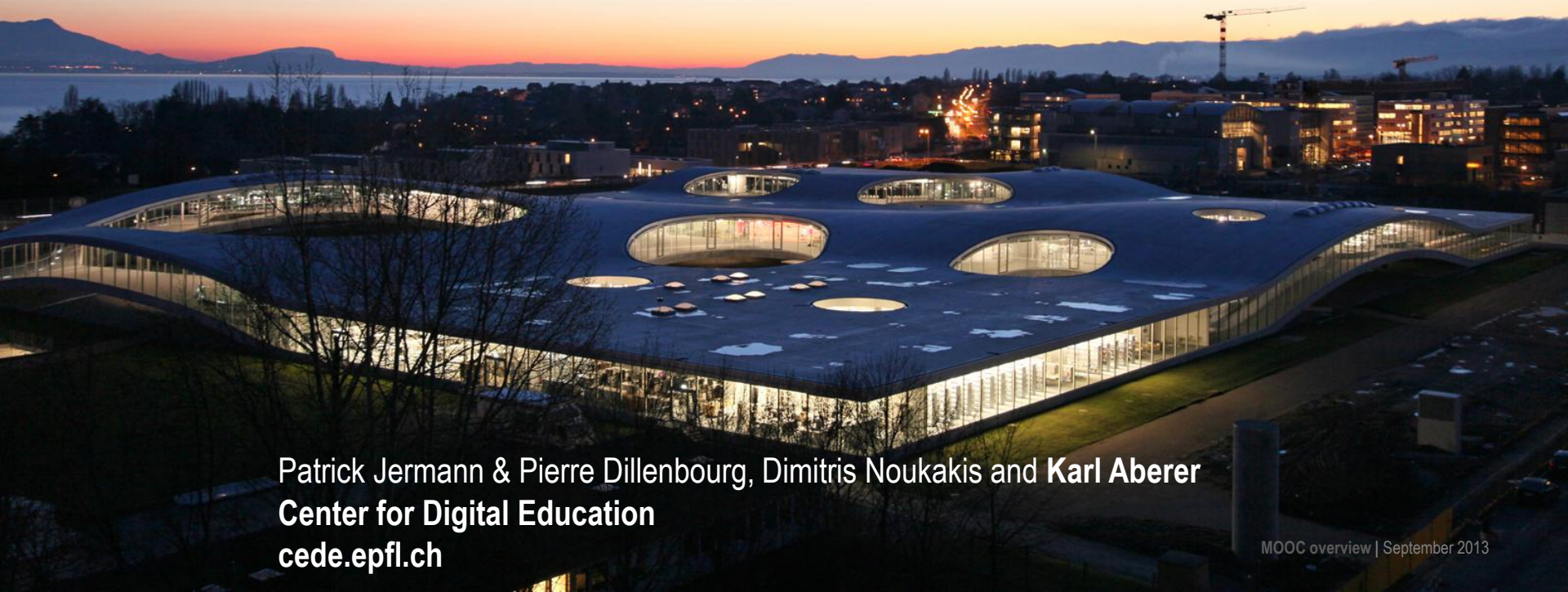


# MOOCs @ EPFL - September 2013

[moocs.epfl.ch](http://moocs.epfl.ch)



Patrick Jermann & Pierre Dillenbourg, Dimitris Noukakis and **Karl Aberer**  
Center for Digital Education  
[cede.epfl.ch](http://cede.epfl.ch)

# Big Question

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Why should a (European) university engage in MOOCs?

Immediate answer

- High global visibility
- Better be an actor than a spectator

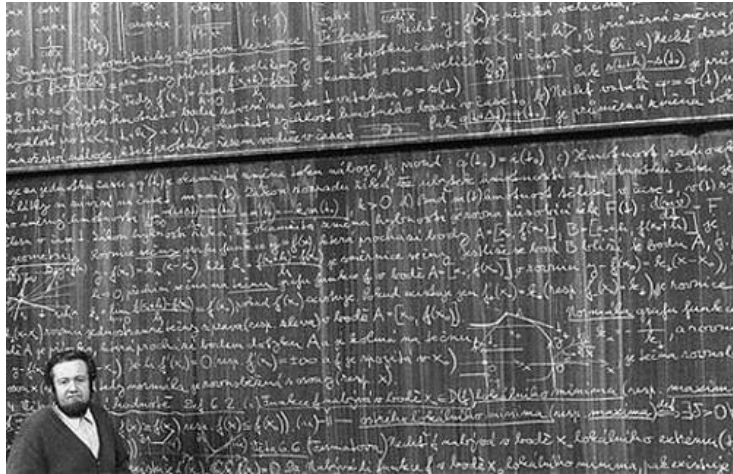
Obvious opportunity

- We see a lot of potential in improving teaching, e.g., through having more data and high quality courses

Long-term perspective

- Opens opportunities to contribute to and enlarge the mission of the university
- Continuous education, international networking and outreach to developing countries

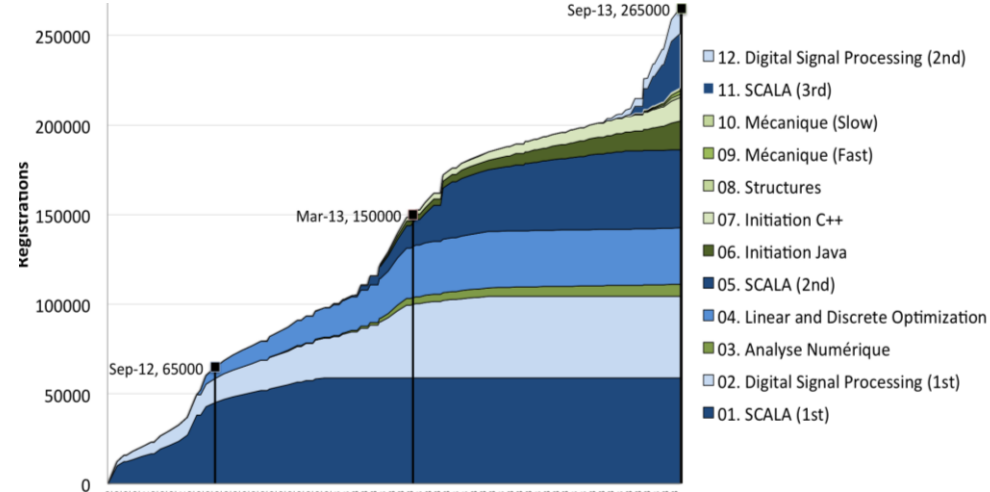
# MOOCs = Massive Open Online Courses



One university professor

10'000

students in a lifetime

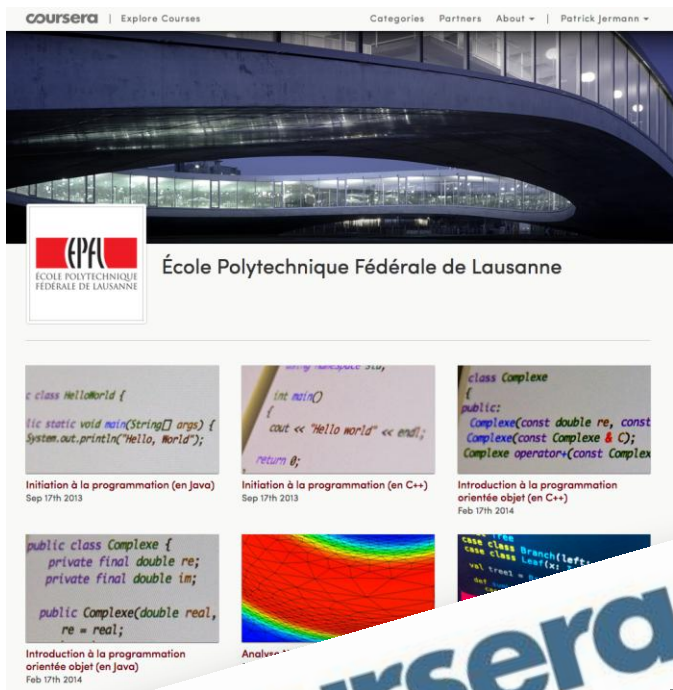


Ten EPFL professors


265'000

students in a year

# Platforms



coursera | Explore Courses Categories Partners About | Patrick Jermann ▾

 École Polytechnique Fédérale de Lausanne

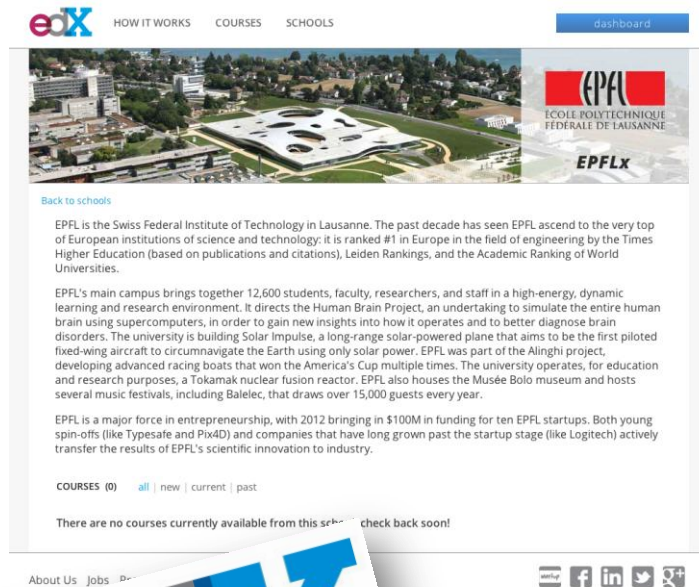
`class HelloWorld {  
 public static void main(String[] args) {  
 System.out.println("Hello, World");  
 }  
}`  
Initiation à la programmation (en Java)  
Sep 17th 2013

`int main()  
{  
 cout << "Hello world" << endl;  
 return 0;  
}`  
Initiation à la programmation (en C++)  
Sep 17th 2013


`class Complexe  
{  
public:  
 Complexe(const double re, const  
 Complexe(const Complexe & C);  
 Complexe operator+(const Complexe  
 & C) const;  
};`  
Introduction à la programmation  
orientée objet (en C++)  
Feb 17th 2014

`public class Complexe {  
 private final double re;  
 private final double im;  
  
 public Complexe(double real,  
 re = real;  
 im = im;  
 }  
}`  
Introduction à la programmation  
orientée objet (en Java)  
Feb 17th 2014

**coursera**



edX HOW IT WORKS COURSES SCHOOLS dashboard

 ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE  
EPFLx

Back to schools

EPFL is the Swiss Federal Institute of Technology in Lausanne. The past decade has seen EPFL ascend to the very top of European institutions of science and technology: it is ranked #1 in Europe in the field of engineering by the Times Higher Education (based on publications and citations), Leiden Rankings, and the Academic Ranking of World Universities.

EPFL's main campus brings together 12,600 students, faculty, researchers, and staff in a high-energy, dynamic learning and research environment. It directs the Human Brain Project, an undertaking to simulate the entire human brain using supercomputers, in order to gain new insights into how it operates and to better diagnose brain disorders. The university is building Solar Impulse, a long-range solar-powered plane that aims to be the first piloted fixed-wing aircraft to circumnavigate the Earth using only solar power. EPFL was part of the Alinghi project, developing advanced racing boats that won the America's Cup multiple times. The university operates, for education and research purposes, a Tokamak nuclear fusion reactor. EPFL also houses the Musée Bolo museum and hosts several music festivals, including Balelec, that draws over 15,000 guests every year.

EPFL is a major force in entrepreneurship, with 2012 bringing in \$100M in funding for ten EPFL startups. Both young spin-offs (like Typesafe and Pix4D) and companies that have long grown past the startup stage (like Logitech) actively transfer the results of EPFL's scientific innovation to industry.

COURSES (0) all | new | current | past

There are no courses currently available from this school. Check back soon!



About Us Jobs

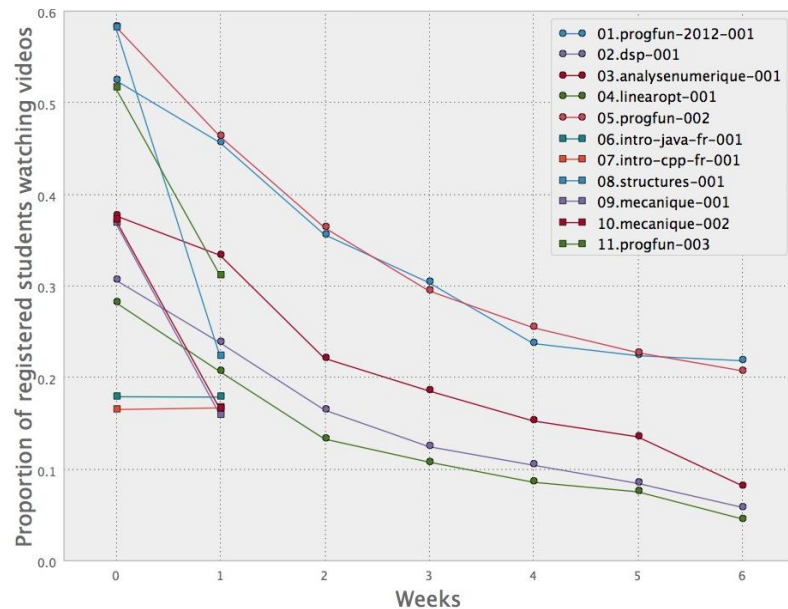
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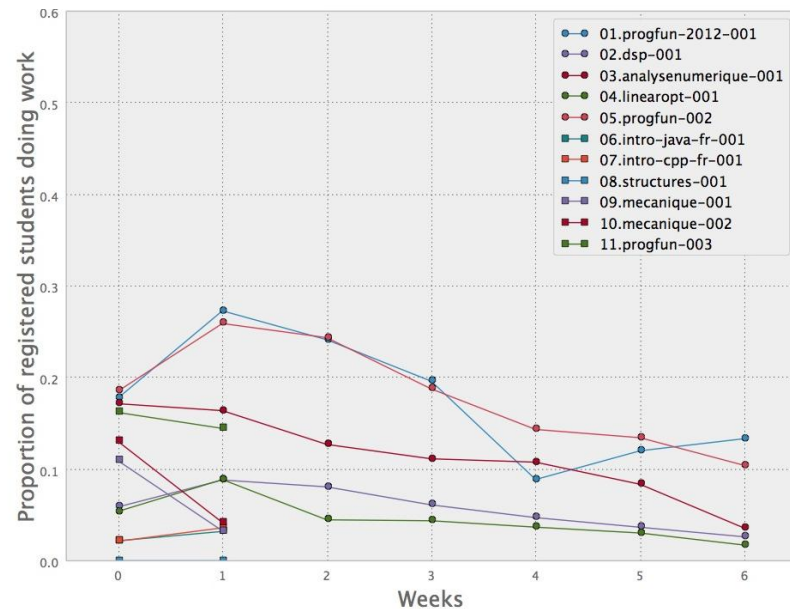
# Retention rates [ N=11 courses ]

## Video retention



Students who come watch videos

## Work retention



Students who do assignments

# After the tsunami: the flipped classroom

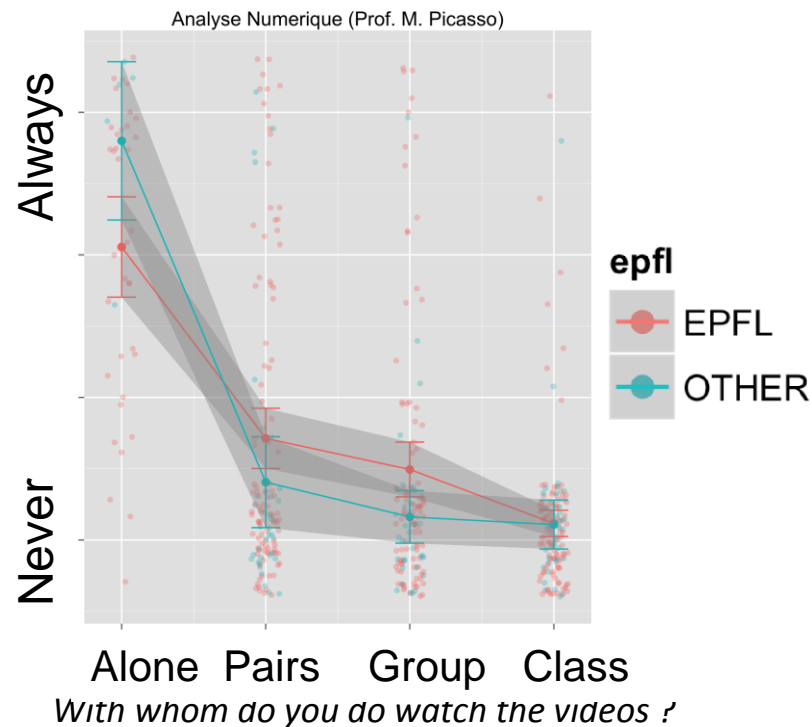
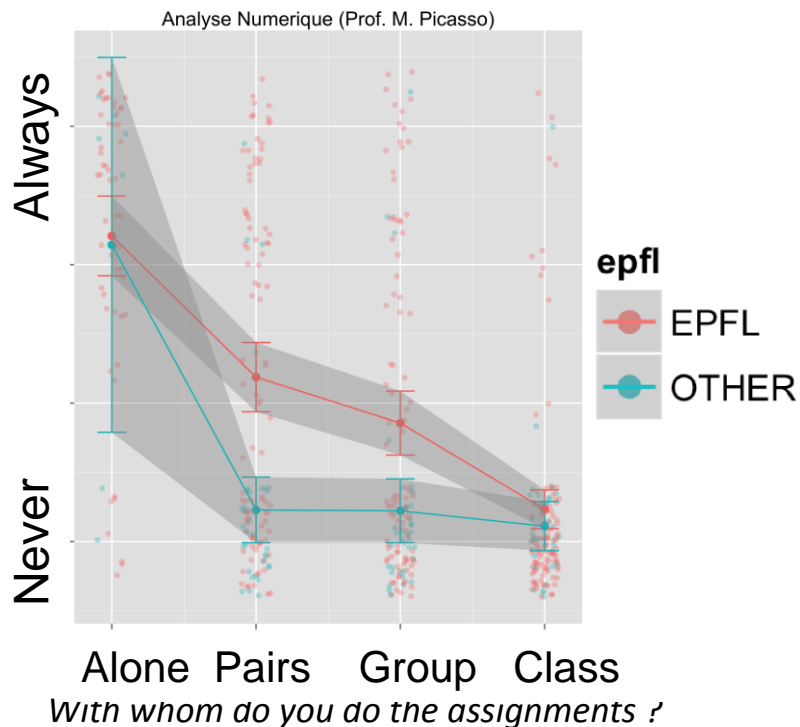
- MOOCs and face to face
- Videos for knowledge transmission
- Quizzes and Assignments
  - Personalization
  - Autonomy
- Face to face time for interaction
  - With teachers (e.g. deepening concepts)
  - With learners (e.g. watching videos)



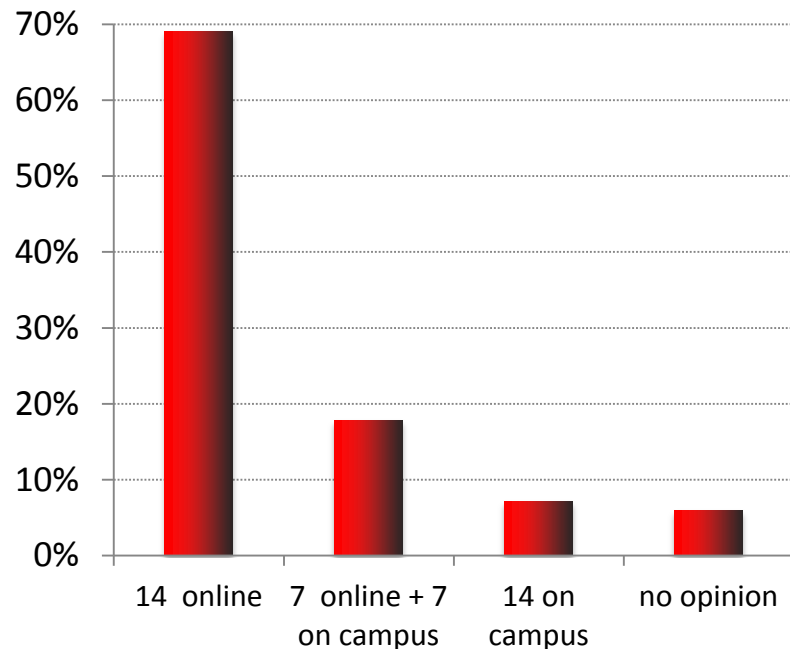
TEAL classroom (MIT)

# MOOCs and group work

[Picasso, Analyse Numérique, N=158]



# Students' & Professors' voice



«In the future, I would prefer to take this course.... »

## • Students

- appreciate flexibility
- like watching the course in groups
- want the contact with the professors
- are concerned about data privacy

## • Professors

- invest a huge energy
- take a risk to open their teaching
- strive for excellence



# International Networking

Education delivered across geographic, economic and societal boundaries

## Europe

- Eurotech collaboration: continued education for sustainability and life science
- First European MOOCS summit (June 6-7): huge interest
- EMOOC conference: 10-12 February 2014, [www.emoocs2014.eu](http://www.emoocs2014.eu)

## Developing countries

- RESCIF network: interest from African universities
- Africa: sabbatical of president Patrick Aebischer

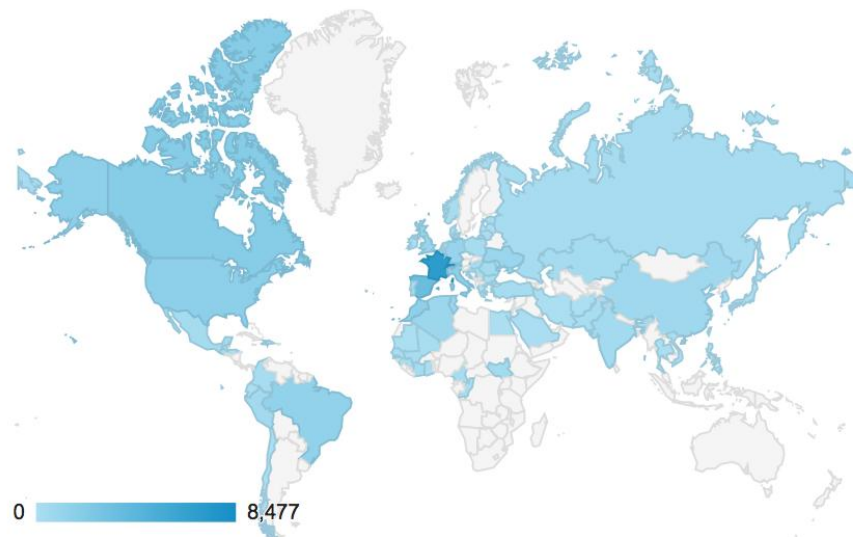
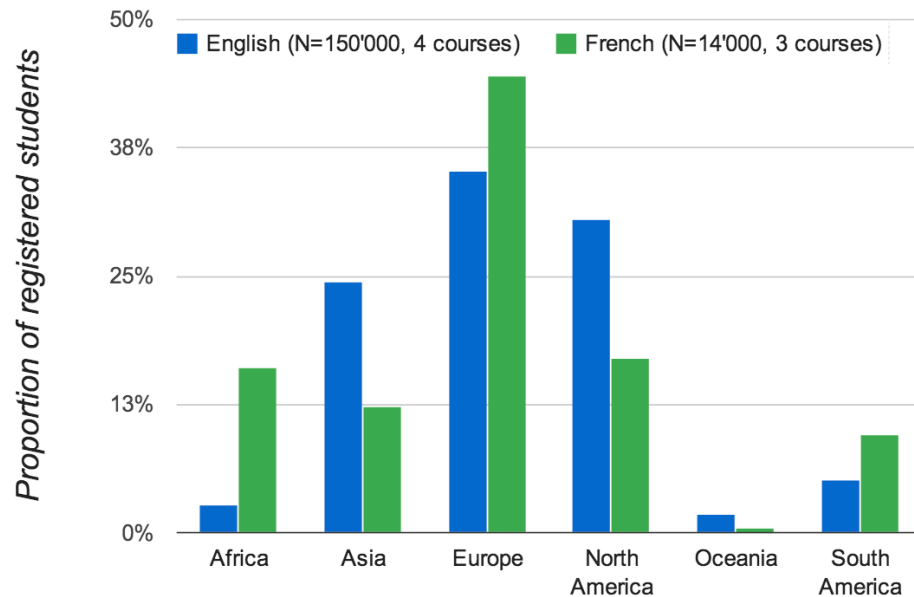


- The **policy** track
  - forum for decision-makers in Higher Education: University leaders as well as for in local, regional, national or European authorities. Chair: Mariana Losada, AMUE, France
- The **experience** track
  - forum for sharing experience among practitioners, i.e. MOOC teachers plus those involved in producing MOOCs. Chair: Carlos Delgado Kloos, Universidad Carlos III de Madrid, Spain
- The **research** track
  - standard research conference (computer science, learning sciences, instructional psychology, HCI,...). Chair: Ulrike Cress, KMRC, Tübingen, Germany
- The **corporate** track
  - set of panels, exhibitions and contacts with and among the providers and consumers of MOOCs in academic and corporate training. Chair: Michel Benard, Google, Switzerland.

# MOOCs in Africa

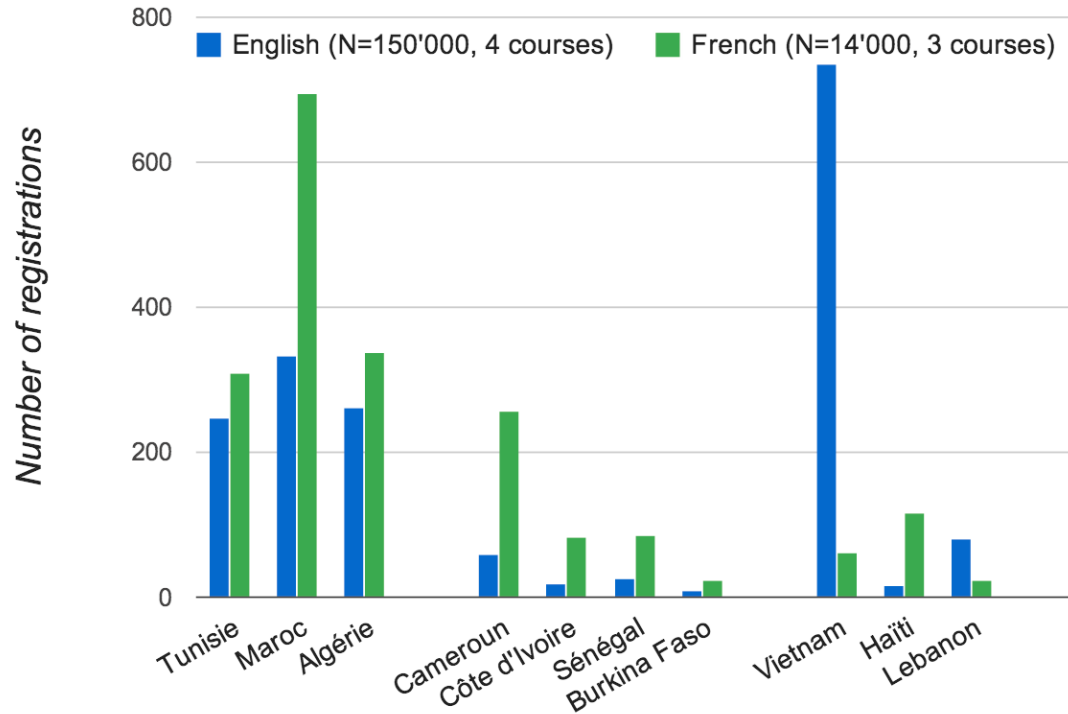


# Geographical distribution [ N=7 courses, 164'000 registrations ]



Initiation à la programmation en C++

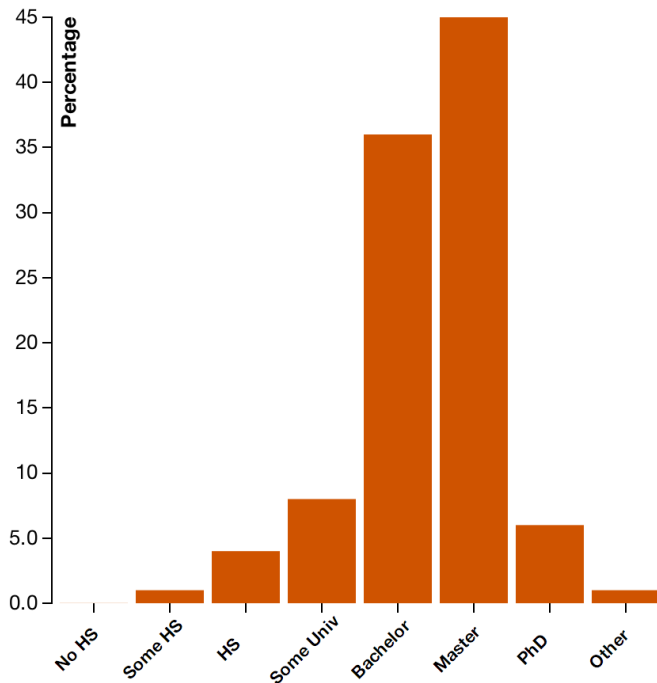
# Geographical distribution [ N=7 courses, 164'000 registrations ]





# Students' profile

PARTICIPANTS' HIGHEST DEGREES



- The average age 26 years
- Educated, with 34% bachelor's and 31% having a master's degree.
- > 90% cite “life-long learning,”
- 79% to advance their career
- 51% of students want a certificate
- Want entry-level courses where they can apply the knowledge learned to their every day life.

*edX Partner News 20, august 2013*

# Starting fall 2013



## Functional Programming Principles in Scala

**Martin Odersky**

Learn about functional programming, and how it can be effectively combined with object-oriented programming. Gain practice in writing clean functional code, the Scala programming language.

>>

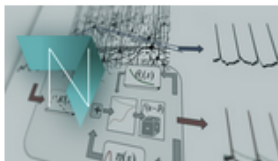


## Digital Signal Processing

**Paolo Prandoni and Martin Vetterli**

Learn the fundamentals of digital signal processing theory and discover the ways DSP makes everyday life more productive and fun.

>>



## Neuronal Dynamics - Computational Neuroscience of Single Neurons

**Wulfram Gerstner**

This course gives an introduction to the field of theoretical and computational neuroscience with a focus on models of single neurons. Neurons encode information about stimuli in a sequence of short electrical pulses (spikes).

>>



## Principles of reactive programming

**Martin Odersky**

Learn how to write composable software that is event-driven, scalable and resilient and responsive in the presence of failures. Model systems after human organizations or inter-human communication.

>>



## L'art des structures 1

### Câbles et arcs

L'art des structures propose une découverte du fonctionnement des structures porteuses, telles que les bâtiments, les toitures ou les ponts. Ce cours présentera les structures en câbles et en treillis, en poutres et en cadre.



## Physique générale - mécanique

**Jean-Philippe Ansermet**

Polytechnique Fédérale de Lausanne, un cours de physique générale pour la formation de tous les futurs ingénieurs et scientifiques. Le présent cours de mécanique en fait partie. Il a pour but de leur apprendre à transcrire un phénomène physique en langage mathématique.

### Initiation à la programmation (en Java)

**Jamila Sam, Vincent Lepetit et Jean-Cédric Chappelier**

Ce cours initie à la programmation en utilisant le langage Java. Il n'y a pas de connaissance préalable. Les aspects plus avancés (programmation orientée objet) sont donnés dans un cours suivant, «Introduction à la programmation orientée objet (en Java)».

>>



### Initiation à la programmation (en C++)

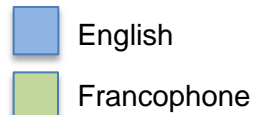
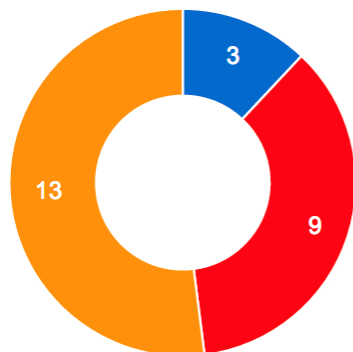
**Vincent Lepetit, Jean-Cédric Chappelier et Jamila Sam**

Ce cours initie à la programmation en utilisant le langage C++. Il n'y a pas de connaissance préalable. Les aspects plus avancés (programmation orientée objet) sont donnés dans un cours suivant, «Introduction à la programmation orientée objet (en C++)».

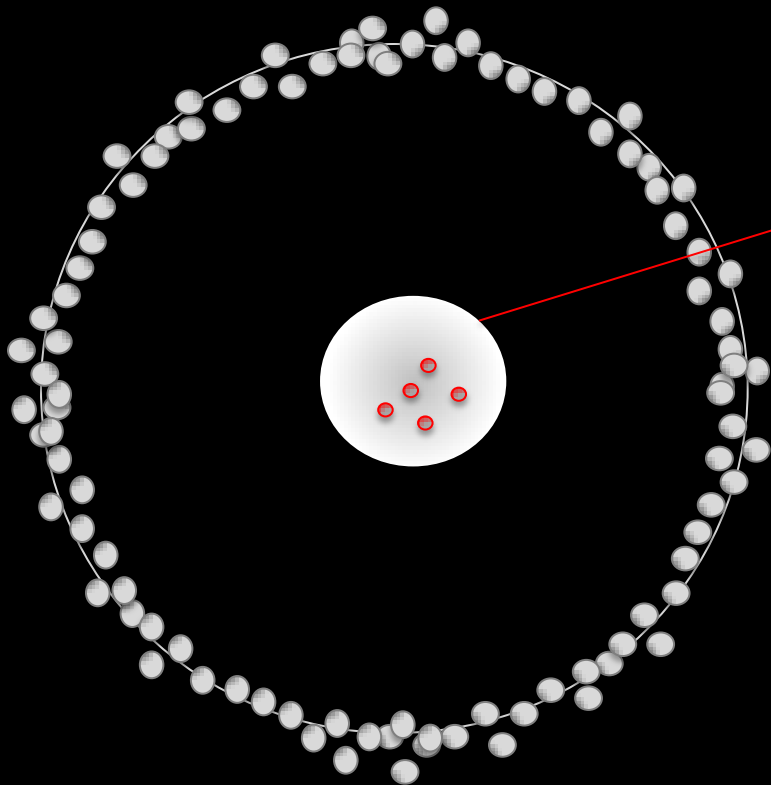
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# EPFL MOOCs [ 25 courses total ]

Type



		Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014
Odersky	SCALA 1	x				
Fritz Eisenbrand	Linear Discrete Optimization		x			
Marco Picasso	Analyse Numérique		x			
Paolo Prandoni & Martin Vetterli	Digital Signal Processing		x			
Odersky	SCALA 1-2	x				
Tobias Kippenberg, Christophe Moser	Theory and applications of lasers			x		
George Candea	Software Engineering			x		
Katerina Argyraki	Principles of Computer Systems			x		
Jérôme Chenal	La ville africaine			x		
Christian Zurburg, Rick Johnston	Save drinking water at households			x		
Jean-Daniel Nicoud, Yves Rochat	Comprendre les microcontrôleurs			x		
Jamila Sam, Vincent Lepetit et Jean-Cédric Chappelier	Initiation à la programmation en JAVA			x		
Vincent Lepetit, Jean-Cédric Chappelier et Jamila Sam	Initiation à la programmation en C++			x		
Wulfram Gertsner	Neuronal Dynamics			x		
Aurelio Muttoni & Olivier Burdet	L'art des structures			x		
Jean-Philippe Ansermet	Physique Générale			x		
Martin Odersky	SCALA 2			x		
Christophe Ancey, François Gallaire	Mécanique des fluides				x	
Pierre-Yves Gilliéron & Bertrand Merminod	Eléments de Géomatique				x	
Jacques Levy	Explorer l'espace des humains				x	
Jamila Sam, Jean-Cédric Chappelier et Vincent Lepetit	Programmation OO en Java				x	
Jean-Cédric Chappelier, Jamila Sam et Vincent Lepetit	Programmation OO en C++				x	
Yves Perriard, Paolo Germano	Electrotechnique I & II				x	
William Pralong, Bernard Rossier	Pharmacologie et Pharmacocinetiques				x	
Luca Ortelli	History of Housing					x



## The MOOC

### Factory

- Producing MOOCs
- Flipped classroom
- Operating platforms
- Data Analytics
- Operating Moodle
- Tools & Services

**EPFL** Center for Digital

# MOOC Studio



Design



Record



Review



Edit



Check



Publish



Design

Record

Review

Edit

Check

Publish

# Video production



Thierry Parel

10 MOOCs to produce in 3 month  
10 man/months editing =>  
300% editor FTE for three month

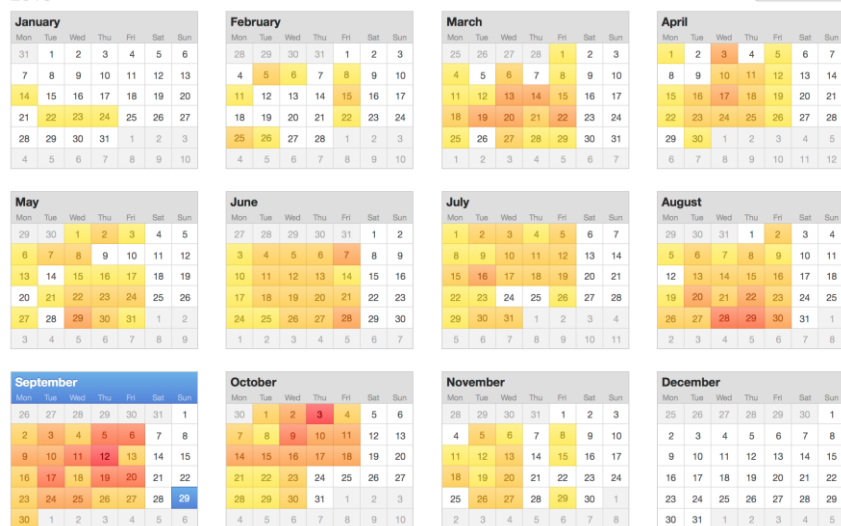
- 1 unit = 7-15 minutes
- 1 unit => 1 hour studio
- 1 unit => 4 hours editing
- 1 MOOC week = 5 units
- 1 week = 5 hours studio
- 1 week = 20 hours editing
- 1 MOOC = 7 weeks
- 1 MOOC = 35 hours studio
- 1 MOOC = 4 weeks editing

# 2 studios = 1 central + 1 IC faculty



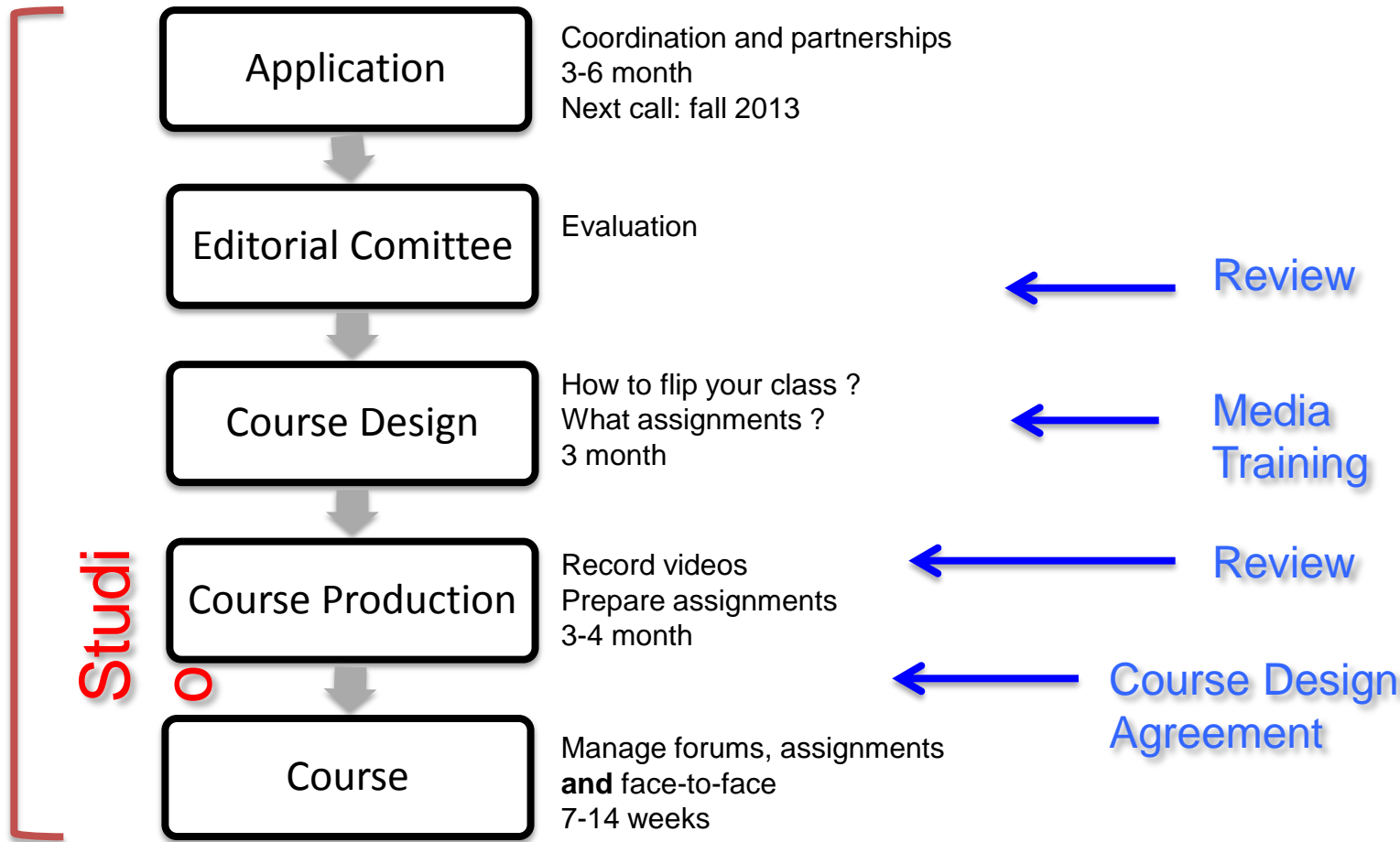
# Production Scheduling Challenges

2013



- Different working styles
  - Last-minute MOOCs (2 month)
  - Long term planners (6 month)
- Several deadlines
  - September (start of term)
  - October (mid-term)
- Capacity
  - Max 8 MOOCs per week in 1 studio
  - 1 MOOC = 10 sessions
  - 100 sessions in three month

# The MOOC



# The MOOC

	Time	Milestone	Duration (est.)	Work to be completed
1	D-8 month	Application		
1	D-6 month	<u>Editorial Committee</u>		
2	D-5 month	Course Design	1-2 weeks	<ul style="list-style-type: none"> <li>Define the structure of one week of instruction =&gt; <b>Video Lecture Scenario</b></li> <li>Cut the course into 7/14 weeks, each week consists of 5-6 small units of 7-12 minutes which each cover 1 concept.</li> <li>Identify Existing Material to be integrated and</li> <li>Define assignments (MCQ, peer assessment, programming assignments)</li> </ul>
2	D-5 month	Media Training	2 hours	<ul style="list-style-type: none"> <li>Slide Design (what happens on the screen) =&gt; <b>MOOC Media Template</b></li> </ul>
3	D-4 month	Prototype Week	1 week (Prof) 1 week (CEDE)	<ul style="list-style-type: none"> <li>Design slides according to the Video Lecture Scenario</li> <li>Record and edit the video</li> <li>Hire video assistant</li> </ul>
3	D-4 month	Review Meeting	2 hours (Prof) 2 days (CEDE)	<ul style="list-style-type: none"> <li>Reflect on quality of video / feedback</li> <li>Define rules for video editors</li> </ul>
4	D-3 month	Teaser	2 days (Prof) 1 week (CEDE)	<ul style="list-style-type: none"> <li>Prepare scenario (text + illustrations)</li> <li>Record in studio and edit</li> </ul>
4	D-3 month	Landing page	2 days	<ul style="list-style-type: none"> <li>Describe course on platform (text + teaser)</li> <li>Create professor(s) pages</li> </ul>
4	D-2 month	<u>Course Description Agreement</u>		<ul style="list-style-type: none"> <li>For coursera courses, defines the content, copyright and period of delivery</li> </ul>
5	D-3 month	Productions weeks 2-7	3 month	<ul style="list-style-type: none"> <li>Studio work, video editing</li> <li>1 hour video = 2-4 hours studio = 20-40 hours editing</li> </ul>
6	D-Day	Course Opening		
6		Delivery	7-14 weeks	<ul style="list-style-type: none"> <li>post weekly announcement</li> <li>monitor forum &amp; supervise assignments</li> </ul>



# (Potential) Effects of MOOCs

---

## Resources at universities

- Less need for big classrooms, more need for small classrooms
- Less ex-cathedra teaching, more face-to-face contact
- Less resources needed?

## Academic system: MOOCs ...

- redefine boundary between academia and professional life
- favor mobility (ECTS, opportunity for Europe)
- more specialization in academia (teacher, researcher, ...)
- require fair use of student data and data protection

## Social Impact

- MOOCs will make knowledge accessible to disfavored people
- Risk of two class education (MOOCs vs on campus)
- Competition in knowledge work market will become global



# Better be an actor than a spectator