

Developing Fundamental Research Practice Training at the University of Oxford

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Abstract

The adoption of up-to-date research practices is the foundation of reliable and trusted academic research. Yet researchers are often left to piece together increasingly more complex and ever-evolving guidance on how to design, plan, execute, and report their research findings or sources. Higher educational institutions have a responsibility to develop more coherent ways to assist researchers to access the latest policies, guidance, and tools, e.g., for establishing equitable partnerships, managing research data, ensuring information security, choosing open and reproducible publication models.

At the University of Oxford, enabling and promoting good research practice is one of three key pillars in our research culture strategy. To deliver on the institutional ambitions for Research Practice, we are designing and implementing a comprehensive training and support programme, which includes running digital transformation projects and defining organisational guidance and policies.

This paper focuses on the training component and the creation of a set of short, e-learning modules on topics which include: Research Integrity and Governance; Open Research Practices; Research Design; Collaboration; Data; Authorship, Publication and Peer Review; and Research Impact and Public Engagement.

We share the criteria we have developed to help us map, assess and integrate pre-existing training and resources. The central aim is to deliver researcher-centred educational material that is applicable to any discipline and career stage. We also discuss how we are engaging key domain experts across the university through membership of small working groups for each of the modules. Once the core modules have been finalised, the materials will be publicly released under an open licence.

Keywords: research practice; research integrity; training; course evaluation

Introduction and Rationale

The research community has become increasingly aware over recent years that there is a considerable gap between behaviours that are good for research as a whole (e.g., collaboration, openness and transparency, rigour) and the behaviours that currently promote the careers of individual researchers (e.g., speed, novelty, ground-breaking results, individualism). This gap needs to be closed, which means we need to develop better ways of encouraging good research behaviour by making acting in those ways that benefit the individual’s research career. This ambition will require a serious culture change from across the research community, from top-down sources like funders and institutions, to bottom-up initiatives from grassroots organisations formed by researchers for themselves and their peers.

This desire to close the gap between what is good for research and what is good for researchers is not unique to the University of Oxford, and there are a great many relevant policies and agreements already developed or signed by universities, funders, and sector governing bodies. They include, but are not limited to (**Table 1**):

Table 1: Key Sector Concordats, Agreements & Community Principles

Sector Concordats ⁱ	Agreements ⁱⁱ	Community Principles ⁱⁱⁱ
Concordat to Support Research Integrity	Technician Commitment	FAIR principles
Concordat on Open Research Data	San Francisco Declaration on Research Assessment (DORA)	TRUST Principles for digital repositories
Concordat to Support the Career Development of Researchers	Leiden Manifesto for Research Metrics	CARE Principles for Indigenous Data Governance
Concordat on Openness in Animal Research	Guidance for Safeguarding in International Development Research	
Concordat for Engaging the Public with Research	Race Equality Charter	
	Athena Swan Charter	

Concordat for the Advancement of Knowledge Exchange in Higher Education		
European Code of Conduct for Research Integrity		

As anyone who has tried to implement policy knows, agreeing best principles for practice is one thing, whereas implementing these practices in day-to-day operations can be a lot harder, requiring people who have the time and effort to be able to engage with and develop these fully.

At the University of Oxford, we are developing a programme to advance Research Culture which consists of aligned policies, support and incentives, and is formed of three priority areas: Research Practice, Careers, and Valuing Contributions. The programme is supported and overseen by the Pro-Vice-Chancellor for Research, the priority areas are led by Academic Leads working with professional staff in Research Services, Research IT, and the University Library. The Programme is in line with the University Strategic Plan, providing the top-down and bottom-up drivers for our work developing and supporting the University’s Research Culture.

Research practice training

We define Research Practice as the approaches by which researchers plan, design, execute, and report their research work, regardless of what domain the researcher is working in. As a team, we work with key stakeholders (including researchers, managers, and professional services staff) to develop and support Research Practice in the University.

Increasing the quality of research practice requires several supporting actions, including **(Table 2)**:

Table 2: Actions Supporting Research Practice Quality

1. Informing researchers about good research practice and demonstrating what good research practice is. This will include:	<ul style="list-style-type: none"> a. Raising awareness about research practice b. Providing training, support and educational resources c. Communicating institutional, sector and funder policies and guidance, as applicable to the researcher and their domain
2. Making it easy for researchers to implement good research practice as part of their work by providing:	<ul style="list-style-type: none"> a. Centralised support, with provision of core tools, services, registries and infrastructure b. Reward and recognition for the researchers who use good research practice, c. Development of a community of practice d. Clearer policies for managing data and digital materials

Research practice training modules and topics

We are developing a set of research practice modules to inform researchers in the University what resources are available, and what is expected of them by way of good research practice.

The modules are:

1. Research integrity and governance
2. Open research practices
3. Research design
4. Collaboration
5. Data
6. Authorship, publication and peer review
7. Research impact and public engagement

The module subjects were originally developed in 2022, following a desk-based mapping of pre-existing training provision, and arising from training needs identified via a series of 40 interviews across the University. This project provided a snapshot of the courses on research practice available to researchers at the time and allowed us to determine where there were gaps in training provision that we needed to fill.

We are designing the Research Practice training to be accessible, foundational and applicable to all disciplines, and we want researchers to use the ideas learned in the training to improve their research practice. We hope they will be a springboard for a more reflexive approach to research practice that enables behaviour change, along with supporting improved supervision and Continuing Professional Development at the University.

We identified our key audience for these modules as researchers who are new to the University, from all career stages and disciplines. The modules can also be used as a refresher for more experienced researchers, and as a place to find pointers to other, possibly more advanced or specialist, university-level resources.

We have determined that the key criteria for a core research practice training needs to be:

- Free to the user
- eLearning – can be done at any time via the web
- Accessible – keeping in mind the needs of screen readers, colour blindness, ability to speed up/slow down content and take breaks

- Less than 1 hour per module to complete
- Foundational, with content relevant across all disciplines
- Completion rates tracked, to monitor engagement
- Updateable and version-controlled

Once developed, the course materials will be made open to other users/institutions once complete. There will be aspects of the training specific to University of Oxford, for example, details on how to get ethics approval for a project which discusses the university ethics committees by name, but we aim to create course materials that are as general as possible, and that can be easily adapted to other contexts/institutions. We plan to provide guidance and support on how to customise these resources for other institutions.

When it comes to determining what information should be included in the core modules, we will determine how generally applicable the material is to all researchers. In general, if the material is domain-specific, then it should be signposted from the 'training and resources' section of the module, but not included in the main text of the module.

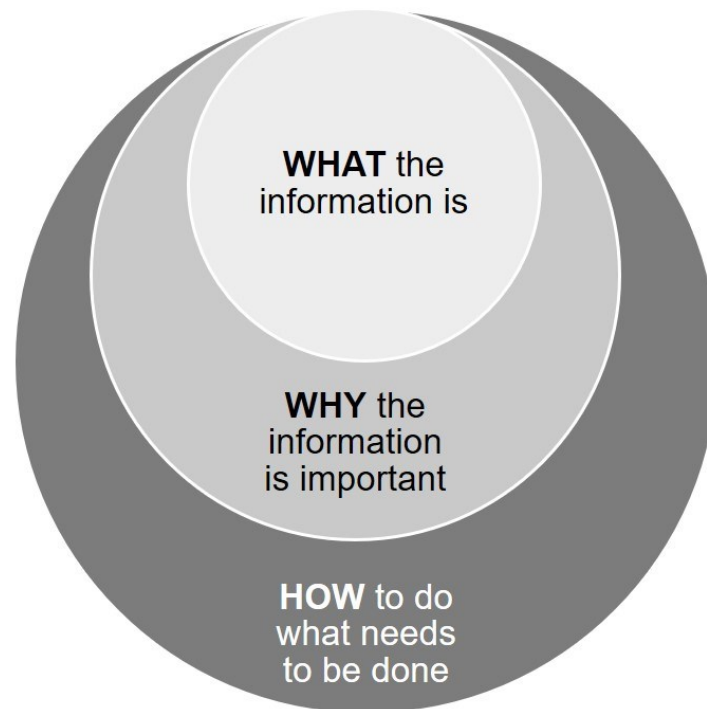
Research practice module development framework

When developing the content for the core training modules, we implemented the following conceptual framework (**Figure 1**):

1. *WHAT* the key principles of good research practice are in the module's scope
2. *WHY* researchers should care about these principles
3. *HOW* to implement the principles and improve research practice

The core modules will cover the *WHAT* and the *WHY* in as much of a 'discipline-agnostic' way as possible. For the *HOW*, each module will include a 'training and resources' page, which will provide links to other, more detailed and discipline-specific training (in Oxford and beyond), factsheets, other resources, etc. This will provide a single place where researchers can go to find out options for more detailed training in their domain, support for using institutional resources, and connections to other sources of information. The courses' key differentiating factor is that they are being designed to be both educational *and* a source of information researchers can return to at any point in their research process and when they need to support the various aspects and stages of a research project.

Figure 1: Conceptual framework for identifying and structuring the content of the core training modules



Module content development

Developing the module content is a collaborative process involving members of the research practice project team and experts in each module's content. The experts — drawn from within the university — were invited to join small working groups to develop the course content via a series of workshops and interactive conversations.

To develop the content, each small working group:

- Had a 1-hour virtual workshop to brainstorm module content
- Provided guidance on the syllabus created based on the brainstormed content
- Provided information about existing courses and materials already available within the University and elsewhere
- Will be responsible, on a yearly basis, for reviewing and updating the content on a set schedule once the modules have gone live

The brainstorming workshops were facilitated by the research practice team to enable the group of experts to conceptualise what the module should cover — to make it as useful, targeted, and successful as possible — and how it should be structured, rather than work from a pre-defined and traditional course structure (e.g., an 'off-the-shelf' solution). The initial workshops are run online using the visual collaboration platform Miro.^{iv} The content from the workshop and further discussion is then expanded into a full draft of the module by the research practice team. Then it is

reviewed again by the small groups through several iterations building from the initial structure and content towards embedding interactivity and engagement. When it is signed off by these experts, it is then used to build the course in the University’s Learning Management System (LMS), Canvas.

The resulting modules – while sharing the same conceptual framework described above – are being shaped by the guiding principle of asking how researchers engage with and approach their research practice. For example, more ‘traditional’ training and resources on research data management employ the research data lifecycle and the actions associated with it as an organising principle. By contrast, our small group identified this structure as a barrier for researchers, who often need to focus on planning their data strategy and may get confused and even obfuscated by a model originally developed for research data managers, not them. As a result, our ‘Data’ module focuses on the researcher experience and the structure and content are guided by key questions researchers should ask themselves about their research data (**Table 3**).

This approach takes on board learner-centred design principles, such as ensuring content is relevant, supporting learners to build and scaffold their learning, or facilitating interaction and conversations where possible. As a result, the learner-centred curriculum maximises *flexibility* of the learning experience, by which we aim to enhance uptake and ensure the programme’s success across all disciplines and career stages.

Table 3: Side by side comparison of the University of Edinburgh’s MANTRA Research Data Management training and the University of Oxford’s ‘Data’ course.v

MANTRA course units	Preliminary course structure for ‘Data’
Research data in context <i>Types of research data, why managing data is important, challenges of data in society</i>	1. What is data in research? <i>Introduction and University of Oxford context</i>
Data management planning <i>Good practice and responsible research, checklists and planning tools, funder compliance</i>	2. How do I plan my project’s data strategy? <i>Where to start and key principles</i>
Organising data <i>Naming and re-naming conventions, file and code versioning, use of cloud collaboration tools</i>	3. What’s my research data and where do I find it? <i>Identifying and assessing data</i>
Preparing your data for archiving <i>What is archiving and why archive your data, file formats and digital preservation, data documentation & metadata</i>	4. How do I manage data during my project? <i>Hardware and software needs, live data workflows, access and rights, data analysis and visualisation</i>

<p>Keeping research data safe <i>Backup and storage methods, password safety and encryption, secure sharing and collaboration</i></p>	<p>5. How do I preserve and share my data and get credit for it? <i>What to share/not share and how to manage each, repositories, archives and more</i></p>
<p>Protecting sensitive data <i>Data protection legislation, ethical considerations and informed consent, safeguarding sensitive data</i></p>	<p>6. What is metadata and why is it important for my research data? <i>Documentation and metadata best practices</i></p>
<p>FAIR sharing and access <i>Benefits and barriers to data sharing, FAIR Principles, open data licences</i></p>	<p>7. What are my data responsibilities and what policies should I follow? <i>Key policies and processes researchers need to be aware of and follow, contextualised at University of Oxford</i></p>
	<p>8. Wrapping up <i>Key points, next steps, training and resources</i></p>

Above, in Table 3, on the left, the MANTRA units focus on actions and processes with data; researchers need to identify and understand where these actions are needed, and plan in advance. On the right, we’ve focused on the researcher experience to design the ‘Data’ syllabus around questions and workflows researchers are most likely to encounter in their work.

External Training Resources

In order not to reinvent the wheel, we attempted to take advantage of all the excellent, pre-existing resources currently available to Oxford’s researchers, as well as external resources including community-developed materials and open educational resources that are licensed for reuse.

For this reason, in each module there is a ‘Training and Resources’ section, which links out to other courses and resources. The question then became: how do we decide which courses/resources to include in this section?

Criteria for recommending external courses/materials

To do this, we developed a set of course criteria to suggest ‘recommended’ and ‘available’ courses and materials (see **Table 4** for the full list of criteria), e.g.,

- Accessible to everyone = recommended
- Restricted to limited audience = available

In order to keep control of our scope, and make the modules more relevant for Oxford researchers, the courses/resources linked to in ‘Further information’ will have a focus on ‘How to do things at the University of Oxford’. The content of the main text of the modules (the ‘What’ and the ‘Why’) is intended to be as general as possible.

Table 3 gives a full list of the recommendation criteria, and presents various examples within each criterion that will lead to ratings of ‘recommended’, ‘available’ and ‘unlikely to be recommended’. Making the decision on whether a course should be recommended or not will be a matter of weighing all the individual criteria according to the small group members’ requirements. In the ‘Further Resources’ section of the modules, the training recommended to researchers does not include ‘recommended’ or ‘available’, but they just appear for the researchers as options. Where there is a small cost attached, this is usually noted for researchers so they know before investigating further.

This is not expected to be an exhaustive list of criteria, and is more subjective than objective, but we have found it useful.

It is also worth noting that we rely on our small groups experts when it comes to determining the suitability of a course for recommendation, as we —the module creators – don’t have the time, effort, or domain knowledge to attend and judge each course on its merits. We aim to be inclusive and err on the side of including resources in our list, rather than leaving them out.

Table 4: Criteria for determining whether a course or other material is recommended, available, or unlikely to be recommended.

Criteria for external (non core) courses/materials	Recommended	Available	Unlikely to be recommended
Cost	Free for users	Relatively small charge by providers	Chargeable to users by providers
Accessibility	Available online to Oxford staff and students	Human-led at specific times (e.g., webinars that aren't recorded)	Requires significant travel to in-person training site
	Flexible start and end times	in person, in classroom training, local to Oxford	Ad hoc or irregular provision
	Accessibility as standard (e.g., suitable for screen readers)	Only available to certain researchers (e.g., from certain Divisions or Departments)	Poor accessibility standards
	Clear definition of audience and learning objectives before signing up		
Scalability	No restrictions on number of users able to take the course	Number restrictions about what we anticipate our usage, or can be fairly easily adjusted	Significant competition for limited places

Evaluation	Course has method for users to provide feedback	Course has method for users to provide feedback	No mechanism to provide feedback
Length	Determined by course content Sufficient breaks Ability to start and stop at will	Timetabled, with breaks	Longer than 1.5 hours without breaks
Sustainability	Already existing mechanism for updating content Has version control Course is date-stamped		Materials not updated, version controlled or dated
Quality and credibility	Signed off and/or recommended by core group of experts/small group members	Provided by well-known or credible training provider	Provided by unknown provider
Usage metrics	Integrated into existing systems so we can access common reports for sign up and completion numbers	Has ability to provide sign up and completion numbers from a different source	No ability to track usage
Content	Clearly identifies course content by type/domain/implementation Expands on core module content Suitable for early career researchers/DPhil students/new postdocs		Very specific training on very specialised content

Further Work

The e-learning series development is just one part of the University programme to change research culture. It is an important first step to raise awareness and train and support researchers in adopting good research practice, which can then be built on to provide communities of practice at a bottom-up level.

We gratefully acknowledge that there is a lot of pre-existing research practice training available in the University, which has been developed by experts and tested and validated by students over many years. As a research practice team we don't duplicate effort or reinvent training courses or materials; instead, we should be filling any identified gaps in the provision of training, and updating existing training where necessary.

Our modules are signposting to pre-existing training, where it is suitable, and we are working collaboratively with colleagues who have existing expertise and real-world knowledge that should be shared.

Our aim is not to mandate a standard set of research practices, but instead to educate researchers on basic principles, then guide them to appropriate

training and resources that suit them, their domain, and their research. We acknowledge that different communities have different practices, and that there is no 'one-size-fits-all' standard that is useful and applicable across all research domains.

Alongside developing the training modules, we are also developing communications plans and channels together with other central services and Divisional management boards, to let people know what training, resources and support are available, where those things are, and how to use them. A key method for communicating will be by promoting and embedding training and resources in Departmental websites, processes, inductions, etc.

We will need to evaluate the impact of the training programme, which will require metrics to be collected, such as completion rates segmented by career stage and department. We should not forget about engagement analytics and qualitative markers, which will enable us to assess the modules' usefulness and their behavioural impact, as well as identify barriers (where is engagement low?), hot spots (where is engagement high?) and opportunities (what topics are emergent? Where do researchers need support?). We will also need to track the effectiveness of our other research practice communications, and whether or not our efforts are resulting in lasting, behavioural change in the university's research profile. The drivers for quantifying these metrics tie in with REF 2029, in particular the People, Culture and Environment element.

We also want to share the work we have done outside the university, as we believe that others can learn from our experiences. We have spent significant time collaborating with training experts and wider stakeholders (within and external to the university) to develop our research practice training and knowledge. We are firm believers in treating the work we have done with the same levels of openness, transparency, and verifiability that we expect our researchers to adhere to.

Acknowledgements

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Sarah Callaghan is Research Practice Manager at the University of Oxford, dedicated to supporting researchers through policy and training to ensure that the integrity of research is preserved, and that research excellence is underpinned by the principles of honesty, rigour, impartiality, collegiality, trust, transparency, and accountability. She was Editor-in-Chief for *Patterns* - a gold open access, multidisciplinary journal of data science by Cell Press. Her PhD involved creating, managing and analysing data for radio propagation engineering and meteorological modelling. She has research interests in research practice, ethics and integrity, data citation and publication, data sharing, metadata, and data management.



Tanita Casci is the Director of the Research Strategy & Policy Unit at the University of Oxford. The Unit leads on institutional strategies and initiatives to further strengthen Oxford's research and research environment. From 2015–2021, Tanita was the Head of Research Policy at the University of Glasgow, where she was also institutional co-lead for [research culture](#), co-lead of [Lab for Academic Culture](#), and co-author of the university's [5-year research strategy](#) (2020–2025). Previously, Tanita launched a Wellcome-funded facility for the analysis of 'big data' in biology, and for 12 years worked as a commissioning editor at Springer-Nature. She has a PhD in Genetics from the MRC-LMB/University of Cambridge, UK.



Kathryn Dally is the Research Integrity and Policy Lead within Research Services at Oxford. She leads the Research Practice team, which works on developing policy, guidance and training in research practice. She is also the University's lead professional services contact for matters related to the integrity of research at Oxford and, as such, provides advice on the assessment and investigation of allegations of research misconduct at Oxford. Kathryn is an active member of the [Russell Group](#) Research Integrity Forum and of the League of European Research Universities (LERU) [Research Integrity Policy Group](#).



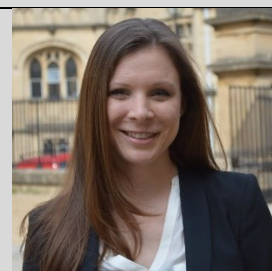
Laura Fortunato is Professor of Evolutionary Anthropology at the University of Oxford; a Fellow of Magdalen College, Oxford; and an External Professor at the Santa Fe Institute. Beginning in 2016 she has established key initiatives relating to reproducibility and open research, including Reproducible Research Oxford (RROx) and, with three others, the UK Reproducibility Network (UKRN). These initiatives provided the impetus for establishment of the University's Research Practice programme, and she co-led development of this effort with Tanita Casci in 2021/22. In March 2022 she was appointed to the role of the University's Academic Lead for Research Culture (UKRN).



Mónica Palmero Fernández is Research Practice Coordinator at the University of Oxford. She obtained her PhD in the archaeology of ancient Western Asia from the University of Reading and has held research and teaching posts at the University of Reading and the University of Glasgow. She has focused her professional practice on initiatives that support more inclusive, ethical, and equitable research and teaching cultures in archaeology. In 2023, she joined the University of Oxford's Research Practice team to help develop a holistic training programme to support fairness, transparency and accountability in the conduct of research.



Jackie Thompson works as a researcher at University of Bristol as well as a professional supporting training in open and reproducible research at University of Oxford, and is heavily involved in the UK Reproducibility Network. She received a PhD in experimental psychology from the University of Oxford in 2015, after which she worked as a postdoctoral researcher in psychology for several years, after which she migrated to the field of meta-research, or research that aims to improve how research is conducted, reported and disseminated.



Susanna-Assunta Sansone is the University's Academic Lead for Research Culture (Research Practice); Professor of Data Readiness in the Department of Engineering Science; and Director of the Oxford e-Research Centre. An author of the FAIR Principles, she leads her Data Readiness Group to research and develop tools, methods and standards to represent and share multi-dimensional data, supporting data readiness, re-usability and reproducibility.



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Endnotes

ⁱ Information on these concordats can be found at: Research Integrity (<https://www.universitiesuk.ac.uk/topics/research-and-innovation/concordat-support-research-integrity>), Open Data (<https://www.ukri.org/wp-content/uploads/2020/10/UKRI-020920-ConcordatOpenResearchData.pdf>), Career Development (<https://researcherdevelopmentconcordat.ac.uk/>), Animal Research (<https://concordatopenness.org.uk/>), Public Engagement (<https://www.ukri.org/wp-content/uploads/2020/10/UKRI-151020-ConcordatforEngagingthePublicwithResearch.pdf>), Knowledge Exchange (<https://www.universitiesuk.ac.uk/sites/default/files/field/downloads/2021-07/knowledge-exchange-concordat.pdf>) & Research Integrity (<https://allea.org/wp-content/uploads/2023/06/European-Code-of-Conduct-Revised-Edition-2023.pdf>).

ⁱⁱ Information on these agreements can be found at: Technician (<https://www.techniciancommitment.org.uk/>), DORA (<https://sfdora.org/>), Leiden (<http://www.leidenmanifesto.org/>), Safeguarding (<https://ukcdr.org.uk/publication/ukcdr-guidance-on-safeguarding-in-international-development-research/>), Race Equality (<https://www.advance-he.ac.uk/equality-charters/race-equality-charter>) & Athena Swan (<https://www.advance-he.ac.uk/equality-charters/athena-swan-charter>).

ⁱⁱⁱ Information on these community principles can be found at: FAIR (<https://www.go-fair.org/fair-principles/>), TRUST (<https://www.nature.com/articles/s41597-020-0486-7>) & CARE (<https://www.gida-global.org/care>).

^{iv} See <https://miro.com/>.

^v To access MANTRA, an online course for people managing digital data within research projects, see: <https://mantra.ed.ac.uk/>.