



Presenting and Lecturing in Engineering

Day 2

Siara Isaac, Ph.D
Joelyn de Lima Ph.D.

Teaching Support Centre
cape.epfl.ch
March 2022

1



Welcome to Day 2!

- Pick a couple of slides that strike you.
- Pair up with someone who has a different slide
- Talk to each other about that slide.



2

EPFL



Active Learning: Why and How

Joelyn de Lima Ph.D.
(some slides courtesy Siara Isaac)
Teaching Support Centre
cape.epfl.ch

4th March 2022

3

EPFL



Learning Objectives

At the end of this presentation, you should be able to:

- Explain the **affordances of active learning**.
- Compare various strategies to **increase active learning** in your classroom
- Facilitate **interactivity using questions**.

■ ACTIVE LEARNING: WHY AND HOW

4

EPFL



Jigsaw: Freeman et al. 2014 PNAS article

- You will start in groups with other people who have the **same alphabet** as you.
- Read the article and answer the questions assigned to your group.
 - A : intro
 - B: results
 - C + D: discussion

■ ACTIVE LEARNING: Why and How

5

EPFL



Jigsaw: Freeman et al. 2014 PNAS article

- Now form groups with people who have the **same colour** as you.
- Share your answers from your first discussion groups.
- How should university teachers respond to this study?

■ ACTIVE LEARNING: Why and How

6

EPFL



Summarise



- What did you learn from this discussion?
- List one action that you will take based on what you learnt.

■ ACTIVE LEARNING: WHY AND HOW

7

EPFL



Active Learning

Students are engaged in the learning process.

Many strategies:

- Think-pair-share
- Jigsaw
- Discussions
- Brainstorming

■ ACTIVE LEARNING: WHY AND HOW

8

Active Learning: Some considerations

- Inclusivity:
 - Students with speech impediments
 - Second language
 - Social anxiety

Active Learning: The pause

- After every chunk of instruction – break for 2 mins.
- Allow students to summarise, make notes.
- Promote encoding

EPFL



Active Learning: Quescussion

A question-based discussion:

- All interventions must be questions.
- Only one question at a time.

■ ACTIVE LEARNING: WHY AND HOW

Prof. Paul Bidwell, University of Saskatchewan, Canada

11

EPFL



Active Learning: Quescussion



What if there were eight colours in the rainbow?

■ ACTIVE LEARNING: WHY AND HOW

12

EPFL

Active Learning: Quescussion

- Choose 2 – 3 question.
- Respond to misconceptions.

■ ACTIVE LEARNING: WHY AND HOW

Prof. Paul Bidwell, University of Saskatchewan, Canada

13

EPFL

Active Learning: Asking questions

- Who asks?
- Who answers?
- What type of question?

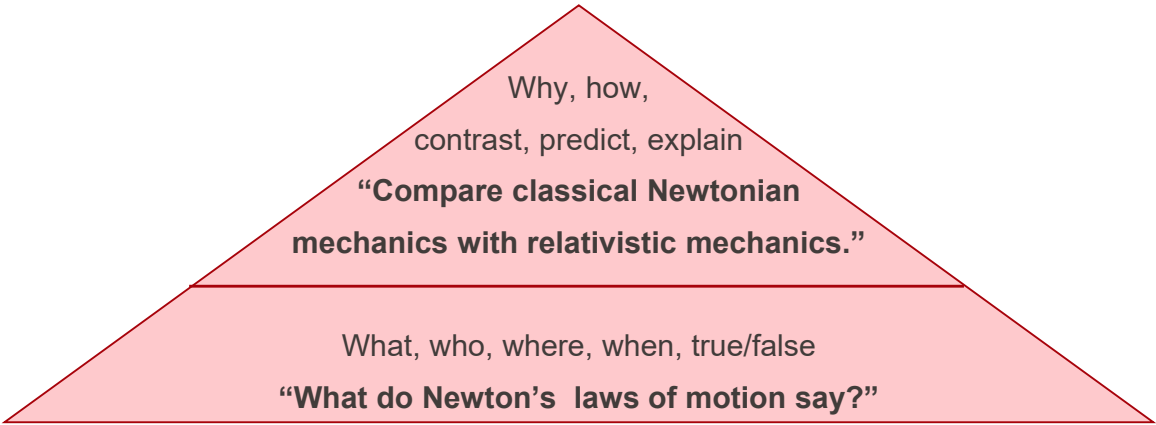
■ ACTIVE LEARNING: WHY AND HOW

14

A Hierarchy of Questions

- Just like the hierarchy of learning objectives.

■ ACTIVE LEARNING: WHY AND HOW



Active Learning: Minute paper

- At the end of class, students write their responses to a specific question.

■ ACTIVE LEARNING: WHY AND HOW

EPFL



Active Learning: Minute paper



- Use your learning objective for today's mini lesson
- Construct one precise question to test that learning objective.

ACTIVE LEARNING: WHY AND HOW



17

EPFL



Methodology for interactive strategies

- Prepare questions appropriate for the learning objective and the teaching strategy
- Foster a climate that encourages participation
- Ask ONE clear, concise question at a time
- Wait

ACTIVE LEARNING: WHY AND HOW

18

EPFL

Why wait?



■ ACTIVE LEARNING: Why AND How

19

EPFL

Still waiting?

- Rephrase your question.
- Do they have all the information?
- Think-pair-share
- Is the classroom environment conducive to their participation?

■ ACTIVE LEARNING: Why AND How

20

Encouraging responses

- Be positive
- Be specific, reiterate
- Build on the response



Encouraging responses

- Be positive
- Be specific, reiterate
- Build on the response
- Ask probing questions:
 - “How did you arrive at that answer?”
 - Clarify: “Could you rephrase that statement?”
 - Increase awareness: “What are you assuming?”
- Invite others to comment on the response.
- Extract important points and clear up confusion.

EPFL



Active Learning: Buzz groups



- Break into 4 teams
- By team, respond to the following question
- On the right side of the room:
How to encourage « timid » students to participate more?
- Left side:
How to contain a student who always has a response?

■ ACTIVE LEARNING: WHY AND HOW

23

EPFL



Active Learning: Rally Robin

- One question at a time
- Each group takes turns to give a suggestion

■ ACTIVE LEARNING: WHY AND HOW

24



Student participation is not a spontaneous phenomena...

- **Structure participation!**
- Explicitly share your expectations
- Formulate learning objectives
- Chose an appropriate strategy
- Prepare clear instructions (time, etc.)
- Consider how to provide feedback

■ ACTIVE LEARNING: Why and How

25



How and when to explain

Siara Isaac Ph.D.

Teaching Support Centre
cape.epfl.ch

March 2022

26

Notes on explaining



“Explaining is often what we think of as the primary activity of teaching. Given its visibility, explaining is often overused and frequently overvalued”

- *good teaching is not good telling*

Ask yourself

- would a question that gets students thinking for themselves be more effective?
- am I making assumptions that this student needs the additional *help* of an explanation rather using a question to guide them to figuring it out themselves?

four key elements to keep in mind when preparing an explanation

- Starting where your audience is
- Keeping it short
- Modeling ALL your thinking
- Using the LOAFS structure

Extract from Chapter 6

- Case study 6.1.C



Classroom Management: Why and How

Siara Isaac Ph.D.

Teaching Support Centre
cape.epfl.ch
4th March 2022

31



Learning to manage your relationship with a class is important for STEM teaching

- relationships with empathy and warmth showed a moderate to strong correlation with achievement in mathematics ($r=.36$; Cornelius-White 2007).
- moderate impacts on cognitive learning ($r=.17$; Wit et al. 2004)
- affect student attendance and absenteeism (Rocca, 2004)
- classroom incivilities (Boice, 1996)



2/9/2024

32

32

EPFL

Class management is a skill that develops and improves over time

Novice teachers who had followed a training programme felt more confident in their ability to develop a positive class environment when compared to those who relied only on their own experiences (Darling-Hammond, 2002).

Lack of confidence leads novice teachers to correct rather than to prevent incivilities (Reupert, 2010)



Alan Hertzog

Linda Darling-Hammond's study in nearly 3000 pre-service New York State teachers: Darling-Hammond, L., Chung, R., and Frelow, F. (2002). Variation in Teacher Preparation: How Well do Different Pathways prepare Teachers to Teach?, *Journal of Teacher Education* 53(4): 286-302

Reupert, A., and Woodcock, S. (2010). Success and near Misses: Pre-Service Teachers' Use, Confidence and Success in Various Classroom Management Strategies. *Teaching and Teacher Education* 26(6): 1261-68

33

33

EPFL

All teachers experience some form of incivility, but new faculty and underrepresented teachers are more likely to experience hostile behavior.

When observing classes for new faculty, class incivilities “emerged as a major factor, frequently dominating classes, often **making** or **breaking novice** teachers” (Boice, 1996, 454). ”

When surveying 397 Geography instructors, results showed that **hostile** behaviors were rare but significantly directed towards women, ethnic minorities and foreign instructors (Alberts, et al, 2010).

Bob Boice's landmark study: Classroom incivilities (1996). *Research in Higher Education* 37(4): 453-486.

Heike C. Alberts , Helen D. Hazen & Rebecca B. Theobald (2010) Classroom Incivilities: The Challenge of Interactions between College Students and Instructors in the US, *Journal of Geography in Higher Education*, 34:3, 439-462.

34

34

Teachers lead the change

Until a **teacher** becomes **aware** of a disruptive behaviour in the class, one that students may have already seen we find “*evidence of understanding ... translated into reliably **changed** practices in classrooms*” (Boice, 1996, 465).

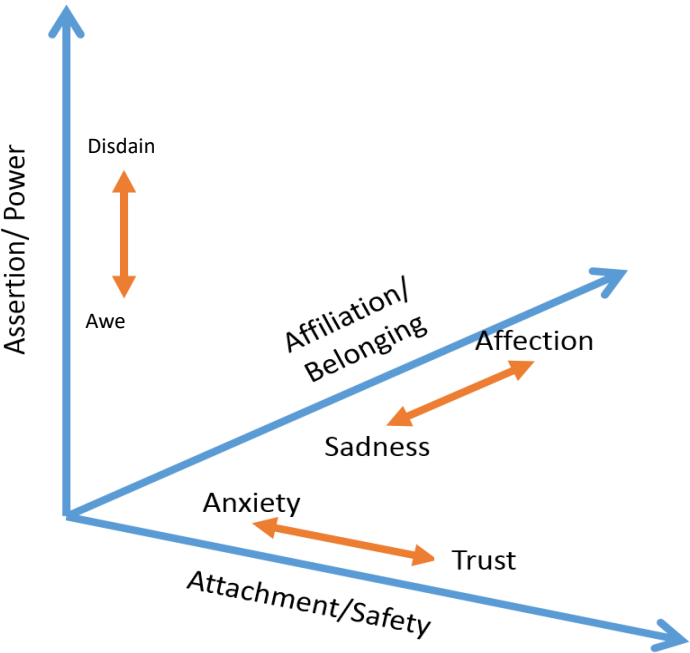
Students see themselves as being on the **same side** as the teacher, but at the same time they **expect** the teacher to manage the situation.



Tormey, R., Isaac, S., Hardebolle, C., & Le Duc, I. (in press). Chapter 7: Managing relations with a class in Facilitating Experiential Learning in Higher Education: Teaching and Supervising in Labs, Fieldwork, Studios and Projects. Routledge.

Bob Boice's landmark study: Classroom incivilities (1996). *Research in Higher Education* 37(4): 453-486.

Warmth
Authority
Safety



Tormey, R. (2021). Rethinking Student-Teacher Relationships in Higher Education: A Multidimensional Approach. *Higher Education*. <https://doi.org/10.1007/s10734-021-0711-w>

Table X.1 activity from « THEORIZING THE EMOTIONAL QUALITY OF TEACHING AND LEARNING RELATIONSHIPS IN STEM FACULTY DEVELOPMENT » TORMEY, LE DUC & ISAAC (2022)

■ ACTIVE LEARNING: WHY AND HOW

- **Affiliation** is characterized by emotions like affection, **warmth**, liking, belonging, or love and provides a foundation for social living. This is increasing important given the importance of cooperation for active and interactive learning in STEM higher education (Johnson et al., 2014; Menekse, 2013; Freeman et al., 2014; Prince 2004).
- **Attachment** reflects feelings of **security** and safety. A large body of evidence shows that feelings of fear or anxiety hinder student learning in STEM. This is distinct from affiliation: ie. a teacher who communicates that they like students can appear warm (high *affiliation*) but as unreliable (low *attachment*).
- **Assertion** arises from a sociological literature on power and **status** in relationships (situations where power differentials are taken for granted). While there are occasions when teachers and students feel anger or contempt; a sense of awe, or more modestly being *impressed*, to a teacher’s desirable cultural capital.



Photo by Artem Maltsev on Unsplash

Teaching without telling JdL0

Asking questions

Tormey & Isaac. (2022). *Facilitating Experiential Learning in Higher Education Teaching and Supervising in Labs, Fieldwork, Studios and Projects*. Routledge. <https://doi.org/10.4324/9781003107606>

JdL0 @Siara - you wanted to replace these with the duck activity
Joelyn de Lima, 2024-02-06T20:15:54.878

What questions do your students ask?

When a student asks you a question, it shows some cognitive effort

But can also result in you doing the next cognitive steps --> never work harder than your students

39

39

There will (hopefully) be (a lot of) questions



Context: You expect students to actively engage with your class – and to ask a lot of questions!

This can generate anxiety and frustration.

Goal: **Create a climate that encourages students** to feel it is ok to ask questions, while at the same time not immediately answering the question for them.

Micro-skill: **Welcome the question (do not answer - yet).**

Task: **Welcome the question (about ducks). Don't answer it!**

40

EPFL

Understand where the question comes from

Context: *The Curse of Knowledge...* Experts (you) often don't remember what novices (them) don't understand.

Goal: Get the student to think, understand their question better, give yourself time to figure out a response.

Micro-skill: Ask for more information.

Task: Welcome the question (about ducks). Don't answer it!

Respond with a question that gets the student to articulate what they do and don't understand.

■

41

41

EPFL

Let the students take the cognitive load

Context: We learn best when cognitively engaged.

Goal: Get the students to learn better by having **them do the thinking** (instead of you telling them).

Micro-skill: Ask a question/give a thinking task.

Task: Welcome the question (about ducks). Don't answer it!

Respond with a question that gets the student to articulate what they do and don't understand.

Ask a question/give a thinking task.

■

42

EPFL

When responding to student questions:

- The **response is welcoming** (i.e. it encourages the student to keep asking questions)
- There is a **genuine, open-ended question** for the student (not rhetorical)
- The question points the student in the right direction while still **requiring them to think for themselves**
- The question(s) **help(s) the student with more than just this question** (i.e. developing process/skills for future tasks)

▪

43

EPFL

Let's practice it together!



- Does energy always have units of kJ?

▪

44

Let's practice it together!



- Does energy always have units of kJ?

The response is welcoming (i.e. it encourages the student to keep asking questions)
There is a genuine, open-ended question for the student (not rhetorical)
The question points the student in the right direction while still requiring them to think for themselves
The question(s) help(s) the student with more than just this question (i.e. developing process/skills for future tasks)

▪

Let's practice it together!



- Can you please explain AGAIN how some wavelengths go through walls and some can't?

▪

EPFL

Let's practice it together!



- Can you please explain AGAIN how some wavelengths go through walls and some can't?

The **response is welcoming** (i.e. it encourages the student to keep asking questions)

There is a **genuine, open-ended question** for the student (not rhetorical)

The question points the student in the right direction while still **requiring them to think for themselves**

The question(s) **help(s) the student with more than just this question** (i.e. developing process/skills for future tasks)

■

47

EPFL

Let's practice some more!



- Stand up!
- Role-play:
 - Person 1 (student): ask a question about your project
 - Person 2 (teacher): reply with a question
 - Person 1 (student): how did the teacher do?
 - Switch
- Turn to someone else and repeat

■

48

Let's practice some more!



- Stand up!
- Role-play:
 - Person 1 (student): ask a question about your project
 - Person 2 (teacher): reply with a question
 - Person 1 (student): how did the teacher do?
 - Switch
- Turn to someone else and repeat

▪	The response is welcoming (i.e. it encourages the student to keep asking questions)
	There is a genuine, open-ended question for the student (not rhetorical)
	The question points the student in the right direction while still requiring them to think for themselves
	The question(s) help(s) the student with more than just this question (i.e. developing process/skills for future tasks)

Homework

1. Daily reflection -> submit it before you go home
2. Preparation Assignment on Moodle
3. Prepare your mini lesson for Day 3
 - Choose a cutting edge procedure or experimental technique that will pose a cognitive challenge for your audience. Focus on modeling disciplinary thinking
 - Use the Day 3 lesson planning matrix
 - 10 minutes
 - Include active learning

