Open and reproducible research: An overview

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Open and reproducible research courses

Sep 8th – 20th 2023

Time and place: Sep. 8, 2023 10:00 AM – 11:00 AM, Zoom

Open and reproducible research: An overview

Learn about what open research is and how to make your own research more transparent and reproducible.

Time and place: Sep. 13, 2023 9:00 AM – 11:00 AM, Zoom

How to preregister research studies?

Learn about what preregistration is and how to preregister your own studies.

Time and place: Sep. 15, 2023 10:00 AM – 11:00 AM, Zoom

How to make research reproducible?

Learn about tools and practices for more reproducible and effective research.

Time and place: Sep. 18, 2023 10:00 AM – 11:30 AM, Zoom

How to publish openly?

Learn about preprints, peer-review process, Open Access and how can you choose the best way to publish your results openly.

Time and place: Sep. 20, 2023 10:00 AM – 11:30 AM, Zoom

How to make research more visible?

Learn about different tools, platforms and services to share your research and other contributions, and how you utilise them to make yourself and your work more visible to the academic community and the society at large.

https://www.ub.uio.no/english/courses-events/courses/other/research-reproducibility/

Roadmap for today

- Why open research?
- Open research plans, materials, data, analyses, publishing: why, how and where?
- Open research and reproducibility
- Take-aways
- Q&A time!

Besançon *et al. BMC Medical Research Methodology* (2021) 21:117
https://doi.org/10.1186/s12874-021-01304-y

BMC Medical Research Methodology

COMMENTARY Open Access

Open science saves lives: lessons from the COVID-19 pandemic

Lonni Besançon[1,2*], Nathan Peiffer-Smadja[3,4], Corentin Segalas[5], Haiting Jiang[6], Paola Masuzzo[7], Cooper Smout[7], Eric Billy[8], Maxime Deforet[9] and Clémence Leyrat[5,10]

Abstract

In the last decade Open Science principles have been successfully advocated for and are being slowly adopted in different research communities. In response to the COVID-19 pandemic many publishers and researchers have sped up their adoption of Open Science practices, sometimes embracing them fully and sometimes partially or in a sub-optimal manner. In this article, we express concerns about the violation of some of the Open Science principles and its potential impact on the quality of research output. We provide evidence of the misuses of these principles at different stages of the scientific process. We call for a wider adoption of Open Science practices in the hope that this work will encourage a broader endorsement of Open Science principles and serve as a reminder that science should always be a rigorous process, reliable and transparent, especially in the context of a pandemic where research findings are being translated into practice even more rapidly. We provide all data and scripts at https://osf.io/renxy/.

Keywords: Open science, Peer review, Methodology, COVID-19

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https://bmcmedresmethodol.biomedcentral.com/articles/10.1186/s12874-021-01304-y

TECHNOLOGY FEATURE | 24 April 2020

Open science takes on the coronavirus pandemic

Data sharing, open-source designs for medical equipment, and hobbyists are all being harnessed to combat COVID-19.

Mark Zastrow

A student in Warsaw assembles 3D-printed protective masks. Credit: Jaap Arriens/NurPhoto/Getty

https://www.nature.com/articles/d41586-020-01246-3

Kaitlyn M. Werner, PhD
@kaitlynmwerner

Open science truly is beautiful. Someone recommended a paper w. open data relevant to this question. Within minutes I was able to analyze my question because the data/code was so beautifully and efficiently organized -- the best I've seen! Major props to @russpoldrack and team.

> **Kaitlyn M. Werner, PhD** @kaitlynmwerner · May 1
> I have been thinking a lot about socioeconomic status and self-control/self-regulation. I'm starting to plan an esm+diary study where I can start digging into this topic in more detail, but in the meantime I'm curious: what are the interesting papers you've read in this space?
> Show this thread

11:52 PM · May 9, 2022 · Twitter Web App

“**Open Science** has the potential of making the scientific process more **transparent**, **inclusive** and **democratic**. It is (…) a true game changer in bridging the science, technology and innovation gaps and fulfilling the **human right to science**.”

UNESCO Recommendation on Open Science

https://youtu.be/I3Wkvx_ZaFo
https://www.unesco.org/en/natural-sciences/open-science

"**Open Science** is becoming the modus operandi for carrying out research and innovation by **sharing knowledge, data and tools** as early as possible, in open collaboration with all relevant knowledge actors and society."

ec_rtd_horizon-europe-strategic-plan-2021-24.pdf (europa.eu)

Open science means transparency and **knowledge-sharing** in research processes to make knowledge **accessible** across academic groups, sectors and national boundaries. The concept of open science encompasses the entire research process […].

- The Research Council of Norway. Policy for open science 2020

Assessment of open science in grant applications

From 2023, open research will be incorporated into the assessment criteria for Researcher Projects and Collaborative and Knowledge-building Projects on open science practice. Here we explain how you can best respond to these assessment criteria when applying for funding.

Through the panel assessment of grant applications, the referees determine how well the grant applications satisfy the various assessment criteria. The assessment of what constitutes good and appropriate open science practice will be made by experts in the various subject areas. The referees often have experience from Horizon Europe and are used to assessing open research in grant applications on the basis of their subject areas.

The referees are to assess open science practice through two subsections of the criterion 'Impact':

- potential impact of the proposed research
- communication and exploitation

Open Science

https://www.forskningsradet.no/en/processing-grant-applications/processing-applications/assessment-open-science/

Changing research assessment system

European Commission

Towards a reform of the research assessment system

Scoping Report

https://op.europa.eu/en/publication-detail/-/publication/36ebb96c-50c5-11ec-91ac-01aa75ed71a1/language-en/

Read final agreement here: https://research-and-innovation.ec.europa.eu/news/all-research-and-innovation-news/reforming-research-assessment-agreement-now-final-2022-07-20_en

The Netherlands:

nature > career news > article

CAREER NEWS | 25 June 2021

Impact factor abandoned by Dutch university in hiring and promotion decisions

Faculty and staff members at Utrecht University will be evaluated by their commitment to open science.

Chris Woolston

"By early 2022, every department at Utrecht University in the Netherlands will judge its scholars by other standards, including their commitment to **teamwork** and their efforts to promote **open science**"

https://www.nature.com/articles/d41586-021-01759-5

Germany:

Information for Researchers No. 61 | 1 September 2022

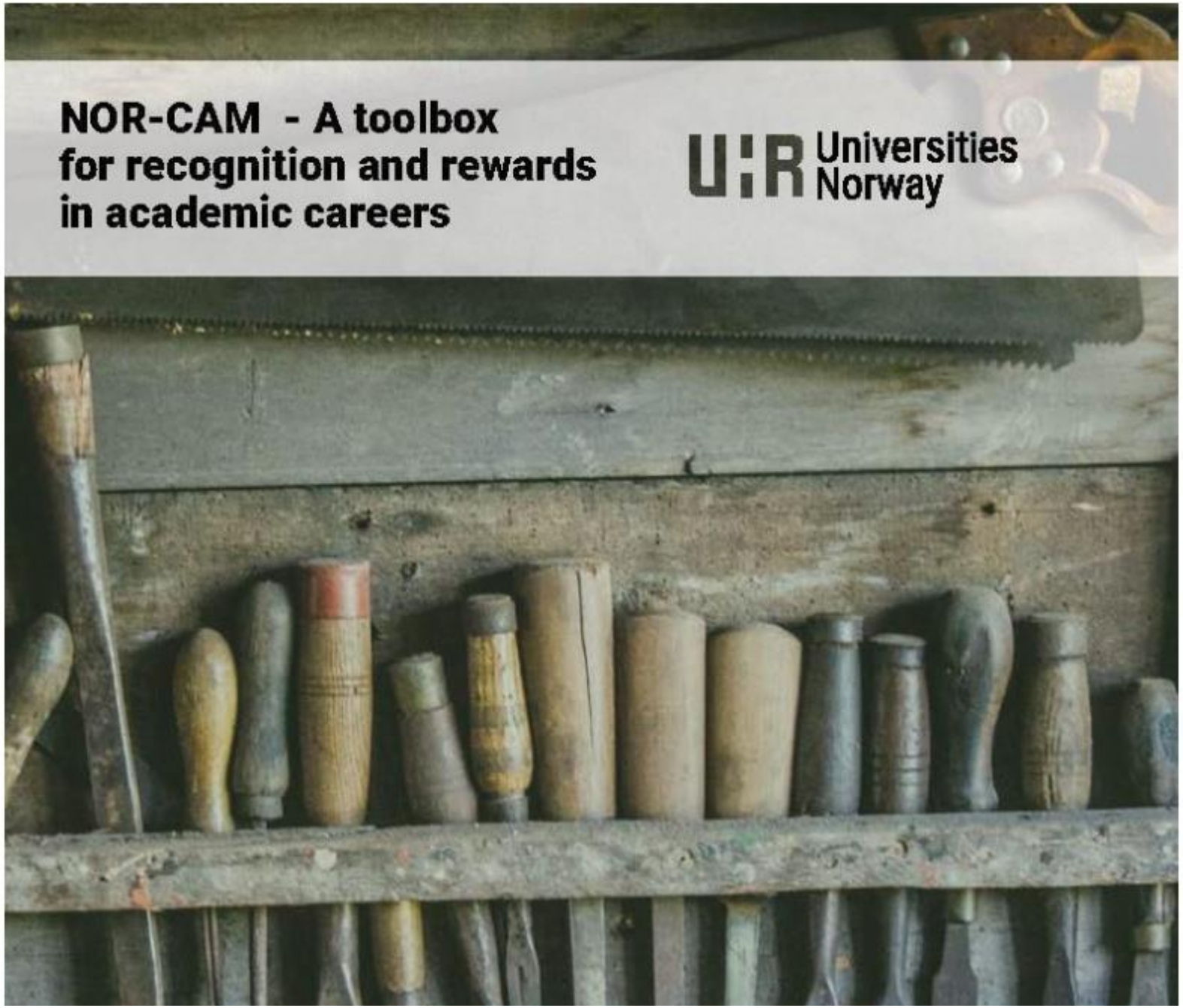
Package of Measures to Support a Shift in the Culture of Research Assessment

DFG changes proposal forms and introduces mandatory CV template / The aim is to support a shift in the culture of research assessment / Improvement of equal opportunity practices

"…CV can therefore now list up to ten further sets of research outcomes and findings that have been publicised in a variety of other ways, including articles on **preprint** servers, **datasets** or **software packages**"

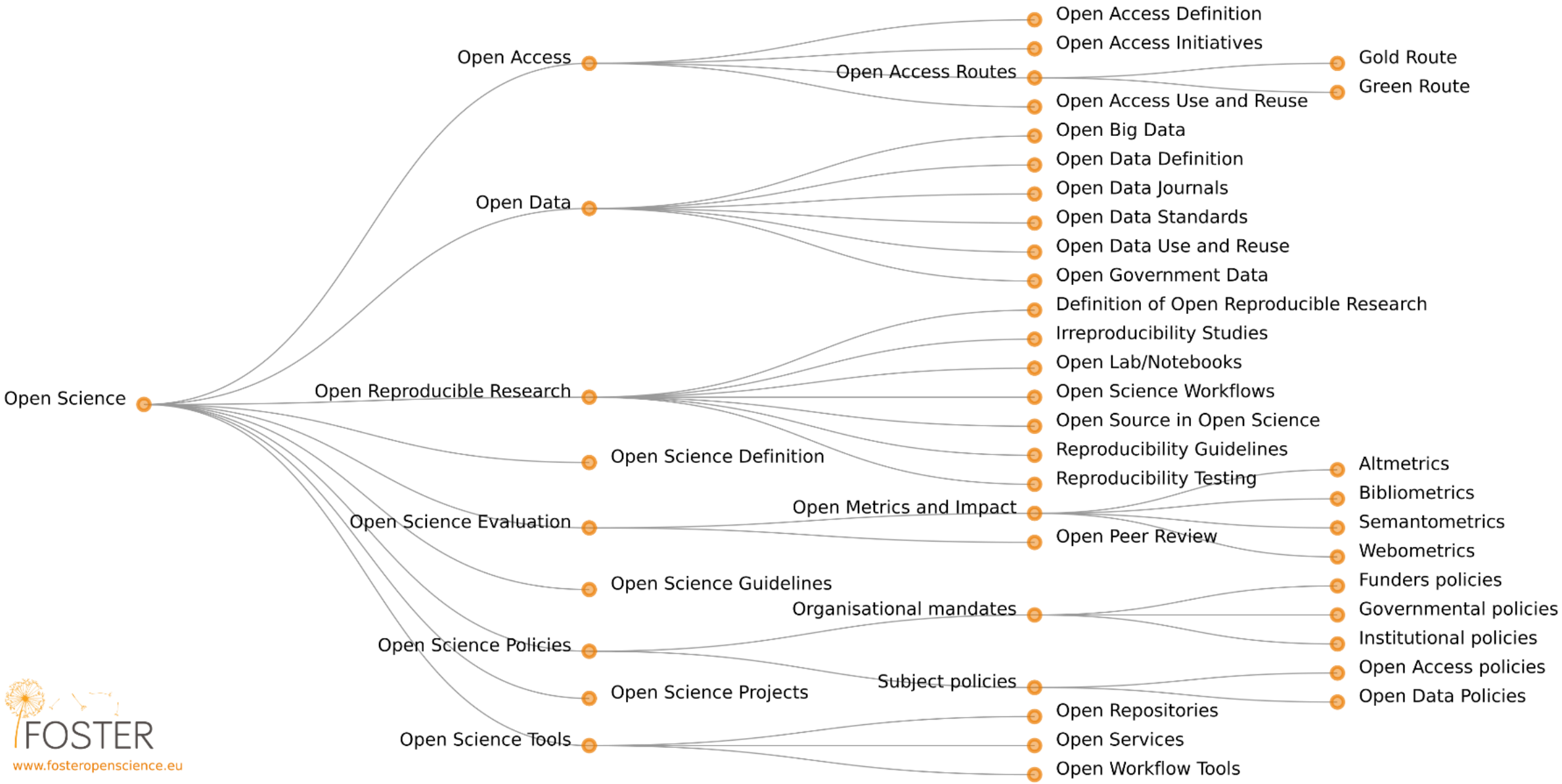
https://www.dfg.de/en/research_funding/announcements_proposals/2022/info_wissenschaft_22_61/index.html

Changing research assessment system – in Norway



https://www.uhr.no/en/front-page-carousel/nor-cam-a-toolbox-for-recognition-and-rewards-in-academic-careers.5780.aspx

Open Science Taxonomy

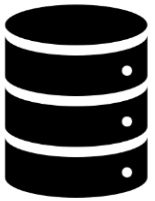


FOSTER
www.fosteropenscience.eu

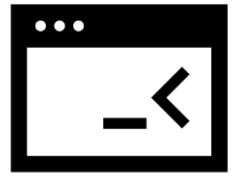
Open research plans

Open materials

Open data



Open analyses

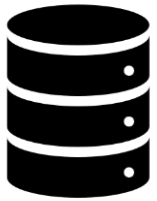


Open publishing

Open research plans

Open materials

Open data



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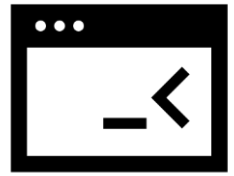

Open publishing

Open research plans: why?

- More **visibility** to research ideas and plans early in the process as well as null results
- Clearer **distinction** between what was planned and what was not planned ahead (e.g. your *post hoc* analyses)
- Reduced researcher **biases** (less data/statistics manipulation)
- You will **think more deeply** about your research design and planned analyses
- You can claim credit for your **research ideas**!

Open research plans: how?

Preregister!

Specify **research questions**, **methods**, and/or **analysis plan** prior to observing the outcomes of a study.

Typically in a form of a time-stamped, frozen document made available on an online platform.

Open research plans

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https://www.ub.uio.no/english/courses-events/courses/other/research-reproducibility/

Need help with preregistration?

Get in touch with:
digitalscholarship@ub.uio.no

Open research plans

Open materials

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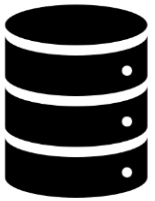

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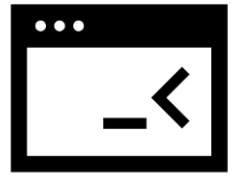

Open publishing

Open research plans

Open materials

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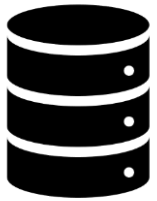

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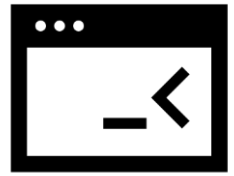

Open publishing

Open materials: why?

- Enable **re-use** of different materials used in research (and reduce resources for development of tools, instruments, stimuli, etc)
- Make it easier for others to see **how (exactly) your study looked**
- Allow for **validating** your research
- Allow for **replicating** your research by other investigators or research groups

Open materials: how?

- Make sure that the materials are not **copyrighted** (when you make them fully open)
- Provide all materials with clear, consistent **names**
- Create comprehensive **documentation**
- Provide detailed **instructions** on how to use the materials (including a **license** for reuse)

Open materials: where?

- Upload on your personal/lab/institutional website
- Upload in an online repository

zenodo

Open Science Framework

figshare

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https://zenodo.org/
https://osf.io/
https://figshare.com/

Open Educational Resources (OER)

Open Educational Resources (OER) are **learning**, **teaching** and **research materials** in any format and medium that reside in the public domain or are under copyright that have been released under an open license, that permit **no-cost access**, **re-use**, **re-purpose**, **adaptation** and **redistribution** by others.

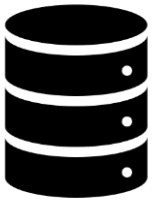
https://unesdoc.unesco.org/ark:/48223/pf0000383205

https://www.unesco.org/en/open-educational-resources

Open research plans

Open materials

Open data



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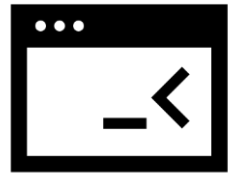

Open publishing

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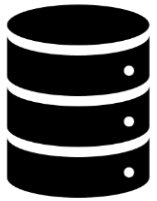

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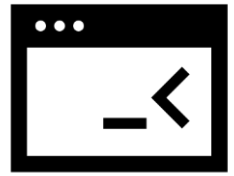
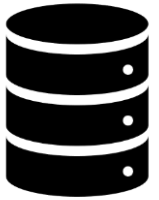


Open publishing

Open data: why?



External Factors

- Funder requirements
- Publisher requirements

Career Benefits

- Increased visibility
- More data reuse
- New collaborations
- Increased citations

Scientific Progress

- More robust research
- Enables verification of results
- Enables new collaborations across disciplines and borders
- Opens up for new uses of data
- Avoids duplication
- Easier to use data in teaching

Research Data Policy

Research data at the University of Oslo shall:

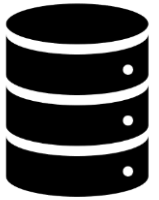
be made **openly available** for further usage
be made available at an **early stage**
have a **data management plan**
have **metadata** and be **documented**
must be securely **archived**
have **licenses** for access, reuse and redistribution made **freely available**
(but the actual distribution cost should be covered)

Source: https://www.uio.no/english/for-employees/support/research/research-data-management/policies-and-guidelines/

Open data: how?

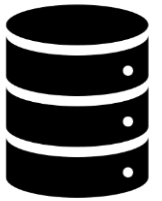
https://twitter.com/mads100tist/status/1366103674989277185

Open data: how?



- Deposit data in a reliable **data archive** (repository)
- Apply consistent, meaningful, and compatible **file naming**
- Choose accessible, patent-free, and open **file formats**
- Make sure you have the necessary **documentation** (and metadata) so that others can understand the dataset

Open data: where?



- General purpose repositories (Zenodo, OSF, Figshare)
- National or institutional repositories (DataverseNO, Sikt/NSD)
- Discipline-specific repositories
- Data papers
- Supplementary materials to an article

Research data management

Norwegian

Research data management includes, among others, data documentation, organization, licensing, sharing and archiving data. The websites are a collaborative project between the University Library, the IT department and the Department for Research and Innovation Administration. For questions, contact **research-data@uio.no**

- Data management plans (DMPs)
- Data classification and storage
- Data organization
- Data documentation and metadata
- Data sharing and publishing
- Finding and reusing data

https://www.uio.no/english/for-employees/support/research/research-data-management/

Courses in research data management and sharing

November 6th – 27th

Upcoming Courses

Data management planning

Nov. 6, 9:00 AM, Zoom

Data organization, metadata, and documentation

Nov. 8, 9:00 AM, Zoom

Data classification and storage selection

Nov. 10, 9:00 AM, Zoom

Copyright and licensing

Nov. 13, 9:00 AM, Zoom

Sharing and archiving research data

Nov. 16, 9:00 AM, Zoom

Finding and reusing research data

Nov. 17, 9:00 AM, Zoom

Upcoming Workshops

Workshop on Data Management Plans

Nov. 20, 12:00 PM, Georg Sverdrups hus: DSC-Oasen

Workshop on Data Documentation

Nov. 23, 9:00 AM, Georg Sverdrups hus: DSC-Oasen

Workshop on Archiving in DataverseNO

Nov. 27, 12:00 PM, Georg Sverdrups hus: DSC-Oasen

https://www.ub.uio.no/english/courses-events/courses/other/research-data/

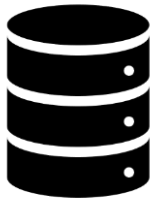
Need help with research materials or data?

Send an email to research-data@uio.no

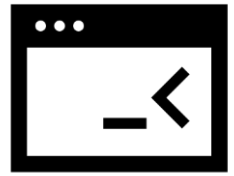
Open research plans

Open materials

Open data



Open analyses



Open publishing

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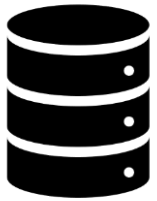

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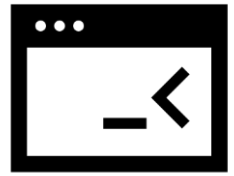
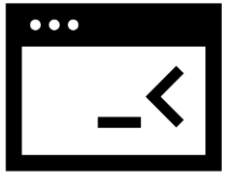


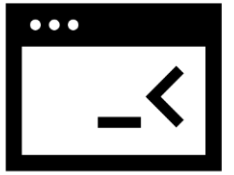
Open publishing

Open analyses: why?



- Makes it easier for you to **re-use** your analyses/code
- Makes it possible for others to **re-run** or **follow** your analyses
- …and spot mistakes (if there are any)
- …or use your workflow or code as an inspiration!
- Allows for **verification** of the results (e.g. during peer-review process)

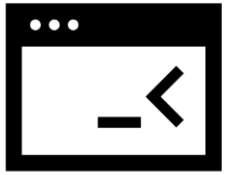
Open analyses: how?



- If you use point-and-click software (Excel, SPSS) write notes that reflect your **workflow**
- If you do qualitative analyses, take care of **annotations** and **notes** reflecting your **reasoning process**
- If you use code, **comment** it clearly
- Use **version control** system if you can (e.g. Git)
- If applicable, consider using **containers** (capture computational environment)

More on reproducible environments: https://the-turing-way.netlify.app/reproducible-research/renv.html

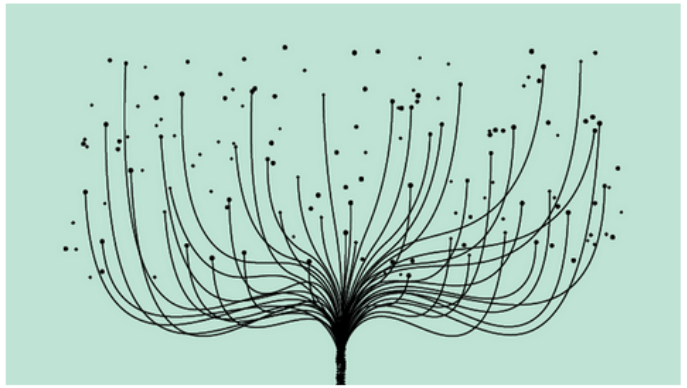
Open analyses: where?



- Share analysis workflow, code or annotations as a **text file**
- Share your analyses through **GitHub** (especially if you use Git as your version control system) or GitHub and **Zenodo** integration
- Use **shareable notebooks** (e.g. Jupyter Notebook)
- If you use containers, share a ‘frozen’ version of your code through any platform/repository you use

https://docs.github.com/en/repositories/archiving-a-github-repository/referencing-and-citing-content

Open analyses



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How to make research reproducible?

Learn about tools and practices for more reproducible and effective research.

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https://www.ub.uio.no/english/courses-events/courses/other/research-reproducibility/

Carpentry@UiO

Carpentry@UiO is a community of people who are passionate about learning, teaching, and sharing best practices and digital skills for making the research process more reproducible and effective. If you want to get involved, or join one of our workshops, check us out!

UNIVERSITETET I OSLO | THE CARPENTRIES | DATA CARPENTRY | software carpentry | library carpentry

The Unix Shell

Shell speeds up repetitive and tedious processes. It is also essential skills needed to use high-performance computing (HPC) resources.

Version Control with Git

Git helps you to keep track of what you've done, for a better collaboration and for yourself in future. In the workshop we use GitHub as well.

Programming in Python

Python is now widely used in scientific computing with various powerful packages. Carpentry@UiO runs workshops for participants with no programming experience ("Plotting and Programming in Python" lesson) and for participants at intermediate level ("Programming with Python" lesson, episodes 10-12).

R for Reproducible Scientific Analysis

R is commonly used for statistical analysis, but it is also a powerful programming language. Workshops on R focuses on teaching best practices for scientific computing: breaking down analyses into modular units, task automation, and encapsulation. Workshops on R may use lessons from Data Carpentry instead.

Using Databases and SQL

Databases include powerful tools for search and analysis, and can handle large, complex data sets. The lesson will show how to use a database to explore research data by using SQL.

https://www.ub.uio.no/english/libraries/dsc/carpentry-uio/index.html

Carpentry@UiO

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Learn, teach, and share digital skills and best practices

Be a part of an interdisciplinary community

Make use of and contribute to community-built teaching materials

https://www.ub.uio.no/english/libraries/dsc/carpentry-uio/index.html

Courses from the IT-department

Events and Courses

Introduction to R and RStudio
Sep. 19, Ole-Johan Dahls hus

Introduction to R and RStudio
Sep. 20, Ole-Johan Dahls hus

Introduction to R and RStudio
Sep. 21, Ole-Johan Dahls hus

Begynnerkurs i Stata
Oct. 10, Seminarrom Pascal i Ole-Johan Dahls hus

Begynnerkurs i Stata
Oct. 11, Seminarrom Pascal i Ole-Johan Dahls hus

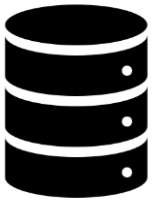
Begynnerkurs i Stata
Oct. 12, Seminarrom Pascal i Ole-Johan Dahls hus

https://www.uio.no/english/services/it/research/

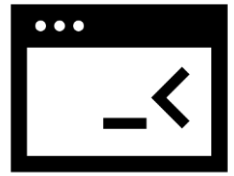
Open research plans

Open materials

Open data



Open analyses

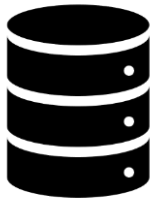


Open publishing

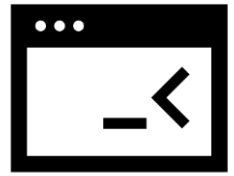
Open research plans

Open materials

Open data

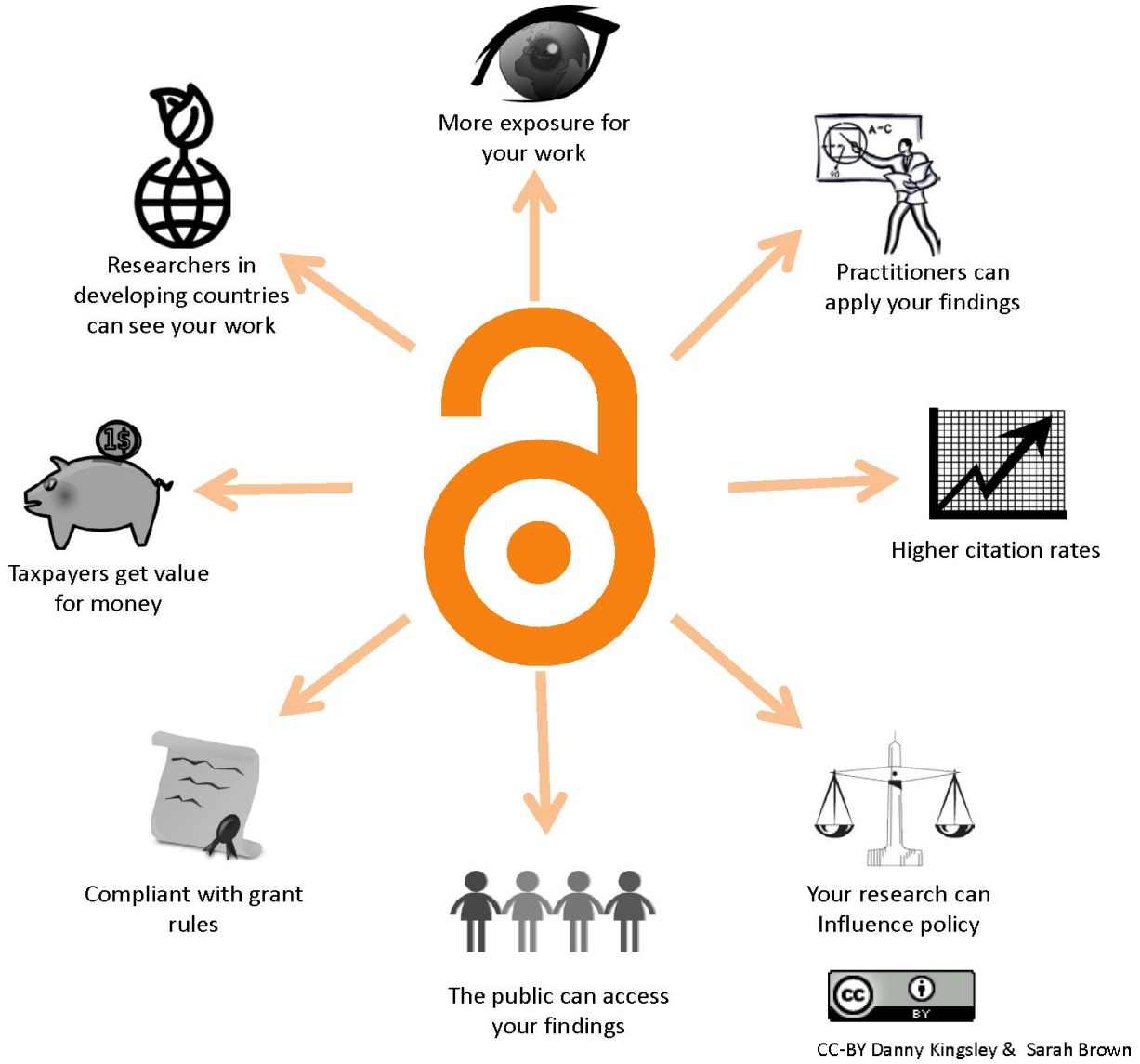


Open analyses



Open publishing

Open publishing: why?



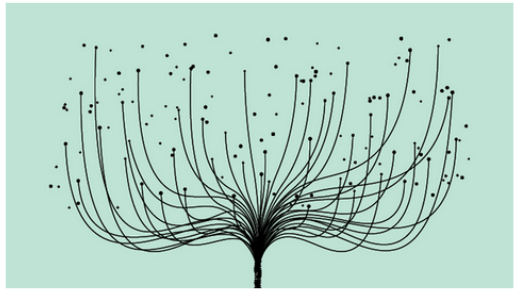
Open Access Policy

The following applies to peer-reviewed scientific articles:

1) Mandatory **institutional archiving** of all peer-reviewed articles in UiO's institutional repository
2) Making scientific articles deposited into the institutional repository **openly available**
3) Choosing where to publish: UiO recommends that all employees select **journals** that allow the article to be openly available

Source: https://www.ub.uio.no/english/writing-publishing/open-access/documents/index.html

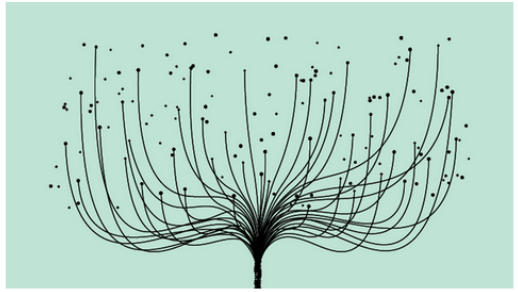
Open publishing



Time and place: Sep. 18, 2023 10:00 AM – 11:30 AM, Zoom

How to publish openly?

Learn about preprints, peer-review process, Open Access and how can you choose the best way to publish your results openly.



Time and place: Sep. 20, 2023 10:00 AM – 11:30 AM, Zoom

How to make research more visible?

Learn about different tools, platforms and services to share your research and other contributions, and how you utilise them to make yourself and your work more visible to the academic community and the society at large.

https://www.ub.uio.no/english/courses-events/courses/other/research-reproducibility/

Open Access

Norwegian version of this page

Open Access

- Self-archiving
- Plan S
- Publishing deals and discounts
- Publish Open Access

It is the University of Oslo's goal that research results shall be openly available to individuals, the public sector, trade and industry, and the global research community.

Publishing Open Access? →

How do I publish Open Access, and how do I avoid fraud?

Requirements for Open Access →

Open Access requirements from University of Oslo, Plan S / Research Council of Norway, EU and the Government.

Open Access-agreements →

UiOs deals and discounts for Open Access publishing.

Research Data Management →

The UiO policy and guidelines. Help and advice on managing research data.

Self-archiving →

How to self-archive in DUO research archive via Cristin. Information on self archiving and other archives.

About Open Access →

What is Open Access? Which advantages does it give you? The paths to Open Access.

Need help with open access?

Send an email to openaccess@ub.uio.no

Open research plans

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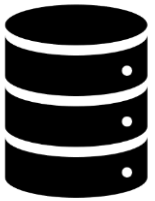
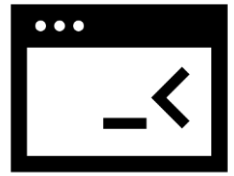


Open analyses

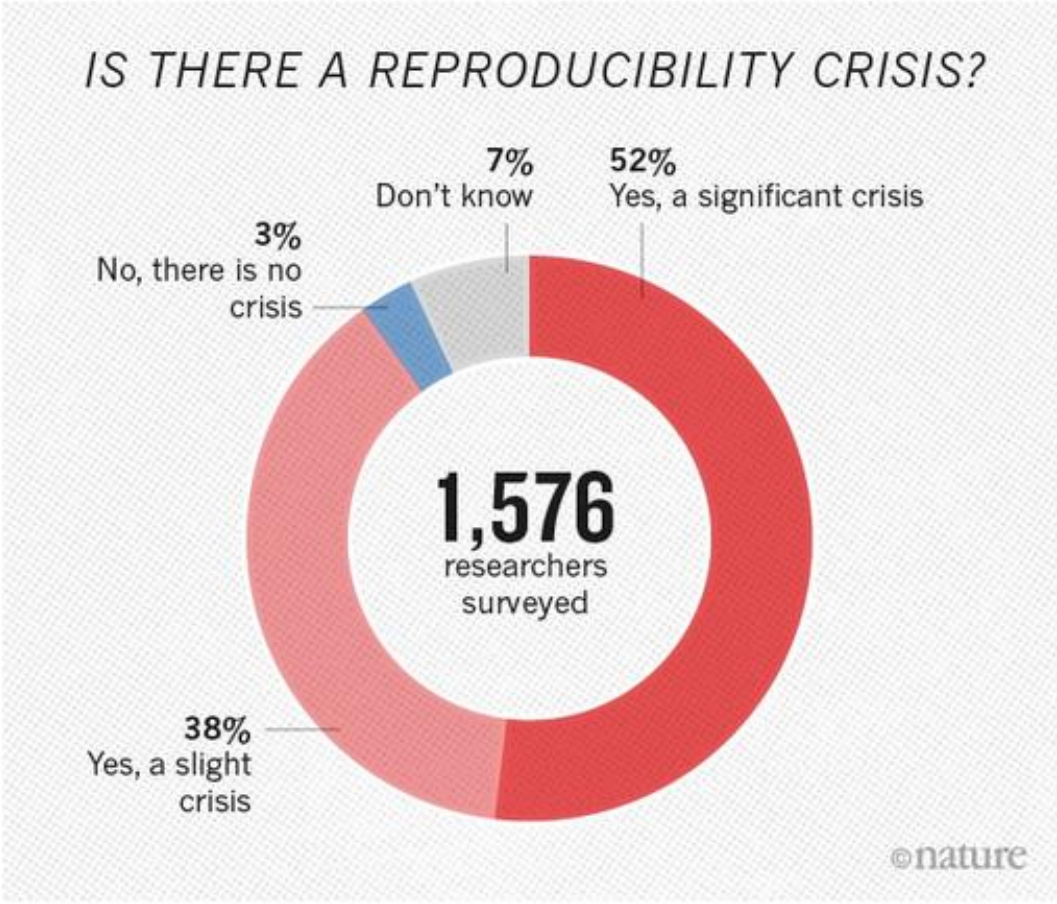


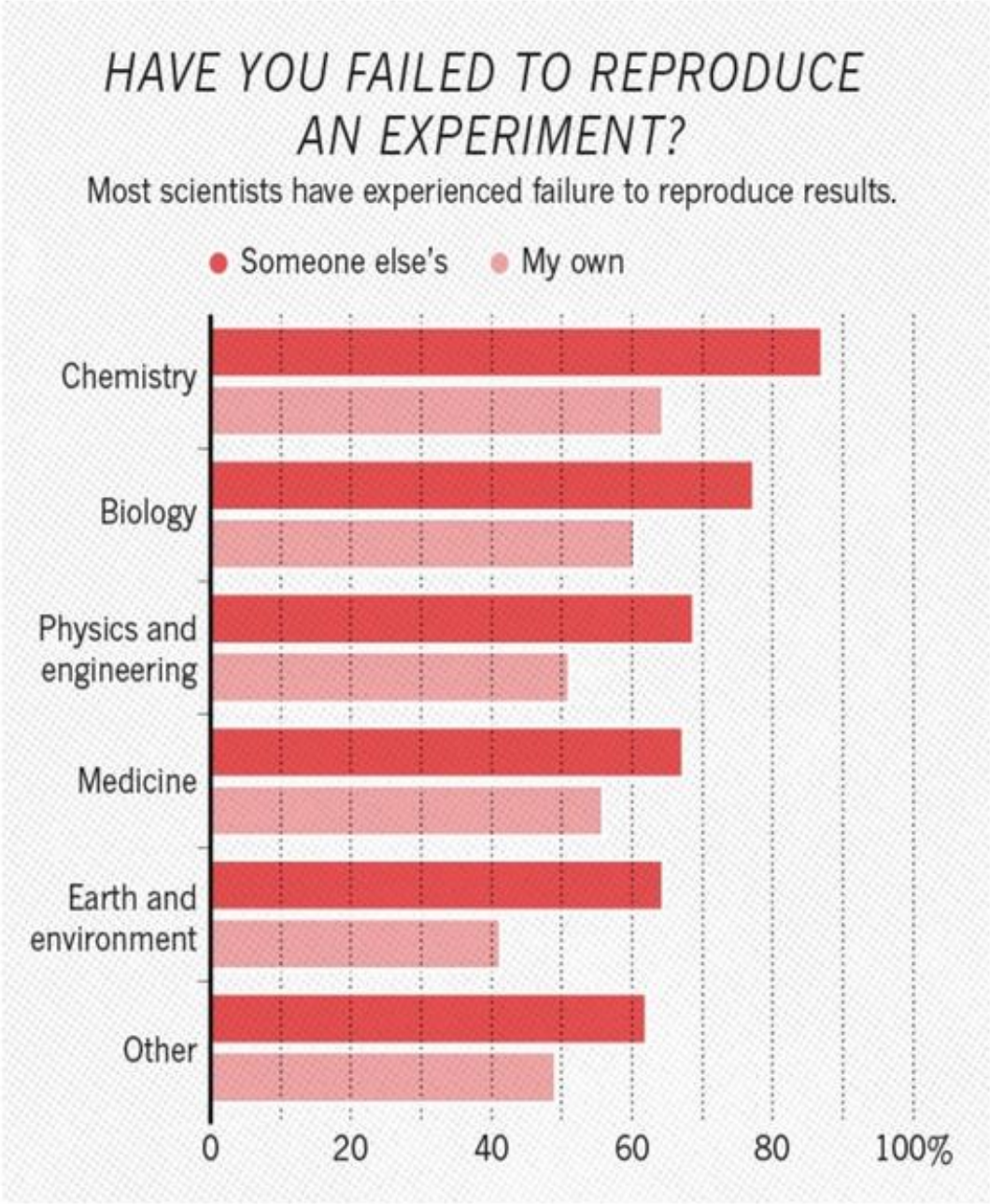
Open publishing

Open methods, data and analyses are essential for reproducibility

Reproducibility means obtaining identical results with the same data

Replication means obtaining similar results with new data





https://www.nature.com/articles/533452a

What can be done?

- Be **transparent** about your research plans, methods, procedures, and analyses (e.g. by preregistering your studies)
- Share the exact research **materials** you use (if you can)
- Share **data** (ideally raw data if you can)
- Make sure you have good **documentation** for all stages of your research process: methods, data, analyses/code
- **Verify** your own work: try to repeat and reproduce your own results (or have others do it)

Reproducible does not (have to) mean fully **open**

As open as possible, as closed as necessary

Menu

← Libraries and centres

https://www.ub.uio.no/english/libraries/dsc/

Norwegian version of this page

Digital Scholarship Centre

At the Digital Scholarship Centre (DSC) you get guidance on how you can make the best possible use of digital tools and methods in your research and communication activities.

Open Access →

Information about open access publishing, publisher agreements, self-archiving, requirements, and guidelines.

Open and reproducible research →

Make your research more transparent and reproducible.

Research Data Management →

Managing your data both during and after a research project.

Text-mining →

Information about digital tools for searching, mining, and analysing textual data.

Systematic search →

Information about systematic literature searching, how to get started, and how to get help.

Visualisation →

Use of visual methods to explore, communicate and understand data.

Carpentry@UiO →

Offers workshops in foundational digital skills such as coding and data management.

Reference management →

Styles, tools, and information on reference management.

Open and reproducible research

Norwegian version of this page

Open research

Research methods

workshop-bilder

Learn about how to make your research more open and reproducible and get involved in initiatives and communities that are interested in sharing and improving research at UiO.

More and more researchers and students across disciplines are implementing open research practices, preregistering their hypotheses, methods, and analysis plans and sharing research materials, data and analysis scripts. Digital Scholarship Center can help you learn about and implement these practices in your own research as well as advise on the policies and requirements from funders.

Open Science Lunch →

Every last Thursday of the month we meet at noon to discuss topics related to open research.

ReproducibiliTea@UiO →

Join us for a Journal Club where we read and discuss papers on open research and meta-science.

Norwegian Reproducibility Network →

Join a broader community that aims to promote and enable rigorous, robust and transparent research practices in Norway

Courses and workshops →

Click here for the list of upcoming and previous courses and workshops on open and reproducible research at UiO.

Open Science Lunch

Each last Thursday of the month at 12:00 we invite you to join us for a lunch seminar to hear about how to make your research more open. We will discuss research transparency and visibility, open publishing, data sharing, and more!

Upcoming

Time and place: Sep. 28, 2023 12:00 PM – 1:00 PM, Zoom

Citizen science: science for everyone?

Join us for the Open Science Lunch to hear about the challenges and opportunities of data provided by the public in research.

https://www.ub.uio.no/english/courses-events/events/open-science-lunch/

UNIVERSITETET
I OSLO

ReproducibiliTea

Journal Club

JOIN IN AND DISCUSS WITH FELLOW STUDENTS AND RESEARCHERS

OPEN RESEARCH, REPRODUCIBILITY and RESEARCH IMPROVEMENT

Join us

Everyone is welcome to join us - whether you are an enthusiast of open and reproducible research, a skeptic, or a cautious explorer. Currently, all meetings are hybrid with the possibility of joining on-site at Blindern or via Zoom. Grab a cup of tea (coffee?) and join us!

Subscribe to our mailing list →

https://www.ub.uio.no/english/libraries/dsc/open-repro-research/reproducibilitea/

Menu

← Libraries and centres

https://www.ub.uio.no/english/libraries/dsc/

Norwegian version of this page

Digital Scholarship Centre

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https://sympa.uio.no/ub.uio.no/subscribe/dsc-news/subscribe

Thank you!

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- Share **data** (ideally raw data if you can)
- Make sure you have good **documentation** for all stages of the research process: methods, data, analyses/code
- **Verify** your own work: try to repeat and reproduce your own results (or have others do it)

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