Philosophic Assumptions in Quantitative Research

Prof. Gavin T L Brown

EDUCATION AND
SOCIAL WORK

Assumption: Realism

- The world exists objectively whether I perceive it or not
  - My perception of the objective world is subject to many factors
- The world is universal in that it exists in a similar way across all individuals, groups, cultures, etc.
  - But not everyone perceives and conceives of the world in the same way; but it's still the same world
- The world is predictable because it exists in a stable fashion
  - Hence, science, technology, engineering, medicine exist because we have detected and exploited regularities

readings

- Almeder, R. (1989). Scientific Realism and Explanation. *American Philosophical Quarterly, 26*(3), 173-185. http://www.jstor.org/stable/20014285
- Chakravartty, A. (2016). Scientific Realism. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy (Winter 2016 ed.). Stanford University, Metaphysics Research Lab.* https://plato.stanford.edu/archives/win2016/entries/scientific-realism/
- Encyclopedia.com. (no date). Scientific Realism. In *Encyclopedia of Philosophy.* Cengage. https://www.encyclopedia.com/humanities/encyclopedias-almanacs-transcripts-and-maps/scientific-realism
- Manicas, P. T. (2006). *A realist philosophy of social science: Explanation and understanding*. Cambridge University Press.
- Saatsi, J. (2013). Scientific Realism. In *Oxford Bibliographies.* https://doi.org/10.1093/obo/9780195396577-0007

Hypothetic-deductive method

- Observations of world generate theories about nature, causation, relationships
  - Hypotheses state if X, then Y
- Deduction is process of determining empirically whether our H have support or evidence
- Post-Positivist approach says H is a good theory if supported, but contradiction of H creates certain KNOWLEDGE
  - Karl Popper falsificationism or fallibilism
- Hence, scientific knowledge keeps changing because we test and eliminate weak theories

readings

- hypothetico-deductive method. In *Oxford Reference.* https://doi.org/10.1093/oi/authority.20110803095954755
- Lawson, A. E. (2015). Hypothetico-deductive Method. In R. Gunstone (Ed.), *Encyclopedia of Science Education* (pp. 471-472). Springer Netherlands. https://doi.org/10.1007/978-94-007-2150-0_260
- Nola, R. (2007). The hypothetico-deductive method. In *Theories of Scientific Method: An Introduction* (pp. 170-184). Acumen Publishing. https://doi.org/DOI: 10.1017/UPO9781844653881.008
- The Editors of Encyclopaedia Britannica. (No Date). hypothetico-deductive method. In *Encyclopedia Britannica.* https://www.britannica.com/science/hypothetico-deductive-method

Experimentation

- Instead of relying only on observations, we can attempt to control events, processes, objects, people in accordance with H
  - True experiment
  - Quasi-experiment
- If we think we understand it, try to control it.
- If it doesn't work according to H, maybe we missed something or it isn't True.

THE UNIVERSITY OF AUCKLAND
Te Whare Wānanga o Tāmaki Makaurau
NEW ZEALAND

EDUCATION AND SOCIAL WORK

readings

- Campbell, D. T., & Stanley, J. C. (1963). *Experimental and quasi-experimental designs for research.* Rand McNally.
- Cook, T. D., & Campbell, D. T. (1979). *Quasi-experimentation: Design & Analysis Issues for Field Settings.* Houghton Mifflin.
- Cook, T. D., & Campbell, D. T. (1979). Causal inference and the language of experimentation. In T. D. Cook & D. T. Campbell (Eds.), *Quasi-experimentation: Design & analysis issues for field settings* (pp. 1-36). Houghton Mifflin.
- Hancock, G. R. (2004). Experimental, quasi-experimental, and nonexperimental design and analysis with latent variables. In D. Kaplan (Ed.), *The SAGE Handbook of Quantitative Methodology for the Social Sciences* (pp. 317-334). SAGE Publications.
- Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference.* Houghton Mifflin.
- Shadish, W. R., & Luellen, J. K. (2006). Quasi-experimental design. In J. L. Green, G. Camilli, & P. B. Elmore (Eds.), *Handbook of complementary methods in education research* (pp. 539-550). LEA.
- Reichardt, C. S. (1979). The statistical analysis of data from nonequivalent group designs. In T. D. Cook & D. T. Campbell (Eds.), *Quasi-Experimentation: Design & Analysis Issues for Field Settings (pp. 147-205). Houghton Mifflin.*
- Wegener, D. T., & Fabrigar, L. R. (2000). Analysis and design for nonexperimental data: Addressing causal and noncausal hypotheses. In H. T. Reis & C. M. Judd (Eds.), *Handbook of Research Methods in Social and Personality Psychology* (pp. 412-450). Cambridge University Press.
- West, S. G., Biesanz, J. C., & Pitts, S. C. (2000). Causal inference and generalization in field settings: Experimental and quasi-experimental designs. In H. T. Reis & C. M. Judd (Eds.), *Handbook of Research Methods in Social and Personality Psychology* (pp. 40-84). Cambridge University Press.

Mathematical Description

- Regularities in events can be quantified and expressed as a mathematical equation (esp. probability theory 18thC)
  - Large *N* of random Var gives Gaussian (Bell) curve in distribution of data points; thus *M*, *SD*
  - Probabilities, likelihood, H: *If X, then probably Y* or *to some degree Y*
- All variables are imperfectly understood or measured
  - So: O = t + e
- All data are samples,
  - so we might have missed something
- Thus, we have to account for CHANCE in describing data

readings

- Bradley, W. J., & Schaefer, K. C. (1998). *The uses and misuses of data and models: The mathematization of the human sciences.* SAGE.
- Kline, R. B. (2004). *Beyond significance testing: Reforming data analysis methods in behavioral research.* American Psychological Association.
- Porter, T. M. (1994). From Quetelet to Maxwell: Social Statistics and the Origins of Statistical Physics. In I. B. Cohen (Ed.), *The Natural Sciences and the Social Sciences: Some Critical and Historical Perspectives* (pp. 345-362). Springer Netherlands. https://doi.org/10.1007/978-94-017-3391-5_11
- Taleb, N. N. (2004). *Fooled by randomness: The hidden role of chance in the markets and in life* (2nd ed.). Texere.
- Wild, C. J., & Seber, G. A. F. (2000). *Chance encounters: A first course in data analysis and inference.* John Wiley & Sons.
- Winer, B. J., Brown, D. R., & Michels, K. M. (1991). *Statistical principles in experimental design* (3rd. ed.). McGraw-Hill.

Methodological pluralism

- Method selection depends on the research question
- All results depend on the methods used to create data
- Multiple methods MIGHT overcome restriction
- Qualitative problems can be approached
  - Scientifically
    - A rigorous protocol for classification / coding and collection
  - Quantitatively
    - Do judges/raters agree in classification or coding?

readings

- Brannen, J. (Ed.). (1992). *Mixing methods: Qualitative and quantitative research.* Avebury Ashgate Publishing.
- Brewer, J., & Hunter, A. (1989). *Multimethod research: A synthesis of styles.* SAGE.
- Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multi-trait multi-method matrix. *Psychological Bulletin, 56*(2), 81-105.
- Eid, M., Nussbeck, F. W., Geiser, C., Cole, D. A., & Gollwitzer, M. (2008). Structural Equation Modeling of Multitrait – Multimethod Data : Different Models for Different Types of Methods. In (Vol. 13, pp. 230-253). https://doi.org/10.1037/a0013219
- Harris, L. R., & Brown, G. T. L. (2010). Mixing interview and questionnaire methods: Practical problems in aligning data. *Practical Assessment, Research and Evaluation, 15*(1). https://doi.org/10.7275/959j-ky83
- Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher, 33*(7), 14-26.
- Smith, M. L. (2006). Multiple methodology in education research. In J. L. Green, G. Camilli, & P. B. Elmore (Eds.), *Handbook of complementary methods in education research* (pp. 457-475). LEA.

Big ideas

- You don't need to subscribe to various prominent philosophies,
  - French sociologists (Foucault, Deleuze, Derrida, etc.)
  - Pragmatism, socio-constructivism, interpretivism, transformativism
- Ontology:
  - world is real and universal, but social arrangements are dynamic but shared
- Epistemology:
  - we have H about the world which we can measure imperfectly to test to destruction those very same H