

## Open Science training and education: challenges and difficulties on the researchers' side and in public engagement

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Stefania Arabito and Nico Pitrelli

### Abstract

Open Science may become the next scientific revolution, but still lingers in a pre-paradigmatic phase, characterised by the lack of established definitions and domains. Certainly, Open Science requires a new vision of the way to produce and share scientific knowledge, as well as new skills. Therefore, education plays a crucial role in supporting this cultural change along the path of science. This is the basic principle inspiring the collection of essays published in this issue of JCOM, which deals with many subjects ranging from open access to the public engagement in scientific research, from open data to the social function of preprint servers for the physicians' community. These are issues that go along with the targets of the FOSTER project (*Facilitate Open Science Training for European Research*) funded by the European Union, which has provided interesting food for thought in order to write this commentary.

### Keywords

Scholarly communication

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"Transition towards Open Science is a complex cultural change" [Bartling and Friesike, 2014]. This is what scientists and activists Sonke Bartling and Sascha Friesike wrote about one year ago in their essay published in the book *Opening Science*, of which they also are co-editors.

We totally agree with such statement. Actually, we would add that the shift to something that some even define as 'the next scientific revolution' cannot be taken for granted. There is nothing necessary or teleological in the transition to open science: it is only one among several possible evolutions of the methods to produce scientific knowledge in the digital era, which may turn into reality only through the combination of multiple factors, and the outcome of which is very likely to be different from what is anticipated today [cf. Delfanti and Pitrelli, 2015].

Certainly, the web enables latent epistemologies and unveils knowledge production dynamics that have been marginalised, if not hidden by the century-old predominance of paper supports [cf. Weinberger, 2012]. However, at the same time, it opens up counter-intuitive scientific collaboration and validation scenarios, threatens well-established academic and editorial power structures, requires new technical and relational skills. For example, think of the patent-related constraints

when information is put at everyone's disposal; the authorship issues connected to the results of research within a scenario where taking part in a wiki project or commenting on a blog means contributing some knowledge; the resistance from global scientific publishers to publishing systems that favour direct interaction among researchers.

As previously demonstrated by the invention of the printing press, a long time will have to pass before a new balanced communication configuration is found and translated into a shared system for the exchange of scientific information and the distribution of the experts' reputation.

In the meantime, we cannot do anything but live the turbulent yet exciting time of transition, which — in the case of Open science — is demonstrated by the impossibility to find general consensus on its definition [cf. Fecher and Friesike, 2014]. This kind of uncertainty actually mirrors the features of the disciplines in search of stabilisation, in a phase that can be termed 'pre-paradigmatic' according to the language used by science philosopher Thomas Kuhn.

The reference to Kuhn's lexicon is only meant to provide an analogy that we wanted to make as it points right to the cornerstone of this collection of essays on Open Science: the centrality of education. It is not by chance that a discipline or school of thought, to be scientifically solid and to be recognised as such and overcome the instability phase, must have a significant presence in teaching and research in the higher education sector [cf. Trench and Bucchi, 2010].

The essays published in this issue, without claiming to be systematic, provide a broad spectrum "awareness-raising platform" on the issue. For example, Ann Grand, in her contribution characterised by an effective historical contextualisation dwells on the relation with the experiences of public engagement in scientific research. In a salient point, she underlines the mutual need — not only of scientists, but also of citizens — to develop new skills in accessing, interpreting, and comprehending the growing flow of data of modern science.

Data, their handling and open sharing within scientific institutions is also the subject chosen by Ignasi Labastida, who proposes a set of actions to draw up joint management plans for the information coming from laboratories. The education initiatives addressed to researchers, librarians, technological transfer technicians and other stakeholders play a central role.

Nancy Pontika shifts the attention to Open Access, especially talking to fledgling researchers starting their career, to whom she provides resources and suggestions to grasp the opportunities offered by open access to scientific literature, as well as to become supporters of the open access cause, and to defeat cultural resistance to its adoption.

The collection is closed by Alessandro Delfanti, who focuses on the social functions of open-access archives of preprints, i.e. research papers shared even before the submission to peer-review journals. In particular, Delfanti refers to particle physics. His essay shows the fundamental role played by such open-access preprint archives in educating and building a sense of belonging to the community. The open-access approach is not only a way to do science, but also and above all a

distinctive feature to be accepted by other particle physicists, almost as if it were an anthropologic trait.

Delfanti makes a reference to the cultural dimension of open science mentioned above, which not by chance is defined and affirmed by communication practices implicitly handed down to theoretical physicists at the outset of their research path. The challenge is to understand whether this educational model can be exported and adapted to other scientific disciplines that show more resistance to open-access instruments to share, pass on and produce knowledge.

Finally, it should be noted that the approach in this commentary draws on a seminar<sup>1</sup> organised with the contribution of the FOSTER (Facilitate Open Science Training for European Research<sup>2</sup>) project, funded for the 2014–2016 three-year term by the European Commission within the Seventh Framework Programme. A project within the scope of FOSTER has implemented an open-access web portal that indexes, collects and disseminates quality information and teaching resources from external resources, as well as the materials produced in an array of events (seminars, lectures, webinars, e-learning courses) funded by the project and addressed to all the stakeholders, with a special focus on younger researchers and trainees. FOSTER promotes a systematic approach to the discipline through an extended taxonomy and a focus on all the aspects concerning the life cycle of research. The final goal is to provide researchers with the cognitive instruments and the practices required to adopt Open Science as a work methodology, in compliance with the European targets on *Responsible Research & Innovation*.

*Translated by Massimo Caregnato*

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<sup>1</sup><https://www.fosteropenscience.eu/event/empowering-graduate-students-science-dissemination-and-science-communication-“-open”>.

<sup>2</sup><https://www.fosteropenscience.eu/>.

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## How to cite

Arabito, S. and Pitrelli, N. (2015). 'Open Science training and education: challenges and difficulties on the researchers' side and in public engagement'. *JCOM* 14 (04), C01\_en.



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ISSN 1824 – 2049. Published by SISSA Medialab. <http://jcom.sissa.it/>.