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D5.4 Initial Training Materials

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Abstract This document provides an overview of the training materials created within FREYA and plans for their future development.
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FREYA project summary

The FREYA project iteratively extends a robust environment for Persistent Identifiers (PIDs) into a core component of European and global research e-infrastructures. The resulting FREYA services will cover a wide range of resources in the research and innovation landscape and enhance the links between them so that they can be exploited in many disciplines and research processes. This will provide an essential building block of the European Open Science Cloud (EOSC). Moreover, the FREYA project will establish an open, sustainable, and trusted framework for collaborative self-governance of PIDs and services built on them.

The vision of FREYA is built on three key ideas: the **PID Graph**, **PID Forum** and **PID Commons**. The PID Graph connects and integrates PID systems to create an information map of relationships across PIDs that provides a basis for new services. The PID Forum is a stakeholder community, whose members collectively oversee the development and deployment of new PID types; it will be strongly linked to the Research Data Alliance (RDA). The sustainability of the PID infrastructure resulting from FREYA beyond the lifetime of the project itself is the concern of the PID Commons, defining the roles, responsibilities and structures for good self-governance based on consensual decision-making.

The FREYA project builds on the success of the preceding THOR project and involves twelve partner organisations from across the globe, representing PID infrastructure providers and developers, users of PIDs in a wide range of research fields, and publishers.

For more information, visit www.project-freya.eu or email info@project-freya.eu.

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Executive summary

This interim report describes the approach taken to creating training materials in the FREYA project and provides an overview of the materials created and links to them. Up to this point in the project the team has migrated and update the FREYA Knowledge Hub to a new location on *pidforum.org*. FREYA has also collaborated with a wide range of stakeholders, including other European projects, to broaden the reach of the training materials and co-organise events which appeal to a broader audience, including co-organising several joint events and creating a guide on personal identifiers. The report also discusses the successes and challenges encountered in creating training materials thus far. In the next six months, prior to submission of the final report, the project will evaluate the training materials created and refine them where possible to better suit users' needs. The sustainability of the Knowledge Hub content will also be addressed. In addition, with the ongoing development of the PID Graph, further materials will be created to support early adopters and all events will be evaluated to inform and improve future events.

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1 Introduction

Training materials for persistent identifiers (PIDs) have a wide range of aspects and are relevant to many communities. This interim report describes the progress in creating and using training material on PIDs within the FREYA project. Final conclusions will be reserved for the final report due in Month 27 of the project, February 2020.

1.1 Training materials within FREYA

The FREYA project aims to extend the infrastructure for PIDs as a core component of Open Research in the EU and globally, by improving discovery, navigation, retrieval and access to research resources. The project's activities are built around three pillars: 1) the PID Graph which designs and implements this extended infrastructure, 2) the PID Forum which engages with stakeholders and 3) the PID Commons which addresses the sustainability of the outputs created. Work Package 5 (WP5), Iterative Engagement, leads the work of building the PID Forum, of which training materials are a core component.

The creation of training materials is nested within the task of Supporting PID Adoption (T5.4), which also includes the running of tailored events. These two tasks are closely linked as seen in Section 3 of this report, because one of the lasting outcomes of events is the materials created for it. Further information about the events will be described in D5.5 “Second Report on the PID Forum”. Developing training materials aimed at different communities will allow them to be adopted and used by other users and enable a “train the trainer” capability. In addition, the FREYA project is leveraging collaboration between other EU projects not only to promote the use of PIDs within the projects themselves but also to the communities with which those projects engage. As the materials described in this report illustrate, the range of stakeholders to be engaged is wide and the methods vary depending on the intended audience.

1.2 Deliverable structure

The first part of this report covers the approach to creating training materials. The Knowledge Hub, found on pidforum.org, is an important instrument to communicate training materials. A consultation of FREYA Ambassadors as well as cooperation with related projects and partners, especially other enabling projects of the European Open Science Cloud (EOSC), also provided input for the creation of training materials. The next part of this report describes the training materials created in FREYA, including the collection and assessment of existing training materials. Throughout the report, links are provided to the materials rather than reproducing them in full. Finally, the report describes the successes and challenges encountered in creating these materials, and concludes by presenting the future training plans of the FREYA project.

2 Approach to creating training materials

2.1 Migrating the Knowledge Hub to *pidforum.org*

As outlined in the Project Summary, one of the three pillars of the FREYA project is the PID Forum, which manifests in concrete form as a site for interactive discussion found at the *pidforum.org* website. FREYA, in consultation with PID providers, who have guaranteed the long term sustainability of the site, envisioned that *pidforum.org* would: 1) be a first port of call for information about PIDs; 2) point users in the right direction when in need of more detailed/technical information; 3) allow users to ask questions that have not been answered yet; 4) allow users to share and discuss PID developments with the community.

Within the THOR project, the predecessor of FREYA, a Knowledge Hub was developed which functioned as a first port of call for information about PIDs. Although much valuable information was available, use of this resource was limited because it sat separately from any other materials available and some of the material had become outdated since its creation. Therefore, the project team decided not only to update the available content, but to migrate this information to *pidforum.org* so that users have one place where they can find all available PID information in a format where it is easier to give feedback on the materials and ask questions. Due to the range of information available on *pidforum.org* the team chose to focus on the basics of PIDs in the Knowledge Hub.

The FREYA project is now able to direct all relevant stakeholders to *pidforum.org* and meet their needs there. For inexperienced users, we have the basic information that was previously available through the Knowledge Hub, divided by categories of different communities to make it easy to find the relevant content. If users need more detail, the introductory texts link out to dedicated resources on external websites where they can find relevant documentation. Should the information not yet be available on *pidforum.org*, users can ask questions or add to the knowledge base by sharing their expertise. This way, the *pidforum.org* functions as the place for all PID knowledge and training.

2.2 Survey of FREYA Ambassadors

Our approach to developing the Knowledge Hub resources began with a survey of the FREYA Ambassadors which ran from 11 to 25 April 2019¹. They were approached as representatives of the different communities that the Knowledge Hub will serve, and we sought not just to attempt to make the Knowledge Hub “better” but to develop it in a way that helped each community to advance towards the ultimate goal of increased PID adoption.

While this sample was a small one, we received a good level of engagement from the ambassadors (12 of 26 responded), and our intention was to get a baseline from which to design a larger survey if required².

Respondents were asked to self-identify as belonging to one of the following communities: funder or policy maker, librarian or repository manager, researcher, developer, publisher or service provider. These communities were retained from the THOR Knowledge Hub, as it was decided by the project team that these were useful classifications as distinct from other divisors such as by research discipline. We asked them to rate the level of experience that their community has with PIDs (on a standard 1–5 scale). This gave us a way to group responses based on the community that each ambassador represented and their perceived level of experience.

¹ <https://www.project-freya.eu/en/ambassadors/our-ambassadors>

² The survey responses have not been made publicly available due to the small sample size and a question asking for contact details in the event that ambassadors are willing to be consulted further. No personal data in addition to the data already held about the ambassadors, with their consent on completion of a memorandum of understanding, was required for the completion of the survey.

The experience level question demonstrated that experience levels are not homogenous within specific communities, and highlighted how important it is for the Knowledge Hub to cater for communities not only by role (which defines what they need to know), but also by experience with PIDs. The team must keep in mind that there are experts and beginners in each group, and clearly define which experience level the resource is primarily developed for. The FREYA team decided that partly in response to the survey, and partly because of the move into *pidforum.org* the Knowledge Hub's content would be refined to include introductory resources, with an understanding that more advanced users would have a natural progression into other resources hosted in *pidforum.org*.

Main survey questions:

- What actions could your community take to increase adoption of PIDs?
- What information do they need to get started?
- Which of the below would be useful for your community?
- Which format would be the best way to communicate this information to your community?
- If you know of any existing resources that we should link to please include them below.

These main questions were used as each section of the Knowledge Hub was developed. The survey identified the main actions each group could take to advance adoption of PIDs, and the knowledge that would be required to help them to take these actions. Answers about format were slightly less useful, with a wide range of formats given as preferable. Instead of trying to develop all formats of content based on the preferences of individuals, the team decided to select the format that most clearly conveys the content. Videos and webinars are often requested, however videos are very time intensive to create, and webinars are in reality often poorly attended relative to the potential number of attendees. Case studies were also indicated as useful, which will be reflected in the Knowledge Hub over time.

2.3 Collaboration with other projects and partners

To increase the potential reach of the training opportunities, FREYA partners have collaborated with others to provide events and materials, which are wider in scope than PIDs to reach broader audiences. An example of this was a workshop on Software Citation held in conjunction between Software Sustainability Institute, Alan Turing Institute, British Library and FREYA. This covered the topic of software citation more widely with an opportunity to discuss the role of PIDs in enabling software citation (link in Section 3.2).

FREYA has also collaborated with other EOSC projects such as OpenAIRE, EOSC-Hub and FAIRsFAIR to leverage their audiences and to support the holistic creation of the EOSC. An outcome of this is a forthcoming workshop "How Persistent Identifiers Can Help You in Open Science" at the Open Science Fair in September 2019 co-organised by FREYA, OpenAIRE and FAIRsFAIR. This workshop is targeted at research support staff with the aim to encourage them to cascade this information within their home institutions.

FREYA has also co-produced a guide with OpenAIRE around personal identifiers (link in Section 3.3) and worked with partners in EOSC-hub to ensure that training materials created by FREYA partners are included in that project's training catalogue and FREYA-related events are included in the event listings³.

FREYA is currently pursuing training opportunities amongst the disciplinary partners, namely CERN, EBI, PANGAEA, DANS and the British Library to explore training tailored to different research communities which will be included in the final report on training materials (D5.6). For example, the importance of ORCID IDs has been integrated in Scholarly Communications training for staff at the British Library and it is hoped to integrate messages about the importance of PIDs and the opportunity they afford within training for Life Sciences staff at the EBI.

³ For example <https://eosc-hub.eu/training-event/freya-midway-webinar> and <https://eosc-hub.eu/training-material/knowledge-hub-pid-basics>

3 Training materials created

3.1 Knowledge Hub

The Knowledge Hub materials are all available on *pidforum.org* at <https://www.pidforum.org/c/knowledge-hub>.

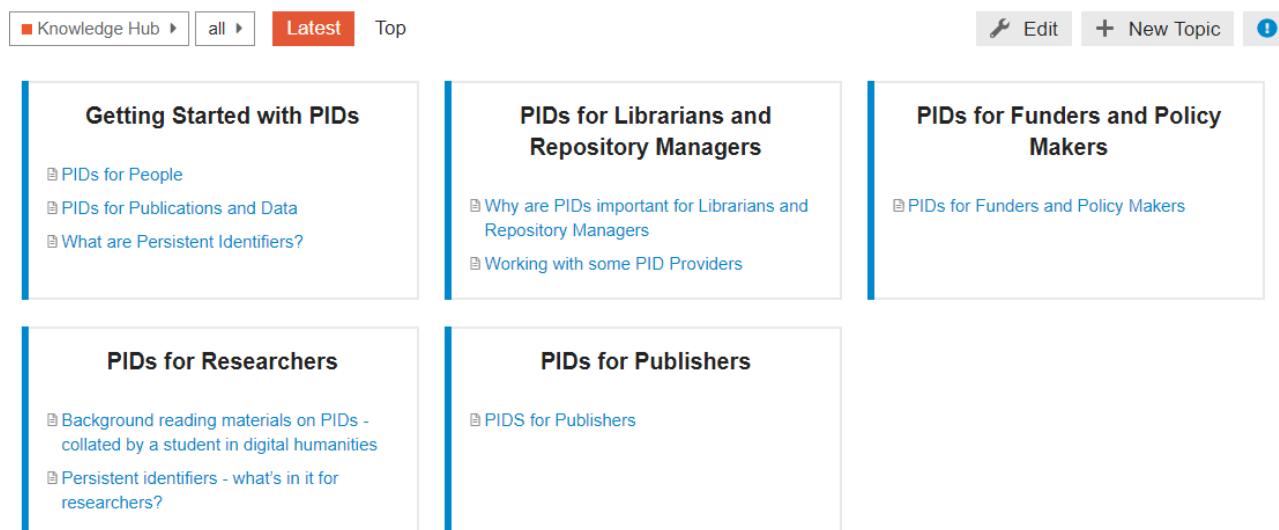


Figure 1 Screenshot of the Knowledge Hub landing page

The structure of the original Knowledge Hub was retained by dividing the content into subcategories aimed at different communities namely:

- Librarians and Repository Managers
- Developers [PENDING]
- Funders and Policy Makers
- Publishers
- Researchers

There is also an introductory section “Getting Started with PIDs” with basic explanatory information. The “PIDs for Researchers” section includes a background reading resource, developed by placement student at the British Library, which compiles resources on PIDs together with details such as the level of the resources, Beginner, Intermediate or Advanced, the PID types covered and the reading time required for each resource⁴. Developed in order to appeal to different types of user, including one who may wish to deep dive into the topic, it is hoped this will be a valuable resource for those providing training and resources on PIDs and to newcomers to PIDs. The PIDs for Librarians and Repository Managers section also includes material on working with several PID providers.

The content on the Knowledge Hub has been completely revised from its previous iteration both to update the content but also it was deemed necessary due to its revised focus as an introductory resource aimed at those who are not familiar with PIDs. Introductory sections for the various communities were all updated and migrated however it was decided not to migrate much of the remaining content as much of it had become out of date and was considered to be too advanced for an introductory resource, and those subjects would be better covered elsewhere on *pidforum.org* through the “PID Best Practices” or “PID Questions” categories.

⁴ <https://www.pidforum.org/t/background-reading-materials-on-pids-collated-by-a-student-in-digital-humanities/577>

At the end of July 2019 the resources on the Knowledge Hub have been viewed 952 times in total since the first resource was posted in March 2019. In the coming months, more case studies will be developed in response to the survey and more audiovisual material will be included where possible.

3.2 Event materials

Slides from events⁵ including the Software Citation workshop and others were made available via platforms such as *pidforum.org*, Zenodo and the project FREYA website⁶.

- Software Citation Workshop materials (60 attendees, 326 views combined) <https://zenodo.org/communities/citesoftware2019>
- Power of PIDs Lightning Talk from Carpentry Connect 2019 (100 attendees, 40 views on *pidforum.org*) <http://doi.org/10.5281/zenodo.3361397> <https://www.pidforum.org/t/power-of-pids-lighting-talk/448/3>
- FREYA/RDA UK Workshop (70 attendees) <https://zenodo.org/communities/freya-rda-uk-workshop-20190716/>

FREYA has held several webinars, three for ambassadors and one for all stakeholders marking the halfway point in the project. Recordings of these are available via the FREYA Youtube channel (311 views combined).

- <https://www.youtube.com/channel/UCQ5Jp19cvtVLPxUB2WVO5CA>

There are also several forthcoming events that will yield training materials which can usefully be repurposed. These include:

- A workshop at the Open Science FAIR in September 2019. Aimed at research support professionals materials produced will include introductory slides which can be reused and a session on methods to promote PIDs within organisations and to different communities, the outcomes of which will be synthesised in a blog post.
- A collocated event at the Research Data Alliance's 14th Plenary Meeting in Helsinki in October 2019. Aimed at a broad audience including members of other EOSC projects, this will include an extensive presentation on the workings of the PID Graph and an interactive tutorial on how to use the PID Graph will also be made available.
- A PID workshop in conjunction with RDA NL in the Netherlands in November 2019. Materials from this workshop will be shared publicly.
- A workshop for humanities researchers co-organised with DARIAH-EU and the School of Advanced Study, University of London, in December 2019. Slides will be made available and blog posts outlining the outcomes of the workshop will be published in several locations to maximise reach to the humanities community including the Royal Historical Society, the British Library and the FREYA blog.
- A hackathon on integrating software into the PID Graph expected to be held in January 2020. Targeted at a technical audience, the intention is for this to lead to an extension of the PID Graph itself created by the community, introductory materials will be made available after the event.

⁵ It should be noted that while FREYA has made many presentations since the beginning of the project, many of them have focused on informing the audience about the project and gathering input from the audience to inform FREYA outputs rather than providing training. Only those which provide training have been listed here.

⁶ <https://www.project-freya.eu/en/resources/project-output>

3.3 Documentation and guidance

How Persistent Identifiers Can Improve the Dissemination of your Research Outputs

A guide has been prepared on personal identifiers in collaboration with OpenAIRE. This covers the use of ORCID, how to get one and why it is beneficial to researchers. Listed amongst other OpenAIRE authored guides aimed at researchers, it promotes PIDs in an appropriate location.

- <https://www.openaire.eu/how-can-identifiers-improve-the-dissemination-of-your-research-outputs>

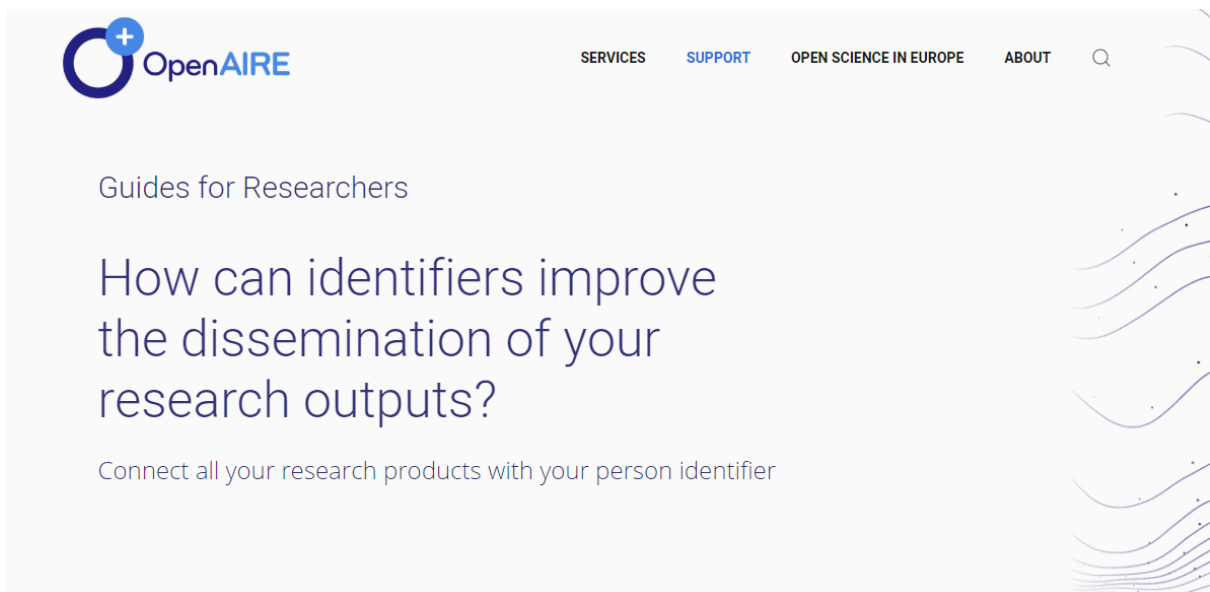


Figure 2 Screenshot of OpenAIRE/FREYA Guide

API Documentation

API Documentation for new APIs created in FREYA such as the DataCite GraphQL API and the DataCite Provenance (activities) endpoint is available for consultation and testing.

The GraphQL API is a key output of the FREYA project as it allows its users to create visualisations of the PID Graph. The guidance includes a short screencast with some example queries to assist users. This guidance can be used in conjunction with the blog posts described below to get started with using the GraphQL API to discover more information about the PID Graph.

- <https://support.datacite.org/docs/datacite-graphql-api-guide>

This API was created within the FREYA project to assist with tracking the provenance of PIDs. It allows users to view the history of a DOI metadata record.

- <https://support.datacite.org/docs/tracking-provenance>

3.4 Non-traditional outputs

Blog posts have proved a useful method for documenting new developments within FREYA and providing a narrative around them. Several posts provide a useful background to the PID Graph.

An introductory post to the PID Graph explaining the concept, how it theoretically works and the types of questions it can answer.

- <https://www.project-freya.eu/en/blogs/blogs/the-pid-graph>

A blog post outlining how the PID Graph can be queried and visualised using Jupyter Notebooks.

- <https://www.project-freya.eu/en/blogs/blogs/using-jupyter-notebooks-with-graphql-and-the-pid-graph>

A blog demonstrating the current size of the PID Graph.

- <https://www.project-freya.eu/en/blogs/blogs/tracking-the-growth-of-the-pid-graph>

Discussions on *pidforum.org* are useful to those involved but also provide a useful record for future users, the PID Graph category demonstrates the potential of this.

- <https://www.pidforum.org/c/pid-graph>















Topic		Replies	Views	Activity
🚩 About the PID Graph category Discussion of the PID Graph and all related activities.		0	69	May 14
Object versions in the PID Graph	 	1	36	Jul 19
Register for the upcoming PIDgraph Webinar		0	80	Jun 20
PID Graph for Climate analytics datasets and workflow provenance, pid-graph	 	2	61	Jun 17
GraphQL project ideas	  	10	253	Jun 17
Using Jupyter Notebooks with GraphQL and the PID Graph		1	101	May 29
Visualizing the PID Graph of FREYA-funded work		0	189	May 28
The DataCite GraphQL API is now open for (pre-release) business	 	2	151	May 22
Introduction to PID Graph		0	108	May 14

Figure 3 Screenshot of the PID Graph category page on pidforum.org

4 Success and challenges in creating training materials

4.1 Successes

The project has successfully leveraged the know-how of the project team as well as the wider PID community to develop, tailor and promote FREYA training materials.

In producing training materials in a variety of formats and publishing in a wide range of locations, the project is able to reach a broad audience with varying existing knowledge of PIDs. Hosting materials on *pidforum.org* allows FREYA to reach communities with an existing interest in PIDs that range from users who are looking to learn about new types of PID, through to those who have specific technical implementations they wish to achieve.

Working with OpenAIRE to produce training material for their community of research support professionals and researchers allows us to reach new audiences and raise general awareness of what PIDs are, how they work, and the benefits to their specific community. Partnerships such as those with OpenAIRE have not only been successful in broadening the reach of training materials, but also have provided useful context for the content of them.

The FREYA project has also successfully leveraged our Ambassadors by getting feedback on what is important to include in training materials for their communities and through their engagement, they will be able to validate training materials and amplify them within their communities.

4.2 Challenges

As the FREYA project has progressed swiftly in the past 18 months, it has proved challenging to ensure timely training materials for newly created services such as the PID Graph—which as a concept has taken much of that 18 months to refine. This lack of definition is a challenge, but one that has been well met. A creative approach to demonstrating the PID Graph with Jupyter Notebooks has allowed the project to make use of these as a type of training material, and one that can be adapted and built on—we have already seen this happening through feedback on *pidforum.org*⁷.

While the support of our Ambassadors and wider community for input on training materials has been invaluable, the geographically distributed nature of the PID community means that real-time training such as webinars can be relatively poorly attended. However, these are recorded and available afterwards, and so have the potential to become more valuable over time, and meet a stated need from the survey. We will continue to monitor the time input and impact of webinars and videos as training outputs to determine whether the investment pays off. However, assessment of impact is a challenge in itself. We may see events well-attended and materials highly downloaded, but it is difficult if not impossible to measure the extent that people act on what they have learned.

As the project is dealing with new concepts and services, these concepts and services are subject to change—this will present an ongoing challenge for training materials that will need to be kept up to date in order to stay useful and relevant. We may see the balance of maintaining existing materials and creating new materials shifts through the second half of the project.

While it was being created, it was also difficult to identify the sustainability plans for the Knowledge Hub. As the sustainability of *pidforum.org* is assured the future of the Knowledge Hub content following the end of the project will need to be addressed. Several options are being considered including that the Knowledge Hub might become obsolete due to the flourishing of content on *pidforum.org*, the updating of the

⁷ <https://www.pidforum.org/t/graphql-project-ideas/408/11>

Knowledge Hub could be handed over to the PID providers, or the content of the Knowledge Hub could be archived or unlisted on *pidforum.org*. The decision of these considerations will be addressed in the final report on the training materials (D5.6).

5 Future plans

A key part of the next six months up to submission of the Final Report on Training Materials will be the various training events which will yield additional materials as well as validating those materials which have already been created. Many of these will continue our collaboration with other EOSC projects and we will enhance this further through exchanging relevant resources, particularly in relation to the disciplinary communities with which all projects engage. In addition, as the PID Graph is now in a state in which it can develop further, more training materials will be created to build it, encourage its development and communicate it to all stakeholders including other EOSC projects. As the Research Organisations Registry (ROR) initiative, supported by many FREYA partners in developing a new organisational identifier, matures we will also support the creation of training materials to support this work including providing case studies of early adopters. We will also continue to work with disciplinary partners to create training materials that appeal to researchers in their specific communities. As stated above, the team will also make a decision about the future of the Knowledge Hub after the end of the project.

Activity	Sept 19	Oct 19	Nov 19	Dec 19	Jan 20	Feb 20
Feedback push on training materials						
Updating Knowledge Hub content						
Creating additional case studies						
Addressing Knowledge Hub Sustainability						
Enhancement of PID Graph training materials						
Creation of disciplinary targeted training materials						
Explore creation of ROR training materials						
Events						
How identifiers can help you in Open Science - OSFAIR						
Collocated RDA Event						
FREYA RDA NL Workshop						
FREYA DARIAH EU Workshop						
Software Graph Hackathon						
D5.6 Submission						

Table 1 Timeline of events and forthcoming activities

5.1 Evaluation methods

Now that the Knowledge Hub materials are available on *pidforum.org* we will seek feedback on them from the ambassadors and communities more widely, especially those unfamiliar with PIDs, attempting to gauge their value. Feedback will be requested and accommodated where possible through updates and additions to the content. Any users wishing to provide feedback on the Knowledge Hub can comment on the Knowledge Hub topics themselves or email info@project-freya.eu.

All training events will include an evaluation exercise in order to improve future events as well as gauge the appetite for other types of training materials and events. The project will also attempt to validate, improve

and refine other training materials such as documentation around various usages of the PID Graph. Where possible a record of numbers attending training events will be captured. We will also assess the impact of online resources through the number of views received is available.

To illustrate a baseline, a summary of the reach of the training materials to end July 2019, where figures are available, is given in Tables 1 and 2. An updated version of these tables will be provided in D5.6 Report on Final Training Materials.

Event	Approximate Number of Attendees (to 31/07/19)
Software Citation Workshop	60
Carpentry Connect Lightning Talk 2019	100
RDA UK Node Workshop	70

Table 2 Summary view of the number of attendees at events to end of July 2019

Resource	Views (to 31/07/19)
Knowledge Hub Content	952
Software Citation Workshop Materials	326
Webinars	311
Power of PIDs Lightning Talk	40

Table 3 Summary view of the reach of online training materials to end of July 2019

5.2 D5.6 Final Training Materials

The final report on training materials in FREYA is due in February 2020. It will include an overview of the additional training materials which are created, an evaluation of the future plans outlined above, an assessment of the reach of the materials created and a plan for the sustainability of the resources.

Annex A: Summary table of training materials

Resource	Audience	Description	Link
Knowledge Hub	Various	Online resource containing basic PID Resources	https://www.pidforum.org/c/knowledge-hub
Event Materials			
Software Citation Workshop	Researchers Developers Librarians & Repository Managers Policy Makers & Funders	1.5 day workshop with presentations covering how to cite software, the benefits, examples of managing citation and advocating for it	https://zenodo.org/communities/citesoftware2019/
Power of PIDs Lightning Talk	Developers Software, Data and Library Carpentry Instructors	Lightning Talk presented at CarpentryConnect 2019 illustrating the value of PIDs for software.	http://doi.org/10.5281/zenodo.3361397
RDA UK FREYA Workshop	Developers Librarians & Repository Managers Policy Makers & Funders	A workshop discussing the role of PIDs in research and the role of the RDA in their adoption and advancement.	https://zenodo.org/communities/freya-rda-uk-workshop-20190716/
Webinars	General PID interest	Ambassador and public webinars providing an introduction to the project and updates on the developments	https://www.youtube.com/channel/UCQ5Jp19cvtVLPxUB2WVO5CA
Documentation and Guidance			
How Persistent Identifiers Can Improve the Dissemination of your Research Outputs	Researchers Librarians & Repository Managers	Guide for researchers about ORCID co-created with OpenAIRE.	https://www.openaire.eu/how-can-identifiers-improve-the-dissemination-of-your-research-outputs
API Documentation	Developers Early Adopters	Documentation on two APIs created by DataCite within FREYA, the GraphQL API and the Provenance API.	https://support.datacite.org/docs/datacite-graphql-api-guide https://support.datacite.org/docs/tracking-provenance
Other outputs			
Blog Posts	Early Adopters	Blog posts describing the PID Graph concept and some early applications of it.	https://www.project-freya.eu/en/blogs/blogs/the-pid-graph https://www.project-freya.eu/en/blogs/blogs/using-jupyter-notebooks-with-graphql-and-the-pid-graph

			https://www.project-freya.eu/en/blogs/blogs/tracking-the-growth-of-the-pid-graph
<i>pidforum.org</i> PID Graph Category	Developers Early Adopters		https://www.pidforum.org/c/pid-graph