



Deliverable 4.4

Final report on the training work package



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Contents

Executive summary 3

Report on the training work package 4

Introduction 4

Objectives 4

Gap Analysis 4

Training Activities: Optimised offline and online trainings 7

Podcast 19

The ORION MOOC for Open Science in the Life Sciences 26

ORION Open Science Train-the-Trainer MOOC 27

Open Educational Resources (OER) on Responsible Research and Innovation 31

Evaluation and Feedback 32

Conclusions & Lessons Learned 34



Executive summary

In moving towards Open Science, training plays a crucial role in advancing the skills of the multipliers who practice and make Open Science a reality. The trainings in Open Science and RRI carried out by the ORION project targeted primarily researchers (PhD students and postdocs) and secondarily research managers, researcher funders and project coordinators. The aim of the ORION trainings are to raise awareness about the topic of Open Science and establish the necessity and benefits of a transparent and accessible research cycle.

In total we delivered 40 online and offline Open Science trainings in 15 countries and reached over 500 people. Additionally, the ORION Open Science Podcast produced 44 episodes on topics ranging from Open Science career pathways to pre-prints and public engagement, to date with over 7.000 downloads by an audience from all over the world.

We concluded the work, by organizing a train-the-trainer workshop in 2020, to further the reach. All our resources are published under creative commons licences and are stored in publicly accessible databases. The results of the gap analysis conducted at the start of the project, are currently being updated with the data for 2020/21 and will be scholarly published soon.



Report on the training work package

Introduction

In moving towards Open Science, training plays a crucial role in advancing the skills of the multipliers who practice and make Open Science a reality. The trainings in Open Science and RRI carried out by WP4 targeted primarily researchers (PhD students and postdocs) and secondarily research managers, researcher funders and project coordinators. The aim of the trainings was to raise awareness about the topic of Open Science and establish the necessity and benefits of a transparent and accessible research cycle. The training activities were designed to give the participants the needed information and to be able to put it into action. A focus was set on supporting participants to develop their own position and opinion and to plan which specific steps they can individually take in adopting Open Science practices.

This final report sums up all of the training activities conducted over the course of the ORION project to train in Open Science and RRI. The following activities are presented:

1. Gap Analysis from 2018 to assess the current state of training in Open Science
2. Workshops and training events across Europe (online & offline)
3. The ORION Open Science Podcast
4. ORION MOOC for Open Science in the Life Science (live & self-paced)
5. The ORION 'Train-the-Trainer' course (live & self-paced)
6. Open Educational Resources

Objectives

D4.4 Report on the training work package (M48)

Gap Analysis

In understanding what the current state of training in Open Science was, in 2018 MDC carried out a program analysis of the transferable and soft skills training courses from the



EU-LIFE institutes, as a case study¹. The gap analysis showed a real necessity for Open Science training. The analysis of the educational programs from the EU-LIFE alliance, an alliance of flagship institutes conducting biomedical and life-science research, showed that just over half of the institutes offered training courses with Open Science content (e.g. Open Access, Open Data, Collaborative Tools, Public Engagement). In total, over 200 courses were reported, of those 200, 20 of them taught some aspect of Open Science as shown in Figure 1. As depicted in Figure 2 one can see that almost half of the 20 courses belong to one institute, the Centre for Genomic Regulation (CRG), the coordinator of the ORION Open Science project and member of the FOSTER project. Both European funded projects aim to further Open Science through training. Looking closer at the specific courses offered with Open Science content one can see that from all of the courses, only three covered Open Access; one Open Data; while 8 courses were on communicating science to a lay audience or public engagement; and six courses were dedicated to the topic of Open Science. The three institutes that offer training in Open Science are members of the ORION project.

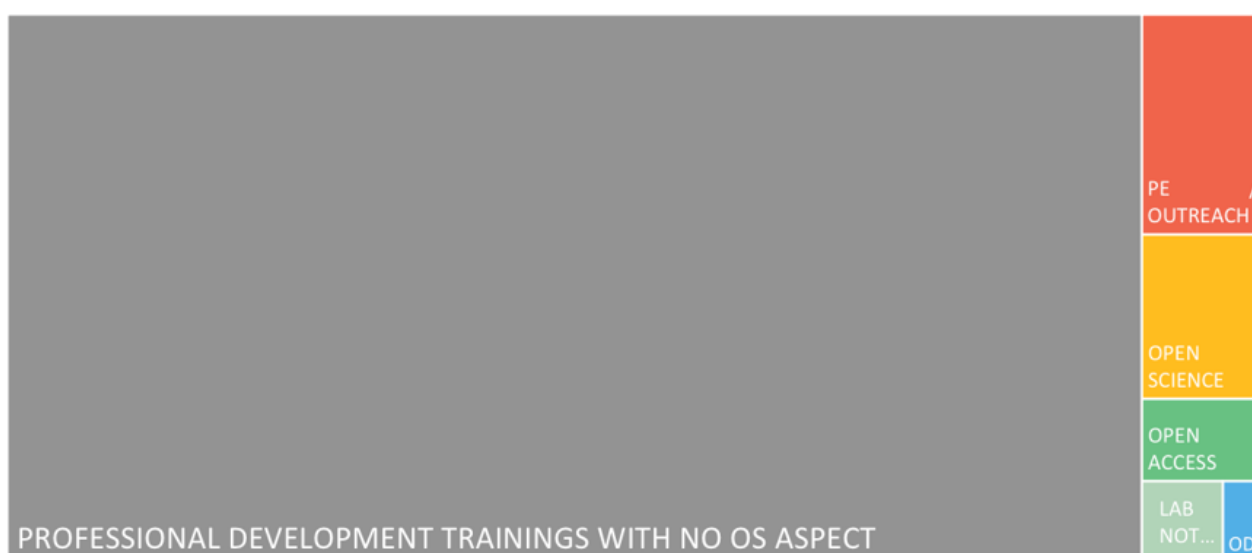


Figure 1 EU-LIFE Trainings 2018 Open Science Courses vs. Non-Open Science Courses (N=207, n=20)

¹A program analyse is a method of adult education studies and can be understood as a social science method of content analysis or document analysis that can be compared with curriculum research in school research. The self-reported data was collected for the courses offered from January to November in 2018.



Open Science Trainings (n=20) in EU-LIFE Institutes

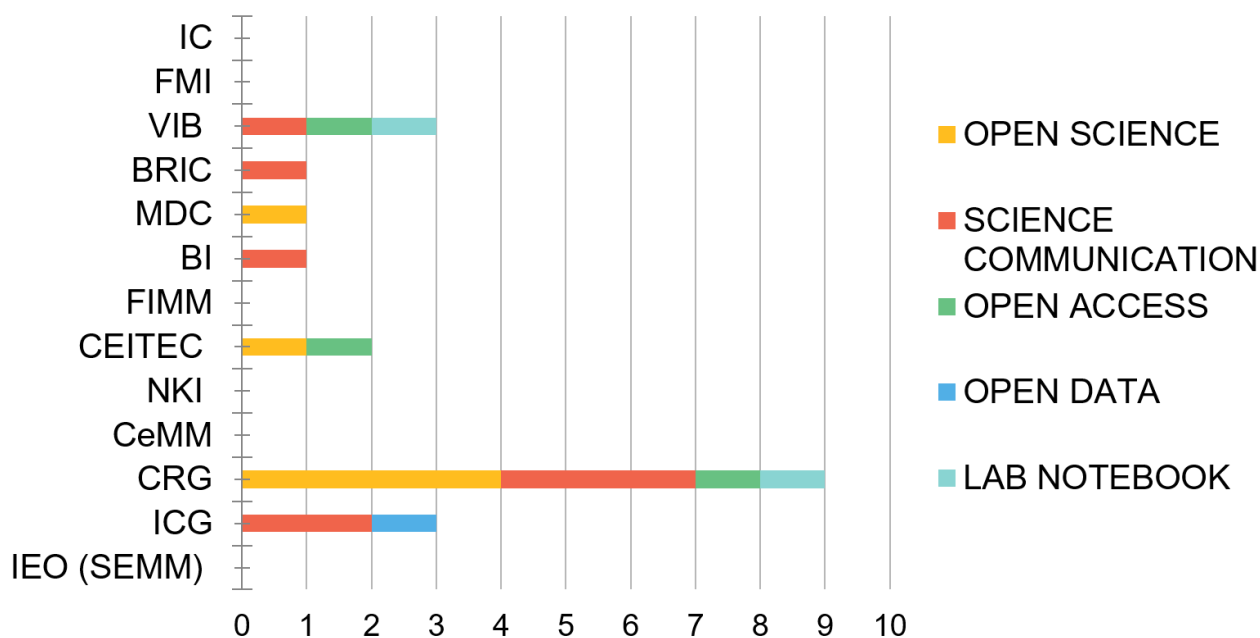


Figure 2 Overview of 2018 Trainings in EU-LIFE Institutes with an Open Science Content

These findings show that neither introductory courses nor courses with specific skills needed to practice Open Science are firmly embedded and part of the core set of doctoral training in this case. If Open Science should be pushed forward through training, then there is a need for more training to be organized and offered to researchers. To read more about the gap analysis, see the report [D4.1 Optimised Offline and Online Trainings²](https://www.orion-openscience.eu/public/2020-04/ORION_D4.1-optimised%20online%20and%20offline%20trainings_v2.1.pdf). This analysis was done in 2018. The numbers of Open Science courses would have been higher if it would have been carried out in 2019, due to the ORION Open Science trainings delivered throughout Europe also carried out in a few of the EU-LIFE institutes.

²https://www.orion-openscience.eu/public/2020-04/ORION_D4.1-optimised%20online%20and%20offline%20trainings_v2.1.pdf

Training Activities: Optimised offline and online trainings

WP 4 delivered in total 40 online and offline Open Science trainings in 15 countries as illustrated in Figure 3. Of those workshops, 8 were full-day workshops, 4 half-day workshops and 28 talks and sessions running under 3 hours. Table 1 lists all of the offline and online trainings delivered from January 2019 until April 2021, their duration and the target group they were developed for and delivered to.



Figure 3 ORION Training workshops in Europe 15 different countries from 2019-2021 - Image created with mapchart.net



Table 1: All Workshops and Training Events

Date	Location	Stakeholders	Event	Content	Duration
25.01.2018	Maple House, Birmingham, UK	<ul style="list-style-type: none"> • Policy Makers • Education Community 	'Preparing Researchers for an Unknown Future: Cultures, Behaviours & Mindsets' Vitae Symposium	<i>Opening Minds, Changing Habits</i> , Talk	60 mins
18-20.04.2018	CRG, Barcelona, ES	<ul style="list-style-type: none"> • Researchers 	FOSTER Bootcamp	Attended	3 days
27.04.2018	Aula der Wissenschaften, Vienna, AU	<ul style="list-style-type: none"> • Project Coordinators • Researchers • Education Community 	2nd HEIRRI Conference: Education towards a responsible society, transforming universities through RRI	x6 'Speed Talks' on ORION Open Science Training	60 mins
03.05.2018	STATION, Berlin, DE	<ul style="list-style-type: none"> • Citizens • Researchers 	Re:publica Session	<i>Doctor, Doctor, Where is my Digital Diagnosis?</i> Citizen Science Interactive Workshop with MDC Scientists and Citizens	90mins
30.05.2018	Corvinus Business School, Budapest, HU	<ul style="list-style-type: none"> • Project Coordinators • Researchers • Education Community 	Living Knowledge Conference	<i>How does Open Science benefit researchers?</i> Interactive Workshop	60 mins
05.06.2018	Maison Communale de Plainpalais, Geneva, SW	<ul style="list-style-type: none"> • Project Coordinators • Researchers • Education Community 	ECSA, European Citizen Science Association Conference 2018	<i>Swipe right for Open Science: How to create the perfect match for Citizen Science?</i> Interactive dialogue session	90 mins
18.06.2018	ISCIII, Madrid, ES	<ul style="list-style-type: none"> • Funders • Research Managers 	Pilot Researcher Workshop	<i>Open Science and the Funding Management Process</i>	Full-Day
12.07.2018	Esplanade Compans Caffarelli, Toulouse, FR	<ul style="list-style-type: none"> • Researchers 	ESOF 2018 Toulouse	<i>Does Open Science Improve Your Career Prospects?</i>	90 mins
14.07.2018	Charite, Berlin, DE	<ul style="list-style-type: none"> • Researchers 	Early Career Scientist Forum on GPCR Signal Transduction (ECSF-GPCR)	<i>Introduction to Open Science</i> Seminar	60 mins
27-	MDC, Berlin, DE	<ul style="list-style-type: none"> • Researchers 	MDC PhD Retreat	<i>Open Science and</i>	120 mins



29.09.2018				<i>Podcasting</i>	
11-12. 10.2018	University of Valletta, MT	<ul style="list-style-type: none"> • Project Coordinators • Researchers • Education Community 	4th NUCLEUS Conference	<i>Motivate public, administrators and researcher's engagement through arts</i>	120 mins
09.10.2018	MDC, Berlin, DE	<ul style="list-style-type: none"> • Researchers 	Pilot Researcher Workshop	<i>The Benefits of Open Science For You!</i>	Full Day
28.11.2018	Online Seminar	<ul style="list-style-type: none"> • Researchers 	#ECRWednesday Online Seminar: Arts in Science Communication	<i>Hear about how science can be effectively communicated to a broader audience using arts.</i>	90 mins
29.11.2018	Vitae Online Seminar	<ul style="list-style-type: none"> • Researchers 	Online Seminar	<i>Open Science: What, Why, How?</i>	60 mins
29.11.2018	Live Twitter Open Science Q&A	<ul style="list-style-type: none"> • Researchers 	Live Twitter Q&A	<i>#vitaechat</i>	60 mins
18.01.2019	TU Braunschweig, DE	<ul style="list-style-type: none"> • Researchers 	Researcher Training Workshop	<i>Open Science and You</i>	Full Day
21.03.2019	Institut Curie, Paris, FR	<ul style="list-style-type: none"> • Researchers 	Researcher Training Workshop	Open Science and You	Full Day
25.3.2019	Technion, Nasholim, IS	<ul style="list-style-type: none"> • Researchers 	SignGene Exchange Programme, Winter School 2019	Science Communication and Storytelling Workshop	90 mins
3.4.2019	Draken Folkets Hus Gothenburg SWE	<ul style="list-style-type: none"> • Project Coordinators • Researchers • Education Community 	The Forum for Science Communication (Forum för forskningskommunikation)	When arts meet science	120 mins
3.4.2019	Draken Folkets Hus Gothenburg SWE	<ul style="list-style-type: none"> • Project Coordinators • Researchers • Education Community 	The Forum for Science Communication (Forum för forskningskommunikation)	Why should the public be engaged in science?	120 mins
08.04.2019	Univ. Pompeu Fabra, Barcelona, ES	<ul style="list-style-type: none"> • Funders • Research Managers 	Funder and Research Manager Training Workshop	Open Science and Funding	Half Day
10.04.2019	Univ. Pompeu Fabra., Barcelona, ES	<ul style="list-style-type: none"> • Researchers 	Researcher Training Workshop	Open Science and You	Half Day
2.5.2019	JCMM, Brno, CR	<ul style="list-style-type: none"> • Funders and Research Managers 	Funder and Research Manager Training Workshop	Open Science and Funding	Full Day



3.5.2019	JCMM, Brno, CR	<ul style="list-style-type: none"> • Researchers 	Researcher Training Workshop	Open Science and You	Full Day
23.05.2019	MDC, Berlin, DE	<ul style="list-style-type: none"> • Researchers 	Brain Tumor Meeting	Open Science and You Lunchtime Seminar	90 mins
01.07.2019	st. Shevchenko, Odesa, UA	<ul style="list-style-type: none"> • Researchers 	Summer School	Open Science and your research Workshop	45 mins
05.07.2019	Landesakademie für Jugendbildung, Weil der Stadt, DE	<ul style="list-style-type: none"> • Researchers 	Helmholtz Graduate School of the German Cancer Research Center (DKFZ) PhD Retreat	Open Science and your research Workshop	120 mins
14.07.2019	Alfândega Congress center, Porto, PL	<ul style="list-style-type: none"> • Researchers 	The XIV European Meeting on Glial Cells in Health and Disease conference	Open Science and You Lunchtime Seminar	90 mins
28.08.2019	MDC, Berlin, DE	<ul style="list-style-type: none"> • Researchers 	MDC PhD Retreat	Open Science MOOC Focus Group and Beta Testing	90 mins
3.9.2019	Live Chat Online Seminar	<ul style="list-style-type: none"> • Funders and research managers 	Live Chat Online Lecture	Let's Talk: What Open Science Means for Funders and Research Managers	90 mins
16.09.2019	Alfândega Congress center, Porto, PL	<ul style="list-style-type: none"> • Project Coordinators • Researchers • Education Community 	Open Science Fair 2019	Lessons Learned From A Year Of European Open Science Training (ORION Project) Interactive Workshop	120 mins
11.10.19	BI, Cambridge, UK	<ul style="list-style-type: none"> • Researchers • Project Coordinators 	Open Science Training Workshop	Open Science and Research	Half Day
08.10.19	Stockholm, SWE	<ul style="list-style-type: none"> • Researchers, Funders, Communicators 	Open Science Training Workshop	Open Science - What's in it for me?	Full Day
11.10.19	Copenhagen, DEN	<ul style="list-style-type: none"> • Researchers 	Open Science Training Workshop	Open Science and Research	Full Day
14.11.19	Leipzig, DE	<ul style="list-style-type: none"> • Researchers 	Doing Good Symposium	Beginner's Guide to Public Engagement	120 min
04.02.20	Stockholm, SWE	<ul style="list-style-type: none"> • Research council 	Open Science Training Workshop	Open Science and Research	Half Day
12.03.20	Berlin, DE	<ul style="list-style-type: none"> • Conference 	Open Science	The Three Golden	30 min



		attendees	Conference 2020	Rules of Open Science Training (link)	
29.09.20	Rome, IT	<ul style="list-style-type: none"> • Conference attendees 	FIT4RRI final conference Online lecture	Lessons Learned from Open Science and RRI Training initiatives: FIT4RRI and ORION results	30 min
29.06.2020	Odesa, UA	<ul style="list-style-type: none"> • PhD Students 	XV Odesa INTERNATIONAL SUMMER SCHOOL "Biology, Biotechnology and Biomedicine" Online Lecture	Open Science And Your Research	60min
29.01.2021	Berlin, DE	<ul style="list-style-type: none"> • Postdoctoral Researchers ASPIRE program 	Online Workshop	Open Science 101	120min
11.03.2021	Berlin, DE	<ul style="list-style-type: none"> • New Phd students 	MDC Phd Students orientation week Online workshop	Open Science 101	60min

There seems from our experience to be a high demand for introductory courses, from those coordinating training activities for early career researchers and from researchers themselves. The attendance for the in-person trainings ranged between 8 and 20 participants. On average there were about 14 participants, which proved to be a good number for an interactive workshop. It is hard for larger groups to share ideas and have space to do activities effectively, while smaller groups do not have enough participants to learn from each other. The researcher workshops have been predominantly attended by PhD researchers, with a small number of postdocs as well. Despite the early stage of their career, a number of attendees have experience with various aspects of Open Science (e.g. they have published a preprint or done a science communication event etc.). This creates a good balance of experiences and facilitates peer-to-peer learning.

The funders workshops were not attended solely by those who are employed directly by funding institutions. Research managers who work at institutions and provide support to researchers looking to fund or manage research projects also participated. In addition, project coordinators from related projects have also wanted to attend.

Goals and Objectives of Training Workshops

The goal of the full- and half-day workshops are to give an introduction into the concept of Open Science: to inform what Open Science is, how it is implemented and how participants



can practice it themselves. The learning objectives focus on linking different aspects of Open Science together to give an overall picture of this concept, while discussing its implications for the participants and for the rigour of scientific findings. Our intention as trainers is to support that the participants get on board with Open Science because they personally, identified the relevance and benefit of it for their own careers and the scientific system as a whole.

Being confronted with Open Science as one more thing to do can be overwhelming, as it is time consuming, not widely recognized and specific and practical skills are needed. With the idea of working towards a cultural change, we wanted to create trainings that give the participants the knowledge they need to be able to reflect and find their own position, while facilitating that participants explore the areas of Open Science practices and plan out individual actions they want to take. **Managing data to share it, choosing journals that are Open Access, publishing a preprint, incorporating citizens into scientific projects, communicating research to lay audiences or spreading the word about Open Science are all actions that contribute to science being more accessible and open.** Not every participant will choose to sign up to every activity of Open Science, but through the workshops they will become aware about the basic components, tools and practices of open and accessible research and will have hopefully perceived themselves as multipliers in the areas that they have identified to be beneficial for themselves and their careers.

The trainings are didactically designed to incorporate these intentions and follow principles of adult and further education, with a learner-centered approach. When talking about Open Science there is a lot of information and content to cover, we endeavour to make the workshops interactive, to use the wisdom of the crowd to exchange experiences and implement peer-to-peer learning, but also to ensure the baseline of knowledge is achieved. Participants are guided to place themselves within the Open Science sphere of action and map out the path they could take in the future. A number of formats were developed to enable this and can be adjusted depending on the length of the workshop, whether it is online or offline and for which target group it is designed. All workshops included a presentation of Open Science content, interactive activities and individual action plans.

Formats

Open Science Question Board

At the beginning of half- and full-day workshops the participants are given three cards, each a different colour. After a short introduction round, each participant is given the task to write down on each card their:

1. Definition of Open Science
2. Why they are participating in the workshop (reason/ motivation)



3. The question they would like to have answered by the end of the workshop

These cards are then presented. With this the first step of working together towards a definition of Open Science is taken. Moreover, the participants interests and motivations are assessed and exchanged.

From the first question, we usually see that the range of understanding about Open Science is very heterogenic and that some participants have a substantial knowledge in one aspect of Open Science, but are unaware of the other surrounding concepts, while other participants only have very broad ideas about what Open Science could be. The second card gives us an understanding of what the background and expectations of the participants are and enables us to see the overall interests of our target group. The third card gives us further insight into the participants' existing understanding and we return to the collected questions at the end of the workshop to ensure everyone has had their questions answered. This last question also helps us as trainers to understand what the specific questions are this target is eager to know. The last two cards also make us aware if we are meeting the interests and expectations of our participants.



Figure 4 Open Science Board © Zoe Ingram

Card Activity

This activity adapts from two separate activities developed by FOSTER+³ and HEIRRI. Each of these projects produced cards with statements about Open Science and RRI on them (e.g. 'Both positive and negative results of research projects should be published' or 'It should be easier for citizen scientists to publish their work in a scientific journal'). The main

³ <https://www.fosteropenscience.eu/content/open-science-cafe-card-deck>



purpose of these cards is prompting discussion between the workshop participants. In ORION workshops, we give each participant a card and ask them to read the statement and form an opinion on the issue it describes. The participants stand and find a partner, the two participants then exchange their opinions on the card and discuss the topics; the participants then find a new partner in order to discuss their card with a new person and learn about their card; this can continue for several turns in a full-day workshop or only once for a conference slot workshop. The activity works to encourage participants to think about the principles behind Open Science and RRI, as well as form their own opinions on different topics. It also works well as an ice-breaker exercise that gets participants to meet each other.

Brain Walking

Three flip charts are placed in a circle with the headings: Open Access, Open Data and Public Engagement.

Each participant is given a marker and is instructed to silently walk from flip chart to flip chart and write down any actions or ideas they have about how researchers or funders (depending on the workshop participants) in general could practice Open Science. For example, under Open Data participants often write the name of some repositories. The participants were encouraged to use the things the others wrote to inspire them.





Figure 5 Brainwalking © Zoe Ingram

Role Play

In this activity participants split into groups of 3 or 4 people. One person in each group assumes the role of the ‘bad guy’, a person who is against adopting Open Science and RRI practices. In researcher workshops this is usually a PI or Group Leader, in funder and research manager workshops it is usually a director or head of department. The other two or three participants have to persuade the ‘bad guy’ to change their mind about Open Science. The participants seem to enjoy this activity very much and are very enthusiastic about adopting their roles. The activity allows participants to articulate and answer their own doubts in an informal way.

Case Studies

The WP4 team also produced three short case studies or scenarios on public engagement, preprints, and data sharing. The case studies are supported by several prompt questions. This activity can either be done by all participants, with the moderator reading out the

scenarios and then writing the answers on a flipchart, or as three groups which then all feedback to the whole workshop.

Presentation

The presentation lasts between 20 mins and 60 mins depending on the length of the overall workshop. The moderator outlines the key information about Open Science (e.g. how to publish open access, what the difference between science communication and public engagement is, what FAIR stands for, etc.). The presentation developed into a fairly interactive element of the full- and half-day workshops because participants often have first-hand experience of the topics being discussed and can share that experience with other participants, thus this session involves more peer-to-peer learning than a traditional presentation.

Meet the Expert

This session is only possible in the full- and half-day workshops. The basic premise is that a local Open Science expert comes to the workshop and discusses Open Science topics specific to that institution and/or country. In TU Braunschweig the experts were two librarians from the institute who were running an Open Access program. In the Pompeu Fabra University, the expert for the researchers was a legal expert in copyright. In Institut Curie the expert was from the data management department. From Copenhagen the expert was a librarian dealing with European funding requirements.

Individual Action Plans

The last activity in the trainings is to create an Individual Action Plan (IPA). The participants are asked to make a synthesis of the information of the day and come up with their own individual actions they want to take in the future to contribute to Open Science. They are asked to write down what they will do in the next one week, one month and one year and then share them with the group.



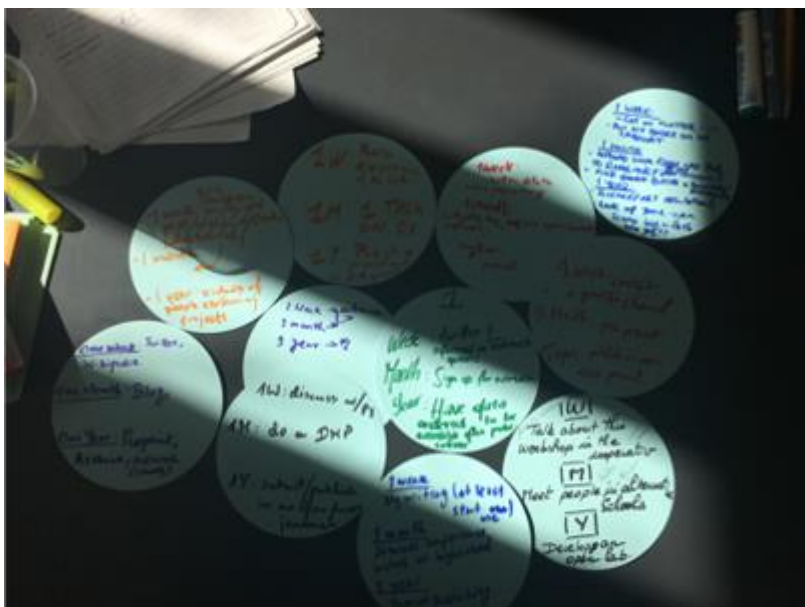


Figure 6 Individual Action Plans © Zoe Ingram

With the consent of the participants, the Individual Action Plans (from the six face-to-face researcher workshops and 2 conferences given in 2019⁴) were photographed and then categorized according to what actions they intended to do to put Open Science into practice. Thereafter, 118 individuals have planned altogether 286 individual actions towards practicing Open Science. The actions range from finding out more about Open Science, telling others about it, publishing via Open Access and communicating their research with lay audiences to name a few. Figure 7 illustrates the Individual Actions that were assessed.

⁴ 18.01.2019 TU Braunschweig, DE; 21.03.2019 Institut Curie, Paris, FR; 08.04.2019 Univ. Pompeu Fabra, Barcelona, ES; 10.04.2019 Univ. Pompeu Fabra., Barcelona, ES; 2.5.2019 JCMM, Brno, CR; 3.5.2019 JCMM, Brno, CR; 23.05.2019 MDC, Berlin, DE; 05.07.2019 Landesakademie für Jugendbildung, Weil der Stadt, DE.

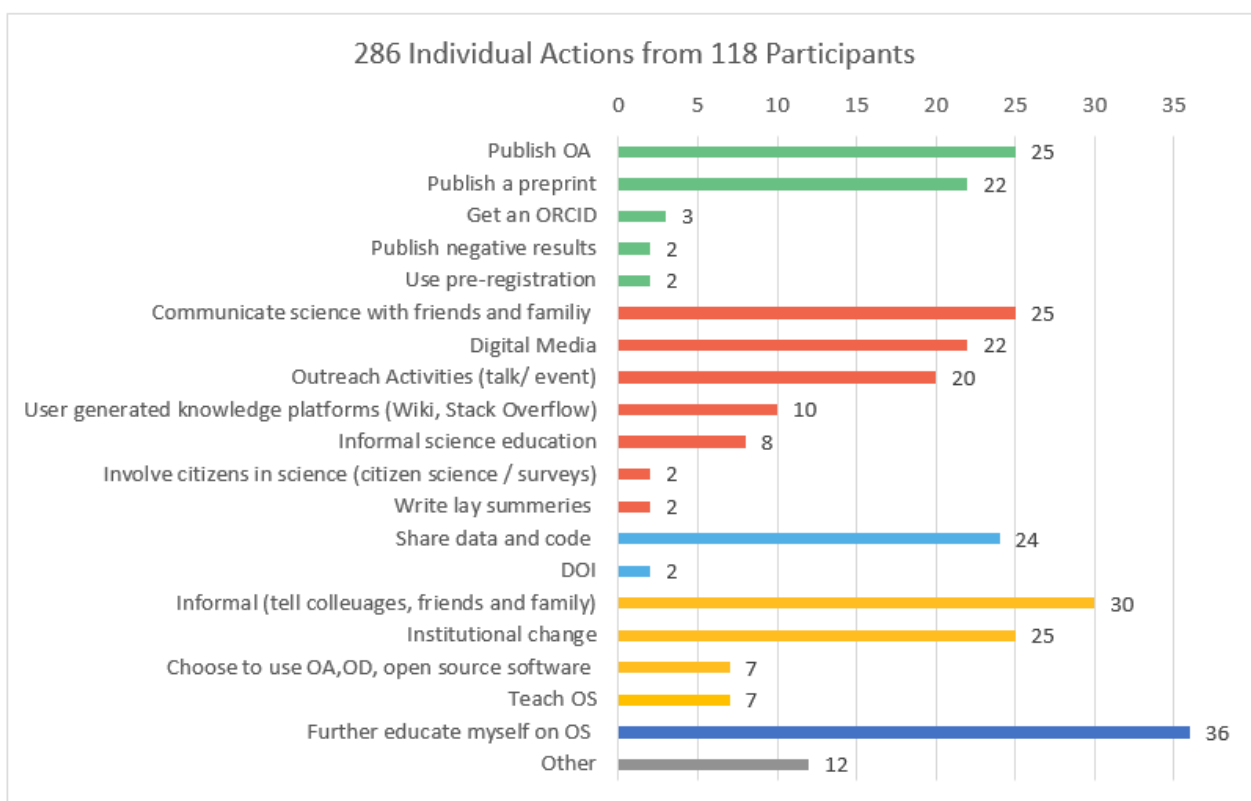


Figure 7 Individual Action Plans Overview 2019

For more detailed information on the individual action plans see [D4.1 Optimised Offline and Online Trainings](#)⁵.

Further information on the different formats can be found in the [ORION Open Science Train-the-Trainer MOOC](#)⁶. Also, they are explained in the YouTube video [Three Golden Rules of Open Science Training](#)⁷.

⁵https://www.orion-openscience.eu/public/2020-04/ORION_D4.1-optimised%20online%20and%20offline%20trainings_v2.1.pdf

⁶<https://www.open.edu/openlearncreate/course/view.php?id=5865>

⁷<https://www.youtube.com/watch?v=0aa4vnAWXJ0&t=285s>



Other Online Training

WP4 has also organized a series of online lectures and talks. Several of these are available on the Zenodo collection and the ORION and ORION MOOC YouTube channels. For example, the Live Chat on Open Science lecture that ORION and the Wellcome Trust co-presented is here: <https://www.youtube.com/watch?v=X9lcHnjmNxM&t=183s> and currently has 60 views. The Three Golden Rules of Open Science talk, recorded for the Open Science Conference 2020 in Berlin, is here:

<https://www.youtube.com/watch?v=0aa4vnAWXJ0&t=285s> and currently has over 130 views.

For a full discussion of other online training, see [D4.1 Optimised Offline and Online Trainings](#)⁸.

Podcast

To promote training and reach a broader audience, WP4 took a leap into a new format and started the *ORION Open Science Podcast* which can be found on Podbean⁹ and Zenodo¹⁰. The ORION Open Science podcast was launched on the 31st of January 2019. To date there are 44 episodes available with over 7.000 downloads from across the world. The twitter account¹¹ has almost 950 followers.

The ORION Open Science Podcast is conversation based, and covers diverse aspects of Open Science. The interviewees are professionals practicing and pushing Open Science forward. Focusing on examples of how Open Science helps individual researchers to do better science and progress their careers, we showcase why Open Science is and could be the emerging future of the scientific system. The episodes range from 40 to 60 minutes and try to give the listeners the feeling they are sitting at the table and are part of the conversation, while at the same time a focus is set on talking about how researchers can practically put what they hear into action.

Table 2 lists all of the episodes in the order of their popularity according to how many times they were downloaded. The list was compiled at the end of April 2021.

⁸https://www.orion-openscience.eu/public/2020-04/ORION_D4.1-optimised%20online%20and%20offline%20trainings_v2.1.pdf

⁹ <https://orionopenscience.podbean.com/>

¹⁰ https://zenodo.org/communities/oosp_orionpod/?page=1&size=20

¹¹ ORION Open Science Podcast (@OOSP_ORIONPod) | https://twitter.com/oosp_orionpod?lang=en



Tabel 2: List of Episodes

Episodes	Downloads
Open Science and Career Pathways	306
Scaling the Paywall: How Unpaywall Improved Open Access	284
There is no spoon!: Imagining Science Without Journals	259
Aubrey De Grey, Aging, and Alternative Approaches to Research	244
Good scientists share data?	219
Preprints: what do scientists think?	211
Are We Doing Good? Discussing Open Science and Scientific Practice at the Doing Good Conference	208
A Public Scandal: Paola Masuzzo on the Absurdity of Locking Up Knowledge	205
Licence to share: how Creative Commons brought clarity to the digital rights and enabled fair content reuse across the web	204
A Metric for Optimism: John Ioannidis on Reproducibility, Preregistration, and Data Sharing	199
A Skeptic's Guide to Open Science: Steven Novella on tackling biases, publication noise, and pseudoscience	197
Retraction Watch, Research Integrity, and Peer Review	193
Life Sciences in the Fast Lane: Dan Qunitana on Rapid Feedback, Tweeting, and Time Management	183
The FAIR is in Town: figshare, The Turing Way, and Open Science Quest at the OSFAIR2019	173
The Choice is Yours? How Algorithm Bias Impacts Fairness and Accessibility of Knowledge	171
Open Data: FAIR, foul, and meta	166
A New Normal: How the Center for Open Science is Changing How Science is Done	155



Stemming the Fake Flow: How Unistem Day Reveals the Importance of Science Communication to Students	149
An Inventive Step: Shobita Parthasarathy on the Role of Patents and Innovation in Science	144
Plan S: Solution or Short-sightedness?	143
Together Works Better: How Sage Bionetworks Use A Collective Approach To Data	143
Is science self-correcting?	142
Next Steps: How the FDNNext Project is Tackling Research Data Management ... and Farewell to Emma	140
Public Money? Public Code: What 'Free' Software Really Means in Research	135
A Week's Worth of SciComm: Berlin Science Week and the Value of Science Communication	133
Signing up to Open Science: Open Peer Review and Aligning Core Values	133
Viral Validation: How the New Journal 'Rapid Reviews: COVID-19' Accelerates Peer Review and Publishing	132
Know Your Research Rights: The Legal Perspective on Copyright and Open Science	129
The COVID Transmission: How Scientists and Science Journalists Are Communicating During the Pandemic	128
Rewriting Diversity: Editing Wikipedia and Opening Science	126
The Utopian Model: How The Neuro Has Become An Open Science Institution	125
Communicating Animal Research Part 1	124
Process Not Product: How the Open Life Science Mentoring Program Creates Open Science Ambassadors	124
A Transformative Edge: How Transformative Learning Can Benefit Open Science	121
Laying it all out: How the Science Breaker is supporting lay summaries and science communication	120



Unlocking Breakthroughs: How DEIP Are Using Blockchain and Open Science to Provide Innovation Evaluation	119
An Ignoble Pursuit: Laughing and Thinking about Science Communication and the Ig Nobel Prize	118
A Slice of the Research Cake: The Impact of Open Science in Africa	112
The Corona Connection: How LabHive and Open Science is Helping Scientists Solve COVID-19	108
Hindsight is 2020: Reviewing How the ORION Project Impacted Open Science	103
Communicating Animal Research Part 2	102
Compound Interest: Discussing the EU Open Screen Project at the MDC	101
You Don't Say! Emma Dorris on Public Engagement and How Discussions with the Public Improve Research	92
Sprint for your eLife! How the eLife Innovation Sprint Helps Drive Forward Open Science Projects	87

Over the course of the last two years the listener base is located primarily in Europe and North America, but we do have listeners from all over the globe, illustrated in Figure 8. The concentration of listeners in the USA and Germany is likely due to the location of the interviewees. Figure 9 illustrates the locations of our interview guests in combination with the topic of the episode.



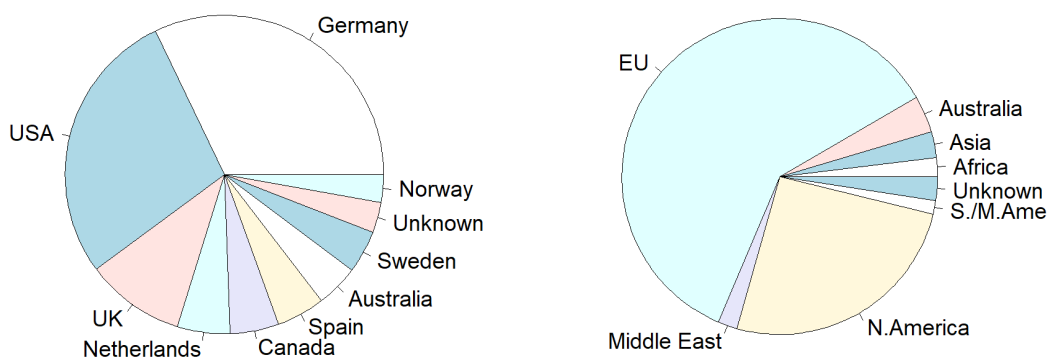
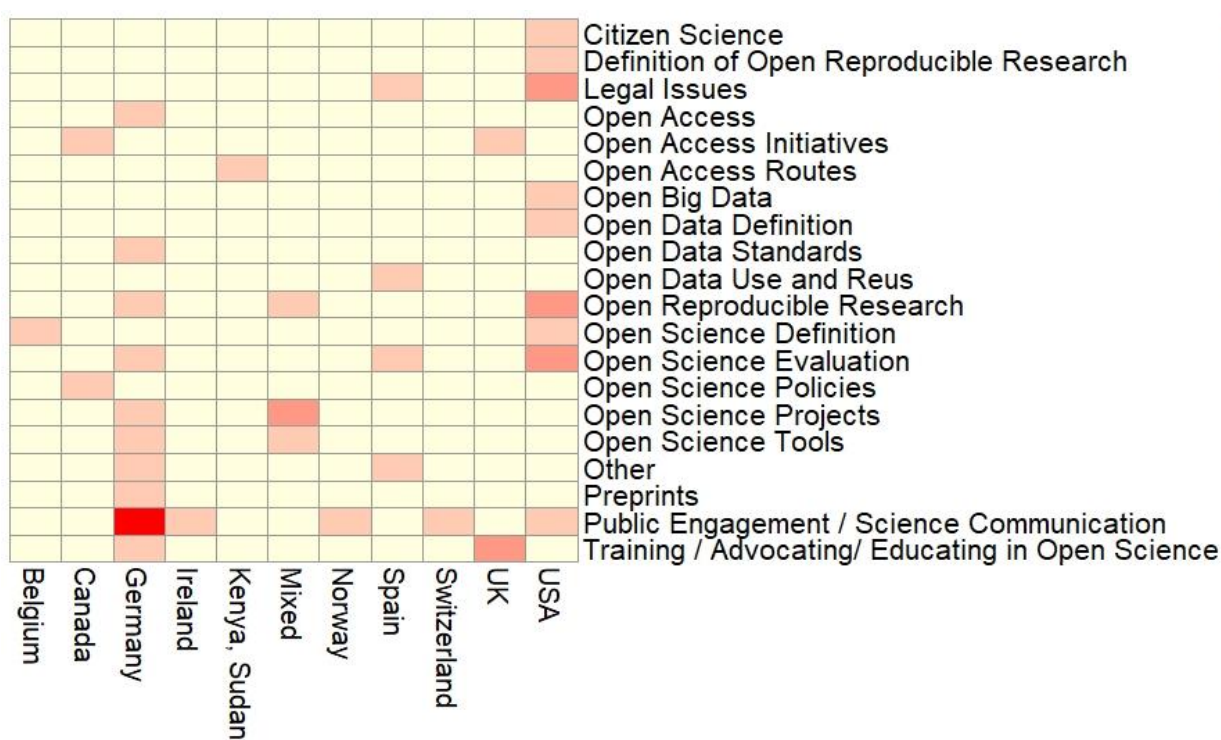


Figure 8 Graph of Listeners by Country and by Region



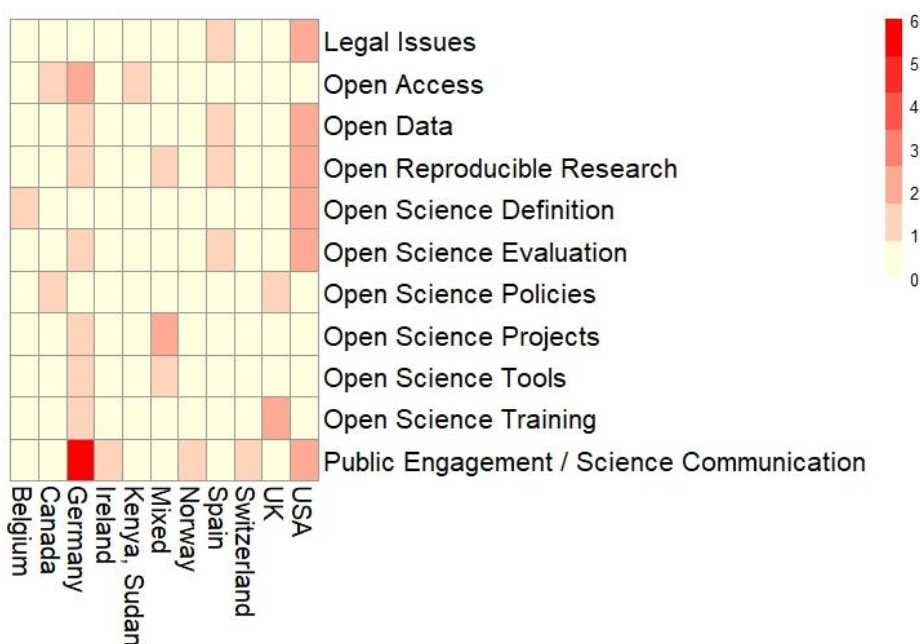


Figure 9 Graph of Episode Topics Covered and Location of Interviewee

For a poster presentation “Tell me more – exploring Open Science through podcasting”¹² in the annual Open Science Conference of 2021, we wanted to map out which areas of Open Science have been explored in our podcast. We mapped them against the FOSTER Taxonomy of Open Science¹³ (see Fig. 10 and Fig. 11). Each episode was categorized to one of the topics in the taxonomy and color-coded, represented in Figure 11, which shows all of the episodes according to the main topic they cover.

To the FOSTER Taxonomy we added: “Public Engagement & Science Communication” and “Preprints/ Publishing outside of the journal system”.

The podcast will continue in the third season and thoughts of how to continue it after the ORION project will come to an end are being explored.

¹² Luiza Bengtsson, & Zoe Ingram. (2021). Tell me more – exploring Open Science through podcasting. Zenodo. <http://doi.org/10.5281/zenodo.4647876>

¹³ Knoth, Petr; Pontika, Nancy (2015): Open Science Taxonomy. figshare. Figure. <https://doi.org/10.6084/m9.figshare.1508606.v3>



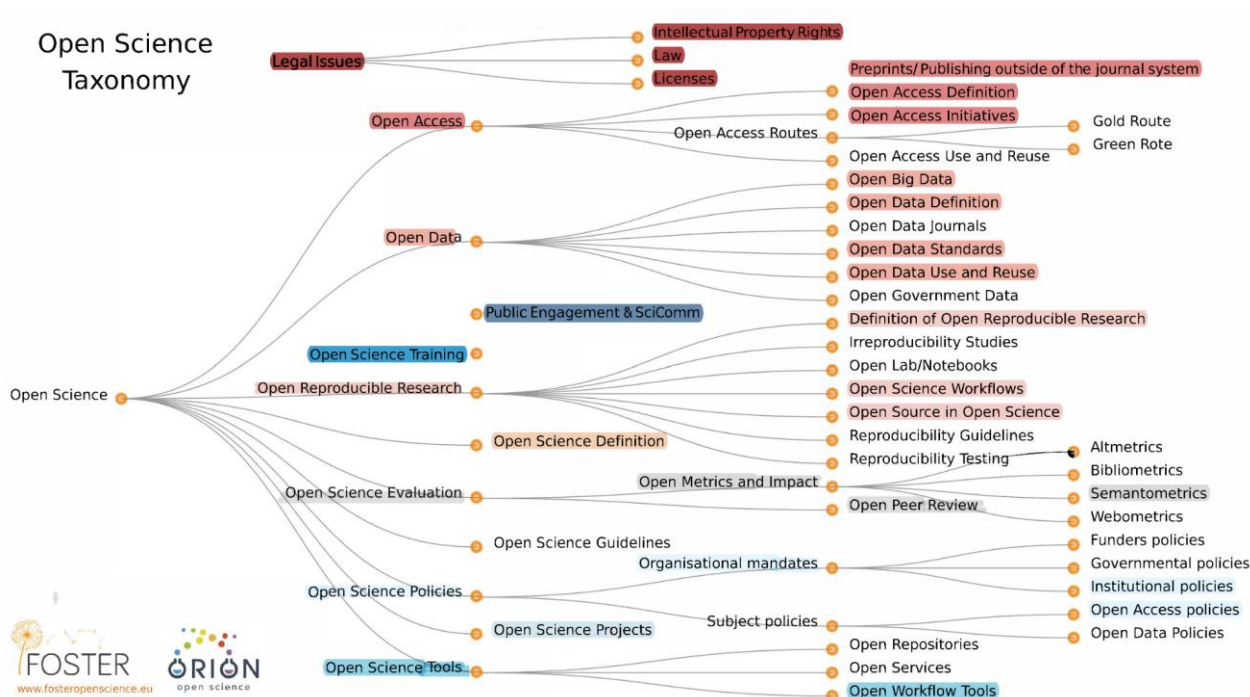


Figure 10 ORION Open Science Podcast Episode Topics Mapped with the FOSTER Open Science Taxonomy

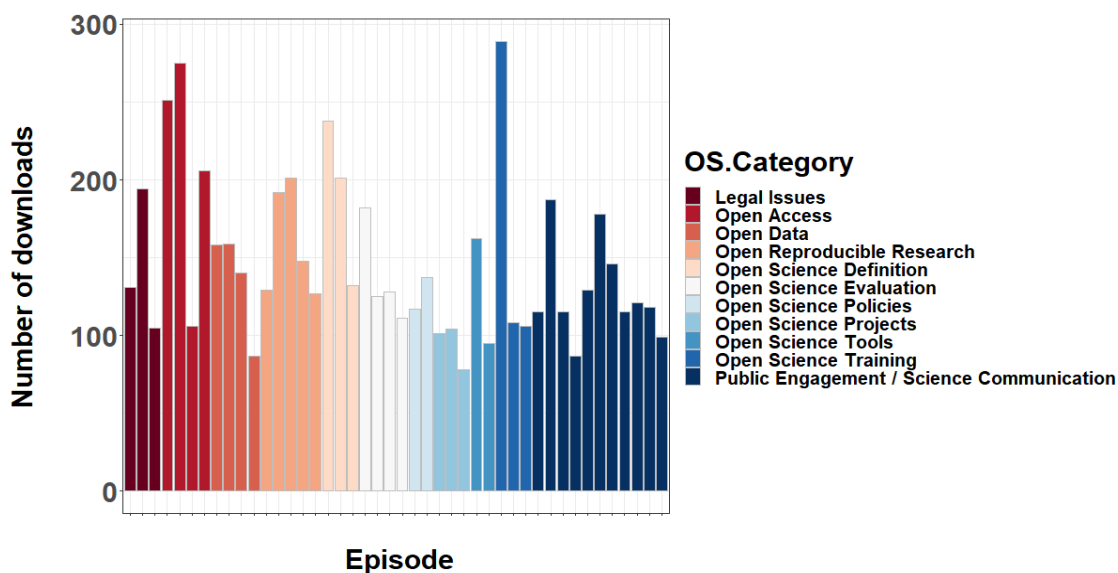


Figure 11 - Topic of Episodes Color-Coded to OS Category to Match Taxonomy



The ORION MOOC for Open Science in the Life Sciences

The ORION MOOC for Open Science in the Life Sciences¹⁴ was developed to give researchers insight into the concept and tools of Open Science through an online format with weekly modules. For a full explanation of the development of the MOOC please see the D4.1 Optimised Offline and Online Trainings¹⁵ report.

The content of the MOOC follows a module structure:

- Landing Page: Introduction, Guidelines, and Pre-survey
- Module 1: Open Access P1
- Module 2: Open Access P2
- Module 3: Data Management
- Module 4: FAIR and Open Data
- Module 5: Sci Comm and Public Engagement
- Module 6: Reflection and Action

Each module requires approx. 90 mins to 120 mins of time to complete. The course also includes interactive videos which use H5P in order to make the learning experience as active as possible. The forum was used extensively to build community. There are also clips from the podcast, quizzes, factsheets, infographics, and presentations.

Live Runs

The course did two 'live' runs for 6 weeks each, one between 21st October - 29th November 2019 and one between 10th February - 23rd March 2020. There were 343 enrolled participants in both editions. The course was adapted and improved between the first and second runs based on participant feedback and moderator experience to create a 2.0 version for the second run.

The trailer that WP4 created to promote enrolment for the second run of the course captures the experience of one participant and gives a sense of the course: <https://youtu.be/nwaEij-AbOE>

¹⁴ <https://www.open.edu/openlearncreate/course/view.php?id=4633>

¹⁵ https://www.orion-openscience.eu/public/2020-04/ORION_D4.1-optimised%20online%20and%20offline%20trainings_v2.1.pdf



The completion rate was 25%, this is actually much higher than average of 4-10% for e-learning courses¹⁶. The feedback was very positive with participants voluntarily giving 5 star reviews and the majority rating it as 'useful or very useful' in the feedback forms. Additionally, several participants shared their experience of doing the MOOC on social media, such as Twitter and LinkedIn, which increases the potential impact and awareness of Open Science online resources.

The MOOC, is now self-paced and available on the platform OpenLearnCreate¹⁷ for those who wish to take it. This platform is dedicated to Open Source and Access principles and the entire MOOC is openly available. It is also available on the ORION website under [Training Materials](#).

ORION Open Science Train-the-Trainer MOOC

The ORION 'Train-the-Trainer' course was developed to help Open Science advocates and stakeholders learn from the training that has been delivered throughout the project and equip the participants with the skills to run their own training.

The course ran from October 19th 2020 to November 4th 2020. 65 applications were received from all over the world and these were then assessed to award the 21 available places. It featured two online seminars, two modules of an online module course (hosted on OpenLearnCreate from Open University¹⁸). The course culminated in the participants delivering a 20-minute talk or micro-training at a live-streamed online event for the Berlin Science Week called the Open Science Cafe. All participants who finished the course got an ORION Open Science Train-the-Trainer certificate. There are possible future collaborations with other EU projects regarding reusing some or all of the ORION Train-the-Trainer course.

The ORION Train-the-Trainer course was originally conceived as an in-person 3 day 'bootcamp' that would take place at the Max-Delbrück-Center for Molecular Medicine in Berlin. However, due to the pandemic restrictions, this was revised at an early planning stage to be an entirely digital program. The knowledge gained in producing the two MOOCs

¹⁶ <https://www.ft.com/content/60e90be2-1a77-11e9-b191-175523b59d1d>

¹⁷ <https://www.open.edu/openlearncreate/course/view.php?id=4633>

¹⁸ <https://www.open.edu/openlearncreate/course/view.php?id=5865>



(1.0 and 2.0, see [D4.1 Optimised Offline and Online Trainings](#)¹⁹) helped immensely in the course design and implementation.

Advertising and Applications

In collaboration with VA, the course was advertised via email to ORION partners and associated partners and general mailing lists, on social media (Twitter, LinkedIn, and Facebook), and via the ORION newsletter and website. Participants had to apply to be on the course for two reasons: we wanted to have a small group size, in order to offer personalized coaching and mentoring, and there was a limited number of places in the final activity, the public Open Science Cafe. LamaPoll, a German Company, was used to create an application form to comply with the European data privacy regulations. 65 applications were received from all over the world and these were then assessed to award the 21 available places. Candidates with a clear plan for implementing an Open Science training were favoured. The selected 21 participants represented 17 countries from 4 different continents. This level of internationality demonstrates the importance of Open Science to institutions across the world, and that digital formats for training can allow for wider participation.

Go to www.menti.com and use the code 45 88 02 5

What country are you located in?

Mentimeter



Figure 12 Some of the Mentimeter Responses from Online Seminar 1

¹⁹https://www.orion-openscience.eu/public/2020-04/ORION_D4.1-optimised%20online%20and%20offline%20trainings_v2.1.pdf



Modules

The [online course](#)²⁰ was created on OpenLearnCreate²¹, a platform created and hosted by the Open University. It was divided into two modules: Theory and Methods. The theory module focused on conveying the principles of adult education, for example identifying audiences, focusing on participants' needs, and selecting material. The methods module focused on formats and activities that can be utilised to create online and offline training, for example, the FOSTER card exchange, a brainwalking activity, improving online seminar experiences, and evaluating training.

These modules used [videos](#)²², [infographics](#)²³, [podcast episodes](#)²⁴, and [factsheets](#)²⁵ to convey material, these were a mix of existing OERs and original materials created for the train-the-trainer course. A number of project partners provided factsheets for the course e.g. UAB wrote a factsheet on evaluations, BI provided one on organising online events and one on organising public dialogues. The participants had one or more activities to do for each lesson in the modules. These were done on activity working documents, using Google Docs which allowed interactive collaboration. The participants could also download these documents at the end of the course so that they had another resource. There were also forums for participants to use to discuss issues.

Online Seminars

The online modules were bookended with two 2.5 hour online seminars in which participants did a number of interactive activities as a full cohort and in breakout rooms. The activities acted both as a way of building a sense of community and of demonstrating how certain online tools could be used in training. For example, in the first online seminars the participants were put in breakout groups and given a mentimeter code, they then looked at

²⁰ <https://www.open.edu/openlearncreate/course/view.php?id=5865>

²¹ <https://www.open.edu/openlearncreate/>

²² <https://www.youtube.com/watch?v=oSiklw6iKug>

²³ Branch, R. M., & SpringerLink (Online service). (2009). Instructional design: The ADDIE approach (1st.;1st; ed.). Boston, MA: Springer-Verlag US. doi:10.1007/978-0-387-09506-6

²⁴ Harris, Emma, Bengtsson, Luiza, Ingram, Zoe, & Oliveira, Paulo. (2020). A Transformative Edge: How Transformative Learning Can Benefit Open Science. Zenodo. <http://doi.org/10.5281/zenodo.4277691>

²⁵ <https://zenodo.org/record/3673086#.YlqLRZAzY7M>



statements taken from the [FOSTER+ card pack](#) and discussed whether they agreed or disagreed before voting. Later, they did an activity where they identified a challenge to delivering Open Science and then turned it into an opportunity. They also received information about the course and had the opportunity to ask questions and give feedback.

Coffee and Chat

In addition to the forum, the moderators held an online 'Coffee and Chat' drop in session each weekday between 15.00 - 16.00 while the course was running. Participants could join and ask questions about the course material or chat about Open Science topics more broadly as well as use the time to prepare for the final delivery of the course, the Open Science Cafe.

Open Science Cafe

The course culminated in the Open Science Cafe event at the international science festival: Berlin Science Week²⁶. The Berlin Science Week is an annual international 10 day science festival bringing the world's most innovative scientific organisations together to celebrate science within the scientific community and with the public. The participants in groups of three choose an Open Science topic to present and train in. Each group was responsible for presenting on one of 7 Open Science topics (Group 1: Open_source, Group 2: Open_access, Group 3: Open_data, Group 4: Science_communication, Group 5: Open_content (licensing), Group 6: Citizen_science, Group 7: Open_hardware).

The event itself ran from 14.00 - 19.00 on Nov 4th, with two talks and two 10 minutes breaks per hour. It was hosted on Zoom and participants joined the call at their time slot. The Zoom call was live streamed to YouTube. This was to ensure participants were not interrupted by people joining and also to increase the reach of the event. The audience could ask questions via the live chat function on YouTube. The resulting talks/microtrainings that the participants delivered were very original and interactive (several used mentimeter and funny videos, as well as one person who delivered the talk in his front garden using cardboard signs to show weblinks).

²⁶ <https://berlinscienceweek.com/>



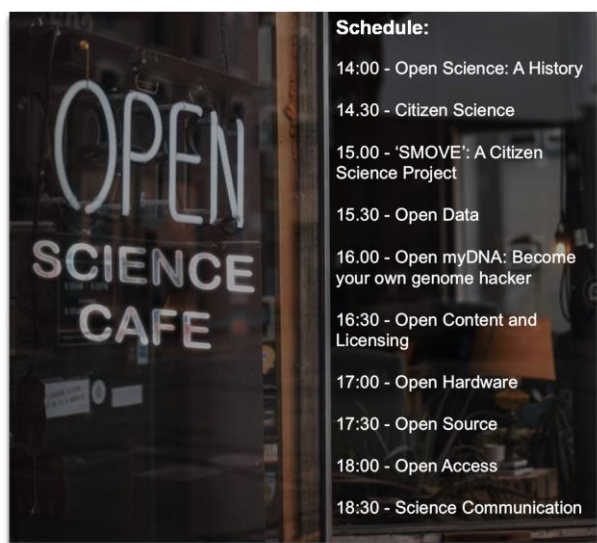


Figure 13 The Open Science Cafe Schedule Poster

The entire event was recorded and is now available on the [ORION MOOC YouTube](#)²⁷ channel and as a downloadable file on [Zenodo](#)²⁸. It (and the videos of the individual talks/microtrainings) will function as a valuable OER for the Open Science community in general.

The train-the-trainer course and the Open Science Cafe event have helped supporting a number of Open Science enthusiasts to have a greater understanding of how to implement Open Science training as well gave them an experience to put it into practice while also having created a new Open Science OER in the form of the videos from the final event.

One of the participants wrote a blog entry on the Train-the-Trainer course, which can be read [here](#)²⁹.

Open Educational Resources (OER) on Responsible Research and Innovation

WP4 has worked to create a range of Open Educational Resources (OER) and make them available on various platforms. OER are available to be used and shared by everyone.

These include: a 6-module MOOC (Massive Open Online Course), seminars, infographics, podcasts, and factsheets. These have been produced in collaboration with internal ORION

²⁷ <https://www.youtube.com/watch?v=rzvpgpM-0i8>

²⁸ <https://zenodo.org/record/4264393#.YHV-l2gzY7N>

²⁹ https://www.fondazionebassetti.org/en/focus/2021/01/orion_open_science_train_the_t.html

partners and a variety of external experts from across European and international institutions and projects. These resources have and continue to be shared and hosted by sustainable platforms, e.g. the podcasts are on RRI Tools.

Zenodo

All of the adopted and developed educational materials on Open Science and RRI created are licenced under CC BY to be shared and reused. The OER can be found on Zenodo under https://zenodo.org/communities/orionmooc_resources/.

All of the podcast episodes can be found on Zenodo:
https://zenodo.org/communities/oosp_orionpod/?page=1&size=20.

Each resource on Zenodo has a DOI, which can be used to share and access the materials. In addition, they are tagged with keywords and credit the project funding. The resources are also indexed in OpenAIRE expanding the findability and reach of the resources.

Zotero

In creating the MOOC the WP4 team created a library of 151 resources related to Open Science, some of which were used in the final version of the MOOC. This library has now been made openly available: https://www.zotero.org/groups/2339267/orion_mooc. These resources can be used for future projects or policy makers which are undertaking a gap analysis of Open Science resources, graduate schools that want to find resources quickly to add to training programmes, or by researchers themselves looking for useful materials.

Evaluation and Feedback

The training activities were evaluated by the ORION partner CRECIM from the Universitat Autònoma de Barcelona (UAB). The evaluation team observed and undertook in-depth evaluation of the training that included both trainers and participants. There was an Open Science attitudes pre-survey sent to participants before they began the course, and a post-survey sent after they completed the final event to ask for feedback.

The objective of the evaluation is to:

1. To monitor the scope (in terms of variety of attendance) and sustainability of the different types and formats of ORION trainings.
2. To assess the overall impact of the different training actions on participants, both in terms of satisfaction and change in participants' views, knowledge, attitudes or beliefs about Open Science topics.



3. To provide data that will help to improve and enrich the general quality of Open Science trainings.

The Final Evaluation Report on Training states the following: A majority of participants claim the ORION trainings met their expectations (95.8%) and would recommend them to others (94.7%). Most training participants find that the content and structure of the trainings are adequate: 97.5% think the information and materials provided are relevant and useful to them, and 91.3% consider that the overall structure and length is appropriate. Interaction, innovative methods, professional and knowledgeable trainers, and the friendly atmosphere of the face-to-face events are the main positive aspects highlighted by ORION training participants.

Most ORION training participants claim to have learnt valuable knowledge about Open Science after participating in the trainings. Overall, ORION training participants have a very positive perception of Open Science prior to attending the trainings, and most of them do not change their initial views after the trainings (with more positive than negative changes). Overall, ORION training participants think that science should be very open to all stakeholders, but especially to those directly involved in scientific research: scientists from the same area/discipline, scientists from other disciplines as well as funders and policy makers. After attending the ORION trainings, participants do not significantly change their views regarding openness to different stakeholders. In terms of disposition, more than 85% of attendees agree that after the ORION trainings they feel more confident and enabled either to practice Open Science or to train others on it and claim that they will use the information and materials presented in their everyday work/life³⁰.

To see more on the evaluation please see the [Deliverable 5.5. Final evaluation report on trainings](#).³¹

The following three quotes are from participants:

“...I loved the friendly atmosphere; it was very personal. Both the presenters, the ladies were understanding the needs. They knew what they were doing. Probably the approach, I loved, it wasn't too big of an event and there were I don't know 20 participants altogether, which was very pleasant. Because when it is too big it becomes overcrowded, and too much is too much. Maybe also the size of the event (...) I liked the methods they use”
(Workshop Participant)

“... one of the good things about the MOOC was that there was a lot of learning together, even though we didn't meet anyone virtually, there was no meetings in the MOOC, but you

³⁰ ORION D5.5 Final Evaluation Report on Training, page 3, 2021.

³¹ <https://www.orion-openscience.eu/index.php/publications/deliverables>



could see the answers from the other students and build on their answers and you felt like you were communicating and interacting anyway. And then, the TtT course left it up to another level, where you actually had to be part of the team, you had discussions and again, that was, I mean I find that the best way for me now in my stage of career to learn is actually through discussion also with others (...) there was clear deadlines, clear expectations, short learning units (...) they managed to keep that enthusiasm and focus” (MOOC and TtT Participant)

“... I learnt a lot. Some things I already knew because I have a lot of experience in doing online sessions, so about interaction and short sessions (...) but I also learnt about some tools I didn't know (...) I learnt about teaching in general, online teaching, interactive teaching, but I also learnt about specifically about [sic] teaching Open Science in ways of making it personal to you, that I thought was very important, and in ways of let making it somehow playful.” (TtT Participant)

Conclusions & Lessons Learned

As established in the gap analysis, the necessity for Open Science training exists. Through the online and in-person workshops, the MOOC for Open Science in Life-Sciences, the Open Science Train-the-Trainer and the ongoing Open Science Podcast, we reached a large number of researchers and Open Science advocates.

Taking a look closer at the trainings themselves there are a few observations worth sharing. Many of the participants entering the trainings had an understanding of some of the areas of Open Science as well as the accompanying principles of transparency, openness and accessibility, yet most of them did not have an overall view nor an in-depth knowledge. Some of the participants had experience in one or the other area (e.g. working in community projects and public engagement, data sharing, pre-registration etc.) which is valuable and worth sharing in the workshops. **Incorporating experiences of participants is highly effective to facilitate peer-to-peer learning and create a community atmosphere.**

Even if by the middle of the workshops there was an overall agreement that Open Science means good science, **there are still barriers that may speak against adopting Open Science practices**, such as the lack of time and acknowledgment, and institutional and administrative hurdles, as well as not knowing how and where to start. Our approach is to take a practical stance and highlight professional benefits such as: increased citations, a raised profile, greater access to data, improved collaborations, more impactful results and higher chances of funding. As well as to present Open Science tools (the open science



framework, pre-registration, Zenodo, institutional repositories, github, ScienceMatters, Jupyter Notebooks, ORCID, re3data, preprints, Figshare, Unpaywall etc.). There is an art of finding a balance between presenting the flaws of the current scientific and publishing system and through questions and discussions reflecting if Open Science can solve these issues. In the course of the day, it seems that **researchers come to understand that Open Science is the future of science and that with it comes career benefits**. The last exercise of the workshops is to plan individual actions, this emphasizes concrete and achievable steps and places the participants in a role of action.

Overall through the workshops, participants can gain depth in the different aspects of Open Science (Open Access, Open Data, Public Engagement) and link them together and reflect on how these principles can make science better and more impactful. We could observe, by the end of a given workshop that the **majority of the participants reframed their approach towards Open Science from a concept to a practice**—perceiving themselves and their colleagues as the ones who choose to practice it. This perception might change due to new knowledge gained in the workshops also in funding mandates or because they identified benefits for their careers. As well as through gaining a new understanding of what it means to be a researcher in the 21st century and a desire to shape the emerging scientific system with principles that fit closer to this generation of researchers' values.

After almost 3 years in delivering Open Science training, the need and demand does not seem to be dissipating from both researchers and from the professionals organizing educational courses for researchers. The demand can also be confirmed by the high interest in the Open Science Train-the-Trainer course. As ORION is drawing to an end, the question arises to which extent, Open Science is now in 2021 institutionally anchored within scientific institutes and with this, is a core part of doctoral training. Or whether with the end of this project a gap in the training landscape remains and we will need to continue our joint efforts in contributing to training and raising visibility of Open Science.

