Getting Started in Statistics and Data Science Education (SDSE) Research Webinar Series

Welcome!

Chair: Dr Margaret MacDougall
University of Edinburgh

- Vice Chair of RSS Teaching Statistics Section
- RoSE Network Research and Scholarship SIG Lead

Co-Sponsors of SDSE Research Webinar Series

Consortium for the **A**dvancement of **U**ndergraduate **S**tatistics **E**ducation (CAUSE) Research

Researchers **o**f **S**tatistics **E**ducation (RoSE) Network

Royal Statistical Society (RSS) - Teaching Statistics Section (TSS)

What is Scholarship and Research in Statistics and Data Science Education?

4 pm (GMT) on 13 February 2025

Dr Jennifer J Kaplan
Middle Tennessee State University
(Speaker)

Professor Rhys C Jones
Educational Consultant
(Discussant)

Webinar Structure and Guidelines

- Chair: 5 mins
- Speaker: 20 mins
- Discussant: 15 mins
- Q&A (audience participation): 10-15 mins

Please include questions in the Zoom Q&A area and specify whether they are for Jennifer or Rhys or both. We will aim to cover any such questions at the end.

The chat area can be used separately during the talks for discussion and reactions.

SDSE Research Webinar Series

Next webinar:
May/June 2025

RoSE Network E-Conference 2025

KEEP THAT DATE: Thursday 31 July 2025

SUBMISSION DEADLINES TO BE ANNOUNCED SOON

MORE DETAILS

https://www.rose-network.org/events/rose-2025

Dr Jennifer J Kaplan

Email: jennifer.kaplan@mtsu.edu

Short Bio

Jennifer has been researching statistics education at the undergraduate level for two decades, focusing on student learning and professional development for statistics instructors. She has served as the Editor of the Statistics Education Research Journal (SERJ). Formerly a high school mathematics teacher, Jennifer currently directs a PhD Program in Mathematics and Science Education.

Professor Rhys C Jones

Email:
minkywhales@hotmail.com

Short Bio

Rhys is an internationally recognised educational leader with significant experience in curriculum development and theory, statistics education, and engaging students in small and large classroom settings. He has been involved with scholarship and research activities in education for over 17 years. Rhys has a passion for making statistics accessible for students and teachers, especially for non-specialists.

What is Scholarship and Research in Statistics and Data Science Education?

Scholarly Teaching

Good content and methods and classroom assessment and evidence gathering, informed by best practice and best knowledge, inviting of collaboration and review.

Scholarship of Teaching and Learning (SOTL)

Is public and open to critique and evaluation; is in a form that others can build on; involves question-asking, inquiry, and investigation, particularly about student learning.

Discipline-Based Education **Research** (DBER)

Like SOTL is public, open to critique, and involves asking questions about student learning

Components Unique to DBER

(1) Begins with a research question focusing on the "why" or "how" of learning

(2) Ties the question to learning, pedagogical, or social theory and interprets the results of the research in light of theory allowing the research to build theory and increase the significance of the findings.

(3) Pays careful attention to design of the study and the methods used to enable the study to hold up to scrutiny by a broad audience, again creating a potential for greater impact of results.

Borrego & Streveler (2015), https://doi.org/10.1017/CBO9781139013451.029: Adapted from (Streveler et al., 2007), who credit Hutchings & Shulman (1999) for definitions of Scholarly Teaching and Scholarship of Teaching and Learning.

What is Scholarship and Research in Statistics and Data Science Education?

Scholarly Teaching

Good content and methods and classroom assessment and evidence gathering, informed by best practice and best knowledge, inviting of collaboration and review.

Scholarship of Teaching and Learning (SOTL)

Is public and open to critique and evaluation; is in a form that others can build on; involves question-asking, inquiry, and investigation, particularly about student learning.

- Questions originate in classroom practice
- Results necessarily inform classroom practices
- Results may or may not inform other researchers

Published in (examples)

- Teaching Statistics
- Journal of Statistics and Data Science Education

Discipline-Based Education **Research** (DBER)

Like SOTL is public, open to critique, and involves asking questions about student learning

Components Unique to DBER

(1) Research Questions

(2) Theoretical Framing

(3) Methodology

- Questions may or may not originate in classroom practice
- Results may or may not inform classroom practice
- Results contribute to the existing body of education research, filling a gap in knowledge and/or providing future directions for research

Published in (examples)

- Statistics Education Research Journal
- Journal of Statistics and Data Science Education

What is Scholarship and Research in Statistics and Data Science Education?

Connecting Research to Practice
in a Culture of Assessment
for Introductory College-level Statistics

Research Priorities from Connecting Research to Practice in a Culture of Assessment for Introductory College-level Statistics

1. Cognitive Outcomes
2. Affective Constructs
3. Curriculum
4. Teaching Practice
5. Teacher Development
6. Technology
7. Assessment

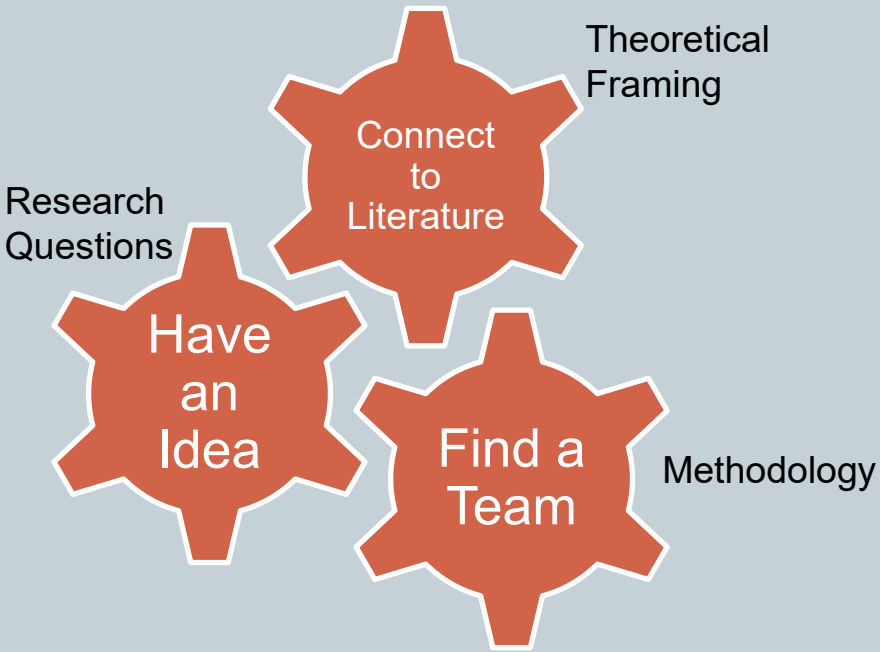
https://www.amstat.org/docs/default-source/amstat/documents/researchreport_dec_2012.pdf

SERJ aims to advance research-based knowledge that can help to improve the teaching, learning, and understanding of statistics or probability at all educational levels and in both formal (classroom-based) and informal (out-of-classroom) contexts. Such research may examine, for example, cognitive, motivational, attitudinal, curricular, teaching-related, technology-related, organizational, or societal factors and processes that are related to the development and understanding of stochastic knowledge. In addition, research may focus on how people use or apply statistical and probabilistic information and ideas, broadly viewed.

https://iase-pub.org/ojs/SERJ/about

How SDS Education Research Happens

1. Research Questions
2. Theoretical Framing
3. Methodology



How SDS Education Research Happens

Theoretical Framing

Connect to Literature

Research Questions

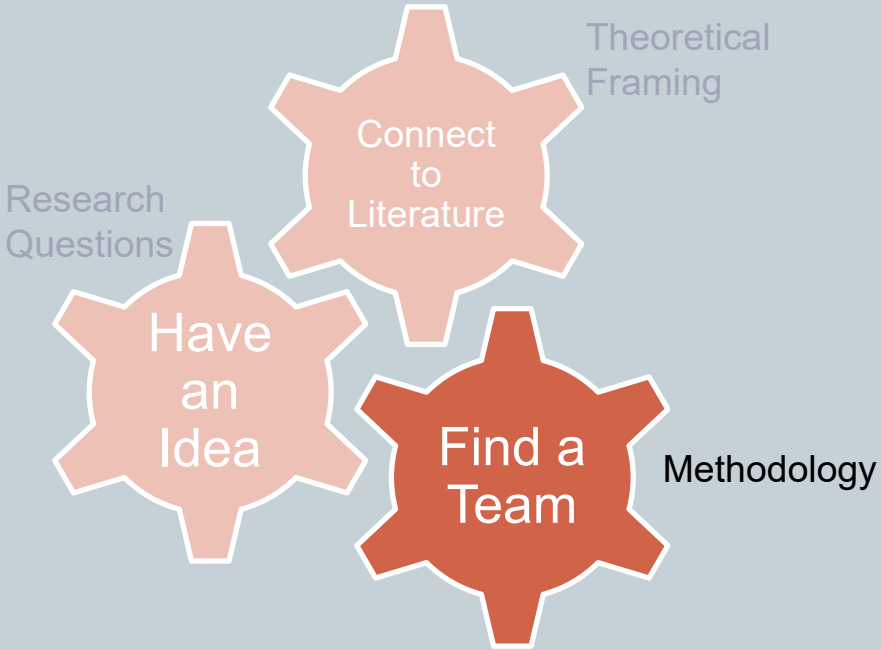
Have an Idea

Find a Team

Methodology

Ask Good Questions

How SDS Education Research Happens



Home / Archives / Vol. 8 No. 2 (2009) / Regular Articles

QUESTION FORMAT AND REPRESENTATIONS: DO HEURISTICS AND BIASES APPLY TO STATISTICS STUDENTS?

JENNIFER J. KAPLAN
Michigan State University

JUAN DU
Kansas State University

DOI: https://doi.org/10.52041/serj.v8i2.395

Keywords: Statistics education research, Probability, Representations, Question format

Download PDF

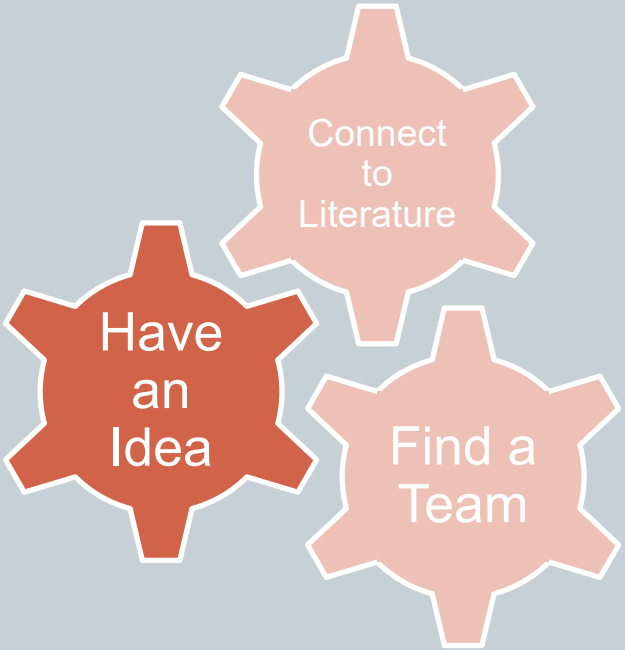
Published
2009-11-29

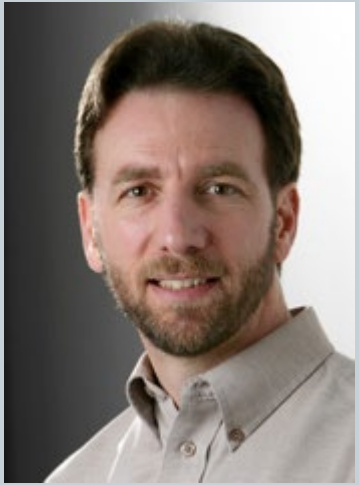
Issue
Vol. 8 No. 2 (2009)

Section
Regular Articles

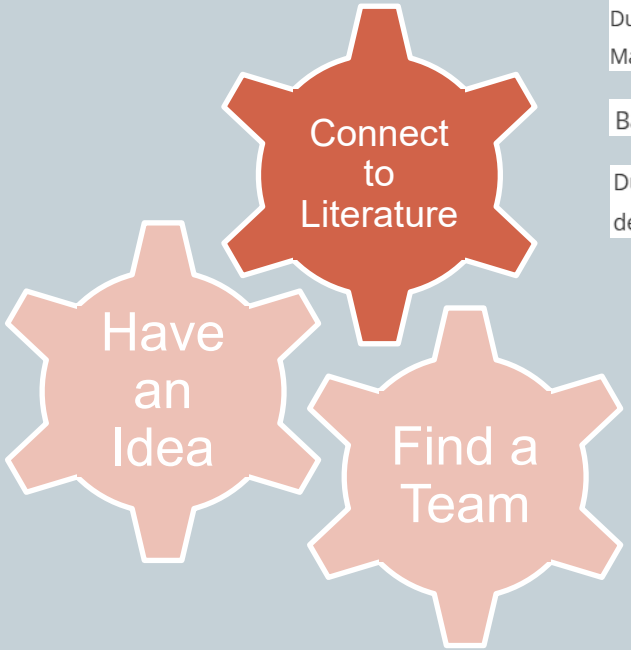
Lexical Ambiguity Origin Story

Lexical Ambiguity Origin Story





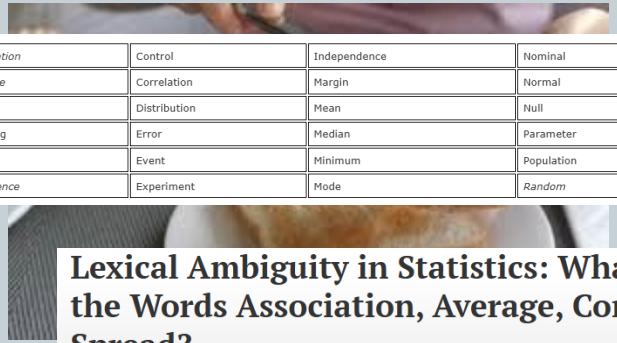
Lexical Ambiguity Origin Story



Durkin, K. & Shire, B. (1991a). Lexical ambiguity in mathematical contexts. In K. Durkin & B. Shire (Eds.) Language in Mathematical Education: Research and Practice. Philadelphia, PA: Open University Press, 71–84.

Barwell, R. (2005). Ambiguity in the mathematics classroom. Language and Education 19 (2), 118–126.

Durkin, K. & Shire, B. (1991b) Primary school children's interpretations of lexical ambiguity in mathematical descriptions. Journal in Research in Reading, 14 (1), 46–55.



Association	Control	Independence	Nominal	Range	Skew
Average	Correlation	Margin	Normal	Response	*Spread*
Bias	Distribution	Mean	Null	Sample	Standard
Blocking	Error	Median	Parameter	Scatter	Statistic
Center	Event	Minimum	Population	Significance	Statistics
Confidence	Experiment	Mode	*Random*	Simple	Variance

Lexical Ambiguity in Statistics: What do Students Know about the Words Association, Average, Confidence, Random and Spread?

Jennifer J. Kaplan, Diane G. Fisher & Neal T. Rogness

| Published online: 29 Aug 2017

Cite this article https://doi.org/10.1080/10691898.2009.11889535

Suggestions for Enactment

- Finding a Research Team
  - Attend Webinars
  - Join Listservs
  - Attend Conferences
    - US Conference on Teaching Statistics (July 2025)
    - International Conference on Teaching Statistics (ICOTS; July 2026)
    - IASE Satellite Conference (October 2025)
    - IASE Roundtables (Summer 2028?)
  - Reach out to authors of papers of interest or speakers

- Finding the Literature
  - International Handbook of Research in Statistics Education (2018)
  - The Teaching and Learning of Statistics: International Perspective (2016)
  - Journals: JSDSE, SERJ, TISE, TS International Journal of STEM Education, Mathematics Education Journals (ZDM)
  - Google Scholar

For Education Research: Remember to look at citation lists and citing papers

Professor Rhys C Jones
minkywhales@hotmail.com

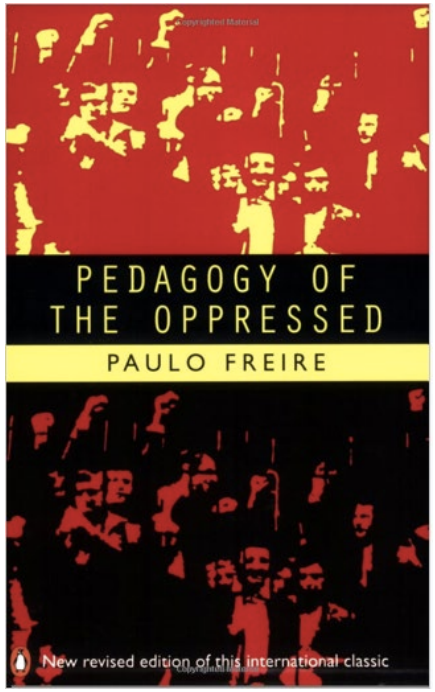
MY JOURNEY

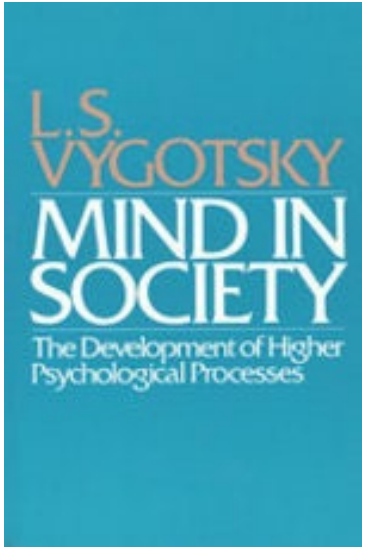
- Academic pathway: Biology, Biomedical Science and Medical Biochemistry (Cancer Biology), Immunology (Allergy and Asthma), Post Grad Cert Ed Further Ed, EdD (co evolution of contextualized transdisciplinary courses)
- Uni of Auckland Stats 10x, Science Scholars – Chair of Board: Potential Plus UK
- Student partners and curriculum design, creation and delivery
- Editorial board and academic editor of Teaching Statistics, reviewer for over 8 years
- Associate Dean Education responsible for supporting scholarship activities for over

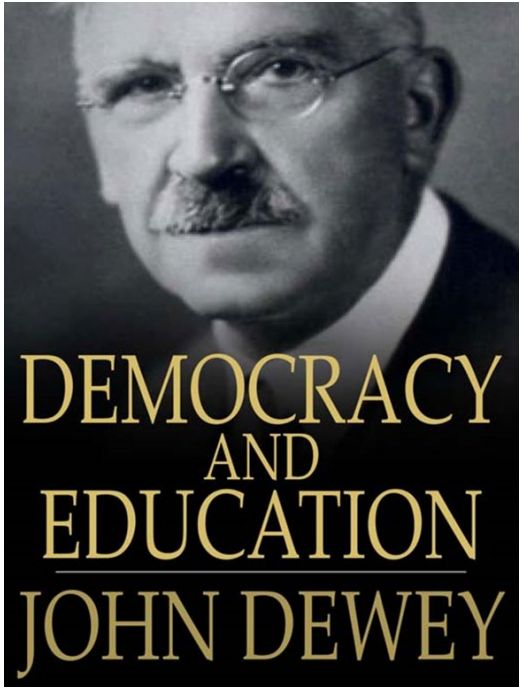
  1000 staff members (University of Surrey)
- Visiting professor of Statistical Education at Manchester Metropolitan University, Department of Social Sciences (Q-Step)
- Professor of Statistical Literacy, written several books on essential maths skills and also statistical literacy, with Sage

- “A democratic society is precisely one in which the purpose of education is not given but is a constant topic for discussion and deliberation”

Gert Biesta


PEDAGOGY OF
THE OPPRESSED
PAULO FREIRE
New revised edition of this international classic


L.S.
VYGOTSKY
MIND IN
SOCIETY
The Development of Higher
Psychological Processes


DEMOCRACY
AND
EDUCATION
JOHN DEWEY

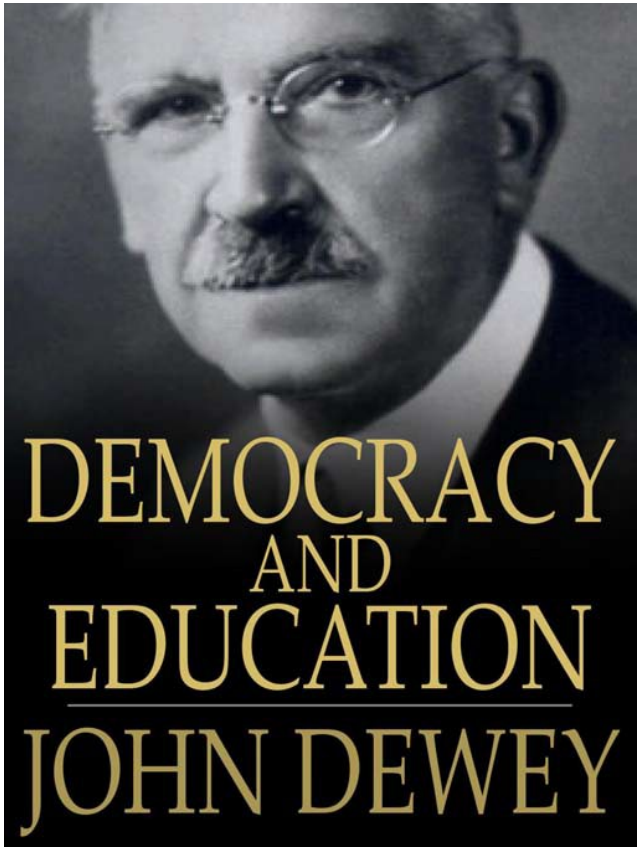
Progressivism in Education – Democracy and Education (1916)

• Learner-centered, education as a process of personal growth and self-realization

• Active learners, learning by doing, deep understanding

• Holistic learning, curriculum connected to local social and physical environment

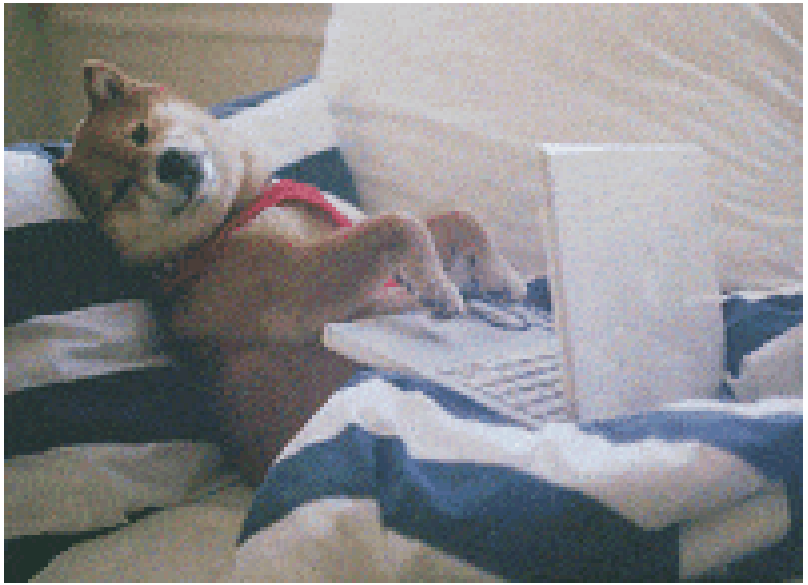
• Social, collaborative learning (Vygotsky – Social constructivism) – teaching philosophy



What is statistics education research?

- Academic research, including statistics education research, involves generating new knowledge through systematic inquiry. This involves identifying a problem or gap, grounding the study in the literature to provide a theoretical framework and motivate research questions prior to data collection, methodologically planning and carrying out the study, and reporting on the results in a way that others can understand

Cross (1999)



What is scholarly teaching?

- Teaching grounded in critical reflection using systematically and strategically gathered evidence, related and explained by well-reasoned theory and philosophical understanding, with the goal of maximizing learning through effective teaching (p. 3).

Potter and Kustra (2011)

What is SoTL?

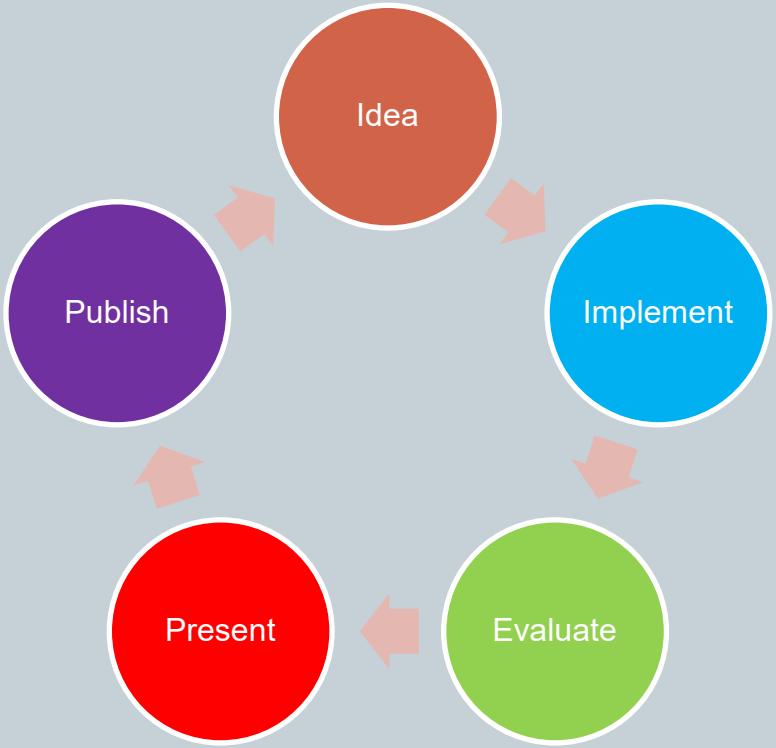
- The systematic study of teaching and learning, using established or validated criteria of scholarship, to understand how teaching (praxis: beliefs, behaviours, attitudes, and values) can maximize learning and develop a more accurate understanding of learning, resulting in products that are publicly shared for critique and use by an appropriate community (p.2)

Potter and Kustra (2011)

Why engage with SoTL in statistics ed?

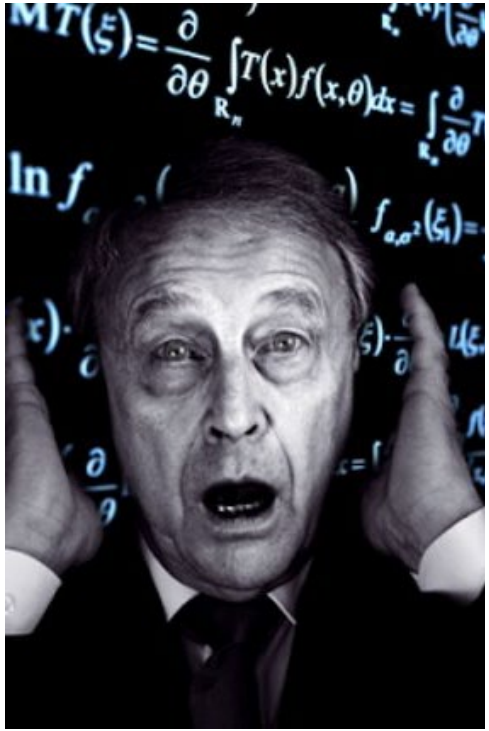
- Can help to rejuvenate and create a dynamic and exciting teaching and learning environment, where students learn
- Provides an intellectual challenge! Enhancing your own skills development
- Helps you to develop the practice of others and can contribute to the development of knowledge across the entire sector
- Will have an impact on your career progression (promotion and job applications, UK: National Teaching Fellow & Advance Higher Education fellowship applications)
- Will enhance your departments reputation, and potentially your university
- Can be a useful stepping stone into more formal research (career pathway)

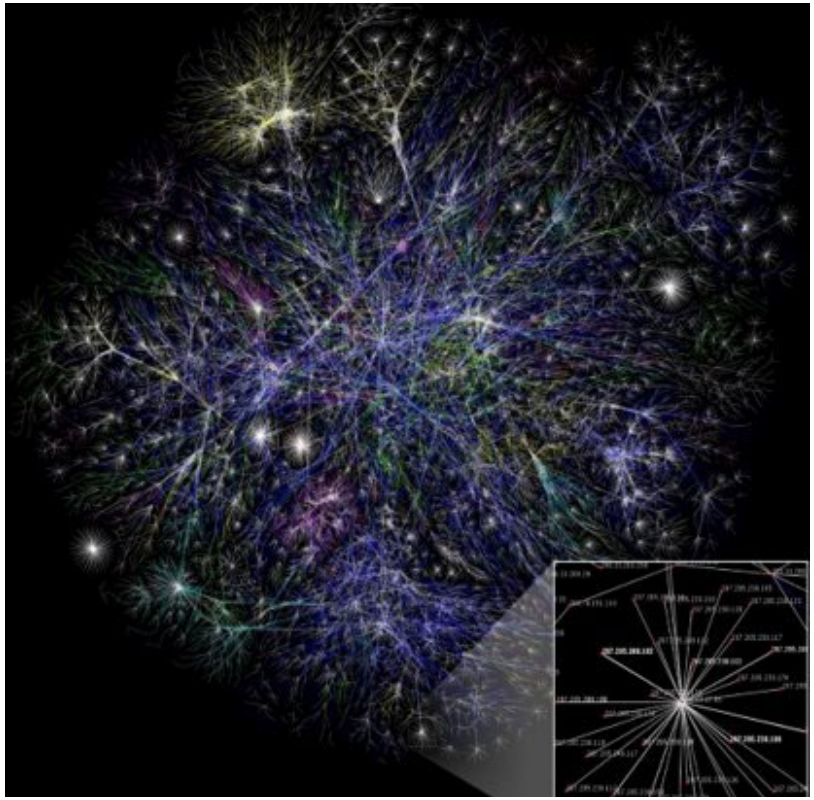
Engaging with SoTL in statistics education



https://www.surrey.ac.uk/sites/default/files/2022-05/developing-disseminating-and-publishing-TL-projects-FHMS.pdf.


EXIT





ENGAGED AND MOTIVATED LEARNERS

- Embedded tasks and activities, not always related to course content
- FUN STUFF!
- Has an indirect effect of engaging students with the course content
- Promotes a safe and inclusive learning environment
- Shows I value their contributions and use them!

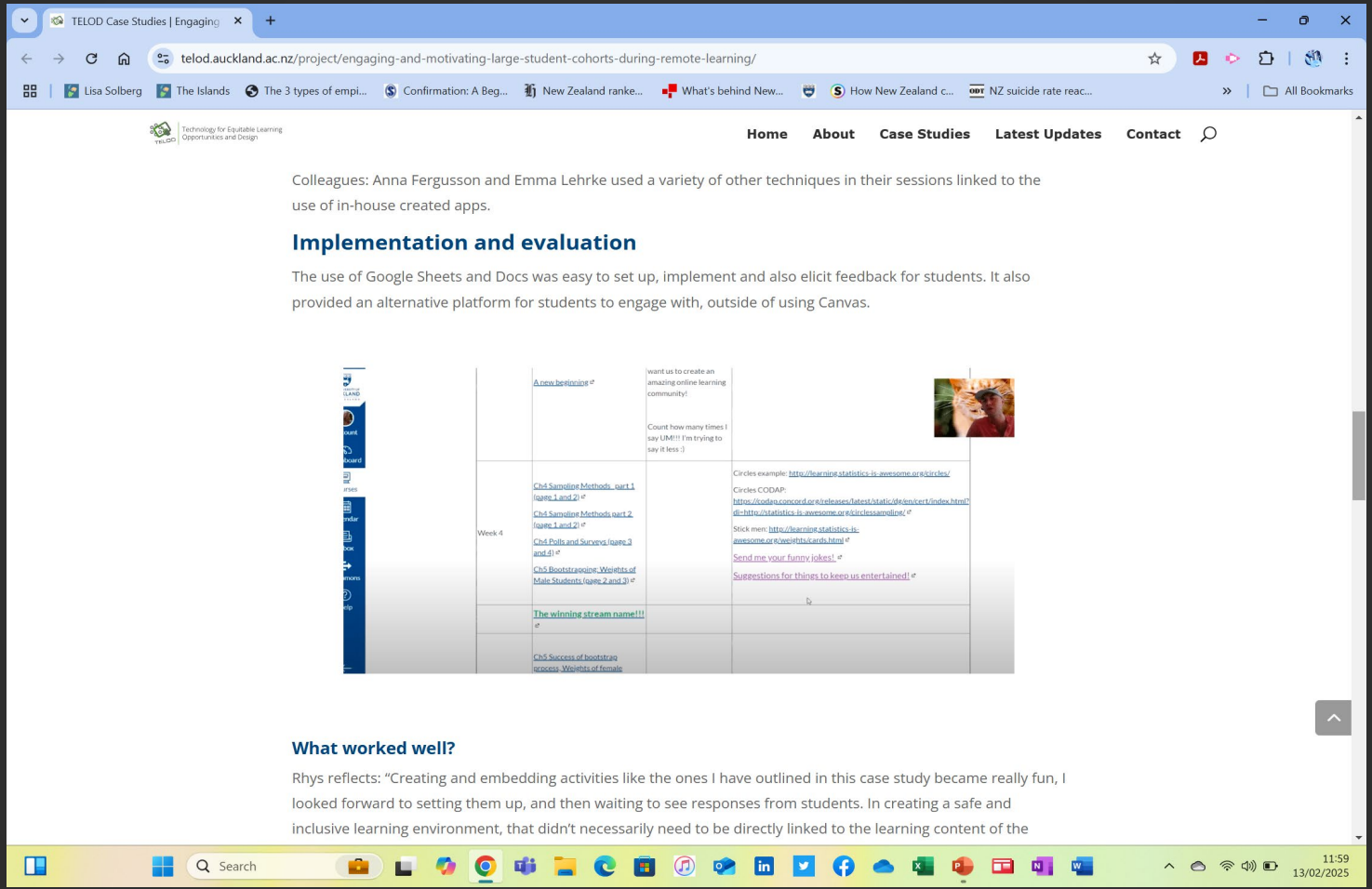
EXAMPLES (ONLINE)

- Stream name – students rearranged sheet themselves!
- Where are you from?
- Auckland Uni VLE: Canvas page
- Taking a sample – some prefer doing it with paper
- Pics of whanau
- iNZight – DEMO (Where are you from data) – assumptions and bootstrapping options

Hi Rhys,

I'm in STATS 108 and I was dreading it, to be honest. It's now my favourite course this semester and I just wanted to thank you for that :)

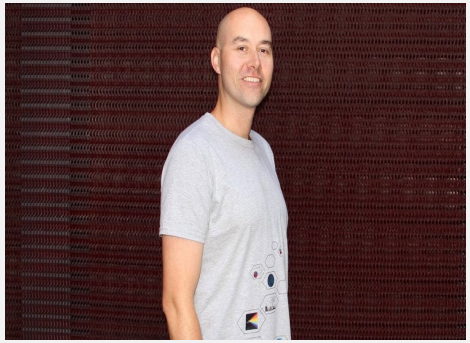
Thanks! I know my friends agree with me - I look forward to coming to stats again in two weeks :)



https://telod.auckland.ac.nz/project/engaging-and-motivating-large-student-cohorts-during-remote-learning/.

Emma Lehrke

Anna Fergusson



Rhys C Jones

THE **SEED**(LINGS)

THE UNIVERSITY OF AUCKLAND
NEW ZEALAND

GO BIG OR GO HOME

- bit.ly/statsinteract
- Webpage outlining activities we have used, with links to **journal articles** for more details
- https://sdse.online/

REFLECTIONS

Remote learning activities (and delivery, and the scholarly work) take **TIME!**

Students LOVE and appreciate these activities

Student's take greater ownership of their own learning

Greater satisfaction (for everyone!), and skills development

Dissemination of activities and publication, used for promotion and on CV for job applications

Top tips to get started

- Think about what really interests you in your teaching practice or more broadly in statistics education
- Read! Read! Read! Check out published research in some of the main statistics education journals: Statistics Education Research Journal (SERJ), Journal of Statistics and Data Science Education Research (JSDSE), Technology Innovations in Statistics Education, Teaching Statistics
- Also check out conference proceedings: International Association for Statistical Education (IASE): International Conference On Teaching Statistics (ICOTS) and satellite conferences: https://iase-web.org/.
- Attend conferences/webinars and network: Royal Statistical Society, IASE, American Statistical Association, National Centre for Research Methods
- Think about upskilling or doing a training course, if you need to develop skills in survey design, ethics application, research methods in education etc – UK Data Service, Consortium for the Advancement of Undergraduate Statistics Education - CAUSE (see above organisations)
- Scholarship activities can lead to more formal research, if you want to go down that path (career pathway)

Burwalls Peer Pedagogic Interaction scheme in statistics

- Burwalls is a network for Teachers of Statistics in the Health and Life Sciences (40 year anniversary): https://sites.google.com/view/burwalls/home
- Pair of colleagues review some element of their teaching and learning activities in a reflective and supportive process
- Could lead to the identification of excellent teaching and learning resources
- Developed into a paper to be submitted to the Statistics and Data Science Educator: https://sdse.online/. Or *Teaching Statistics* Journal
- Excellent statistical teaching resources could also be shared on the Burwalls website, Please email Dan Green: d.green3@aston.ac.uk, for consideration from Burwalls
- Email me for support/advice/questions: minkywhales@hotmail.com

References from Prof Jones

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- UoS FHMS (2024). A brief guide to developing and disseminating your learning and teaching ideas. Accessed on 28/05/2024. Available from: https://www.surrey.ac.uk/sites/default/files/2022-05/developing-disseminating-and-publishing-TL-projects-FHMS.pdf.


THANKS


QUESTIONS
ANSWERS

Additional references forthcoming from Q&A session

- **Publishing in SERJ: Processes and Suggestions, Jennifer J Kaplan and Sue Peters**
  https://iase-web.org/Webinars.php?p=230426_1800.

- Jennifer mentioned work by Victoria Woodard on the topic of cognitive overload. Here are a few relevant references:

How Students Use Statistical Computing in Problem Solving
https://www.tandfonline.com/doi/full/10.1080/10691898.2020.1847007

Defining the Relationship Between Statistical Thinking and Statistical Computing
https://iase-web.org/icots/10/proceedings/pdfs/ICOTS10_3F2.pdf