GRE@T-PIONEƎR

Teaching advanced courses in a sustainable manner – example from the GRE@T-PIONEeR project

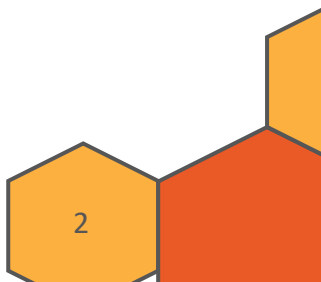20 November 2025

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CHALMERS

Strål
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myndigheten
Swedish Radiation Safety Authority

BACKGROUND

BACKGROUND

- **Advanced courses**
  - Attracting only **few** students **locally**
  - **Not sustainable** to regularly offer such courses regularly

➢How to offer such courses on the long run in a sustainable manner?

- Need to achieve a **critical mass**
  - **Sharing** of **students**
  - **Sharing** of **teachers**

BACKGROUND

- **Advanced courses** = often offered as intensive <u>onsite</u> "workshops" or "summer courses"

  ➢ Onsite attendance resulting in a limited number of attendees

  ➢ Too condensed format to lead to "efficient" learning

  ➢ Issuance of certificates of attendance (with no real measure of engagement, progress and understanding)

- **<u>Online</u> and <u>hybrid</u> learning environments** = more accessibility and flexibility

  ➢ Often low engagement and high drop-out rates

BACKGROUND

- "Innovative" learning design proposed in the GRE@T-PIONEeR Alliance, having for objectives:
  - To offer **advanced** courses
  - In a **flexible** manner
  - Having a **high engagement** of the participants in the activities
  - Making sure that the **participants successfully learn** the concepts/principles/methods
  - Having a **worldwide coverage**

  while having a **sustainable approach** to the delivery of the courses
- **Target groups**: MSc/PhD/Post-Doc students, professionals

WHAT IS GRE@T-PIONEeR?
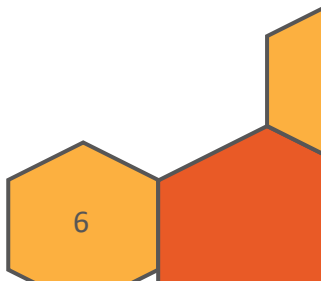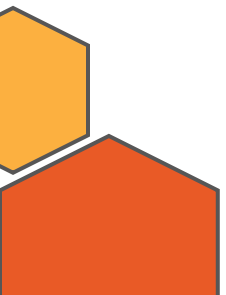
WHAT IS GRE@T-PIONEeR?

- **18** university teachers from **8** different universities in **6** different countries

- Main **goals** of the project:
  - Maintain or further develop **competences** in **computational and experimental nuclear reactor physics and safety**
  - Deliver **top-class courses** using **state-of-the-art pedagogical methods** (active learning through flipping)
  - Create a **community** of **reactor physicists**

- **8 courses** currently offered

- More info at: https://great-pioneer.eu

PEDAGOGICAL DESIGN

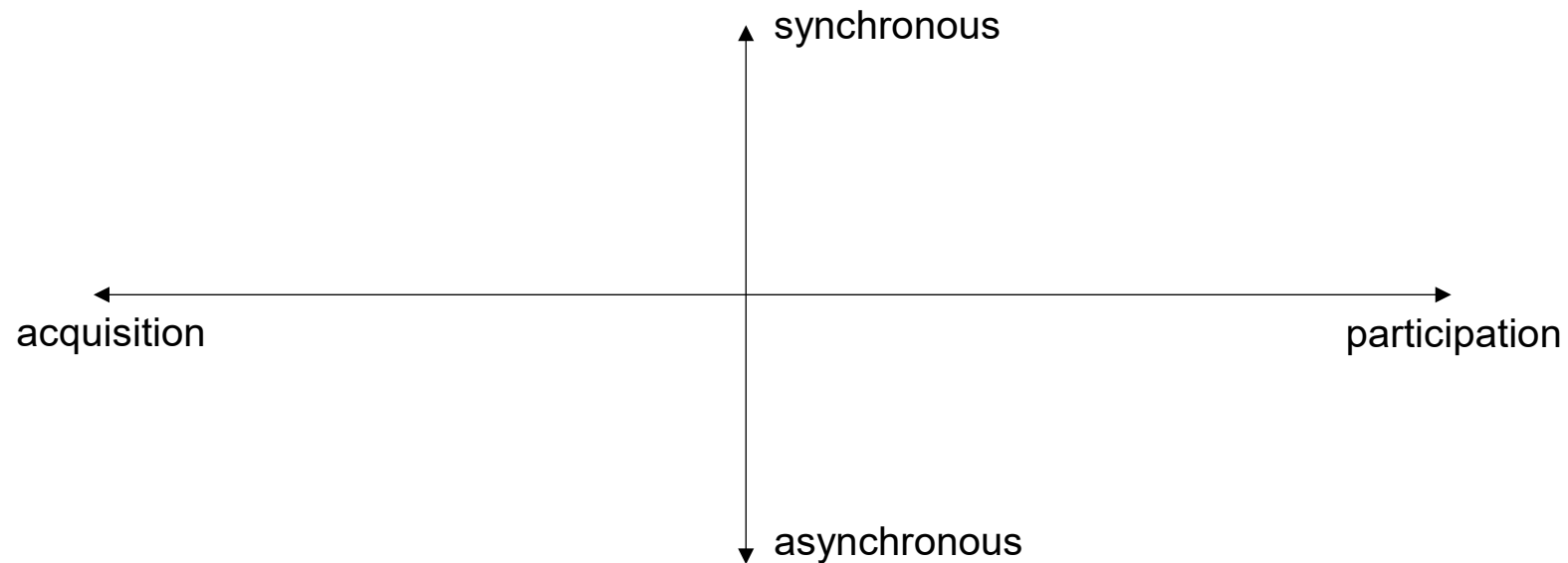# PEDAGOGICAL DESIGN

- Flipping:

acquisition ⟷ participation
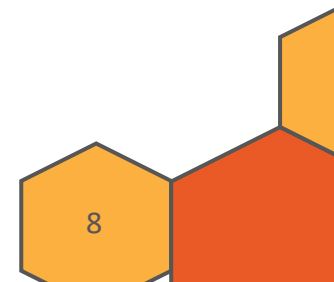
Sfard, A. (1998). On two metaphors for learning and the dangers of choosing just one. Educational researcher, 27(2), 4-13.
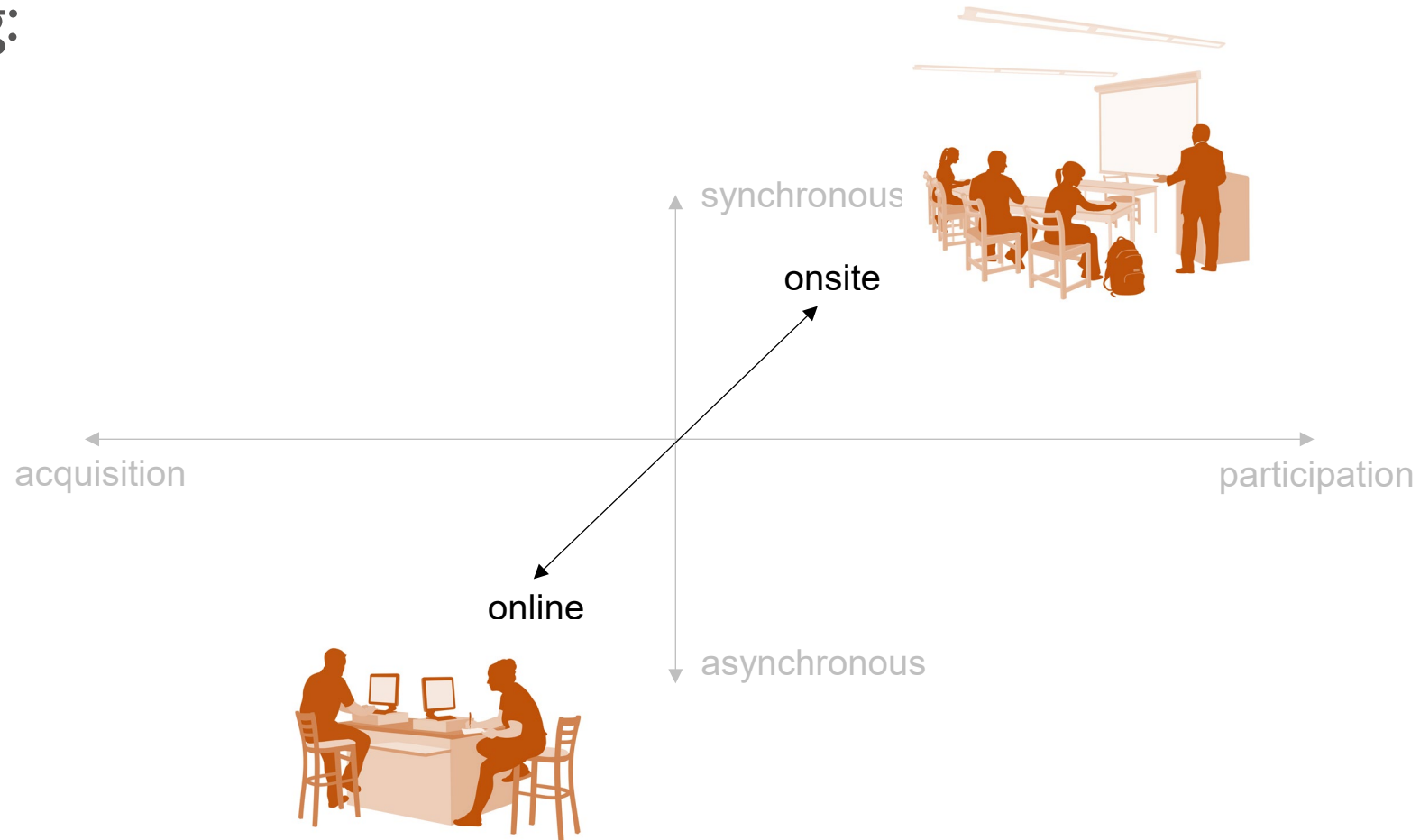
PEDAGOGICAL DESIGN

- Flipping:

synchronous

acquisition ←――――――――――――――→ participation

asynchronous

Hrastinski, S. (2008). Asynchronous and synchronous e-learning. Educause Quarterly, 31(4), 51-55.

PEDAGOGICAL DESIGN

- Flipping:

synchronous

onsite

acquisition   participation

online

asynchronous

PEDAGOGICAL DESIGN

- Flipping:

Short summarizing lectures

synchronous

Q&A

Hands-on training

acquisition

participation

Textbooks

Pre-recorded short lectures

QUiZ

Discussion forum

asynchronous

Hrastinski, S. (2008). Asynchronous and synchronous e-learning. Educause Quarterly, 31(4), 51-55.

PEDAGOGICAL DESIGN

- Flipping:

Active learning
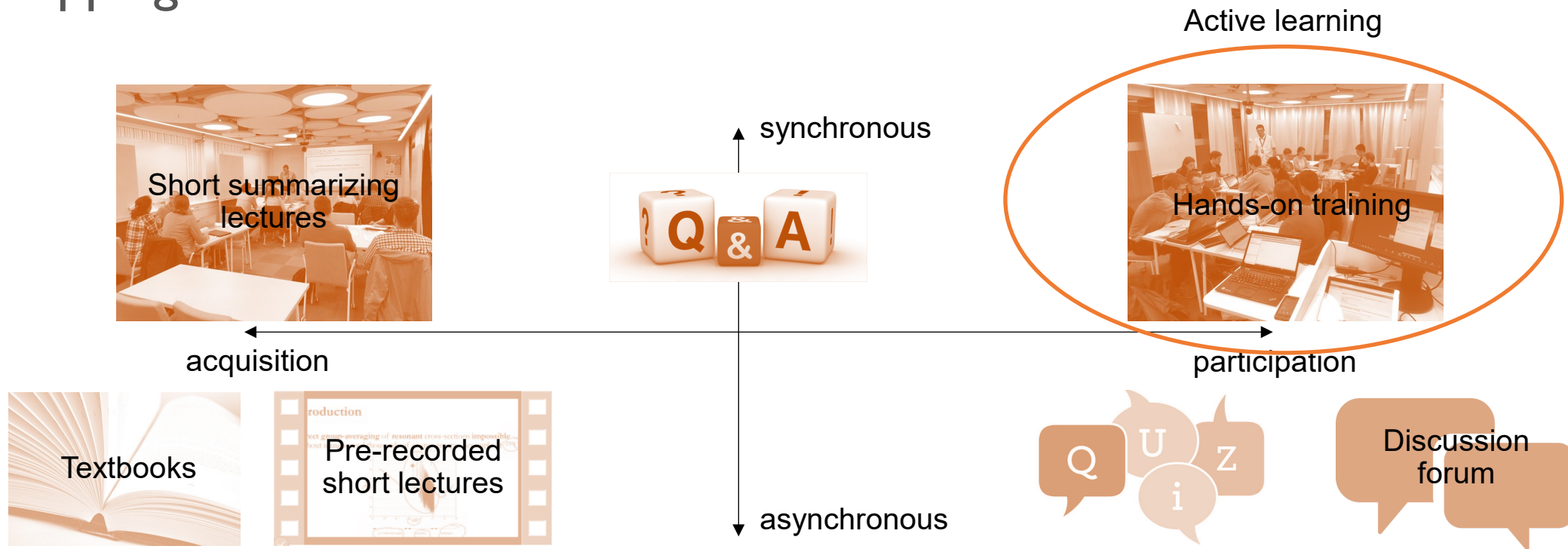
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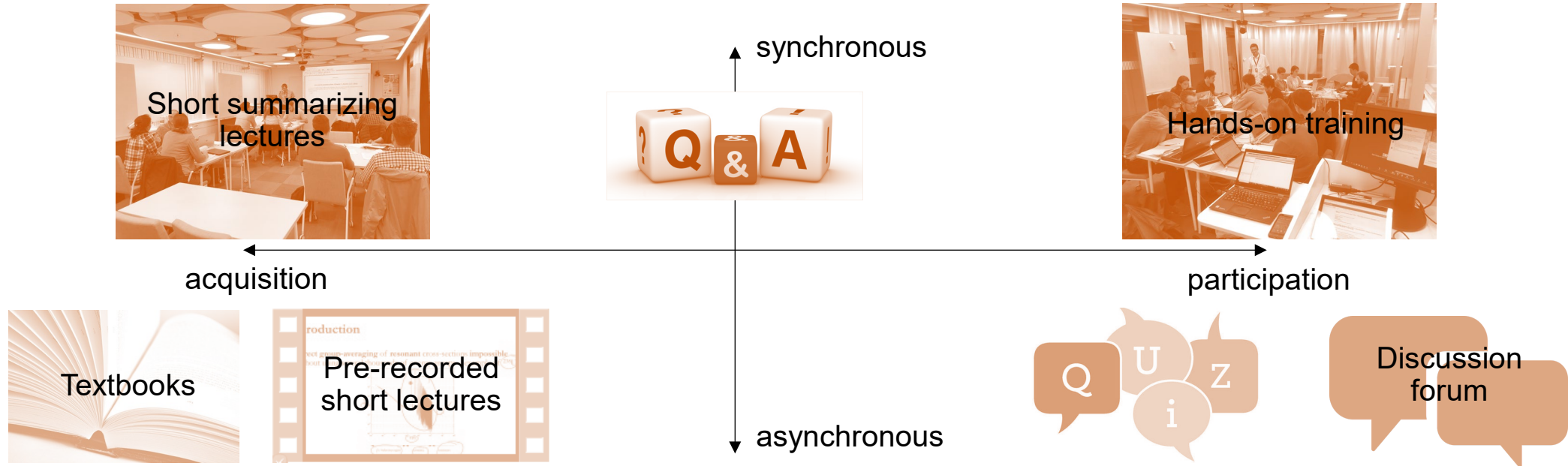
asynchronous
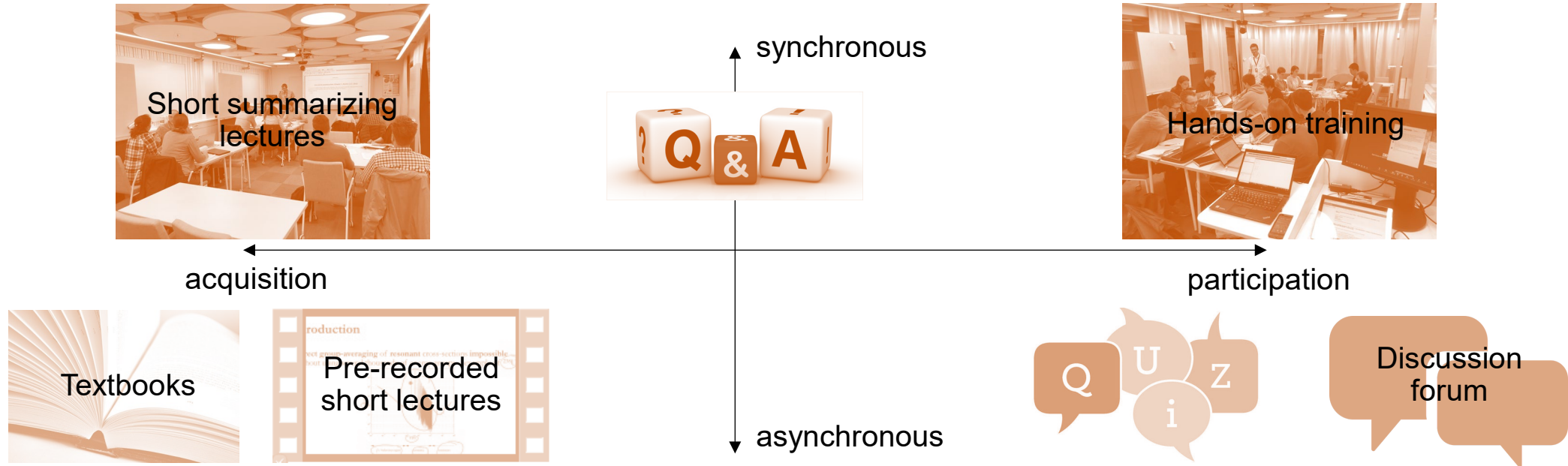
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PEDAGOGICAL DESIGN

Synchronous <u>hybrid</u> learning phase concentrated on **5 consecutive days/course**

synchronous

Short summarizing lectures

Q&A

Hands-on training

acquisition

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QUIZ

Discussion forum

asynchronous

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Asynchronous <u>online</u> learning phase spread on **4 weeks/course** (self-paced learning)

PEDAGOGICAL DESIGN

- **Delivery** of **all teaching resources** (asynchronous and synchronous) via a **Learning Management System** (LMS):
  - **Compulsory learning sequence** to be followed (parts of the resources are locked until selected activities are completed)
  - Students can see their **progress** (completion) and **grades** (performance) at all times
  - **Access** to **synchronous elements** only possible if **sufficient asynchronous work completed** (50% of the preparatory work)
  - **Course certificate only delivered** if the participants get at least **50 points** (out of 100)
- **Same learning environment** offered to both **onsite** and **online** participants

PEDAGOGICAL DESIGN

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ANALYSIS OF THE TWO FIRST EDITIONS

ANALYSIS OF THE TWO FIRST EDITIONS

- **Research questions** addressed:
  - How did the participants **use** the various teaching resources?
  - What did the participants **learn** in relation to the theoretical concepts?
  - To what extend were the participants **able to apply** those concepts and **critically reflect** on those?
  - How did the participants **perceive** the course?

➢ **Meta-analysis** of all courses offered during the academic years 2022/2023 and 2023/2024
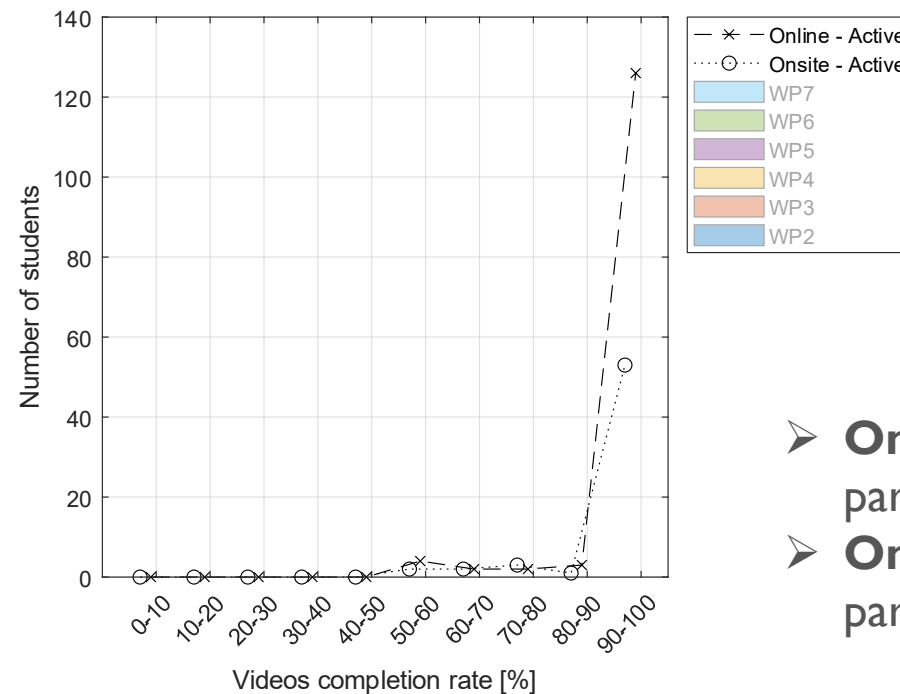
ANALYSIS OF THE TWO FIRST EDITIONS

- Student statistics for academic years 2022/2023 and 2023/2024:
  - **851 applicants**
  - 143 rejected applications (upper limit for each course set to 50 participants)
  - ➢**708 accepted applications** (228 onsite and 480 online)
  - ➢**716** persons granted access to the LMS (late registrations)
  - **504 participants qualified for the synchronous sessions** (with 159 onsite and 345 online)
  - **411 participants received a course certificate** (159 onsite and 252 online)

IN-DEPTH ANALYSIS OF THE FIRST EDITION
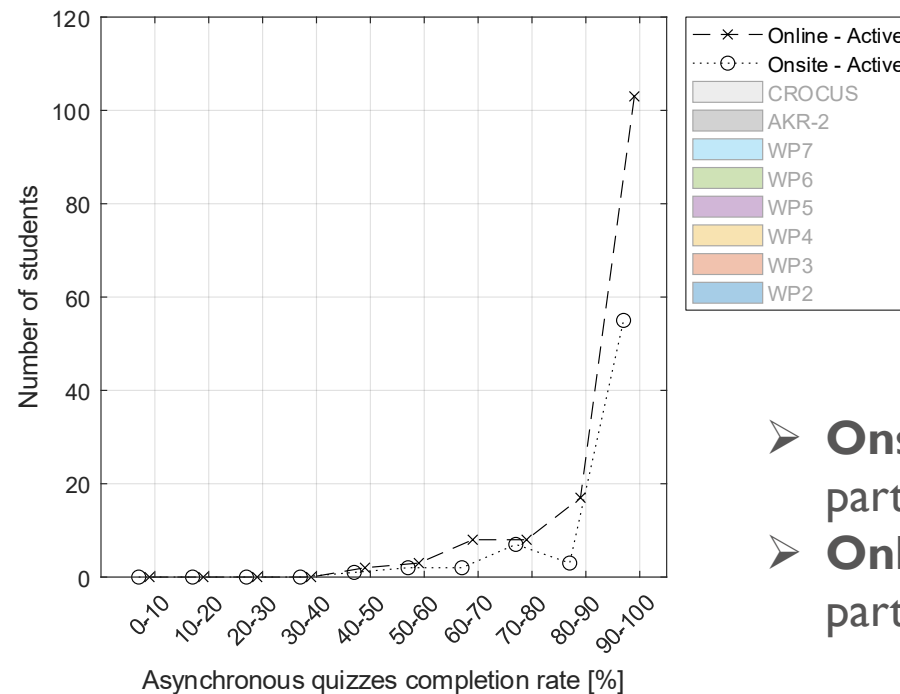
IN-DEPTH ANALYSIS OF THE FIRST EDITION

- **Use** of the various teaching resources – **asynchronous videos**:

> **Onsite – active**: came for onsite participation
> **Online – active**: accepted for online participation, and did "show up"
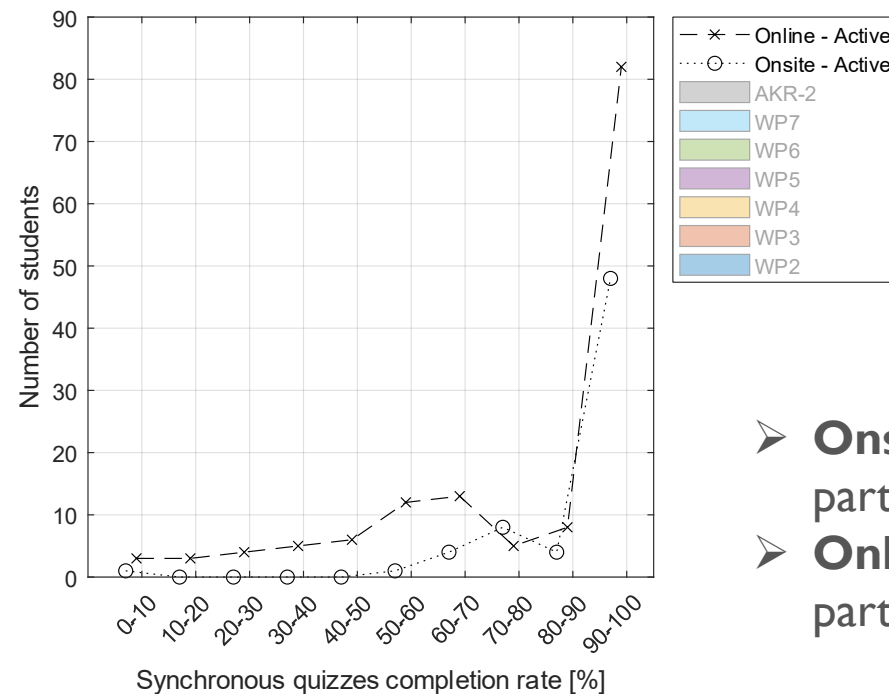
IN-DEPTH ANALYSIS OF THE FIRST EDITION

- **Use** of the various teaching resources – **asynchronous quizzes**:
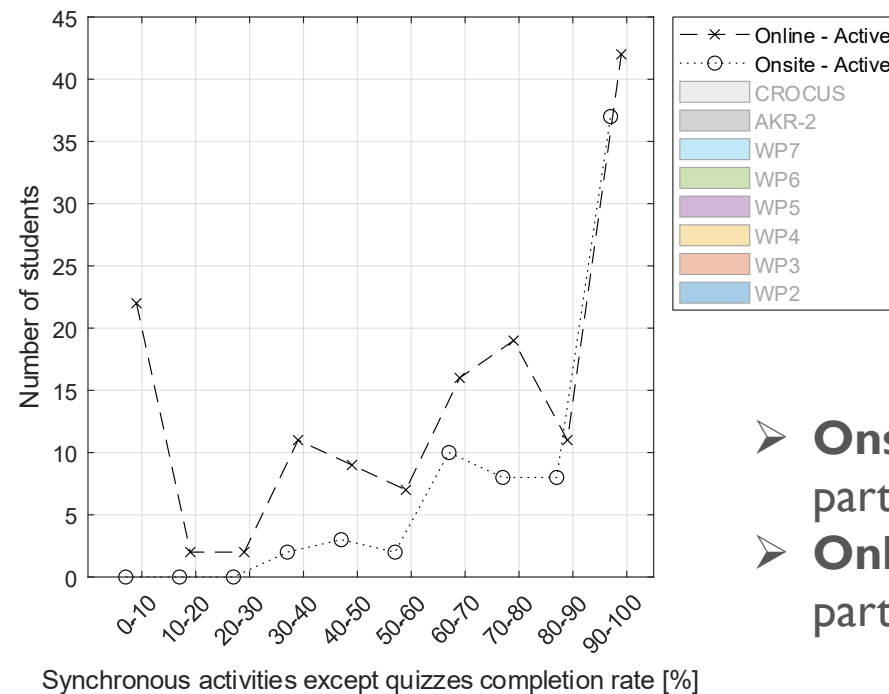

- ➢ **Onsite – active**: came for onsite participation
- ➢ **Online – active**: accepted for online participation, and did "show up"

IN-DEPTH ANALYSIS OF THE FIRST EDITION

- **Use** of the various teaching resources – **synchronous quizzes**:

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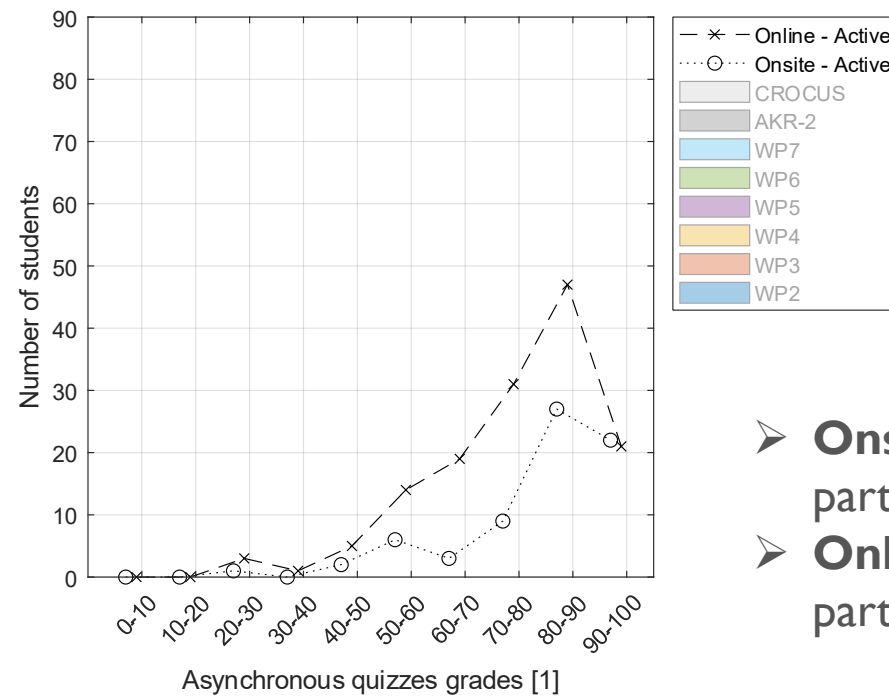
IN-DEPTH ANALYSIS OF THE FIRST EDITION

- **Use** of the various teaching resources – **synchronous activities other than quizzes**:

Synchronous activities except quizzes completion rate [%]

- ➤ **Onsite – active**: came for onsite participation
- ➤ **Online – active**: accepted for online participation, and did "show up"
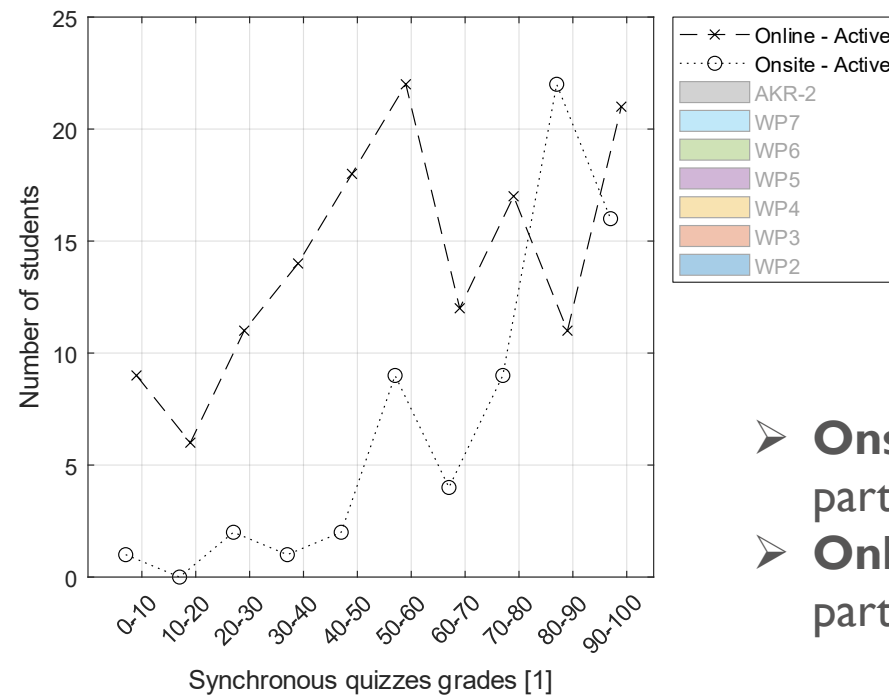
IN-DEPTH ANALYSIS OF THE FIRST EDITION

- **Learning** of the theoretical concepts – **asynchronous quizzes**:

> **Onsite – active**: came for onsite participation
> **Online – active**: accepted for online participation, and did "show up"
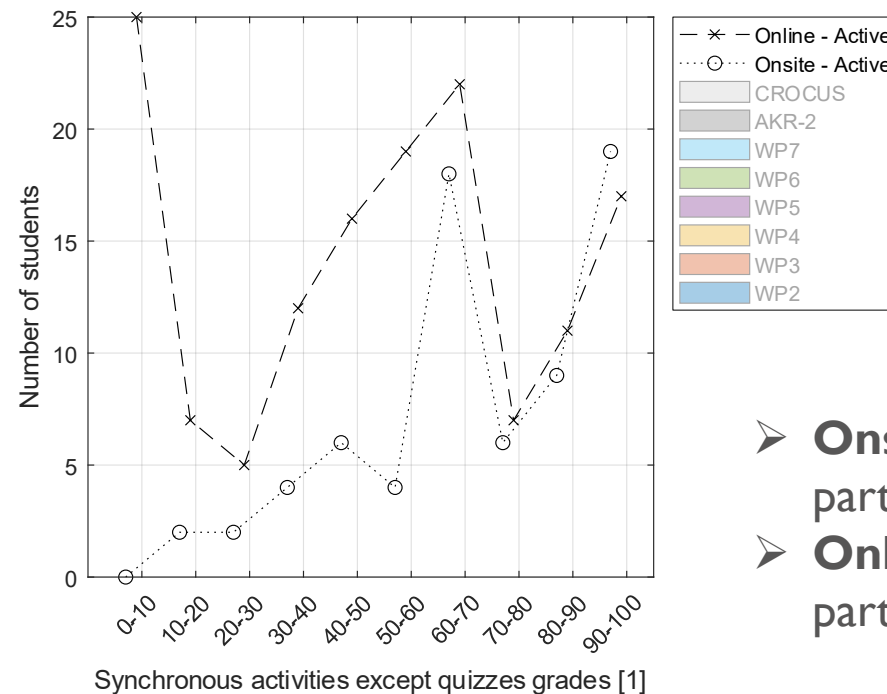
IN-DEPTH ANALYSIS OF THE FIRST EDITION

- **Learning** of the theoretical concepts – **synchronous quizzes**:

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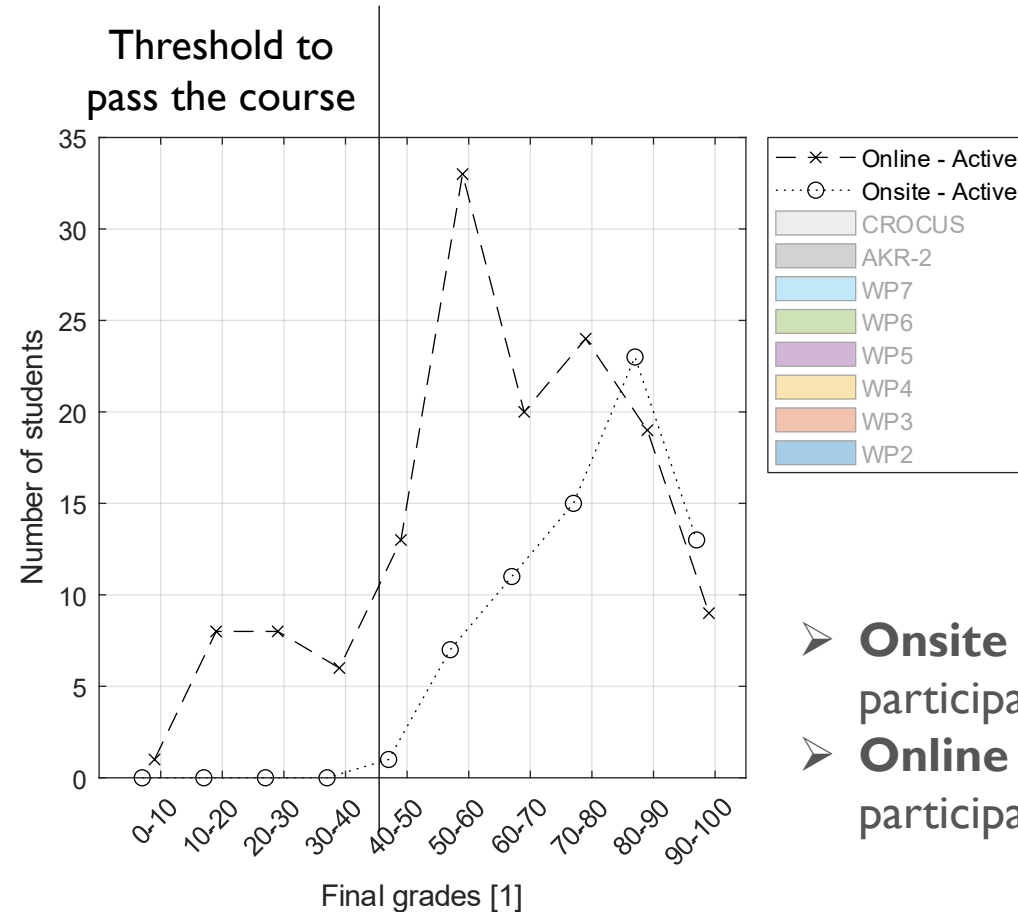
IN-DEPTH ANALYSIS OF THE FIRST EDITION

- **Ability to apply** the concepts in practical situations – **synchronous activities other than quizzes**:

Synchronous activities except quizzes grades [1]

- ➢ **Onsite – active**: came for onsite participation
- ➢ **Online – active**: accepted for online participation, and did "show up"

IN-DEPTH ANALYSIS OF THE FIRST EDITION

- **Final grades**:

> **Onsite – active**: came for onsite participation
> **Online – active**: accepted for online participation, and did "show up"

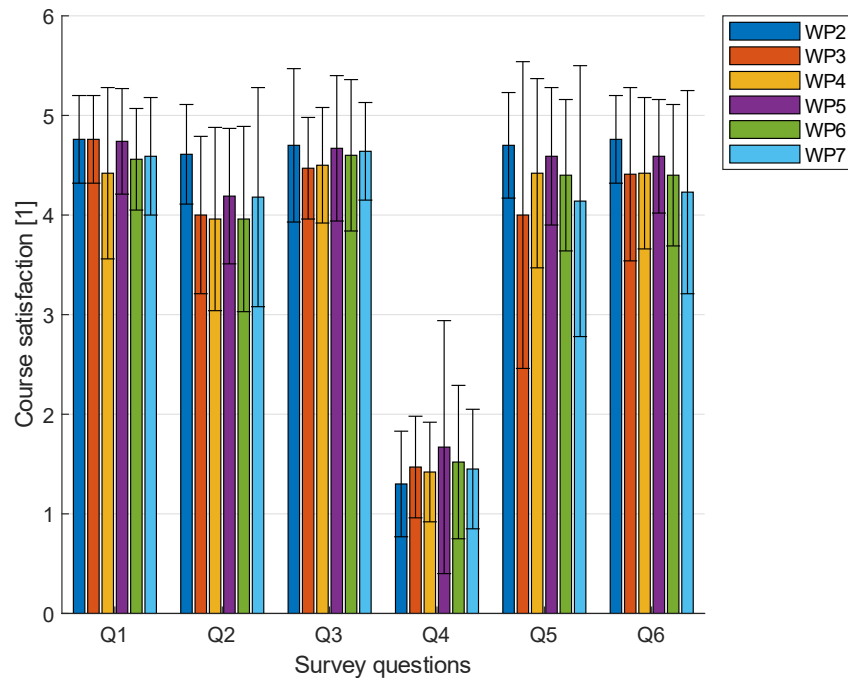# IN-DEPTH ANALYSIS OF THE FIRST EDITION

- **Participants' own perception** of the course:

Q1: I benefited from this course.
Q2: This course met my expectations.
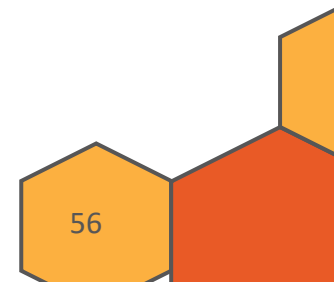Q3: I experienced and learned new things in this course.
Q4: The content covered in this course was NOT interesting.
Q5: I would like to take more courses like this one.
Q6: I would recommend this course to others.

CONCLUSIONS

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- **Very good outcomes** in terms of **participation, engagement** and **completion**

- **Teachers complementing** each other

- **Teachers = catalysts** for **attracting** students

- **Significant differences** between **onsite** and **online** participants
  - ➤**"Strategic" learning** for the **online** participants?
  - ➤**High workload** to be combined with **other duties**?

CONCLUSIONS

- **Generalization** to **non-PhD education**:
  - Main issue: **fitting into existing teaching framework**
  - Although apparently difficult:
    - The **asynchronous part** can be easily studied in **addition to other existing courses** (due to its self-paced nature)
    - The **synchronous part** requires **five days absence**
      - ➢ **Often not an issue for MSc students** (except in case of exams) + recordings of the synchronous sessions available in case of absence
      - ➢ Requires **careful planning** for the **teachers**

- ➢ **New edition** of all courses being **rolled out** in this academic year

Thank you!

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