THE UNIVERSITY OF WESTERN ONTARIO
LONDON, CANADA

Department of Psychology

Psychology 9560B
Open and Reproducible Science
January – April, 2026

Instructor: Dr. Lorne Campbell
Office: 6328 SSC
Phone: (519) 661-2111 Ext. 84904
Email: lcampb23@uwo.ca

Office Hours: By Appointment
Room: [redacted]
First Meeting: January 5, 2026

OVERVIEW

The purpose of this course is to acquaint students with recent developments in open science and reproducibility of the research workflow. By the end of this course students will be familiar with documenting their research workflow (e.g., idea generation, hypotheses, study materials and procedures, re-usable data sets, annotated code, meta-data, output), in both a private and public manner, from beginning to end in a way that allows others to reproduce their methods, analyses, and results. Students will also become familiar with using the Open Science Framework to document their own research workflow. **Wednesdays 1:00 pm to 4:00 pm; SSC 7405/09** Half course (0.5); one term.

CLASS FORMAT

The class will meet once a week to discuss the assigned topic. Participants are expected to complete *all* the weekly reading assignments and to actively contribute to the discussions in class.

EVALUATION

Throughout the course you will be asked to complete assignments relevant to some of the course material. You are required to create an account on the Open Science Framework (OSF; https://osf.io), if you do not already have one. You will be asked to use the OSF for some of the following assignments. Details of all assignments will be discussed in more detail in class.

- After discussing pre-registration (January 29), prepare a pre-registration of a research project you are currently planning (10%)
    - Due the following week
- After discussing statistical power (February 5) and data analytic plans (February 12), prepare a data-analytic plan for your pre-registration that takes statistical power into consideration (10%)
    - Due February
- After discussing data management plans (February 26), prepare a data management plan for your pre-registered project (10%)

    - Due the following week
- After discussing open and reproducible code (March 4), write a 1 page single-spaced thought paper regarding your opinion on sharing your own data and code from your pre-registered project (10%)
    - Due the following week
- After discussing pre-prints and open access publishing (March 11), write a 1 page single-spaced thought paper regarding your opinion on sharing a pre-print of a manuscript of your pre-registered project, and on choosing an open access vs. traditional publication outlet (10%)
    - Due the following week
- Final paper: In no more than 8 double spaced pages, write an opinion piece regarding the degree to which you will, or will not, adopt the open and reproducible research practices discussed in the readings and in class. Please provide rationale for your decisions (30%)
    - Due April 8th by 5pm
- Class participation (20%)
    - Due each week ☺

Classes, Topics and Readings

January 8: Introduction to Course

Reinventing Discovery—TED talk by Michael Nielsen: https://www.ted.com/talks/michael_nielsen_open_science_now

Blog post: A Meta-Psychological Perspective on the Decade of Replication Failures in Social Psychology. https://replicationindex.com/2020/01/05/the-decade-of-replication-failures-in-social-psychology/

Reading: Munafo et al. (2017). A manifesto for reproducible science. Nature Human Behavior 1, 0021(2017), doi: 10.1038/s41562-016-0021. (https://www.nature.com/articles/s41562-016-0021)

January 15: Why Should Science be Open and Reproducible?

- **Nullius in verba** (Take nobody's word for it)
- Publication bias and file drawer problem
- Questionable Research Practices
- External pressures: government, funding agencies, TOP guidelines (https://cos.io/our-services/top-guidelines/)
- Are data and code really "available upon request"?

Readings:

Merton, R.K. (1973)[1942]. The normative structure of science. In R.K. Merton (Ed.) The sociology of science: Theoretical and empirical investigations (pp. 267-280). Chicago, IL: University of Chicago Press. (http://www.collier.sts.vt.edu/5424/pdfs/merton_1973.pdf)

Vanpaemel, Vermorgen, & Deriemaecker (2015). Are we wasting a good crisis? The availability of psychological research data after the storm. Collabra, 1(1), Art. 3. DOI: http://doi.org/10.1525/collabra.13

Nuitjen, M.B. et al. (2016). The prevalence of statistical reporting errors in psychology (1985-2013). Behavioral Research Methods, 48(4), 1205-1226. (https://link.springer.com/article/10.3758/s13428-015-0664-2)

Wicherts, J.E., & Crompvoets, E.A.V. (2017). The poor availability of syntaxes of structural equation modeling. Accountability in Research, 24:8, 458-468, DOI: 10.1090/08989621.2017.1396214 (http://www.tandfonline.com/doi/full/10.1080/08989621.2017.1396214)

Simmons, Joseph P., Leif D. Nelson, and Uri Simonsohn. (2011). False-positive psychology: Undisclosed flexibility in data collection and analysis allows presenting anything as significant. Psychological Science, 22, 1359-1366 (http://journals.sagepub.com/doi/full/10.1177/0956797611417632)

John, L.K., Loewenstein, G., & Prelec, D. (2012). Measuring the prevalence of questionable research practices with incentives for truth telling. Psychological Science, 23, 524-532. (http://journals.sagepub.com/doi/abs/10.1177/0956797611430953)

Case studies: http://www.flexiblemeasures.com

January 22: Transformation of the Research Process: Start at the beginning

- Think about open and high powered research from the beginning
- Open notebook
- Creating R package for projects
- "Dear research diary"
    - How to use the OSF to document communication between collaborators during the research process

Readings:

Lebel, E., Campbell, L., & Loving, T.J. (2017). Benefits of open and high-powered research outweigh costs. *Journal of Personality and Social Psychology, 113,* 230-243.

How to create an R package for projects: http://rpubs.com/ndphillips/rpackagescience

January 29: All about Pre-Registration

- What is it? How do you do it? What information should be part of the pre-registration?
    - Open Science Framework
    - https://aspredicted.org/
    - project Tier (https://osf.io/n2vwt/)
- https://osf.io/x5w7h/wiki/03%20Supplemental%20material/
- Campbell Lab: Pre-registration templates: https://osf.io/jrd8f/
- OSF—Register your project: http://help.osf.io/m/registrations/l/524205-register-your-project
- Advice from the Data Colada team: http://datacolada.org/64

Readings:

Nosek, B. A., Ebersole, C. R., DeHaven, A. C., & Mellor, D. T. (2017, August 24). The Preregistration Revolution. Retrieved from https://osf.io/2dxu5/

Linsday, D.S., Simons, D.J., & Lilienfeld, S.O. (2016). Research pre-registration 101. Association for Psychological Science. Retrieved on November 30, 2018 from https://www.psychologicalscience.org/observer/research-preregistration-101.

van 't Veer, A.E., & Giner-Sorolla, R. (2016). Pre-registration in social psychology—A discussion and suggested template. Journal of Experimental Social Psychology, 67, 2-12. (http://www.sciencedirect.com/science/article/pii/S0022103116301925)

Nosek, B.A., Beck, E.D., Campbell, L., Flake, J.K., Hardwicke, T.E., van't Veer, A.E., & Vazire, S. (2019). Preregistration is hard, and worthwhile. Trends in Cognitive Science, 23, 815-818. https://www.sciencedirect.com/science/article/pii/S1364661319301846

Szollosi, A., Kellen, D., Navarro, D., Shiffrin, R., van Rooij, I., Van Zandt, T., & Donkin, C. (2019, October 31). Is preregistration worthwhile?. https://doi.org/10.1016/j.tics.2019.11.009

Van den Akker, O., Weston, S. J., Campbell, L., Chopik, W. J., Damian, R. I., Davis-Kean, P., … Bakker, M. (2019, November 20). Preregistration of secondary data analysis: A template and tutorial. https://doi.org/10.31234/osf.io/hvfmr

February 5: Study Design—focus on Statistical Power and Alpha Levels

- A serious consideration of statistical power can significantly influence the very nature of your research process (e.g., how you design studies, what studies you decide to run, and how you interpret your results in terms of evidence for or against hypotheses)
- Share your decision making process regarding study design given presumed effect sizes
- Uri Simonsohn's talk on statistical power (2014, Austin, TX, at the conference of the Society of Personality and Social Psychology): https://www.youtube.com/watch?v=HzE9HtOX_sE
- G power; simulations
- Dance of the p-values: https://www.youtube.com/watch?v=5OL1RqHrZQ8
- https://osf.io/adkj4/ (helpful material on estimating effect sizes and power calculations)
- The p-hacker Shiny App: Train your p-hacking skills! http://shinyapps.org/apps/p-hacker/

Reading:

Albers, C., & Lakens, D. (2017). When power analyses based on pilot data are biased: Inaccurate effect size estimators and follow-up bias. DOI: 10.17605/OSF.IO/B7Z4Q (https://psyarxiv.com/b7z4q/)

A power analysis reveals the smallest effect size you find interesting: http://daniellakens.blogspot.ca/2017/05/how-power-analysis-implicitly-reveals.html

Lakens, D. (2014). Performing high-powered studies efficiently with sequential analyses. European Journal of Social Psychology, 44, 701-710. (http://onlinelibrary.wiley.com/doi/10.1002/ejsp.2023/abstract)

Benjamin, D.J. et al. (2017). Redefine statistical significance. Nature Human Behavior. doi:10.1038/s41562-017-0189-z (https://www.nature.com/articles/s41562-017-0189-z)

Lakens, D. et al. (2017). Justify your alpha: A response to "redefine statistical significance". DOI: 10.17605/OSF.IO.9S3Y6 (https://psyarxiv.com/9s3y6/)

February 12: Study Design—Data Analytic Plans, Open Materials, Methods, Procedures

- What is a data analytic plan? Why do I need one?
- How to create data analytic plans
- Approaches to sharing study materials, methods, and procedures
- Goal: make it so other researchers can reproduce your methods (a) without needing to contact you, and (b) after you are dead (and therefore cannot contact you, I think)

Reading:

Campbell, L., Loving, T. J., & LeBel, E. P. (2014). Enhancing transparency of the research process to increase accuracy of findings: A guide for relationship researchers. *Personal Relationships, 21*, 531-545. (http://etiennelebel.com/documents/cl&l(2014,pr).pdf)

Panter, A.T. (2010). Writing the data analysis plan. In Pequegnat, W., Stover, E., & Boyce, C. (Eds.), How to write a successful grant application. Springer: Boston, MA. (https://link.springer.com/chapter/10.1007/978-1-4419-1454-5_22)

Simpson, S.H. (2015). Creating a data analysis plan: What to consider when choosing statistics for a study. The Canadian Journal of Hospital Pharmacy, 68, 311-317. (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4552232/)

February 19: Reading Week (no classes)

February 26: Study Design—Data Management Plans

- Research Data Management, Western Libraries: https://guides.lib.uwo.ca/rdm
- Data Sharing and Management Snafu in 3 Short Acts: https://www.youtube.com/watch?time_continue=2&v=N2zK3sAtr-4

March 4: Study Design—Open and Reproducible Data and Code

- How to share your data, meta-data, and code, properly/ethically (but meaningfully)
- Ensuring reproducibility of your code and reported results
- Reproducible APA manuscripts using papaja package in RMarkdown: https://crsh.github.io/papaja_man/
- Data anonymization tools (open source and commercial): https://guides.lib.uwo.ca/ld.php?content_id=32771367

Readings:

Campbell, L. (2016). Organize your data and code for sharing from the start. http://www.lornecampbell.org/?p=116

Stodden, V. (2011). Trust your science? Open your data and code. https://web.stanford.edu/~vcs/papers/TrustYourScience-STODDEN.pdf

Chadwick, I. (2015, May 21). Can I really share that? Working with sensitive and confidential data. Retrieved from http://www.open.ac.uk/blogs/the_orb/?p458

Mackinnon, S. (2014, January 29). Privacy in the age of open data. Retrieved from http://osc.centerforopenscience.org/2014/01/29/privacyand-open-data/

Fraser, R., & Willison, D. (2009). Tools for de-identification of personal health information. Pan Canadian Health Information Privacy (HIP) Group. http://www.ehealthinformation.ca/wp-content/uploads/2014/08/2009-Tools-for-De-Identification-of-Personal-Health.pdf

Friedlin, F. J., & McDonald, C. J. (2008). A software tool for removing patient identifying information from clinical documents. Journal of the American Medical Informatics Association, 15, 601– 610. (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2528047/)

Rouder, J.N. (2015). The what, why, and how of born-open data. Behavioral Research. DOI 10.3758/s13428-015-0630-z (https://link.springer.com/article/10.3758/s13428-015-0630-z)

Piwowar, H.A., Vision, T.J. (2013). Data reuse and the open data citation advantage. PeerJ 1:e175 https://doi.org/10.7717/peerj.175

Creating a synthetic version of a real dataset to facilitate data sharing https://www.dsquintana.blog/creating-and-synthetic-version-of-a-real-dataset/

March 11: Openly Sharing Research Reports

- Pre-print servers
- Open Access journals
- Other alternative publication outlets
- Citable units—thinking beyond the typical research report (e.g., introduction, methods, results, discussion) and sharing different aspects of the research process along the way and/or in unique outlets
- Open Peer Review

Readings:

Aman, V. (2014). Is there any measurable benefit in publishing preprints in the arXiv section Quantitative Biology? arXiv:1411.1955 (https://arxiv.org/pdf/1411.1955.pdf)

Campbell, L. (2016). How to publish and open access edited volume on the open science framework (OSF). http://www.lornecampbell.org/?p=111

Chambers, C. (2014). Psychology's "registration revolution". Retrieved from theguardian.com on November 20, 2018: https://www.theguardian.com/science/head-quarters/2014/may/20/psychology-registration-revolution

Ross-Hellauer, T. (2017). What is open peer review? A systematic review [version 2; referees: 4 approved]. F1000Research, 6:588 (doi: 10.12688/f1000research.11369.2) (https://f1000researchdata.s3.amazonaws.com/manuscripts/13517/bc73e2bd-0906-48a1-a9fe-fcb771c19f0d_11369_-_tony_ross-hellauer_v2.pdf?doi=10.12688/f1000research.11369.2)

March 18: Reviewing manuscripts in the age of open science

Reading:

Schmdt, B., Ross-Hellauer, T.,… & Moylan, E.C. (2018). Ten considerations for open peer review. Version 1. F1000Res. 2018; 7: 69.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6073088/#__ffn_sectitle

Davis, W.E., Giner-Sorolla, R., Lindsay, L., Lougheed, J.P., Makel, M.C., Meier, M.E., Sun, J., Vaughn, L.A., & Zelenski, J.M. (2018). Peer-review guidelines promoting replicability and transparency in psychological science. Advances in Methods and Practices in Psychological Science, 1, 556-573.
https://journals.sagepub.com/doi/10.1177/2515245918806489

Reviewing from an open science perspective: https://osf.io/c56jx/

March 25: Scaling up: How Open and Reproducible Practices can help you Make use of Extended Research Networks

- Many Labs (https://osf.io/89vqh/)
- The Many Babies Project https://osf.io/rpw6d/
- Pipeline Project (http://www.thepipelineproject.org/)
- Psychology Accelerator (https://psysciacc.wordpress.com/)
- Registered Replication Reports (https://www.psychologicalscience.org/publications/replication)
- Curate Science http://curatescience.org/

Reading:

Frank, M.C. et al. (2017). A collaborative approach to infant research: Promoting reproducibility, best practices, and theory-building. Infancy, 22: 421–435. doi:10.1111/infa.12182 (http://onlinelibrary.wiley.com/doi/10.1111/infa.12182/abstract)

Open Science Collaboration (2012). An open, large-scale, collaborative effort to estimate the reproducibility of psychological science. *Perspectives on Psychological Science, 7*, 657-660. (http://journals.sagepub.com/doi/abs/10.1177/1745691612462588)

Moshontz, H., Campbell, L.,……& Chartier, C.R. (2018). The psychological science accelerator: Advancing psychology through a distributed collaborative network. Advances in Methods and Practices

in Psychological Science. 1, 501-515.
https://journals.sagepub.com/doi/full/10.1177/2515245918797607

April 1: Transforming Discovery

- How technological developments make everything discussed in this class (and things that I very likely missed) possible to do, right now, by you
  - An example of how we organize our open science in my lab:
    - Campbell, L. (2016, September 27). Campbell Lab: OSF Research Milestones. Retrieved from https://osf.io/jrd8f/
- Yes, but …..
  - Common reasons provided for not being able to engage in various open and reproducible scientific practices, and some counterarguments

Readings:

McKiernan, E.C. et al. (2016). Point of view: How open science helps researchers succeed. eLife 2016;5:e16800 DOI: 10.7554/eLife.16800 (https://elifesciences.org/articles/16800) (Presentation of these ideas by E. McKiernan: https://www.youtube.com/watch?v=qFsc6rf8kOs)

Finkel, E. J., Eastwick, P. W., & Reis, H. T. (2015). Best research practices in psychology: Illustrating epistemological and pragmatic considerations with the case of relationship science. Journal of Personality and Social Psychology, 108, 275–297. http://dx.doi.org/10.1037/pspi0000007 (discusses concerns)

Washburn, A.N., Hanson, B.E.,… & Carsel, T.S. (2018). Why do some researchers resist adopting proposed reforms to research practices? A description of researchers' rationales. Advances in Methods and Practices in Psychological Science, 1, 166-173.
https://journals.sagepub.com/doi/full/10.1177/2515245918757427

Allen, C., & Mehler, D.M.A. (2019). Open science challenges, benefits and tips in early career and beyond. PLoS Biol 17(5): e3000246. https://doi.org/10.1371/journal.pbio.3000246

Klein, O., Hardwicke, T. E., Aust, F., Breuer, J., Danielsson, H., Hofelich Mohr, A., … Frank, M. C. (2018). A Practical Guide for Transparency in Psychological Science. *Collabra: Psychology*, *4*(1), 20. DOI: http://doi.org/10.1525/collabra.158

Other excellent resources for everything on meta-science, open science, replicability, and reproducibility

- Reproducibility and Replicability Reading List (Brent Roberts and Dan Simons): https://docs.google.com/document/d/14lBD0aZDPij2Z6AOpAharOAtmt6ZBI0EuF3_tu8m66I/edit
- Open Science Literature: https://osf.io/kgnva/wiki/Open%20Science%20Literature/
- About (pre) registration: https://osf.io/x5w7h/wiki/03%20Supplemental%20material/
- Zotero—Open Science publications: https://www.zotero.org/groups/479248/osf/items/collectionKey/6NTIIMHN?
- Good science, bad science (E.J. Wagenmakers): http://www.ejwagenmakers.com/GSBS/GSBS.html
- Transparent, Open, and Reproducible Research Practices in the Social and Behavioral Sciences: https://psu-psychology.github.io/psy-511-reproducible-research-spring-2017/
- Curate Science: http://curatescience.org
- Syllabi for other related course: https://osf.io/bt6j2/ ; https://psu-psychology.github.io/psy-511-reproducible-research-spring-2017/

Podcasts:

- The Black Goat: https://blackgoat.podbean.com
- Everything Hertz: https://soundcloud.com/everything-hertz
- The Bayes Factor: https://sites.tufts.edu/hilab/series/the-bayes-factor/

Blogs:

- The 20% Statistician: http://daniellakens.blogspot.ca
- Code Ocean Blog on Reproducibility: https://codeocean.com/blog/
- Data Colada: http://datacolada.org

Other

- OpenCon: http://www.opencon2017.org/
- Society for the Improvement of Psychological Science: https://improvingpsych.org/
- Berkeley Initiative for Transparency in the Social Sciences: http://www.bitss.org/