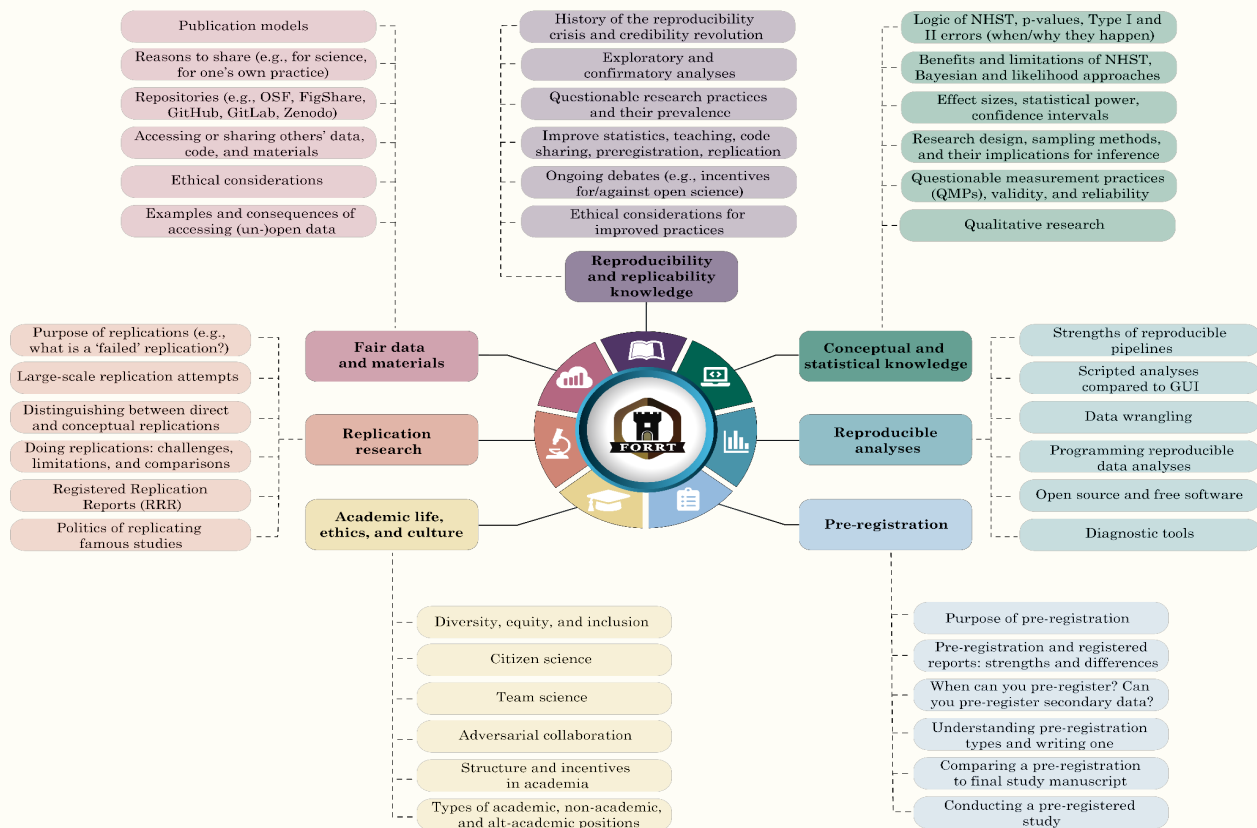# Open Scholarship in QAA Briefing

For students to become effective and responsible consumers of research evidence, they require a critical understanding of how these are created. Recent replication attempts (e.g., Open Science Collaboration, 2015), have provided valuable insights and acted as a springboard to reconsider where various standards of research are suboptimal. In response, the open scholarship movement started to reform thinking and practices, encouraging all research stakeholders to reconsider how to think about, design, and implement research to prioritise high-quality and transparent evidence.

As such, students require a more nuanced understanding of the different approaches to thinking about, doing, and sharing research. Firstly, students should hold critical reading and writing skills demonstrating an understanding of how our way of thinking about research and evidence has changed, recognising the core conceptual debates (e.g. the role of theory, how to evaluate quality) and the wider culture in which evidence is created. Second, students should have an understanding of the research process itself, the purpose and limits of practices that promote rigour and transparency (e.g. replications and registered reports), and experience negotiating the core principles (e.g. quality measurement). Third, students should have experience engaging with modern practices that maximise research transparency and constructive discussion (e.g. accessing open data/code/materials) and hold a critical appreciation for evidence communication and dissemination.

> Open Science is an umbrella term reflecting the idea that scientific knowledge of all kinds, where appropriate, should be openly accessible, transparent, rigorous, reproducible, replicable, accumulative, and inclusive. Open science consists of principles and behaviors that promote transparent, credible, reproducible, and accessible science. The term 'Open scholarship' is often used to extend these values to all disciplines, drawing in those which might not traditionally identify as science-based. It reflects the idea that knowledge of all kinds should be openly shared, transparent, rigorous, reproducible, replicable, accumulative, and inclusive (allowing for all knowledge systems). Open scholarship is also inclusive of all scholarly activities that are not solely limited to research such as teaching and pedagogy (Parsons et al., 2022; FORRT Glossary).

For interested readers, the FORRT (Framework for Open and Reproducible Research Training) clusters provides an overview of some of the most common themes and features of the discussions in Open Scholarship. For more information, see the FORRT Clusters site linked in the "Further Resources" below.

Fair data and materials
- Publication models
- Reasons to share (e.g., for science, for one's own practice)
- Repositories (e.g., OSF, FigShare, GitHub, GitLab, Zenodo)
- Accessing or sharing others' data, code, and materials
- Ethical considerations
- Examples and consequences of accessing (un-)open data

Reproducibility and replicability knowledge
- History of the reproducibility crisis and credibility revolution
- Exploratory and confirmatory analyses
- Questionable research practices and their prevalence
- Improve statistics, teaching, code sharing, preregistration, replication
- Ongoing debates (e.g., incentives for/against open science)
- Ethical considerations for improved practices

Conceptual and statistical knowledge
- Logic of NHST, p-values, Type I and II errors (when/why they happen)
- Benefits and limitations of NHST, Bayesian and likelihood approaches
- Effect sizes, statistical power, confidence intervals
- Research design, sampling methods, and their implications for inference
- Questionable measurement practices (QMPs), validity, and reliability
- Qualitative research

Replication research
- Purpose of replications (e.g., what is a 'failed' replication?)
- Large-scale replication attempts
- Distinguishing between direct and conceptual replications
- Doing replications: challenges, limitations, and comparisons
- Registered Replication Reports (RRR)
- Politics of replicating famous studies

Reproducible analyses
- Strengths of reproducible pipelines
- Scripted analyses compared to GUI
- Data wrangling
- Programming reproducible data analyses
- Open source and free software
- Diagnostic tools

Academic life, ethics, and culture
- Diversity, equity, and inclusion
- Citizen science
- Team science
- Adversarial collaboration
- Structure and incentives in academia
- Types of academic, non-academic, and alt-academic positions

Pre-registration
- Purpose of pre-registration
- Pre-registration and registered reports: strengths and differences
- When can you pre-register? Can you pre-register secondary data?
- Understanding pre-registration types and writing one
- Comparing a pre-registration to final study manuscript
- Conducting a pre-registered study

Proposed Intended Learning Outcome Themes

- **Thinking About Research.** Students should hold a constructively critical attitude towards research. Students should have an understanding of the wider context and culture in which evidence is created, have an appreciation for core conceptual debates, and be able to evidence key critical skills in research consumption (e.g., critical reading and writing).
- **Doing Research.** Students should be familiar with the rationale and limitations of contemporary research practices informed by the open scholarship movement (e.g. Registered Reports, replications) and should have a practical understanding of high-quality research practices (e.g. study design and measurement).
- **Engaging with Research.** Students should be familiar with what is required to be transparent across the research lifecycle (e.g. open data), and to share these diverse research products with others (e.g. preprints and authorship taxonomies).

Example Implementation Across Disciplines

Some topics may be more or less applicable to different disciplines, depending on research type (e.g., quantitative, qualitative, descriptive, experimental, exploratory, confirmatory), the form of raw data or materials (e.g., tabular data, physical materials, video, physical artefacts), and data privacy and security concerns.

Thinking	
	In any field, including exercises to understand the difference between critical and cynical perspectives about research evidence ([lesson plan](#))
	In social sciences, engage with discussions on the replication, measurement and generalisability crises to enrich critical reading and writing skills, to discuss research quality and impact, and to consider the priorities and purpose of research.
Doing	
	In disciplines that use quantitative data, including instruction on the underlying skills needed for transparent and reproducible data preparation and analysis in methods classes ([McAleer et al., 2022](#))
	In disciplines with empirical research projects, supervisors can educate students in the methods used to reduce the likelihood of researcher error ([Strand, 2021](#))
Engaging	
	In biological fields, debating the ways in which the FAIR (Findable, Accessible, Interoperable and Reusable) data principles could be applied to human biological data and providing experience with how to negotiate the repositories most suitable for accessing genomic, mass spectrometry, microscopy, and structural biology data ([Wilson et al., 2021](#))
	In all fields, discussing the potential for preprints to increase the speed of scientific progress but to raise questions about credibility ([Soderberg et al., 2020](#)) and the subsequent role of journals and peer-review

Further Resources

- [FORRT Glossary](): Definitions of ~250 Open Scholarship Terms
- [UKRN Primers](): Introductions to Data Sharing, Open Access, Open Code & Software, Preprints, Pre-registration and Registered Reports
- [TOP Guidelines](): Transparency and Openness Promotion Guidelines for Data Citation, Data, Materials, and Code Transparency, Design and Analysis, Preregistration, and Replication
- [APA Open Guide](): Guidance from the American Psychological Association on Transparency and Openness Statements, Registered Reports, Preregistration, Open Materials, Open Data, Open Code, Citation, Authorship and Preprints
- [FORRT Clusters](): Compiled resources on Reproducibility and replicability knowledge, Conceptual and statistical knowledge, Reproducible analyses, Preregistration, FAIR data and materials, Replication research, and Academic life and culture

Contact us

This document has been produced by Flavio Azevedo, Lisa DeBruine and Thomas Rhys Evans (ordered alphabetically by last name) on behalf of the FORRT (Framework for Open and Reproducible Research Training) and UKRN (UK Reproducibility Network) communities.

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