Davies, Projects Advisor, HEFi

- Nottingham Learning Technologies Team (Alec Millward, Simon Barnett, Julien Tenney)