Teaching & Learning with Jupyter Notebooks

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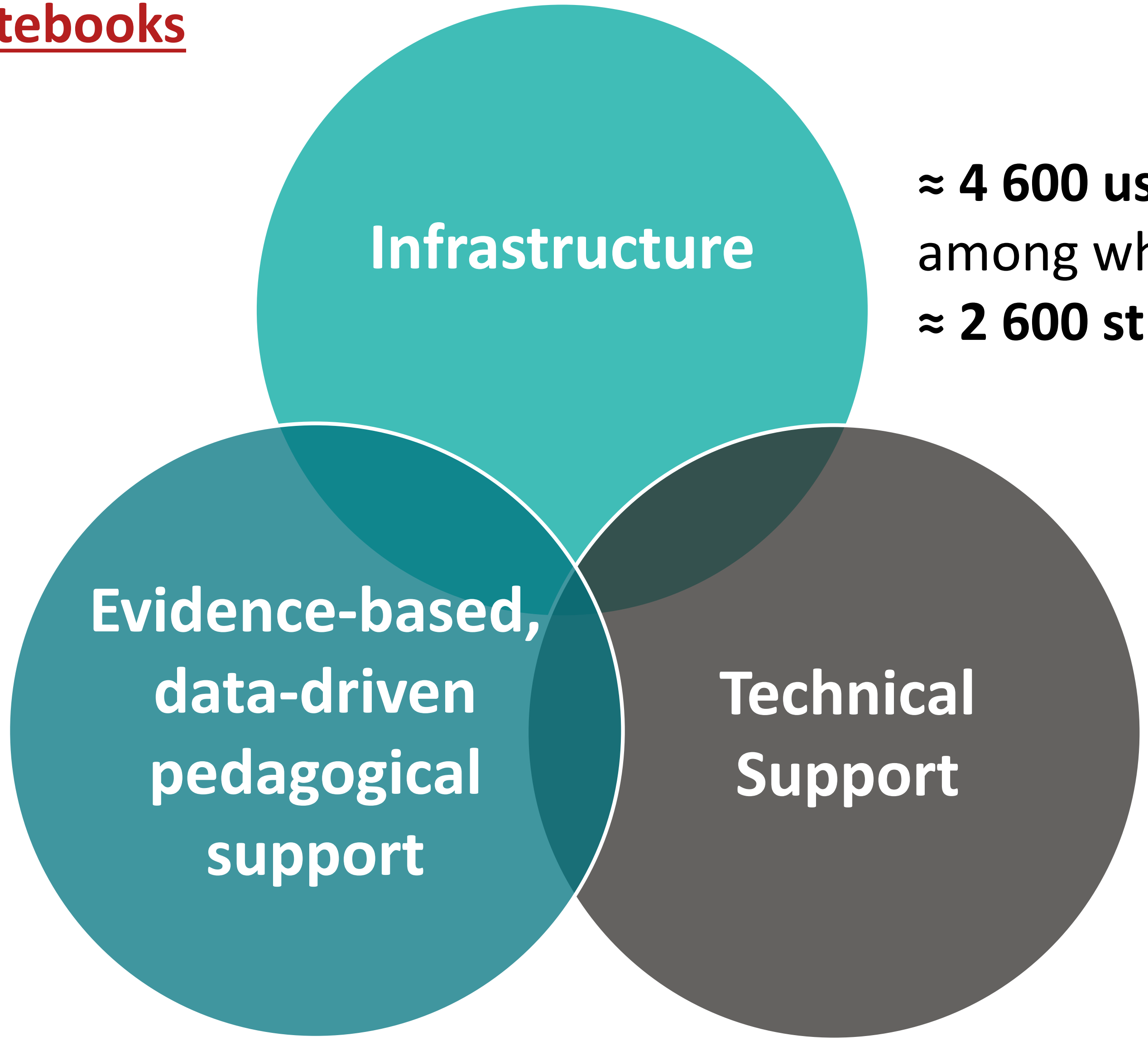
Jupyter Notebooks for Education @ EPFL

https://go.epfl.ch/notebooks

≈ 4 600 users, among which **≈ 2 600 students**

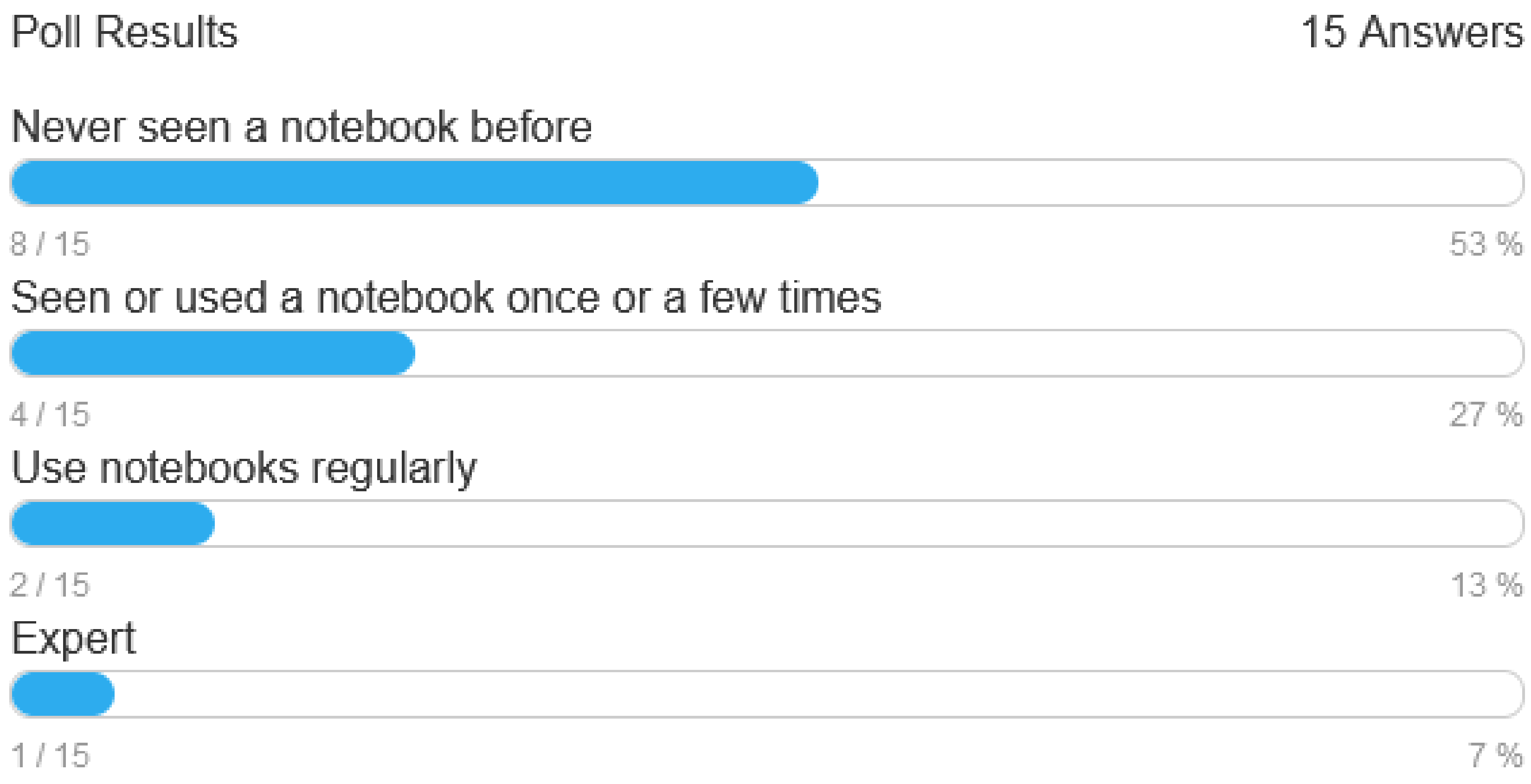


Accompany teaching teams and carry out in-class and in-lab **evaluation studies**

Develop and maintain the platform, **integrate** with other tools

Updated 07/09/2021

How familiar are you with Jupyter Notebooks?



Learning goals

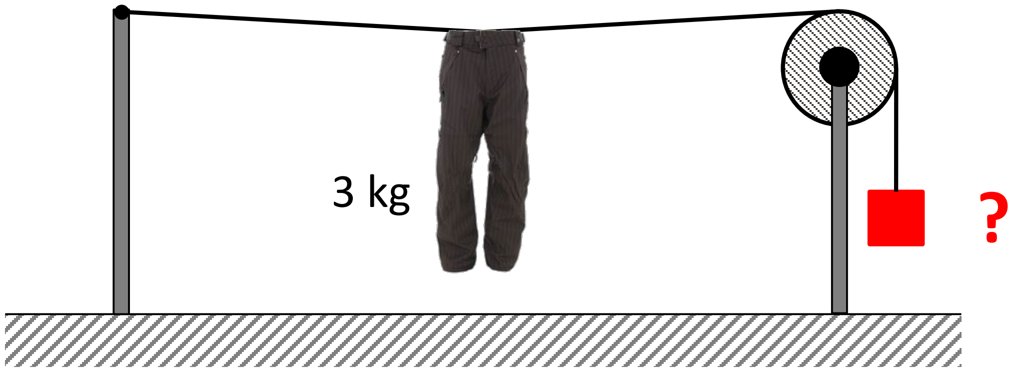
At the end of this session, you should be able to:

- Describe the **features** offered by Jupyter Notebooks and how they differ from other tools
- Analyze which elements can **foster learning** in a notebook
- Identify how notebooks can be used for teaching and learning in **sciences** and **engineering**

Agenda

25’	Learning discipline-specific content with a notebook
15’	What make notebooks effective for learning?
15’	When / for what to use notebooks?

<u>Estimate</u> which counterweight allows to suspend wet jeans (3kg) on the cable in the position illustrated below



https://speakup.epfl.ch/room/88899

a. 1,5 kg
b. 3 kg
c. 6 kg
d. 20 kg
e. 50 kg or +

Adapted from Marc Legrand, IREM de Grenoble

Let's do some physics with a notebook!

Connect to our JupyterLab platform:

- Link: https://go.epfl.ch/15sept21-nb
- Login: **valid email address**
- Password: **Demo**

Use Firefox or Safari
(avoid Chromium)

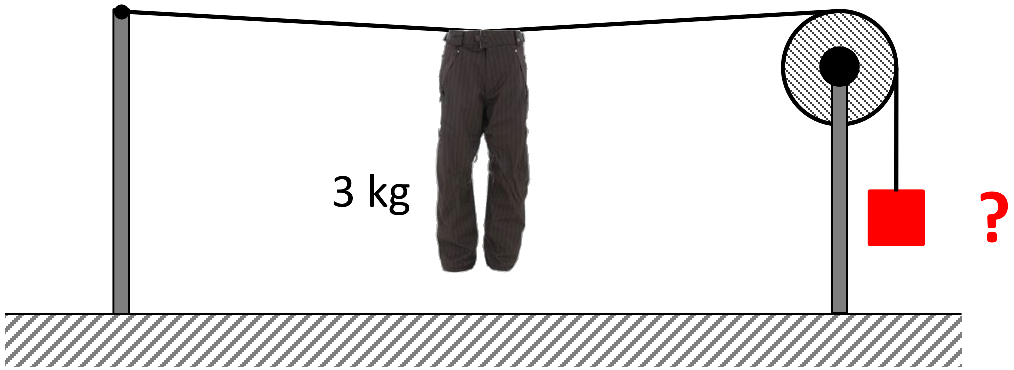
Let me briefly introduce how to use a notebook

Work on the notebook:

- Activity 1: virtual lab (no programming)
- **[Optional]** Activity 2: computation and visualization with Python

Let's debrief the physics

Which counterweight allows to suspend wet jeans (3kg) on the cable in the position illustrated below?
And more importantly can you explain why?



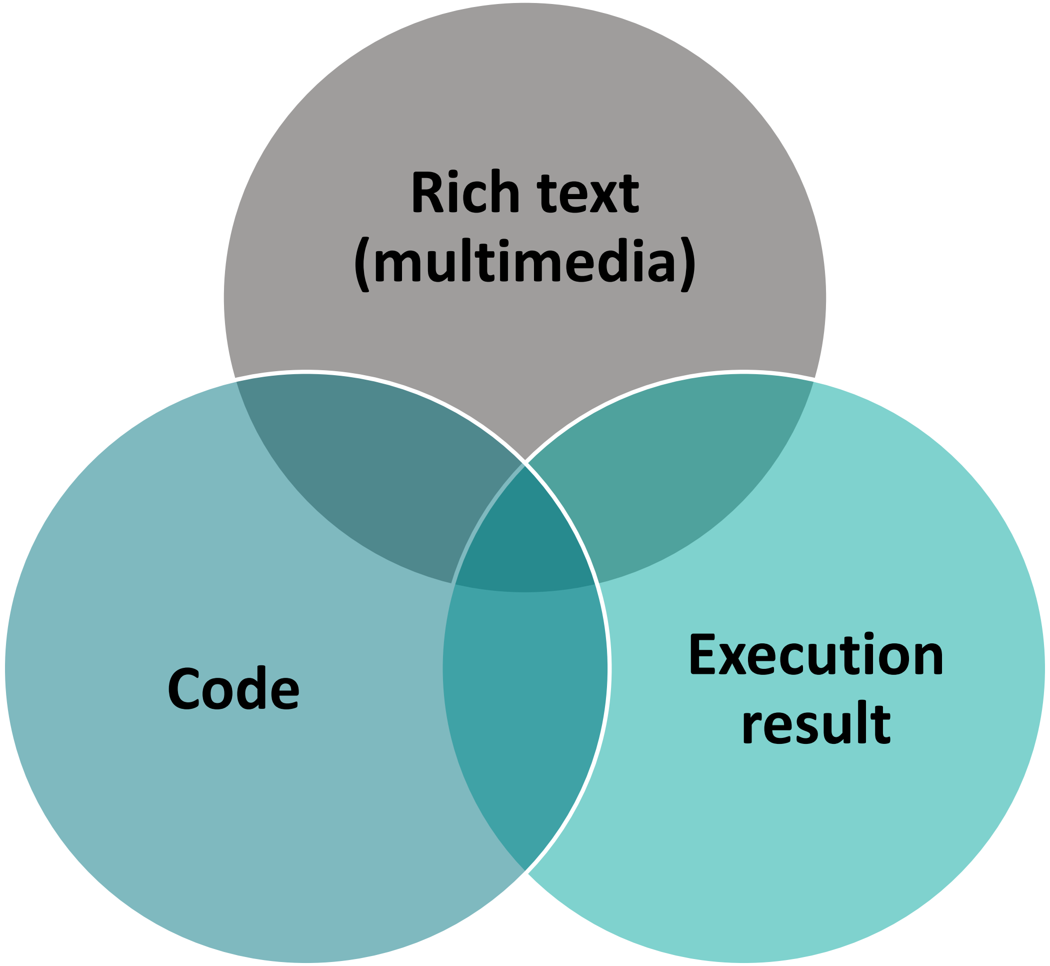
https://speakup.epfl.ch/room/12989

Which features of this notebook did you find the most helpful for learning?
Compare with other tools you know, in particular online textbooks and code editors.

Online brainstorming:

- Link: https://speakup.epfl.ch/room/36212
- **1 message = 1 feature**
- **Vote** for features you find the most helpful for learning

What make notebooks effective for learning sciences and engineering?



Expert thinking in the form of problem solving or scientific investigation **narrative** including equations, diagrams, etc.

+

Code & output as **interactive illustrations** and **activities**

[Knuth, 1984 ; Granger & Pérez, 2021]

What make notebooks effective for learning sciences and engineering?

Benefits

- Multiple **representations**
- **Interaction** and **manipulation** of representations

Challenges

- Presentation issues (cognitive load)
- Relating representations
- Programming background and skills
- Learning from doing

[Ainsworth, 1999 ; Mayer, 2009 ; Chandler & Sweller, 1991 ; Mayer & Fiorella, 2014 ; Robins, 2019 ; Dewey, 2015]

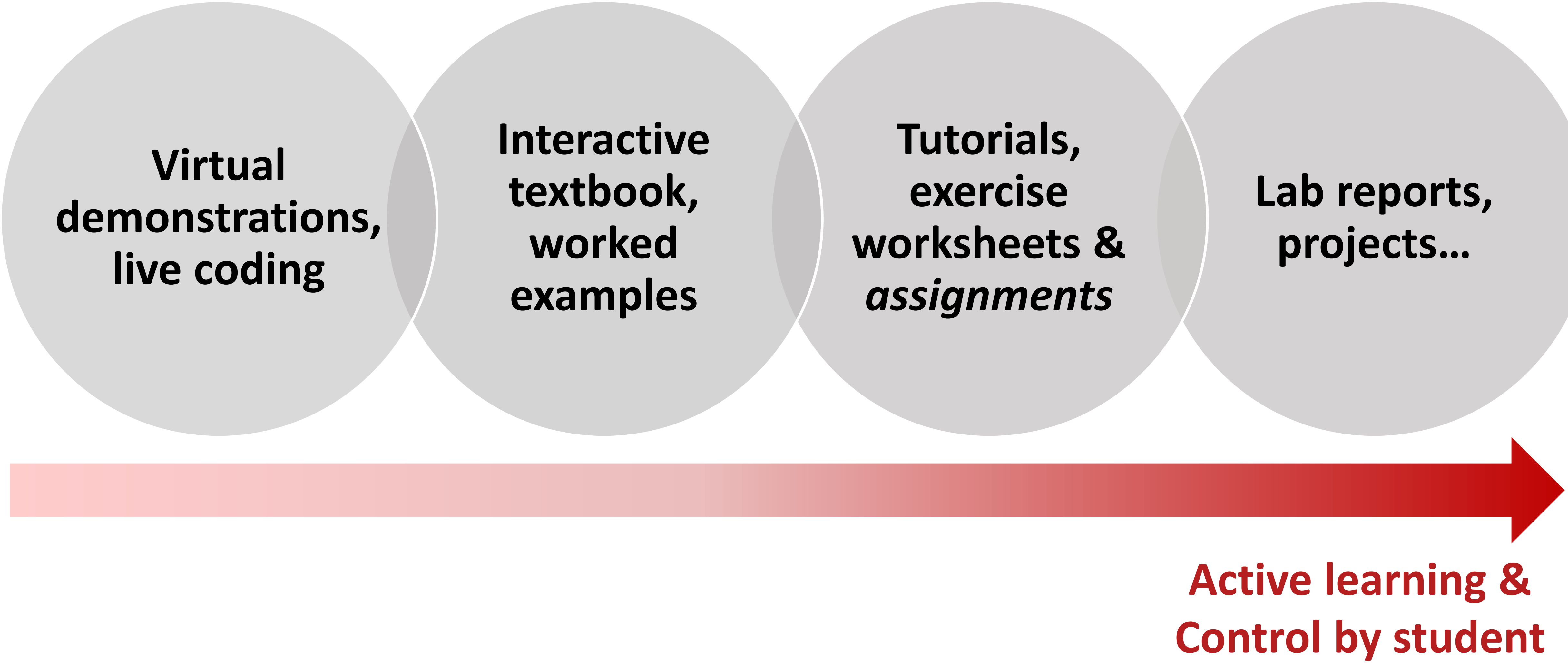
How could you use notebooks in your own teaching?

In groups of 4, in breakout rooms :

- Brainstorm
- Take notes in the shared document
  - Link: https://go.epfl.ch/15sept21-gdoc
  - **Find the slide corresponding to your breakout room number**

Let's debrief in plenum!

When / for what to use notebooks?



[Freeman, 2014; Hattie, 2009]

Is it worth it?

160 first year STEM bachelor students with minimum programming level

Notebook on inferential statistics

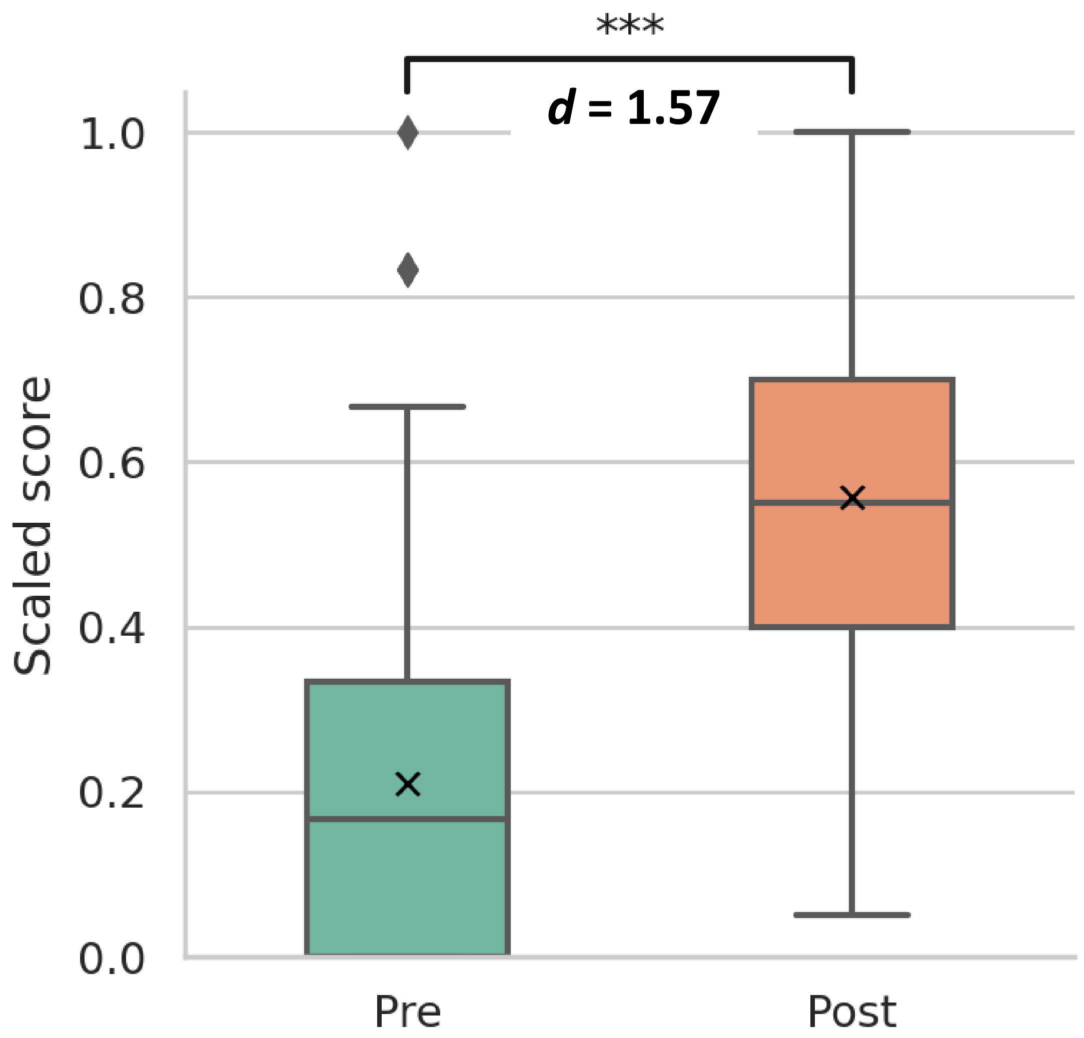
- **Conceptual explanations** with simulated sampling, statistical tests & **visualizations**
- Integrated **questions** (mini-activities) either with or without programming

2 hour autonomous online activity

MCQ pre- and post-tests

[Hardebolle et al., TBP]

Conceptual understanding of statistics (N = 160)



Summary

Write down for yourself **3 things you have learnt** about teaching and learning with Jupyter Notebooks:

-
-
-

Any **remaining question?**

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