Introduction to pedagogy and training design

Adapted from the EOSC Synergy Train the Online Trainer course
For the Atlanta CODATA/RDA School by
Rob Quick - Indiana University

EOSC-SYNERGY receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 857647

Program

- Introduction to pedagogy
- The CODATA/RDA Schools
  - History
  - Modules
  - Resources
- Improve this course for future participants
  - Pick a module/aspect/delivery method used during this course and redesign it
- Feedback and Next Steps

Before we start

- Our aim is to create the best training experience possible
- Meet the aims and the needs of your learners
- We are starting from the assumption that training is the right solution!

- What makes a good / bad training experience?

Cathy Moore's action mapping workflow
https://blog.cathy-moore.com/action-mapping-workflow-at-a-glance/

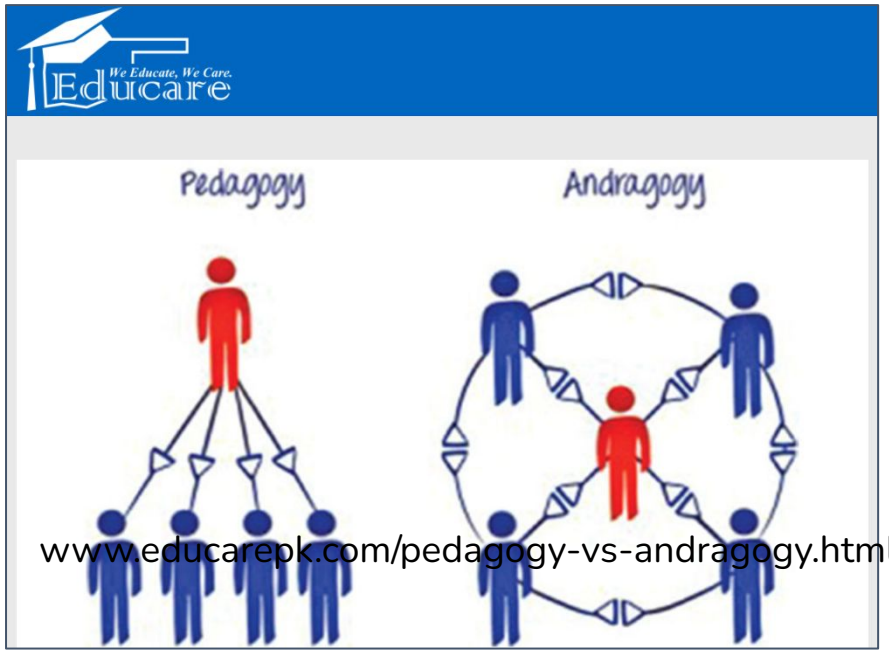
Pedagogy

"the art, science, or profession of teaching"

www.merriam-webster.com

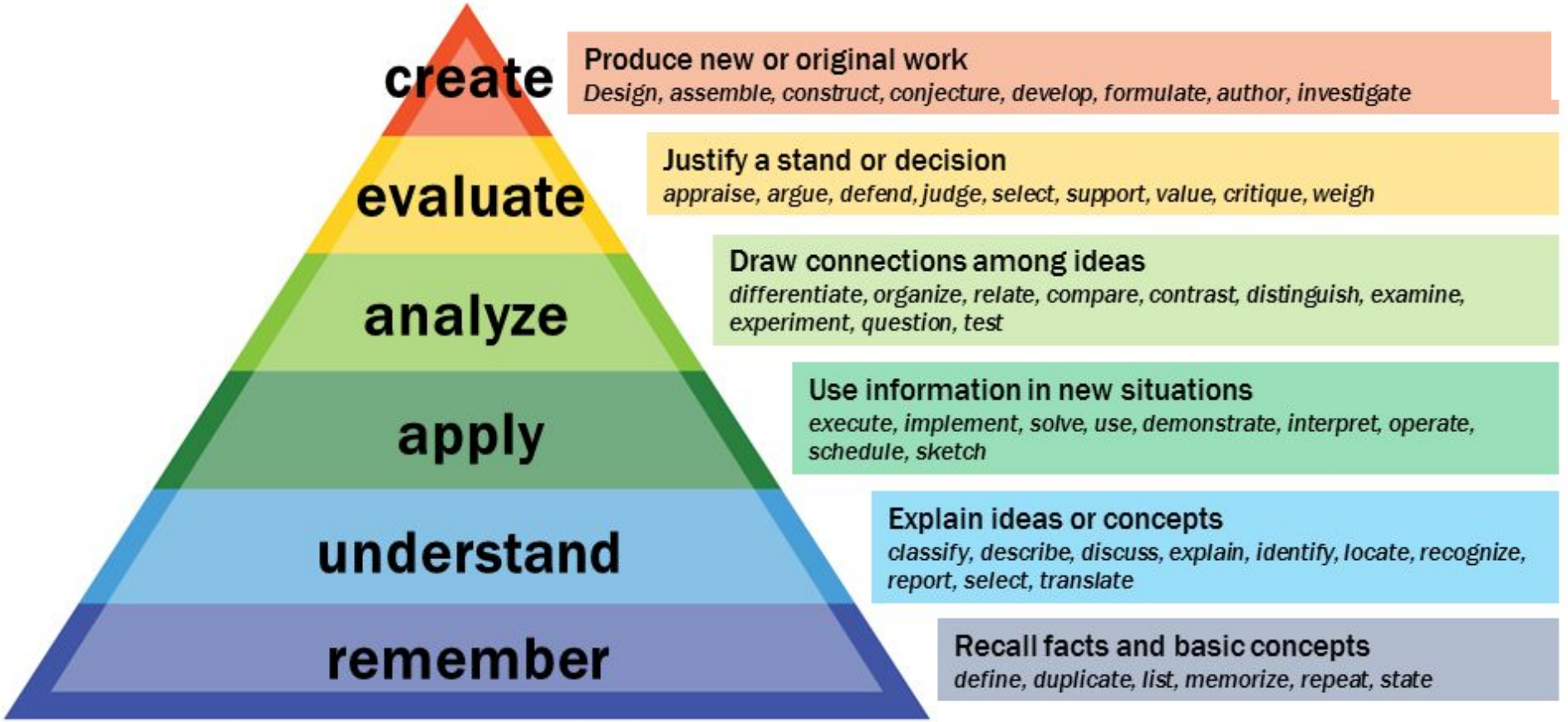
"the study of the methods and activities of teaching"

dictionary.cambridge.org

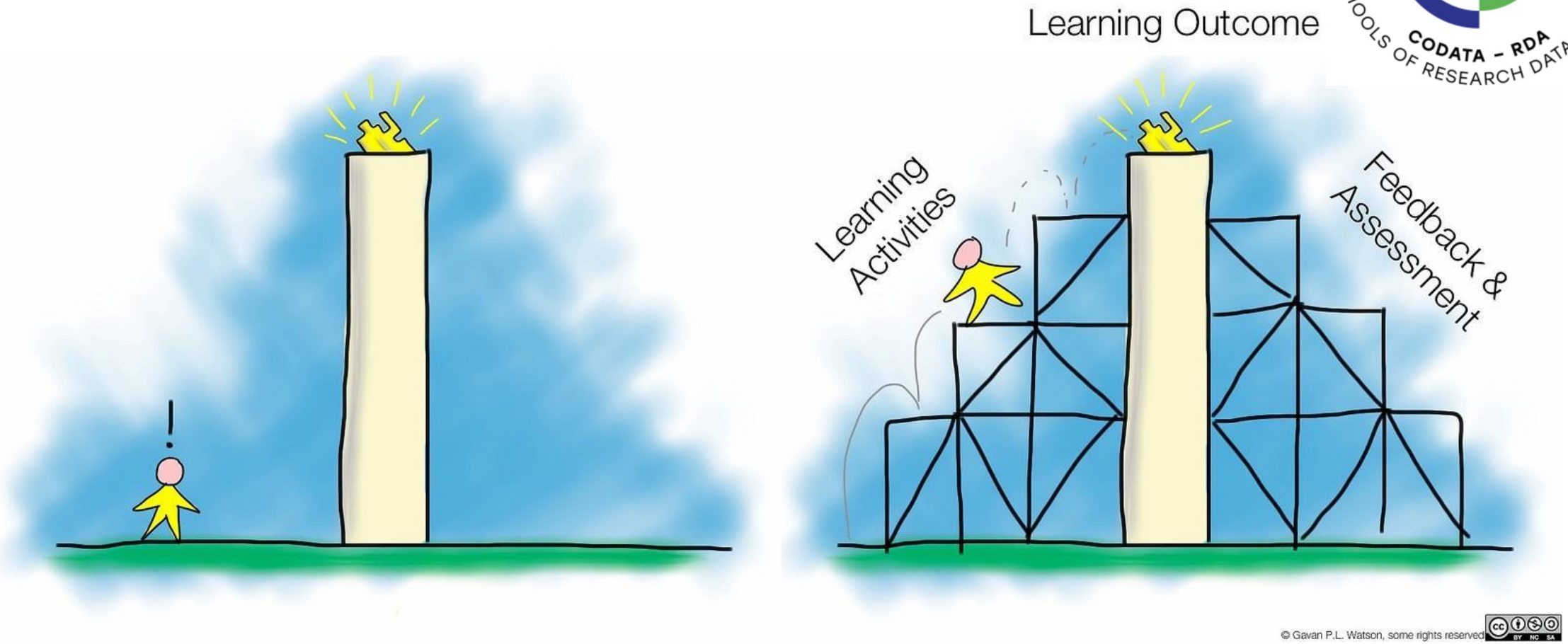


www.educarepk.com/pedagogy-vs-andragogy.html

Bloom's taxonomy



Scaffolding

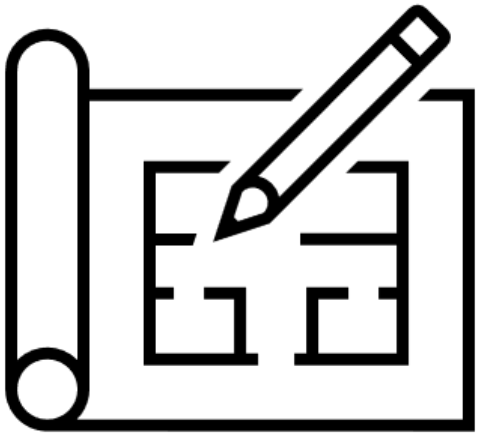


Why are you doing training?

- Teach others a topic/skill
- Encourage best use / practice
- Change attitudes
- Promote open science
- Build a community

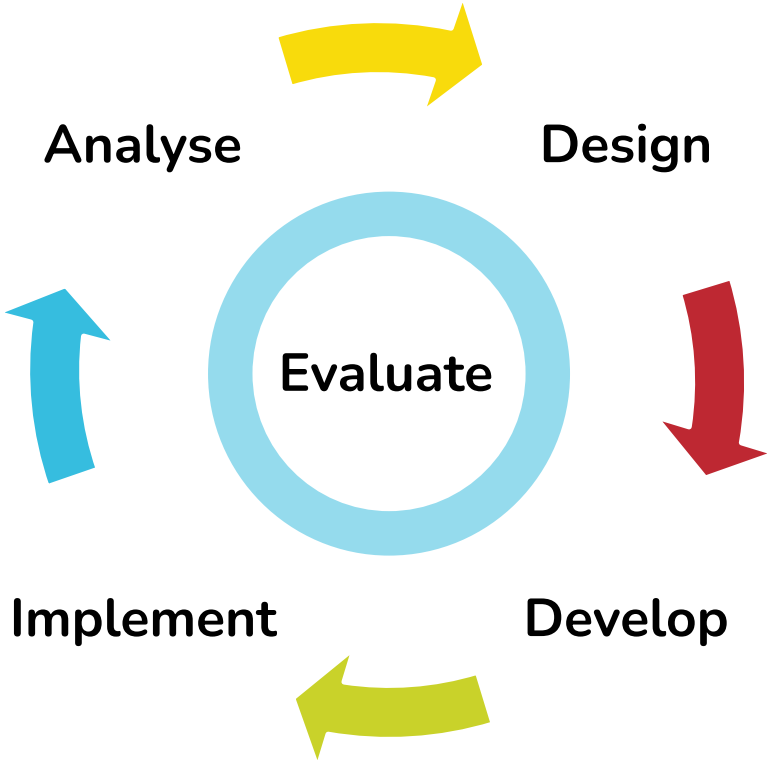
Reasons to think about design

- Make your course more effective
- Choose suitable methods and tools
- Make best use of resources
- Make materials easy to use and re-use
- Meet legal requirements
- Save yourself time
- To measure the success of your training



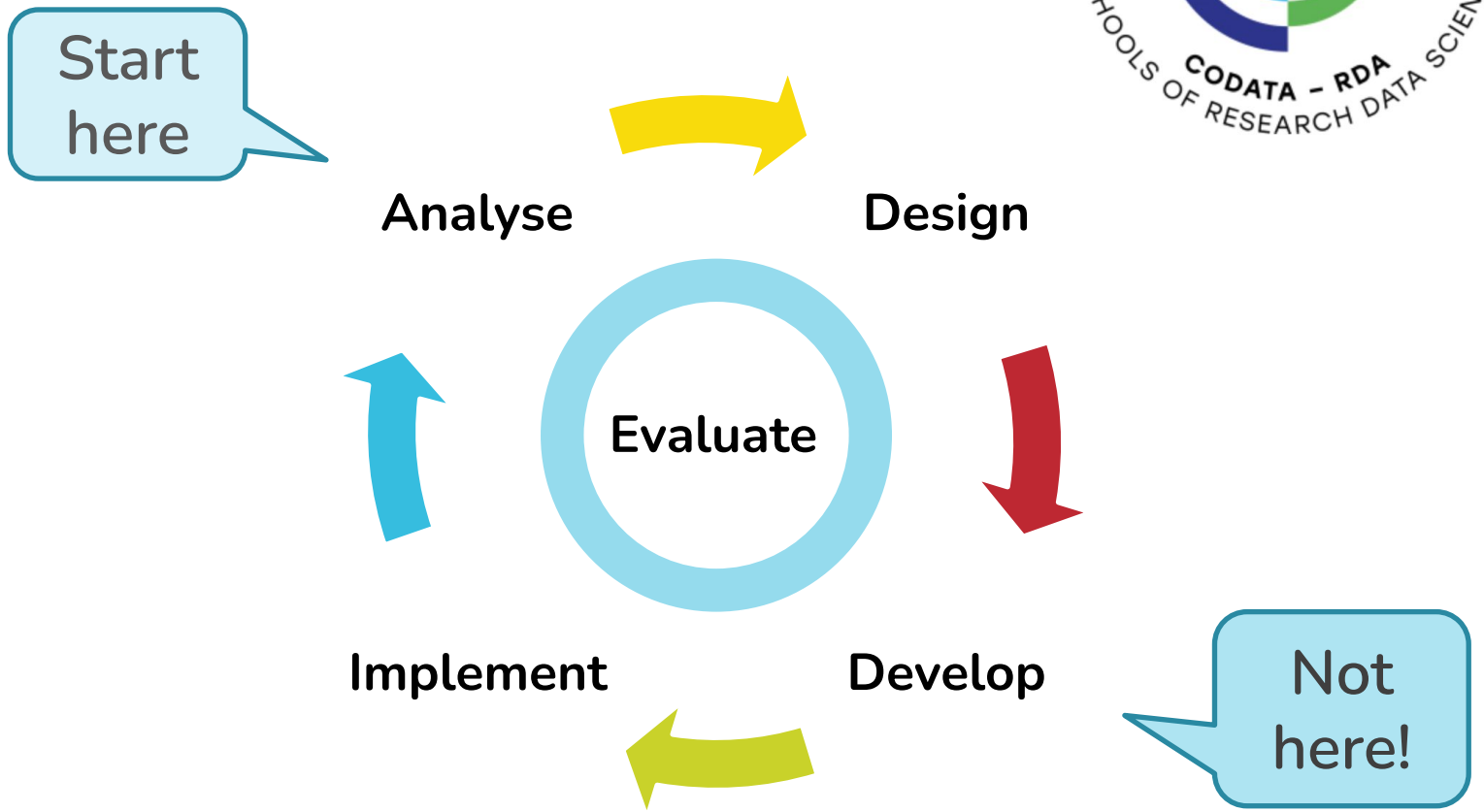
How to think about good design

- Many models available
- ADDIE gives an overarching framework
- Other models can be used to guide each stage



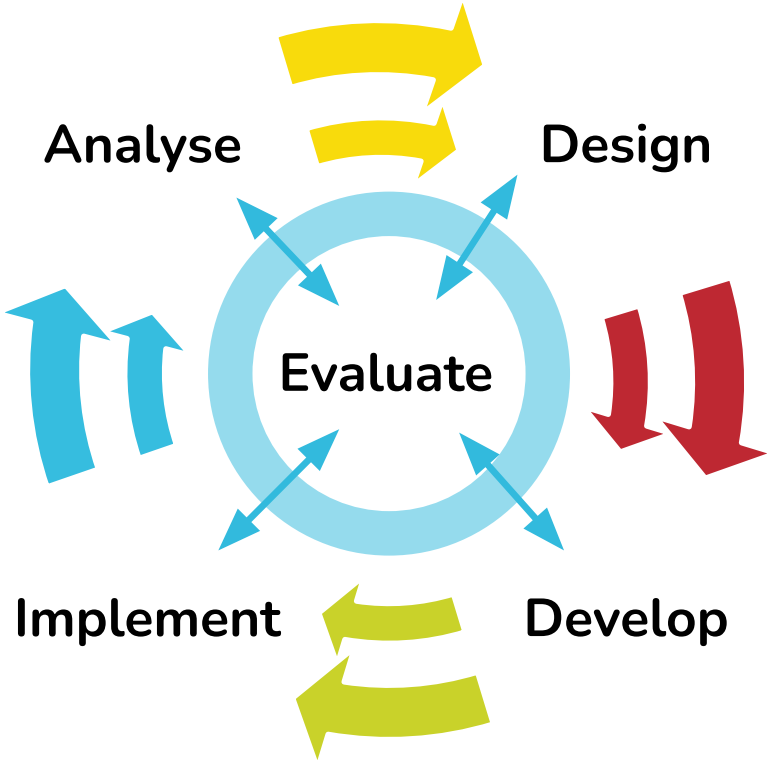
In reality

- It's tempting to jump straight into development
- Don't skip analysis and design



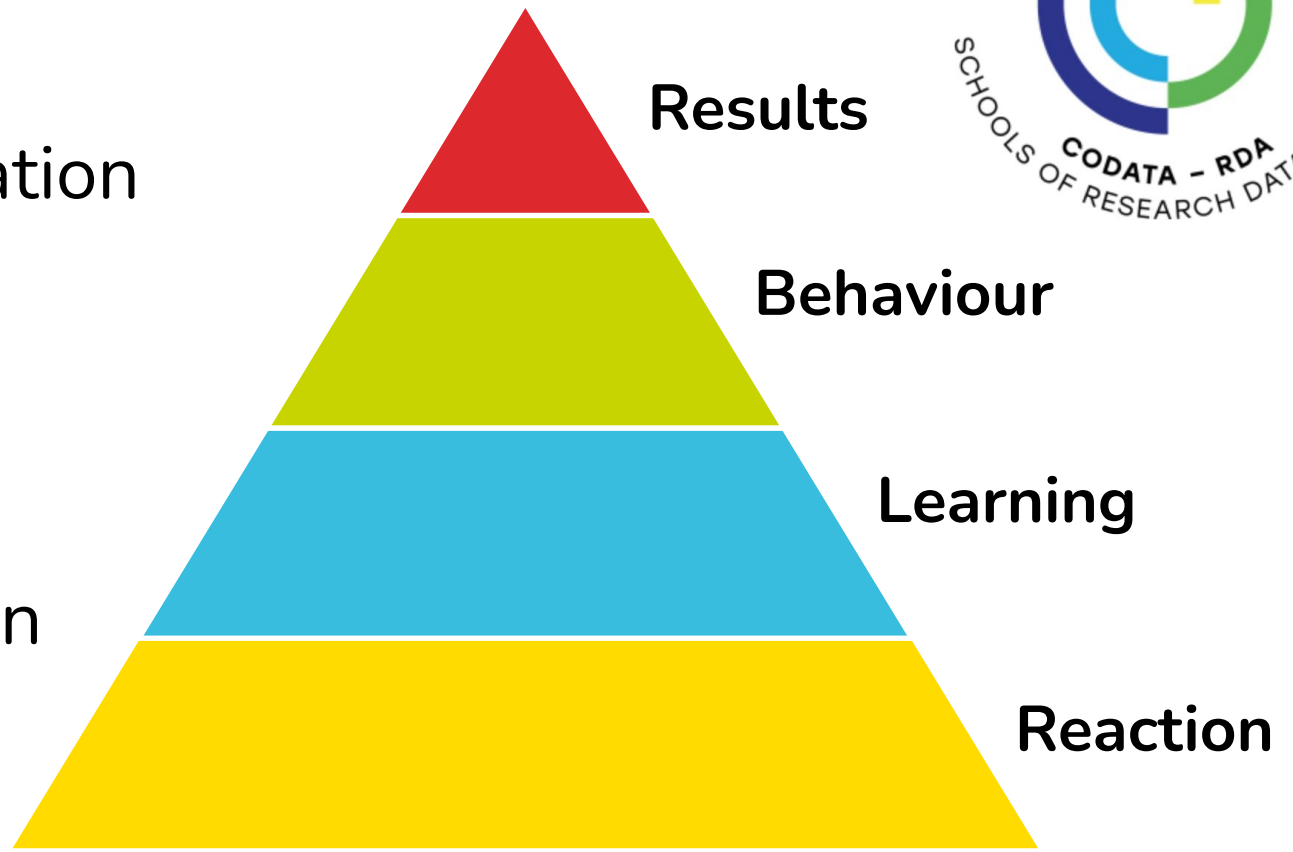
In reality

- It’s iterative
- It’s not always linear
- Evaluation at the core



Evaluation

- Different levels of evaluation
- Linked to assessment
- Needs to be considered in design, not at the end



Kirkpatrick, D. L. (1994). Evaluating training programs: the four levels. San Francisco: Berrett-Koehler.

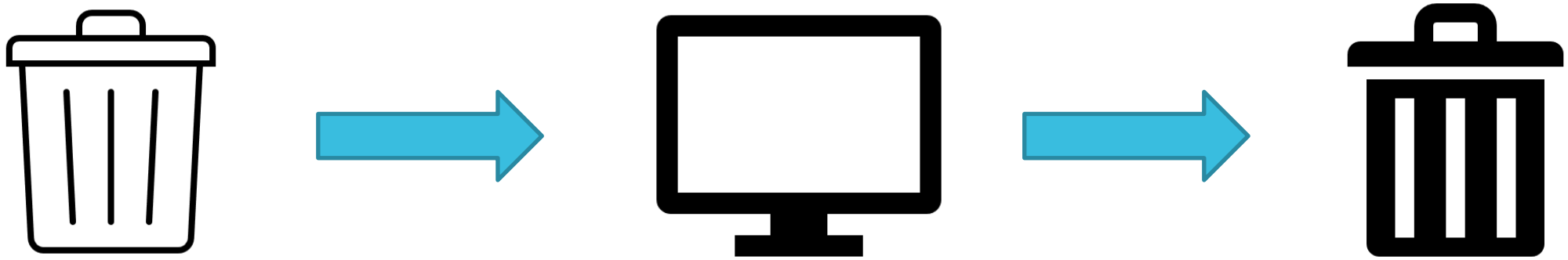
Two points to remember

1. Activities should match the intended outcomes

2. And be engaging and appropriate for learners

Image: Ron Carranza, https://teachonline.asu.edu/2016/05/integrating-technology-blooms-taxonomy/

Technology won't fix poor training design

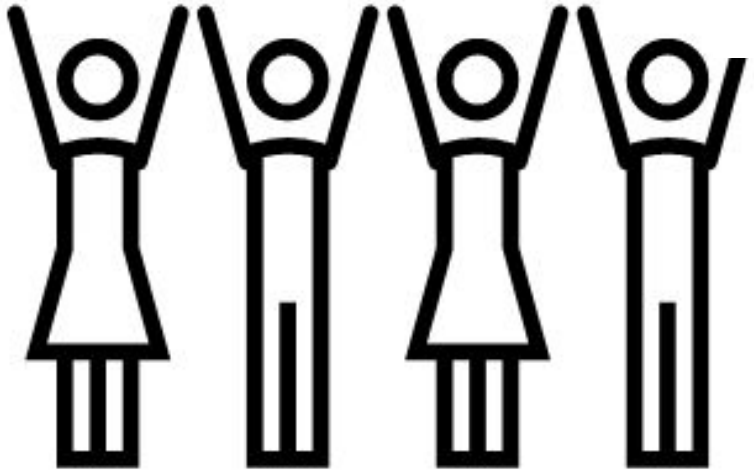


Your initial training analysis

- The goals of your training
- Topics to cover
- Your audience / learners
- Learning outcomes
- Delivery method
- Practical issues

Your audience

- Role, background and context
- Prior knowledge, skills and experiences
- Motivation
- Barriers / fears



Our first exercise

The CODATA/RDA Schools were designed and tested in Low and Middle Income countries.

The challenges of LMICs are not the same as MSIs.

Take 10 minutes to discuss the specific challenges faced by your institution.

This will be followed by 10 minutes of report outs and discussion.

An introduction to the CODATA/RDA SoRDS initiative

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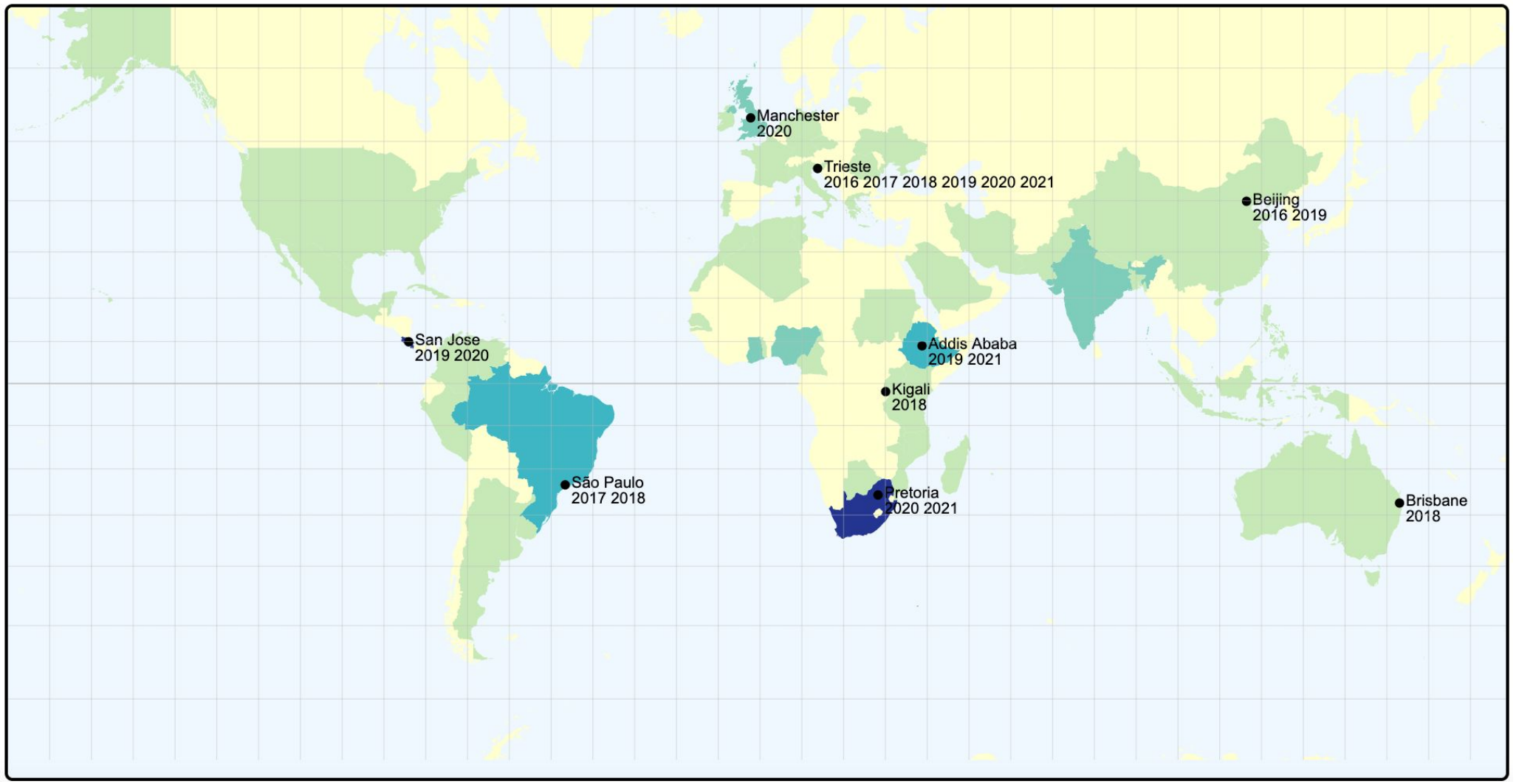
A Brief History

- Joint CODATA and RDA project
  - Committee for Data of the International Science Council
  - Research Data Alliance
- First event August 2016 in Trieste, Italy
- Regular events in Italy, South Africa, and Brazil
- Additional events in Costa Rica, Rwanda, Australia, UK, and China


Manchester
2020
Trieste
2016 2017 2018 2019 2020 2021
Beijing
2016 2019
San Jose
2019 2020
Addis Ababa
2019 2021
Kigali
2018
São Paulo
2017 2018
Pretoria
2020 2021
Brisbane
2018

Core Tenets

- Open Science and Open Data
- Ethical Data Use
- The Community and Network are the Product

Community Driven

- Half of the Leadership Team were initially participants
- Mostly volunteer driven effort
- Hosts cover most expenses
- While the foundation is data science molding it for communities is encouraged
- Cost model varies depending on event
- Which leads us into a second exercise…

Open Module of Product Evolution

The community itself drives improvements in Open Source products.

Pick one aspect of the current CODATA/RDA SoRDS (DataAtlanta2022) and discuss how it can be improved.

15 Minutes of Discussion followed by 15 minutes of reporting your groups suggestions.

Planning and Preparation

- Funding
- Logistics
  - Physical and Virtual
- Materials Preparation
- Arrange Instructors and Classroom Assistants
- Instructor and Assistant Pre-Meeting

- The planning and preparation usually takes 6 months

Curriculum Modules

- Software Carpentry Modules
  - Git, UNIX
  - R or Python
- Open and Responsible Research
- Data Management Planning
- Train the Trainer
- Visualization
- Data Analysis
  - Machine Learning and Recommender Systems
  - Artificial Intelligence and Neural Networks
- Data Security
- Cyber Infrastructure

Software Carpentry Modules

Aims:
To have an introductory understanding of programming and software engineering skills to manipulate data and analyze data in a reproducible fashion.

Learning Outcomes:

At the end of this course, a student will

- have an introductory understanding of the Unix shell,
- be able to execute simple commands in R,
- be able to use Git.

Data Analysis

Aims:

To have an understanding of the principles necessary to analyze data in terms of being able to make decisions from large amounts of data and applying machine learning techniques.

Learning Outcomes:

At the end of this course, a student will

- understand the basic principles of machine learning,
  - Differ supervised from unsupervised, regression, classification, and clustering;
- understand how to use Artificial Neural Networks, with hands-on experience,
- understand the principles of Boosted Decision Trees and Support Vector Machines,
- apply pipelines to build recommender systems.

Open and Responsible Research

Aims:

To consider the importance of open and responsible research.

Learning Outcomes:

At the end of this course a student will

- Understand responsible conduct of research as it pertains to data science
- Have a broad understanding of the Open Science movement
- have reflected on the impact Open Science on their own research and future career.

Research Data Management

Aims:
To have an understanding of the principles of research data management (RDM) and the impact of Openness and Sharing in Research

Learning Outcomes:

At the end of this course a student will

- Understand the data curation lifecycle
- Appreciate the practical advantages of good RDM and open research/science
- How to add value and longevity to your data
- Understand the principles and importance of standardisation
- How to publish data

Train the Trainer

Aims:

To be able to reuse the techniques and materials presented in the CODATA/RDA Schools of Research Data Science (SoRDS)

Learning Outcomes:

At the end of this course a student will have

- Documentation on the location of the materials associated with this course
- An understanding of what aspects of the course are core to the course
- A general understanding of the skills and systems underlying the course materials
- A path to recreating part or all of a SoRDS event
- Know the history of these events and how to become involved in future events

Visualization

Aims:

To have an understanding of the principles of visualizing data.

Learning Outcomes:

At the end of this course a student will

- understand how to use R to perform visualization,
- be able to perform a critical assessment of effective visualization techniques.

Information Security

Aims:

To have an understanding of the importance of Information Security in an Open era.

Learning Outcomes:

At the end of this course, a student will have

- Understood that their online activity, and any systems they create or use for Data Science, will be subject to online attack
- Understood security design principles that they can apply to their work
- Understood the basics of cryptography and encryption, and their importance

Computational Infrastructure

Aims:

To introduce students to open computational infrastructures available to them when analysis tasks outgrow their local computational resources.

Learning Outcomes:

At the end of this course a student will

- understand the basic concepts of HTC, HPC and Cloud computing,
- be able to execute a distributed computing job
- be able to use more advanced features such as batch schedulers or containers.
- Be able to interact with Cloud services

Feedback

Feedback is an important part of improving any product or offering. During our fully in-person events we do this exercise daily.

Provide at least one positive feedback item at:
https://docs.google.com/document/d/1GKR3mdouieFQXLL7qHqkhon2pDyqNqDRD-klQ1cKWwQ/edit?usp=sharing

Provide at least two critical feedback items at:
https://docs.google.com/document/d/1ryCAiK7tJpjNMrA8jLy6MNjkYDp4-BdZLC_wPYRQtBc/edit?usp=sharing

We will discuss a few of these items before wrapping up this session.

Wrap Up and Next Steps

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Resources

- All materials presented during the entirety of this course are licensed under the CC BY license.
- All materials will be posted and given a PID to preseve their status as of the end of this course.
- The github repo at https://github.com/CODATA-RDA-DataScienceSchools/Materials/tree/master/docs/DataAtlanta2022 will be frozen.
- The Google Drive space for materials will also be frozen and available for future review.

Next Steps

- Use What You've Learned
- Communicate - Network
- Thank Our Sponsors and Think About Their Contributions
- Thank Organizations that Contributed
- Collaborate
- Seek Collaborative Funding
- Look for Regional Opportunities
- Join and contribute to RDA, Data Carpentries, AIM-Ahead, SBDH
- Evangelize Open Science, Open Data, and FAIR Concepts and Ethical Data Use

“What should young people do with their lives today? Many things, obviously. But the most daring thing is to create stable communities…”

– Kurt Vonnegut