Train the trainer

Warm up – What did you learn yesterday

Train the trainer

Session 3 - Session, course, and materials design

Training requirements

- **What** is the training topic?

- **Who** are you training?

- **Where** will the training be delivered?

- **When** will the training take place?

- **Why** are you training them?

Session Plan

- Using Concept Maps to develop courses and sessions

- Training session design and plan

- Training materials: sharing and making re-use possible
  - Training materials repositories and resources: GOBLET, TeSS, GitHub, etc.

- Reproducibility of compute environments

- Training rooms for bioinformatics

What - Using Concept Maps to develop courses and sessions

- **Learning objective**: Develop an understanding of concept maps, apply concept maps to the development of courses and course sessions

Concept Maps

- Concept maps are graphical tools for organizing and representing knowledge (Novak and Cañas, 2008, "Theory underlying concept maps and how to construct them").

- Nodes = concepts, knowledge

- Edges = relationships between nodes

- For students and teachers

Concept map – FAIR principles

What are FAIR principles?

Concept map – FAIR principles

Research Data

What are FAIR principles?

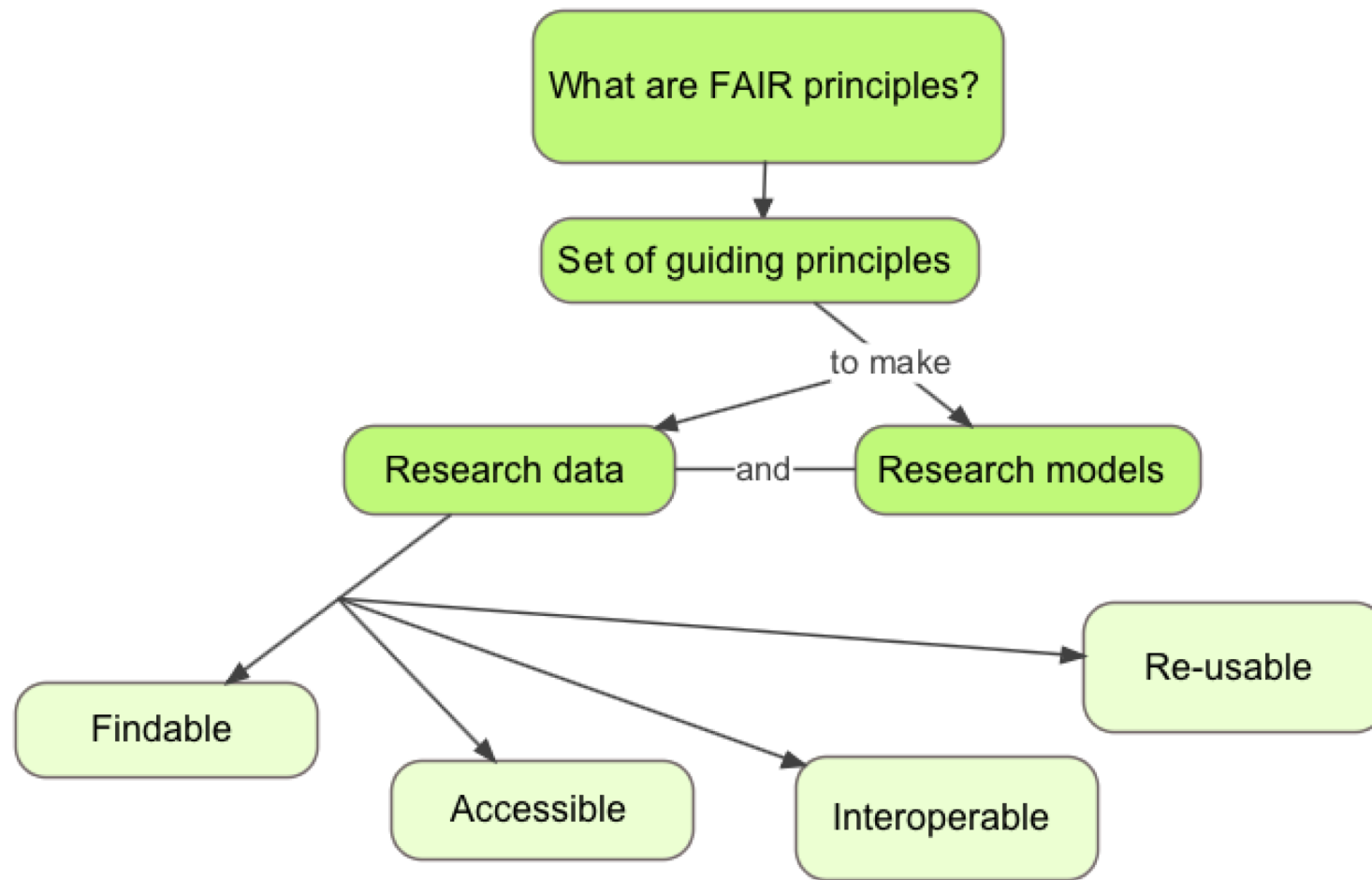Recherche models

Findable

Accessible

Interoperable

Re-usable

Concept map – FAIR principles

Atoms

Molecules

Matter

Light

Chemical

Electrical

Nuclear

Transformations

Motion

Kinetic energy

Potential energy

Universe

Mass

Energy

Heat

Stored

Elements

Space

State of Matter

Gases

Liquids

Solids

Focus question: What is the structure of the Universe?

Atoms

Molecules

Heat

Light

Chemical

Electrical

Nuclear

Transformations

Motion

Kinetic energy

Potential energy

Elements

Space

State of Matter

Gases

Liquids

Solids

Focus question: What is the structure of the Universe?

The Universe

contains

Matter ← transformed where E=mc2 → Energy

is — Particulate

has — Mass

may be — Organized

is — Usually Conserved

is

used to make things

can be — Stored

comes in — Different Forms
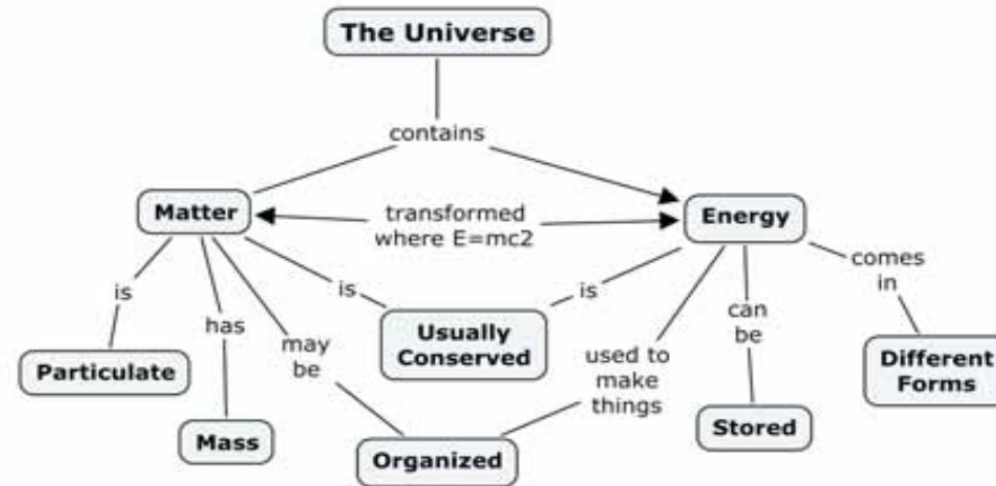
Activity (individual): Building up step by step the design of a very short lesson (3' session)

- Choose a topic you think you can teach in three minutes - **Any topic**
  - how to make an origami bird
  - introduction to biochemistry
  - how bats recognise the presence of obstacles
  - the second law of Newton
  - how to draw a comic strip, etc);

- Draw a concept map for your mini-session; What are the concepts that you want the learners to learn and the relations among the concepts

Training session - design and plan

- **Learning objective**: To reflect on, and to practice the design and planning of a training session

Training session - design and plan

- Iterative and circular process:
  - Define the overall AIM
  - Define SMART learning outcome(s) related to the concepts, knowledge and skills you want the learners to develop (see concept maps).
  - Define the pre-requirements (what they bring, what you need to provide)
  - Define an evaluation (measure achieved learning outcomes), and the concepts/competencies/skills needed to succeed the evaluation.
  - Describe and create the course session activities, content, the process of the session (instructions), and any materials needed.

  - This is an iterative process and can/should be revised several times!

Activity (individual): Defining the content and resources of a 3' session

Following up on the previous Activity (concept map):

- Set a learning aim and a learning outcome;

- Identify the target audience and prerequisites;

- Decide:
  - active and interactive (practice to draw a stylised bicycle with you);
  - visual support
  - distribute some material in advance to the audience (e.g. paper for origami);

- Sketch the structure of your presentation and the content
  - e.g., 40 secs introduction, 2 mins on topic, 20 secs conclusion;

Activity (group): Recording the 3' session

- You will be split into groups of 3 or 4;

- Make sure your group has a laptop and a phone which can record video;

- You need to each deliver your 3 minute session to the others;
    - One person delivers the session;
    - One person records on the phone;
    - One person notes down comments real-time;

- You then provide feedback to each individual, and give your own comments on your delivery;

- You then have time to revise your session, before delivering to the whole group.

Example: Plan for a 1h15 session

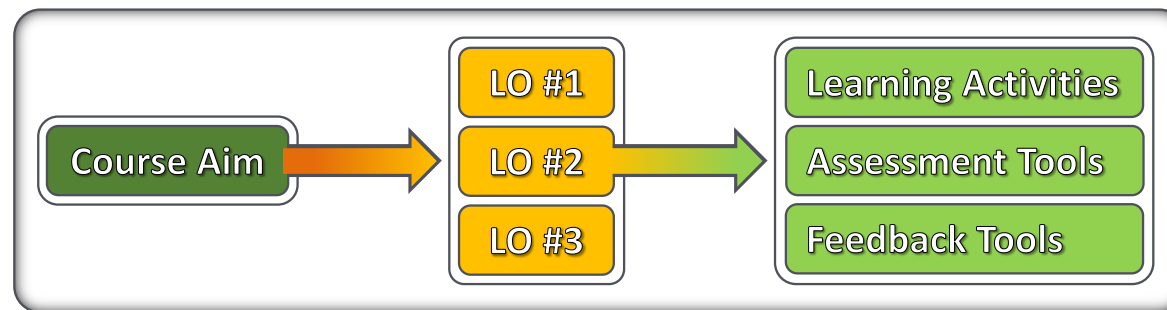| Time	Activity	Description	Goal/Outcome
9.00-9.15	warm-up	Learners summarise the key points of each session from the previous day and answer questions from the audience. The instructor describes the plan of the day in detail.	Retrieval from memory, repetition, get prepared for new topics, expose learners
9.15-9.25	lecture	Python functions	Learning to write a function, about function input and output, and how to call a function.
9.20-10.00	practical activity	Two exercises two be solved in pairs on a single computer. After solving the first exercise, the "driver" and the "navigator" will swap. Two learners (one per exercise) will display their solutions to the audience. Questions and discussion.	Learners will be able to write and call a function calculating the distance between two points in the 3D space and a function taking the base and height of a triangle as input and returning its area.
10.00-10.15	wrap-up	Group test on functions (match input and output with specific functions; fill gaps in pieces of code). Game: repetition using ball throwing.	Assess learning. Do we need to work more on functions? Repeat meaning and usage of all Python objects introduced so far.

From session to course – defining the aim

- Combine the **who**, **what** and **why** requirements into a **course aim**
  - **Who:** write clear trainee specifications;
    - *e.g.* undergraduate biologists with basic knowledge of Unix and R
  - **What & why:** describe what trainees will learn, and the benefit of that

- Consider the **where** and **when** requirements (*i.e.* the logistics)
  - How much can you do in the time available (including tests, feedback)
  - Resources limitations (space, equipment, assistants)

We quote *Chris Taylor – Earlham Institute - https://www.mygoblet.org/training-portal/materials/train-trainer-course-materials*

From learning outcomes to a course outline

- A well-written course aim will guide the generation of LOs

```
┌─────────────────────────────────────────────────────────────────┐
│                          ┌─────────┐     ┌──────────────────────┐ │
│                          │  LO #1  │     │  Learning Activities │ │
│  ┌─────────────┐         ├─────────┤     ├──────────────────────┤ │
│  │ Course Aim  │ ──────▶ │  LO #2  │ ──▶ │   Assessment Tools   │ │
│  └─────────────┘         ├─────────┤     ├──────────────────────┤ │
│                          │  LO #3  │     │    Feedback Tools    │ │
│                          └─────────┘     └──────────────────────┘ │
└─────────────────────────────────────────────────────────────────┘
```

- LOs should then be instantiated as activities and quality checks
  - **Learning activities**: scripts, slides, exercises, tutorials, …
  - **Assessment tools:** creative activities, written tests, …
  - **Feedback tools:** observation, interaction, forms, …
- Learning activities (LAs) should be tightly-linked to quality checks
  - This is not 'teaching to the test' because it's training not education
- When all the LOs are expanded, you have your course outline

We quote *Chris Taylor – Earlham Institute - https://www.mygoblet.org/training-portal/materials/train-trainer-course-materials*

Activity (group) - Challenge

In your group…

- Take one session idea and expand to a "real" training session
- You will need to:
  - Identify target audience
  - Define training session structure (include indicative content, length, breakdown and timings)
  - Set learning objectives and outcomes
  - Decide learning activities
  - Suggest how you will assess trainee progress
- Let us know of anything else you will need to think about….

Training materials: sharing and making re-use possible

- **Learning outcome**: Be able to identify training materials that exist already, and develop a routine of sharing training materials.

FAIR principles

Data and models are:

- Findable - can be searched for by the community after publication

- Accessible - can be read/downloaded by other researchers

- Interoperable - can be understood clearly in the context of the original experiment

- Re-usable - can be used by other researchers

FAIR principles – in the training context

Training course materials: slides, exercises, datasets

- Findable - can be searched and found by the trainers community

- Accessible - can be read/downloaded by other trainers

- Interoperable - can be understood clearly in the context of the original course

- Re-usable - can be used by other trainers

Training materials repositories and resources

- **GOBLET – http://mygoblet.org/training-portal**
- **TeSS - https://tess.elixir-europe.org/**
- **GitHub - https://github.com**
- **Jupiter - http://jupyter.org/**
- **Other?**

Reproducibility of compute environments

- Different courses, different compute requirements: Unix, R, Python, metagenomics, long read sequencing

- Installation process time-consuming and technically challenging

- Every computer should have an identical installation setup and sufficient hardware (power and memory) to run the tools

- Virtual machines, cloud computing, containers, software images

Training rooms for bioinformatics

Physical environment

- Room geometry: seats' quality, the lighting, the room temperature control, the stability of power and network connections

- Functionality : video, audio, drawing surfaces (whiteboard, flipchart paper), a corkboard to pin materials

- Hardware needs: power suppliers, network connections with a good quality wifi access

Wrapping up

What did you learn in this session?

- One person a time, no repetition

Wrapping up

- Using Concept Maps to develop courses and sessions

- Training session design and plan

- Training materials: sharing and making re-use possible
  - Training materials repositories and resources: GOBLET, TeSS, GitHub, etc.

- Reproducibility of compute environments

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Train the trainer

Session 4 - Assessment and feedback in training

Session Plan

- Introduction to assessment and feedback in training
- Pre-course assessment - Diagnostic questionnaires
- Feedback to learners
    - Summative and formative assessment
- Feedback from learners
    - Systematic Feedback
- Short term feedback - assessment of training quality, participant and instructor performance
- Long term post-course feedback
- Dealing with (bad) feedback

Assessment

- the evaluation of a student's achievement on a course

Feedback

- a reaction or response to a particular process or activity

We quote *Dictionary.com*

Practice makes perfect

Practice with feedback makes perfect

Feedback

- The feedback itself is not important, but what you do with it is …

- Giving and receiving

Activity (individual) - Challenge 1: what kind of feedback/assessment do you know as a learner or use as a trainer?

- What type of assessment did you undertake as a learner or trainer?

- What was its purpose in your opinion?

- Was it useful to your learning or teaching?

- Reflection – 5'

Pre-course assessment - Diagnostic questionnaires

- Useful tools - to get an idea of where the learners and the group of learners stand before the course starts

  - setup realistic learning objectives,
  - meet expectations of learners,
  - adapt the course content to fill gaps identified in the diagnostic questionnaire,
  - avoid spending time in things that are not necessary.

Pre-course assessment - Diagnostic questionnaires

- Anonymous
  - Level of knowledge of the whole group of learners

- Non-anonymous (individual answers)
  - Learner has a necessary pre-required knowledge, and in the negative case indicate an appropriate teaching choice to palliate this lack.
  - Example: Unix questionnaire before an HPC course

Feedback to learners

- Anything we do to help both ourselves, the instructors, and learners to get information about whether learning

    - is occurring (if during the teaching)
    - or has occurred (at the end of the teaching).

Summative x Formative assessment

- **Summative:** is aimed at evaluating learners' performance at the end of teaching.

- When: at the end of a topic, a session, or at the end of the entire course.

- Frequently occurs in schools and universities and usually includes grading. It is less frequent in training.

Summative x Formative assessment

- **Formative assessment: during** teaching and learning.

"Classroom assessment's purpose is to improve the quality of student learning, not to provide evidence for evaluating or grading students. The assessment is almost **never graded** and are almost always **anonymous**."

We quote *Angelo & Cross* [Classroom Assessment techniques, a Handbook for College Teachers)]

Formative assessment

Can help understand:

- knowledge gaps need to be filled before moving on
- If their mental models are correct
- if the level of mastery is sufficient according to the course's learning objectives and outcomes
- if learners goals and objectives are aligned to the course's goals and objectives
- types of mistakes need special attention

Self-assessment, self-confidence and usage independence

- Active learning:
  - learners so involved in the learning process loose consciousness about accumulated knowledge

- Good quality training
  - instructors make efforts to keep the interaction loop closed, contribute to build-up

- At chosen times: intervene and stimulate self assessment

Instant feedback

- Minutes cards; One-up, one-down - are forms of Instant Feedback.
- Fist or Five Feedback
- Socrative app

Instant feedback - benefits worth noticing

- For the LEARNER:
  - obliges the learner to introspect, to answer himself first (do I really know this? How easy it is for me to do this by myself?)
  - awareness of own progress -> smartest way to gain self-confidence
  - when questioned at the end-of the course, much more able to make encompassing self assessments

- For the INSTRUCTOR:
  - checking effectiveness
  - assessment - quality of materials and performance of instructor
  - identify learners - dragging behind and need more attention
  - identify learners - getting ahead of the group (receive harder assignments, help their colleagues, etc.)
  - judge the pace of training delivery - correct for the audience

Feedback

- The feedback itself is not important, but what you do with it is …

- Giving and receiving

Activity (individual) - Post-course feedback - organisation

- Write in the post-it the kind of information we would like to collect once the course is over

- Reflection – 5'

Post-course feedback - organisation

- Information
- website
- registration process
- venue
- IT support
- Catering
- Social dinner
- Overall organization

From very bad to excellent

Post-course feedback – course content

- Topics were relevant for my work/research interests
- Inspired to new ways of thinking
- Lectures were clearly presented and comprehensible
- Pace of teaching was right
- Teaching aids used (e.g. slides) were well prepared
- Hands-on exercises and demonstrations were a valuable contribution to the course
- Course too short, too long, the right length

Yes, rather yes, rather no, no, no opinion

Post-course feedback – appreciation

- Would you suggest this course to a friend/colleague?
- The course met my expectations
- Overall, how would you rate this course?
- What did you like most about the course?
- What did you like least about the course?
- Additional comments and suggestions on the content, specific lectures, specific trainers, etc.

Yes, rather yes, rather no, no, no opinion

Long term post-course feedback – impact

Change

- employment sector

- confidence/competency in the resource(s)

- work/research

- collaborations with the other course participants, colleagues

Summary- When and why to assess

1. Before the course - pre-course assessment - verify the target audience of the course

2. Beginning of the course - preventive assessment - final adjustments of the course to the reality of the participants

3. During the course - formative assessment - pilot in real time if learning is taking place

4. At the end of the course - summative assessment - measure and evaluate the knowledge and skills acquired

5. Right at the end of the course and long time after the course - strategic evaluation - measure the adequacy, quality and impact of the course

Dealing with (bad) feedback

- Trainees feedback should be considered along other forms of quality evidence:
  - Review what they have effectively learned (in exams)
  - Consider your own experience of teaching
  - Discuss with colleagues and friends
  - Look at the feedback from past sessions of the same course

Dealing with (bad) feedback

- Breath deeply
- Look at the response rates
- Look at the counter examples (contradictions)
- Look at the repetitive patterns (not at only one single answer)
- Humans focus more on negative feedback than on positive (you are not alone)
- Try to see the point in the criticism, learn from it
- Don't take it personally (easier said than done). Try to focus on what they say about what you do (not who you are)

Activity (individual): Give us your feedback

- Our teaching
- Our course

Activity (individual): reflective thinking

Let us know:

- Your own learning experience – Self-assessment