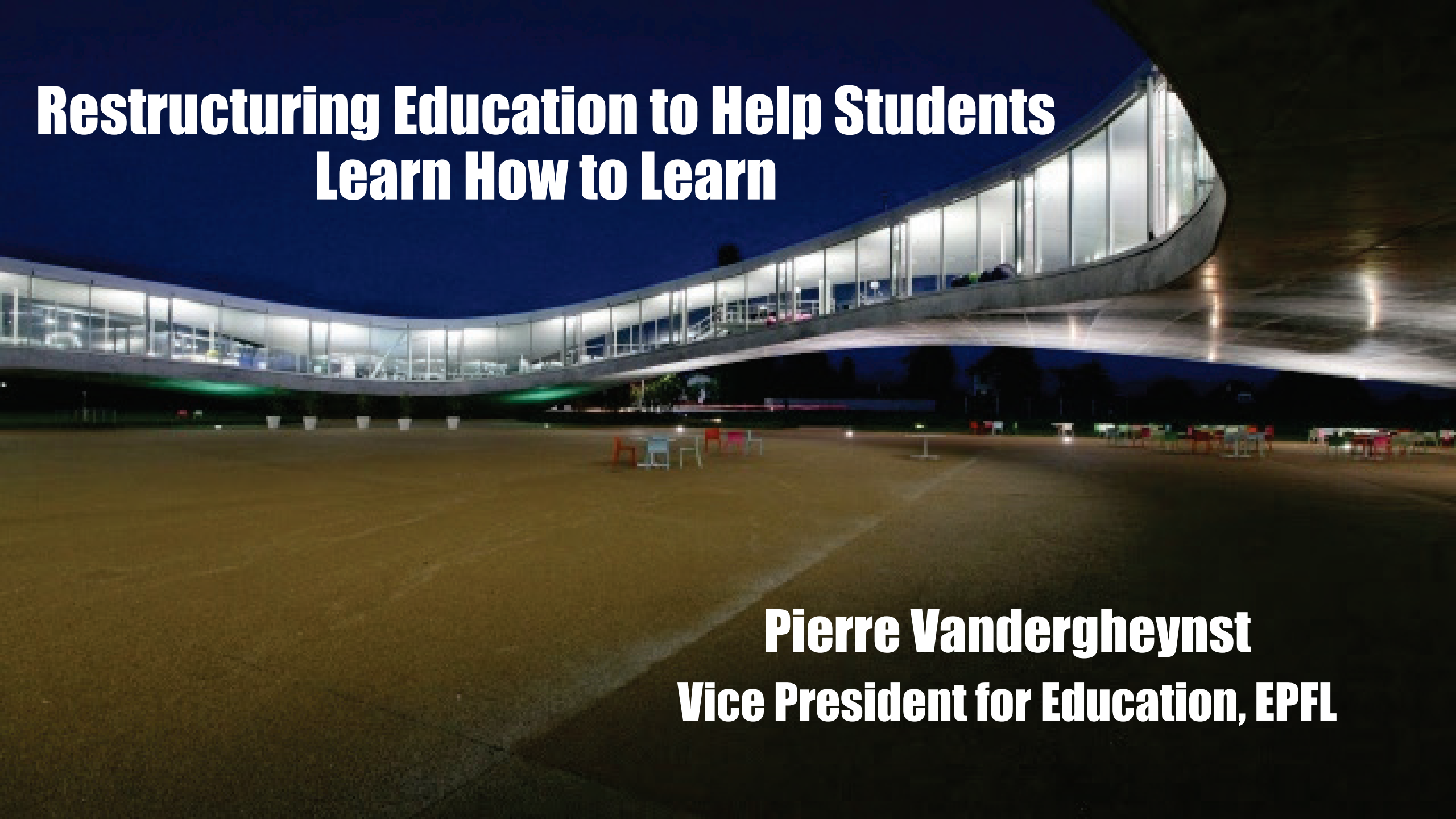


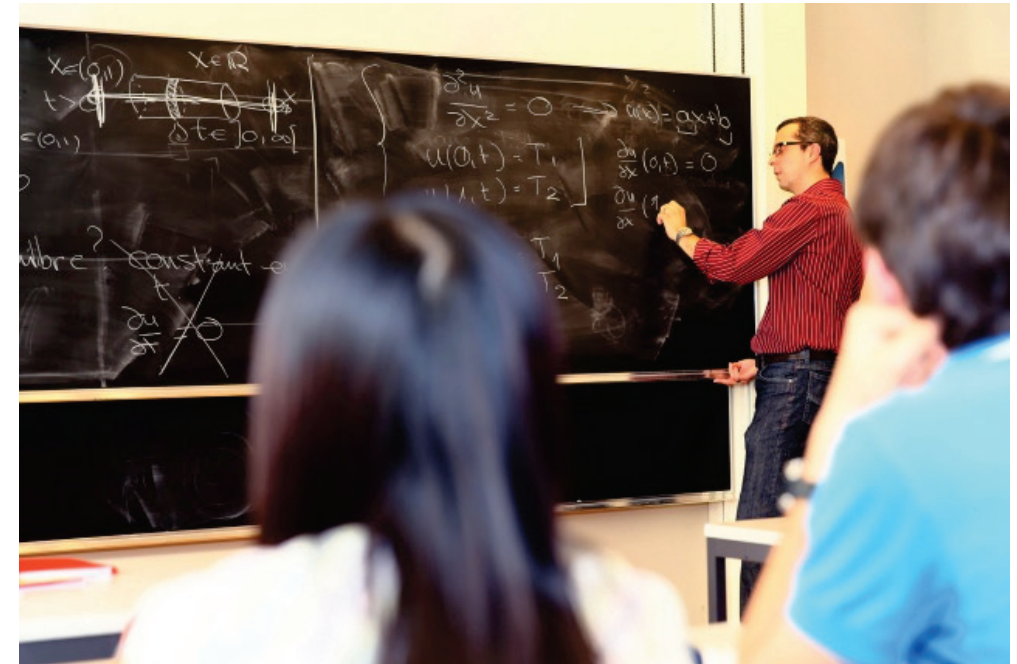


# **Restructuring Education to Help Students Learn How to Learn**

**Pierre Vandergheynst**  
**Vice President for Education, EPFL**

# Where we have come from

- Students see our education as very good
- First year is very challenging
  - High level of competence required...
  - ...in many subjects
- Different outcomes:
  - Some emerge with good content knowledge and ability to solve problems
  - Some learn enough to pass exams (and then forget)
  - Many don't learn enough and don't pass
- JSP (Faculty Retreat) 2015 established a Task Force on Education

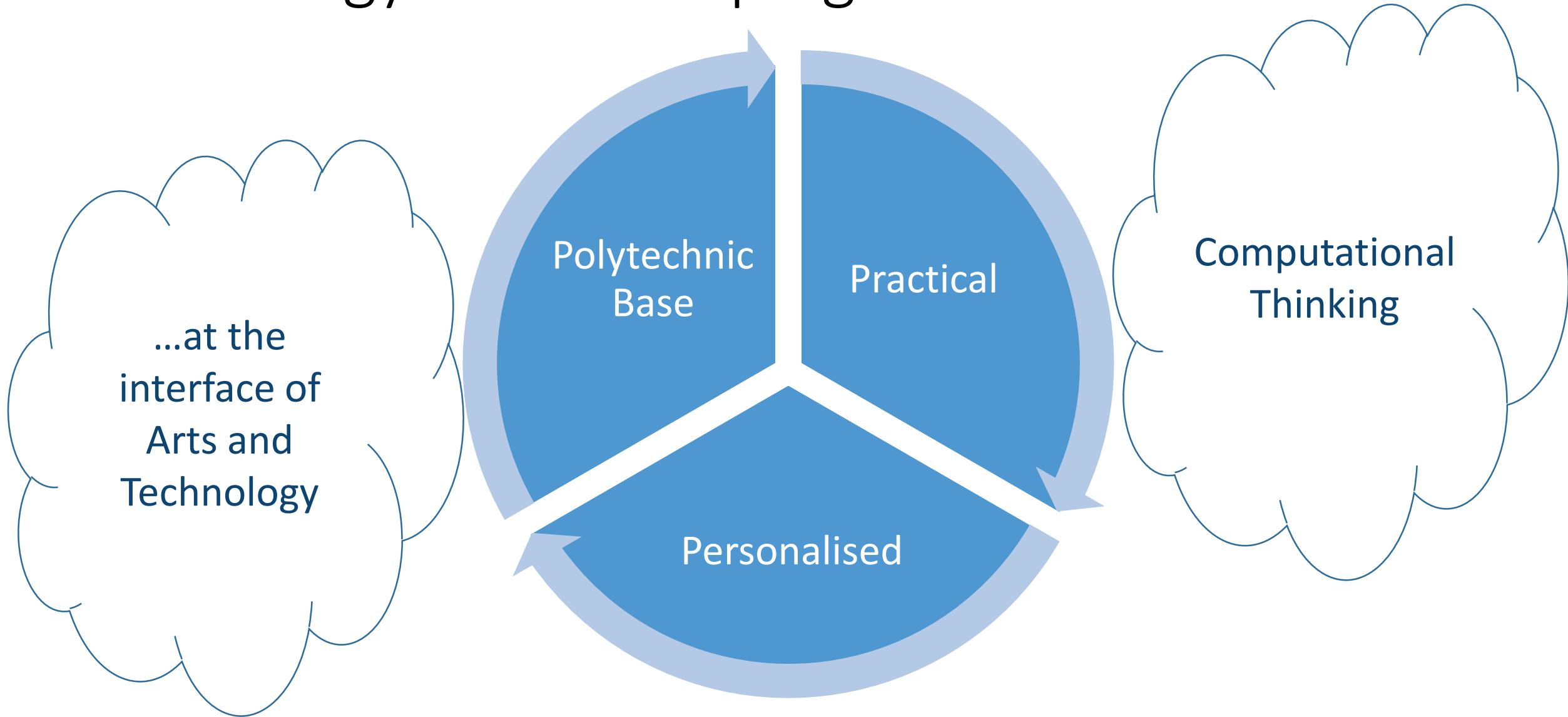


*Photo: Alain Herzog*

# Report of the Task Force on Education (2016)

1. Narrow the Polytechnic Core to provide more depth and time for understanding on fewer disciplines, and increased focus on personal work.
2. Focus on thinking skills: being able to abstract and to model, systematic approach to solving complex problems, computational thinking.
3. Support pedagogical innovations aimed at improving the effectiveness of students' personal work, fuelled by teachers and by the digital revolution.

# A Strategy for Developing our Education

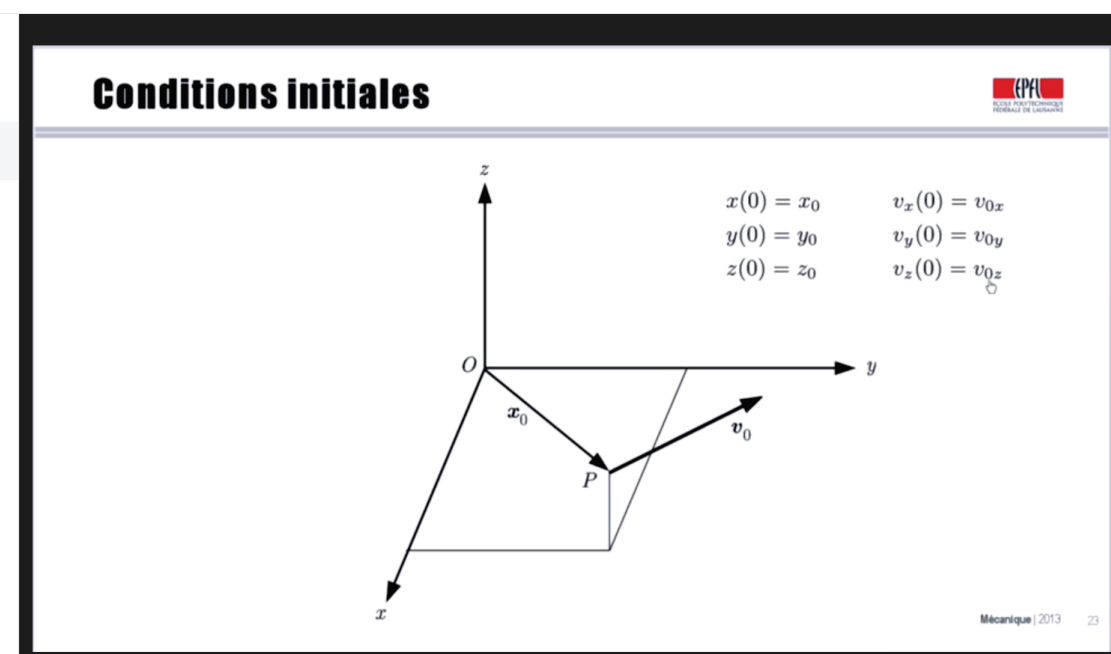


# Polytechnic base

Students will:

- have a strong, shared foundation in core scientific disciplines
- develop the deep understanding in these disciplines
- become an independent and autonomous learner

| Leçon 3 |                                                      |              |
|---------|------------------------------------------------------|--------------|
| ▶       | 3.1 Les lois de Newton                               | 18 min       |
| ▶       | 3.2 Balistique sans frottement                       | 13 min       |
| ▶       | Expériences leçon 3                                  | 13 min       |
| ★       | Practice Quiz: Questions conceptuelles de la leçon 3 | 5 questions  |
| 📄       | Enoncé des problèmes de la leçon 3                   | 10 min       |
| ★       | Quiz: Problème 3.1 - Boules de neige                 | 12 questions |
| ★       | Quiz: Problème 3.2 - L'accident                      | 13 questions |



**MOOC Mécanique de Newton**



*Photo: Alain Herzog*

Reduced number of  
courses in first year

Pedagogical R&D on  
Flipped Classrooms in  
Linear Algebra

Polytechnic  
Base

MOOC supports for first  
year core courses

Book, MOOC and  
classes for students on  
study and thinking skills

**Leçon 3**

- 3.1 Les lois de Newton 18 min
- 3.2 Balistique sans frottement 13 min
- Expériences leçon 3 13 min

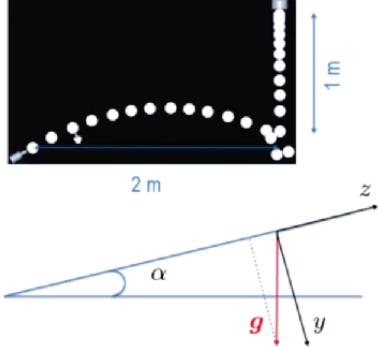
**Practice Quiz:**  
Questions conceptuelles de la leçon 3 5 questions

**Énoncé des problèmes de la leçon 3** 10 min

**Quiz:**  
Problème 3.1 - Boules de neige 12 questions

**Quiz:**  
Problème 3.2 - L'accident 13 questions

**Analyse quantitative d'une expérience**

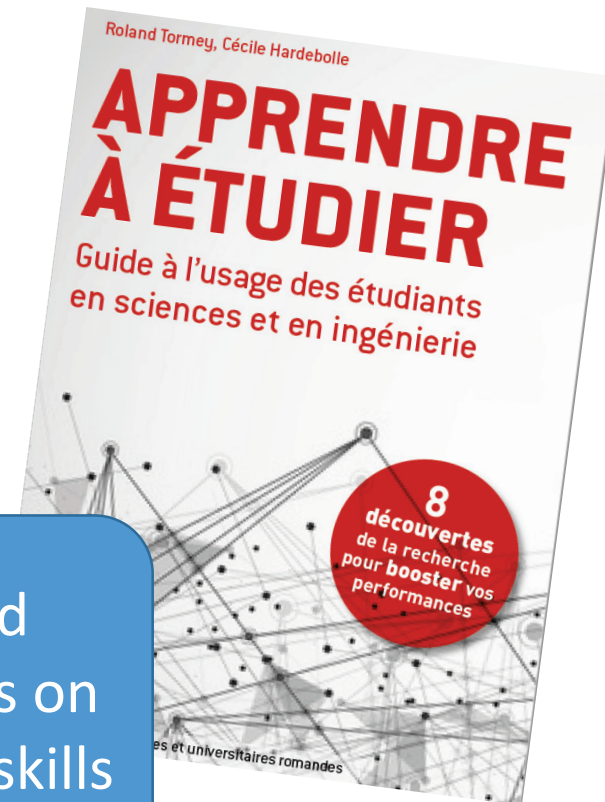


**Données :**  
Deux points matériels partent entrent en collision.

- Temps jusqu' à la collision
- Table inclinée dans la large

$$\sin \alpha = \frac{2H}{gt^2} \quad v_{0x} =$$

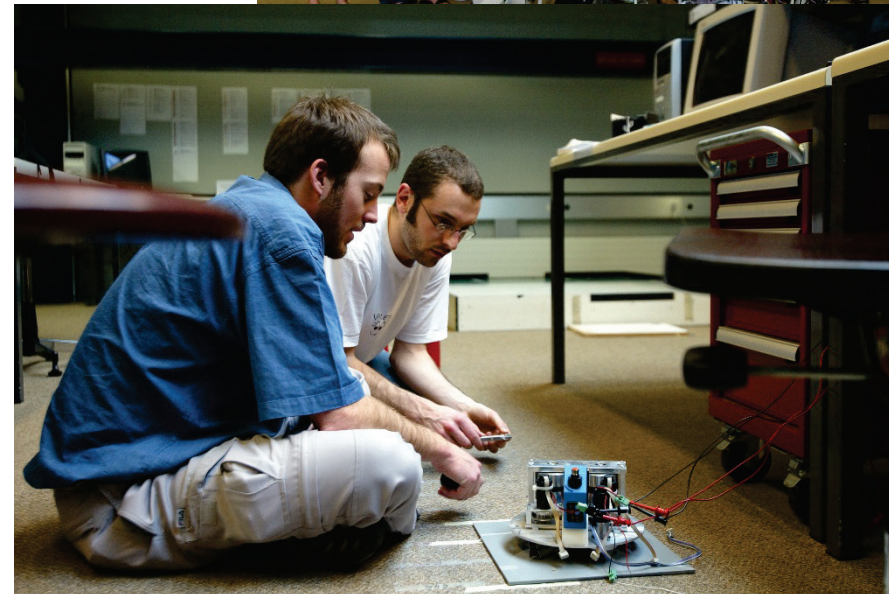
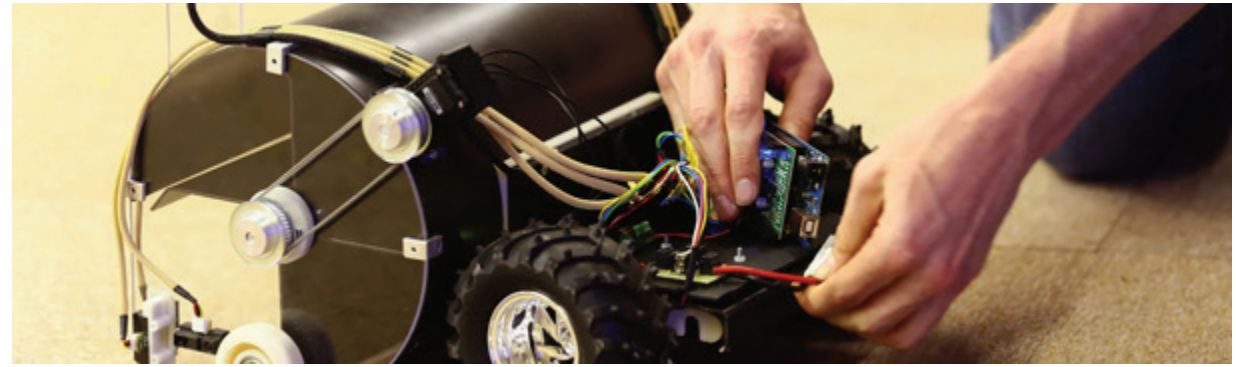
**MOOC Mécanique de Newton**



# Practical Learning

Students will be able to:

- solve open-ended, interdisciplinary problems
- manage team projects
- be ethical in their professional life
- take into account financial constraints and realities



*Photos: Alain Herzog &  
<http://robot-competition.epfl.ch/>*



Discovery Learning Labs  
(e.g. ME building)



Practical  
Learning



Interdisciplinary extra-  
curricular projects

[Home](#) [About](#) [Discovery Learning Laboratories](#) [Prototyping](#) [Interdisciplinary](#)

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**Lab in a Tube**



Pedagogical R&D on  
working in teams,  
open-ended design  
projects

Projects built into the  
curriculum

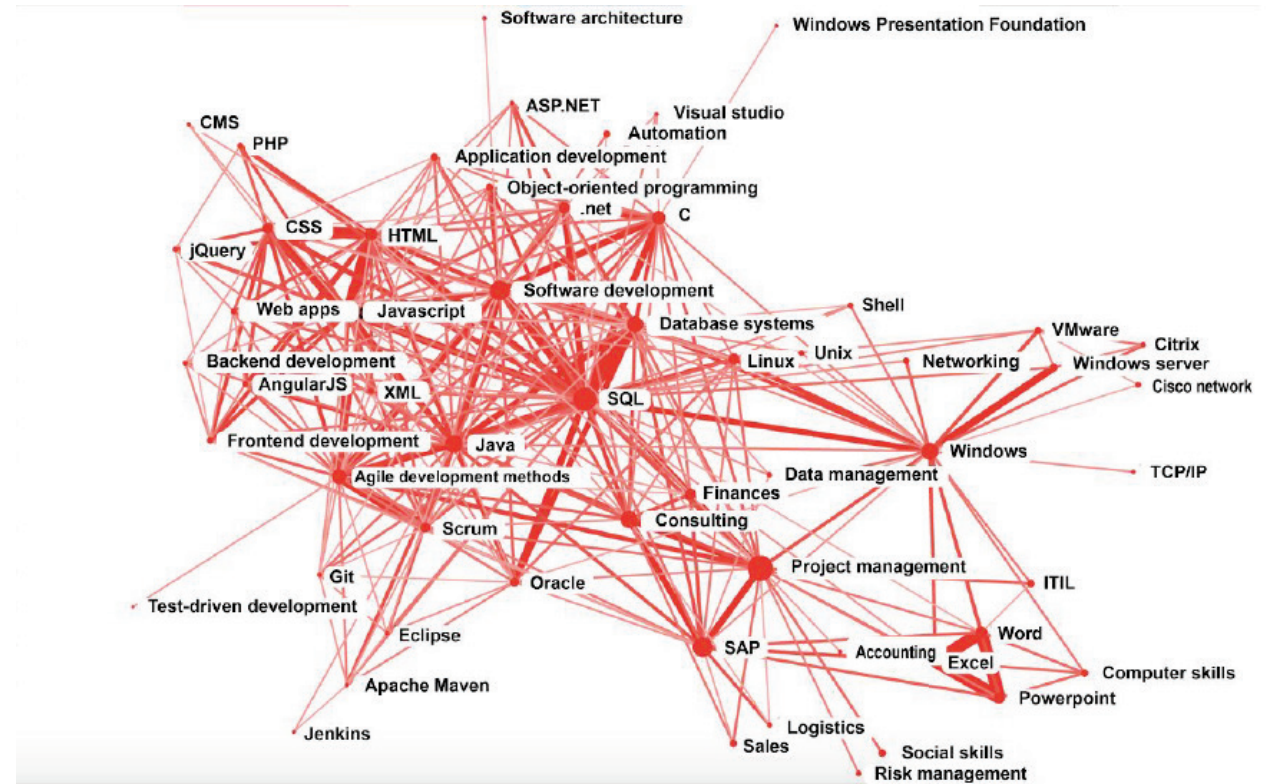


Photos: Alain Herzog,  
<http://chi.camp/projects/>  
<http://discoverylearningprogram.epfl.ch//>

# Personalised Learning

Students will be able to:

- Make decisions about what to study and how
- have choices
- have tools to enable them to make informed choices



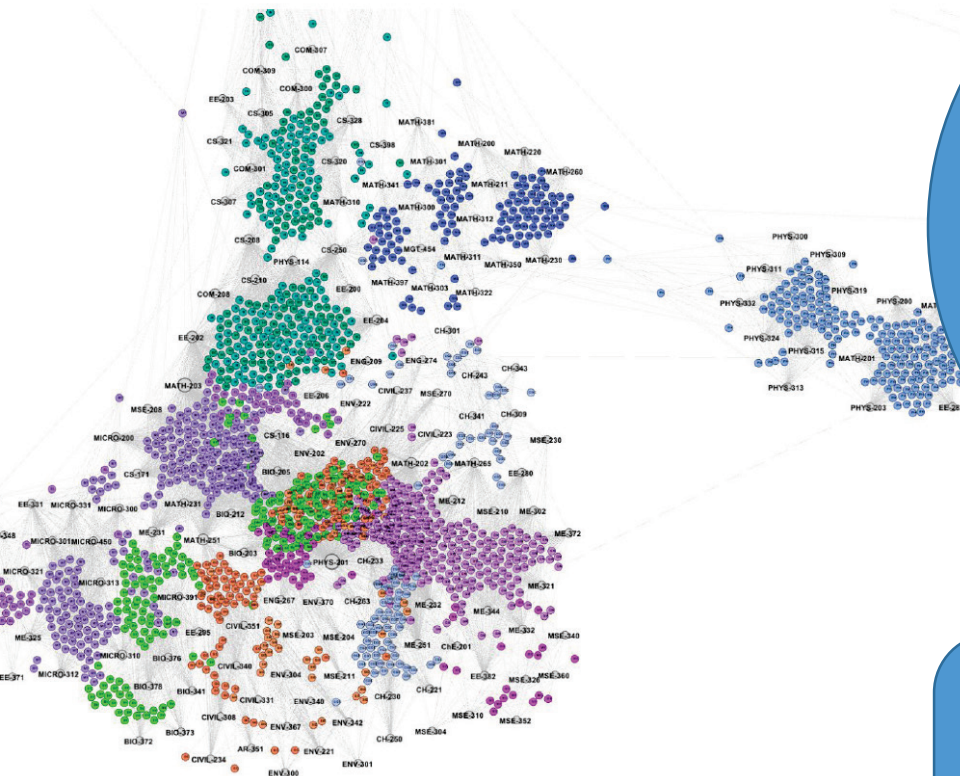
***Data mining to represent the Swiss IT job market by the Centre for Digital Education (CEDE), EPFL***

Choice

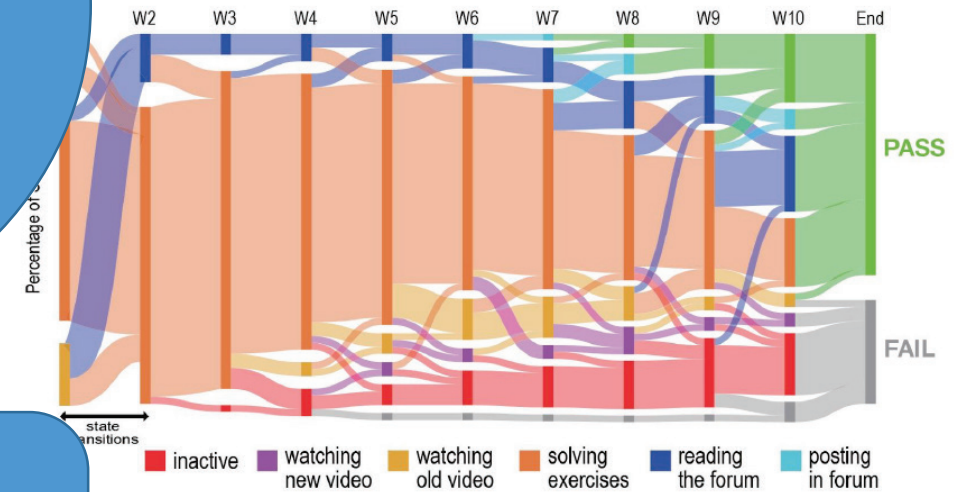
Analytics

Personalized

Feedback

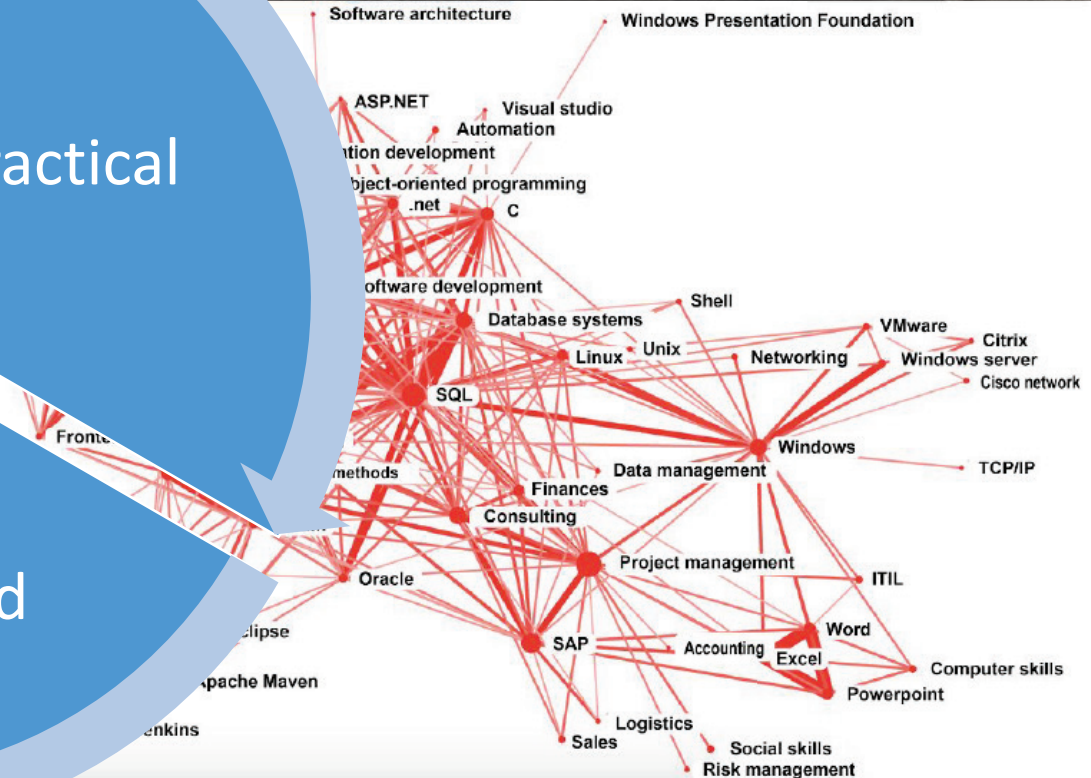
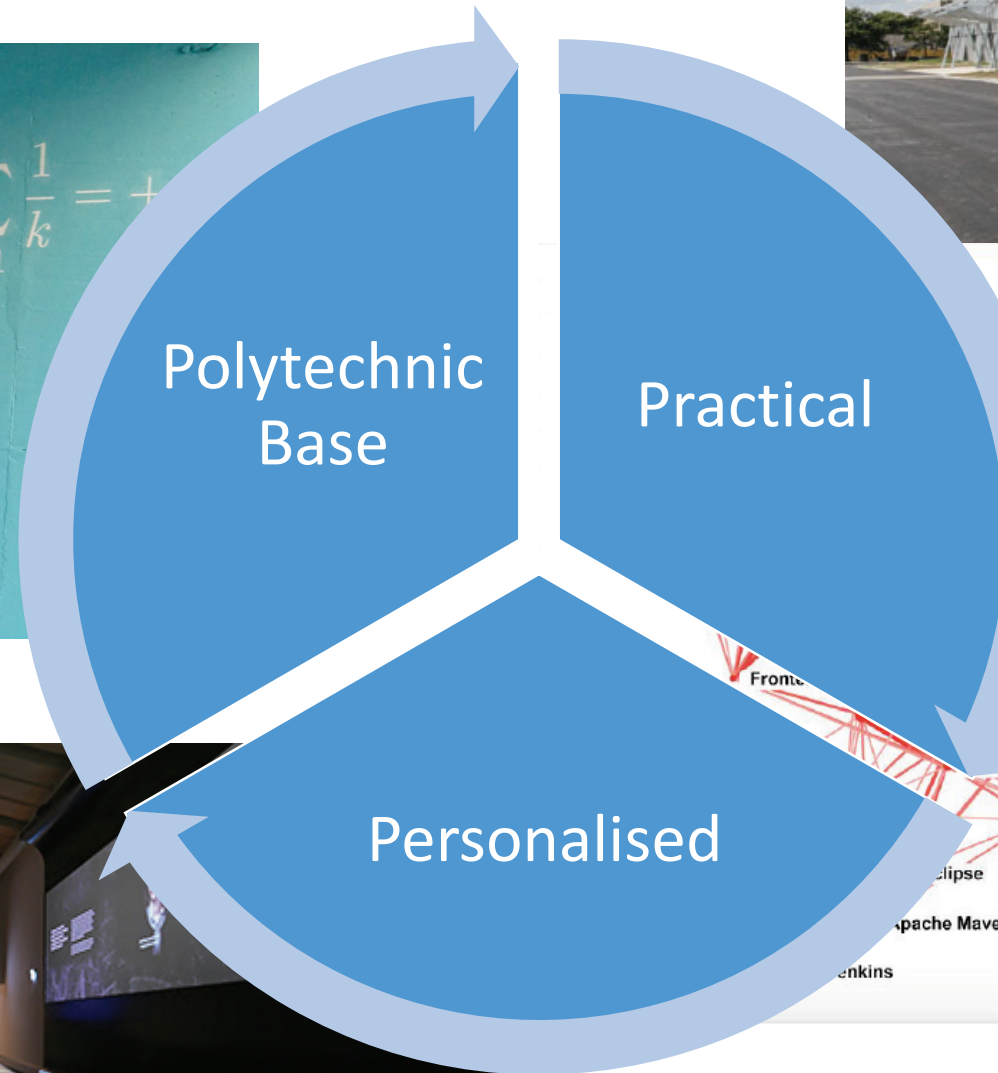
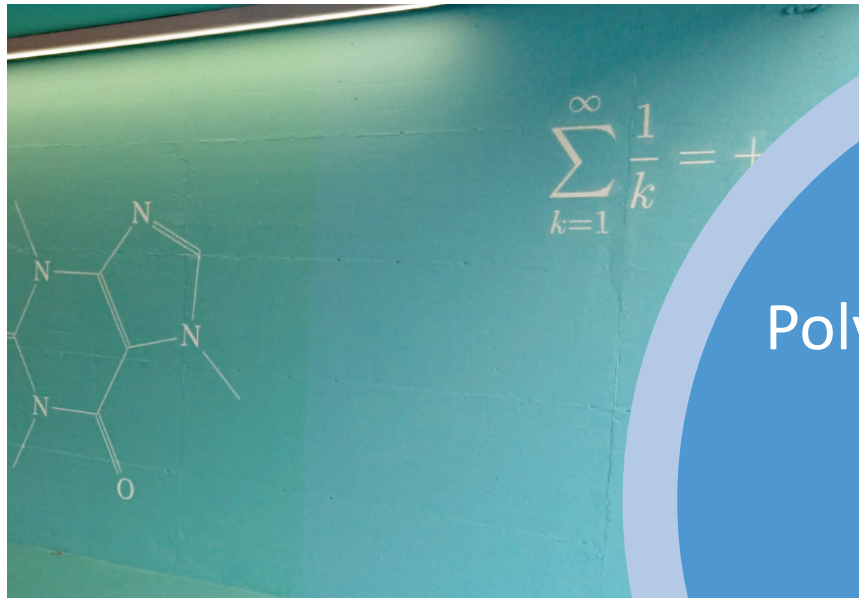


***Using Big Data to map the study programme routes available to students***



***Using MOOC data to analyze learning strategies and rates of success***

# Conclusion



*Images: Alain Herzog,  
Giordano Favi  
CEDE, EPFL*