Welcome to Day 2!

Train the Trainer:
Design and plan: session, course, materials

SciLifeLab Training Hub - Spring 2024

Course Leader - Jill Jaworski

SciLifeLab

Train the Trainer Course Schedule

Day 1	Wednesday, April 10 - 12:30-16:30 CET, over Zoom	Introductions Principles of Teaching and Learning
Day 2	**Wednesday, April 17 - 12:30-16:30 CET, over Zoom**	**Designing and Planning Sessions**
Day 3	Wednesday, April 24 - 12:30-16:30 CET, over Zoom	Enhancing Learner Participation and Engagement
Day 4	*Thursday, May 2 - 12:30-16:30 CET, over Zoom (May 1 is a holiday in Sweden)	Assessment and Feedback in Teaching and Learning

SciLifeLab

Housekeeping

- Zoom Etiquette:
  - Please change your Zoom screen name to show your full name
  - Please keep your camera on as much as possible
  - …Try not to multitask… you and everyone else will have a better learning experience that way!
- We will be recording these sessions
- Contribute your thoughts!
  - Ask questions as we go along if anything is unclear

  - Be curious! Both on the material and on each others experiences

  - Write down any "Aha's" (things you come to think of) along the course [for course leaders to collect and improve sessions]

Code of Conduct

- Be respectful, honest, inclusive, appreciative and open to learning from all present
- Do not attack, demean, disrupt others or encourage such behaviours

SciLifeLab

Train the Trainer - Materials Needed

Pen and paper! We will be doing some concept mapping today

Any and all materials needed for your 3 minute trainings

SciLifeLab

Recap from Day 1

Feedback

Discussion:

- What were your most important take-aways from Session 1?

SciLifeLab

By the end of this session, you will be able to:

- Design a mini-training
  - Write Learning Outcomes (SMARTIE)
  - Identify target audience
  - Draw a concept map
  - Select content
  - Deliver
  - Provide and receive targeted feedback
- Create a plan from lesson to session
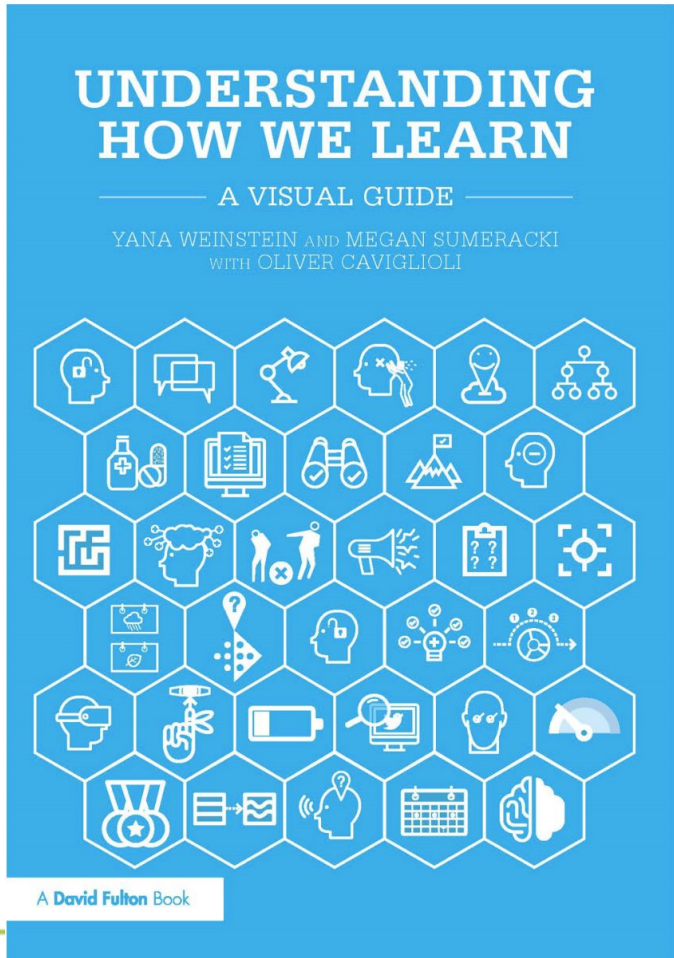- Create a plan from session to full course

Key: Shared notes

Break time

Group Activity

SciLifeLab
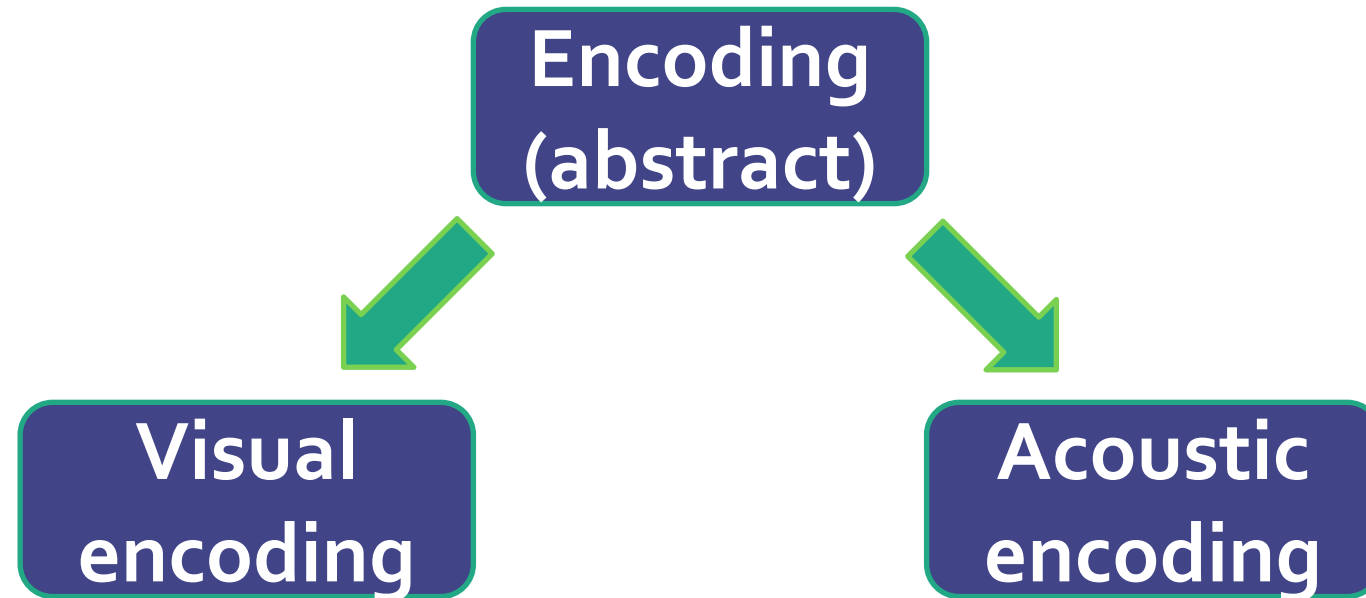
Germane Load: 6 strategies
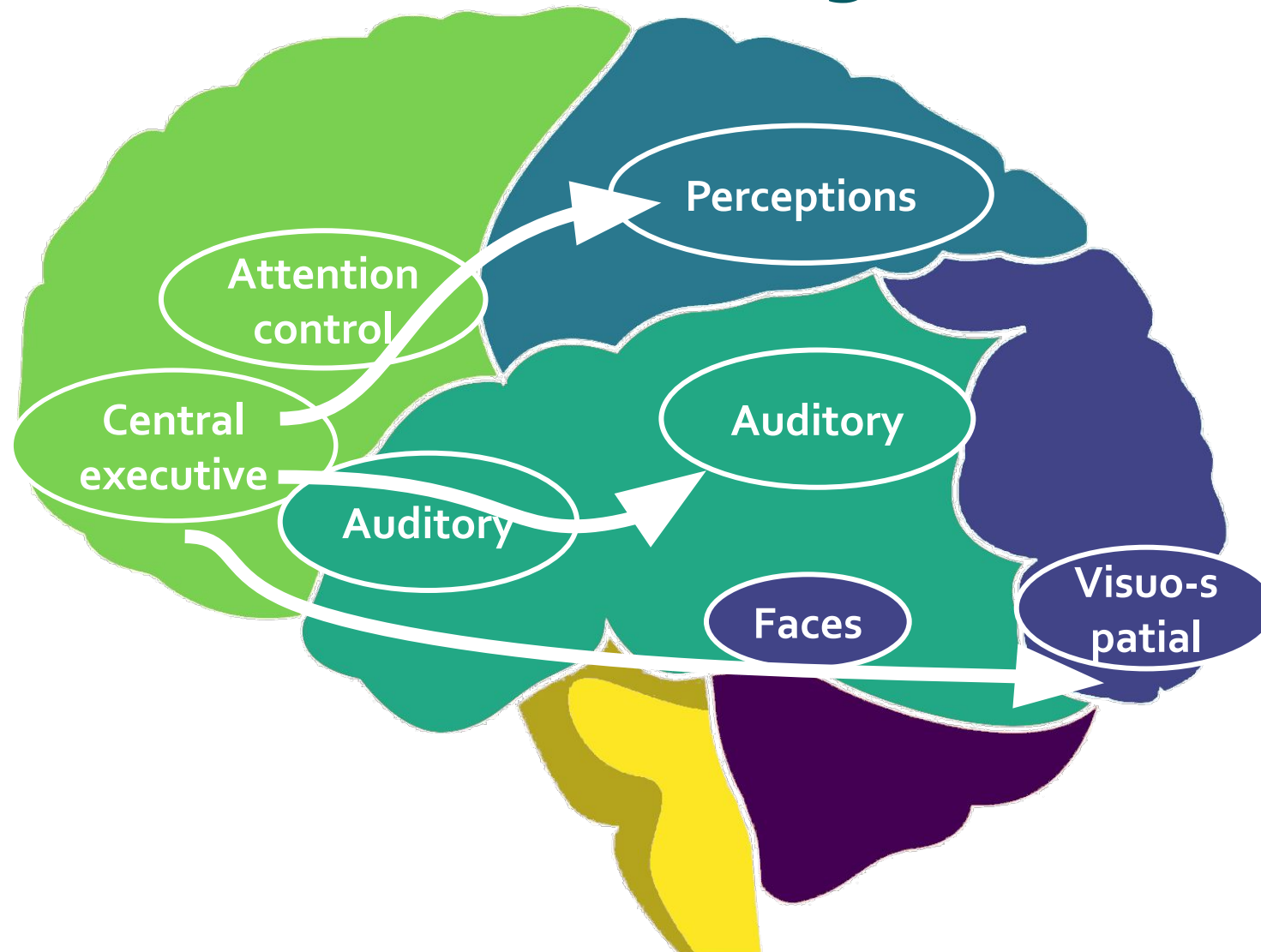
concrete examples

dual coding

interleaving

elaboration

spaced practice

retrieval practice

Concrete examples

Dual Coding

Adapted from 2010 Baddeley

Blocked vs Interleaved practice

Blocked practice

defining core concepts

highlighting common aspects

comparing highly dissimilar abstract categories

identifying similar items in diverse categories

listing similarities within one category

=

best for **novices**

Interleaving

practicing core concepts (motor behaviors)

relating concepts for problem-solving

distinguishing highly similar abstract categories

finely discriminating similar items

classifying

=

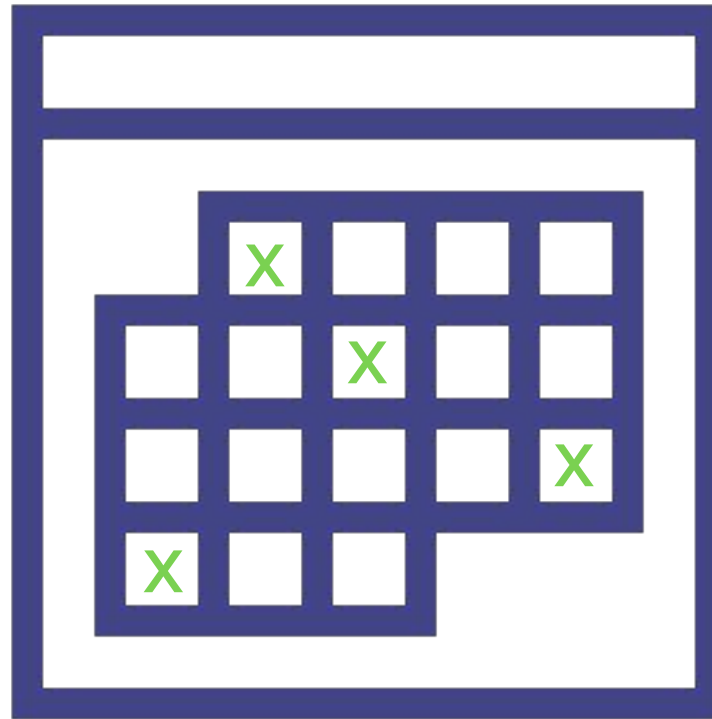best for **experienced learners** and **experts**

SciLifeLab

Elaboration

Why?

Spaced Practice

Retrieval practice

P5: To develop **mastery**, students must:
  - acquire **component skills**
  - practice **integrating** them
  - know when to **apply** what they've learned

P8: To become self-directed learners, students must learn to **monitor and adjust** their approaches.

SciLifeLab

Challenge 1.7 (8 min + 3 to discuss)
How do you understand the 6 strategies?

6 breakout rooms - Room number corresponds to the strategy number

(1) concrete examples (2) dual coding (3) interleaving
(4) elaboration (5) spaced practice (6) retrieval practice

Did you understand your learning strategy the same way? Do you have questions? Provide examples of how you could implement it as an instructor.

SciLifeLab

Mental Models

understanding

problem-solving

decision-making

learning

communication

SciLifeLab

Knowledge representation: schemas

cell wall

central   nucleus   offset

cell membrane

many, small   vacuoles   few, large

Golgi body

chloroplasts

animal   plant

SciLifeLab
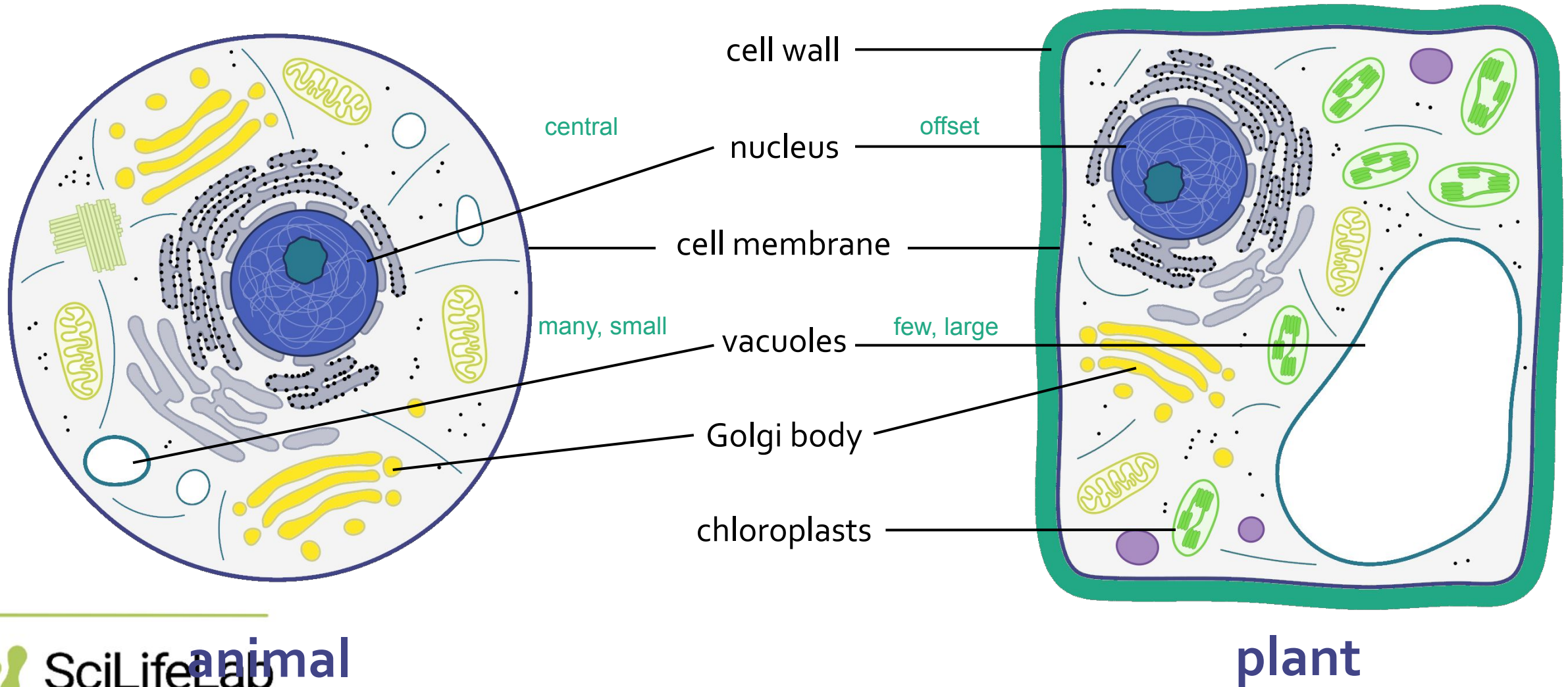
Concept mapping of a mental model
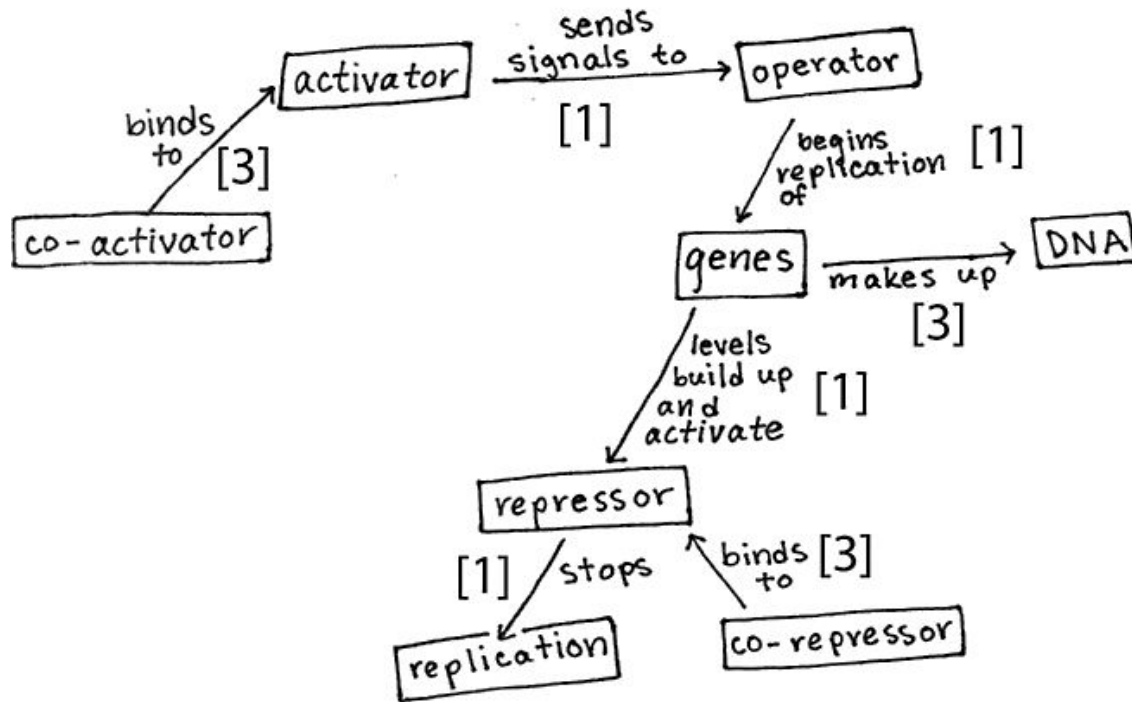
before lesson
average correctness = 1.9
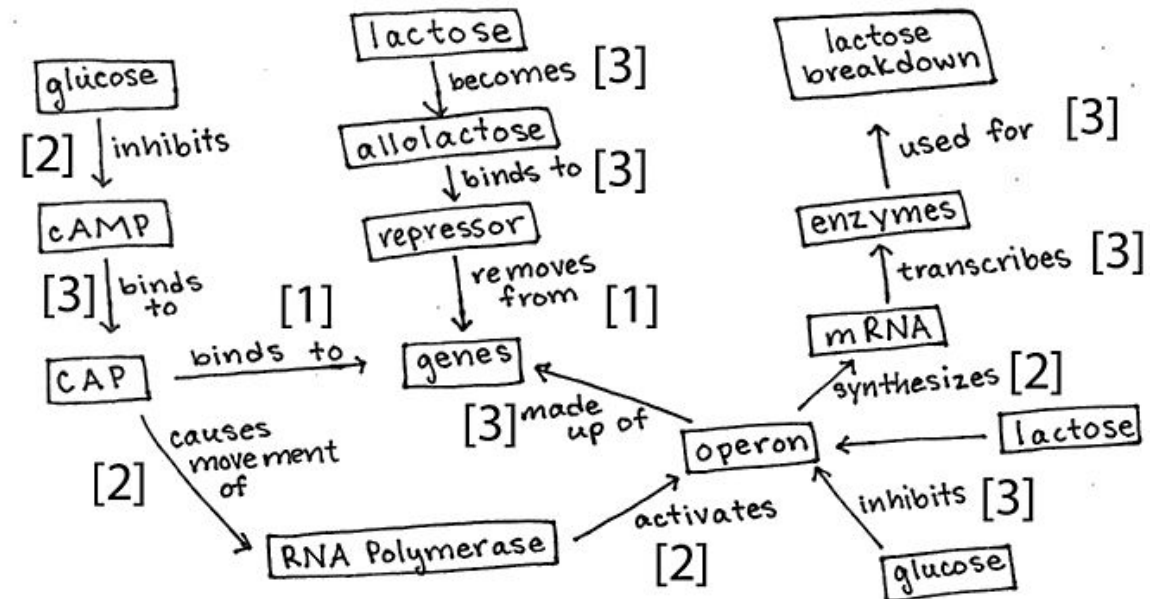
after lesson
average correctness = 2.4

Dauer JT et all. Changes in students' mental models from computational modelling of gene regulatory networks. Int J STEM Educ. 2019;6(38).

Broken mental models: misconceptions

simple factual errors

broken models

fundamental beliefs

easier

harder

SciLifeLab
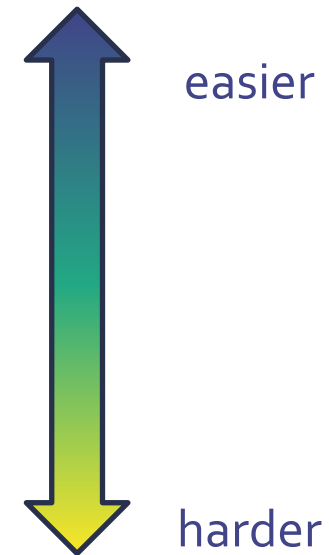
Dreyfus model of skills acquisition

| Novice | Advanced beginner | Competent | Proficient | Expert |

rules → intuition

Progression: components

Basic rules, can't prioritize → Recognizes more components → Identifies important components → Adapts and modifies components → Innovates new approaches

context-free → situational

SciLifeLab

Progression: perspective

Progression: decision

Rule-based	Follows examples	Adapts rules to context	Intuitive, adaptive choices	Instant, experience-based decisions

analytic   intuitive

SciLifeLab

Progression: commitment

| Minimal emotional investment | Recognizes skill's value | Invested in mastery | Identity linked to skill | Continuous growth |

detached → involved

Integrating the Dreyfus model

Principles of knowledge

Learning theories

Memory, attention, and cognitive load

Strategies for effective learning

SciLifeLab

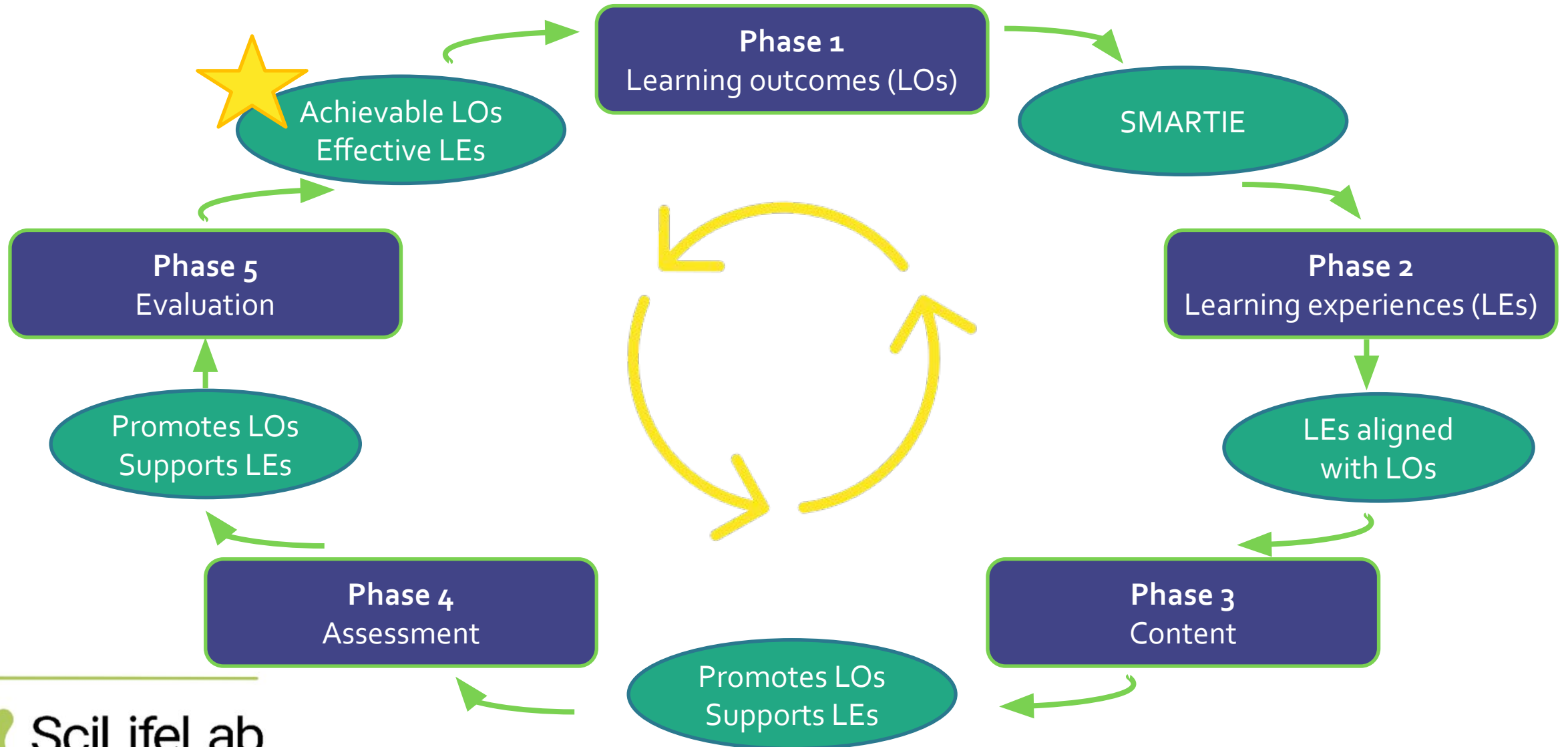# Instructional design

Nicholl's 5-step model

Knowledge, skills, abilities

Learning outcomes and assessable verbs

Bloom's taxonomy

SciLifeLab

Nicholl's 5-steps

Phase 1
Learning outcomes (LOs)

SMARTIE

Achievable LOs
Effective LEs

Phase 2
Learning experiences (LEs)

Phase 5
Evaluation

LEs aligned
with LOs

Promotes LOs
Supports LEs

Phase 4
Assessment

Promotes LOs
Supports LEs

Phase 3
Content

SciLifeLab

Nicholls G. Developing teaching and learning in higher education. London:Routledge;2002.

Phase 1

1. Define the learning outcomes (LOs)

SciLifeLab

Specificity of objectives

	Teaching goals	KSAs	Learning outcomes
Scope	broad	moderate	narrow
Time needed	year(s)	weeks/months	hours/days
Purpose	provide vision	design curriculum	prepare lesson plans
Example of use	plan a learning path	plan units of instruction	plan daily experiences

SciLifeLab

Knowledge, Skills, Abilities (KSAs)

Identify the set of KSAs

Example:
– knowledge of learning principles
– skills to adapt your curriculum based on what you've learned
– ability to evaluate prior knowledge in your students

SciLifeLab

Learning Outcomes (LOs)

What are Learning Outcomes?

Statements expressing which Knowledge, Skills, and Abilities (KSAs) learners will be able to demonstrate upon completion of a learning experience or a sequence of learning experiences

What learners will be able to do, at the end of a lesson that, the teacher (you) can in principle evaluate?

SciLifeLab

Operational definitions of LOs

: statements expressing the KSAs that can be **demonstrated** upon LE completion

: what learners will learn and the instructor can **assess**

https://irds.stanford.edu/assessment/assessment-overview/assessment-tools

SciLifeLab

SMARTIE learning outcomes

S pecific

M easurable

A chievable

R elevant

T ime-limited

I nclusive

E quitable

SciLifeLab

Frameworks and taxonomies

framework: distinct categories

taxonomy: continuum of categories

SciLifeLab

Bloom's taxonomy: cognitive complexity

Combining parts to make a new whole — Create

Judging the value of information or ideas — Evaluate

Breaking down information into component parts — Analyze

Applying the facts, rules, concepts, and ideas — Apply

Understanding what the facts mean — Understand

Recognizing and recalling facts — Remember

abstract

concrete

© tips.uark.edu

SciL

Taxonomy of verbs

Create	assemble, build, collect, combine, compile, compose, constitute, construct, design, develop, devise, formulate, generate, hypothesize, integrate, invent, make, manage, modify, **organize**, **perform**, plan, prepare, produce, propose, rearrange, reconstruct, reorganize, revise, rewrite, synthesize, write
Evaluate	advise, appraise, argue, assess, **compare**, **conclude**, consider, contrast, convince, correct, criticize, critique, decide, **defend**, determine, discriminate, grade, judge, justify, measure, rank, rate, recommend, review, score, select, standardize, support, test, validate
Analyze	**arrange**, break down, **categorize**, **classify**, **compare**, **conclude**, connect, **contrast**, deconstruct, deduce, detect, diagnose, diagram, differentiate, discriminate, **distinguish**, divide, examine, **explain**, identify, integrate, **inventory**, **list**, order, **organize**, relate, separate, structure
Apply	calculate, carry out, change, choose, classify, complete, compute, construct, demonstrate, dramatize, employ, examine, execute, experiment, generalize, illustrate, implement, infer, interpret, manipulate, modify, operate, **organize**, outline, **perform**, predict, solve, transfer, translate, use, verify
Understand	**arrange**, associate, **categorize**, clarify, **classify**, **compare**, **conclude**, **contrast**, **defend**, diagram, differentiate, discuss, **distinguish**, estimate, exemplify, **explain**, express, extend, extrapolate, generalize, give examples of, illustrate, infer, interpret, match, outline, paraphrase, predict, rephrase, represent, **restate**, summarize, transform, translate
Remember	cite, define, describe, identify, **inventory**, label, **list**, match, name, outline, quote, recall, recognize, report, reproduce, **restate**, retrieve, show, state, tell

SciLifeLab

By the end of the course, learners will know DNA sequencing process

How to assess whether learners know the DNA sequencing process?
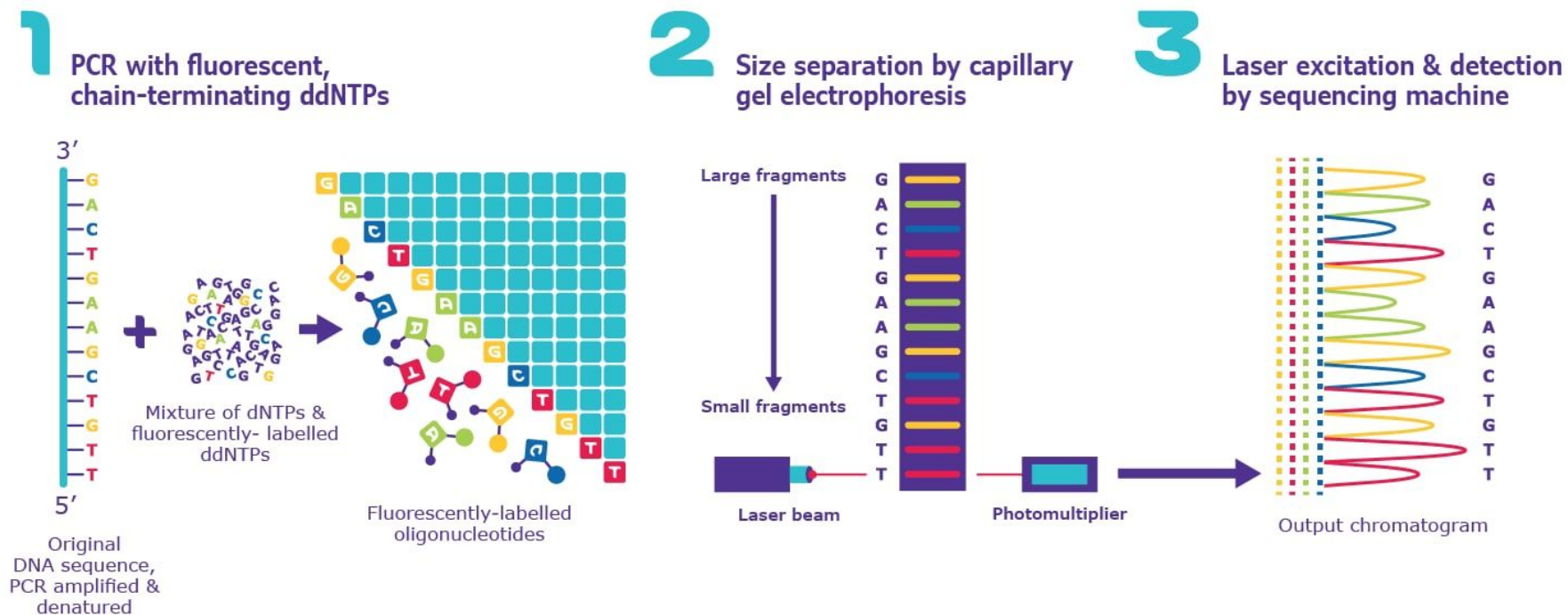
What do we mean by «knowing» the **DNA Sequencing** process?

- They are able to describe it?
- They are able to explain it?
- They are able to apply it theoretically/practically in a project?
- They are able to demonstrate it?
- They are able to use it in a solving problem?

SciLifeLab

What do we mean by «knowing» the **DNA Sequencing** process?

- Are learners able to describe it?
- Or explain it?
- Or apply it?
- Or demonstrate it?
- Or use it in problem solving activities?

It would make more sense to ask:

What will learners be able to do to show they understand **DNA sequencing**?

SciLifeLab

Writing LOs with assessable verbs

Avoid verbs that are:

unassessable

unmeasurable

open to interpretation

SciLifeLab

Writing learning outcomes using ACTION verbs

Think about: what learners will be able to do by the end of a course that I will be able to evaluate

By the end of the course, learners will be able to
....

Avoid verbs open to multiple interpretations

Use a verb that describes an observable action

SciLifeLab

Implications for classroom teaching

learning

instruction

assessment

alignment

SciLifeLab

Challenge 2.1 - define the audience, goal and outcomes (12 minutes)

1. **Choose a topic**

2. **Define teaching/learning objectives** (describe your goals and intentions as the instructor)

3. **Write learning outcomes (**think about what learners will be able to do by the end of this instruction) - using Bloom's taxonomy - actionable verbs

4. **Identify the target audience and prerequisites**

5. **Identify the learning experiences**

6. **Start thinking about the content - but don't spend time in preparing this yet**

Use pen and paper

SciLifeLab

Challenge 1.9 (3 min + 3 to discuss)
Identify LEs and assessments aligned with LOs
Breakout Rooms: groups of 4

Pick one learning outcome from below and identify a
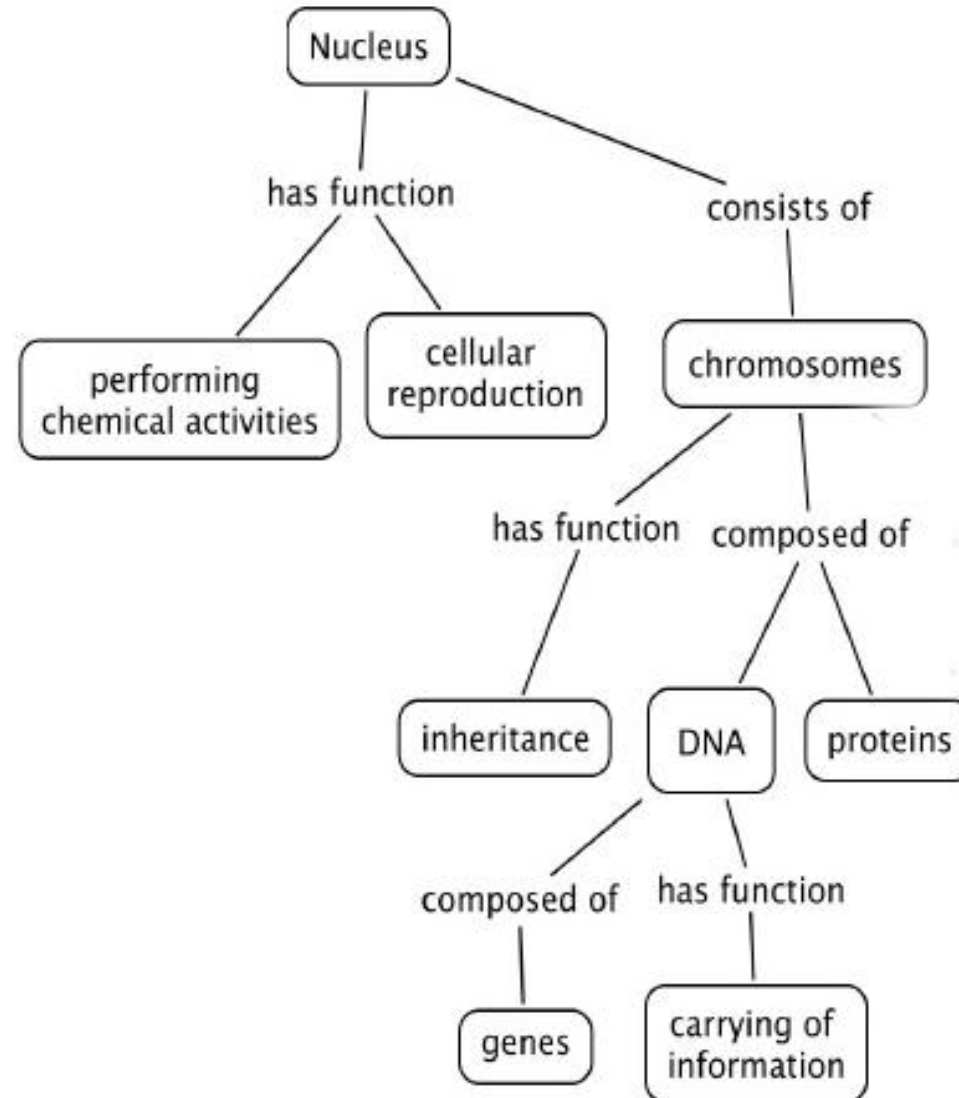learning experience and an assessment aligned with that LO.

By the end of this course, you should be able to:

list the planets of the solar system

explain the difference between a nut and a berry

develop a short programming script (in *x* language)

SciLifeLab

Defining content with Concept Maps

- 9 nodes
- 6 edges
- Total: 15 concepts

SciLifeLab

Concept maps – how to use the tool

- Concept maps are graphical tools for organizing and representing knowledge

- Include concepts and relationships to link concepts

- Good to start a concept map with a focus question - context

- Help to organize knowledge and to structure it

- Good concept maps are built with iterations and feedback

- Concept of mapping: invented by Joseph D. Novak , 1972

Further reading - The Theory Underlying Concept Maps and How to Construct and Use Them

SciLifeLab

Challenge 2.2 - Draw a concept map (15')

Draw a concept map of your topic of interest, start with a question

- Include 7 (+ - 2) concepts

- Include relationships and cross-links between these concepts

- Arrange it in a hierarchical structure with the key concepts on top

Use pen and paper

SciLifeLab

Discussions / feedback - How to give and receive feedback

- Listen actively and attentively
- Ask for clarification if you are confused
- Do not interrupt one another
- Challenge one another, but do so respectfully
- Critique ideas, not people
- Do not offer opinions without a supporting evidence
- Take responsibility for the quality of the discussion
- Build on one another 's comments; work toward shared understanding.
- Do not monopolise discussion.
- Speak from your own experience, without generalizing.
- If you are offended by anything said during discussion, acknowledge it immediately.

SciLifeLab

👥 Challenge 2.3 - Feedback on concept maps (10')

In pairs, exchange concept maps. <u>No need to explain the map</u>.

• Highlight one thing you are confused;what you are not sure about the map?

• Highlight one thing you like; what is clear about the map?

Each person will give and receive two feedbacks:

Positive and Constructive on content

SciLifeLab

Content

- **Content collection**

  Appropriate content to the needs and capabilities of your target audience

- **Content reduction**

  One of the biggest challenges in designing training courses is the reduction of content to the training format. **Key points!**

SciLifeLab

Discussions / Feedback - How to give and receive feedback

- Listen actively and attentively
- Ask for clarification if you are confused
- Do not interrupt one another
- Challenge one another, but do so respectfully
- Critique ideas, not people
- Do not offer opinions without a supporting evidence
- Take responsibility for the quality of the discussion
- Build on one another 's comments; work toward shared understanding.
- Do not monopolise discussion.
- Speak from your own experience, without generalizing.
- If you are offended by anything said during discussion, acknowledge it immediately.

SciLifeLab

Discussions / Feedback - What to give feedback on

- **Instructor:** the atmosphere they create, rapport, approachability, presence, patience, tone, energy, the learning environment and learning experience created
- **Instruction:** clarity, ability to explain in multiple ways,
- **Content - Concepts:** level of difficulty, whether concepts were described in a clear way, whether level of knowledge was tested and improved, whether an improved understanding of the content was achieved
- **Content - Slides:** images, text, image-text pairings, font, readability, colour scheme, overall clarity
- **Activities:** Was the activity well suited to the content? Did it enhance or hinder your understanding? What were the group dynamics like for group activities?

What else can we think of?

SciLifeLab

The 8 Dimensions of Wellness

SciLifeLab

Broadly speaking...

What factors do we first think of that we know affect health?

SciLifeLab

Some factors are likely to come to us easily…

But other factors may be more subtle…

SciLifeLab

8 Dimensions of Wellness

EMOTIONAL   SPIRITUAL   INTELLECTUAL   PHYSICAL   ENVIRONMENTAL   FINANCIAL   OCCUPATIONAL   SOCIAL

SciLifeLab
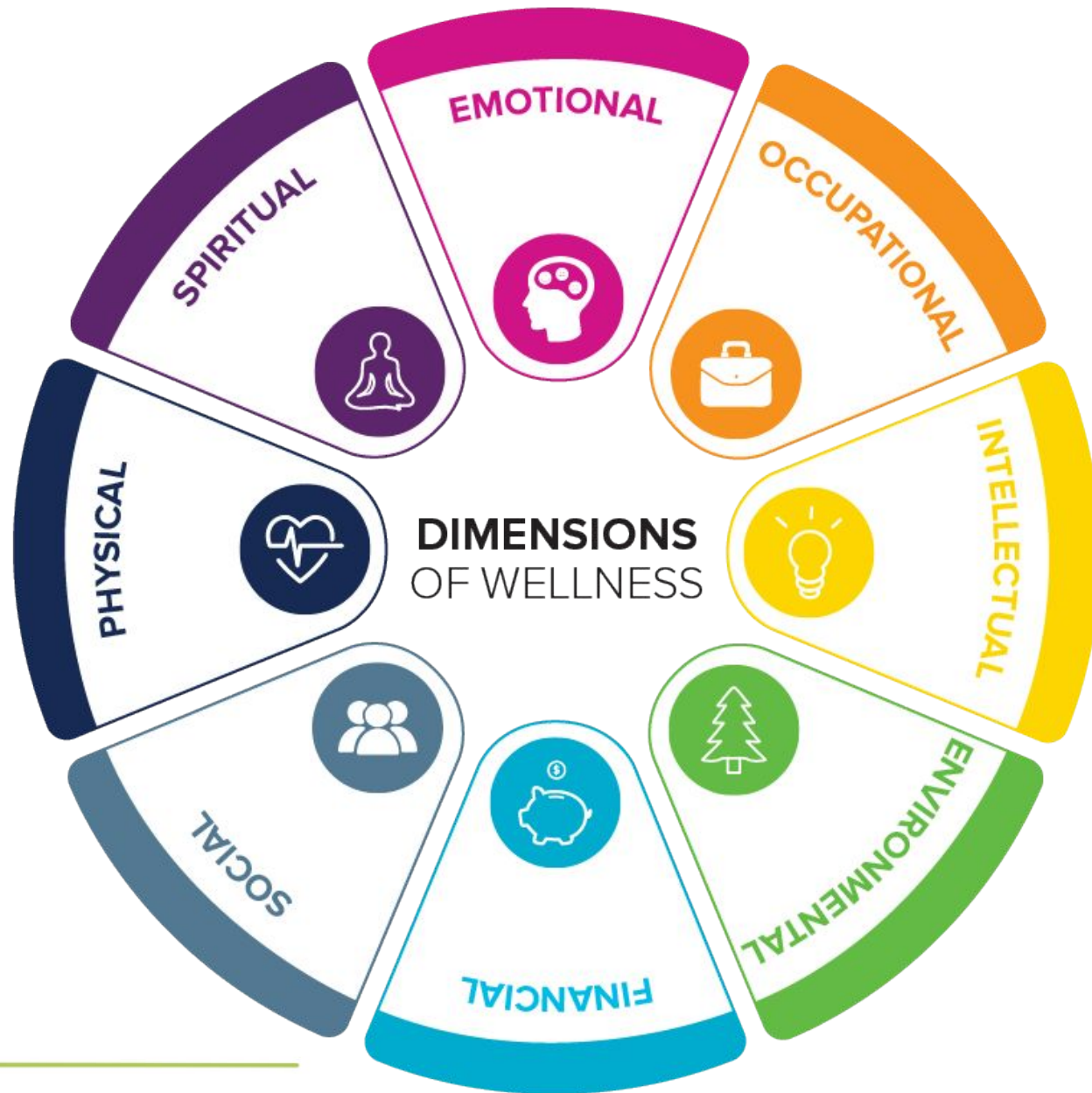
There is interplay between these dimensions…
- Overlap
- Mutually exclusive
- Synergies
- Dysergy

What examples (+ & -) can you think of for each dimension?

8 Dimensions of Wellness

EMOTIONAL · SPIRITUAL · INTELLECTUAL · PHYSICAL · ENVIRONMENTAL · FINANCIAL · OCCUPATIONAL · SOCIAL

SciLifeLab

How can the 8 dimensions of wellness be used in health assessments and health promotion?

Breakout rooms of 3

1. Each will deliver their 3 minute session to the others
   - Person 1 delivers the session
   - Persons 2 and 3 note down feedback in real-time
2. Feedback
   - You describe your own feedback (self-feedback) on your delivery
   - Persons 2 and 3 provide feedback to the Person 1
3. Rotate presenters

SciLifeLab

Re-cap

Nicholl's 5-steps

Phase 1
Learning outcomes (LOs)

SMARTIE

Phase 2
Learning experiences (LEs)

LEs aligned with LOs

Phase 3
Content

Promotes LOs
Supports LEs

Phase 4
Assessment

Promotes LOs
Supports LEs

Phase 5
Evaluation

Achievable LOs
Effective LEs

SciLifeLab

Nicholls G. Developing teaching and learning in higher education. London:Routledge;2002.
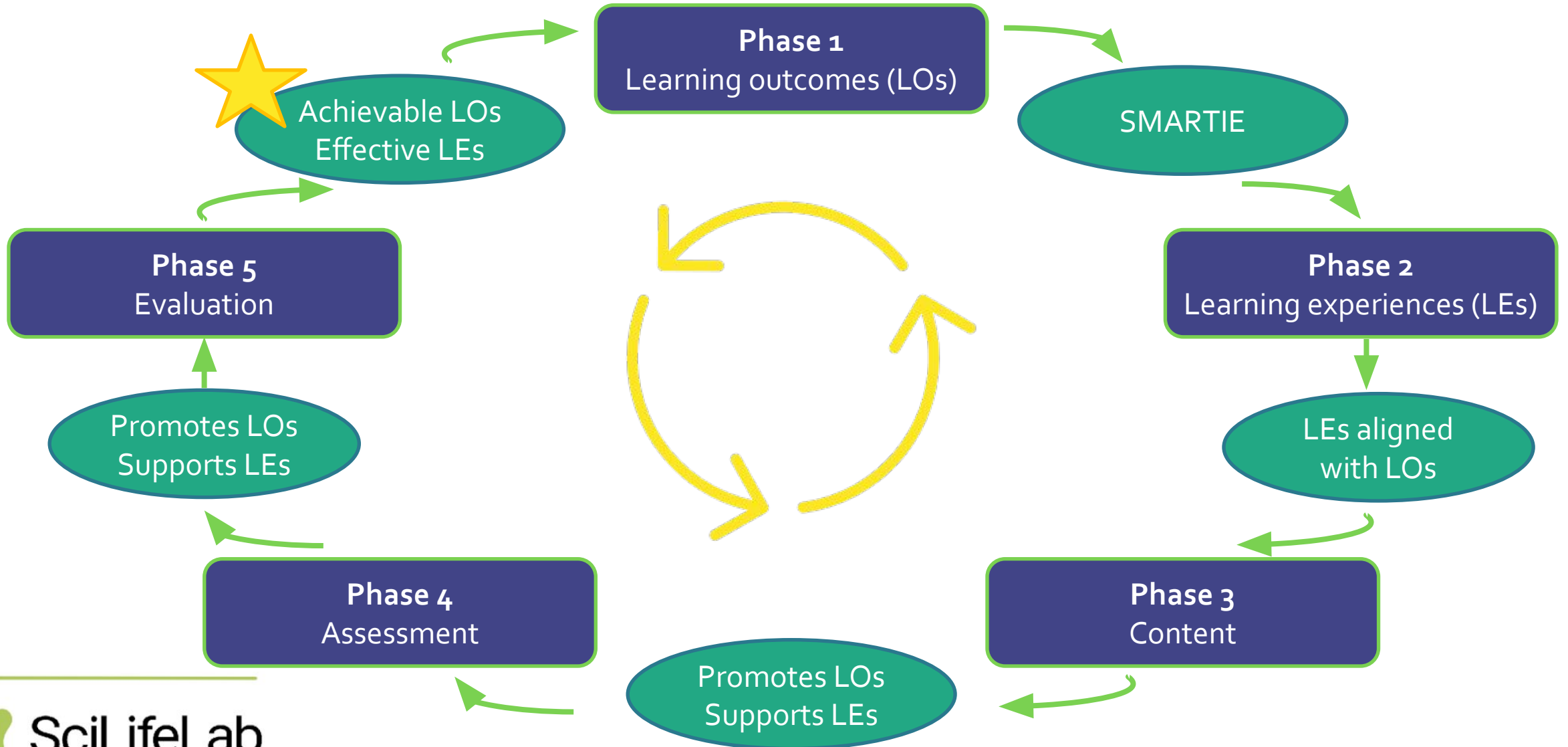
From learning outcomes to a lesson/session/course outline

- Well-defined and well-written SMARTIE LO will guide the whole structure

- Learning outcomes (LO): knowledge, skills and abilities (KSA) that learners will be able to demonstrate after instruction

- Learning experiences (LE): lectures, scripts, exercises, a game, a video, group work, …

- Assessment and feedback tools: creative activities, written tests, observation, interaction, forms,…

- LO, LE, Assessment should be tightly-linked

- When all the LOs are expanded, you have your course outline

SciLifeLab

Lesson/session/course plan

Time	Activity	Description	Goal

SciLifeLab

Example: Plan for a 1 hour 15 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.

SciLifeLab

See you on Wednesday, April 17!

Before you go: Please fill out today's feedback form (in the chat)

SciLifeLab

Summary of LOs: Learning <u>outcomes</u> should map to learning <u>experiences</u>, aims and titles

- Learning outcomes should start with verbs
  - e.g. List, Design, Write script
- Learning activities should allow outcomes to be achieved
- Example of verb "List" - knowledge domain, bottom of Bloom's taxonomy
  - Activity should involve listing, remembering, choosing correct answers, etc.

SciLifeLab
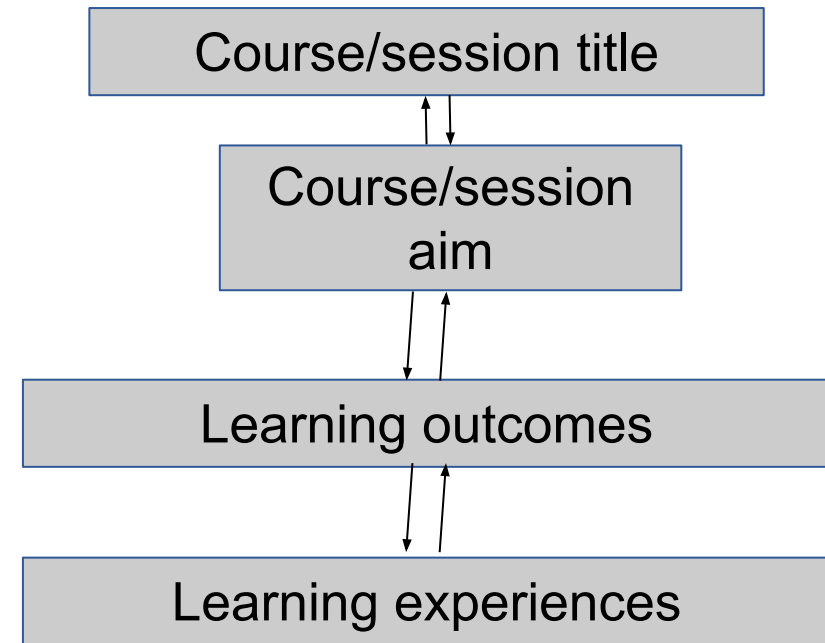
Instruction design in five steps
Tools for session, course, curriculum design

1 Select or identify LOs

→

2 Select **learning experiences** (LEs) that will help learners achieve LOs

→

3 Select **content** that is relevant to LOs

5 **Evaluate** the effectiveness of the LEs for leading learners to the LOs

←

4 Identify/develop **assessments** to ensure learner is progressing towards LOs

Nicholls G (2002). *Developing teaching and learning in higher education*. London, UK: Routledge. Pp 51-75