

Title: Open Science to Scientific Research

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Introduction (*Nancy Pontika*)

Recently, we are experiencing a new trend, where research stakeholders ask researchers to open up not only their scientific outputs, such as journal articles, but also all the procedures with regards to research, like data and lab notes. Among the research stakeholders, funders are primarily the driving forces behind this new and evolved type of scholarly communication, called open science, which promotes the open dissemination and accessibility of the research outputs.

Another recent trend is that funders would like to see more and more the level of influence that the research they fund brings to the society and researchers need to make efforts to provide evidence of that influence. Open science is the movement where those mechanisms and strategies can be developed to assist researchers in accomplishing this goal. The benefits of applying open science can be tremendous not only for researchers and their affiliated institutions, but also for the society.

(Slide 2: course structure)

In this course we will explain what is open science, which elements of the research lifecycle it affects, how it can be achieved and what researchers need to do to apply open science successfully.

What is Open Science (*Ivo Grigorov*)

(Slide 3: Open Science is an umbrella term)

There are many definitions for Open Science, some are simple, others more elaborate. Whatever the case, there are two commonalities to remember:

(Slide 4: Research Life Cycle)

First, the Open Science consists of ideas relate to openness of each step of the Research Lifecycle:

- (a) **Open Notebook** is an emerging practice about documenting and sharing the experimental process of trial and error;
- (b) **Open Data** refers to managing research data in a way that optimises access, discoverability and sharing for use and re-use;

(c) **Open Research Software** is about documenting your research code and routines, again freely accessible and available for collaboration;

(d) **Open Access**, is about making all your published output freely accessible for maximum use and impact.

The second point to keep in mind, is that in order to accomplish open science there are some basic rules.

(Slide 5: Rules)

(a) **publicly available**: it is difficult to benefit and use knowledge hidden behind username and password barriers, or if it does not contain the right metadata to make it discoverable.

(b) **reusable**: meaning that the research outputs files must be licensed accordingly so that prospective users know clearly the limit to re-use.

(c) sharing should **induce collaboration** between researchers through better access and better online tools;

(d) last, **transparency and the right metadata** will provide clear instructions on how your research output was produced, and can be re-used.

Open Science benefits researchers, institutions, funders and the public *(Nancy Pontika)*

Open Science benefits equally all research stakeholders:

First of all, with regards to **Researchers**:

(Slide 6: FULL SCREEN)

Open science increases the visibility of the researcher's profile. Studies have concluded that open access content attracts higher citations than content behind access barriers. In addition, the open provision of research data and lab notebooks increases the active participation of the research community and speeds up the dissemination and conduction of new research. Now, by combining and linking all the research outputs together, researchers can create a complete profile of their work, which is not limited to peer-reviewed research publications only, but extends to the rest of the research related components. That way researchers can create a strong case not only about the research impact of their work but also the societal impact.

Institution:

(Slide 7)

The benefits for the research institutions relate to prestige and the cost savings for conducting research. With regards to the first, institutions that promote a strong open access agenda not only gain the funders' attention, but they can also act as good examples and lead among other institutions that haven't adopted the implementation of an open science strategy. There is also evidence that open science leads to economic benefits. For example the cost for retrieving existing knowledge is much cheaper than recreating it, while there are reduced costs that relate to staff salaries in terms of data duplication and improvement of collaboration.

Funders: *(Slide 8)*

When open science to research procedures and results is applied, funders can demonstrate adequately the return on investment and are also in position to demonstrate the societal impact of the research.

Public: *(Slide 9)*

The public gains access to important and useful publicly funded research that can be applied to improve their quality of life. They also enjoy the benefit of being aware on how taxes have been spent and they have a greater awareness of societal challenges.

How to integrate Open Science in the research workflow? *(Ivo Grigorov)*

While Conducting Research, there a number of ready, off-the-shelf tools to assist researchers to share your notebooks, when and IF you choose, manage and archive your data, and document versions of your research software, all in the interest of multiplying your collaborations.

Regardless of which tool you choose, here are the basic features you are looking for.

(Slide 10)

A digital object identifier (DOI) is key for the discoverability of your electronic documents. In addition, the metadata that accompanies your document, should be as as rich as possible. Last but not least, the e-infrastructure should be offer long-term archiving.

Once you are ready Publish your Research:

(Slide 11: full screen)

Dissemination can be optimised through one of the two open access routes: open access journals, or if none exist in your discipline, through open access repositories. Currently, most academic institutions have open repositories, while there are subject repositories in pretty much every subject field.

In addition, new peer-reviewed journals specifically focus on data and research software publications, thus potentially tripling your publication output for the same research effort.

To optimise impact, researchers aim for quality research that is independently verifiable and reproducible. Young researchers can really capitalise on Open Science practices to expose the full value of their work. An open research workflow is also more compatible with more sophisticated communication and outreach strategies, and social networking and media tools, that raise public awareness.

Conclusion (Nancy Pontika)

(Slide 12)

Open Science is about opening up the research process to multiply collaborations, as well as empowering knowledge transfer between academia and society.

This new era in the scholarly communication calls for researchers to capitalise on OPEN and Virtual Research Environments. The benefits span from optimising your research impact, to setting you up for the evolution of the current research assessment criteria away from just the Impact Factor towards Societal Impact.

(Slide 13: FULL SCREEN)

Ultimately, your Open Science can help you place your efforts in societal context, it empowers co-creation between academia and society, and speeds up innovation.

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