



Teaching Thermodynamics with MOOC: Motivations and Results

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Institut Mines Telecom (IMT)



Institut Mines Telecom in some figures

- 13 700 students
- 8 Engineer Schools + 1 Management School:
 - IMT Atlantique, IMT Lille Douai, Mines Alès, Mines Albi, Mines Saint-Etienne, Télécom Ecole de Management, Telecom ParisTech, Telecom SudParis, Mines ParisTech
- 2 Engineer Schools subsidiaries
 - Eurecom and Mines Nancy
- 13 Schools affiliated



Teaching with MOOC at IMT

MOOC at IMT & MINES ParisTech: for open audience and students

- Information and Communication Technology in Education (ICTE):
 - Massive Open Online Course: MOOC
 - Small Private Online Course: SPOC
 - Combination of MOOC + work in presence of teachers & students
- MOOC given by IMT or MINES ParisTech (from 2013 until present)
 - 4 MOOC on France Université Numérique Platform (FUN) by MINES ParisTech
 - 26 MOOC on France Université Numérique Platform (FUN) by IMT
 - 3 MOOC on Coursera Platform by IMT
 - 1 MOOC on Unow / Canvas by IMT

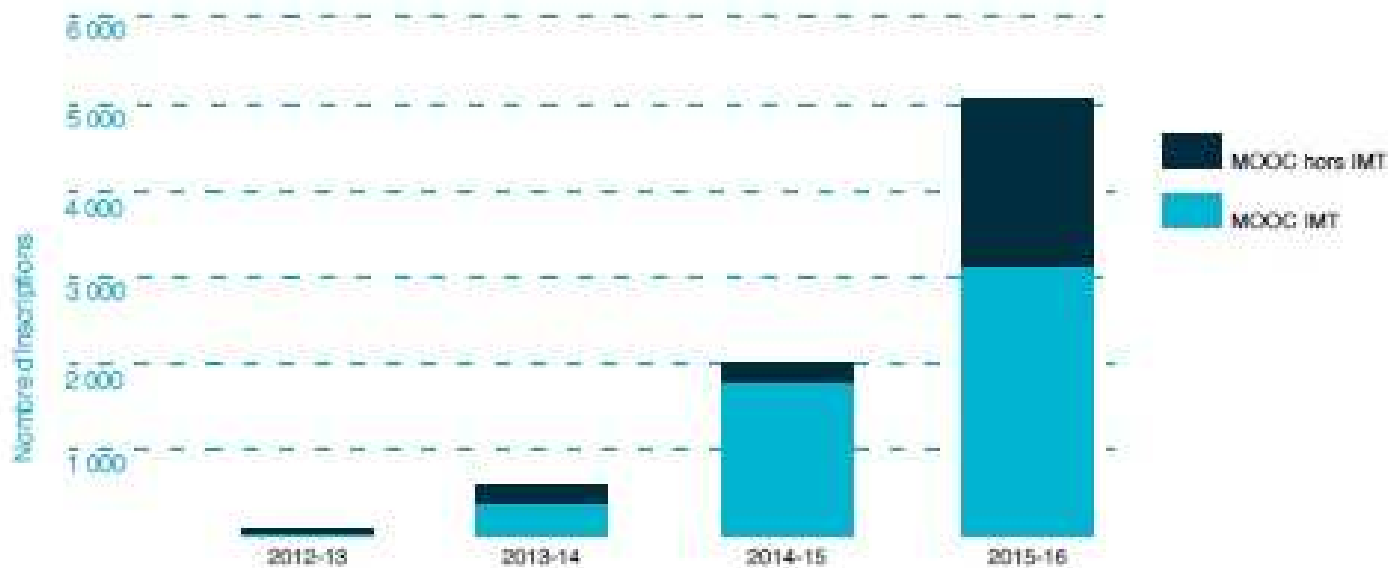


 <p>SESSION 2</p> <p>Concevoir pour innover introduction à la théorie C-K</p> <p>Mines ParisTech</p>	 <p>SESSION 1</p> <p>Conversion Thermodynamique de la Chaleur : Cycles classiques et innovants</p> <p>IMT</p>	 <p>SESSION 2</p> <p>Problèmes Energétiques Globaux</p> <p>MINES ParisTech</p>	 <p>SESSION 1</p> <p>Conversion Thermodynamique de la Chaleur : Modéliser et Simuler</p> <p>IMT</p>
<p>Débute</p> <p>05 jui 2017</p> <p>En savoir plus</p>	<p>Terminé</p> <p>04 mai 2017</p> <p>En savoir plus</p>	<p>Terminé</p> <p>24 oct 2016</p> <p>En savoir plus</p>	<p>Terminé</p> <p>24 avr 2017</p> <p>En savoir plus</p>

Teaching with MOOC at IMT

MOOC: A new way of teaching for IMT's students

- Attendance of the 13 700 IMT students to IMT's MOOC and MOOC from other producers



Teaching Thermodynamics



Experiencing Thermodynamics teaching to engineer students

- To train students with less developed scientific skills than before whilst solving more complex problems, with less scheduled time devoted to thermodynamics
- Classical methods dilemma: To improve energy technologies (i.e. environment impact and efficiency). Thermodynamics models are considered either too simple or too complex for simulation
 - Consequence: Students do not understand the benefit of simple models or do not feel comfortable with complex models
- Moreover (too) much time devoted to fluid properties equation writing and modeling elementary components of cycles limit teaching to basis cycles without dealing with innovating ones

Teaching Thermodynamics



Renovating Thermodynamics teaching to engineer students

- Reduction of time devoted to the writing of equations describing the evolutions imposed to fluids
- Calculations are made by software without precise description of their calculations by students
- Students spend their learning time to understanding technology and learning thermodynamics cycles architecture
- First generation of new tools using Information and Communication Technology in Education (ICTE) for Thermodynamics teaching:
 - Thermoptim simulator http://direns.mines-paristech.fr/Sites/Thopt/en/co/presentation-thermoptim_1.html
 - Diapason modules <http://direns.mines-paristech.fr/Sites/Thopt/en/co/seances-disponibles.html>
 - Thermoptim Portail http://direns.mines-paristech.fr/Sites/Thopt/en/co/Arborescence_web.html

Teaching Thermodynamics



Teaching Thermodynamics with MOOC: Conversion of Heat (1)

- « Producing a MOOC demands a quality approach when preparing teaching » (Renaud Gicquel, Mines ParisTech)
- 1st MOOC. Thermodynamics Conversion of Heat: Modelization and Simulation. Session #1 from 13/2/17 to 24/4/17
- 2d MOOC. Thermodynamics Conversion of Heat: Classical and Innovating Cycles. Session #1 from 27/3/17 to 4/5/17
- Registration to 1st MOOC possible during the duration of the 2d MOOC session in case of needs for fundamentals
- Content:
 - MOOC 1: basic thermodynamics for simple systems: steam cycle, gas turbine, refrigeration machines. Choice of parameters for cycle simulations
 - MOOC 2: classical motor and receptor cycles, innovative ones with lower environmental impact

Teaching Thermodynamics



Teaching Thermodynamics with MOOC: Conversion of Heat (2)

- MOOC: Thermodynamics Conversion of Heat: Modelization and Simulation. Session #1 from 13/2/17 to 24/4/17
 - Participants : 1987 (on the last day of the exam)
 - 56 % >Master – 15 % Female
 - Active participants: 486 (25%)
 - Attendance to final exam: 238 (76%)
 - 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 (the last day of the exam)
 - 60 % >Master – 18 % Female
 - Active participants: 162 (7.9%)
 - Attendance to final exam: 109 (67%)
 - Successful evaluation: 86 (4.2%)

Teaching Thermodynamics



Teaching Thermodynamics with MOOC: a MOOC in construction “Introduction to experimental Thermodynamics”

- MOOC for preliminary knowledge to experiences & characterization
 - (1) Fundamental and basis of thermodynamics
 - (2) Technics 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
- First session in March 2018
- Dedicated to Ms of PhD students as well a personal or customers of companies involved in products and processes for thermodynamics
 - A first step to understand methodology and to choose thermodynamical characterization of fluid or mixture
 - Self Paced (in French subtitled in English)
 - Practical works on specific cases possible in MINES ParisTech laboratories
- [MOOC Teaser](#)

Teaching Thermodynamics



Acknowledgments

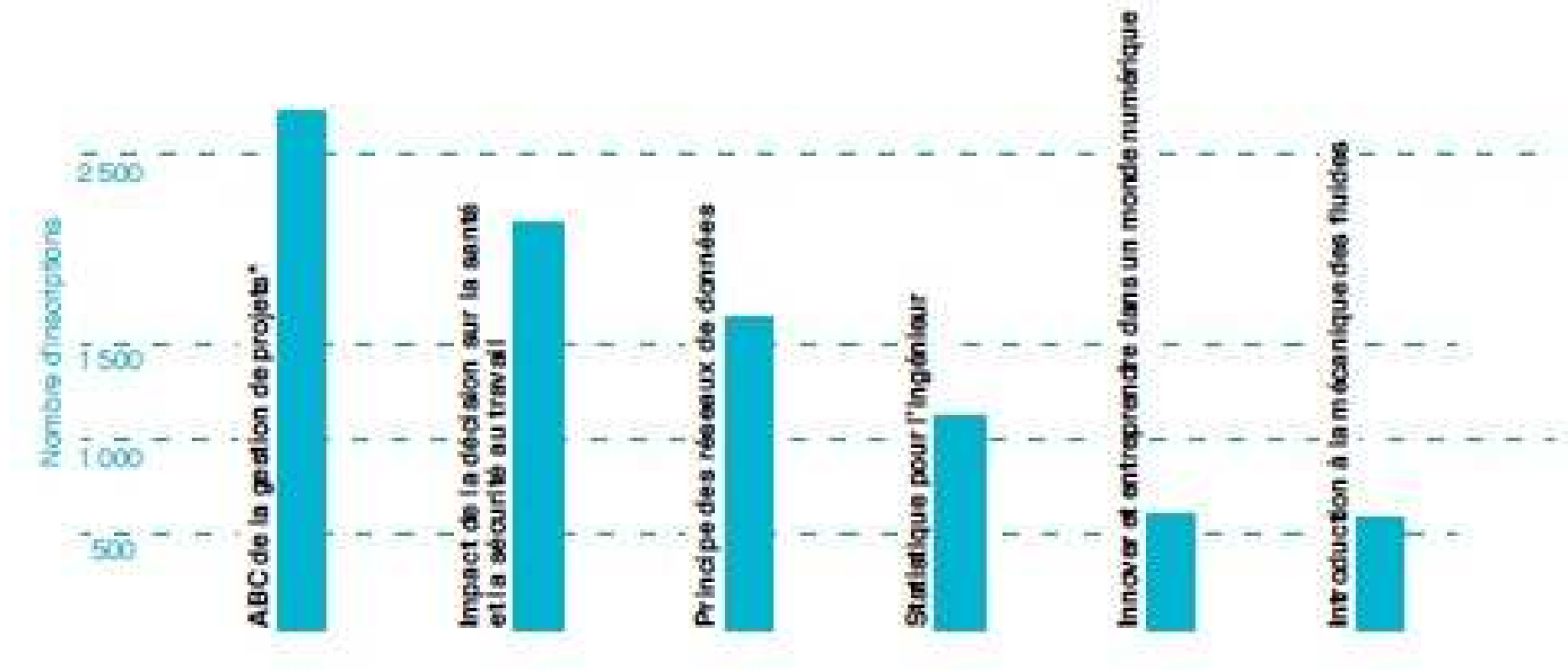
- UNIT Université Numérique Ingénierie et Technologie UNIT for its funding of the MOOC on Thermodynamics
 - MOOC Conversion Thermodynamique de la Chaleur (Thermodynamics Conversion of Heat Part 1)
 - MOOC Conversion Thermodynamique de la Chaleur (Thermodynamics Conversion of Heat Part 2)
 - MOOC Introduction to Experimental Thermodynamics
- The ComUE PSL Research University for its funding of the MOOC “Understand the process, design the plant”
- The Institut Mines Telecom IMT for its help in gathering data

Teaching with MOOC at IMT

MOOC: A new teaching for IMT's students (2)

- Use of MOOC mainly for the IMT students' common core

Principaux MOOC utilisés dans les enseignements de l'IMT



Teaching with MOOC at IMT

MOOC: A new teaching for students

- Use of “MOOC made in IMT” by students from other institutions

Utilisation des MOOC de l'IMT dans d'autres établissements

