Reproducibility and standards: ELIXIR Training Platform perspective

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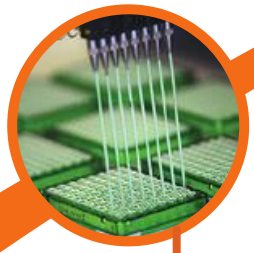
www.elixir-europe.org

ELIXIR connects national bioinformatics centres and EMBL-EBI into a sustainable European infrastructure for biological research data

medicine

agriculture



bioindustries

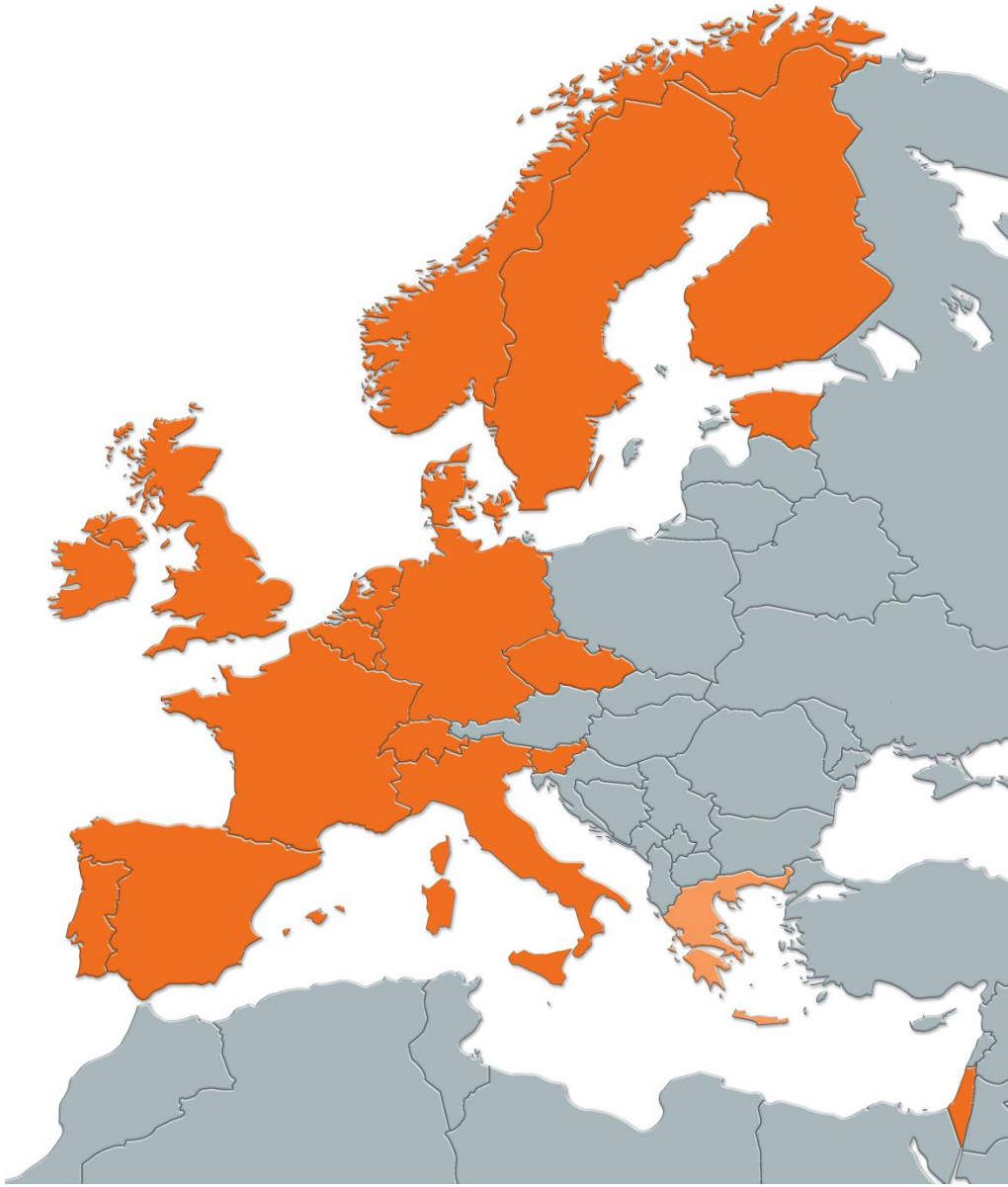
environment

ELIXIR underpins life science research – across academia and industry

ELIXIR Membership

ELIXIR Members

ELIXIR Observers



ELIXIR Structure

Five technical platforms for Data, Tools, Interoperability, Compute and Training

Complemented by four Use Cases for marine meta-genomics, rare diseases, human data and plants sciences

Training: Professional skills for managing and exploiting data

- Mission: provide developers, researchers and trainers with skills to use and exploit ELIXIR services
- Builds on and complements trainings in ELIXIR Nodes

Chris Ponting, UK, **Patricia Palagi,** CH, **Celia van Gelder,** NL, **Rita Hendricusdottir,** UK

Training: Professional skills for managing and exploiting data

- ELIXIR Training infrastructure:
  - TeSS portal to share and exchange training content and events: http://tess.elixir-uk.org
  - E-learning platform and solutions
  - Large pool of ELIXIR trainers (Train the Trainer)
  - Good training practices and guidelines, including metrics and evaluation
  - Training events for researchers, developers, trainers and infrastructure operators

We need standards to

Describe Training related:

- Measures and metrics
- Events
- Materials
- Trainer competencies

Standardised measures - training quality, success & impact

1st step: Survey the community – identified descriptors in 3 categories

- descriptors for training programs
- quantitative metrics for individual training events
- questions for short-term feedback

Standardised measures - training quality, success & impact

1st step results - Some descriptors

- **quantitative data** - course program:
  - #events, #days, #participants, geographical spread
- **trainers' quantitative data** - effort involved:
  - #trainers, #hours in preparation/delivery/post course
- **course ratings** - overall organization, course content, balance and level, evaluations of each day of the course
- **qualitative data** - capturing suggestions for improvements and additional training topics.

Standardised measures - training quality, success & impact

Next steps – descriptors of impact on

- **productivity and quality** – publications, citations, skills learned useful to the research, to validate results, data analysis shorter
- **career trajectory of the trainee** – hired, promoted, same job but accomplished better, new collaborations
- **career trajectory of the trainer** – efforts acknowledged or validated in job, hired, promoted, same job but accomplished better, new collaborations

Standardising the process

And then next steps:

- From the set of common descriptors – **create a standard**
- Define a mechanism to ensure and facilitate capturing this information from Nodes
- Best practices and guidelines on standard and capturing
- Seek commitment of the community to adopt the standard

TCC BD2K Training Coordinating Center

NIH Big Data to Knowledge(BD2K)

GOBLET Global Organisation for Bioinformatics Learning, Education & Training

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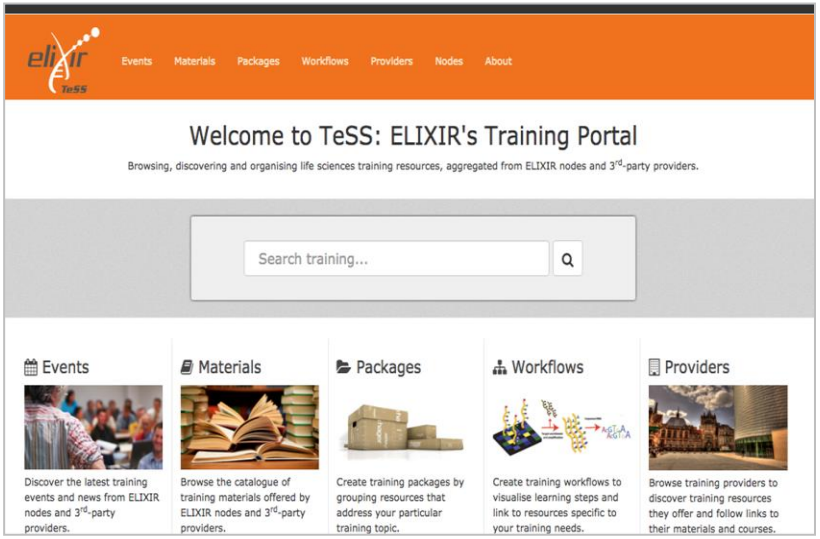
ELIXIR TeSS Portal (Training eSupport System)

for browsing, discovering and organizing training events, courses and materials

https://tess.elixir-uk.org/



ELIXIR TeSS Portal (Training eSupport System)

https://tess.elixir-uk.org/

Aims to give a snapshot of the ELIXIR training landscape

- automatically aggregating data from Nodes & 3rd-party providers
- making events & resources discoverable through useful filtering tools
- surfacing information to support user decisions & choices via training packages & workflows
- forming a resource network by linking data with other ELIXIR registries such as bio.tools and biosharing

Allows Nodes to contribute their training resources

- showcase latest news, events, activity highlights, *etc*.

TeSS driving development of standard for sharing training materials and events

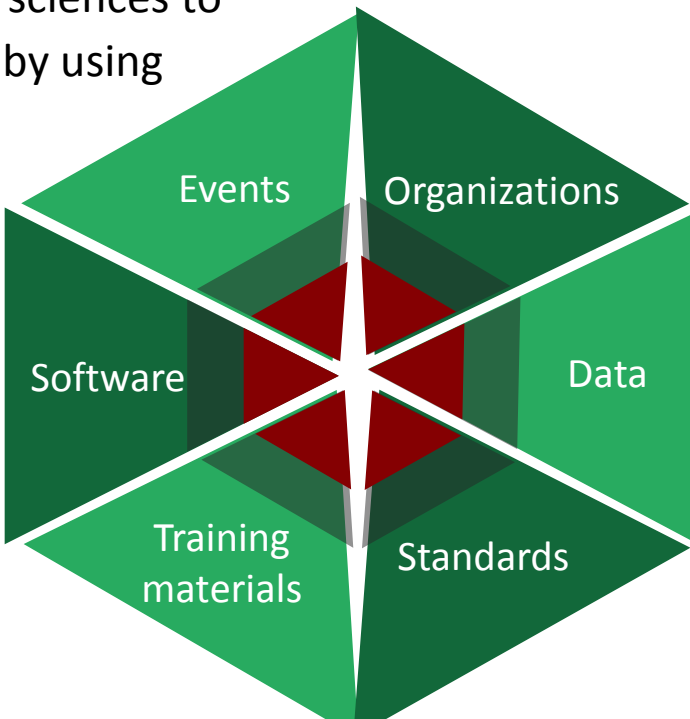
Bioschemas

- improves data discoverability in life sciences by improving the exposure of our data repositories:
  - By search engines like Google
  - By aggregated portals like TeSS
- It does this by encouraging content providers in life sciences to expose consistent structured data in their websites by using schema.org mark-up.

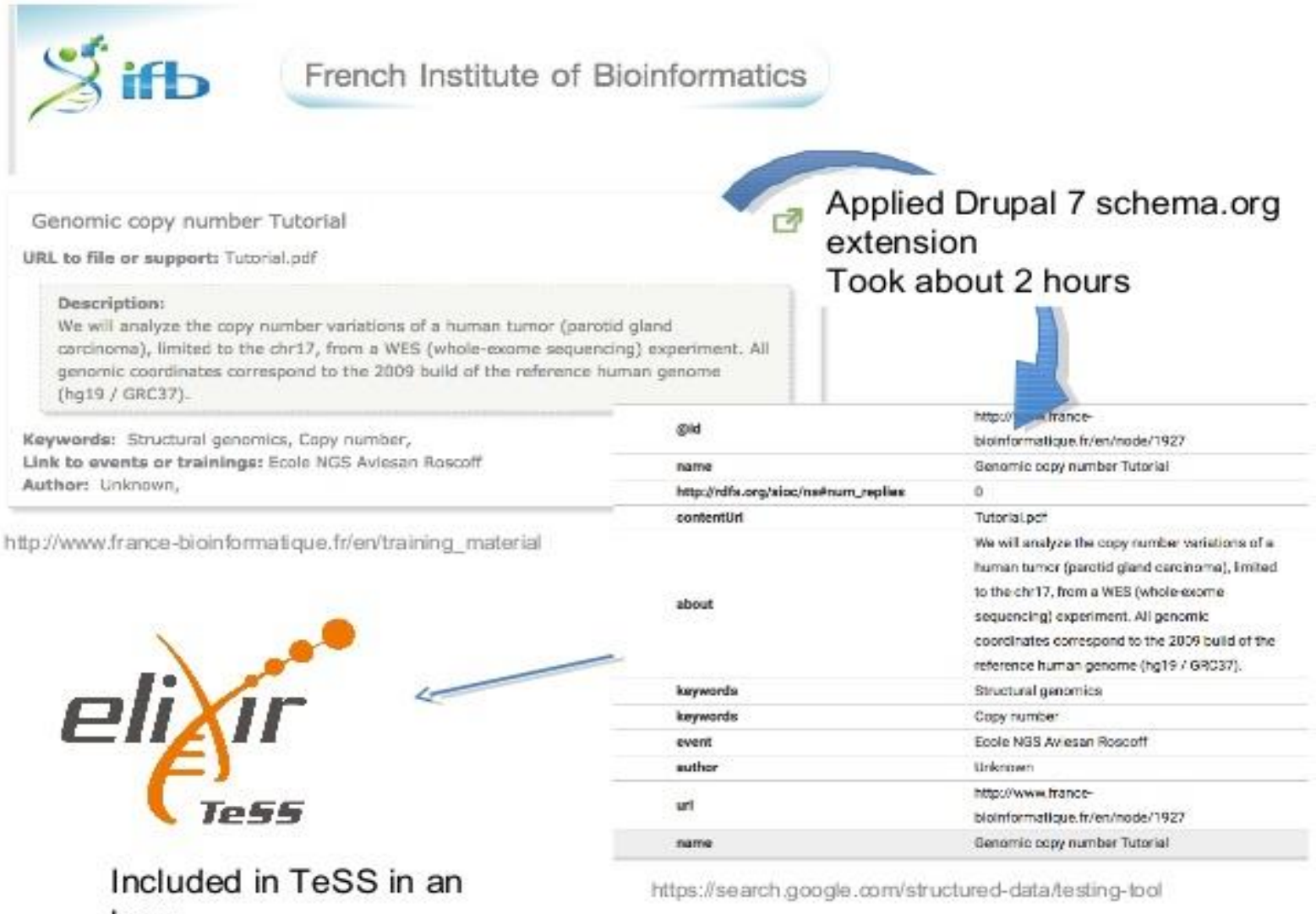
In TeSS

- Describes all training events and materials using Bioschemas
- Parses, aggregates and integrates any Bioschemas compliant training resource metadata

Identifier, Title, Description, Author, Topics, Audience, Publication Date, …

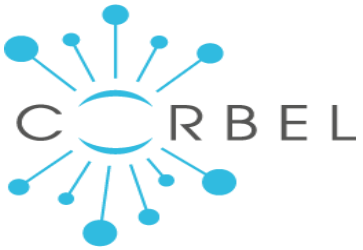


Bioschemas compliant metadata integration into TeSS



Competency profiles

- Standards to describe the knowledge, skills, values and attitudes necessary for a profession or a particular job role
- Initiated in ISCB
  - developing competency profiles for bioinformatics users, scientists and engineers. Examples: Welch, L. et al. (2014) *PLoS Comp. Biol.*
- Applying such profiles to define professionals and the identify training needs



We care for reproducibility

In Training related:

- Courses
- Materials

Insuring courses can be reproduced

Course materials (slides, exercises, datasets)

- Training materials annotated, findable in TeSS and reusable
- Hackathons: Metagenomics, Data carpentry, etc.

Clouds, virtual machine (VM) images and Docker

- Overcoming technical problems during courses
- Containers pre-installed
- Cloud platforms: more computing power and memory, scaling for running hundreds of simultaneous jobs

Distance learning

- Enable remote execution of a live course: teacher in one location and students on remote and distributed locations

Train the trainers - why

- Need for courses outweighs the number of places available, notably in NGS courses
- Life sciences expand into newer territories
- Need for bioinformatics competencies (and hence training):
  - well recognised
  - ability to provide such training - not yet well developed in all ELIXIR Nodes

New trainers are therefore required across both academia and industry

Train the trainers

Build a highly skilled and coherent community of trainers

- Tools and tips for providing an enriching learning experience to their trainees
- Guidance on course development
- Access to a wider support network, with a focus on ELIXIR-derived resources and infrastructure

Development

- Reproducible framework and associated material
- Guidelines for delivery of TtT courses

GOBLET
Global Organisation for Bioinformatics Learning, Education & Training

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Training for Standards and Reproducibility

We are responsible for:

Scientists
Developers
Trainers

ELIXIR community and beyond

Courses - Data management and data stewardship

- Data-intensive analyses: data-management expertise is essential
- Scientists need to ensure that:
  - their experiments are reproducible
  - the resulting data ("data stewardship") are :
    - accessible
    - reusable
    - sustainable

- ELIXIR priority: providing solutions, best practices and training

ELIXIR Software and Data Carpentry programme

- Bring the model and format of Carpentry training to ELIXIR and its Nodes
- Several workshops organised within Nodes
- **~ 240 life science researchers and instructors trained**
- First ELIXIR instructors received their certificates in February 2016
- Many more yet to come in collaboration with Software and Data Carpentry

software carpentry

DATA CARPENTRY
MAKING DATA SCIENCE MORE EFFICIENT

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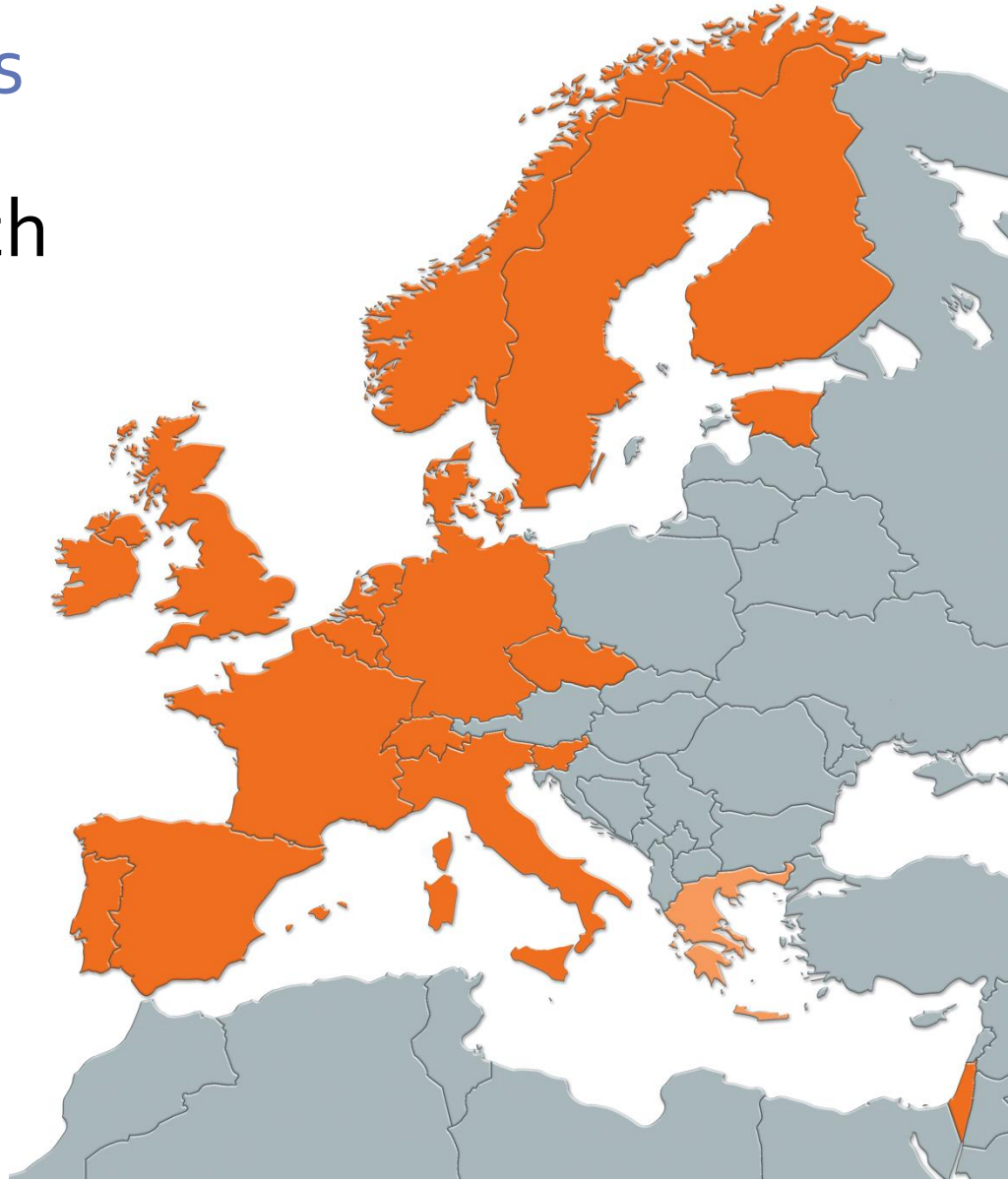
Training in ELIXIR Nodes

- Reproducible research
- Experimental design
- Statistical analysis



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Acknowledgements – Train the trainers

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And many more, that I have certainly forgotten and I apologise in advance ….

Acknowledgements

Over 160 institutes involved in ELIXIR

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