Carpentries Instructor Training

Mateusz Kuzak
Lieke de Boer

THE
CARPENTRIES

Welcome

(30 minutes)

THE
CARPENTRIES

Introductions

Mateusz Kuzak
Lieke de Boer

THE CARPENTRIES

Collaborative documents

- Open (and bookmark) the shared documents
  https://codimd.carpentries.org/2023-10-31-ttt-day1
  https://codimd.carpentries.org/2023-10-31-ttt-day2

- Make sure you've taken the pre-workshop survey
  https://liekelotte.github.io/2023-10-31-ttt-escience/

crushed paper - writer's block - crumpled paper with unfocused background" by photostev101

Code of Conduct

The Carpentries Code of Conduct:
https://docs.carpentries.org/topic_folders/policies/code-of-conduct.html

"Be nice to each other #ねこ #cat" by mystelynx

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Schedule

Day 1, part 1	Research-based teaching principles
Day 1, part 2	Creating a respectful, inclusive learning environment
Day 2, part 1	Practicing teaching and improving skills
Day 2, part 2	How to teach a workshop

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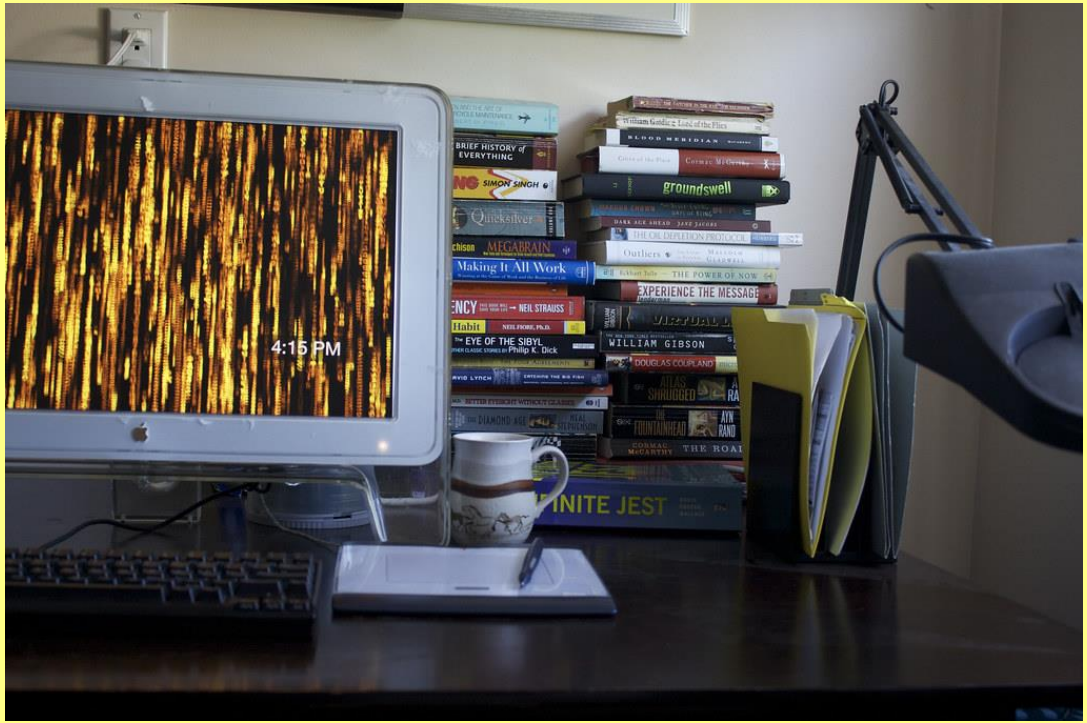
Exercise: Familiarity with the Carpentries

Go to the CodiMD for the first exercise

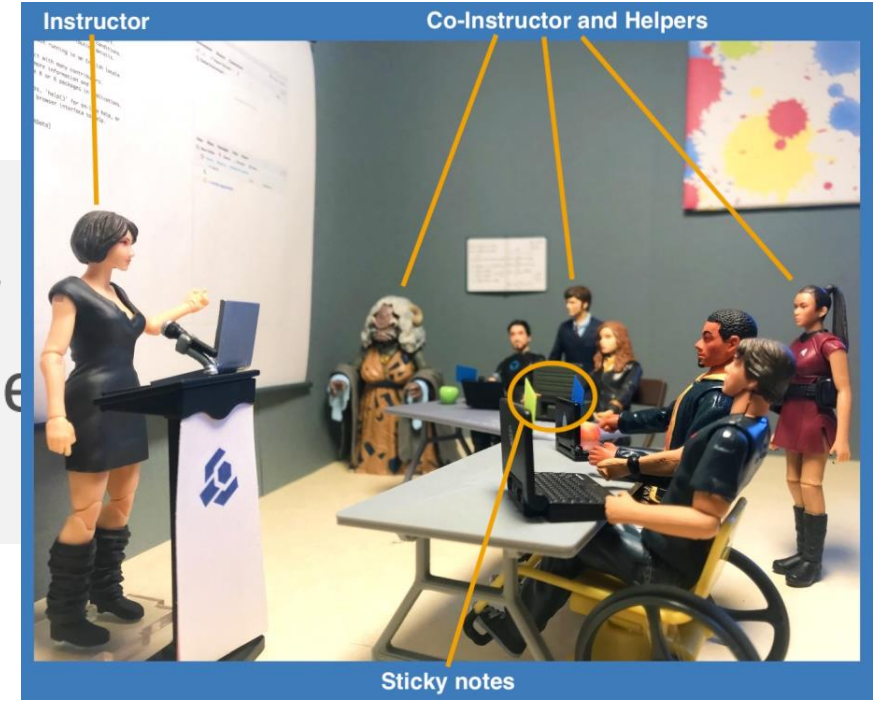
Icebreaker



"My reading list is now out of control" by simon.carr

An overview of the Carpentries

- Goal: to convey best practices that will enable researchers to be more productive and do better research.



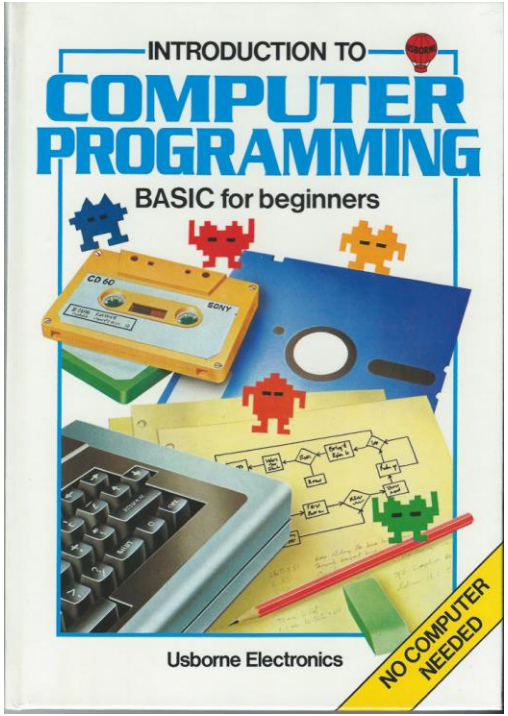
Goals of this instructor training

- Understand how to apply **research-based teaching principles**
- Understand the importance of a **respectful and inclusive classroom environment**
- **Practice and develop skills** in the Carpentries teaching methods
- Learn about **the Carpentries as an organization**

"I'm So Confused!" by Ian Sane

What we will not cover

- Workshop content
- Lesson development
  - But if you want to learn about this…



"Introduction to Computer Programming" by tattlemuss

Building Skill with Practice

(60 minutes)

- How do people learn?
- Who is a typical Carpentries learner?
- How can we help novices become competent practicioners?

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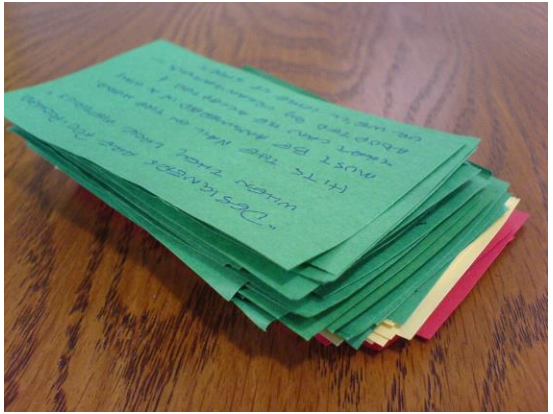
The Carpentries pedagogical model

- Practical over theoretical
- Specific over general
- Learning in real time
- Dependent on feedback between learners and instructors
- Thought of as skill development, rather than a source of information



"panel feedback: bar chart" by bschmove

Dreyfus Model of Skill Acquisition

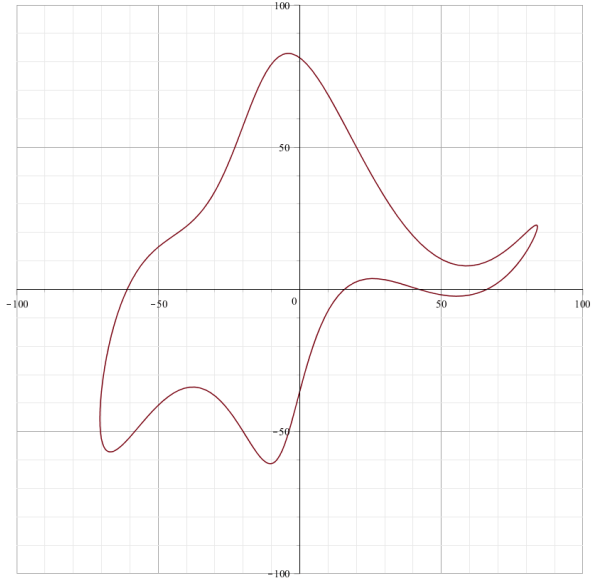
Building a mental model

“All models are wrong, but some are useful”

- George Box

“With four parameters I can fit an elephant,
and with five I can make him wiggle his trunk.”

- John Neumann



https://www.johndcook.com/blog/2011/06/21/how-to-fit-an-elephant/

Exercise: Analogies (In pairs)

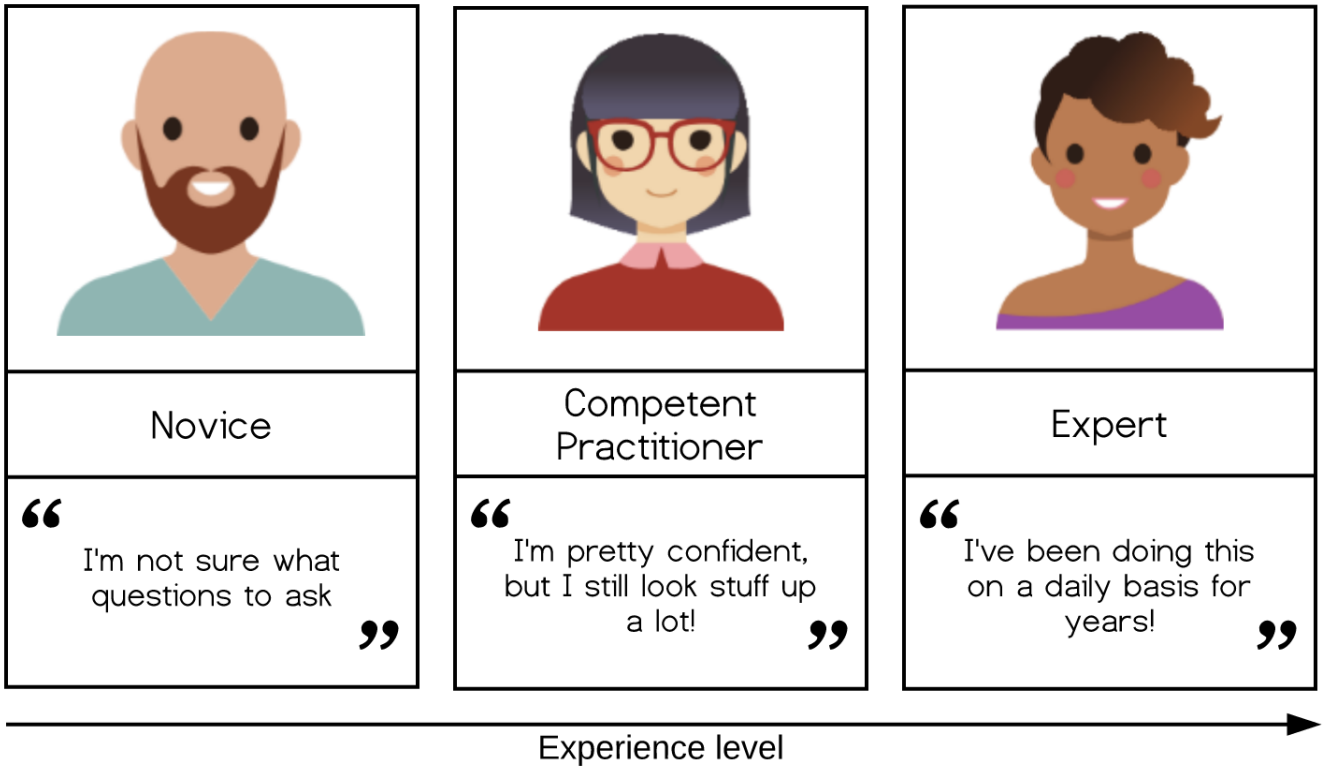
Breakout rooms, 10 minutes

Consider an analogy that you might use to explain your work/hobby

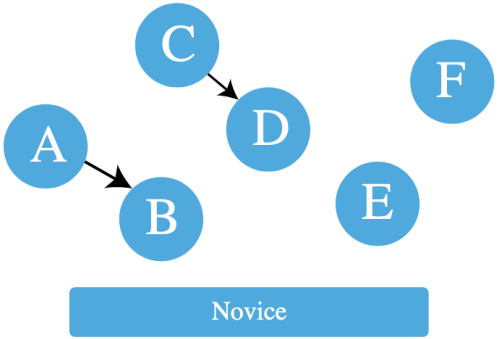
Share it with your group

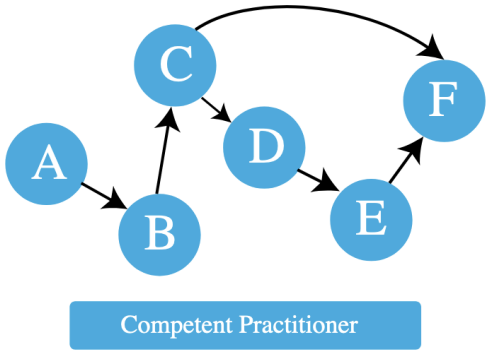
Discuss how it is useful, how it is wrong

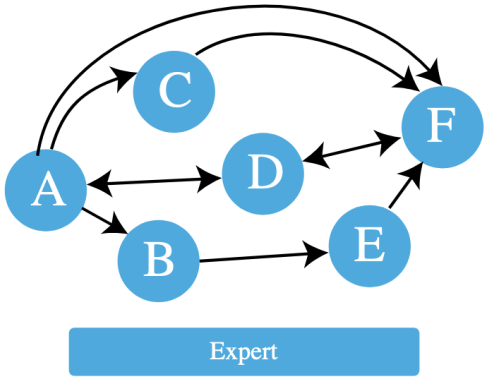
Mental models and expertise



Mental models and expertise

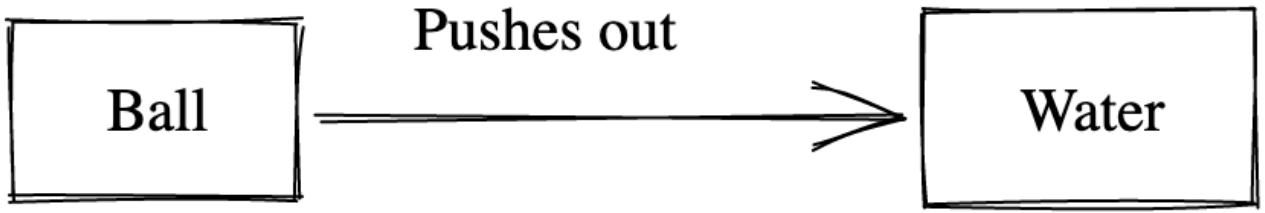






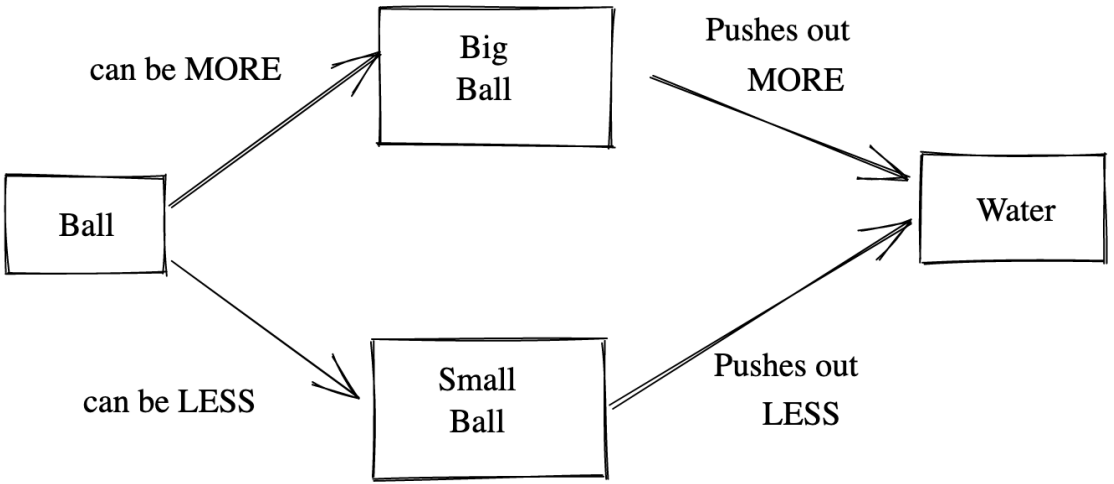
A concept map of a simple mental model

A kid has a ball and a full bucket of water



A concept map of a simple mental model

Now, the kid has 3 different-sized balls:



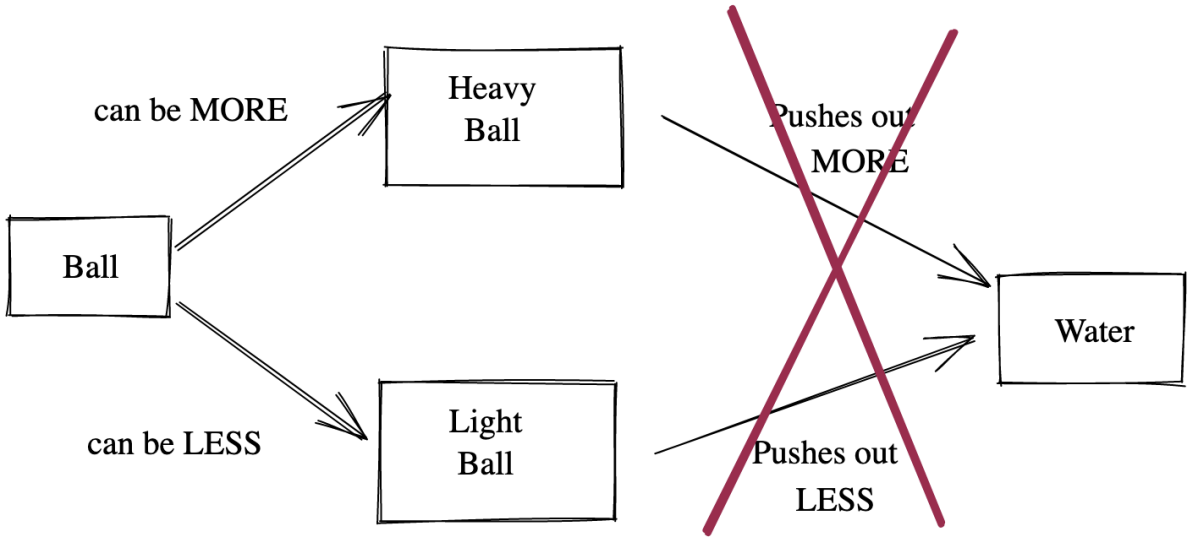
Exercise: Concept Mapping (10 minutes)

1. On a piece of paper, draw a simplified concept map of the same concept you discussed in the last activity, but this time without the analogy. What are 3-4 core concepts involved? How are those concepts related? (5 minutes)

2. (plenarily) What did you think of this exercise? Do you think this could be a useful practice in the classroom? (5 minutes)

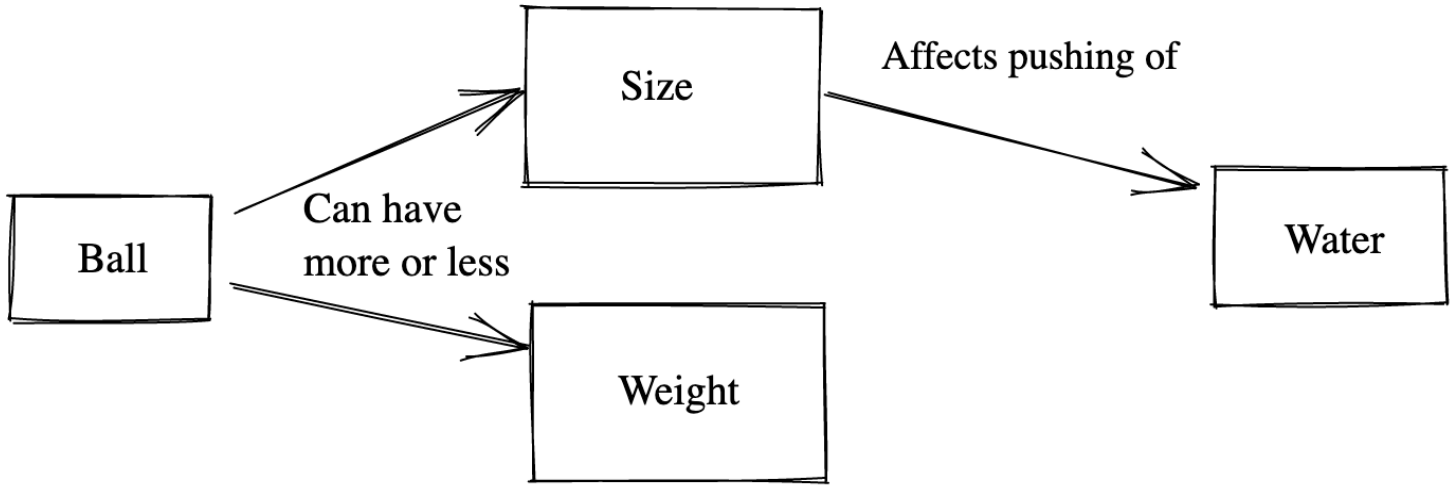
Misconceptions

What if they also have different weights?



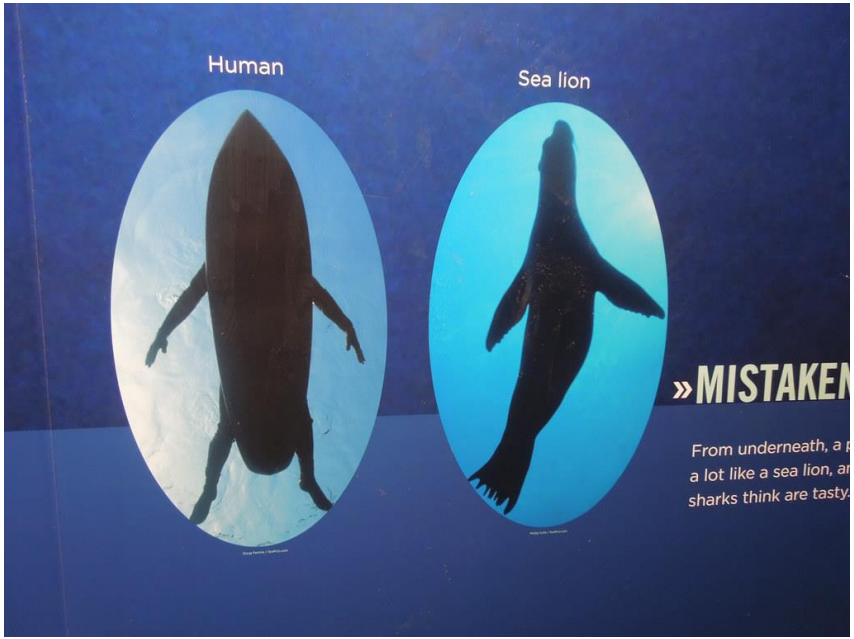
Correcting mental models

Unlearning takes time!



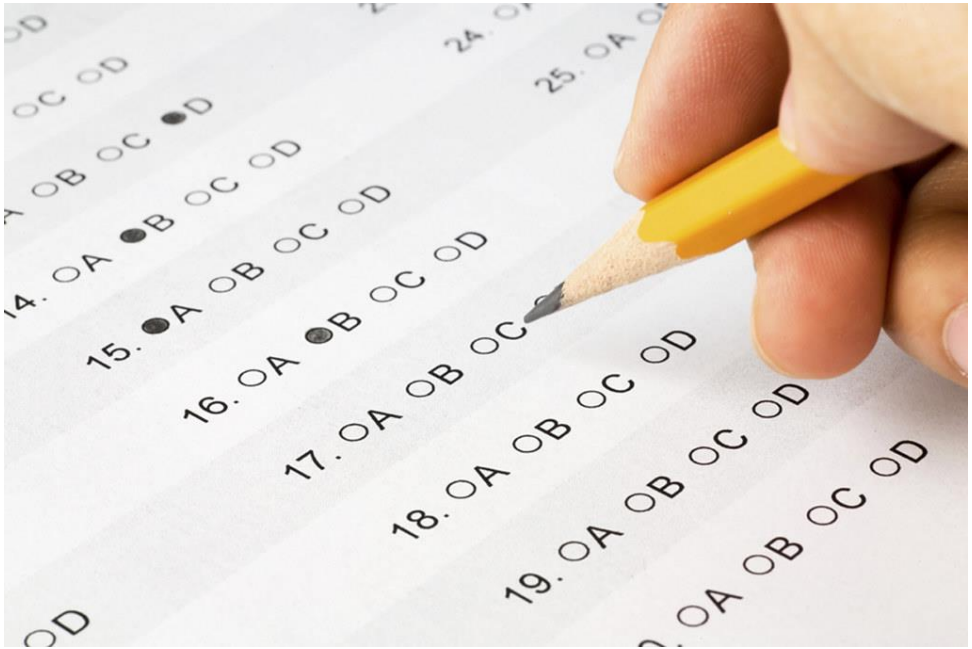
Types of misconceptions

- Factual error
- Broken model
- Fundamental belief



"Honest Misunderstanding" by thekirbster

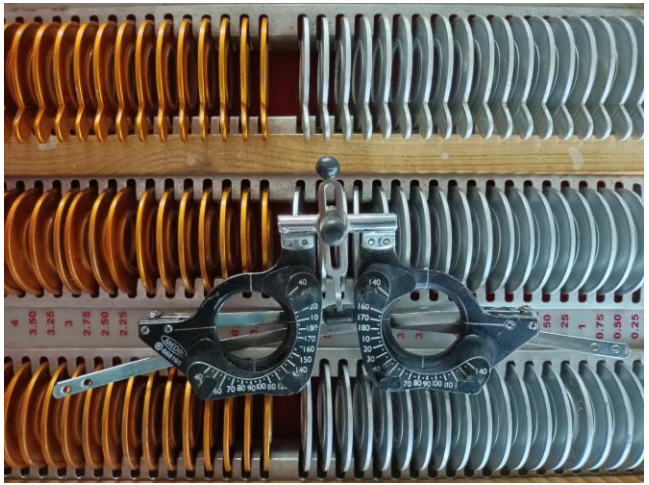
Formative assessment



"Exam" by albertogp123

Formative assessment

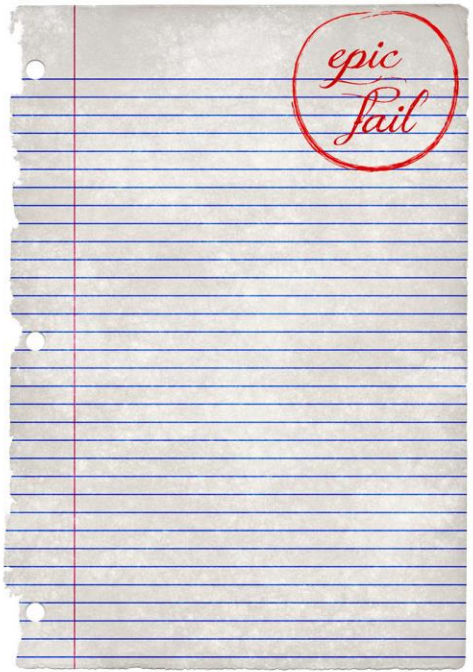
Any instructional tool that generates feedback that is used in a formative way



"Ophthalmic trial frame 4" by Ajeeshkumar4u

How can formative assessment be useful?

- It generates immediate feedback for both learners and instructors
- The feedback helps us assess the mental model that is forming in our learners
- We can identify misconceptions
- We can go on to correcting those misconceptions
- Formative assessment is different from **summative** assessment



"Epic_Fail.Grade" by Free_Grunge_Textures_-_www.freestock.ca

How should you use formative assessment?

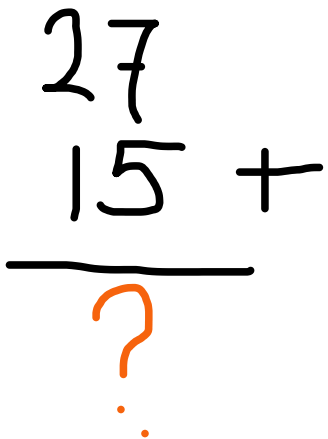
- Use it regularly (ideally an exercise every 10 minutes)
- Make sure all learners are assessed
- Respond promptly to the results of the assessment

Exercise: Formative Assessment (5 minutes)

Based on your previous educational experience (or even this training so far!) what types of formative assessments do you know about?

Write them in the CodiMD.

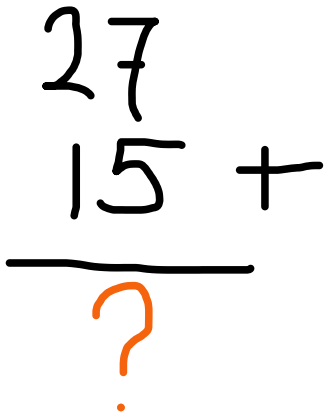
Example: plausible distractors



A) 42
B) 32
C) 312
D) 33

Example: plausible distractor

What does each wrong answer tell you about the learner's misconception about long addition?



A) 42

B) 32

C) 312

D) 33

Exercise: Formative Assessment MCQ (CodiMD)

Choose one wrong answer and write in the CodiMD what the misconception is associated with that wrong answer

Exercise: Handling Outcomes (5 minutes)

Formative assessments allow us as instructors to adapt our instruction to our audience. What should we do as instructors if the class chooses:

1. mostly one of the wrong answers?
2. mostly the right answer?
3. an even spread among options?

For one of the above, enter your answer in the CodiMD.

The importance of going slowly

- Assessing mental models takes time
- Presenting too many facts too soon can reinforce an incorrect mental model
- Most Carpentries learners are novices – goal is to help them construct a working mental model of programming or data management

"Baby_Gopher_Tortoise" by Steven Beger Photography_(Beger.com_Productions)

→ teach people **how to think** about programming and data management in a way that will allow them to learn more easily on their own

Example: lesson on Unix shell in Software Carpentry

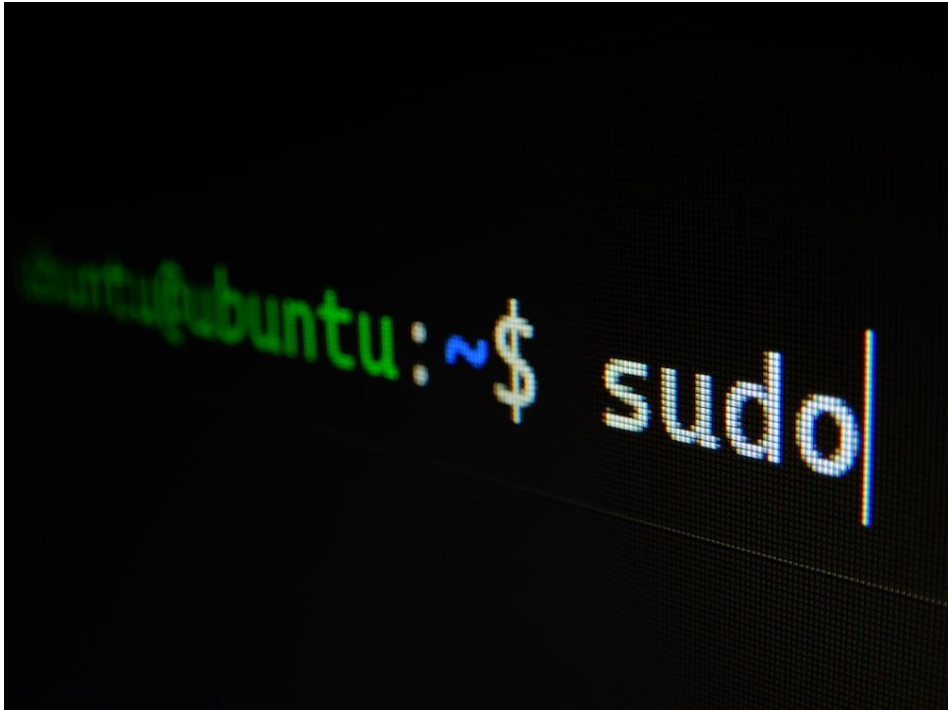


Photo by Gabriel Heinzer on Unsplash

Break

(15 minutes)

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Key points

- Our goal when teaching novices is to help them construct useful mental models.
- Exploring our own mental models can help us prepare to convey them.
- Constructing a useful mental model requires practice and corrective feedback.
- Formative assessments provide practice for learners and feedback to learners and instructors.

Expertise and Instruction

(45 minutes)

- Does subject expertise make someone a great teacher?
- How are we different from our learners and how does this impact our teaching?

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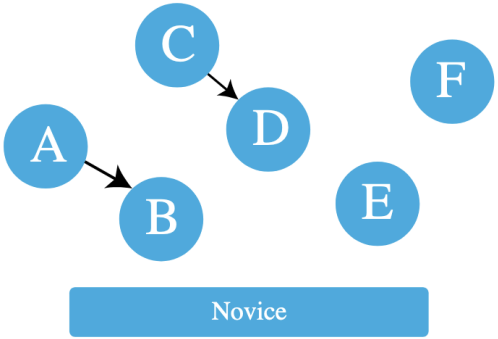
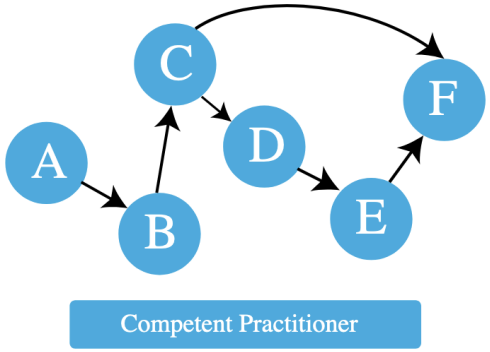
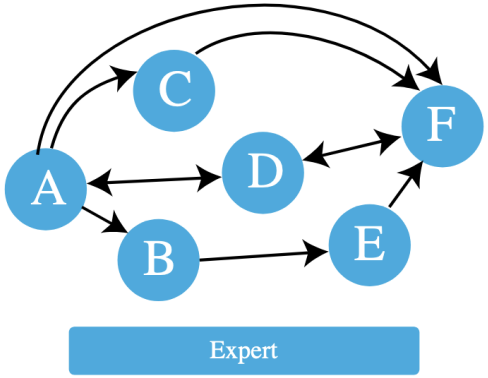
Exercise: Expertise (discussion, 5 minutes)

What is something that you are an expert in? How does your experience when you are acting as an expert differ from when you are not an expert?

Expertise and instruction







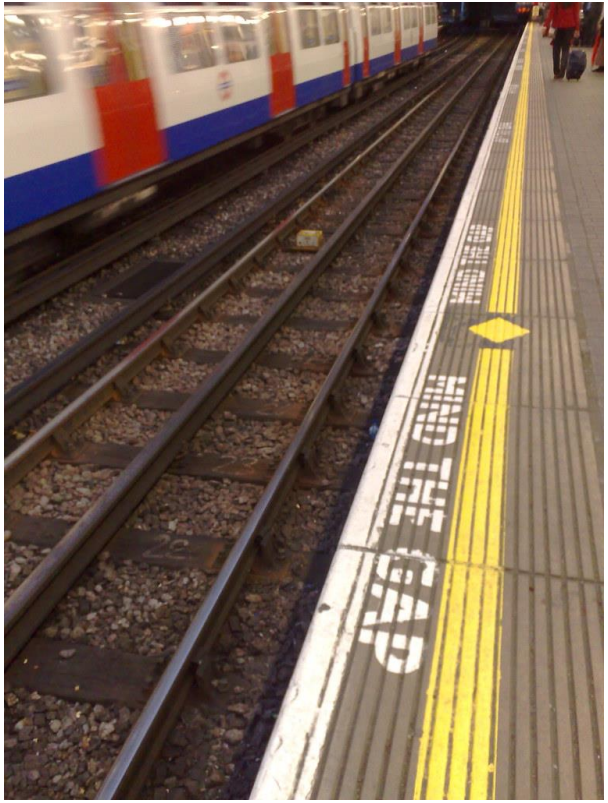
If your mental model is very connected you..

- see connections that others do not see
- see a single problem in several different ways
- know how to solve a problem, or what questions to ask
- jump directly from a problem to its solution

"leap" by sabrina's stash

Expert awareness gap

- Leaping from A to F can mean you forgot that B, C, D and E exist!
- Listen carefully to your learners!
- Expertise can stand in the way of effective teaching



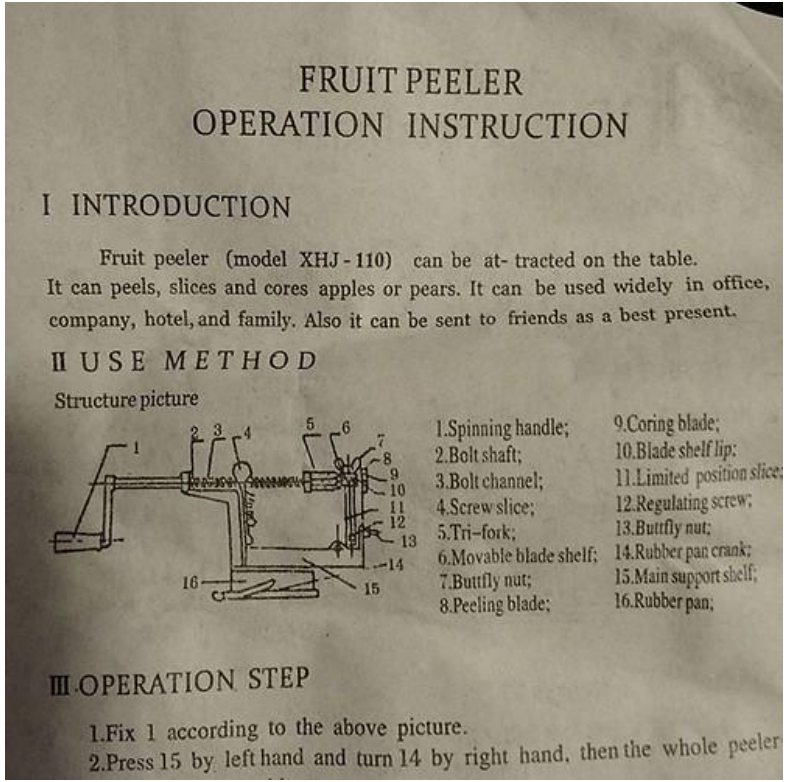
"Mind the gap" by markhillary

Exercise: Awareness Gaps (5 minutes, CodiMD)

- Is there anything you are learning how to do right now? Can you identify something that you still need to think about, but your teacher can do without thinking about it?
- Think about the area of expertise you identified for yourself earlier. What could a potential awareness gap be?

Switching language & diagnosing errors

- Experts often use language interchangeably (e.g. *bash, shell, terminal*)
- Key shortcuts and different notations are often used without thinking by experts
- Novices can be confused by this



FRUIT PEELER
OPERATION INSTRUCTION

I INTRODUCTION

Fruit peeler (model XHJ-110) can be at- tracted on the table. It can peels, slices and cores apples or pears. It can be used widely in office, company, hotel, and family. Also it can be sent to friends as a best present.

II USE METHOD

Structure picture

1.Spinning handle;
2.Bolt shaft;
3.Bolt channel;
4.Screw slice;
5.Tri-fork;
6.Movable blade shelf;
7.Buttfly nut;
8.Peeling blade;
9.Coring blade;
10.Blade shelf lip;
11.Limited position slice;
12.Regulating screw;
13.Buttfly nut;
14.Rubber pan crank;
15.Main support shelf;
16.Rubber pan;

III OPERATION STEP

1.Fix 1 according to the above picture.
2.Press 15 by left hand and turn 14 by right hand, then the whole peeler

"Funny translation on my new Apple peeling gizmo" by bnilsen

Switching language & diagnosing errors

- Experts are better at diagnosing errors than novices
- Errors occur while teaching – do not brush over them but engage with the process of fixing an error!

“Just” and other dismissive language

"Class Dismissed" by Orin Zebest

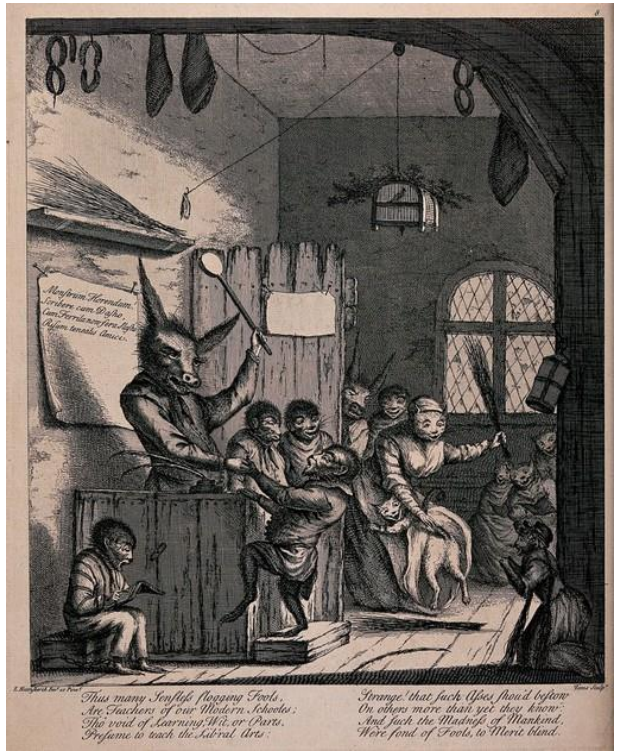
Exercise: inclusive language (5 minutes)

- What other words or phrases, besides “just”, can have the same effect of dismissing the experience of finding a subject difficult or unclear?
- Propose an alternate phrasing for one of the suggestions above.

Write your answer in the CodiMD

You are not your learners!

- Fun facts about programming are not always of interest to novice learners
- People's motivation may be more fragile than yours when you started!



"A schoolroom with animals as teachers and pupils. Engraving by Toms after E. Heemskerck."

Lastly..

- Use formative assessment to make sure the expert awareness gap is not affecting your teaching
- The more you teach, the more aware you become of your own expertise
- Practice makes perfect!

Key points

- Experts face challenges when teaching novices due to expert awareness gaps.
- Things that seem easy to us are often not experienced that way by our learners.
- With practice, we can develop skills to overcome our expert awareness gaps

Memory and cognitive load

(45 minutes)

- What is cognitive load and how does it affect learning?
- How can we design instruction to work with, rather than against, memory constraints?

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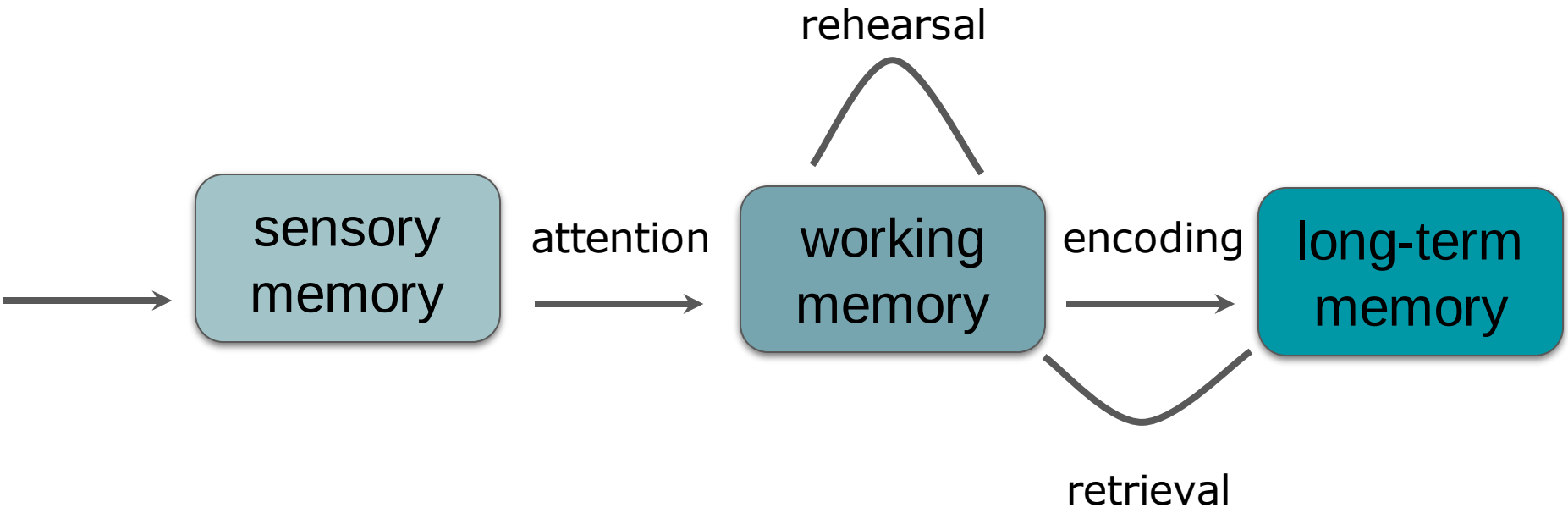
Memory and cognitive load

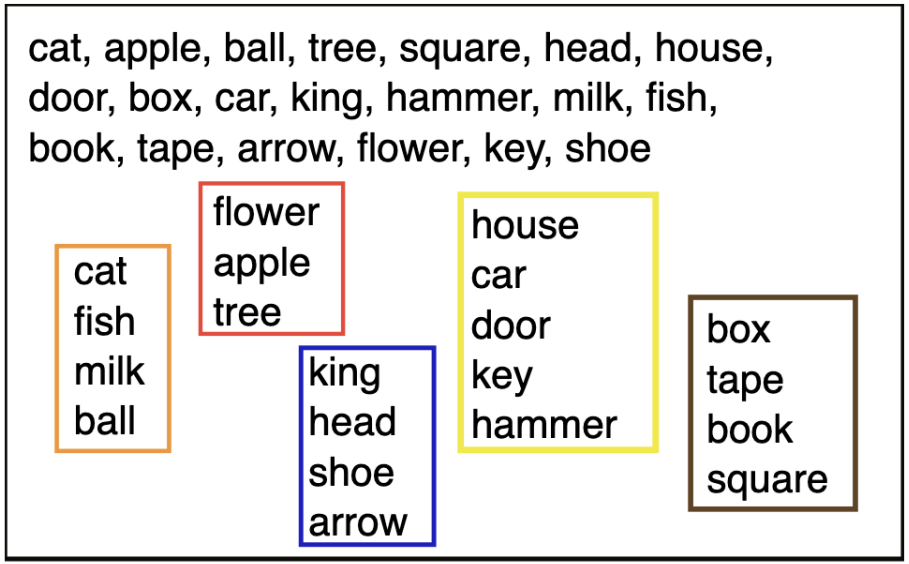


Exercise: test your working memory

https://miku.github.io/activememory/

Write your score in the CodiMD!

Strategies for memory management



cat, apple, ball, tree, square, head, house,
door, box, car, king, hammer, milk, fish,
book, tape, arrow, flower, key, shoe

cat
fish
milk
ball

flower
apple
tree

king
head
shoe
arrow

house
car
door
key
hammer

box
tape
book
square

Exercise: test your working memory (again)

- Repeat the memory exercise you did earlier, but this time, try to form short stories or phrases, or a visual image, from the words you see.
- Write the number of words you remembered in the CodiMD. How does this compare with your first attempt?

Strategies for memory management

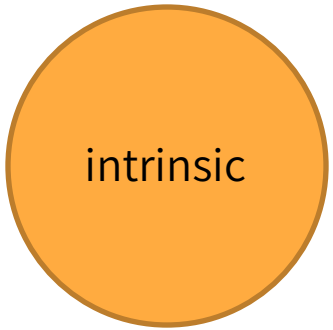
- Group work (teaching as learning!)
- Opportunities for reflection (asking feedback can be a memory consolidation prompt)
- Limit concepts

"college memories" by Sean MacEntee

Cognitive load

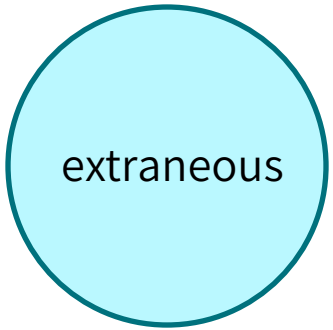
Depressed musician vintage drawing" by The British Library

Cognitive load types



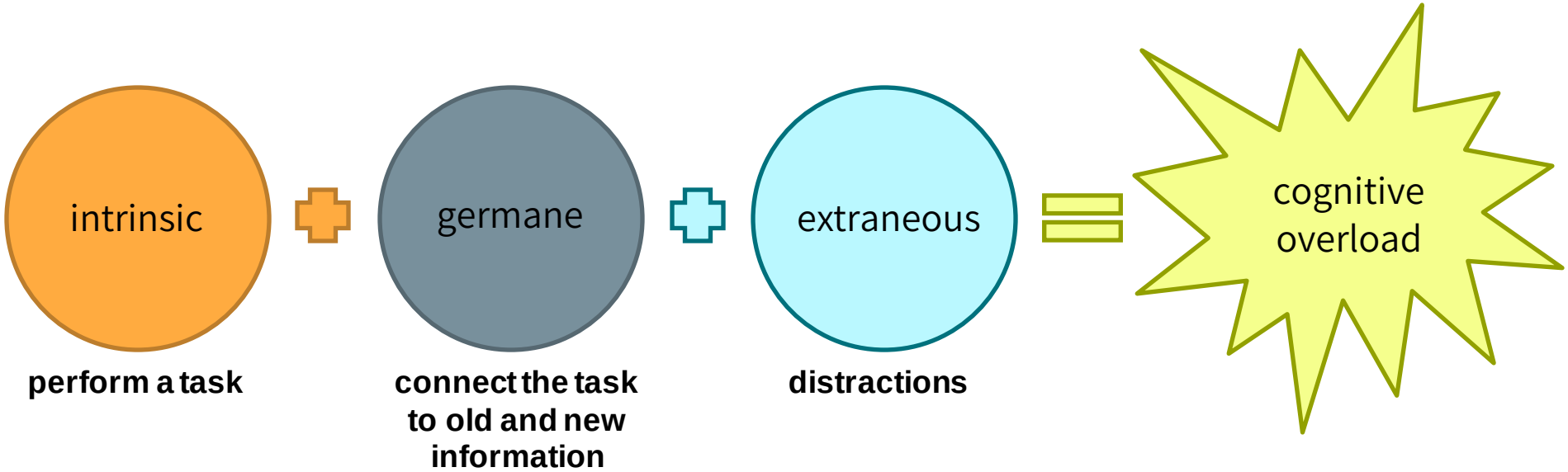
perform a task

connect the task to old and new information



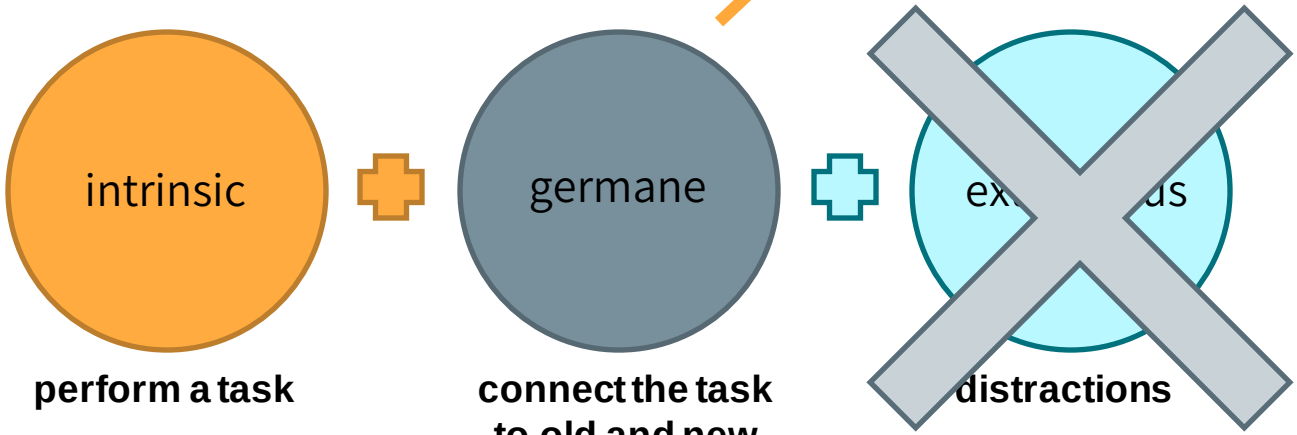
distractions

Cognitive load



Cognitive load

Use formative assessments and keep the steps small



Attention management during a workshop

- Use formative assessment in the right way
  - Parson's problems (rearrange the order of code pieces)
  - Faded examples (fill in the blanks)
- Not recommended to share Carpentries materials before class
- Speak commands as you type them on screen

"focus (challenge)" by ankakay

Key points

- Most adults can store only a few items in short-term memory for a few seconds before they lose them again.
- Things seen together are remembered (or mis-remembered) in chunks.
- Cognitive load should be managed through guided practice to facilitate learning and prevent overload.
- Formative assessments can help to consolidate learning in long-term memory.

Building skill with feedback

(20 minutes)

- How can we get feedback from learners?
- How can we use this feedback to improve our teaching?

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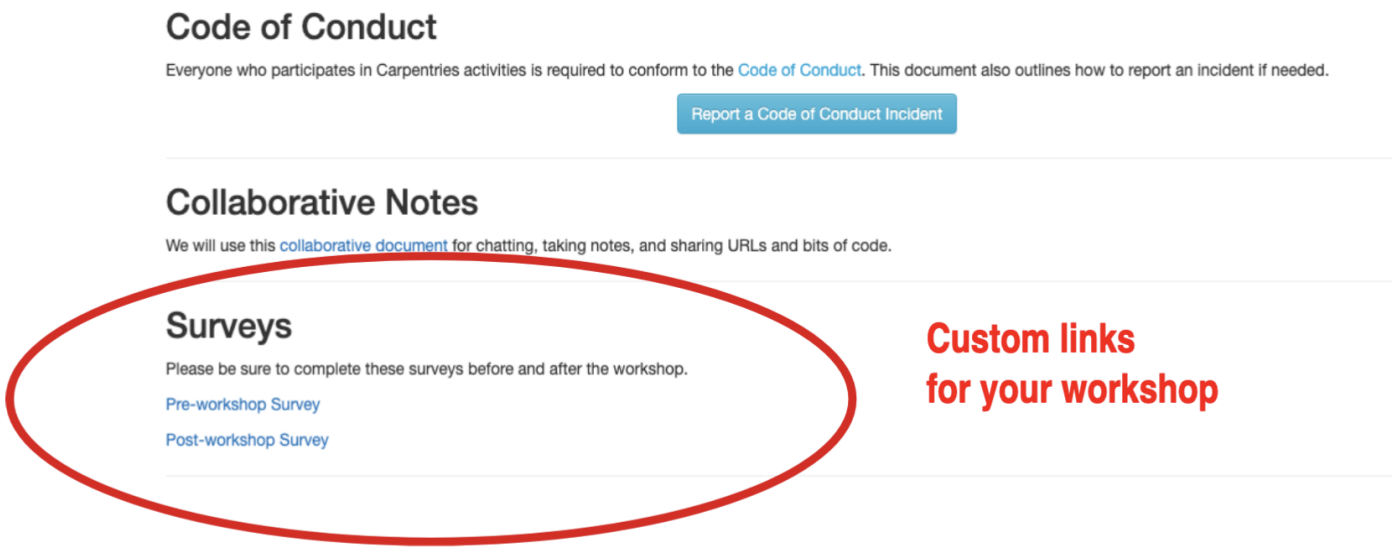
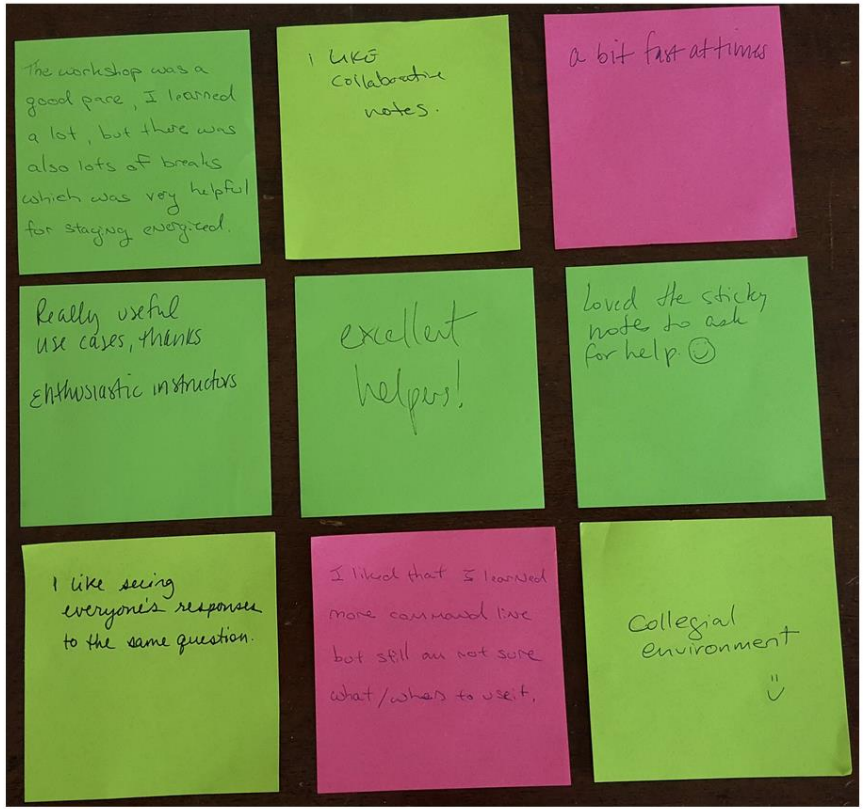
Surveys


Code of Conduct
Everyone who participates in Carpentries activities is required to conform to the Code of Conduct. This document also outlines how to report an incident if needed.
Report a Code of Conduct Incident
Collaborative Notes
We will use this collaborative document for chatting, taking notes, and sharing URLs and bits of code.
Surveys
Please be sure to complete these surveys before and after the workshop.
Pre-workshop Survey
Post-workshop Survey
Custom links
for your workshop

Minute cards



One up, one down

Lunch break

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Day 2, afternoon

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Feedback

More practice live coding

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Live demo rubric (10 min)

Read the rubric that is given to Instructor Trainers as a suggested framework for evaluating the online teaching demonstration sessions that are part of Instructor checkout.

https://data-lessons.github.io/instructor-training/demos_rubric/.

What questions do you have?

More practice live coding (25 min + 10 min discussion)

Return to your groups and repeat the previous live coding exercise, re-teaching the same content as before (3 minutes!). This time, the presenter should incorporate changes based on feedback received, and everyone should try to ‘level up’ their feedback using the rubric for teaching demos (5 minutes).

When you are finished, share some thoughts on this process in the plenary discussion: What did you change? Did it work better or worse with the change? How might you do it if you were to teach it again?

Working with your team

- What are the challenges of managing a heterogeneous classroom?
- What should we do if there is a Code of Conduct violation?
- What does it mean to be a co-Instructor?
- How does an instructional team prepare for a workshop?

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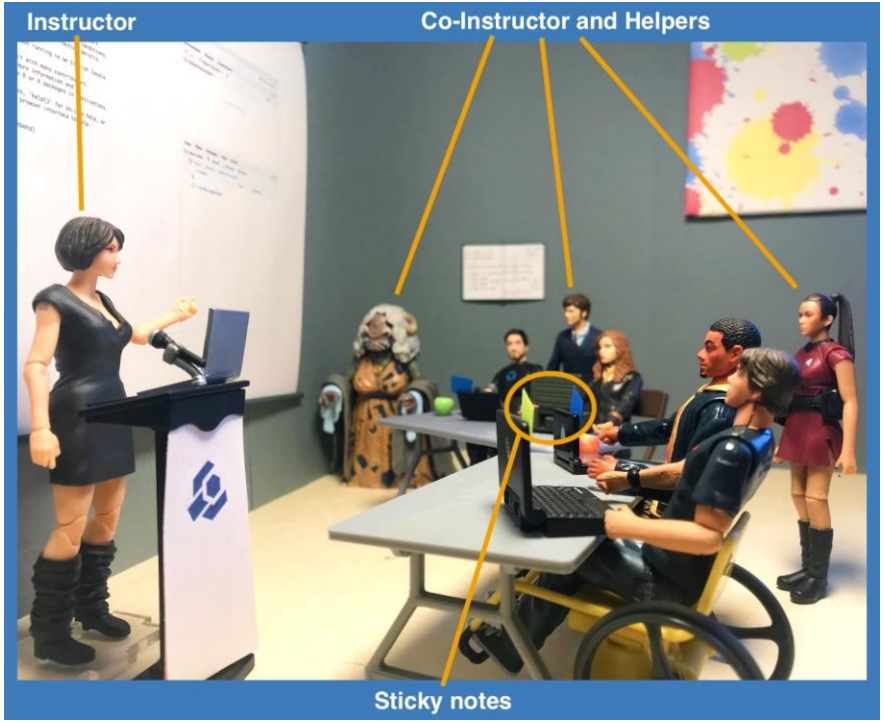
Never teach alone



Roles

- Host
  - Logistics (unrelated to teaching)
  - Checklist in Carpentries Handbook
- Co-instructors who are either:
  - Team teaching
  - Teach and assist
- Helpers
  - Setup and installation
  - Monitoring the room to spot people who need help during class or exercises
  - Monitoring the shared notes and answering questions there / reminding the Instructor
  - Helper checklist

Carpentries Classroom Practices

- Starting with Code of Conduct
- Participatory Instruction & Hands-off Help
- Sticky Notes
- Formative Assessment
- Breaks with snacks
- Feedback

Sticky Situations

fig rolls stuck together by fsse8info

What are the challenges?

What are some of the challenges you might expect when teaching learners with a broad range of expertise?

1. Learners at many levels

- Communicate level clearly, describe topics
- Beginner and advanced options for exercises
- Encourage learners to help others
- Do not let advanced learners take over the conversation
- Be vigilant for learners who are falling behind

2. Code of conduct violations

- Ensures that our community does not tolerate or encourage the persistence of harmful behaviors
- Incidents must be reported for the CoC to work well
- When in doubt, report (not the responsibility of the reporter to determine if there has been a CoC violation or not)
- Discuss how to manage CoC violations in advance

Know your resources (10 minutes)

Take 5 minutes to read through the Code of Conduct Incident Response Guidelines: https://docs.carpentries.org/topic_folders/policies/incident-response.html

Discuss what you have read in small groups. As questions arise, you may wish to refer to our complete Code of Conduct section in The Carpentries Handbook or to the Transparency Reports released by The Carpentries Code of Conduct Committee (links in CodiMD)

What kinds of things could your instructional team agree upon in advance of your workshop?

What questions do you have about CoC enforcement? Write in the CodiMD

2. Code of conduct violations

- Fortunately, violations have been extremely rare

Planning together

- Planning is half the fun!
- Connect with people on your instructional team
- Share the load of planning a workshop

introduction to horce racing by woodley wonderworks

Teaching together – Nuts and Bolts (10 minutes)

With a partner, imagine that you are planning a workshop together. For this exercise, you may assume that your workshop has a separate, designated Host.

- How would you prepare to teach a workshop together?
- How would you coordinate with other members of your instructional team (e.g. Host, Helpers)?
- What kinds of things will you do to support each other during the workshop? What won't you do?
- Record some notes, and share your thoughts with the group.

Co-instruction suggestions

- Decide who teaches what and for how long
- Advance preparation together or asynchronously
- Practice together
- What information is needed to advertise and communicate: Audience, in person vs online, setup instructions and setup sessions
- Where will you communicate together?
- Who is the contact person for participants?
- Discuss how to manage CoC violations in advance
- Signal things like going too fast / who needs help / it's time for a break - agree on the signal if people do not like to be interrupted
- Active classroom assistance Carpentries style
- Who sets up the repository and HackMD / CodiMD?

Key points

- Working with a broad range of learners can be challenging, but there are many ways to keep a classroom happy and motivated
- The instructional team decides how to respond to Code-of-Conduct incidents during a workshop; all violations should be reported to The Carpentries Code of Conduct committee for follow-up.
- Team work takes work, but allows you to share the load and build connections

Break

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Launches and landings

- How do you actually start a workshop?

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The introduction

- How do good workshops begin?
- Introductions set the tone for the workshop and the path for learning
- Empowering, yet intimidating moment
- Having a plan relieves stress and will get you started

What is an introduction?

Discuss in pairs:

What do you hope to accomplish in a workshop introduction?

What information do you need to include in an introduction to accomplish these goals?

After the introduction, learners should

- be able to predict the type of instruction
- know what will be taught
- understand what will be required of them
- believe that they can learn from the workshop

After the introduction, the instructional team should

- know who is participating in the workshop and what their expectations are
- have an initial impression of how learners respond to participation prompts and what will be needed to encourage them to engage

Setting the stage

- Attire
- Physical environment
- Your use of the few minutes before class
- Introduction of yourself
- Your doubts
- The classroom community and icebreakers

Teaching your trajectory: what you can communicate

- Describe the prerequisites
- Schedule and logistics
- Workshop structure
- Your expectations (Code of Conduct, asking for help / feedback)
- Baseline data on learners
- Advice for success
- Whet appetite for workshop content

Practice your introduction (15 minutes)

Write out some notes, covering a few of the topics described above

1. Introduce yourself effectively
2. Clarify learning objectives and expectations
3. Set the tone for the workshop
4. Return to your groups of 2 or 3 and each give about 90 seconds of your introduction. (5-6 min)

After each introduction, briefly share feedback, reserving extensive discussion for after all have had a turn to present.

The art of a smooth landing

Brainstorm: making the last moments count (5 minutes)

What could you do at the end of a workshop? What would be the value?

Brainstorm: making the last moments count (5 minutes)

What could you do at the end of a workshop? What would be the value?

- Close and save files
- Reflect on learning
- Plan next steps
- Reiterate where lesson materials are
- Collect feedback
- Check with the host to see if they have closing remarks or instructions
- Celebrate hard work

Key points

- A planned introduction is key to creating a functional workshop environment
- Conclusions support reflective practice and set the stage for continued learning

Putting it together

- How are teaching practices we have learned used in Carpentries workshops?

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Putting it together (5 minutes)

Based on the content we've discussed throughout this workshop, add at least one item to each category below in the CodiMD:

- Concepts/Theories
- Tools/Practices

This exercise can be done individually and should take about 5 minutes.

Some topics we discussed!

- novice, competent practitioner, expert
- mental model
- formative assessment
- expert awareness gap
- short-term and long-term memory
- cognitive load
- motivation
- demotivation
- error-framing
- life-long learning
- feedback
- lesson study
- Code of Conduct
- concept maps
- Multiple Choice Question (MCQ)
- peer instruction
- going slowly
- “just”
- accessibility
- sticky notes
- one-up, one-down
- pre- and post-workshop surveys
- participatory live coding
- introductions

Wrapping up

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Wrapping up

How can we improve this workshop?

- One up, one down
- Minute cards
- Post-workshop survey

Thank you!

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Feedback

- Checkout requirements: https://carpentries.github.io/instructor-training/checkout/index.html
- Centrally and self-organised workshops: https://carpentries.org/workshops/#workshop-core
- Ways to connect with the carpentries community: https://carpentries.org/connect/ and https://carpentries.topicbox.com/groups
- Carpentries handbook (contains everything you may need to know and more): https://docs.carpentries.org/