UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

Choosing the proper ingredients for the pizza

The balance between on site, remote, and AI assisted university teaching

Daniel Crespo

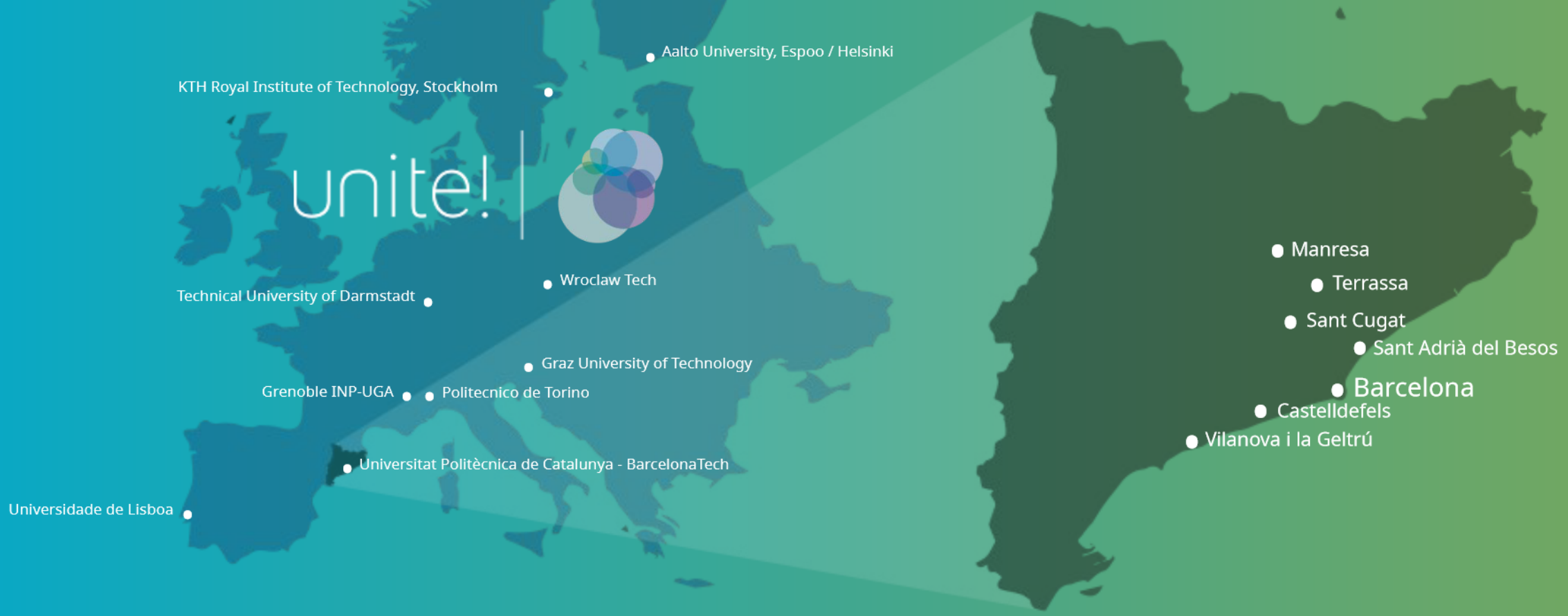
Rector of Universitat Politècnica de Catalunya

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

Outline

- The pandemic caused notable changes in student habits that have only partially reversed
- Digitalization is not a target by itself. It offers new tools and new channels
- Digital transformation must be focused on a better learning experience
- Artificial Intelligence is here to stay

We're a **lead in technological university at the south of Europe**



UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

29812

undergraduate and master students

2107

PhD students

31 %

of women in the new intake of students

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

2 756

students in international exchange programmes

30%

of master's students are international, 79% of them are from outside the EU

55%

of PhD students are international, 82.5% of them are from outside the EU

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

Fields

- ☐ Architecture and Urban Planning
- ☐ Aerospace Engineering
- ☐ Agricultural and Biosystems Engineering
- ☐ Civil, Environmental and Geological Engineering
- ☐ Computer Science
- ☐ Engineering for Industry: Energy, Biomedical, Chemical, Electrical, Materials and Mechanical, Naval, Maritime and Nautical Engineering, Telecommunications and Electronic Systems Engineering
- ☐ Applied Sciences: Mathematics, Statistics, Physics, Optics and Photonics

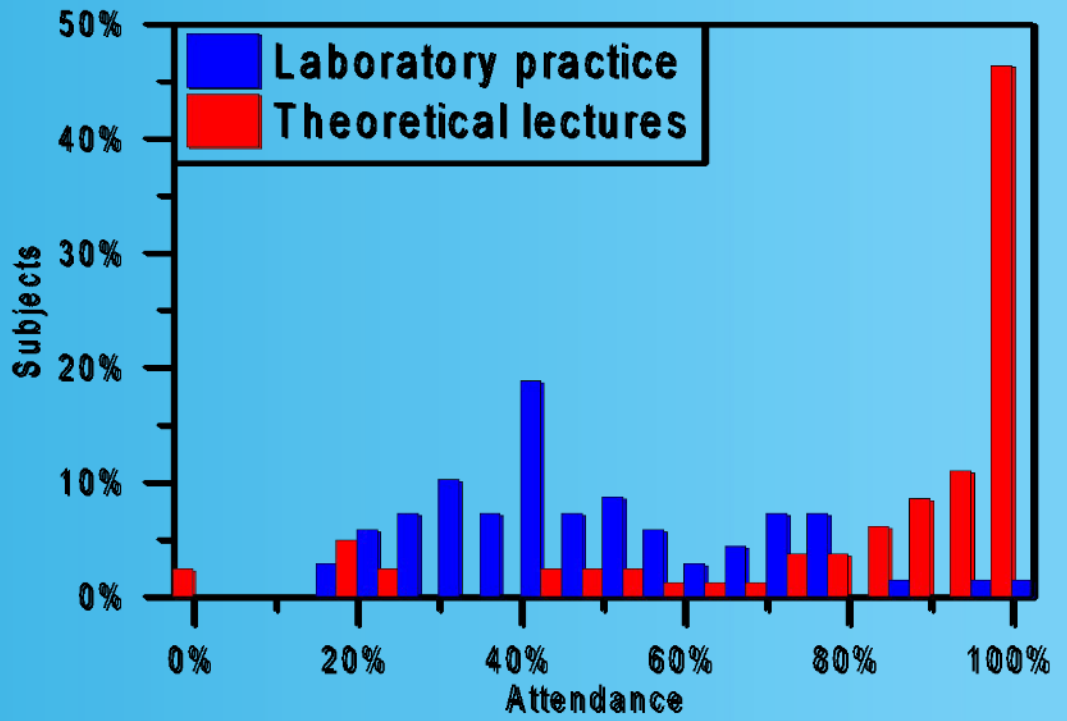
Initial and boundary conditions

- UPC is a technological university
- UPC is an onsite university
- Laboratory training in most of the subjects
- *9-10 theoretical lecturing or laboratory supervised hours per ECTS*
- Project based learning in some subjects
- Part time company internships, simultaneous to regular learning
- International experience
- Final project, either in the university or in company premises

Initial and boundary conditions

- *Classical* virtual campus in all subjects (contents storage, self-test and remote test facilities…)
- Largely digitized, almost paperless

- The attendance to theoretical lectures is decreasing in a significative number of degrees



The (not so new) elements

- Digital elements in onsite teaching
- Online teaching
- Simulation environments
- Virtual reality environments
- Artificial intelligence

How can they help to improve the learning experience?

Online teaching

Pros

- Not new. Both teachers and students used it on the covid pandemics.
- Asynchronous learning → Non-sequential teaching and learning
- Hybrid mode gives value to on-site teaching

Cons

- The adaptation to online teaching was too fast and by force. The materials developed did not have the proper quality. Much of it was not used again.
- Part of the faculties reduce the concept of online teaching to the supply of digital materials
- A large amount of material online reduces the attendance to lectures and the teacher-student interaction.

Online teaching (multimedia)

Pros

- Highly effective and valued by the students.
- Adequate for wide concepts, large groups, MOOCs
- Effect on the brand image

Cons

- Academics are not youtubers
- Good quality materials are produced by experienced professionals
- Resource consuming (5-10 minutes of video require up to 12 hours of work)
- Need to maximize impact and return of investment
- Effect on the brand image

Simulation tools

Pros

- Low cost (compared to laboratory cost)
- Adequate for very expensive experiments and for large groups

Cons

- They are not a substitute for actual hands-on experience

Virtual and augmented reality tools

Pros

- Adequate for specific purposes (Health, some branches of engineering)
- Strong experience for the student, attractive for *gamers*
- Safe, adequate to train in risky environments

Cons

- High cost, but very convenient for risky environments
- Very few applications

Artificial intelligence assisted teaching

Pros (1/2)

- Learning personalization
  - personalized recommendations
  - adaptive learning paths
  - and real-time feedback
  - Virtual tutoring and adaptive learning projects already in progress (not yet at UPC).
- Student Performance Assessment
  - Assessment triangle: student – AI – teacher. Importance of the *AI – teacher interaction*.
- Student engagement
  - Positive feedback, the student deepens into his or her interests. Could be enhanced by Virtual and augmented reality (VR/AR).

Artificial intelligence assisted teaching

Pros (2/2)

- Innovative teaching: big data analysis, pattern identification, fuzzy problems
- Possibility of rethinking laboratory practice
- Rethinking the evaluation process is mandatory

Cons

- Rethinking the evaluation process is mandatory
- Need of Teacher’s training
- Batch reports much less reliable for student’s performance assessment.
- Ethical considerations: Privacy and Intellectual property

Artificial intelligence assisted management

Pros

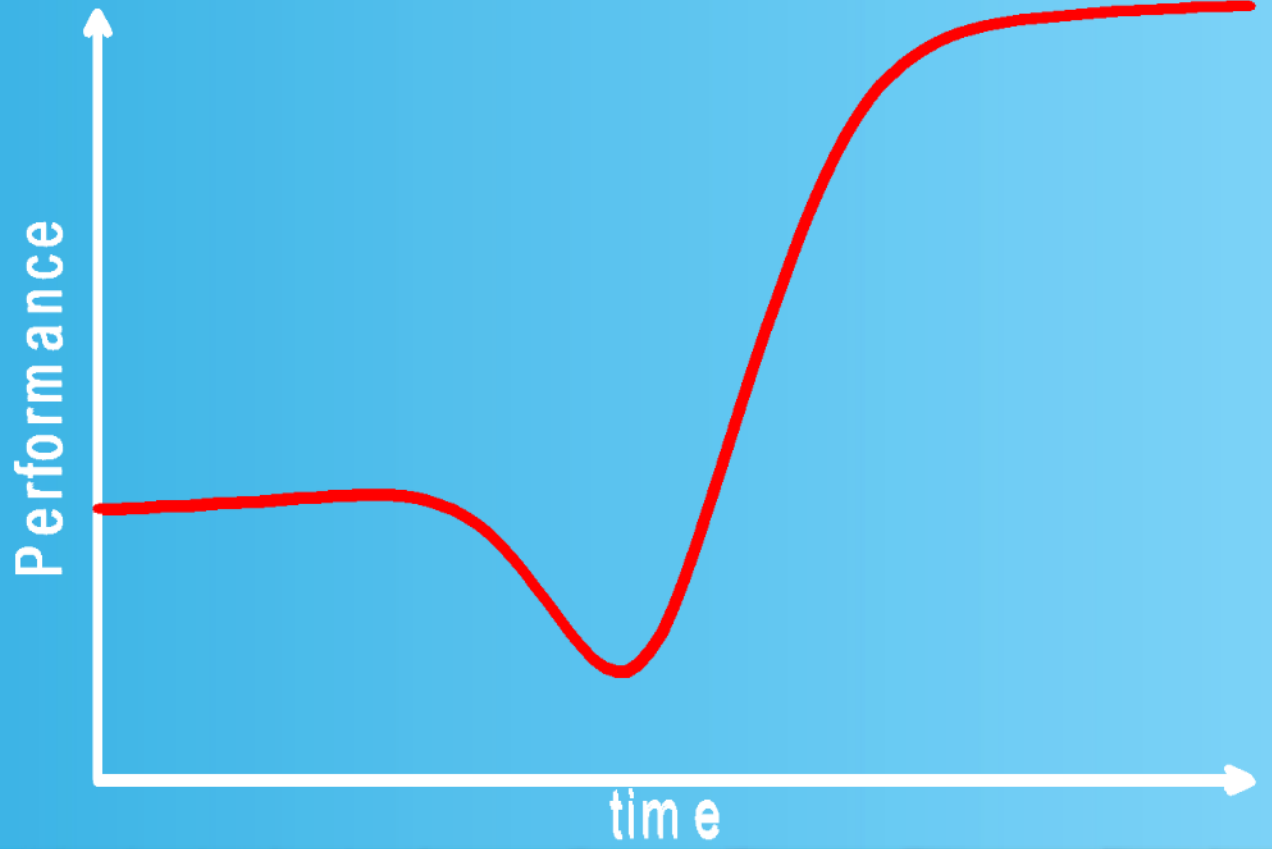
- Student's support: Automated analysis of global student's performance, personalized tutoring
- Decision Support for strategic decisions: Resource management, forecasting enrollment trends, identifying expansion opportunities, optimizing budgets.
- Automation of administrative tasks: process robotization, resolution of doubts and queries, 24/7 assistance, personalization of information…

Cons

- Need of personnel training and resources
- Insertion of AI into the existing structure

Artificial intelligence expected impact

- AI is a General purpose technology, its impact may be similar to electric power.
- AI will affect all areas of University activity: Teaching, Research and Managing
- We face the productivity J-curve
  - Initial investment and training reduces productivity

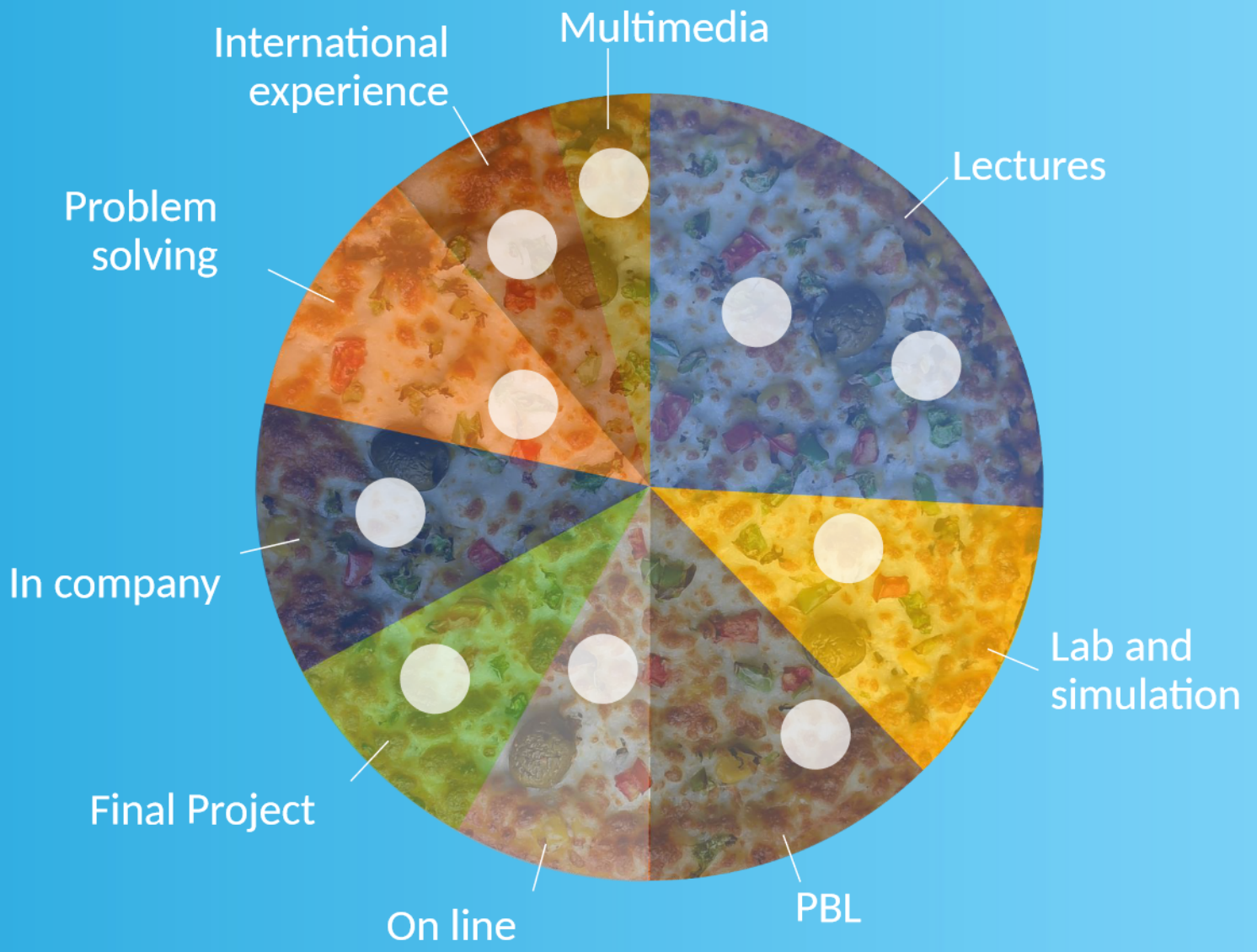


The future of higher education…

- Must be student centered: the purpose of digitalization is to improve the learning experience
- Must allow flexible curricula (difficult in some countries) and internalization (European diploma)
- Must reduce lecturing. Lecturing must really give added value to the student
- Digital resources must be available to everyone, it is our responsibility
- The big challenge is that faculties are still digital immigrants, while students are already digital natives

… is a pizza

- Choosing the proper amounts of every ingredient will be crucial for on-site universities
- Artificial Intelligence may become the mozzarella



UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

Choosing the proper ingredients for the pizza

The balance between on site, remote and AI assisted university teaching

Daniel Crespo