



Universität  
Zürich <sup>UZH</sup>



## Designing Aha-Moments: Human-powered techniques for faculty development

Dr. Sara Petchey

- *Institute of Education*

- *Faculty of Science Teaching Hub*

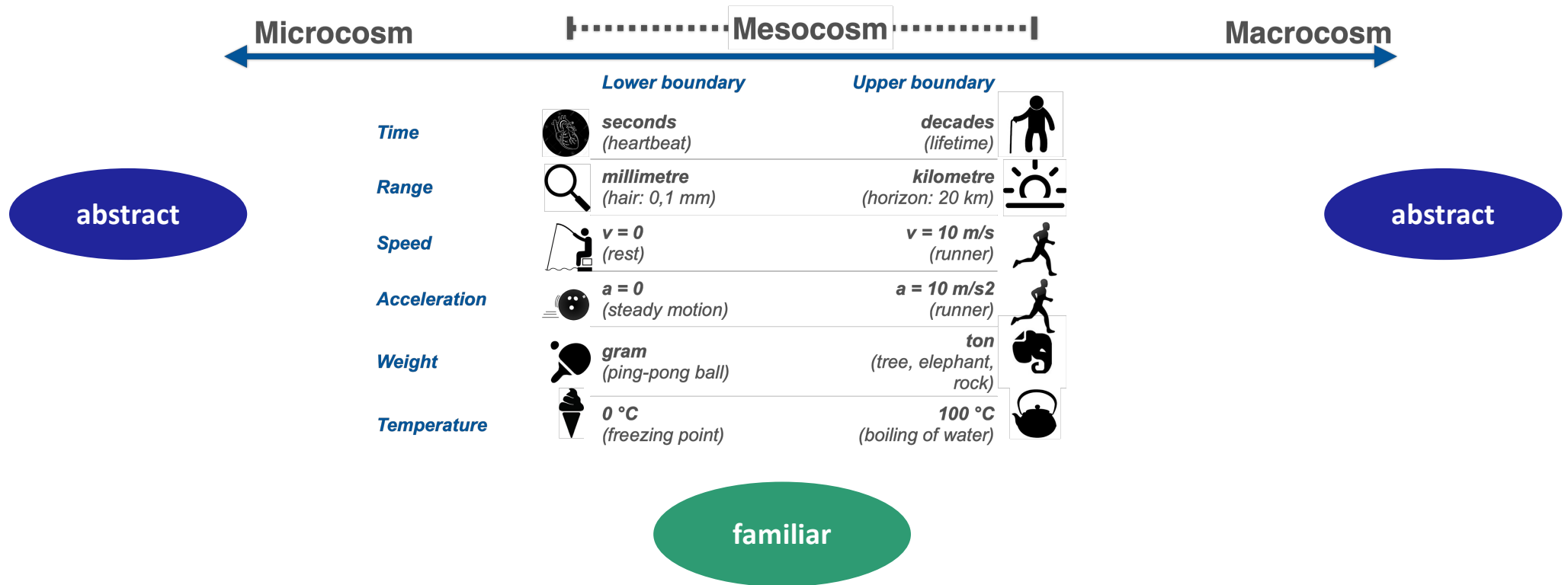
# Share-a-thon

**What helps your instructors integrate new elements into their teaching, learning, assessment practices?**

# Embodied cognition

Q. What makes learning difficult for our (novice) students?

A. Much scientific content cannot be directly observed or experienced.



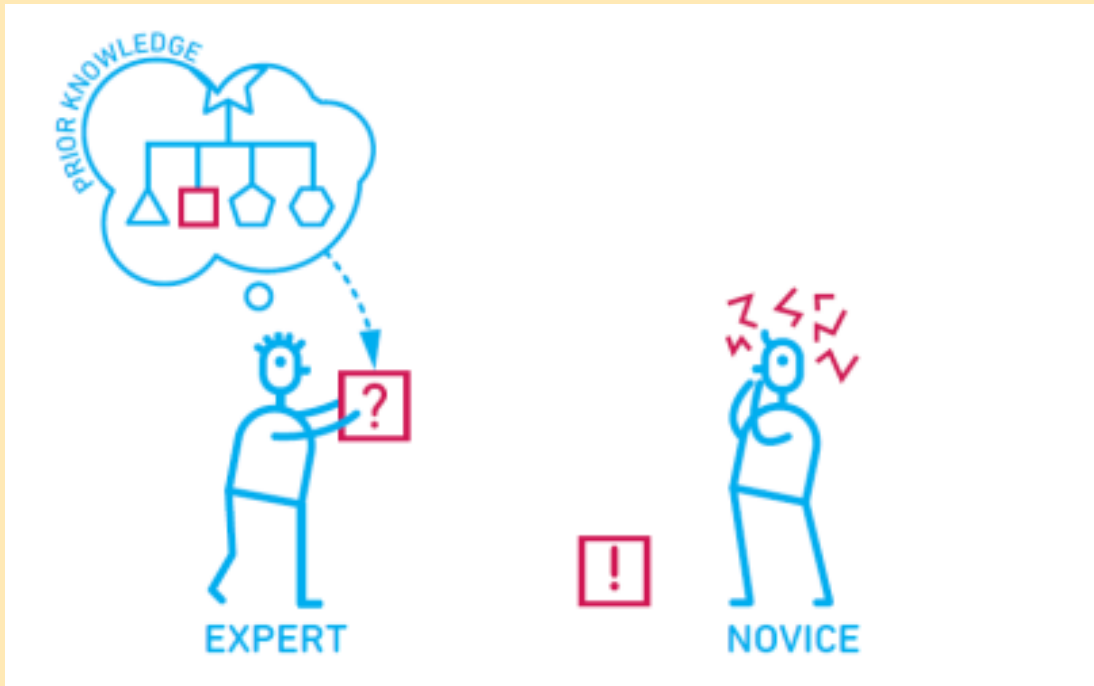
Niebert, K., & Gropengiesser, H. (2015). Understanding starts in the mesocosm <https://doi.org/10.1080/09500693.2015.1025310>

University of Zurich | sara.petchey@mnf.uzh.ch

## **Example 1: Feeling like a novice**

Put course participants in the shoes of their own students, letting them feel the confusion and cognitive overload that students often face when encountering new concepts taught by disciplinary experts.

## Our students are (relative) novices



### Without expert knowledge, direct experience, or adequate context, science can seem like “a crazy bunch of ideas”:

Airplanes are supported by the air.

Time slows down when you travel at the speed of light.

Air has mass.

Most of the atom is empty space.

Objects do not need a force (in the absence of friction) to keep going.

Most of the atoms that make up our bodies were created in stars a long time ago.

Most of the matter in a plant comes from the air.

Illustration by Oliver Caviglioli <https://furtheredagogy.wordpress.com/2016/07/16/experts-and-novices/> List of “crazy ideas” by Jonathan Osborne, 3 Sept 2024

## **But how does it FEEL to be a novice??**

Tune tapping

**But how does it FEEL to be a novice??**



## **IMPORTANT TASK!!**

The procedure is straightforward and simple. First you arrange items into different groups by characteristics. Of course, one pile may be sufficient depending on how much there is to do. Depending on the facilities, you may be able to take care of all groups simultaneously. It is important not to overdo things. That is, it is better to do too few things at once than too many.

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## **Example 2: Contrasting kinds of thinking**

An interactive challenge where participants complete two very similar tasks that nonetheless require different mental processes: one is smooth and almost automatic, the other surprisingly effortful and frustrating. Comparing the two experiences leads to an eye-opening discussion about fast and slow thinking, bias and intention.

**Read the following words**, ignoring the colors that you see:

<b>BLUE</b>	<b>ORANGE</b>	<b>YELLOW</b>	<b>RED</b>	<b>PURPLE</b>
<b>PINK</b>	<b>BLUE</b>	<b>BLACK</b>	<b>PURPLE</b>	<b>GREEN</b>
<b>ORANGE</b>	<b>BLACK</b>	<b>YELLOW</b>	<b>PINK</b>	<b>RED</b>
<b>BLUE</b>	<b>PINK</b>	<b>ORANGE</b>	<b>BLACK</b>	<b>BLUE</b>

Now **state the colors** that you see, ignoring the written words:

<b>YELLOW</b>	<b>RED</b>	<b>PINK</b>	<b>BLUE</b>	<b>GREEN</b>
<b>PURPLE</b>	<b>YELLOW</b>	<b>BLUE</b>	<b>BLACK</b>	<b>PINK</b>
<b>BLUE</b>	<b>RED</b>	<b>GREEN</b>	<b>ORANGE</b>	<b>PINK</b>
<b>BLACK</b>	<b>RED</b>	<b>YELLOW</b>	<b>PURPLE</b>	<b>BLUE</b>

# Thinking, Fast and Slow by Daniel Kahneman

System 1 thinking = fast, instinctive, and emotional

System 2 thinking = slower, more deliberative, and more logical

## STROOP Test

### Round 1

- Pure system 1
- Habitual readers - our brains can't help but read
- Easily ignored conflicting information

### Round 2

- Greater cognitive load- Systems 1 and 2 are in conflict
- Resolving information conflict required prevention of reading and slowed us down

## Unconscious Bias

### Bias

- System 1 product: fast, effortless associations shaped by experience, norms, media.
- Just as reading is automatic, many of our social judgments are automatic, constant, unconscious.

### Values, good intentions

- System 2 products: 'fairness', 'equity', 'treat all students the same'
- In many moments (grading, hiring, calling on students), System 1 may respond before System 2 has a chance. Structures and systems can help.

# The floor is yours

What strategies, activities, and tools do you use to create “aha moments” ?

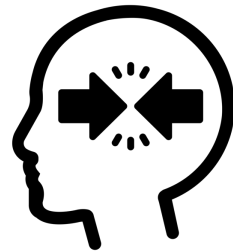
Where/when/with whom do these techniques work best?

# More examples: Conceptual change teaching

intuitive thinking  
everyday life experiences  
movies and TV shows  
simplified science instruction



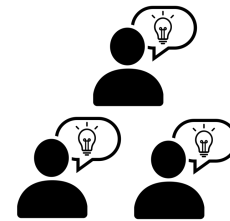
Identify students' everyday conceptions



Lead students into cognitive conflict  
CREATE DISSATISFACTION -  
core of all inquiry-based learning



Present scientific conception



Students consider new concept  
– Greater intelligibility?  
– Plausibility?  
– Explanatory power?  
– Fruitfulness?



## Example: Predict – Observe - Explain



### **Bernoulli's Principle:**

*As the speed of a fluid (or air) increases, the pressure within that fluid decreases.*

## Key take aways?

### 1: Facilitating an ah-ha moment is a key element of human academic development

- Evoke emotion, surprise, and insight
- Use experience-based learning to facilitate lasting change

### 2: Share-a-thons are great

**Thank you!**

[Sara.petchey@mnf.uzh.ch](mailto:Sara.petchey@mnf.uzh.ch)



