EPFL MOOCs

Lessons learned

Prof. Pierre Dillenbourg

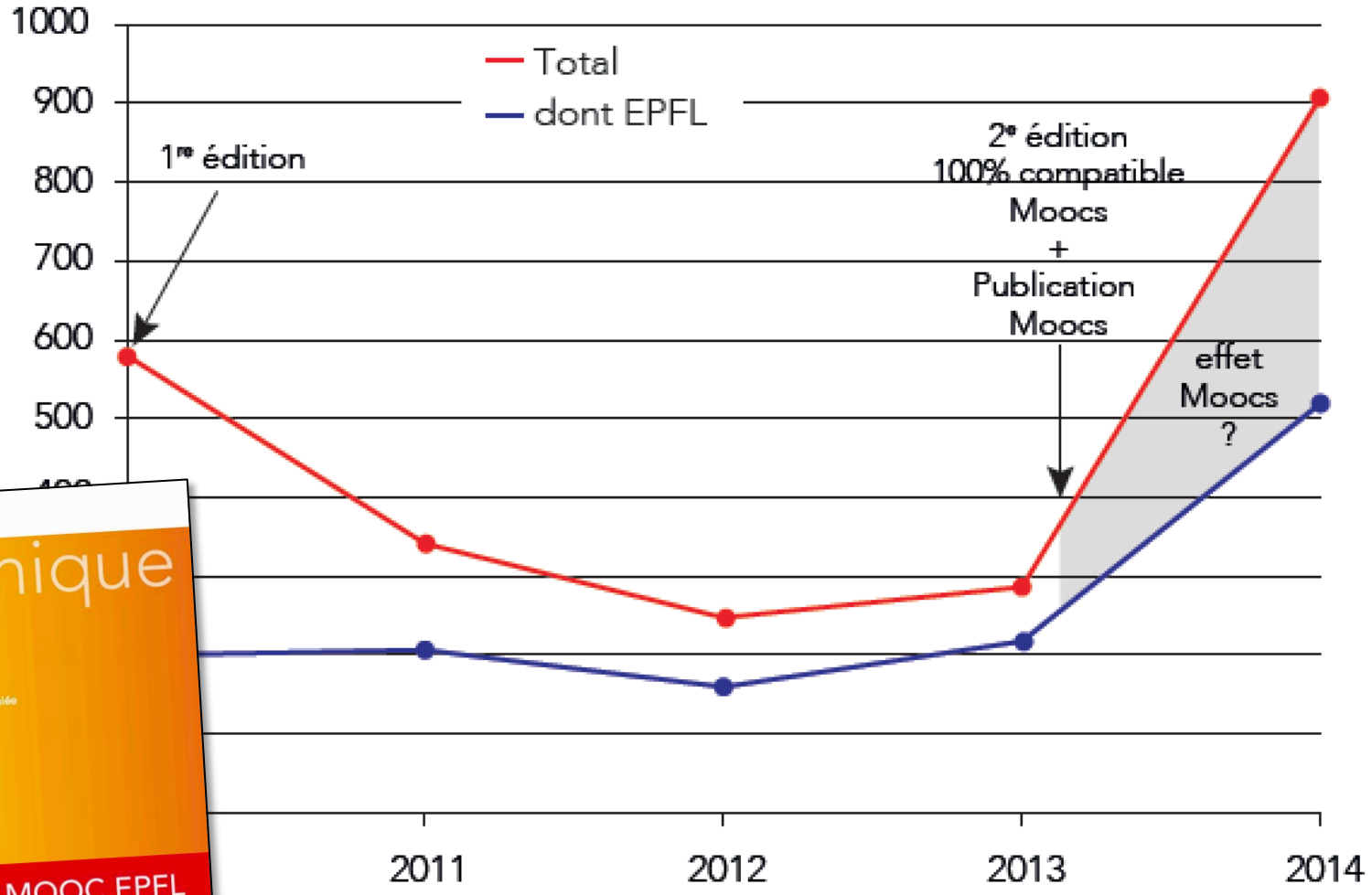
Data from F. Pinto and P. Jermann

http://www.cgarchitect.com/

EPFL Center for Digital Education.

Rolex Learning Center

Mécanique, de J.-Ph. **Ansermet**



Presses polytechniques
et universitaires romandes
Publisher of the EPFL Press

Functional Programming Principles in Scala	M. Odersky	EN	Bs	Functional programming; object-oriented programming; Scala programming language.
Digital Signal Processing	P. Prandoni, M. Vetterli	EN	Ms	Digital signal processing theory, algorithms, and applications.
Linear and Discrete Optimization	F, Eisenbrand	EN	Bs	Linear and discrete optimization in the context of computational mathematics.
Analyse numérique pour ingénieurs	M. Picasso	FR	Bs	Basic numeric analysis tools; solving numerical differential equations.
Mécanique I	J.-P. Ansermet	FR	P	Mathematical description of physical phenomena; Newtonian mechanics.
L'Art des Structures I: Câbles et arcs	A. Muttoni, O. Burdet	FR	Bs	Supporting structures of buildings, roofs and bridges; Design of cables and arches.
Initiation à la programmation en C++	V. Lepetit, J. Chappelier	FR	Bs	Basics of C++ programming language.
Initiation à la programmation en Java	J. Sam, V. Lepetit	FR	Bs	Basics of Java programming language.
Neuronal Dynamics: Computational Neuroscience of Single Neurons	W. Gertsner	EN	Ms	Theoretical and computational neuroscience; single neuron models.
Comprendre les Microcontrôleurs	J.-D. Nicoud, P. Rochat	FR	HP	Theory and practice of microcontrollers; practical examples of their usage.
Principles of Reactive Programming	M. Odersky	EN	Bs	Composable event-driven software; scalability, resiliency, and responsiveness.
Electrotechnique II	Y. Perriard, P. Germano	FR	Bs	Three-phase AC systems; loads and transients; power supplies.
Éléments de Géomatique	P. Gilliéron, B. Merminod	FR	Bs	Procurement methods; modeling and representation of spatial data.
Villes Africaines - Introduction à la planification urbaine	J. Chenal	FR	Ms	Basics of urban planning; technical, environmental, socio-economic factors.
Introduction à la programmation orientée objet (en C++)	J. Chappelier, J. Sam	FR	Bs	Basics of object-oriented C++.
Introduction à la programmation orientée objet (en Java)	J. Sam, J. Chappelier	FR	Bs	Basics of object-oriented Java.
Mecanique des Fluides	C. Ancey, F. Gallaire	FR	Bs	Physical properties of fluids; surface tension; capillary action; hydrostatics.
Introduction to Household Water Treatment and Safe Storage	R. Johnston	EN	HP	Water treatment methods; successful implementation strategies.
Electrotechnique I	Y. Perriard, P. Germano	FR	Bs	Linear electric circuits; continuous and alternating currents.
Introduction à l'Astrophysique	F. Courbin	FR	Bs	Physical principles of astrophysics.
Planning and Design of Sanitation Systems and Technologies	C. Lüthi	EN	HP	Urban sanitation planning; sanitation systems and technology.
L'Art des Structures II - Structures en treillis, poutres et cadres	A. Muttoni, O. Burdet	FR	Bs	Operation principles of lattice structures, beams, slabs and frames.
Mécanique II	J.-P. Ansermet	FR	P	Rigid body dynamics; basic principles of relativity and the Lagrangian formalism.
Cellular mechanisms of brain function	C. Petersen	EN	Ms	Mammalian brain function; nerve cells and synaptic interactions.

coursera edX

24 +

25 +

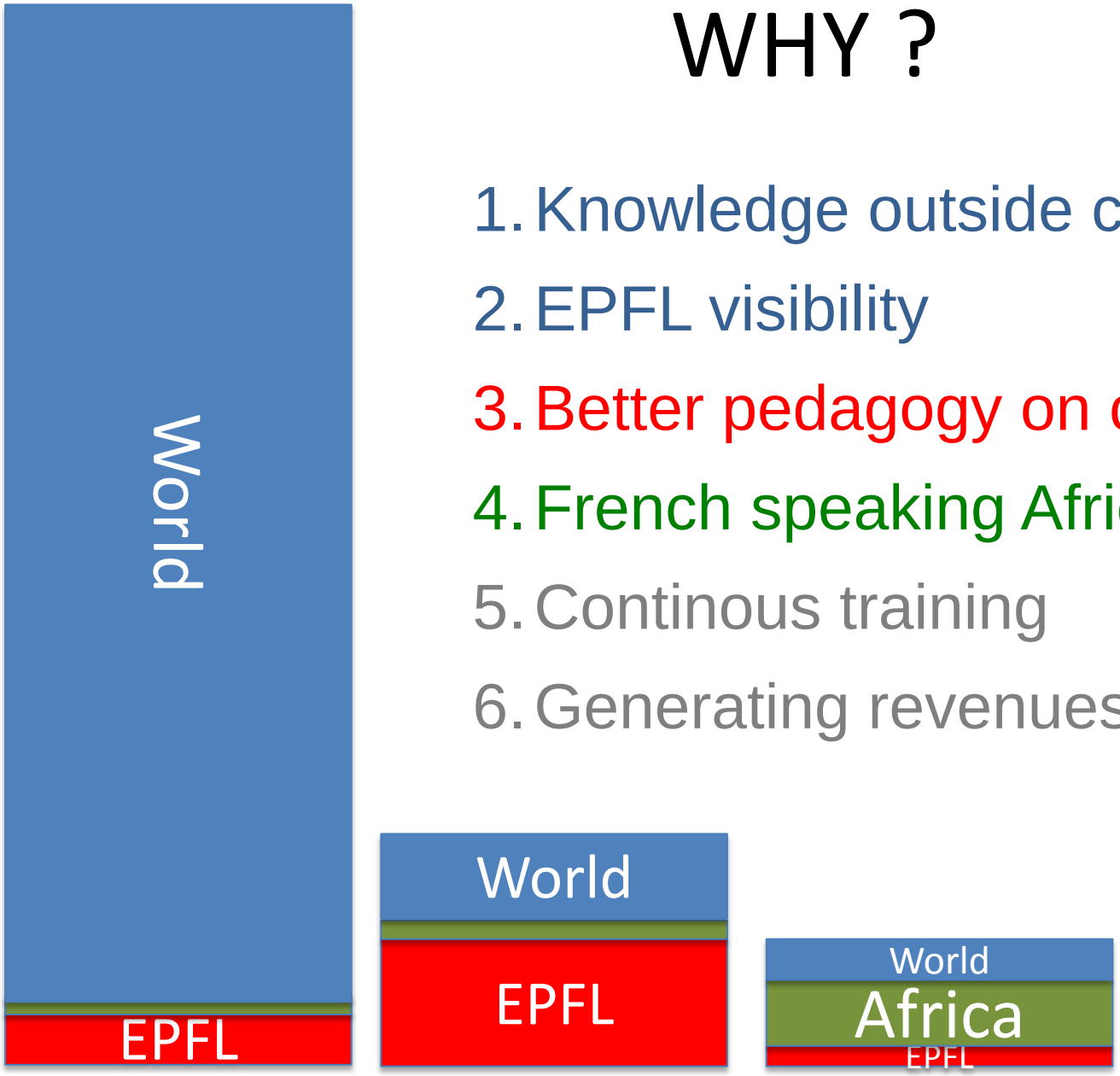
15

Why does EPFL produce MOOCs ?

1. Share knowledge outside campus
2. Increase EPFL visibility
3. Better pedagogy on campus
4. Support French speaking Africa
5. Boost Continous training
6. Generate revenues

WHY ?

1. Knowledge outside campus
2. EPFL visibility
3. Better pedagogy on campus
4. French speaking Africa
5. Continous training
6. Generating revenues



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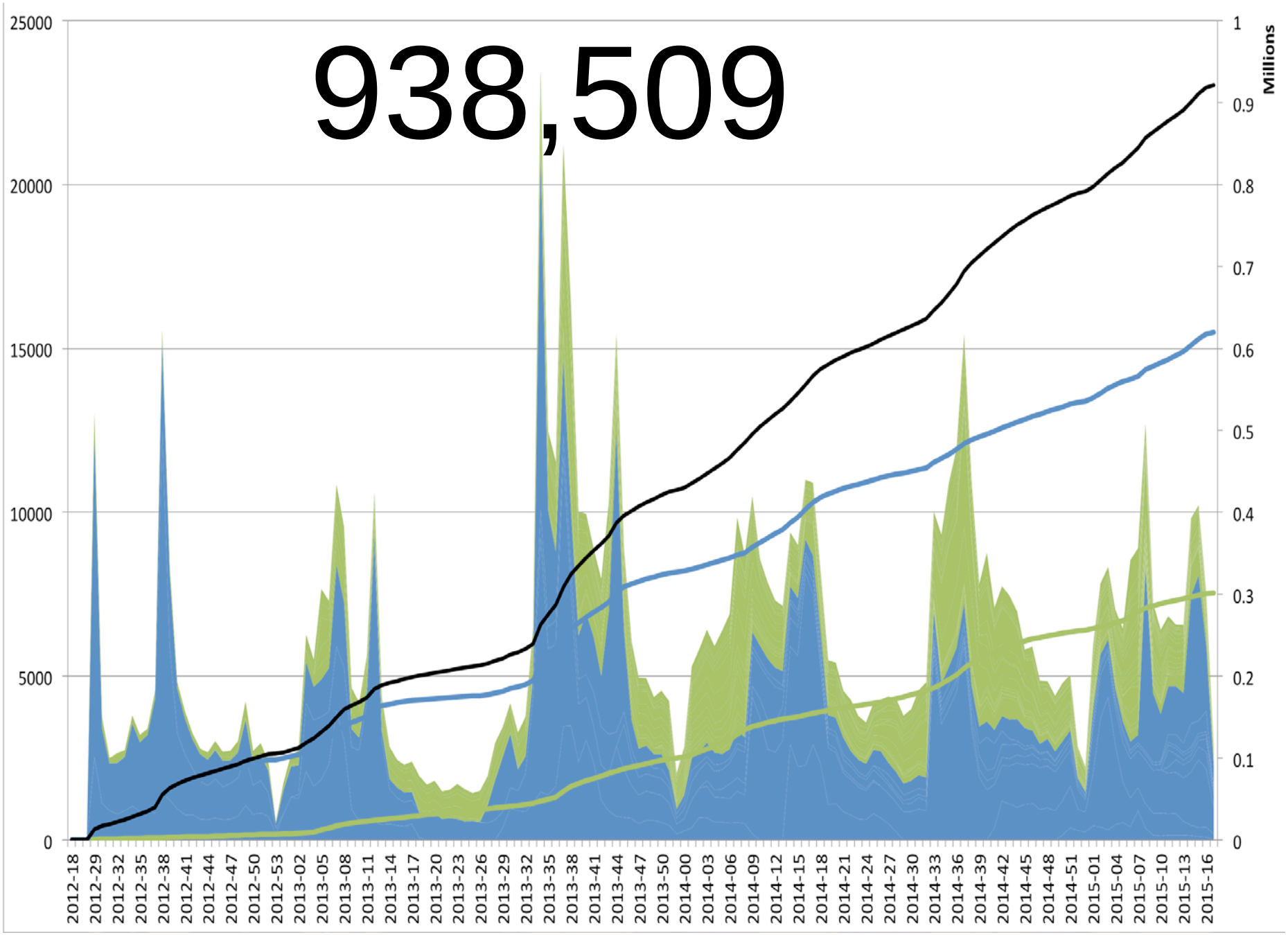
938,509
25000
20000
15000
10000
5000
0
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Millions
2012-18
2012-29
2012-32
2012-35
2012-38
2012-41
2012-44
2012-47
2012-50
2012-53
2013-02
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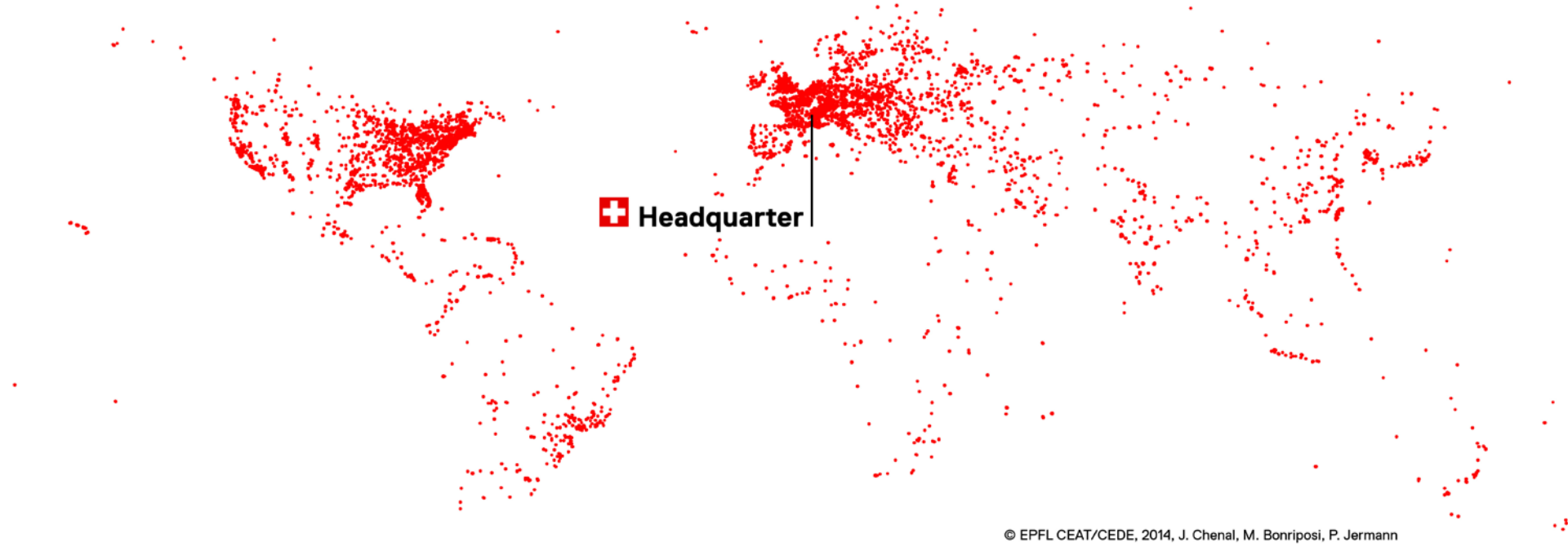
2015-16

EPFL CAMPUS



MOOCs are **not** the « McDonaldisation » of European universities

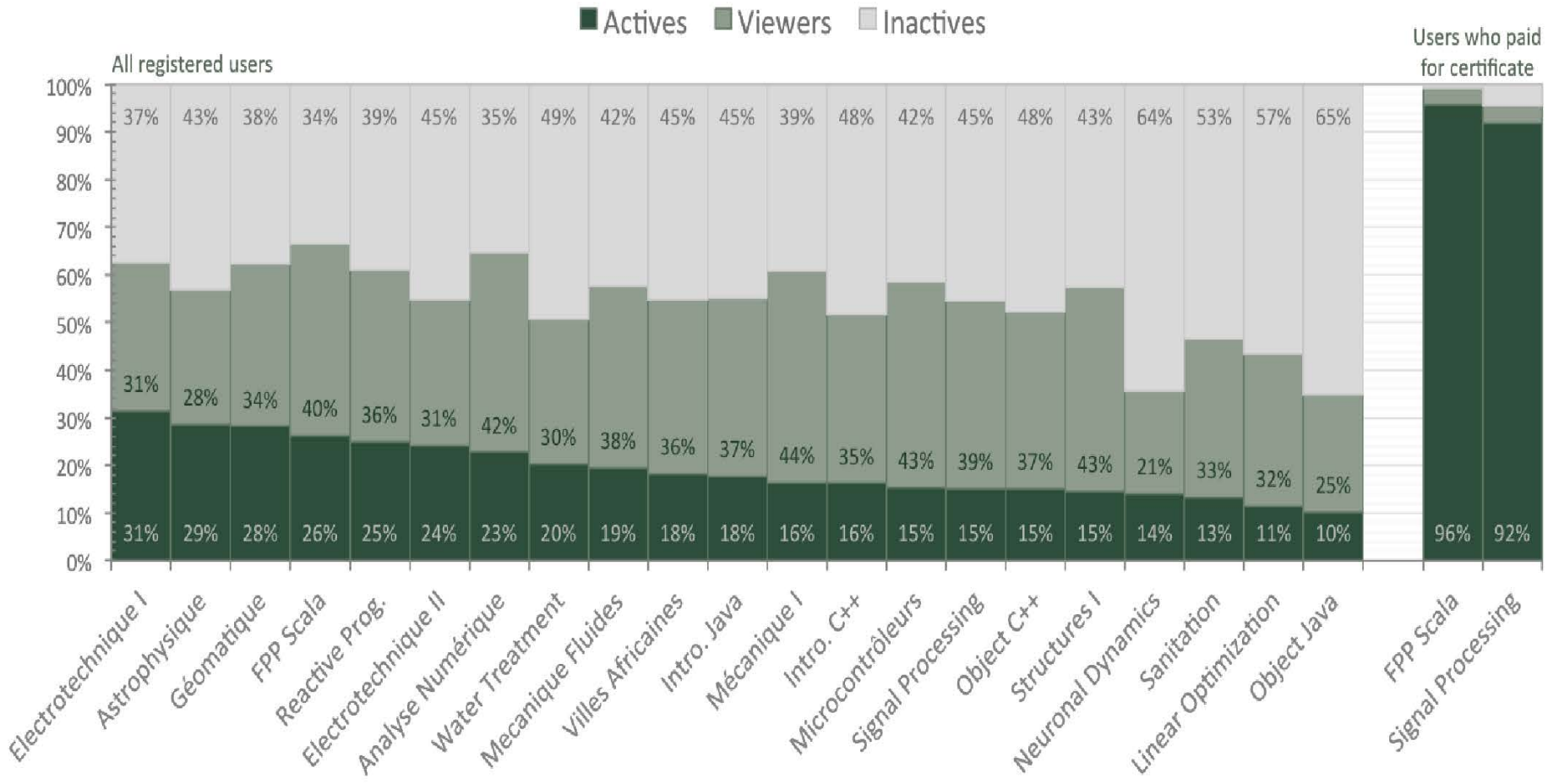


Figure 17. Users' level of engagement for each MOOC. The users are classified as *actives* (solved at least one exercise), *viewers* (watched a video, but didn't solve any exercise), and *inactives* (never watched a video nor solved an exercise). The 21 bars on the left represent all registered users for which the data is available [N = 645,455]; the 2 bars on the right represent only those users who've paid $50 for a verified Coursera certificate [N = 2,847].

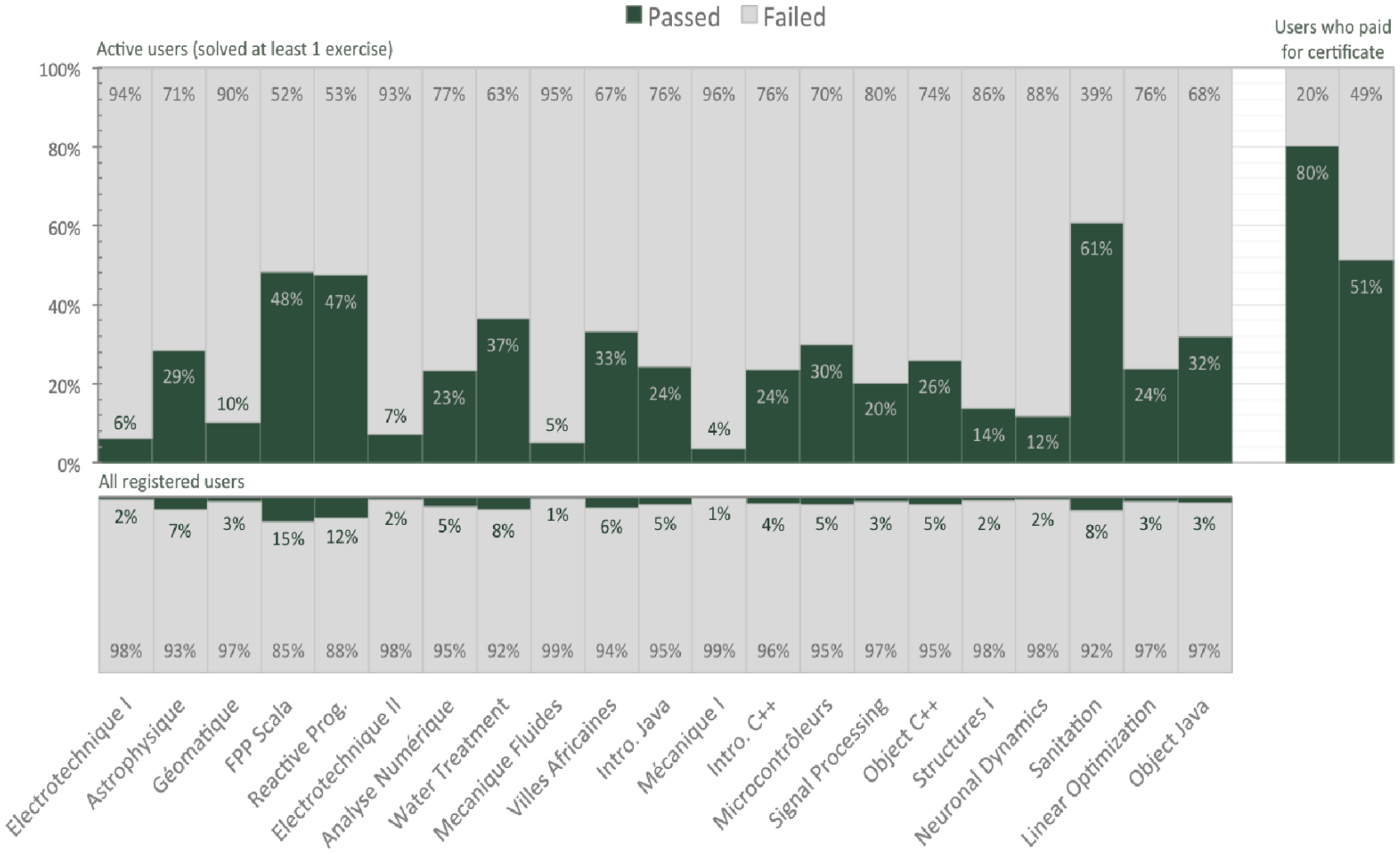
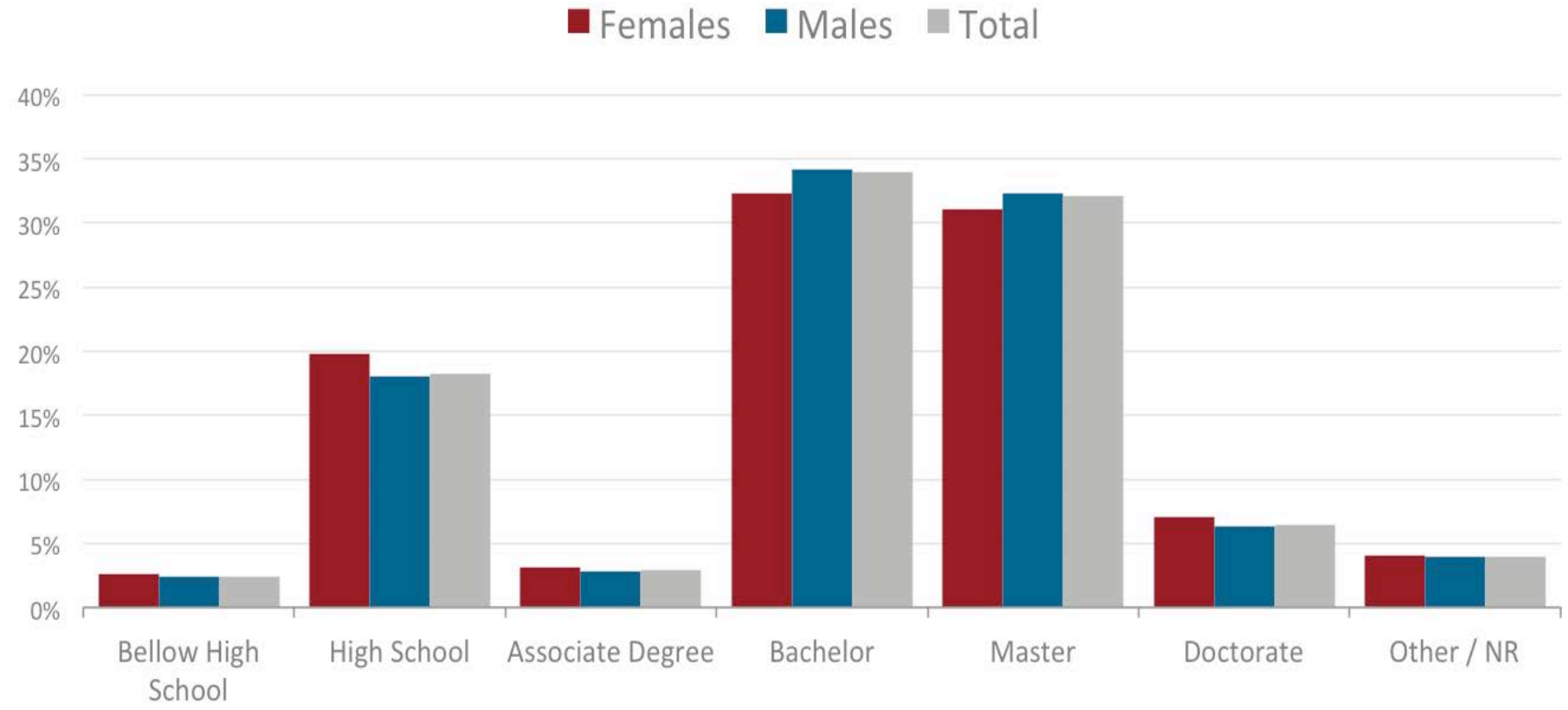
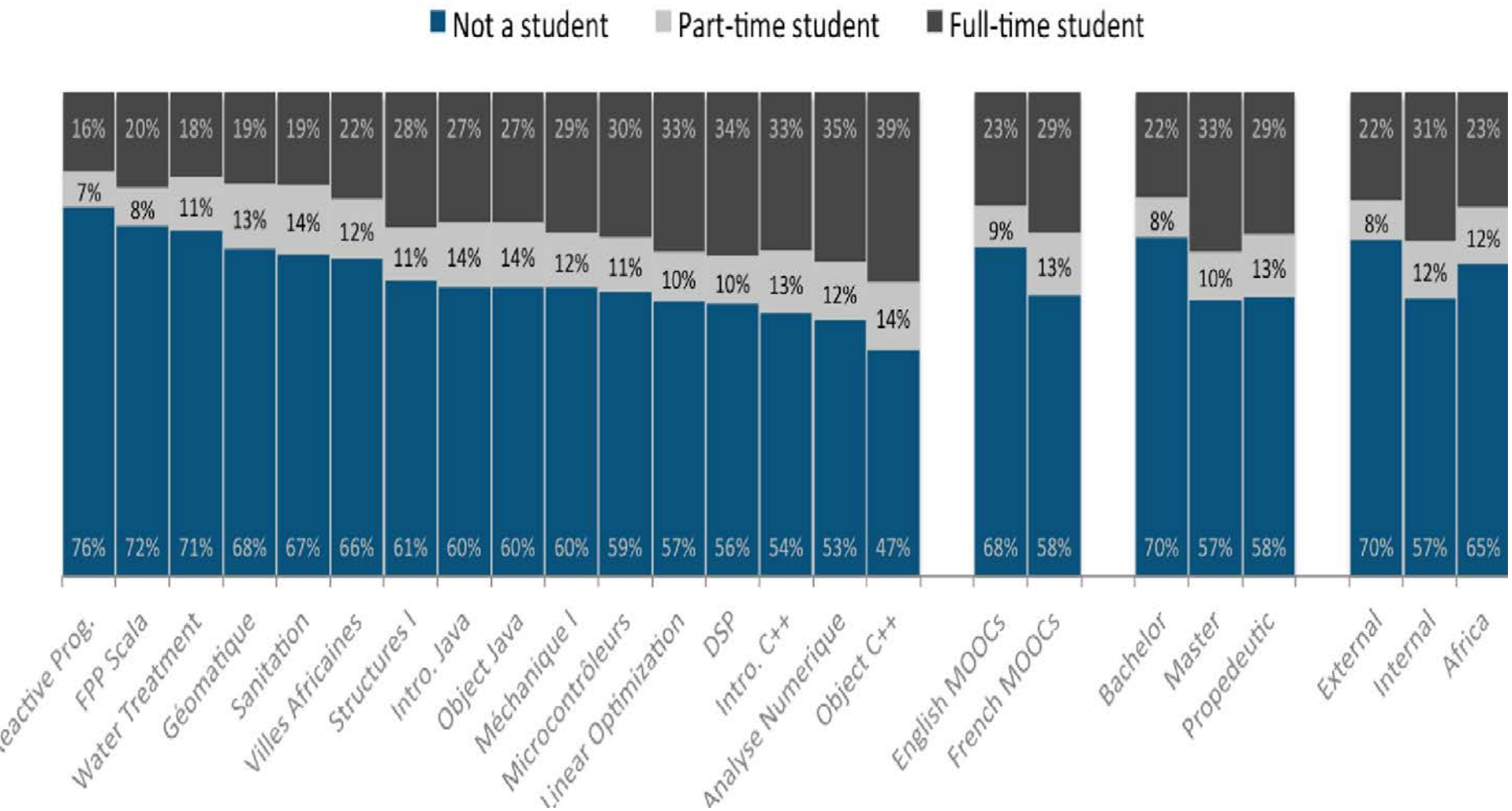


Figure 19. Users' level of achievement for each MOOC. The users are classified as having *passed* (obtained the minimum grade specified by the teacher) or *failed* (didn't obtain the minimum grade). The top 21 bars represent all registered users for which the data is available [N = 655,453]; the middle 21 bars represent only those users who were classified as active [N = 120,985]; the bottom 2 bars represent only those users who've paid $50 for a verified Coursera certificate [N = 2,847].


Females
Males
Total
40%
35%
30%
25%
20%
15%
10%
5%
0%
Bellow High School
High School
Associate Degree
Bachelor
Master
Doctorate
Other / NR


Not a student
Part-time student
Full-time student
16% 20% 18% 19% 19% 22% 28% 27% 27% 29% 30% 33% 34% 33% 35% 39% 23% 29% 22% 33% 29% 22% 31% 23%
7% 8% 11% 13% 14% 12% 11% 14% 14% 12% 11% 10% 10% 13% 12% 14% 9% 13% 8% 10% 13% 8% 12% 12%
76% 72% 71% 68% 67% 66% 61% 60% 60% 60% 59% 57% 56% 54% 53% 47% 68% 58% 70% 57% 58% 70% 57% 65%
Reactive Prog.
FPP Scala
Water Treatment
Géomatique
Sanitation
Villes Africaines
Structures I
Intro. Java
Object Java
Méchanique I
Microcontrôleurs
Linear Optimization
DSP
Intro. C++
Analyse Numerique
Object C++
English MOOCs
French MOOCs
Bachelor
Master
Propedeutic
External
Internal
Africa

Category	Percentage	# Participants	% Explored	% Certified
Teacher (is or has been)	39%	33,228	42%	20%
Not a teacher (has never been)	61%	51,127	34%	15%
Teaches this topic	21%	6,122	46%	21%
Teaches another topic	79%	22,915	43%	20%
Responded	21%	84,355	38%	17%
Did not respond or unsure	79%	310,485	13%	4%
Surveyed	27%	394,840	19%	7%
Not surveyed	73%	1,077,305	16%	8%

If our MOOCs are continuing education

And if we are lazy on continuing education

Then MOOCs solve a problem

Why does EPFL do MOOCs ?

- ✔ Knoweldge outside campus
- ✔ EPFL visibility
- Better pedagogy on campus
- French speaking Africa
- ✔ Continous training
- Generating revenues

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« Flipped Class »

Introducti

MOOC Phy

Standard Lectu

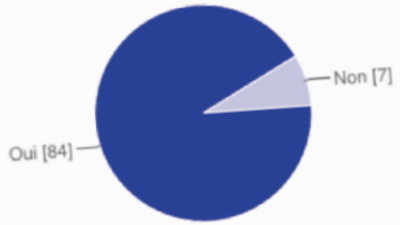
Dans l'ensemble, j'estime que cet enseignement est:

[A choix unique]

Réponses possibles :	Nb. réponses :	En % :
6 excellent (6)	46	41
5 bon (5)	47	42
4 suffisant (4)	12	11
3 insuffisant (3)	4	4
2 très insuffisant (2)	2	2
1 mauvais (1)	0	0
pas concerné	1	1

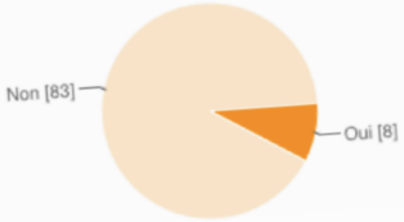
Moyenne :	Médiane :	Ecart-type :
5.2	5.0	0.9

Le MOOC vous aide-il pour la physique ?



Oui	84	92%
Non	7	8%

En physique, le MOOC serait-il suffisant ?



Oui	8	9%
Non	83	91%

Pierre

can you prove that MOOCs are courses in lectures rooms ?

Good MOOCs

are (in general) better than

bad MOOCs

What is a « Good MOOC » ?

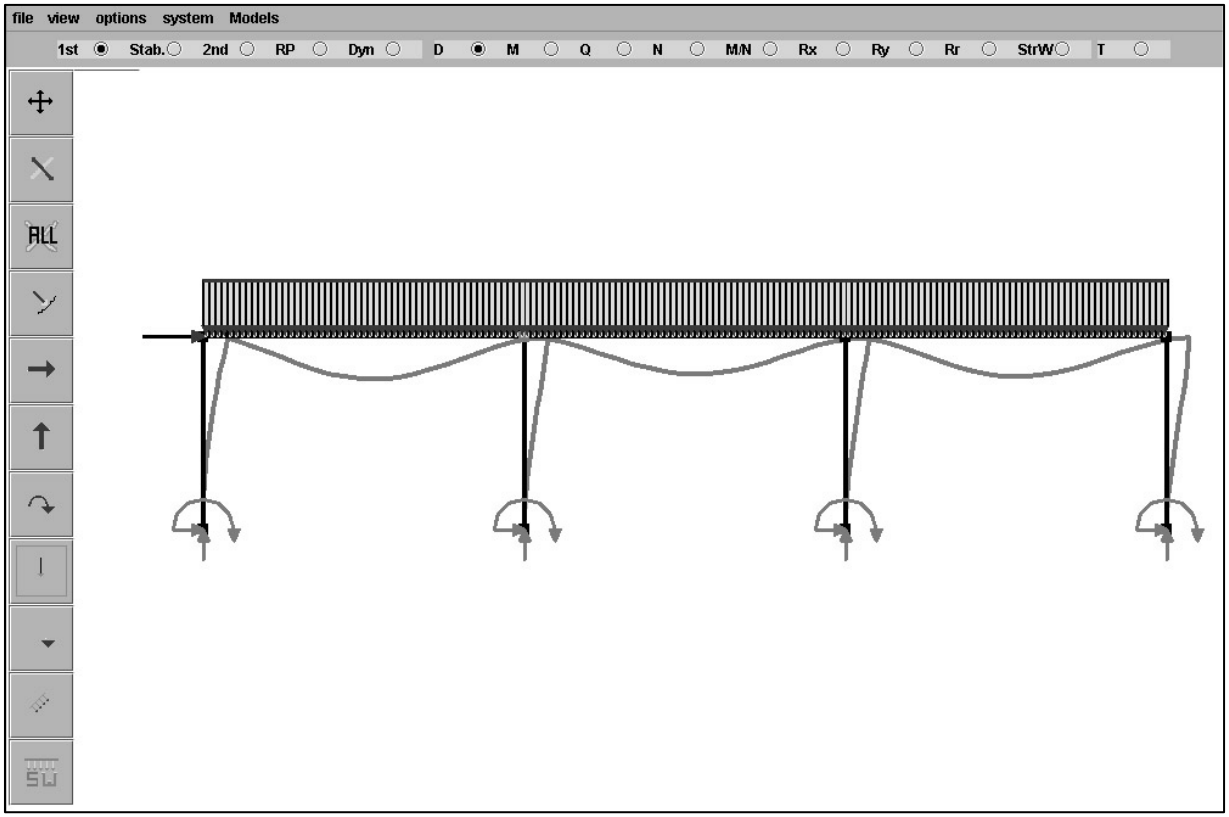
A MOOC

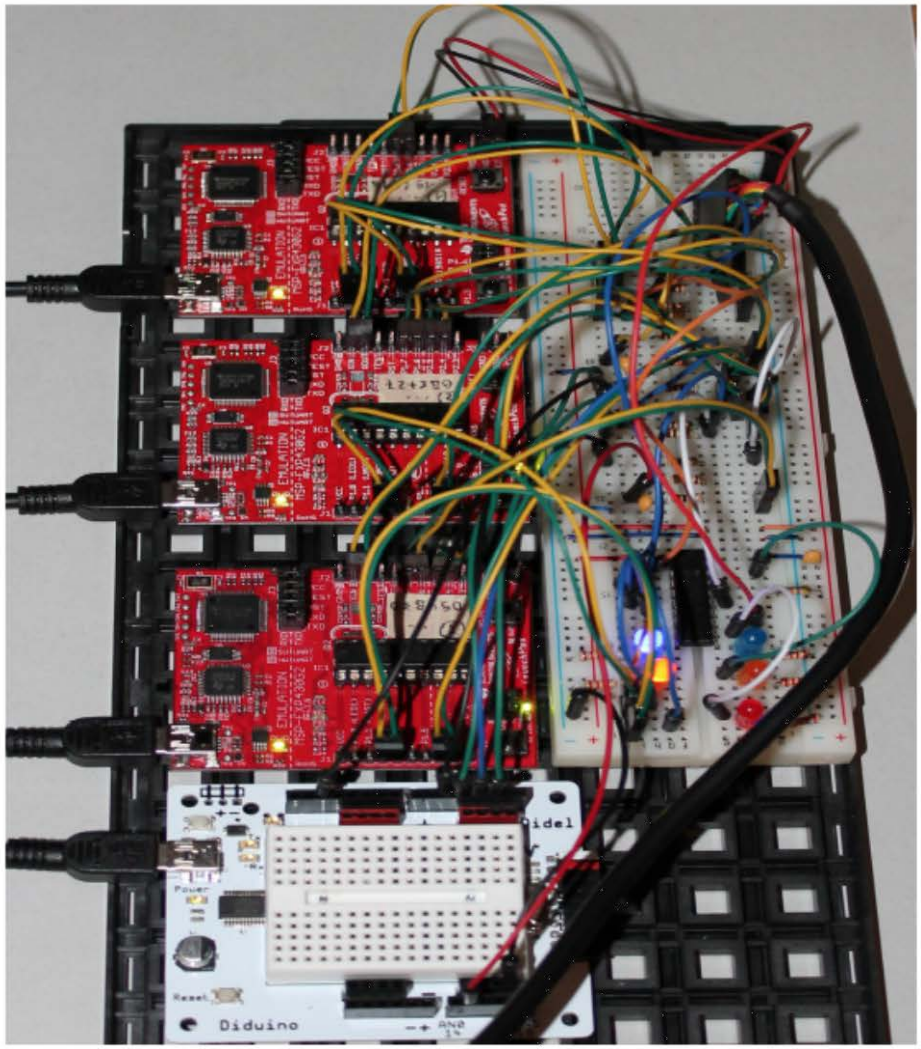
with rich activities

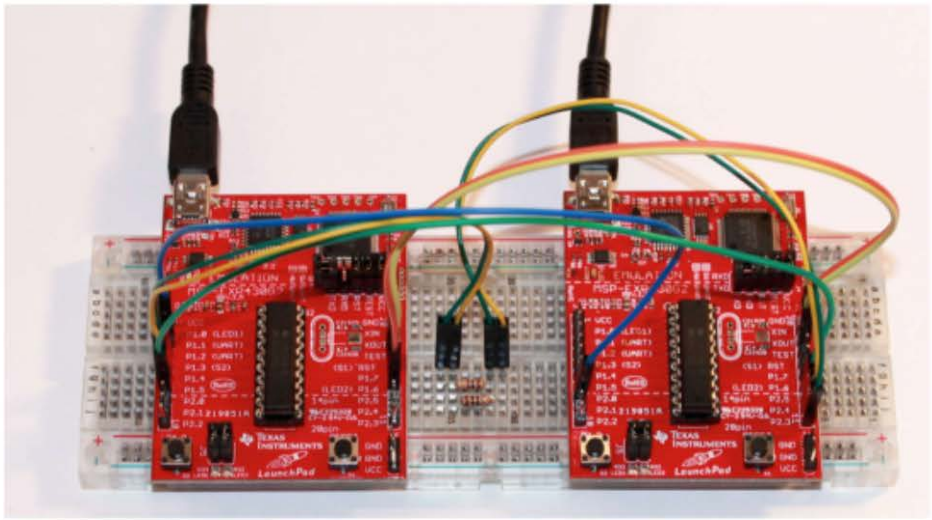
Fluid Dynamics (Gallaire & Ancey)

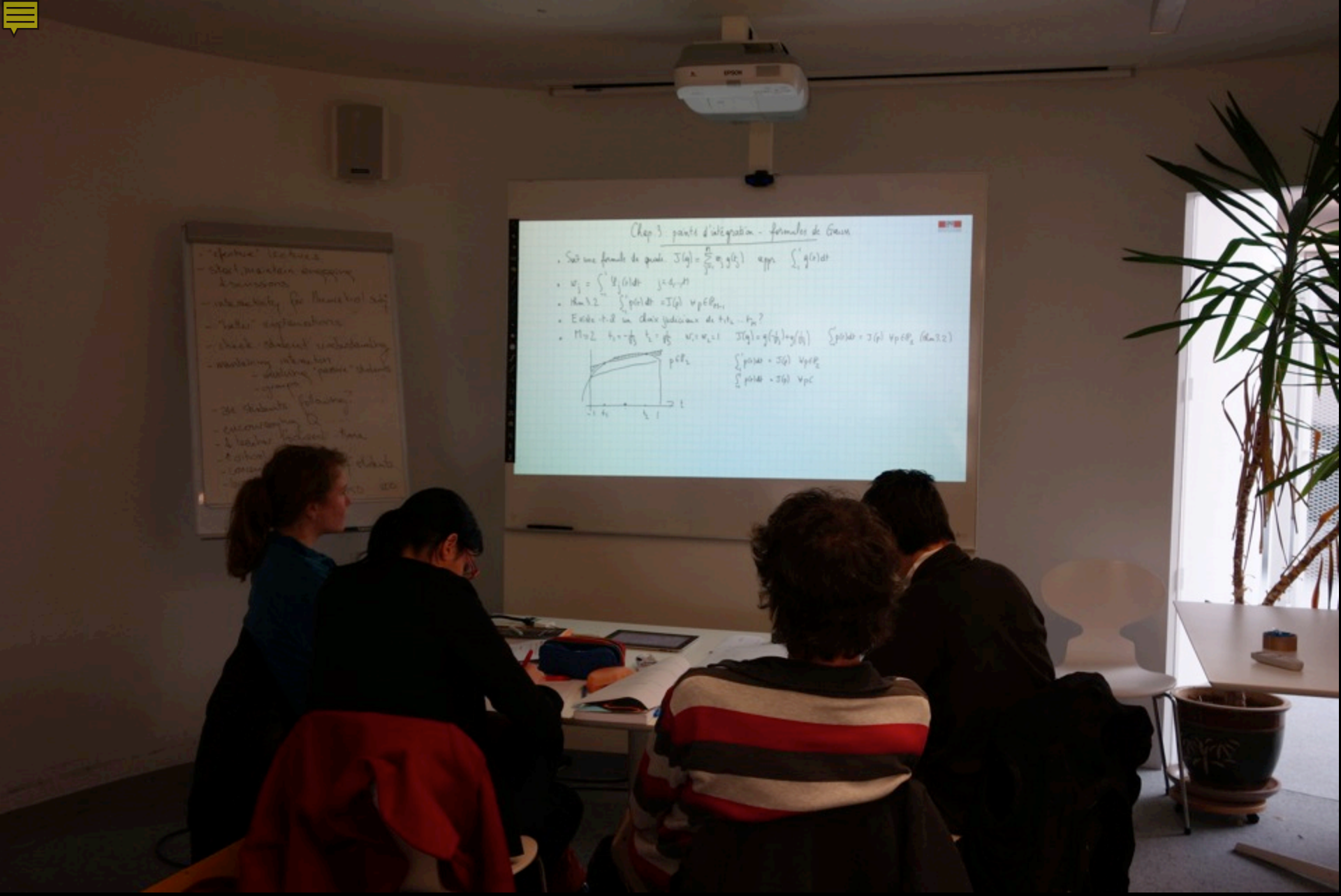
http://128.178.27.98:8082/LHE1.html

Statics (Muttoni & Burdet)




Diduino





Watching MOOCs together

MOOCs are very social

Why does EPFL do MOOCs ?

✔ Knoweldge outside campus

✔ EPFL visibility

? Better pedag… …pus

Fren… …Speaking Africa

✔ Continous training

Generating revenues

Teaching became a hight stake activity

Teachers spend more time preparing their course

Is it better to have a paper in nature

or

a MOOC with 50’000 participants ?

Why does EPFL do MOOCs ?

✔ Knoweldge outside campus

✔ EPFL visibility

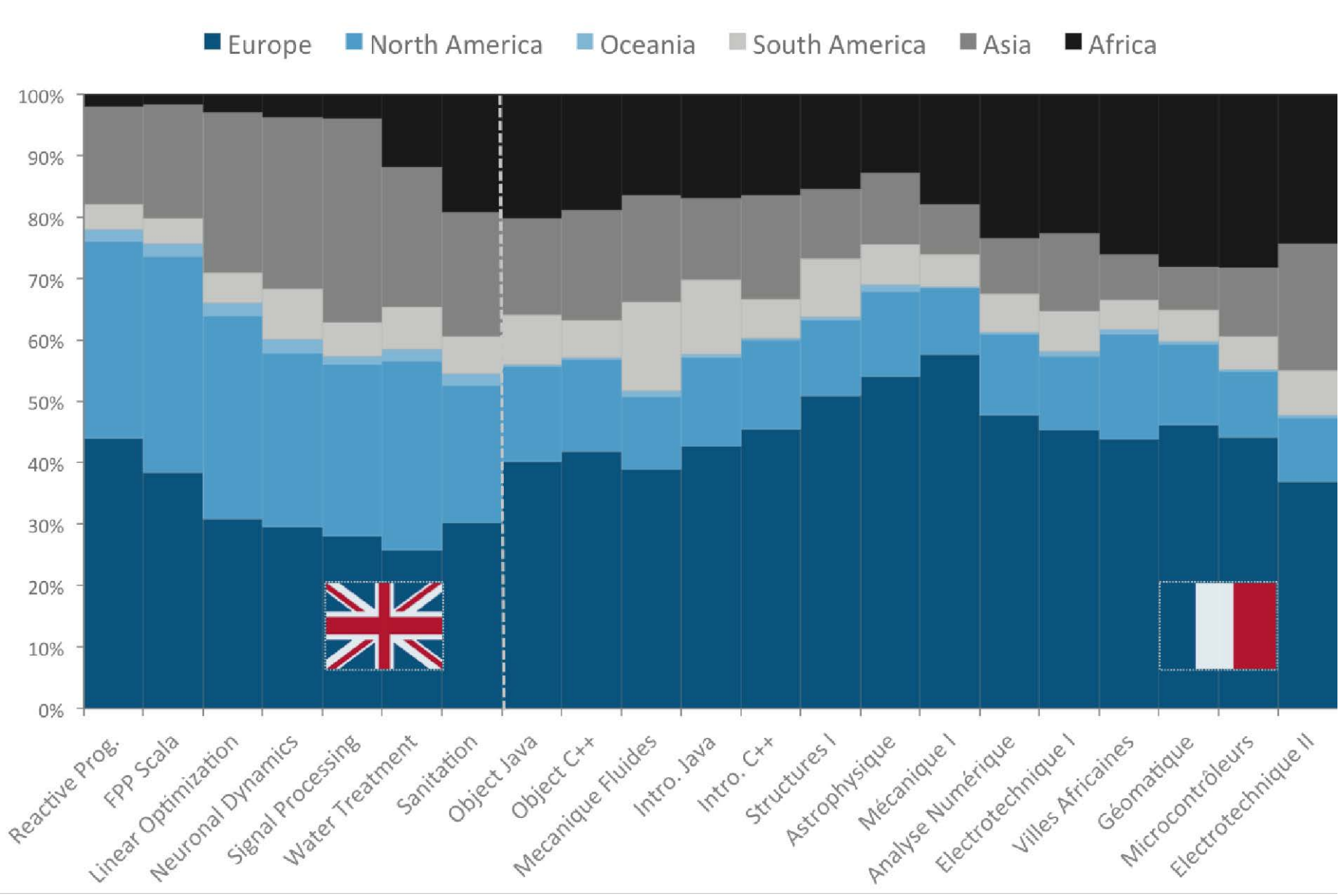
? Better pedagogy on campus

✔ **French speaking Africa**

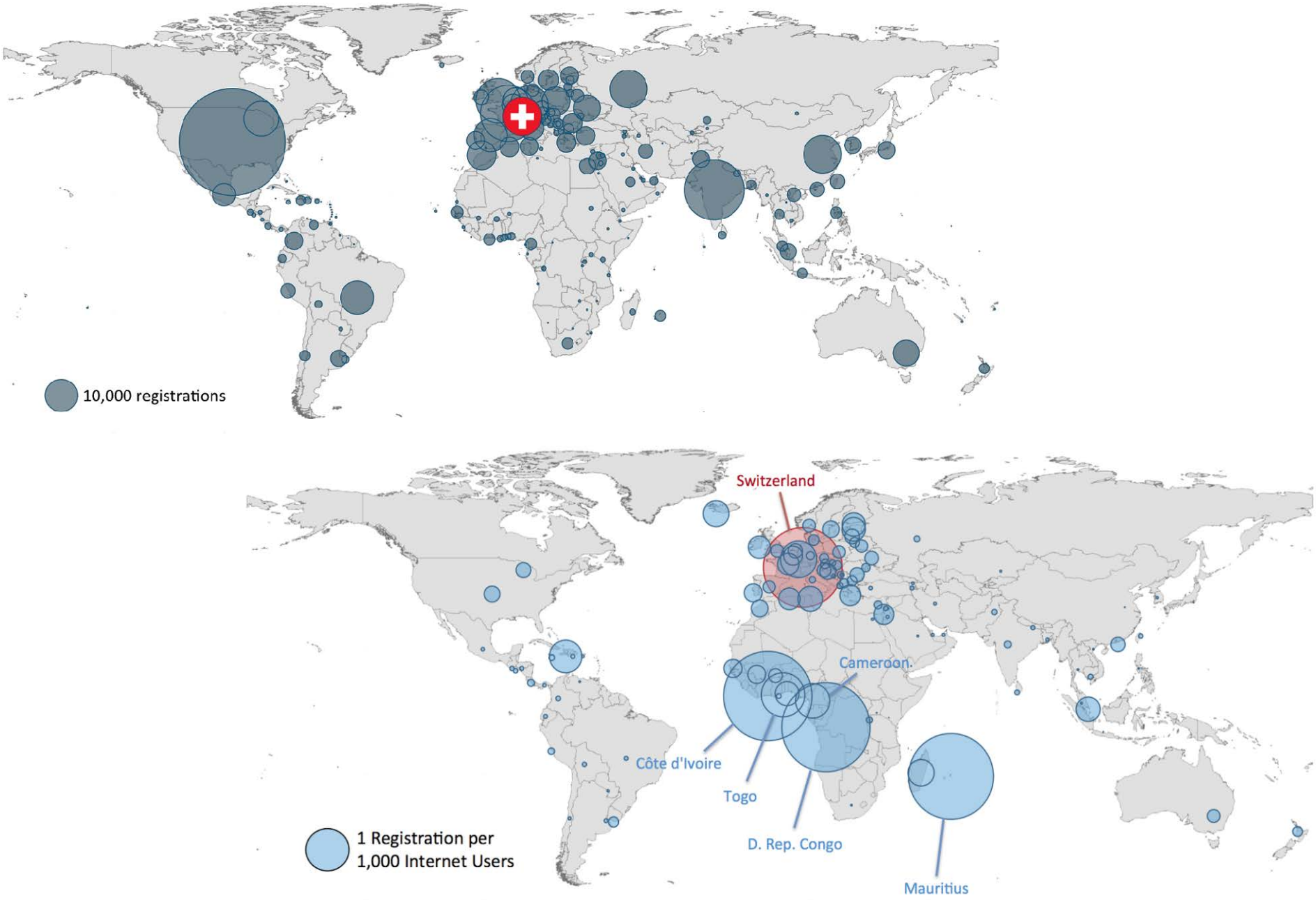
✔ Continous training

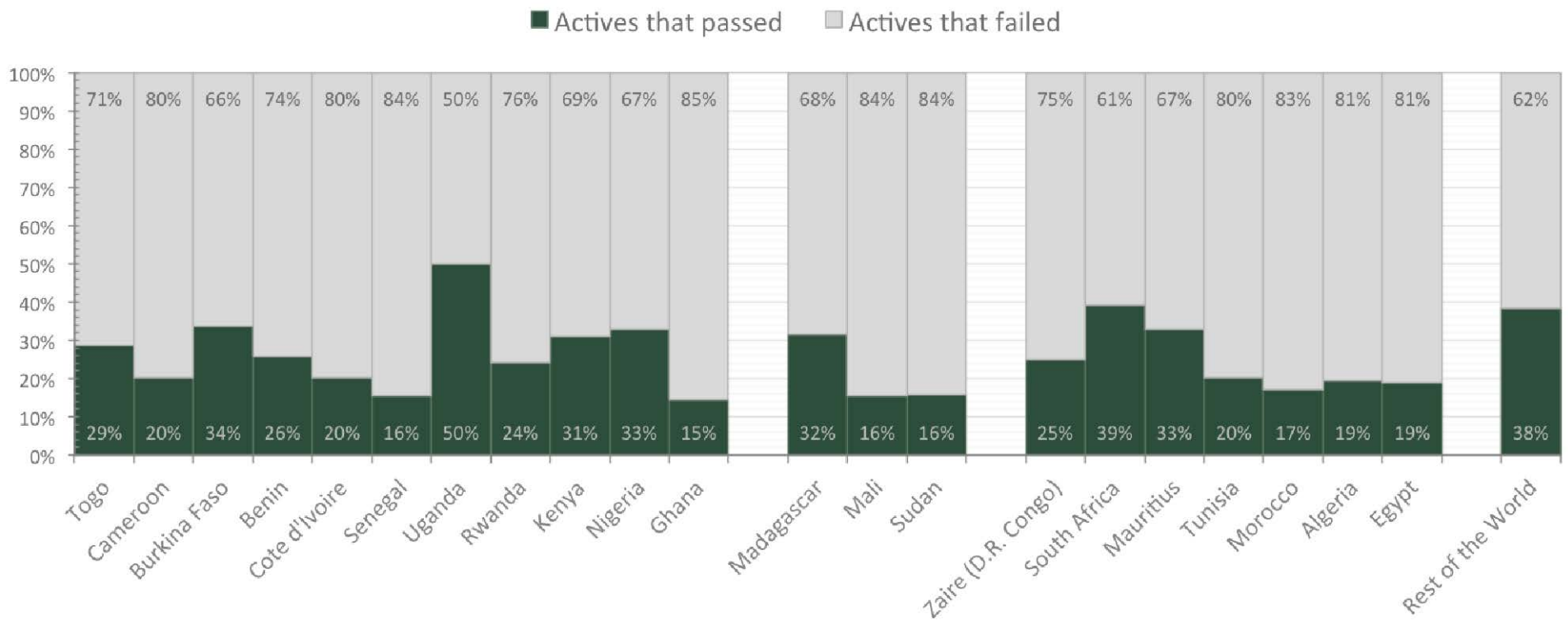
Generating revenues

MOOCs in Africa ?



Language Matters

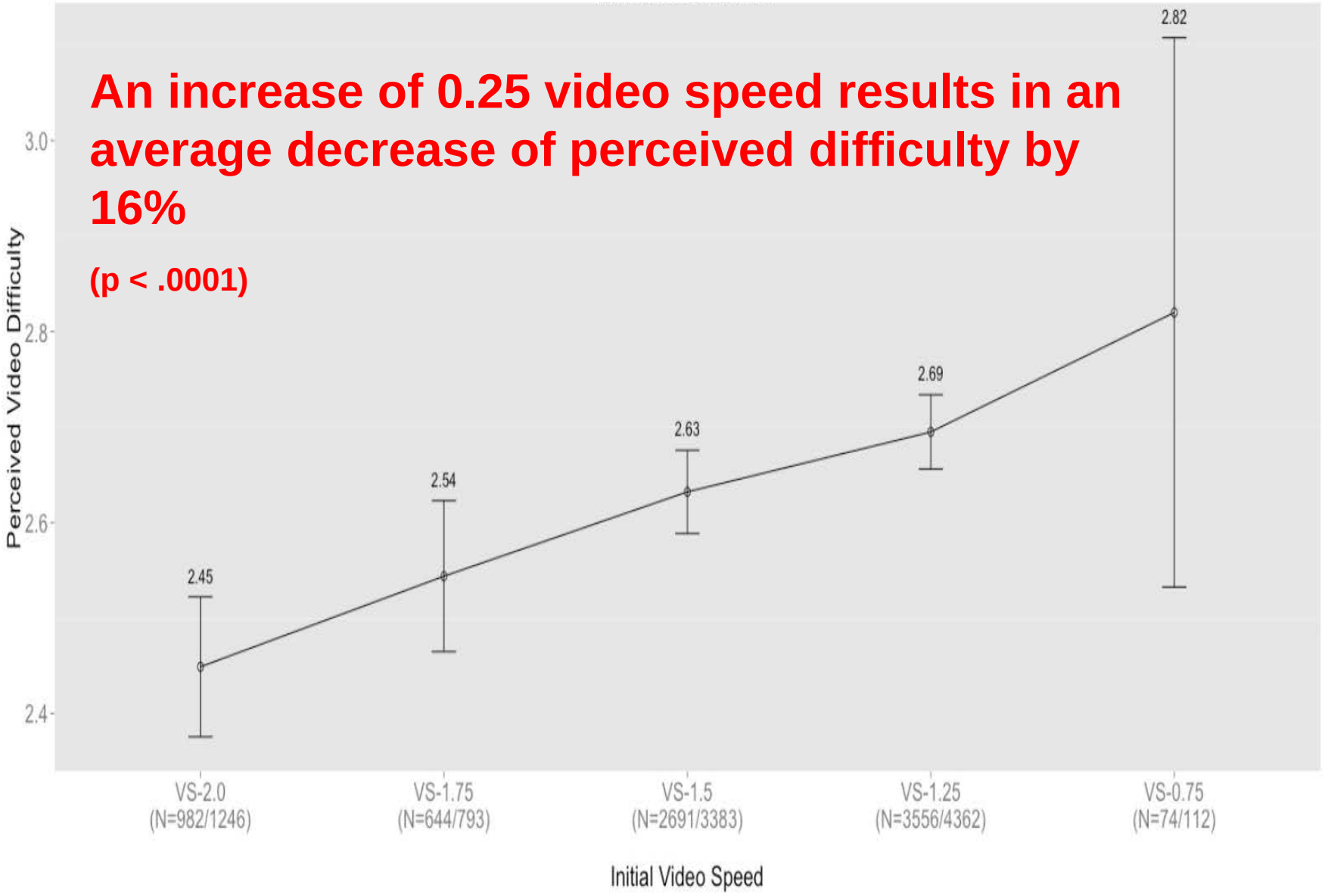

10,000 registrations
Switzerland
Cameroon
Côte d'Ivoire
Togo
D. Rep. Congo
Mauritius
1 Registration per
1,000 Internet Users

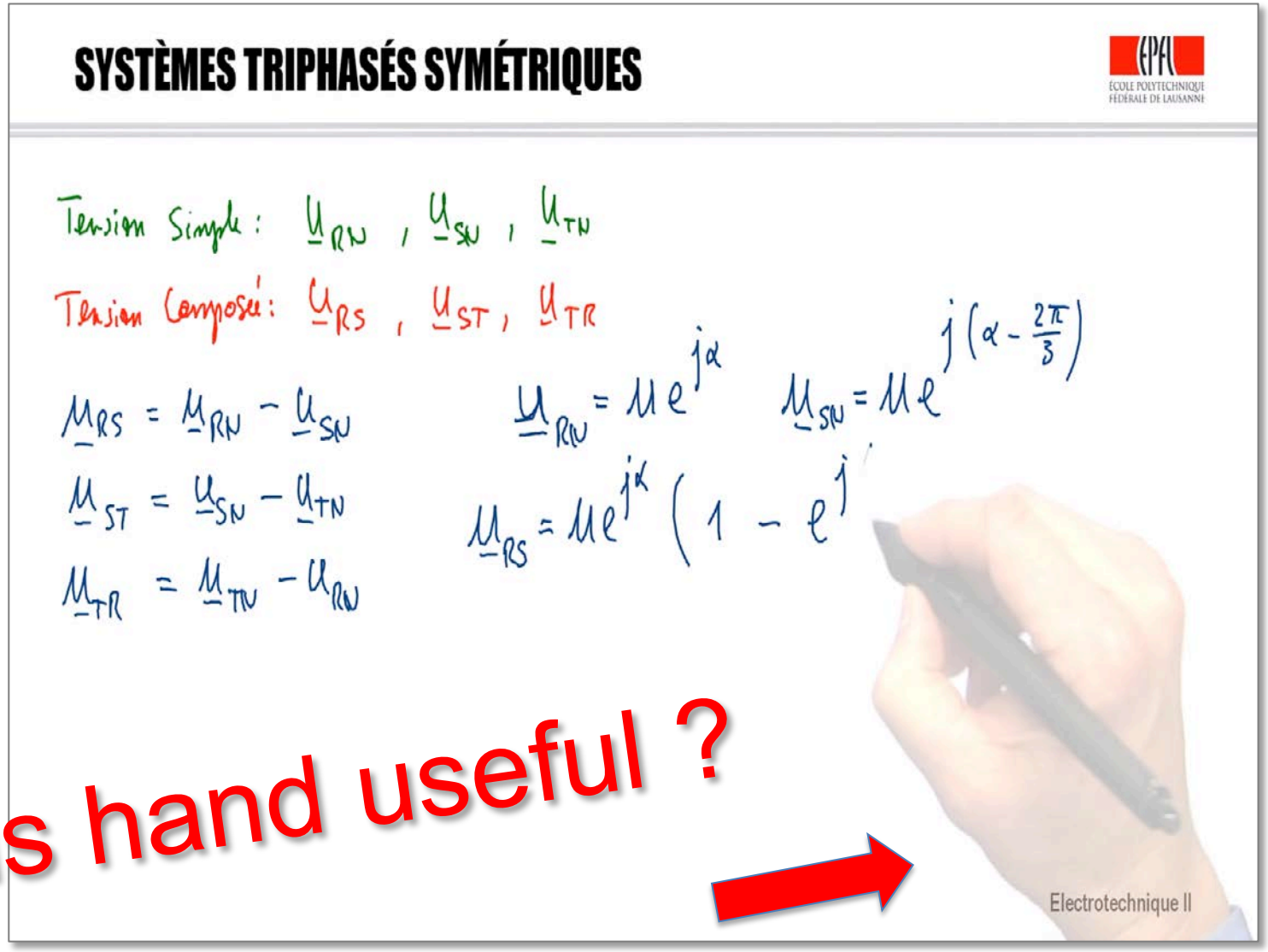


!!! Raw numbers are low

Research

Nan Li, Lukasz Kidzinski; 175,621 video sessions

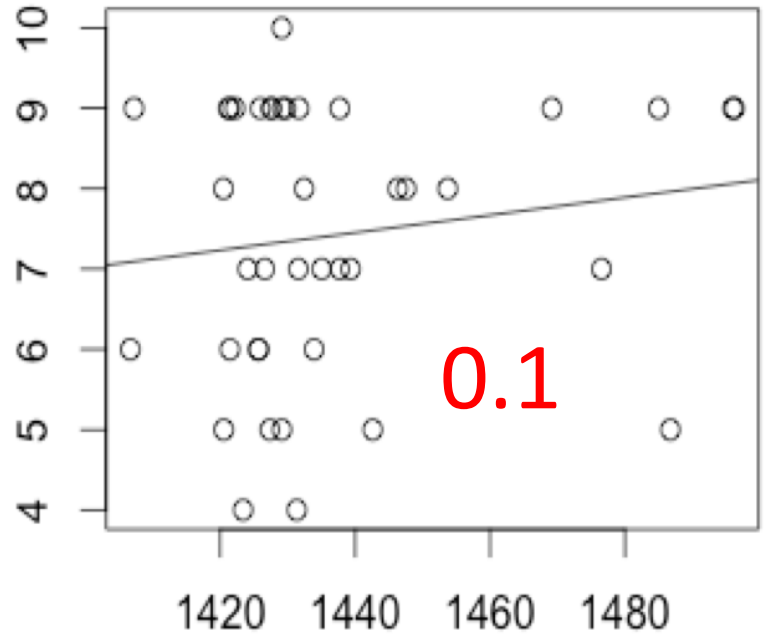




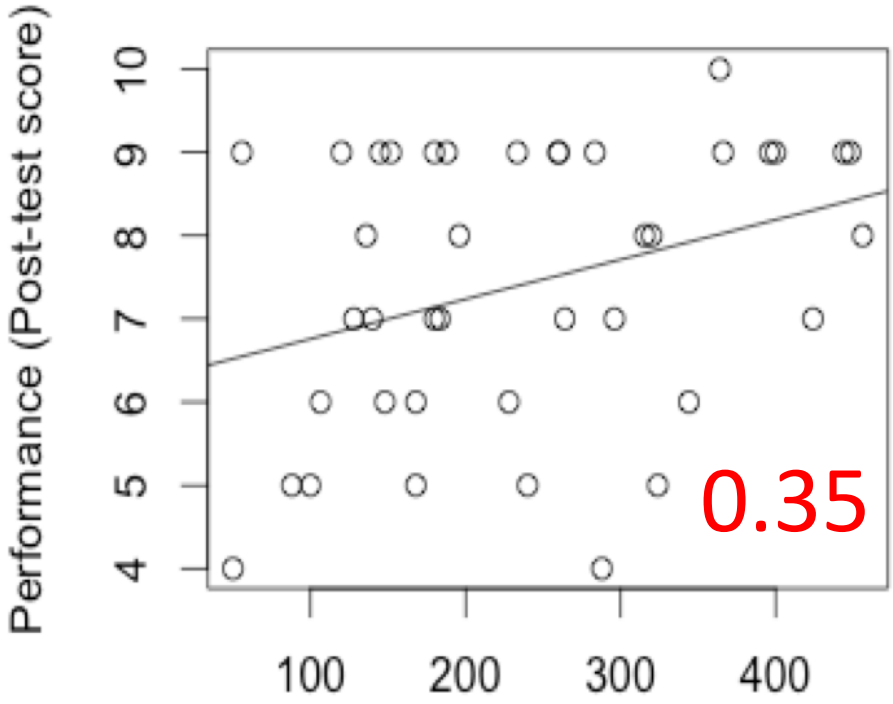
Kshitij Sharma, Patrick Jermann, Pierre Dillenbourg

EPFL Center for Digital Education

« withmeness »



Time [msec] to visit the referred sites, first time



First Fixation Duration [msec] the referred site

Kshitij Sharma, Patrick Jermann, Pierre Dillenbourg

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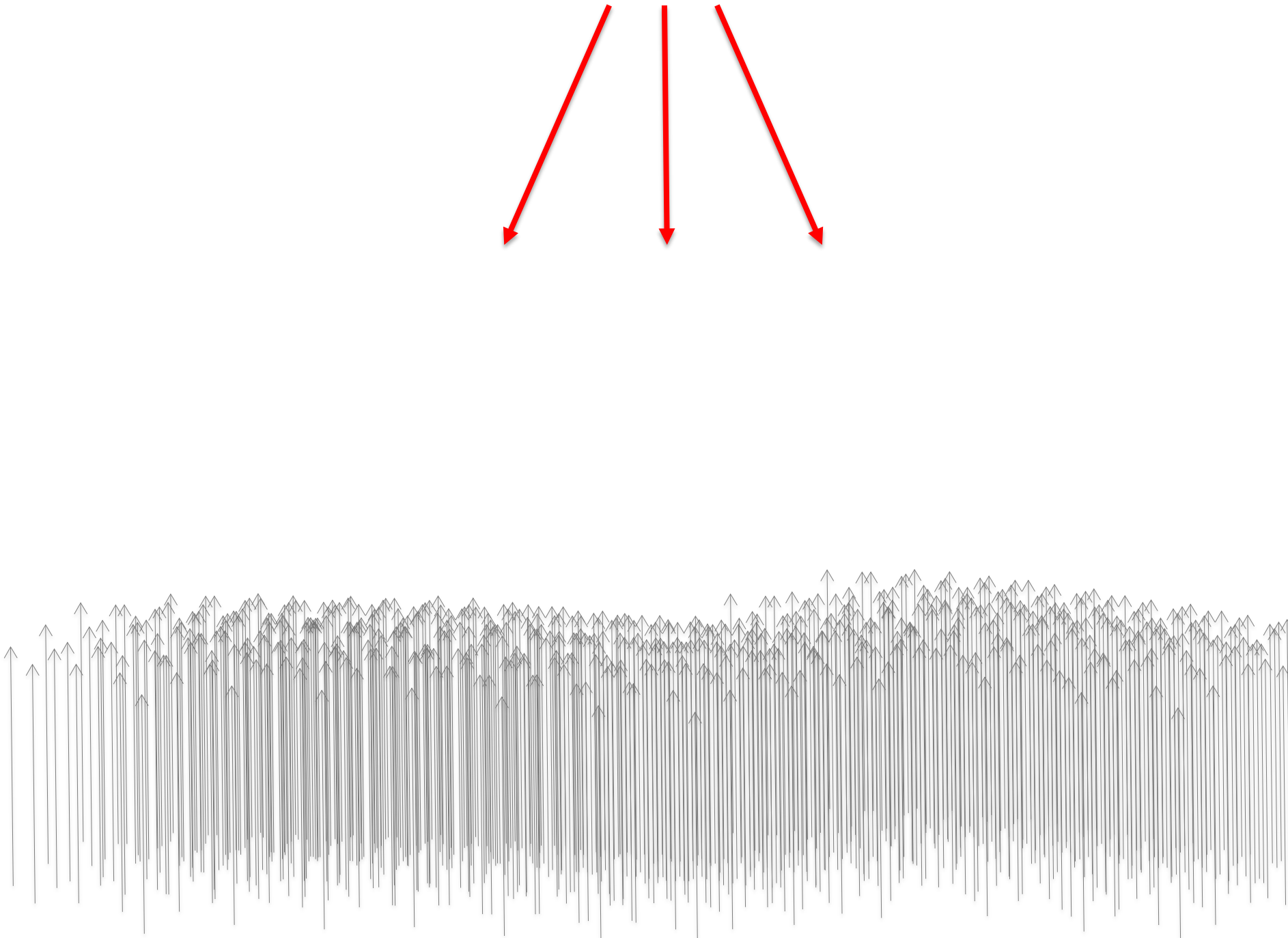
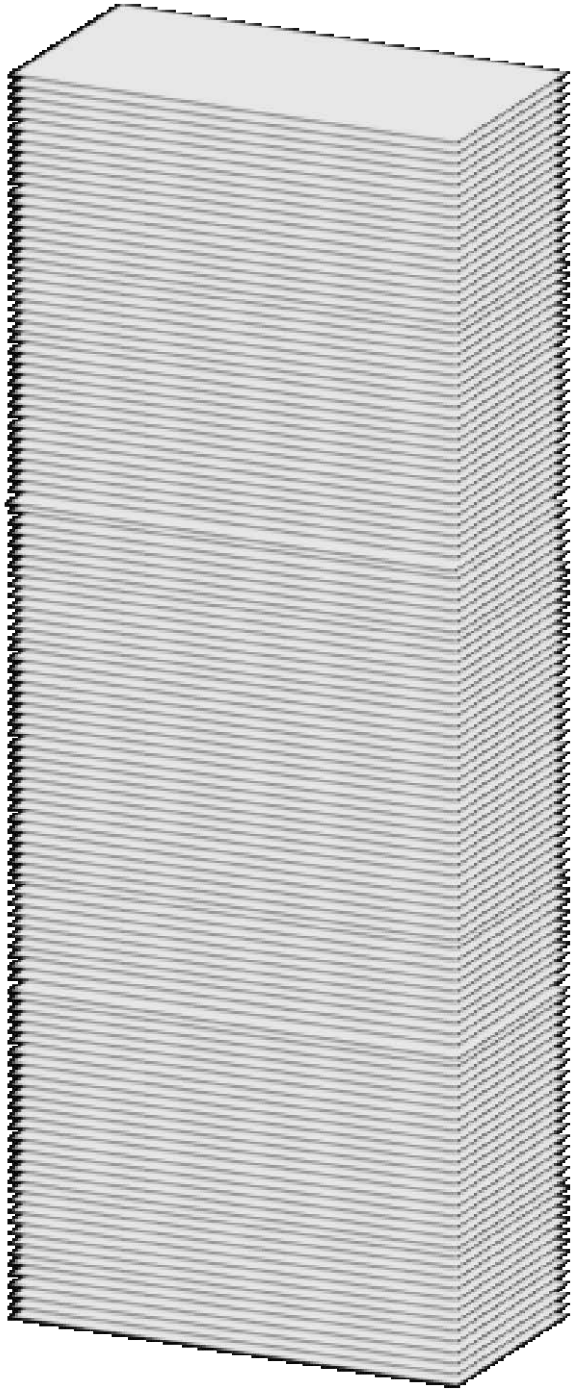
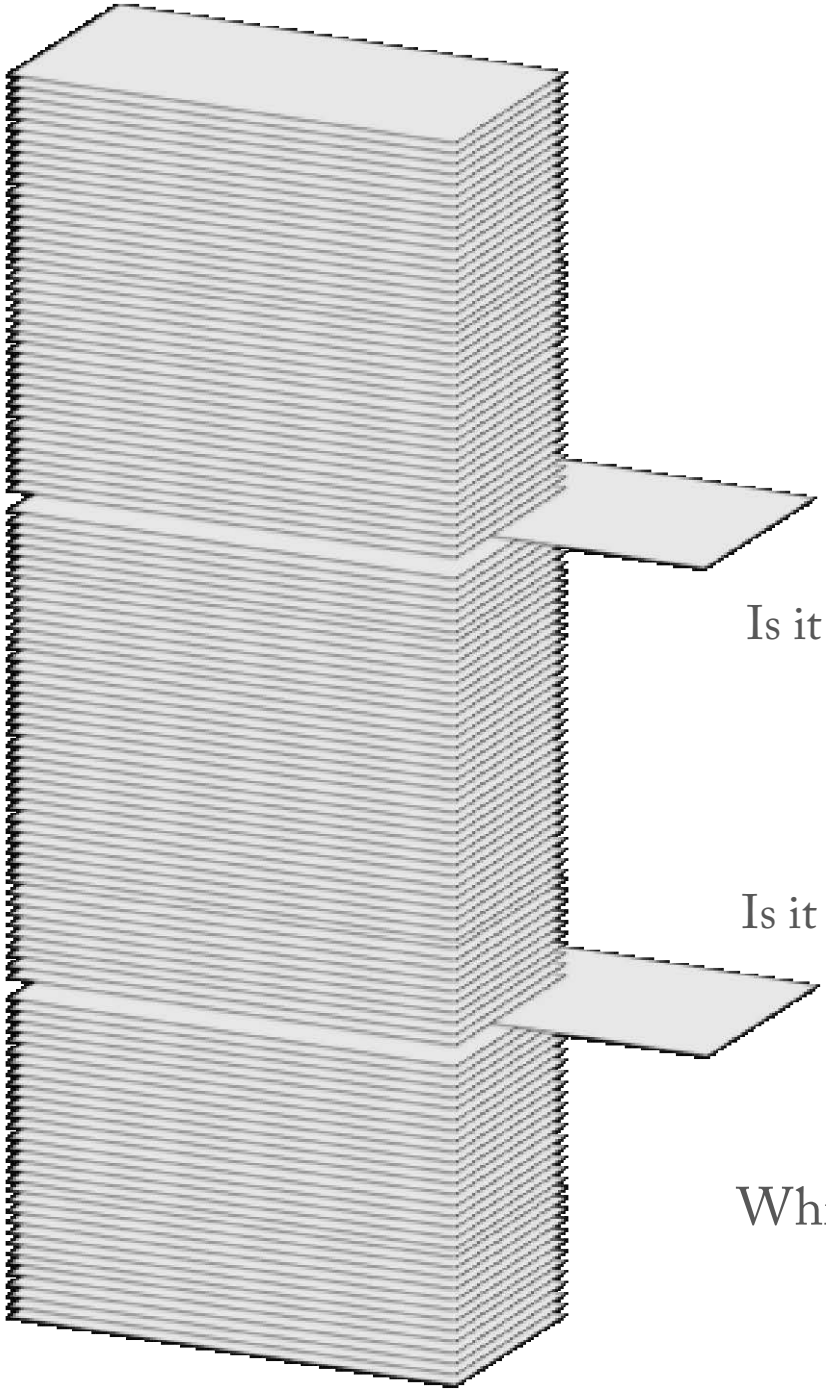


Please upload 3 pictures of soil erosion



20’000 X 3 / 0.5 = 30’000 pictures

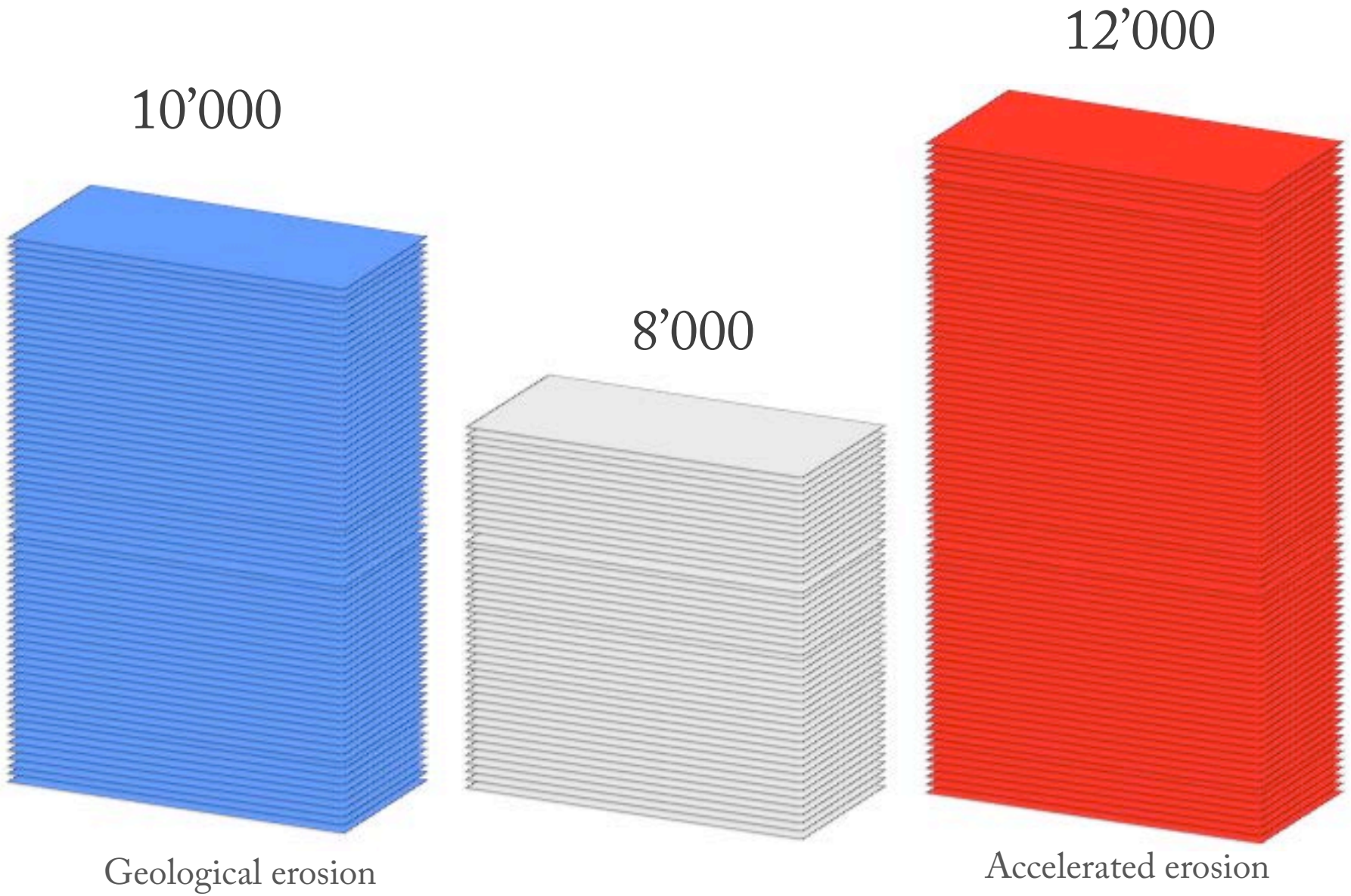


30’000 pictures

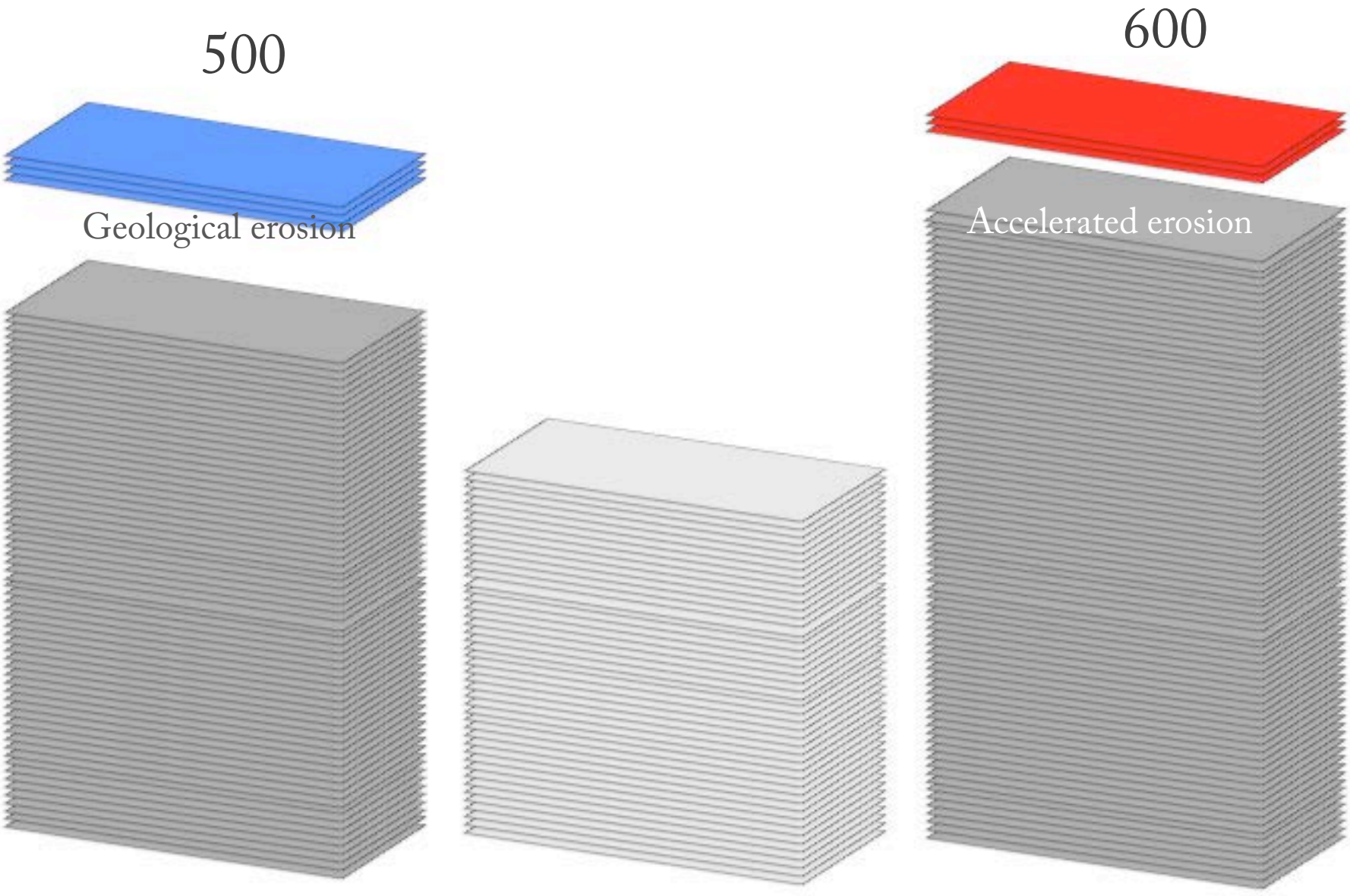
Is it geological erosion or accelerated erosion ?

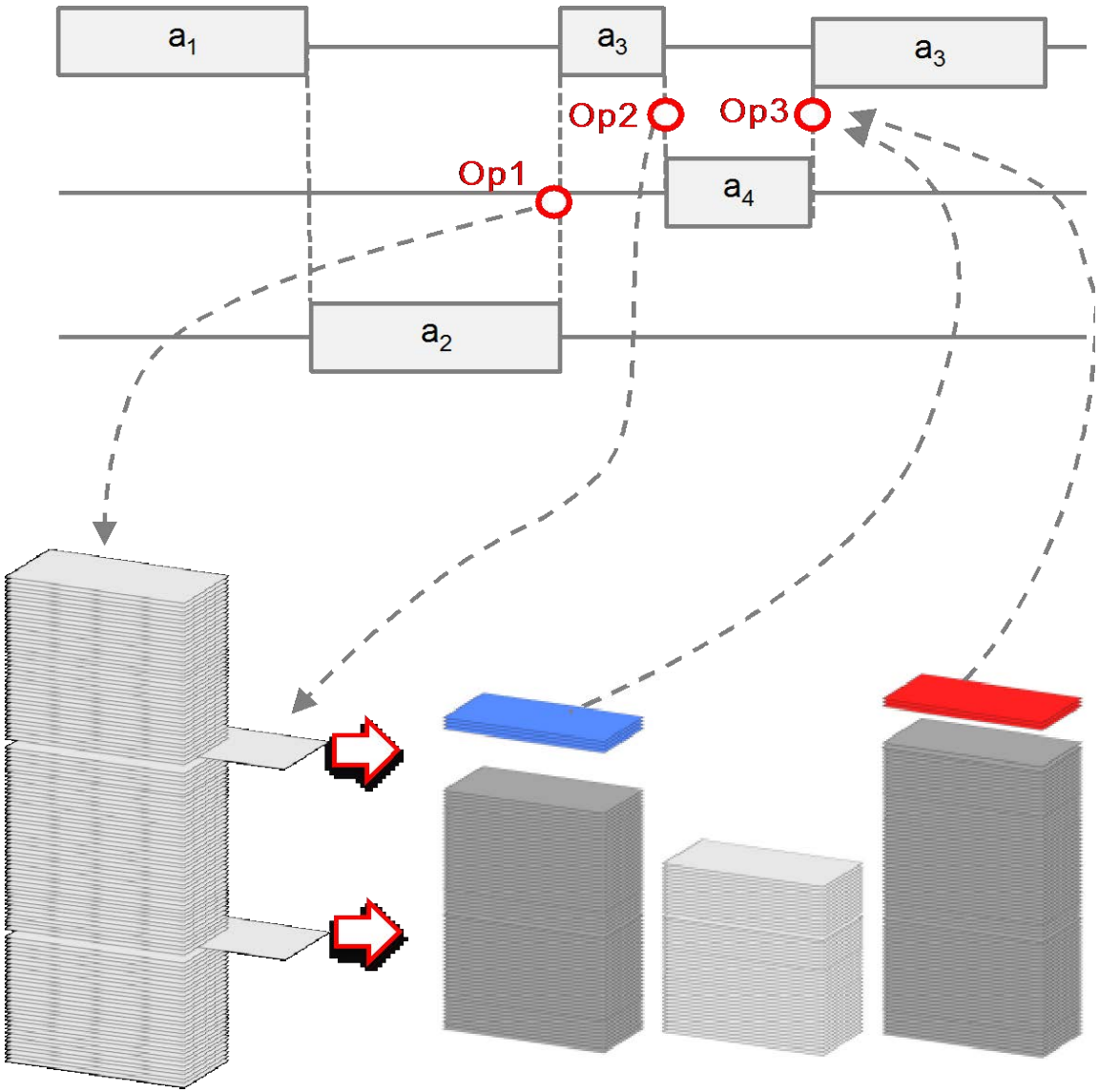
Is it geological erosion or accelerated erosion ?

Which one illustrates the best erosion?

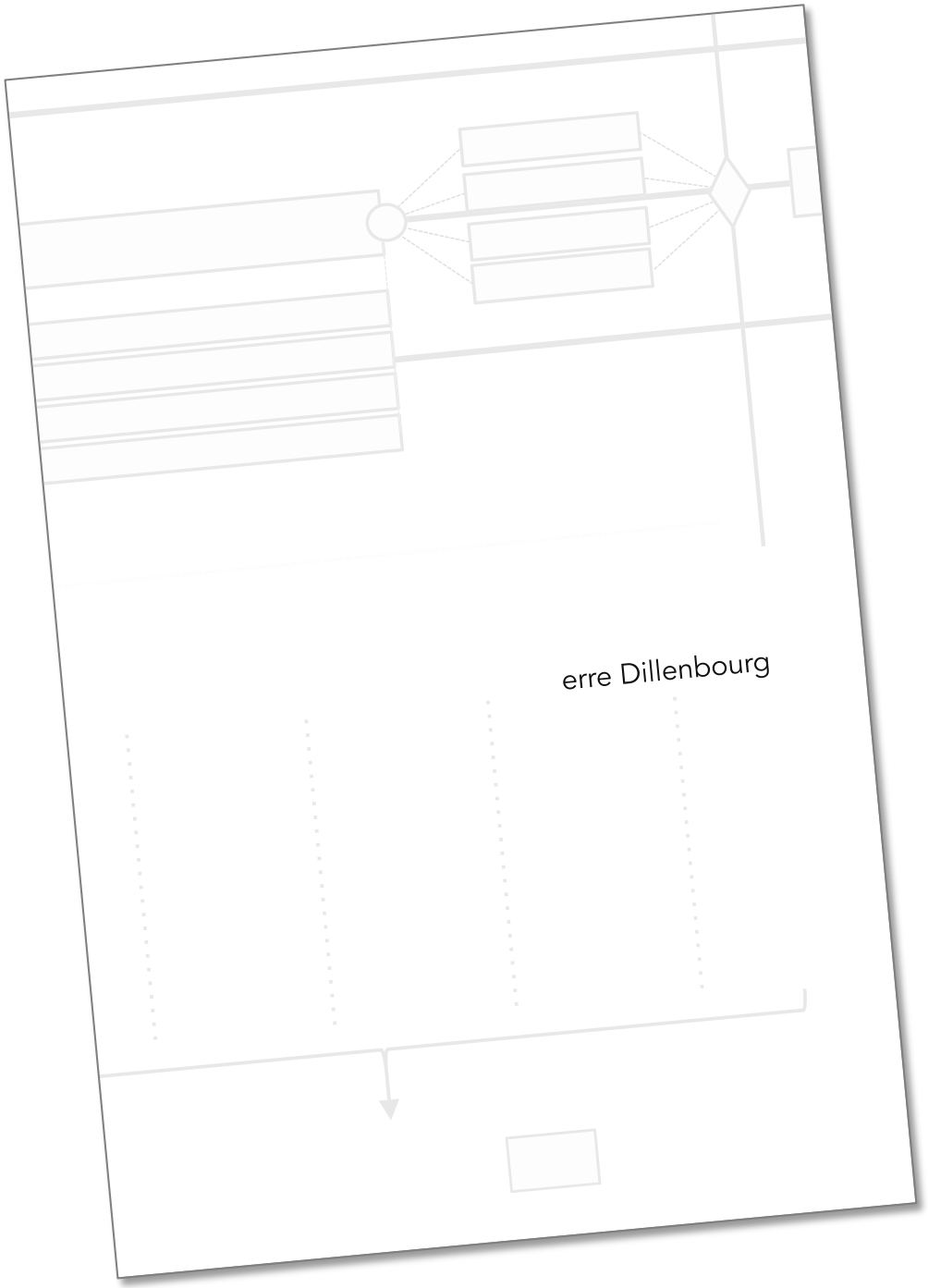

10’000
8’000
12’000
Geological erosion
Accelerated erosion

Select top 5% pictures





Orchestration Graphs


erre Dillenbourg

And….

- Students spent 4-5 h/week
- No ECTS credits so far
- Series 3 MOOCS + capstone
- Interest for corporate training
- Interest from vocational education

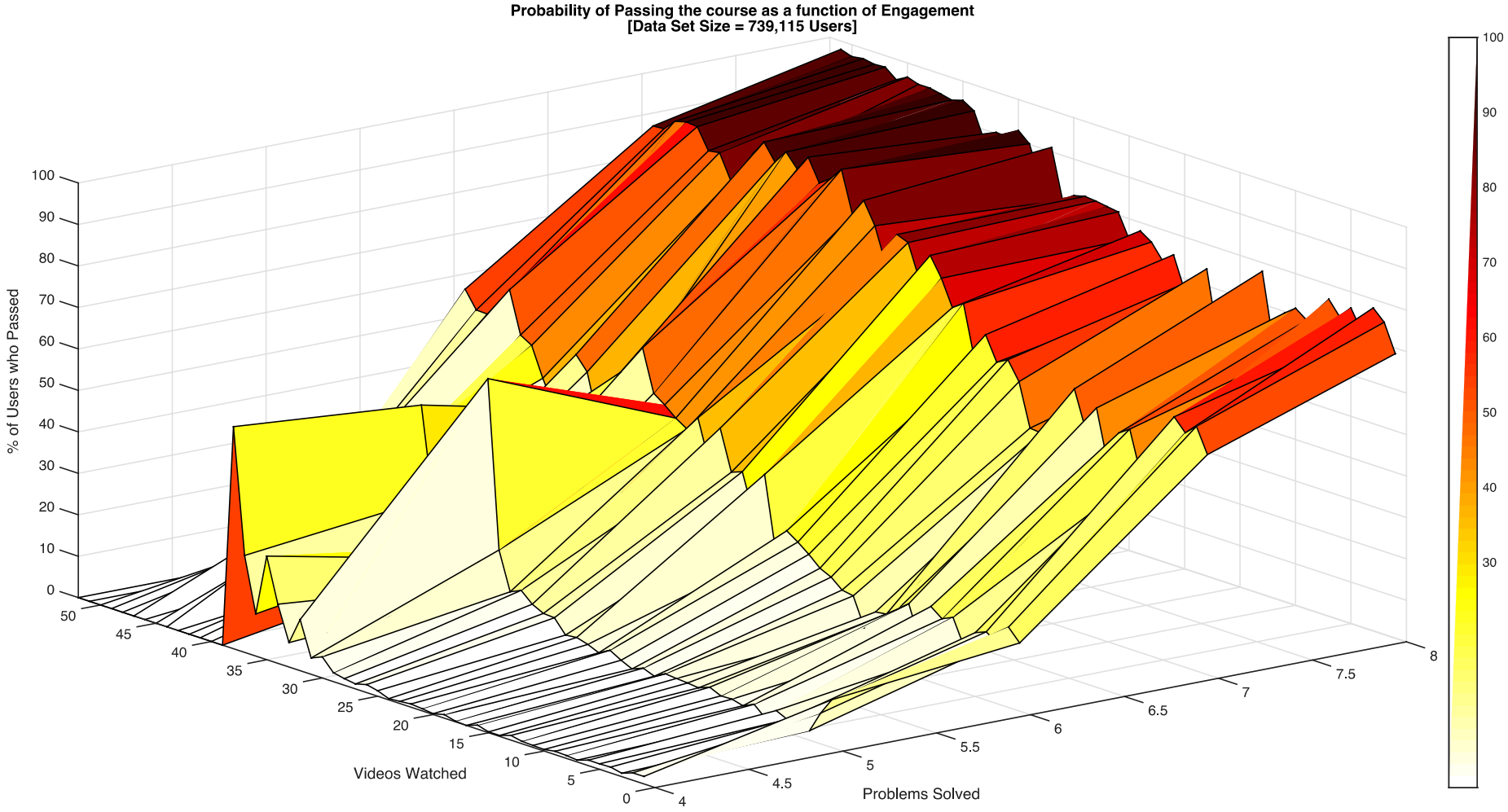
Why is instructional psychology absent ?

« MOOCs are lower quality than standards in instructional design, hence learning scientists should not work on MOOCs »

Better be an actor than a spectator

Beware of the Kodak syndrome

Pierre Dillenbourg, Center for Digital Education, EPFL


Probability of Passing the course as a function of Engagement
[Data Set Size = 739,115 Users]
% of Users who Passed
100
90
80
70
60
50
40
30
20
10
0
Videos Watched
50
45
40
35
30
25
20
15
10
5
0
Problems Solved
4
4.5
5
5.5
6
6.5
7
7.5
8
100
90
80
70
60
50
40
30

Will small universities disappear ?

ONLINE LEREN MAAKT SCHOOL

‘De KU Leuven en de Universiteit Gent zullen niet meteen verdwijnen, maar over de universiteiten van Antwerpen, Brussel en Hasselt ben ik niet zeker’

PIERRE DILLENBOURG, MOOC-EXPERT

de klassieke universiteiten verpletteren. Dat is niet gebeurd. Is het dan niet toch gewoon een hype?

Dillenbourg «Toen MOOCs plots een hoge vlucht namen, zijn er veel overstatements gemaakt. Volgens sommigen zouden ze alle onderwijsproblemen oplossen, volgens anderen zouden ze het einde van de universiteit inluiden. Zo’n vaart liep het niet, maar het is wél een evolutie die je niet naast je kunt neerleggen. In het huidige systeem zijn studenten gevangenen van het aanbod. Krijgen ze les van een slechte docent, dan moesten ze het daar tot voor kort mee stellen. Maar als er een MOOC van diezelfde cursus bestaat, door een geweldige docent aan een topuniversiteit, dan hebben ze de vrijheid om die te volgen. En dat zullen ze ook doen. Mijn studenten volgen óók MOOCs.»

HUMO Veel studenten haken vrij snel af. Slechts 5 procent zou de cursus voltoolen.

Dillenbourg «Dat is niet per se een probleem. Studenten pikken mee wat ze willen en nuttig vinden.»

HUMO Vaak komt een MOOC neer op een video van een hoorcollege aangevuld met oefeningen. Is dat zo vernieuwend?

Dillenbourg «MOOCs veranderen niet per se de pedagogie, maar wel het academische landschap. Het doel is niet dat steeds meer studenten thuis en online

sages die ze niet begrijpen, kunnen herbekijken. Een docent kan via analyse van de MOOC-beelden ook zien waar hun studenten blijven haperen en vervolgens zijn uitleg bijsturen of tijdens de oefeningen dieper ingaan op die moeilijke passage.»

HUMO Universiteiten hebben het financieel al moeilijk, nu krijgen ze er gratis concurrentie bij. Welk voordeel kunnen ze zelf uit MOOCs halen?

Dillenbourg «MOOCs kunnen de visibiliteit van de universiteit enorm verhogen. In twee jaar tijd hebben 600.000 studenten zich geregistreerd voor de MOOCs aan onze Ecole Polytechnique Fédérale. Dat is véél, zelfs als die cijfers overdreven zijn en één derde nooit echt deelneemt. De EPFL heeft daardoor een goede naam, en we scoren ook hoger in internationale rankings. Dat is belang-

ook een opportuniteit zijn voor kleine universiteiten.»

HUMO Bewijst het profiel van de MOOC-student dat de drempel van de universiteit lager wordt?

Dillenbourg «De gemiddelde MOOC-student is 28 jaar, mannelijk, leeft in een stad en heeft al een diploma. Meestal zijn het mensen die dus al een opleiding genoten hebben. MOOCs zullen nog moeten bewijzen dat ze kennis beschikbaar maken voor iedereen. Dat gezegd zijnde: het is ook logisch dat niet iedereen in een cursus van Harvard of Stanford geïnteresseerd is. Een landbouwer uit Denderleeuw heeft wellicht meer aan een MOOC van de Boerenbond over de nieuwste landbouwtechnieken. Als de Boerenbond een heel goede reputatie heeft, kan dat een succes worden. MOOCs zijn nu nog erg academisch,

HUMO