

The Carpentries approach to training

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Agenda

- The Carpentries approach
- Get inspired by other initiatives:
 - CodeRefinery and The Galaxy project

About The Carpentries

A non-profit, fiscally-sponsored project that:

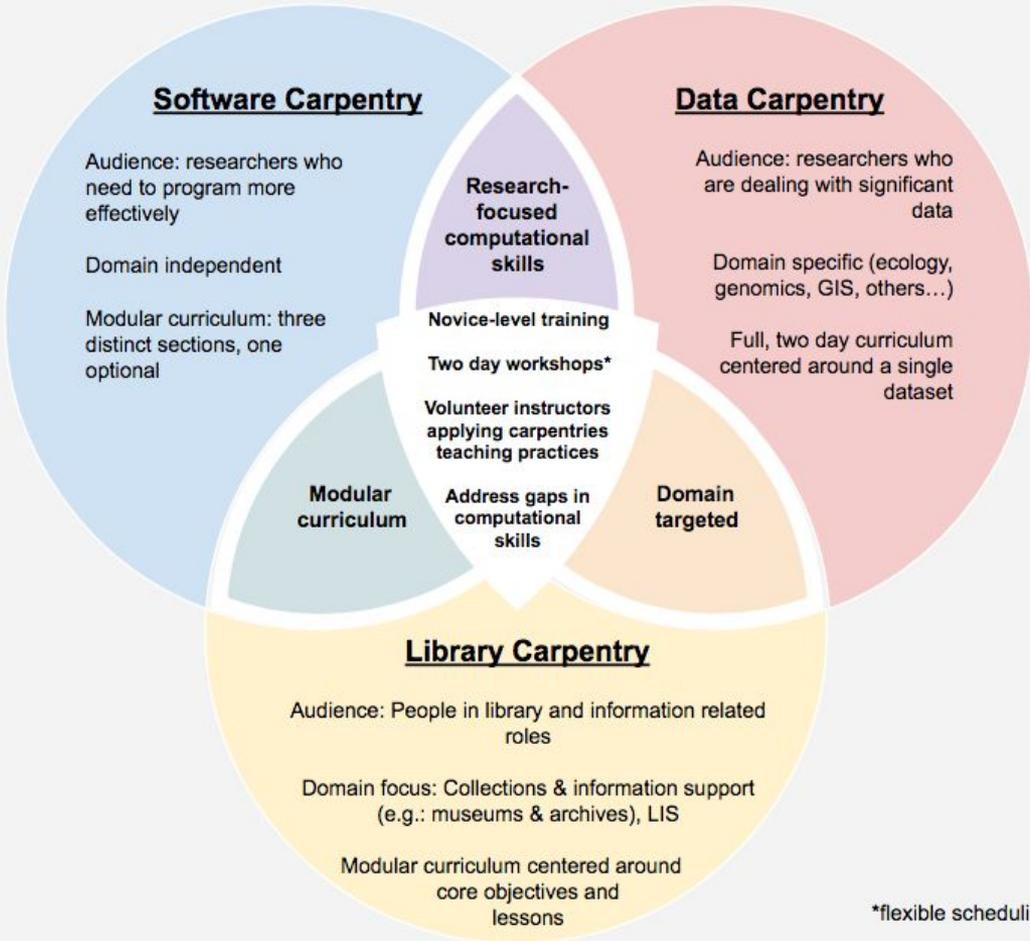
- **Supports training** in entry-level software and data skills for researchers
- **Builds community** and local capacity for teaching and continued learning of related skills and perspectives



Carpentries workshops



Since 2012, we have run **2,300** workshops in **61** countries and trained **2,400** volunteer instructors to deliver our **33** collaboratively developed, open lessons to **56,900** novice learners at our **85** member sites and beyond.



*flexible scheduling

Carpentries Workshops are:

Accessible
Approachable
Aligned
Active



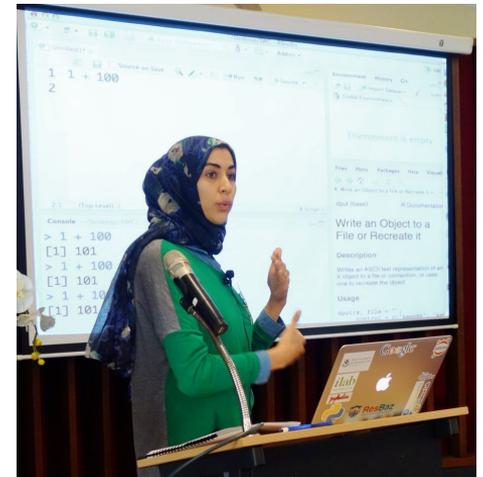
Accessible

- Available in a time and place where a person can attend
 - 2-day format with flexibility
- Proactive in ensuring accessibility
- Open-source curriculum and tools
- Welcoming, Code of Conduct



Approachable

- Friendly learning environment
- Focus on entry, meeting learners where they are
- Helping overcome activation barriers to getting started
- The mistakes are the pedagogy



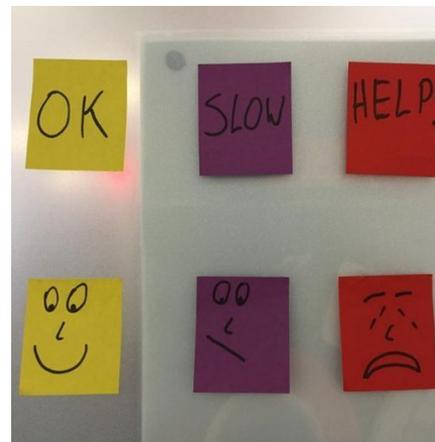
Aligned

- Curriculum collaboratively updated to reflect current practices
 - Datasets relevant to learners
 - Skills and perspectives relevant to current work
- Instructors current in field
 - peer instruction



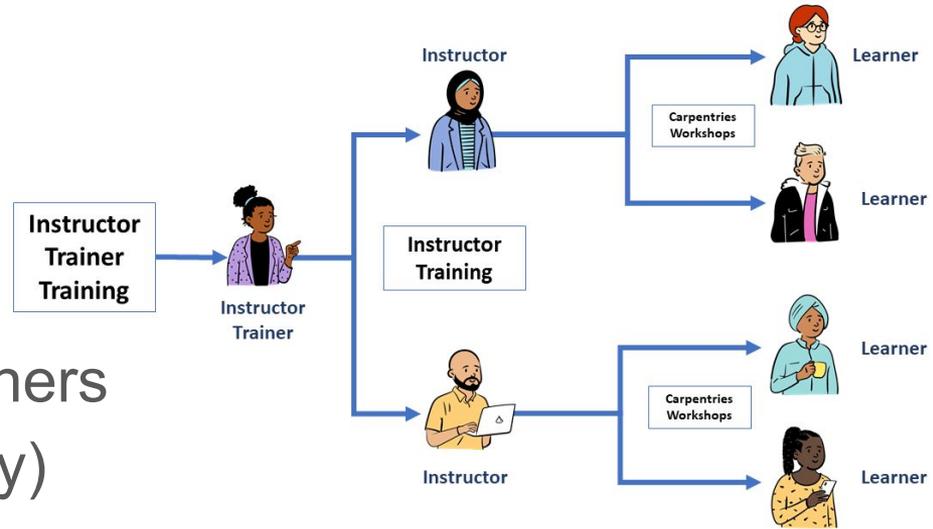
Active

- Participatory live coding with trained instructors
 - I - We - You
- Helpers
- Formative assessment
 - Sticky notes!



How are Carpentries Instructors trained?

- 2 days, active learning
- Essentials of educational theory and practice
- Taught by 2 certified Carpentries Instructor Trainers
- Online or in person (usually) delivery
- 3 'checkout' steps



The Carpentries Membership

Membership Benefits					
	Bronze	Silver	Gold	Platinum	Titanium
Number of Centrally-Organised workshops	2	2	3	0	0
Number of Instructors trained	0	5	12	15	0
Membership Fee (USD Annual) per <u>World Bank's income categorisation</u>					
High income	\$3,600	\$8,100	\$16,200	\$13,500	\$5,000
Upper-middle income	\$2,700	\$6,075	\$12,150	\$10,125	\$3,750
Lower-middle income	\$1,800	\$4,050	\$8,100	\$6,750	\$2,500
Low income	\$900	\$2,025	\$4,050	\$3,375	\$1,250

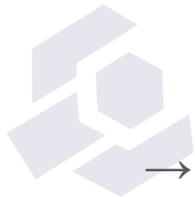
→ Unlimited number of self-organised workshops

→ Opportunity to submit a candidate for our Trainer Training course, through which individuals can become certified to teach our Instructor Training courses (additional fees apply).

How are Carpentries lessons developed?

- **Collaboratively develop** lessons using The Carpentries lesson infrastructure
 - **identify and characterise** the target audience for a lesson
 - **define** specific, assessable learning objectives
 - **explain** the pedagogical value of authentic tasks
 - **create** exercises for formative assessment
 - **summarise** considerations of cognitive load
- **Maintain** accessible and usable lesson repositories
- **Regularly update and improve** lesson material guided by feedback
- **Review** and provide constructive **feedback** on lessons

Identify and characterise your target audience

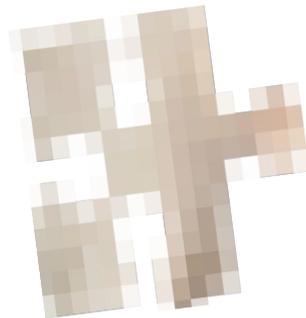
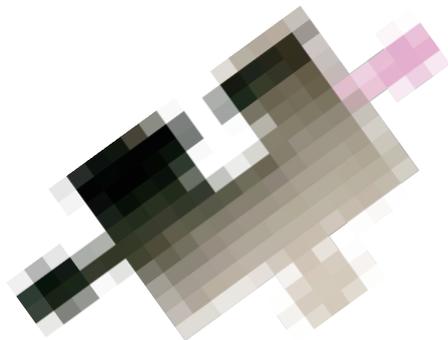
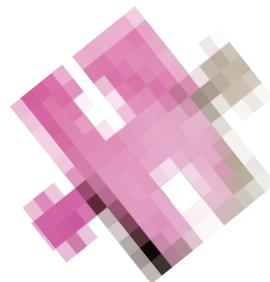
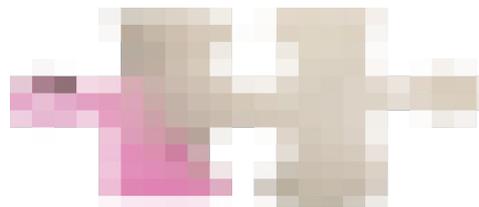


→ Use pre-workshop questionnaires and assessments to adjust your teaching.

Expert



Novice



Expert



Novice



Expert

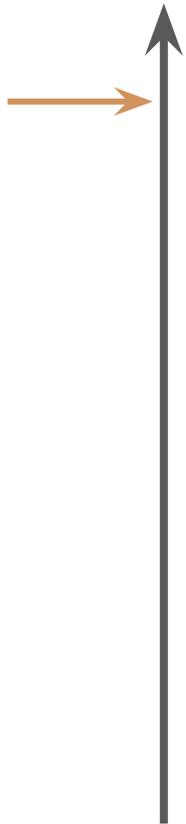
2018-08-01 -- Michonneau 40SS
Hackathon Utrecht



Novice



Expert



Novice



Image credit: <https://ceaco.com/collections/animals-puzzles/products/avanti-kitten-bouquet-300-piece-puzzle>

Define specific and assessable learning objectives

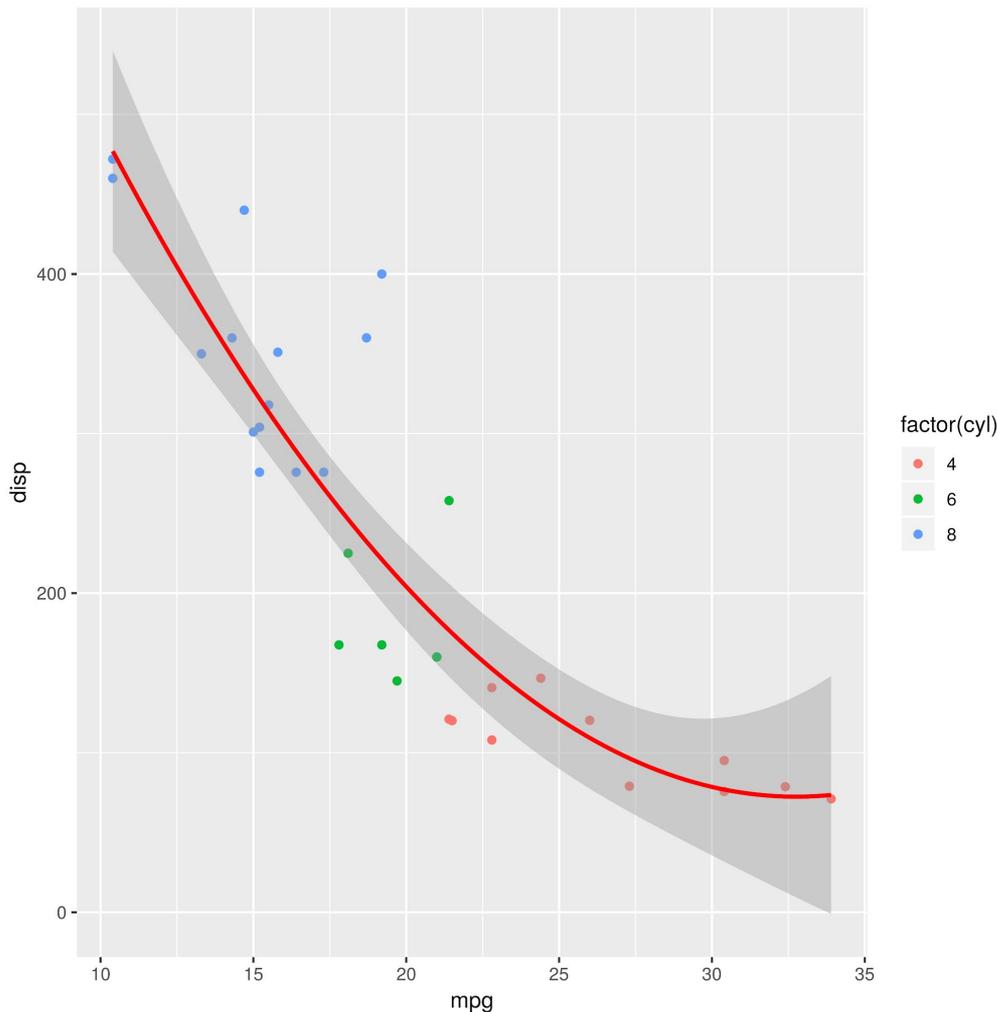
Backward design

- » What should learners be able to do after taking the course?

**What do you
want your
learners to
learn?**

What would a **beginner** need to know to be able to write this?

```
1 ggplot(mtcars, aes(x = mpg, y = disp)) +  
2   geom_point(aes(color = factor(cyl))) +  
3   geom_smooth(method = "lm", formula = y ~ poly(x, 2),  
4               color = "red")
```



- Why some words have quotes and others don't?
- What does the "~" do?
- Why do we need "color" twice but other arguments are only listed once?
- Why "color" is within "aes()" in one case and not the other?
- What does "factor()" do?
- What do the "+" do?
- When to use argument names?
- Why is there no "aes()" in "geom_smooth()"?

Example of Learning Objectives

? Overview

Teaching: 25 min

Exercises: 0 min

Questions

- How can I identify old versions of files?
- How do I review my changes?
- How can I recover old versions of files?

Objectives

- Explain what the HEAD of a repository is and how to use it.
- Identify and use Git commit numbers.
- Compare various versions of tracked files.
- Restore old versions of files.

→ Given on top of each Carpentries lesson

The elements of a Carpentries lesson

Lesson design:

- » Learning objectives
- » Chunking (7 ± 2)
 - > Meet learners where they are
 - > Break down concepts needed
 - > Identify in which order to teach them
 - > Teach the most useful first

Lesson content:

- » Live coding
- » Challenges

Lesson Development Study Groups

- Ten-week program
 - <https://carpentries-incubator.github.io/study-groups/>
- Reading, weekly group discussion, and homework tasks
- Main texts: [Curriculum Development Handbook](#) & [Teaching Tech Together](#)



Lesson Development Study Groups

Lesson Development Study Groups are for community members who would like to begin working on a new lesson in The Carpentries Incubator. The study group will bring these community members together to develop their lessons as a cohort. Participants will benefit from the process by learning good practices in lesson design and sharing experience as they build their lessons.

The overall goal of the program is that every lesson will have a realistic and coherent outline, a repository set up to encourage collaboration, and at least one complete episode that has been taught once. This should equip developers with the knowledge, skills, and confidence they need to continue developing the lesson after the round ends, and begin to create a more tangible community around curriculum development in The Carpentries.

🌟 Target Audience

The Study Groups are aimed at certified Carpentries Instructors who have an idea for a new lesson, that e.g. draws on an example or data from a discipline or uses a new tool, and want to begin developing that idea into a lesson. The lesson should not already exist, even as a partially-complete lesson, except perhaps as a "placeholder" lesson repository in The Carpentries Incubator. A good source of course ideas could be found under issues tagged with "lesson-idea" in the Incubator Proposals repository (provided that development work on them has not started yet). Plans are also being made for follow-up sessions/activities/events, covering topics more relevant at later stages of the development process, which would be open to other lesson developers.

These Study Groups are not appropriate for developers of lessons that have already been through the early stages of design, e.g. lessons that already include a significant amount of content, or that have already been taught. Additional sessions/activities/events are planned for developers with lessons at these later stages of development. The Study Groups are also not appropriate for developers of lessons being translated/converted from existing Carpentries/Incubator material, e.g. translations of existing lessons into a new language, or creation of a Python equivalent of an existing lesson currently taught with R etc. These efforts are still very valuable but fall outside of the context of this program!

If you would like support with activities such as those listed above, please contact tobyhodges@carpentries.org



Where to find information about The Carpentries

- Website: <https://carpentries.org/>
- The Carpentries Handbook: <https://docs.carpentries.org/>
- The Carpentries curriculum handbook: <https://cdh.carpentries.org/>
- Lesson design study group:
<https://carpentries-incubator.github.io/study-groups/>
- Instructor training material:
<https://carpentries.github.io/instructor-training/>
- Carpentry Trainer Training program:
<https://carpentries.github.io/trainer-training/>

Other initiatives inspired from The Carpentries

- Many initiatives get inspired from The Carpentries to develop, maintain and teach their own training material
 - Often have different target audiences
 - Still get their instructors trained by The Carpentries (<https://carpentries.github.io/instructor-training/>)
 - Adapt teaching to scale up e.g. increase the number of participants per workshop



CODE REFINERY

Training and e-Infrastructure for Research Software Development

We teach all the **essential tools** which are usually skipped in academic education so everyone can make full use of software, computing, and data. We don't just give courses, but **we are a training network** that you can join to share the effort and bring better courses to your community.

Our [standard workshop](#) is well known in Nordic academic circles and our [engaging online teaching style](#) is considered best-in-class even compared to in-person teaching. CodeRefinery aims to operate as a community project with support from academic organizations.

View our [vision of the future of teaching](#) (or [read it](#)).

<https://coderefinery.org/>

CodeRefinery provides

- For **organizations**: an opportunity to pool competence and offer more training and development opportunities than they could individually. A place to share best teaching practices and other skills.
- For **volunteers** and the team: a community around teaching and opportunity for skill development, both in pedagogy and practical skills.
- For **learners**: a welcoming and useful environment for learning many necessary practical skills that may otherwise not be explicitly taught. This can be through courses, hackathons, and the like.

Newsletter

This is a low traffic newsletter about our events and updates: One email every 1 or 2 months ([archives](#)).

SUBSCRIBE

Become part of the team

Come and join our team. Let us create something amazing together! Let us create something amazing together!

TASKS/ROADMAP

JOIN AS INDIVIDUAL

AS STAFF

AS ORGANIZATION

CodeRefinery approach

- Teach intermediate-level software development tool lessons
- A few CodeRefinery instructors (some are trained by The Carpentries)
- CodeRefinery Community teaching guidelines:
<https://coderefinery.github.io/community-teaching/>
 - Different workshop roles: <https://coderefinery.github.io/manuals/roles-overview/>
 - Different teaching collaboration models to scale-up and reduce the load on instructors:
<https://coderefinery.github.io/community-teaching/collaboration-models/>
- CodeRefinery MOOC strategy:
<https://coderefinery.github.io/manuals/coderefinery-mooc/>
- Mega-CodeRefinery online training event:
 - Audience of around 90-100
 - “bring your own breakout room”
 - 3 days/week, 6 days total
- CodeRefinery Operation manuals: <https://coderefinery.github.io/manuals/>

Galaxy Training approach

<https://training.galaxyproject.org/>

- Part of the Galaxy Project, an open-source community for reproducible data analysis:

<https://galaxyproject.org/>

Contributor Hall of Fame

320

Contributors

37

Topics

360

Tutorials

8.1

Years

This project would not be possible without the many amazing community contributors!

Many training materials on various topics for scientists, developers, contributors to training material, etc.

The screenshot shows the Galaxy Training website. At the top is a dark navigation bar with the logo and menu items: Contributors, Learning Pathways, Help, Extras, and a search bar for Tutorials. The main content area has a heading 'Welcome to Galaxy Training!' followed by a sub-heading 'Collection of tutorials developed and maintained by the worldwide Galaxy community'. Below this is a section titled 'Galaxy for Scientists' which contains a table of topics and their respective tutorial counts.

Topic	Tutorials
Introduction to Galaxy Analyses	12
Assembly	17
Climate	7
Computational chemistry	8
SARS-CoV-2	9
Ecology	15
Epigenetics	9
Evolution	2
Genome Annotation	15
Imaging	5

To the right of the table is a video player titled 'Welcome to the GTN!' with the subtitle 'Find out more about Galaxy Training Network'. The video thumbnail shows the Galaxy Training Network logo and a play button. Below the video is the text 'Video created by Geert Bonamie.' and a link for 'The latest GTN news' with an RSS icon and the text 'Read about new tutorials, features, events and more!'.

Galaxy Training events

- Training material is meant to be used as self-paced training:
 - The training material is build around an existing user workflow (reproducible data analysis) e.g. it is mostly hands-on;
 - Training material is made available in different languages (google translate!) so narrative needs to be as limited as possible;
 - Training material is reviewed by one topic expert and someone from the community who does not know the topic.
- A few training events are organised:
 - [Galaxy Community Conference](#): in-person with 30-50 persons; short overview of a topic and not the full lesson.
 - [Smörgåsbord](#): **online asynchronous** (no live sessions, pre-recorded videos with subtitles, support via Slack, YOU decide your schedule). More than 1000 participants from all over the world. Organised once a year.

Thanks for your attention