

Key–Note Lecture

Irakaskuntza-Ikaskuntzarako Metodologia Berritzaireen Erabilerari

Eta Ikasleengen Zentratutako Ikaskuntzari Buruzko Mintegia

Bilboko Ingeniaritza Eskola (UPV/EHU) **Jan 27th, 2020**

Promoting Active Learning in Universities

Xavier Giménez

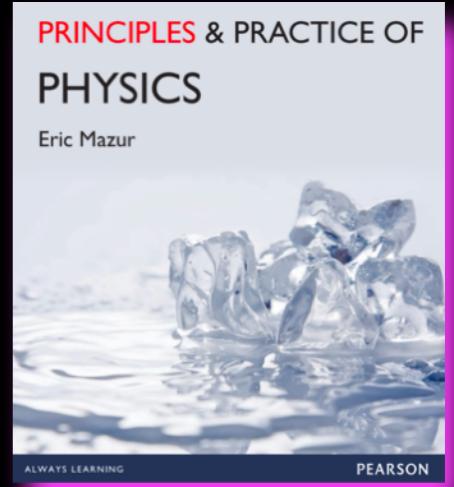
**Departament de Ciència de Materials i Química Física
Universitat de Barcelona**



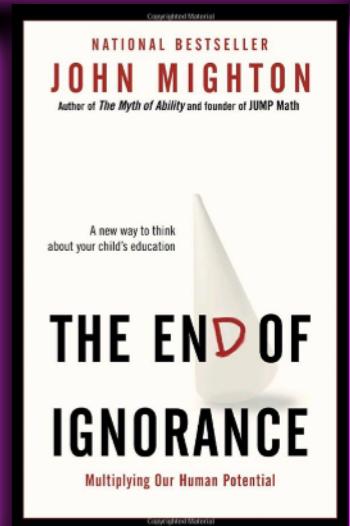
UNIVERSITAT DE
BARCELONA

Critical voices favoring academic changes (I)

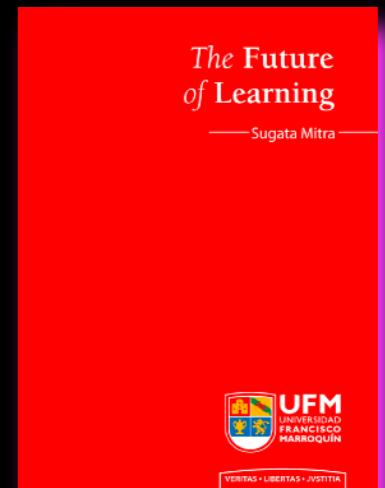
- **Classical teaching is a selection process for “fast learners”:** Eric Mazur, Prof. Physics at Harvard University, pioneer of “peer teaching” and flipped classroom. Author of “Principles and Practice of Physics” (2015).



- **It forces students to an homogeneous learning rate:** John Mighton, creator of JUMP Math. Author of School Math books and “The End of Ignorance” (2013).

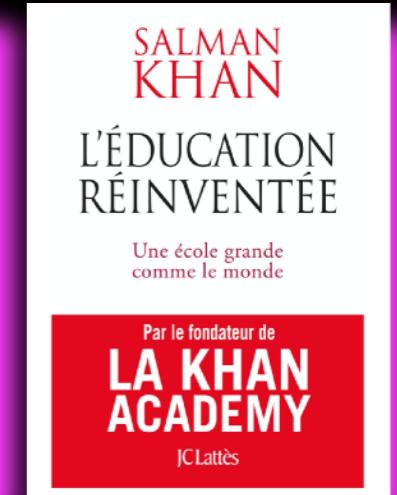


- **Exams system is a threat, at odds with professional needs:** Sugata Mitra, creator of SOLE, Self–Organized Learning Environment. Author of “The Future of Learning” (2016).

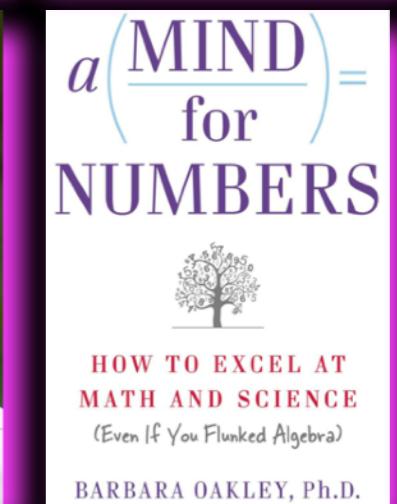


Critical voices favoring academic changes (II)

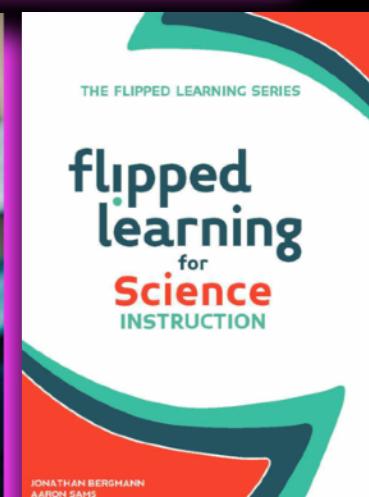
- **Education must be essentially practical, oriented towards useful abilities and skills:** Salman Khan, creator of the “Khan Academy”. Author of “Education reinvented” (2013)



- **Had I known in my school days, what I know today on how to learn, could have made those days way easier:** Barbara Oakley, author of “A mind for numbers” (2014)



- **Flipped learning prompts a radical redefinition of the role of the teacher, the student and the best use of time between them:** Jonathan Bergmann and Aaron Sams, creators of the Flipped Classroom, authors of “Flipped Learning for Science Instruction” (2015)



The need to change: **a relevant fact**

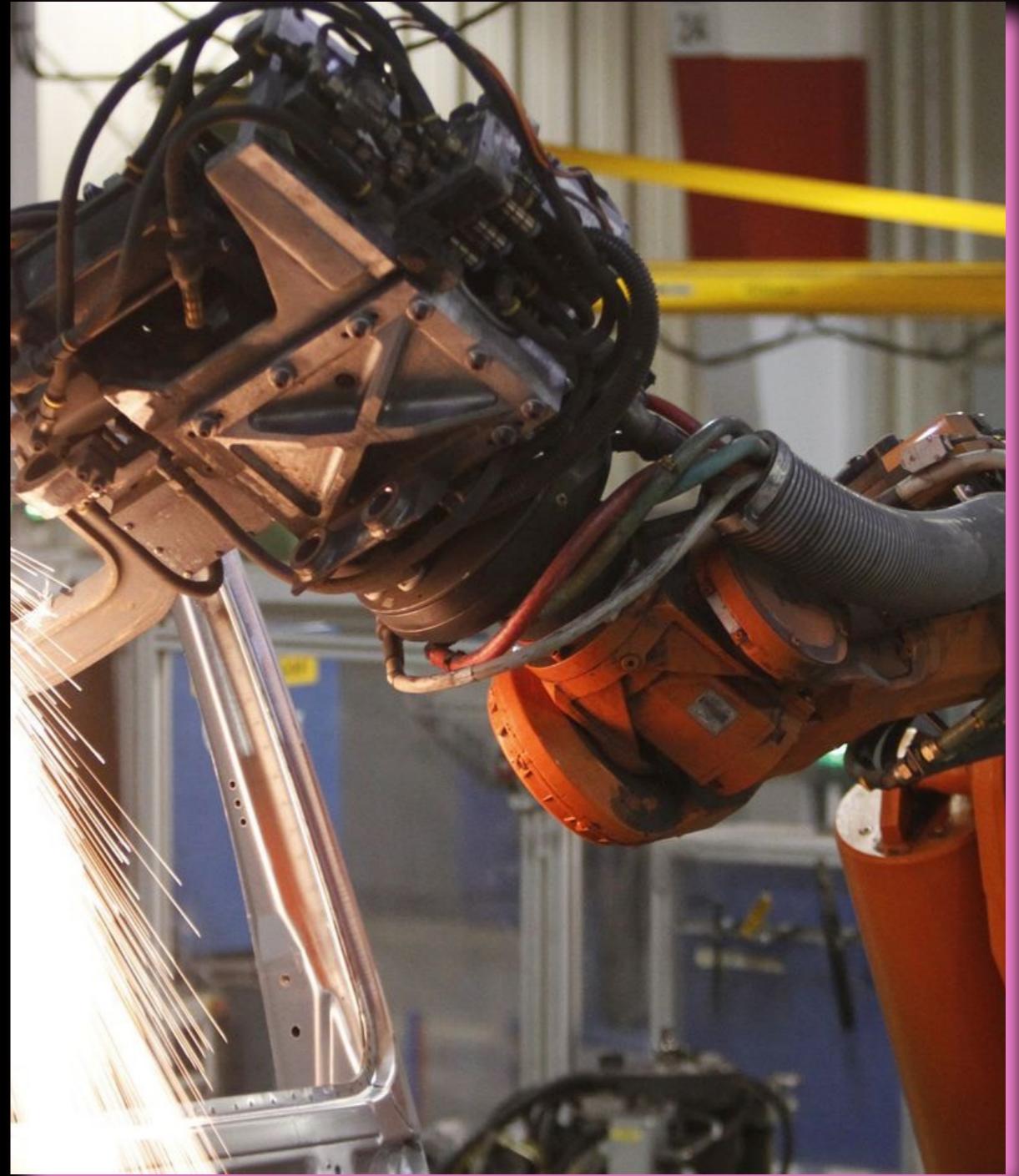
*Students **professional** performance
weakly correlates with academic performance*

- Increasingly true the lower the students achieve, academically
- How many students make a professional choice **after avoiding academic curricula?**
- What could professional performance have been, **if students had better academic experiences?**
- Wouldn't it be highly beneficial, for society, **having professionals more academically satisfied?**
- **Isn't it relevant, that private companies evaluate individuals with very minor use of academic evaluation?**
- **Country's Economic Wealth directly correlates with professional competence!**



New, or not so, needs of labour market

- Automatization of routine processes, i.e. **robotics** and **artificial intelligence**, is profoundly changing professions.
- Professional “pyramid” changes to professional “pear”...
- ... much more intermediate positions and much less low qualified
- **Multidisciplinary needs** multiply,
- **Self-learning requirements increase**, extended to the **complete professional life**



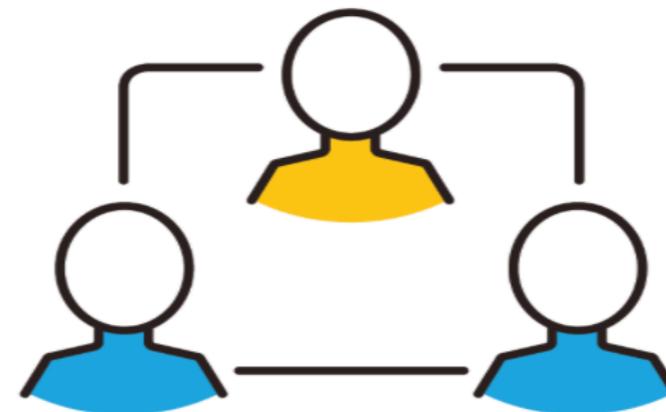
Soft Skills

A sort of abilities providing a T-shaped background

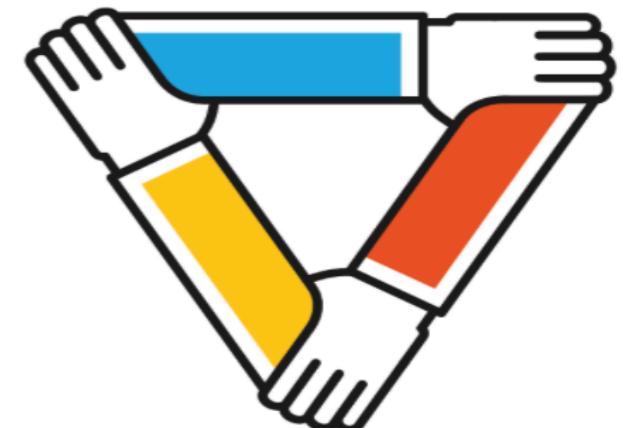
- **Cognitive skill:** ability of inferring conclusions from a given set of data
- **Self-learning ability:** being able of life-long self-learning
- **Global, International, Multicultural knowledge**
- **Effective leadership ability:** making a step forward when needed, but teaming up when other individuals provide such effective, natural leadership
- **Humbleness:** professional success does not deteriorate social relationships



TEAMWORK



RELATIONSHIP



COOPERATION

Relevance for ***social justice***

Young & Lambert: “Knowledge and the future school: curriculum and social justice” (London, Bloomsbury Academic, 2014).

- Traditional university degrees were designed for *upper 15% ensemble*.
- This is true for “heavy” degrees, having kept the status in most of engineering, and science & math.
- These requirements were considered adequate for 50–60s public and private positions.
- It has been a common issue, internationally. (*C.T. Fosnot (Ed.): “Constructivism. Theory, perspectives and practice”. Teachers College Press, New York, 2005*)

I still find teachers stating that university is for an elite, so not everybody must have a degree

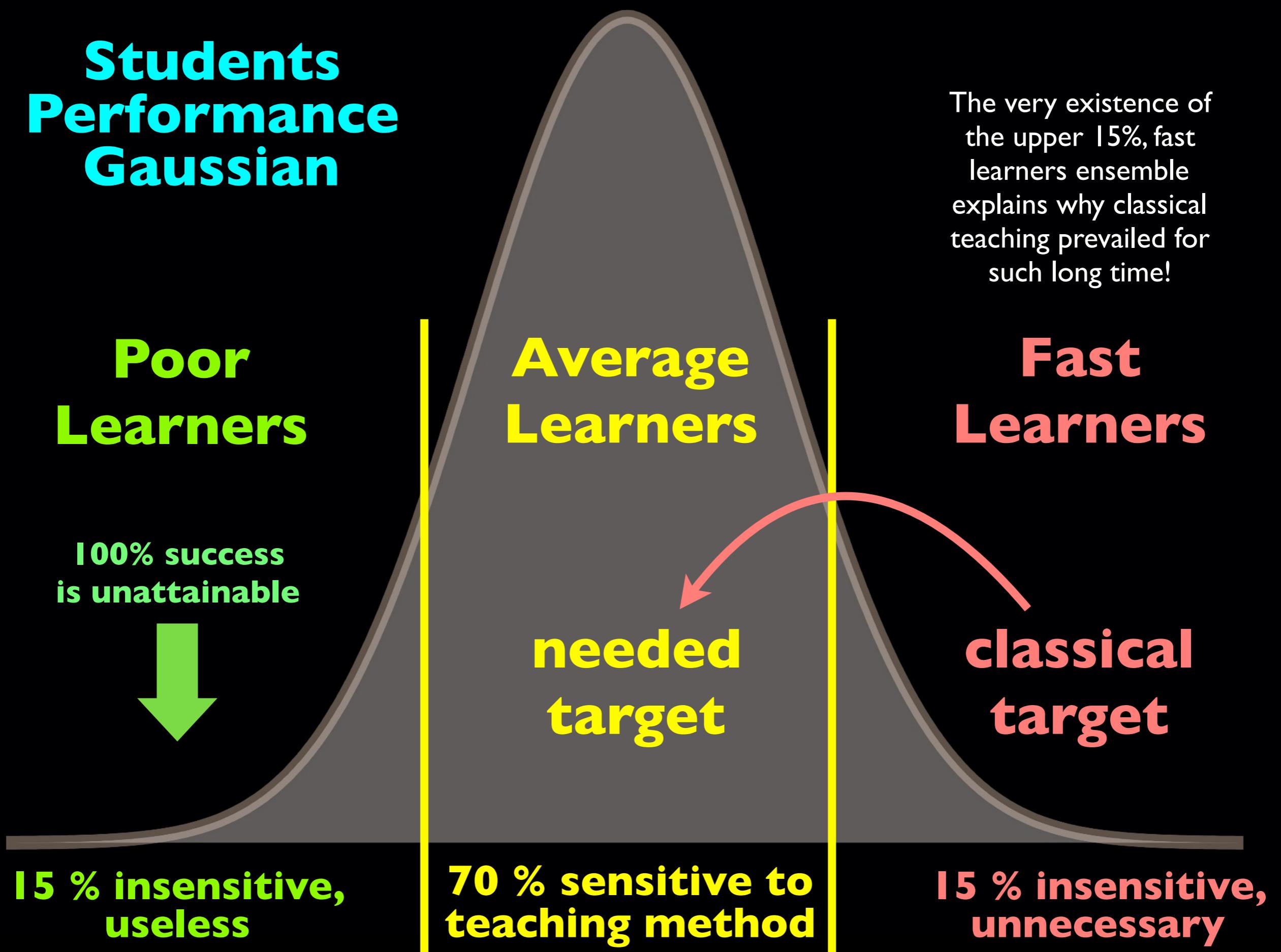


University Teaching now addresses “average learners”

- Since Bologna, for E.U. (90s in USA) such studies address **central 70% ensemble**, owing to more technical professional needs (both private and state).
- Such transformation **stimulates a deep change in teaching paradigm**.
- In particular, it is no longer possible to assume that higher education students have, as traditionally thought:
 - **enough maturity,**
 - **working habits,**
 - **abstraction ability.**
- **Actually, addressing such features pushes us forward, towards how the brain learns...**



Students Performance Gaussian



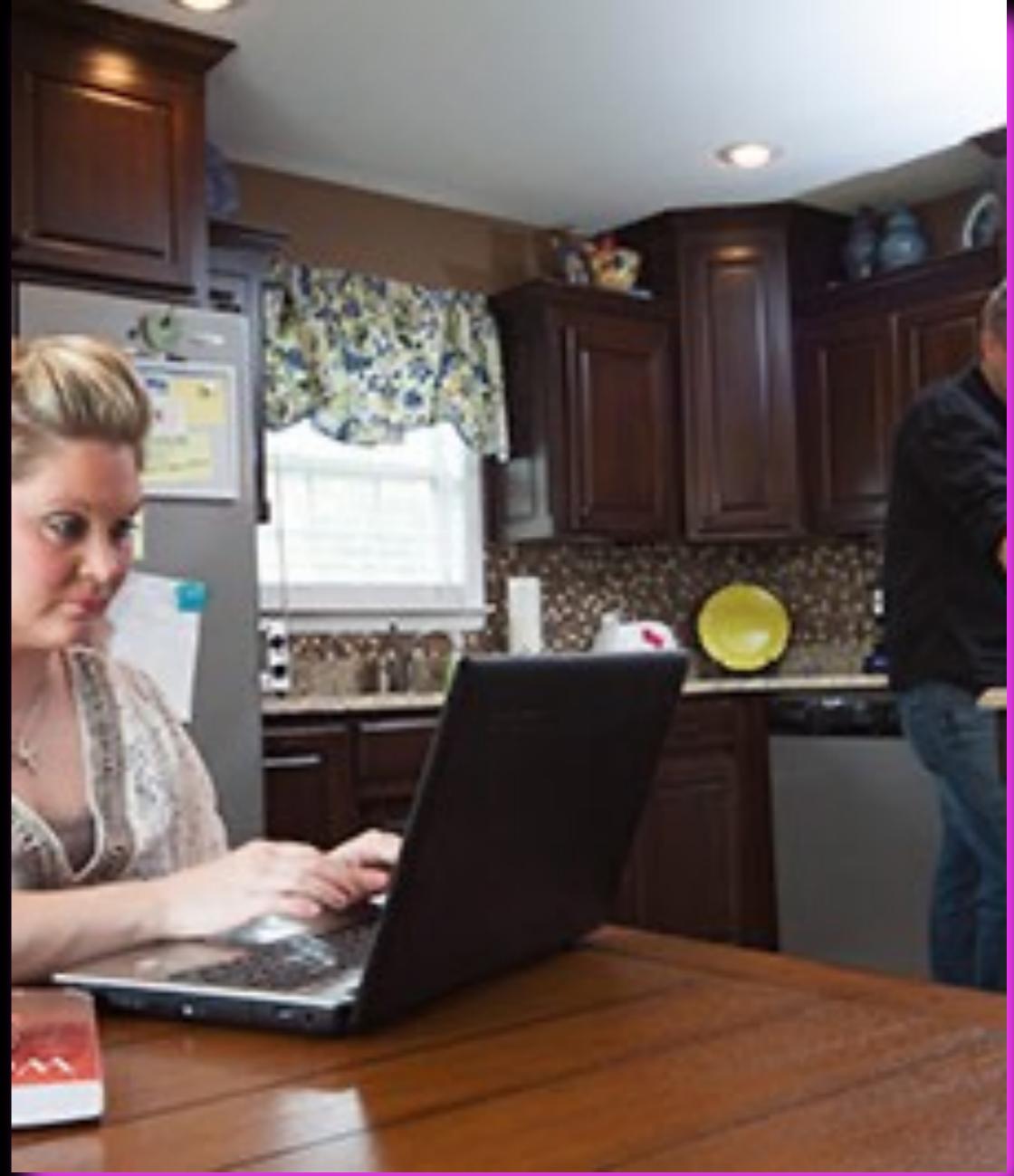
Let's transform our form of teaching:

- **So that students learning is pivotal**
- **Classroom time is used efficiently for students learning**
- **Subject content difficulty and workload is set according to mid, average learners**
- **Knowledge is introduced from practical to abstract**
- **Subject content is practiced & revisited**

A change that is already ongoing, internationally

What we should always keep in mind ...

**As we are facing times of big technological changes, how
is it going to be the
University of the future?**



**Massively on-line courses?
New classroom settings?
Digital resources as common tools?**

Is it true, as Harvard experts eagerly state, that MOOCs will make regional universities fade off?

The University in the near future

- New materials **developed and shared** internationally
- Less “physical” lectures
- Project-based work groups
- Explicit self-learning practice, a principal ability to be developed during college.
- Teachers will be given a thorough, extensive formation on **pedagogy, communication skills** as well as on **modern learning paradigms**.
- *The time of the classical lecturer is nearly gone.*

The combination of new technologies and active learning methods will definitely change teaching in the Universities.



The active learning classroom setting at Case Western University, Ohio, USA

New classroom settings

- Much larger classes and sessions.
- Classroom time is not constrained to 50 min moduli.
- Interdisciplinary!
- Several connections to the network, digitalization of the complete learning environment
- Different arrangements and areas within the same classroom, depending on the activity
- Collaborative work always
- **Professor walks around students groupings, giving advice, or asking questions, or helping understand a web page, or helping in running a simulation...**



**What might we do, meanwhile
we don't have the right setting,
technology and material?**

**How can we make this
transition truly successful?**

Actions are needed at all levels

Contrary to what was believed in the early 90's, when a first version of the present reform was initiated, changing L&T in Higher Institutions is **extremely difficult, complex**, and **a cultural shift is needed**.

Simultaneous actions are needed:

- **Students:**

- ★ They must embrace, *participate* and **co-create** the active learning activity.
- ★ Students must be given the essentials of active learning knowledge.

- **Teachers:**

- ★ **Individual:** thorough, long-term (several years) formation on cognition, neurological learning mechanisms, communication, learning evaluation, ...
- ★ **Collective:** cooperation mechanisms & resources provided, pooling of resources available, at the international level.
- ★ **Contents:** a **major action**, extending for many years (may be endless!), in mutual interaction & feed-back with new teaching methodologies. **Core concepts** identified and implemented. **Efficiency in the classroom** as a must.

More on actions...

- **Departments, Colleges, Universities:**

- ★ Infrastructures investment: human resources, classroom, communications, digitalization...
- ★ Coordination of formative actions at Department, College & University “shells”.
- ★ **Sustainability of reforms** enforced throughout the years.

- **University Associations, Administration:**

- ★ Communication strategy coordination and implementation.
- ★ Sensitization campaigns reaching all levels, including citizenship.
- ★ Exchange of experiences between Universities, both global and specific.
- ★ Promote & Provide legal, economic and administration framework for **acknowledgement of best practices**.

- **Stakeholders:**

- ★ Provide source information on labour market needs.
- ★ Facilitate a smooth transition between academy and private companies, at all levels (not only freshman graduates).

What is being done, internationally?



EUROPEAN
UNIVERSITY
ASSOCIATION

The European University Association is actively working in providing a common body of knowledge, concerning the **current development and implementation of active learning** across its members.



The Voice of Europe's Universities

Resources

Promoting active learning in universities: Thematic Peer Group Report

Report

28 January 2019

Active learning encompasses a broad range of pedagogical approaches involving the learner in every s...

Evaluation of learning and teaching: Thematic Peer Group Report

Report

24 January 2019

The evaluation of learning and teaching is one central activity through which universities monitor t...

Continuous Development of Teaching Competences: Thematic Peer Group Report

Report

16 January 2019

Higher education stakeholders are increasingly aware of the need for systematic continuous professio...

Career paths in teaching: Thematic Peer Group Report

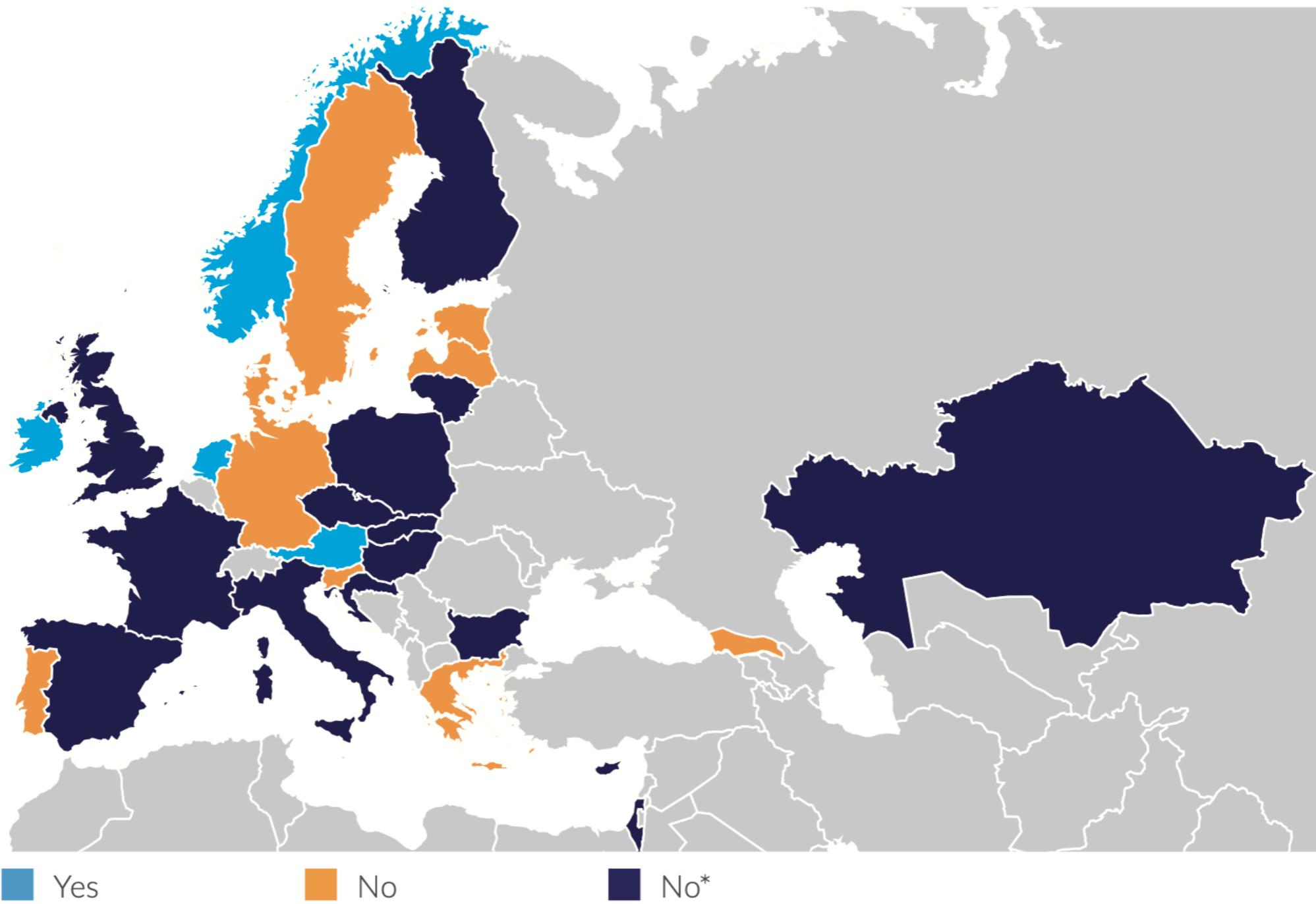
Report

14 January 2019

Attention to career paths in teaching and staff development, in order to enhance learning and teachi...

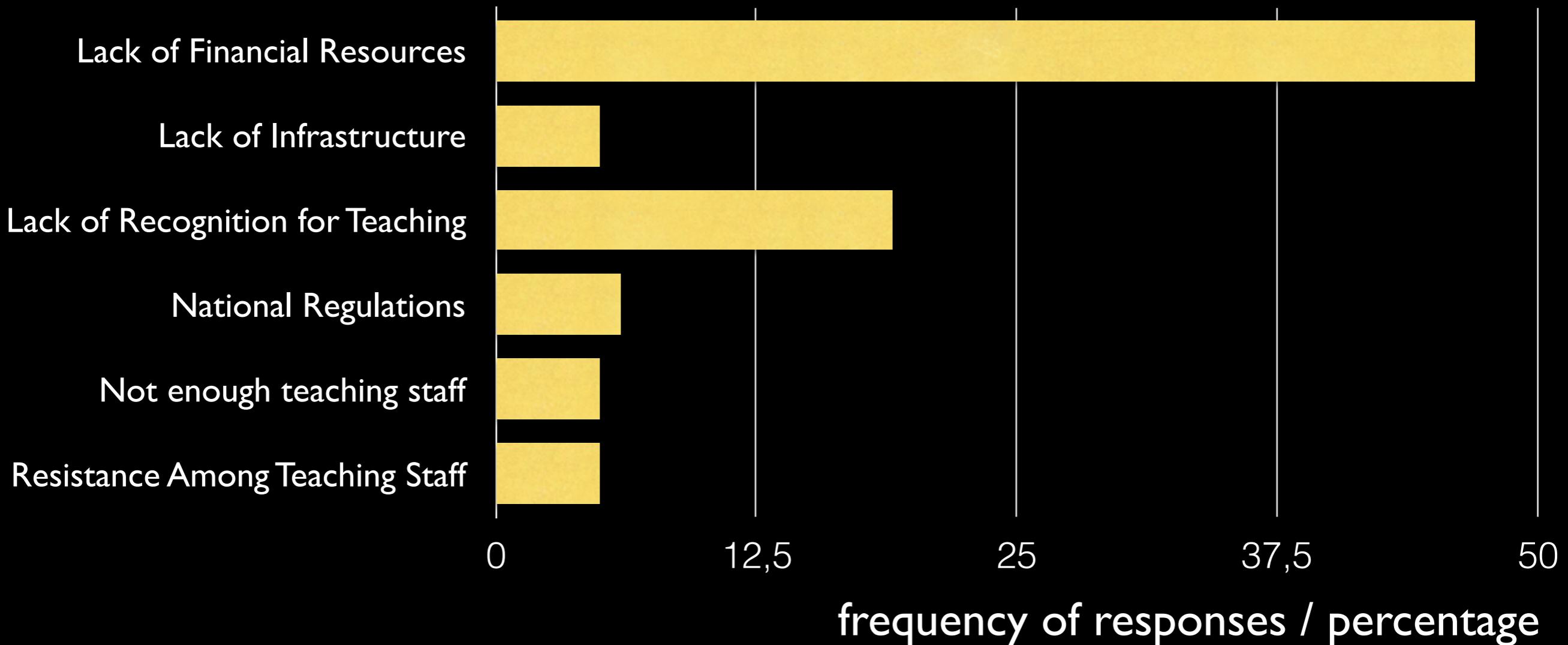
Status of development

Fig.1 – Dedicated national strategies for learning and teaching



* but mentioned in the overall strategy for higher education or in other strategic national documents

Obstacles to further progress



Trends from a EUA non-comprehensive survey, Q3 2018

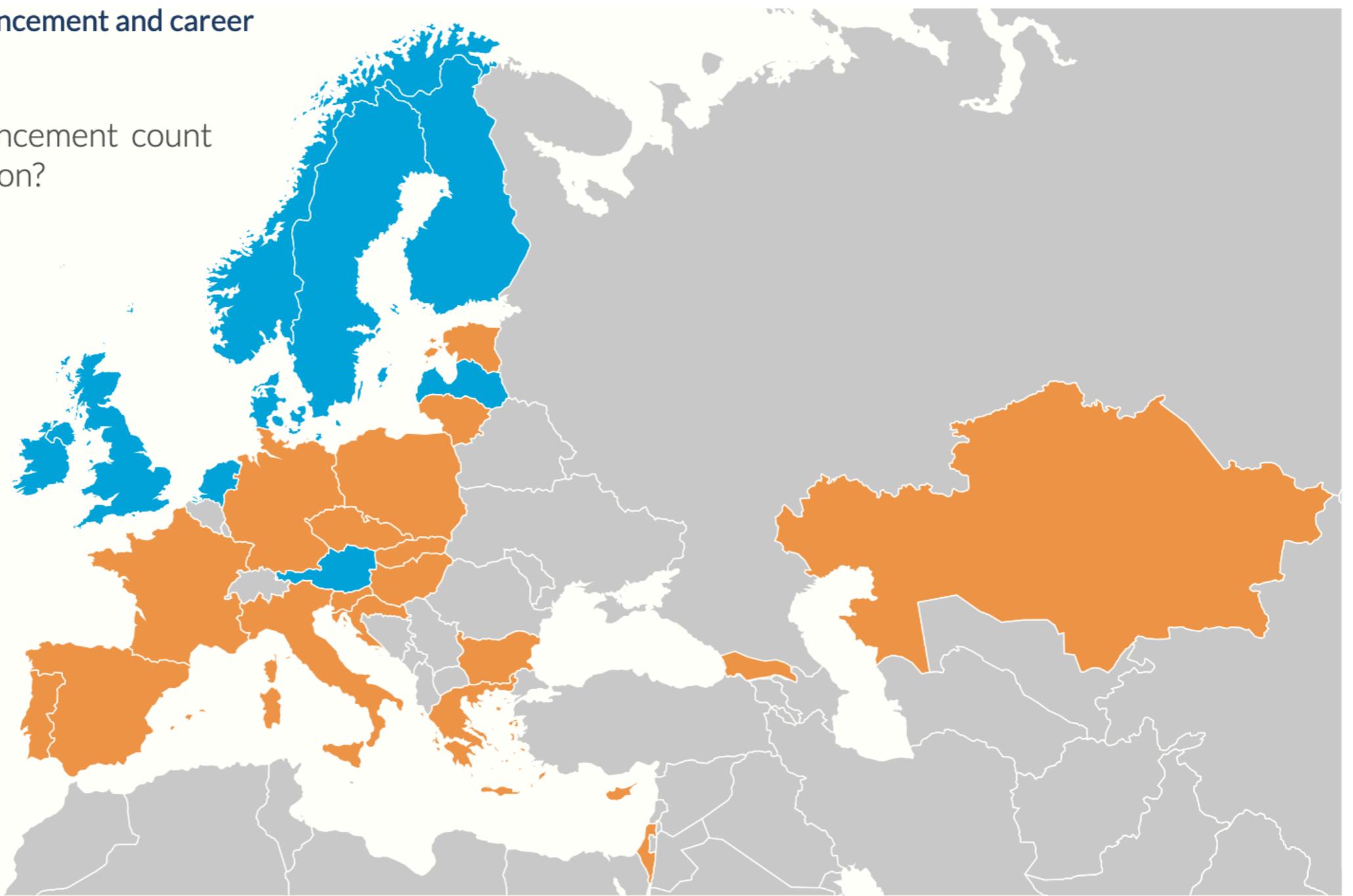
Teacher recognition

Fig.3 – Teaching enhancement and career progression

Does teaching enhancement count
for career progression?

Yes

No, very little



LEARNING & TEACHING PAPER #5

Promoting active learning in universities

Thematic Peer Group Report

Composition of the Thematic Peer Group ‘Promoting active learning in universities’

- Malmö University, Sweden: Cecilia Christersson and Patricia Staaf (chairs), Sissel Braekhus and Rickard Stjernqvist (students)
- Catholic University of Louvain, Belgium: Vincent Wertz
- Politecnico di Milano, Italy: Andrea Giulia Pusineri and Carlo Giovani (students), Susanna Sancassani and Paola Corti
- University Paris-Est Marne-la-Vallée, France: Gerald Lebigot (student) and Venceslas Biri
- University of Twente, The Netherlands: Xenia Una Mainelli (student) and Frank van den Berg

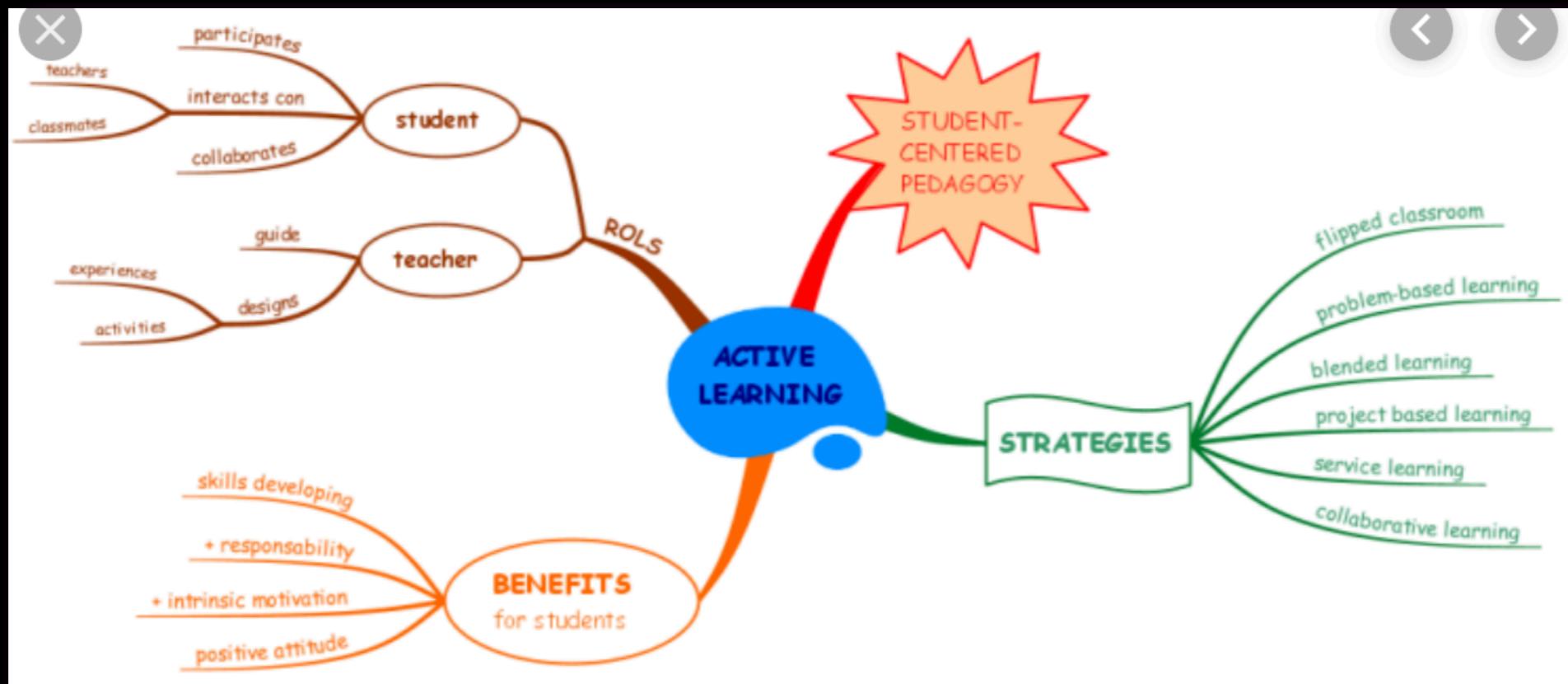
- The 30–people group was active during 2018
- Meetings in **Malmö** (April), **Cork** (June), **Enschede** (September) and **Porto** (November)
- Final gathering in **Warsaw** (February 19), during the **II Learning and Teaching Forum**
- Working formats: Presentation of participant institutions, Discussions, Hands-on, Brain-storming, Visits to Local Facilities, Summary

- Ruhr University Bochum, Germany: Robert Queckenberg (student), Kornelia Freitag and Susanne Lippold

- University of Barcelona, Spain: Xavier Giménez Font
- University College Cork, Ireland: Therese Collins and Aaron Frahill (students), Marian McCarthy and Catherine O’Mahony
- University of Lausanne, Switzerland: Loïc Pillard (student), Sylvestre Emmanuel and Marine Antille
- Coventry University, United Kingdom: Duncan Hookey and Grace Cappy (students), Ian Dunn and Andrew Turner
- Group coordinators: Goran Dakovic (Policy & Project Officer at EUA until August 2018), Helene Peterbauer (Policy & Project Officer) and Thérèse Zhang (Deputy Director, Higher Education Policy unit; both from August 2018 onwards)

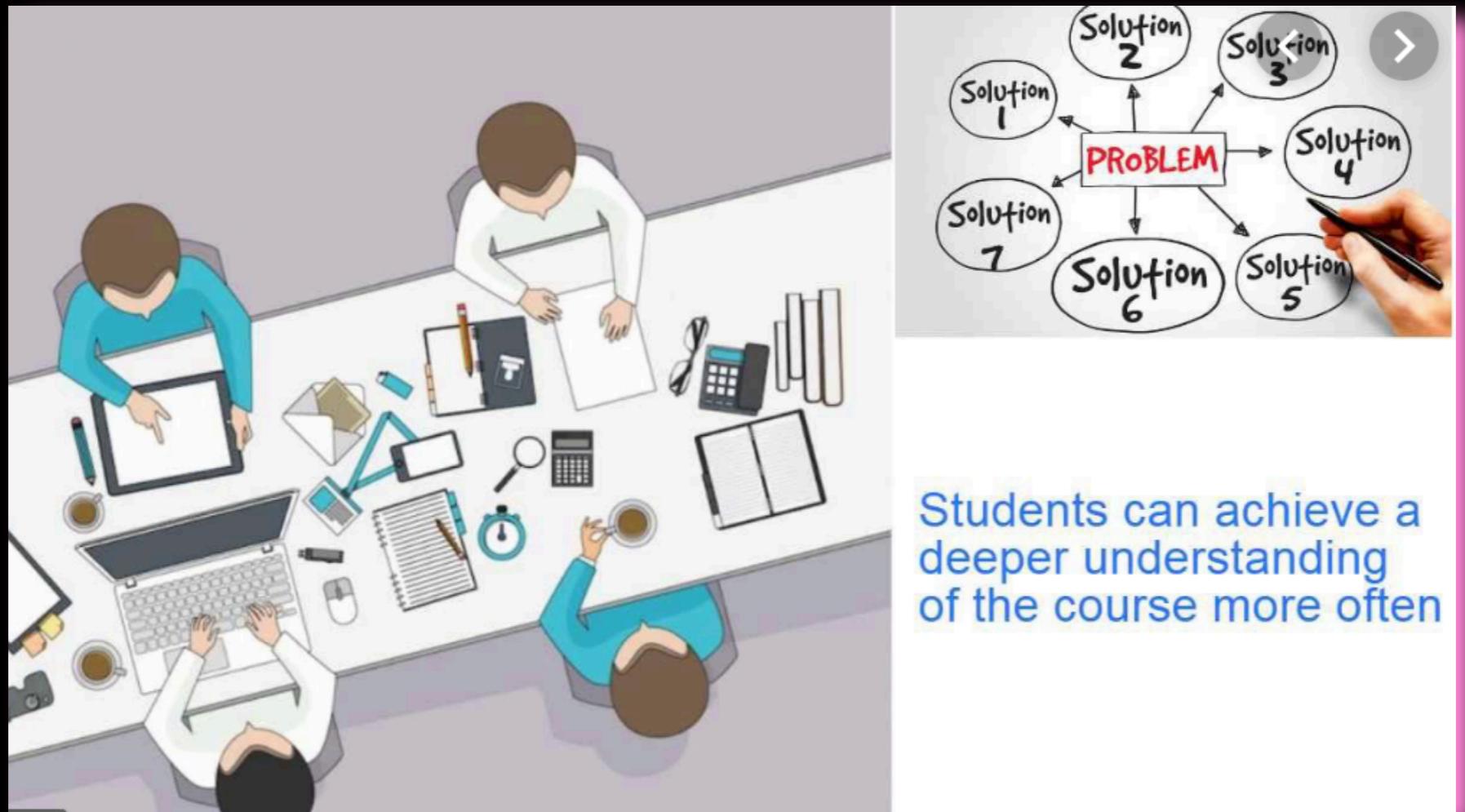
TPG Conclusions (I)

- **Active learning (AL)** has the potential to fundamentally shift the way **universities take responsibility** as drivers of societal and educational changes:
 - ★ Student centered, encompasses all learning styles, uses scientifically evidenced teaching methodologies;
 - ★ Oriented towards life-long and life-wide learning;
- **AL** provides possibilities for both students and teachers to redefine learning in higher education and to move beyond comfort zones into **collaborative learning and co-creation of knowledge**:
 - ★ It involves a **cultural shift** at all levels: institutional, student, stakeholders;
 - ★ Complete, multidisciplinary, international **networking**;



TPG Conclusions (II)

- **AL** is an educational philosophy, ensuring student development into active citizenship with global engagement, as well as ensuring involvement of all higher education stakeholders:
 - ★ It requires a proper **curriculum content, space**, as well as **assessment redesign**;
 - ★ Theory and practice properly related, balanced and taught according to **pedagogically sound strategies**;
 - ★ Pedagogic approaches proceed **from reality to abstraction**, e.g. by using **authentic** (i.e. real-life), practical tasks as starters for learning;



TPG Conclusions (III)

- Formative assessment leads to complete abandonment of classical assessment;
- Continuous professional development offered to teachers, **teaching status leveled with research**;
- **AL** should be part of universities' strategies to observe their societal mission and a part of education for sustainable development:
 - ★ A **compulsory, unique means** for embracing **sustainable development goals** (SDG) of 21st century modern society.



Specific Cases

How to start active learning (I)

- The move from classical (passive) to active learning is by no means easy, nor immediate!
- It involves a cultural shift at all levels, which may lead to struggling for years.
- Once you are convinced, you must be aware that student's won't be happy with the change.
- Students **need the same information that you have**, since they have to understand what and why they are doing the move.
- The transformation needs **time and space:**
 - Time for combining the general aspects of active learning, with the specifics of your students, degree and subject.
 - Space for providing a natural setting oriented towards collaborative work



Rafael Porlán (Coord.)



How to start active learning (II)

- Prof. Rafael Porlán and his group, at the University of Seville (Spain), are providing a **magnificent three-year (!) course**
- They've been training classical teachers for the transition, since 2014, having had more than **600 teachers in their courses**
- Teachers participate while they are actually teaching. It's a mandatory condition.
- During first year, **changes are made on one chapter only** of your subject.
- Most of the first-year work is devoted to adapt the teacher to her **new, coaching, conducting** role.

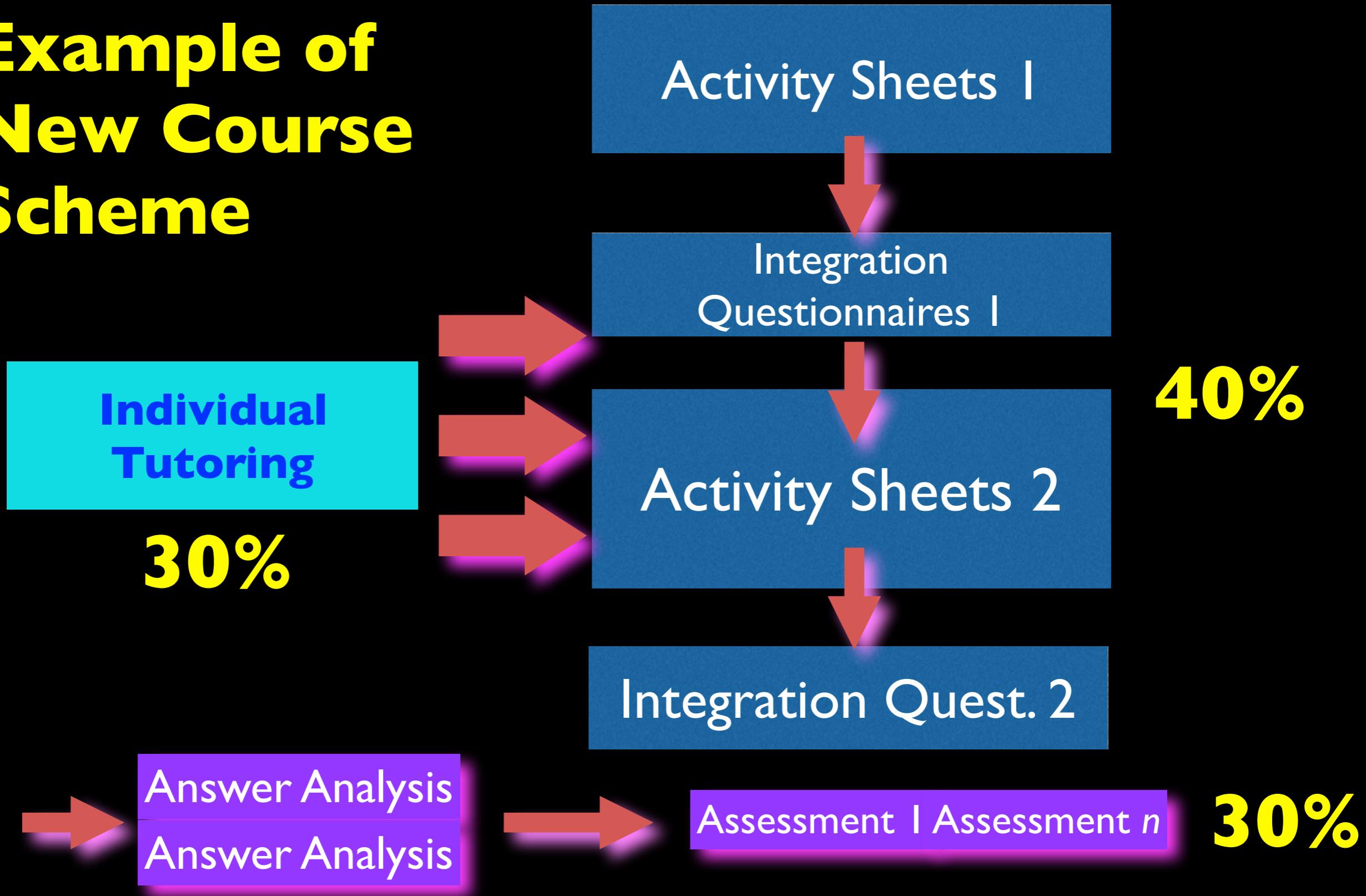


How to start active learning (III)

- Second year deals with a second chapter of your subject
- Corrections are made also on the first chapter, according to the experience gained during first year
- Finally, **third year involves changing the remaining course chapters.**
- First and second year proposals are corrected again, during this year.
- The methodology is therefore called **“Improving Cycles for the Move to Active learning”**
- It may be applied to any specific active learning methodology, i.e. **it is valid for any of the current proposals** (flipped classroom and any variant, problem/project based learning, ...)



Example of New Course Scheme



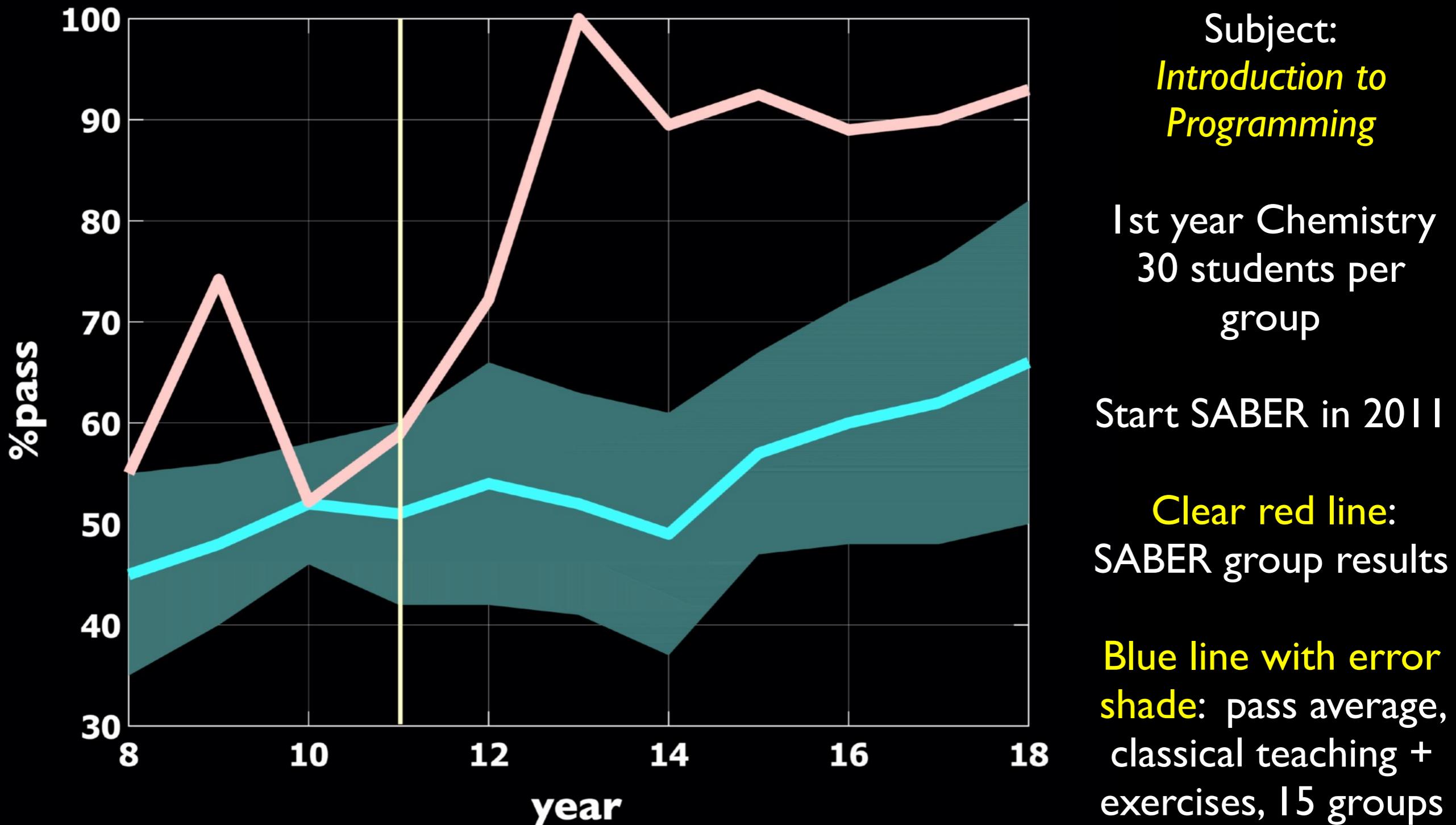
$$\begin{aligned}\text{Evaluation} = & (4 \cdot \text{Integration Questionnaires}) \cdot 0.4 + (2 \cdot \text{Answer Analyses}) \cdot 0.3 \\ & + (\text{Classwork} + \text{Ind.Tutoring}) \cdot 0.3\end{aligned}$$

How do we select new material?

- Advances in neuroscience and cognitive psychology suggest that content selection should be based on:
 - **Core ideas**
 - **Cross-cutting concepts**
 - **Science practices**
- that is, content that really helps students in their learning...
- ... and make **transferable** the resulting knowledge, which means **being able of using it in different contexts**.
- We do not have available a “magical recipe” by which efficient new content is readily developed.
- This is a key issue **that should concentrate a large part of our future professional activity**.

Arévalo, Gamallo, Giménez: “*SABER 2.0 in STEM: Rewarded Correction and Subject Content – Active Learning practical matching strategies*”. REIRE 11 (2) (2018).

How does active learning work?



Comparison based on the **same list of exercises** to be worked out during the course, the **same final exam**, as well as the **same correction criteria** of this final exam.

SABER Current experience (ongoing)

- Introduction to Programming (1st year, Chemistry): 2011–2016, 2018–19
- Chemistry (1st year, Geological Engineering): 2012 partially, 2013–2015
- Environmental Chemistry (4th year, Chemistry): 2014 partially, 2015–19
- Physical Chemistry of Materials (2nd year, Materials Engineering): 2015–19
- Applied Thermodynamics (2nd year, Chemical Engineering): 2017 (*)

UB RIMDA Program

www.ub.edu/rimda

University of Barcelona has launched **Campus Active Learning** programs, by which tutored moves from classical to active learning teaching are promoted. Such moves encompass three years, in order to facilitate getting acquainted with the specifics of the new methodology. Several hundred teaching staff joined such program, since 2017, being under development in **Health, Experimental and Social Science campuses.**

Previous analyses point that may be we should question everything, concerning education

- David Didau: “**What if everything you knew about education was wrong?**”. Crown House Publishing Limited, UK, 2015.
- Three principles on which **we should not compromise**:
 - students are **respectful, hard-working and cooperative**.
 - **Institutions support teachers**, to allow professional excellence through reflection and development.
 - **powerful knowledge is the right of every student**.

Every student is willing to learn...

... even though they make every effort to show the opposite

Moltes gràcies!!