

# EDUCATION OF STUDENTS AND CITIZENS FOR NEW MATERIALS



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## CONTEXT

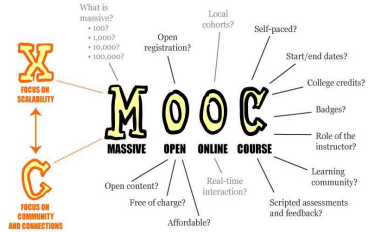
- Information and Communication Technology in Education: efficiency and pleasure of attendees to learning programs.
- Enlargement of the audience: Training of citizens ; Dissemination of knowledge such as that regarding new materials.
- Consolidation of knowledge and know how of institution personals. Time management of teachers-researchers.
- Enhancement of quality standards of teaching and well adapted to new audience.

• Examples of new tools and methods for education :

- Massive Open Online Course (MOOC)
- Small Private Online Course (SPOC)
- Platforms edX, Coursera, Unow-Canvas and others based on these platforms (e.g. France Université Numérique - FUN)

• Return of experience of MOOC and SPOC at MINES ParisTech - PSL, Shanghai Jiao Tong University (SJTU) ParisTech Elite Institute of Technology (SPEIT), and Institut Mines Telecom (IMT)

- MOOC « Problèmes Energétiques Globaux » on France Université Numérique (FUN)
- SPOC « World Energy Issues – Technological Solutions » at SPEIT and SPOC « Problèmes Energétiques Globaux » at MINES ParisTech
- MOOC and SPOC « Introduction to Experimental Thermodynamics » for customers, industrial partners and pre-doctorate students
- SPOC « Understand the process, design the plant »



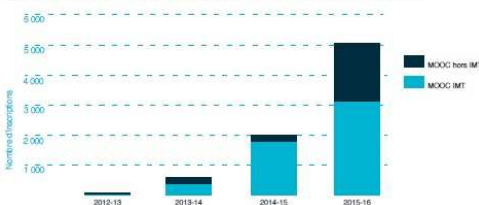
## MOOC AT INSTITUT MINES TELECOM

• MOOC and SPOC – Balance 2013-2016



- 25% of registered scholars effectively begin the first proposed activity
- 4-6 weeks ; 2 to 5 hours of work / week ; weekly quiz or tests ; final examination
- 8% of registered learners successfully complete the MOOC

Nombre d'inscriptions d'étudiants à un MOOC de l'IMT dans le cadre de leur cursus

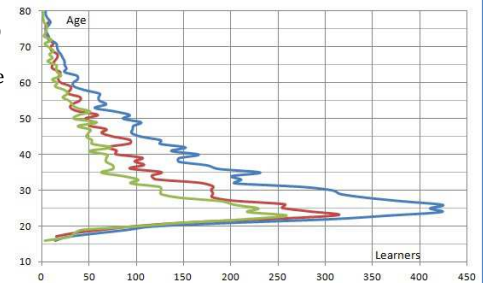


- Development of MOOC (homemade or others) use in teaching at IMT
- Assessment may be internally controlled for external MOOC and credits transferred to learners

## MOOC «PROBLÈMES ENERGÉTIQUES GLOBAUX» (GLOBAL ENERGY ISSUES)

MOOC created by Renaud Gicquel, MINES ParisTech.  
Six weeks MOOC with a first play on Platform FUN in 2016

- Session 1: end 14th March 2016 ; 8 947 learners; 36% F – 64% M; Master 53%; PhD 6%; Final exam: 1080; Successful exam: 848 (9.8% of registered learners); blue
- Session 2: end 24th October 2016 ; 5 531 learners; 40% F – 60% M; Master 64%; PhD 5%; Final exam: 675; Successful exam: 606 (11.1%); red
- Session 3: end 3rd November 2017 ; 5 189 learners; 40% F – 60% M; Master 61%; PhD 5%; Final exam: 502; Successful exam: 470 (9.1%); green



## THERMODYNAMICS FOR NEW MATERIALS AND NEW PROCESSES

MOOC Thermodynamics Conversion of Heat: Modelization and Simulation

Session 1 from 13/2/17 to 24/4/17

Participants : 1987 - 56 % > Master – 15 % Female

Active participants: 486 (25 %)

Attendance to final exam: 238 (12 %) - Successful evaluation: 197 (9.9 %)

MOOC Thermodynamics Conversion of Heat: Classic and Innovating Cycles

Session 1 from 27/3/17 to 4/5/17

Participants: 2050 - 60 % > Master – 18 % Female

Active participants: 162 (7.9 %)

Attendance to final exam: 109 (5.3 %) - Successful evaluation: 86 (4.2 %)

## INTRODUCTION TO EXPERIMENTAL THERMODYNAMICS

- MOOC for preliminary knowledge of experiences & characterization
- (1) Fundamental and basis of thermodynamics
- (2) Technique to generate phase diagrams or other thermodynamics data
- (3) Options and decisions making among various experimental methods
- (4) Settings, scaling, measure quality and measurement accuracy
- (5) Two practical filmed demonstrations of measurements
- (6) Data treatment including modeling and writing of report or publication

• Dedicated to Ms of PhD students , personal or customers of companies involved in products and processes for thermodynamics

• Self Paced in French subtitled in English

## CONCLUSIONS

- Continuous development of MOOCs in Engineering Schools (e.g. IMT, SPEIT, Polytechnique) shared with other schools and a general audience.
- No dedicated platform; no specific language; no evaluation model; no fees; organized within session or as self paced.
- Appreciated by intern and extern learners; high participation to final exam.

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