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Tackling the generic deficit in QM

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SHAPING SOCIETY



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Background: the generic QM deficit'

- Maths skills poor (90% no maths 16+) and inability to apply maths in unfamiliar contexts
- Marginal place of QM in first degrees: 20 credits out of 360
- Few students consider using QM in their doctoral research and M level training focused on basic skills
- V. low proportion of HEI staff with QM skills or teaching ability beyond psychology and economics
- *Decline* in research output using quantitative methods (?) despite technological change and 'data deluge'
- Marginalisation of quants and quants 'specialists'
 - People with Quants skills not necessarily interested in teaching



UK sociology journal articles 1960-2010

	1960-62	1984-86	2000-01*	2008-10
Non-empirical	34	44	37.7	30
Qualitative	8	19	40.6	43
Quantitative	32	23	14.3	16
Mixed empirics	26	15	7.4	11
Total	100	101 ⁱ	100	100

ⁱ Total percentages deviating from 100 are due to rounding of results



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Strategies for change

- ▶ Longstanding, self-reproducing problem (back to 1980s)
- ▶ University autonomy means few levers for change
- ▶ Focus resources on advanced students? Or raise general level?
- ▶ All universities or embrace 'stratification'
- ▶ Focus on employability and transferrable skills or go for academic standards?
- ▶ Focus on PG or post docs, or UG? Or schools?
- ▶ Work with stats and maths depts? Or focus on 'embedding' in a disciplinary context?



Change in HE

- 
- ▶ Research suggests two key issues for student engagement
 - **Confidence:** elementary maths skills go a long way...
 - **Relevance:** not about specific wrote learnt techniques in a methods module
 - ▶ Key problem is ‘marginalisation’ of QM in methods courses
 - ▶ Address this in ways
 - Abandon ‘mean median mode’ approach to social statistics
 - *Embedding:* bring methods into *substantive* modules
 - Shift in balance of attention from *argument* to *evidence*
 - Shift from *theorists* to *theory*
 - *Use visualisation* and web resources more
 - Encourage students to *use* data themselves with a focus on process rather than technical proficiency
 - Shift to secondary data analysis from primary data collection


Statistical Literacy v Technical proficiency

Engage students with arguments about data/evidence quality


- Kahneman's WYSIATI: knowledge unavailable to personal experience and reflection
 - non observations, selection effects, lurking variables, the wrong variables
- Measurement 'error': social construction not collection
 - » If it has been counted it has been defined, and that will almost always have meant squeezing reality into boxes that don't fit. ... The idealised perception ... is that someone measures something, the figure is accurate and goes straight in the database. That is about as far from the truth as it is possible to get.
- Randomness: its vicissitudes and advantages
- Non-linearity (Taleb's Turkey)
 - Not all the world is Gaussian, unlike atoms people learn and anticipate
- Interpretation/presentation errors
 - Denominator / numerator neglect e.g. relative risk change without base rate




Statistical Literacy v Technical proficiency

- 
- Variation, distribution and substantive inequality
 - Thinking about the world in terms of variables
 - Graphical representation of quantity (and process)
 - ‘Love pie hate pie charts’; Gapminder
 - Independence and association
 - The difference between an experiment and *observation*
 - *Random* sampling and inference
 - Probability & conditional probability
 - Ability to apply simple idea across unfamiliar contexts (e.g. contingency table and false positives)
 - Significance and substance
 - Regression to the mean
 - Good table manners
 - sources, definitions, Ns, spurious accuracy


Problems / dilemmas

- 
- ▶ ~~SAT scores, tossing coins, and urns with balls~~
 - ▶ Real data needed to sustain interest, but real world is rarely simple:
 - Teaching datasets
 - Teacher collaboration on producing teaching and assessment resources
 - Engaging or entertaining examples
 - cognitive testing on sexual orientation
 - Suicide and country music
 - ‘sampling’ counterfeit coins


Problems / dilemmas

- 
- ▶ Variation in student ability
 - Blended learning and peer learning
 - Lectures v web based exercises
 - Mazur approach (Physics)


Problems / dilemmas

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- ▶ Technical correctness, rigorous standards and awareness of modest skill level?
 - ▶ Practice and encouragement, engaging with and exploring data?

Risks and Opportunities

- 
- ▶ Scale of the problem: transforming an entrenched indifference to QM in social sciences
 - Institutional inertia, fragile teaching base, student skepticism, the rule of the essay in assessment
 - Effort will fall disproportionately on small number of staff with QM skills
 - Delicate relations between professional statisticians and application of basic statistics concepts
 - Effort may dissipate when funding stops
 - National Student Survey pressure to maximise student ‘experience’
 - Research Evaluation Framework pressure to prioritise research

Risks and Opportunities

- 
- ▶ Active hostility to QM has dissipated
 - ▶ QM teaching community is highly motivated and better connected
 - ▶ Web makes teaching with data much easier
 - ▶ Weak graduate labour market moves employability up the agenda

Resources

- ▶ quantitative_methods_teaching-join@ncrm.ac.uk

A discussion/ mailing list for QM teachers

- ▶ <http://www.qm.ac.uk>

A web portal with QM teaching resources, news of training events for QM teachers under the ESRCs curriculum innovation call and a wiki space for collaborative development of material. It will go live by this September, meanwhile there is material on the ESRC's website at

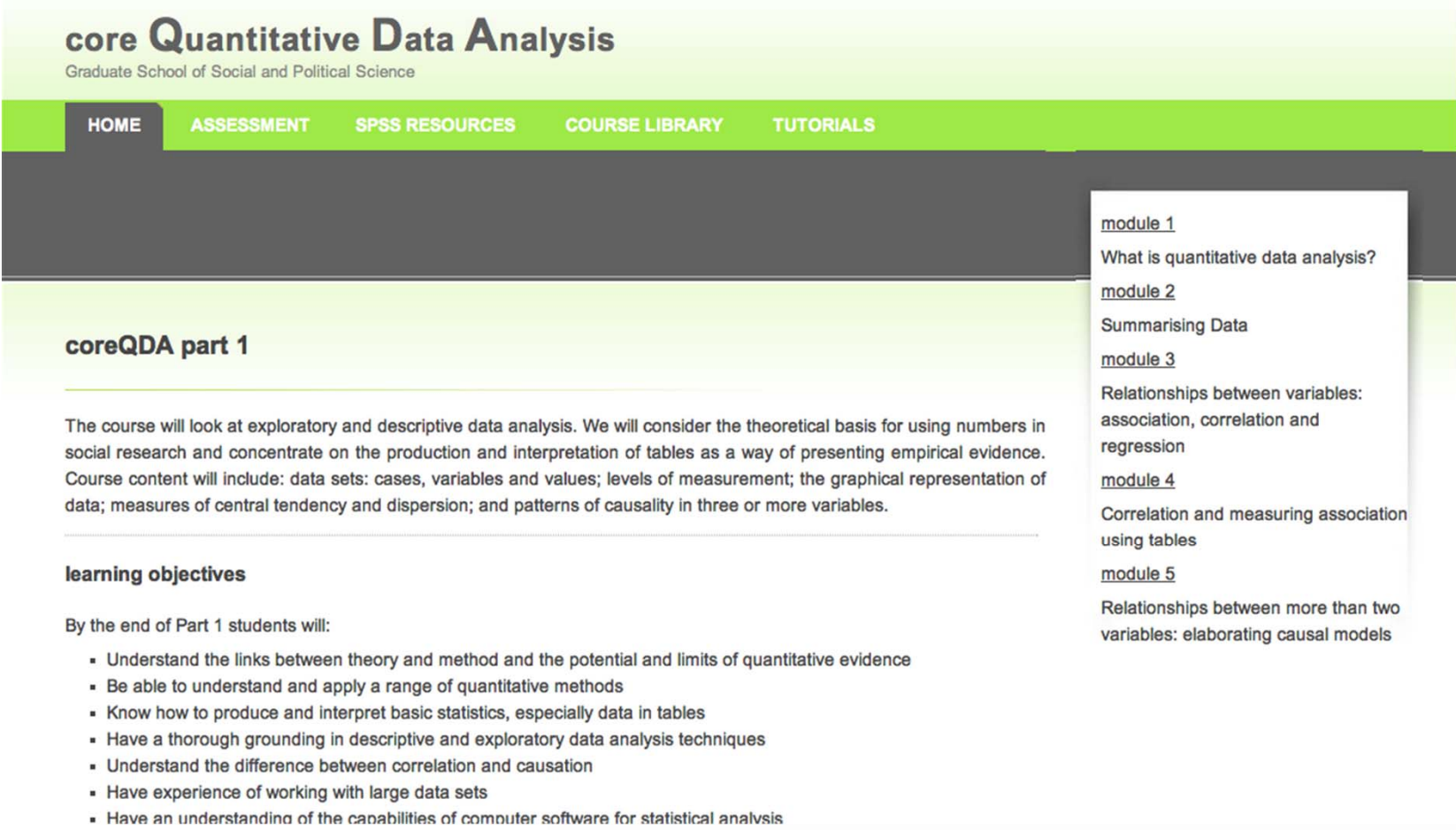
- ▶ <http://www.esrc.ac.uk/funding-and-guidance/tools-and-resources/research-resources/initiatives/qmi.aspx>

- ▶ <http://www.qmteaching.wordpress.com>

A rather intermittent blog that I run

Resources

At Edinburgh we run an online course for approx 150 Masters students each year. We back it up with lectures and practicals. It is currently being re-built as an undergraduate course and sits behind a login. To get guest access, email me at john.macinnnes@ed.ac.uk.



The screenshot shows the website for 'core Quantitative Data Analysis' at the Graduate School of Social and Political Science. The page has a green header with navigation links: HOME, ASSESSMENT, SPSS RESOURCES, COURSE LIBRARY, and TUTORIALS. The main content area is titled 'coreQDA part 1' and contains a description of the course, learning objectives, and a list of modules. A sidebar on the right lists the modules with brief descriptions.

core Quantitative Data Analysis

Graduate School of Social and Political Science

HOME ASSESSMENT SPSS RESOURCES COURSE LIBRARY TUTORIALS

coreQDA part 1

The course will look at exploratory and descriptive data analysis. We will consider the theoretical basis for using numbers in social research and concentrate on the production and interpretation of tables as a way of presenting empirical evidence. Course content will include: data sets: cases, variables and values; levels of measurement; the graphical representation of data; measures of central tendency and dispersion; and patterns of causality in three or more variables.

learning objectives

By the end of Part 1 students will:

- Understand the links between theory and method and the potential and limits of quantitative evidence
- Be able to understand and apply a range of quantitative methods
- Know how to produce and interpret basic statistics, especially data in tables
- Have a thorough grounding in descriptive and exploratory data analysis techniques
- Understand the difference between correlation and causation
- Have experience of working with large data sets
- Have an understanding of the capabilities of computer software for statistical analysis

module 1
What is quantitative data analysis?

module 2
Summarising Data

module 3
Relationships between variables:
association, correlation and
regression

module 4
Correlation and measuring association
using tables

module 5
Relationships between more than two
variables: elaborating causal models