



FONDATION

La main à la pâte

POUR L'ÉDUCATION À LA SCIENCE

# *Tomorrow, curriculum as usual ?*

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*The New Vision of Science and Its Implications for Curriculum,  
INNOVEC Conference, Mexico City, Nov 5-6, 2015*

1. Introduction
2. New vision of science ?
3. New curricula ?
4. New Teachers ?
5. Special education
6. Conclusion

# The Great Story



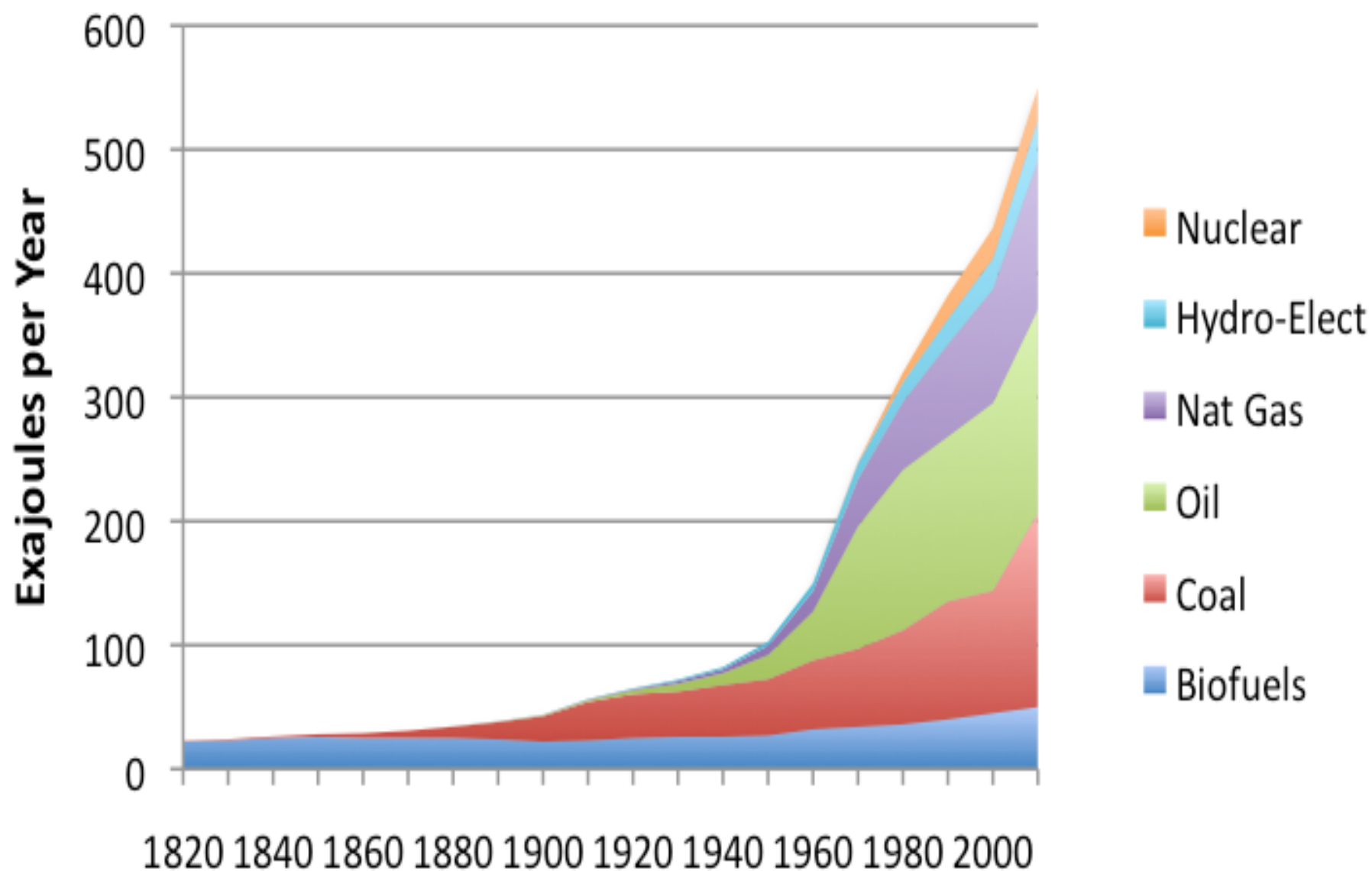


## *The new French Curriculum (K-9) ambitions, for science subjects*

- to pursue fostering inquiry (C2 & C3) ;
- to improve natural sciences/maths relations ;
- to enhance pluridisciplinarity (C4)
- to account for social “hot” issues ;
- to include informatics, early on (C2 to C4) ;
- to emphasize rationality, critical mind, secularity (*laïcité*), citizenship ;
- Technology remains isolated from science...  
(STEM issue)

BASIC EDUCATION : C2 = Gr.1 to 3      C3 = Gr. 4 to 6      C4 = Gr. 7 to 9

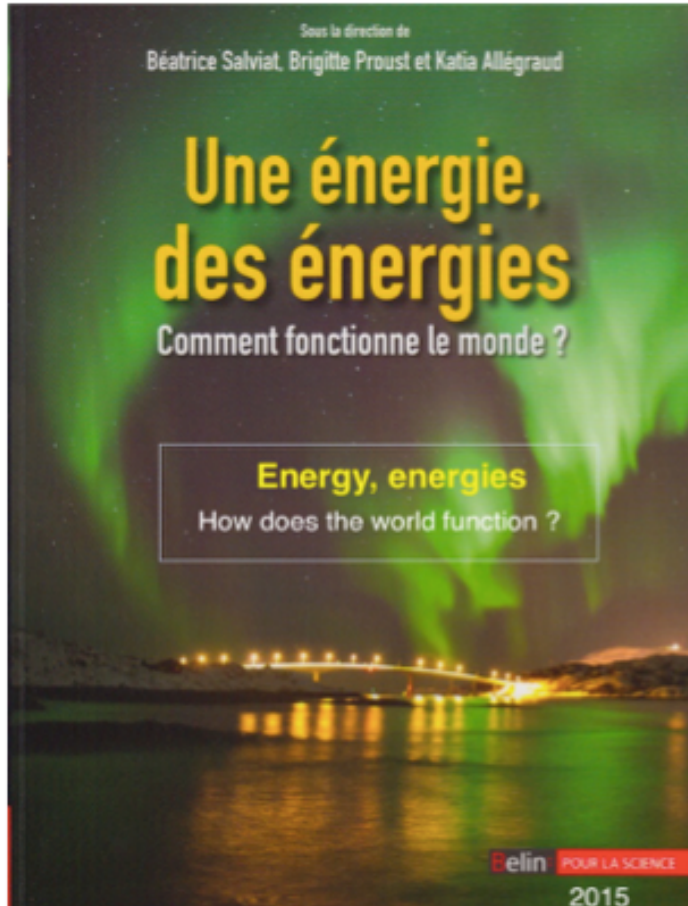
# World Energy Consumption



## *How to make a long story short ?*

- Aristotles : ενεργια
- G. Leibnitz (1750) : *vis viva*  $\rightarrow mv^2$
- T. Young (1807) : *energy*
- S. Carnot (1829) : *heat*
- G. Coriolis (1829) : *kinetic energy*
- W. Rankine (1853) : *potential energy*
- J.P. Joule (1845) : *heat is energy*
- J.J. Thomson (1850) : *energy conservation*
- Clausius (1850s) : *“usable” energy*

A book from *La main à la pâte*



Citizen  
Biosphere  
Earth  
Universe

## TRANSFORMATIONS USEFUL FOR HUMAN BEINGS

Nutrition and Health  
Producing and stocking Energy  
Energy and Transportation  
Energy and Housing  
Art, Industry and Communication

## KEYS TO ENERGY

What is energy ?  
History of a concept  
Principles of Thermodynamics  
Electromagnetic Phenomena  
Mass and Energy  
Units and Comparison of energies

To help teachers to understand ENERGY in its science/technology/social aspects

# Complexity

1. Multiple parameters and hidden variables ;
2. Proportionality & non-linearity ;
3. Dynamic equilibrium ;
4. Positive feed-back and runaway ;
5. Phase transitions



*Has evolution shaped our brain to properly cope with these « unusual » aspects of complex systems ?*

Wolf Singer, *Max-Planck Institute für Hirn Forschung*, Frankfurt a.M., 2015

## Modules for teachers (cycles 3 & 4) : science & inquiry lessons

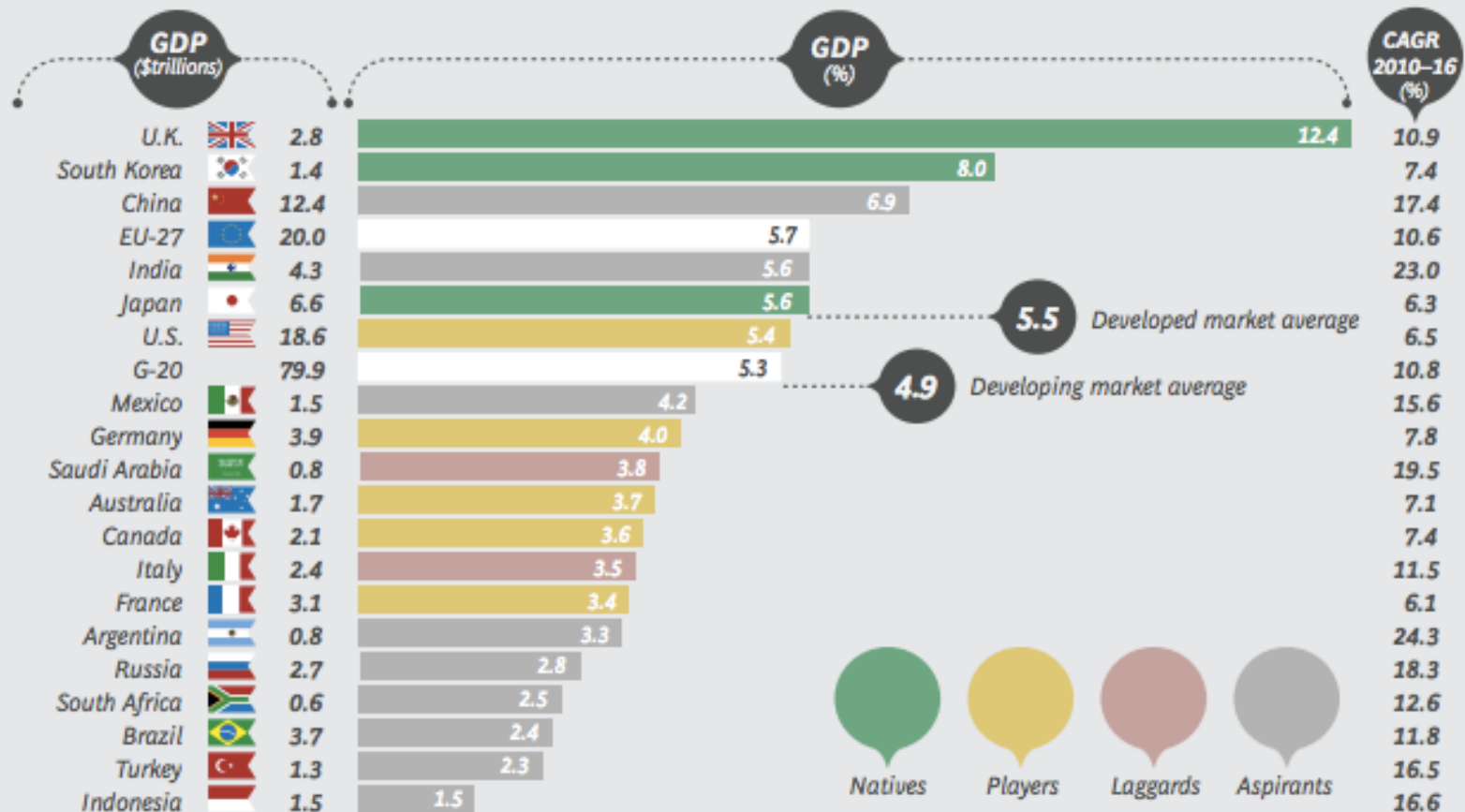


Two of the modules for teachers, produced by *La main à la pâte* (2015), currently in French, exploring how to deal with complexity and interdisciplinarity in Grades 4 to 6 (cycle 4 of French curriculum)

## Apple: un trésor de 205 000 000 000 dollars

### EXHIBIT 5 | The Internet Economy Will Account for 5.3% of GDP in the G-20 Countries in 2016

Internet economy as a percentage of 2016 GDP



# Informatics in new French curriculum

## a transversal or specialized subject ?

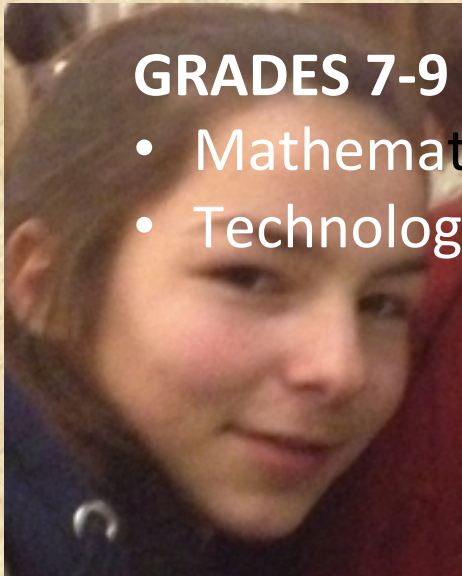
### **GRADES 1-3** (very ambitious !)

- To describe the simple architecture of a computer system
- To be familiar with word processor and use it rationally.
- To observe the connections between various pieces.
- Capturing, treating, saving, restituting data
- :



### **GRADES 7-9**

- Mathematics : Algorithmics & Programming
- Technology : Robotics & Programming



### QUESTIONS

Teacher training?  
Inquiry learning ?  
Other subjects ?

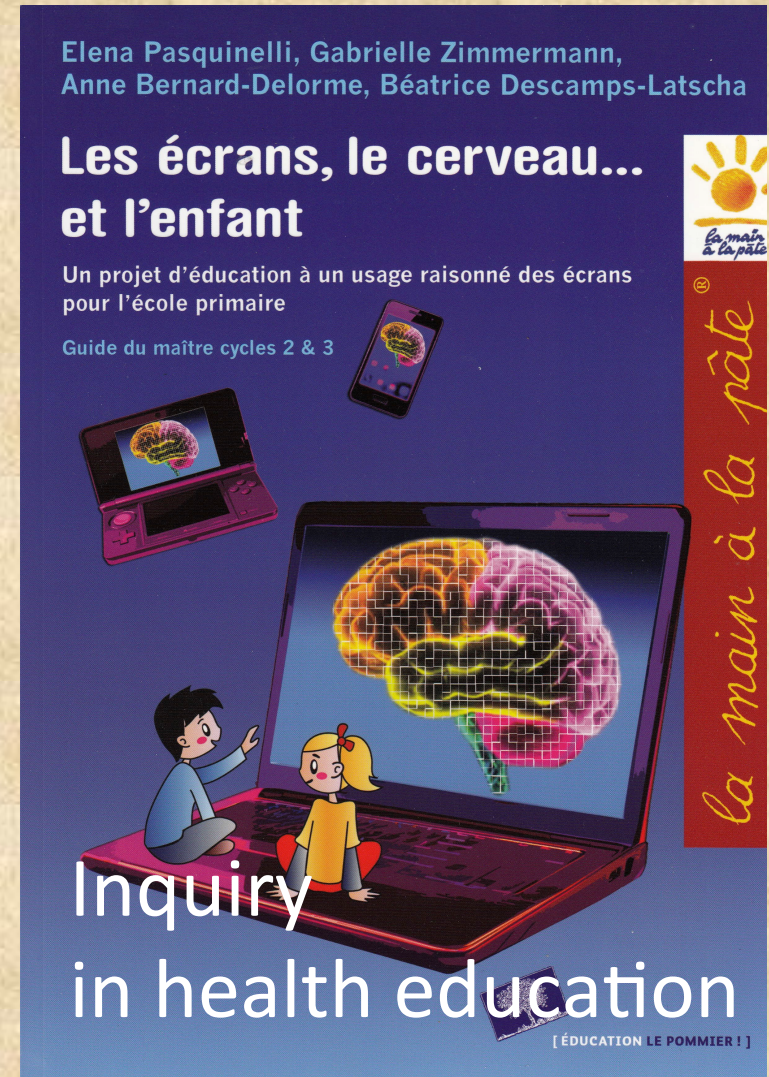
# Should today a curriculum include the study of the cognitive functions of the brain ?



## LESSONS

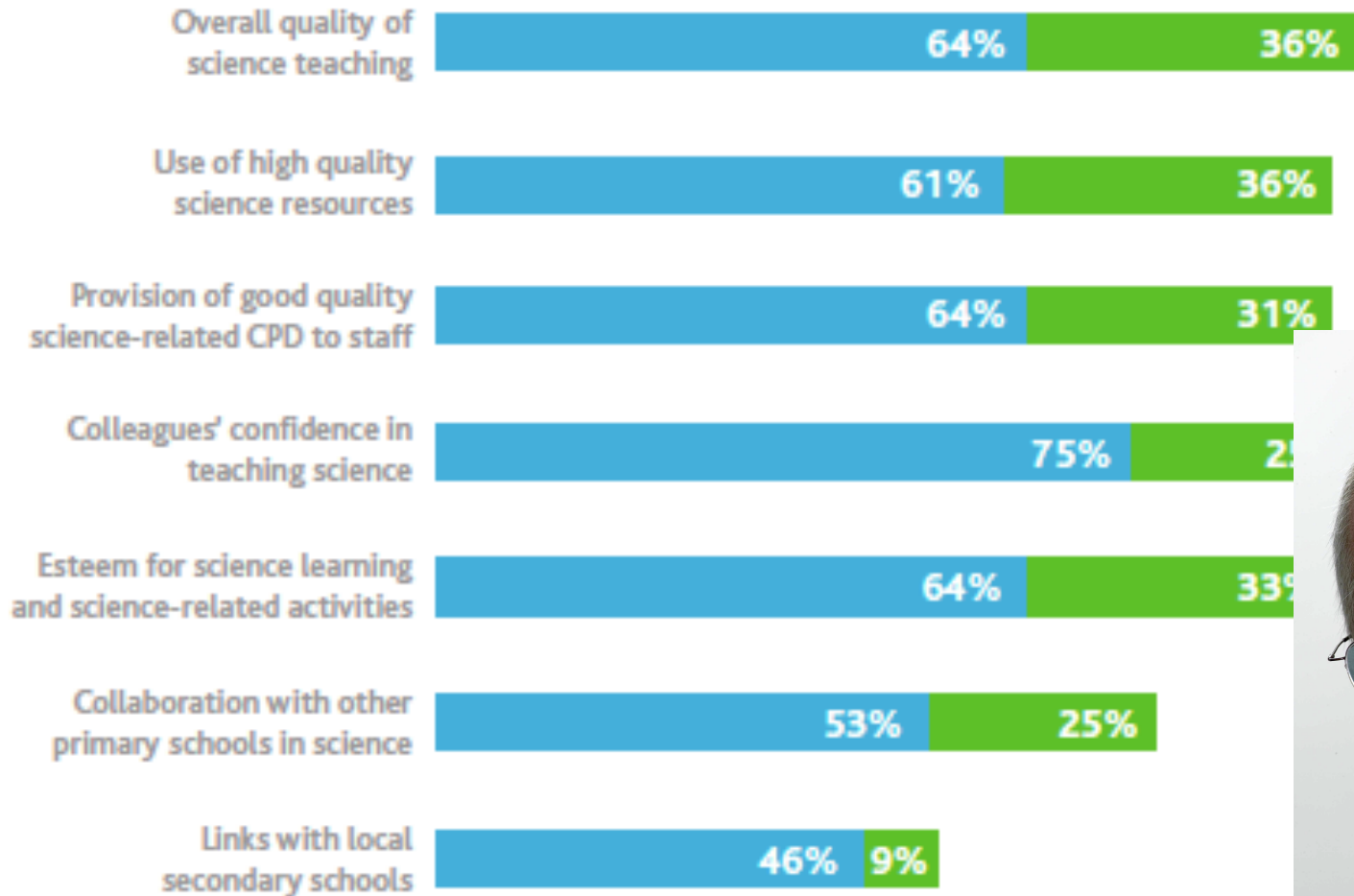
1. Attention
2. Memory
3. Sleep
4. Multiple tasks
5. Communication
6. Vision

Available in English on [www.fondation-lamap.org](http://www.fondation-lamap.org)



# Impact of *National science learning centers* in UK (2006-2015)

This CPD course has helped our school improve in the following areas:



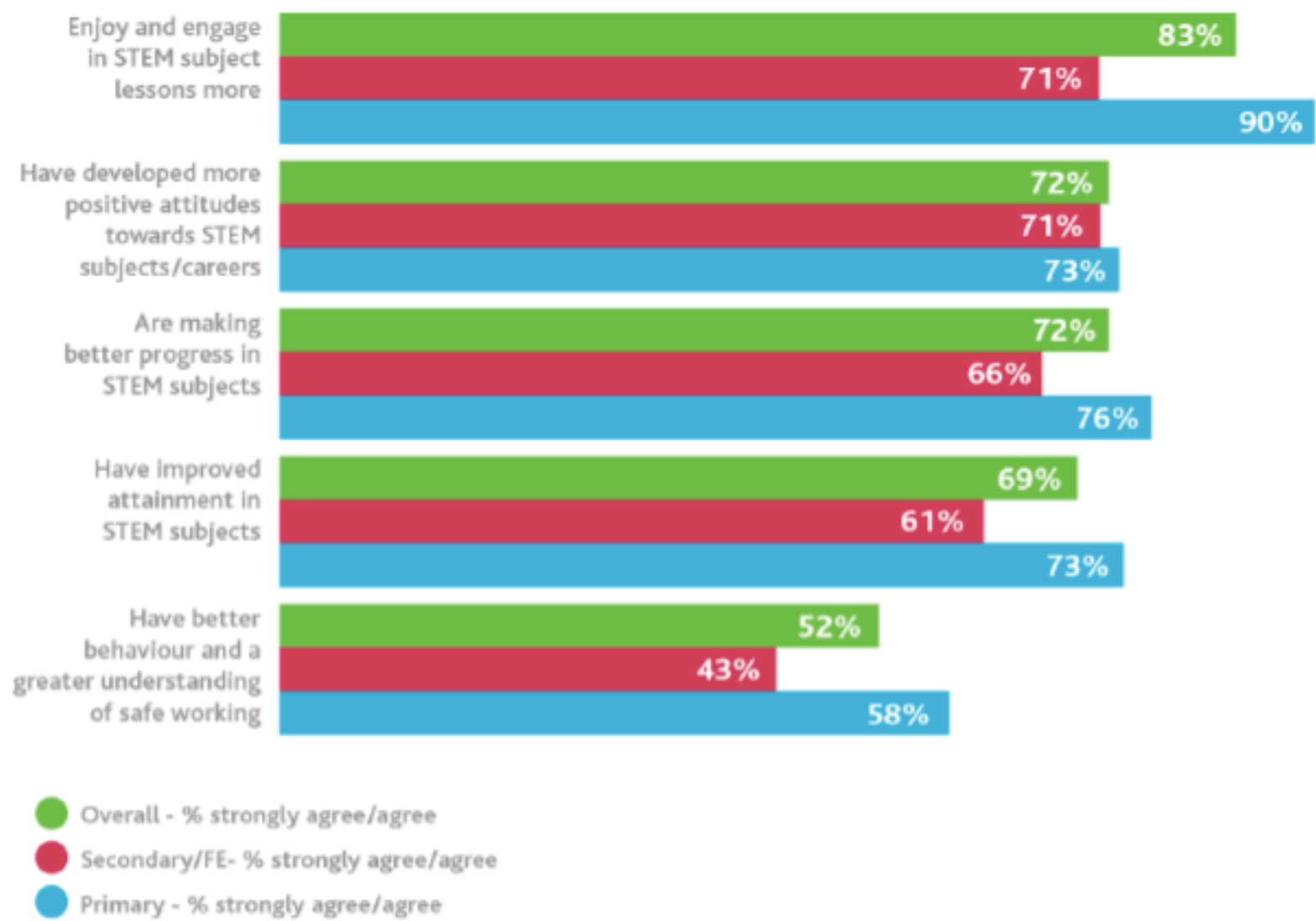
● Agree ● Strongly agree

Ten Years Study - 2015

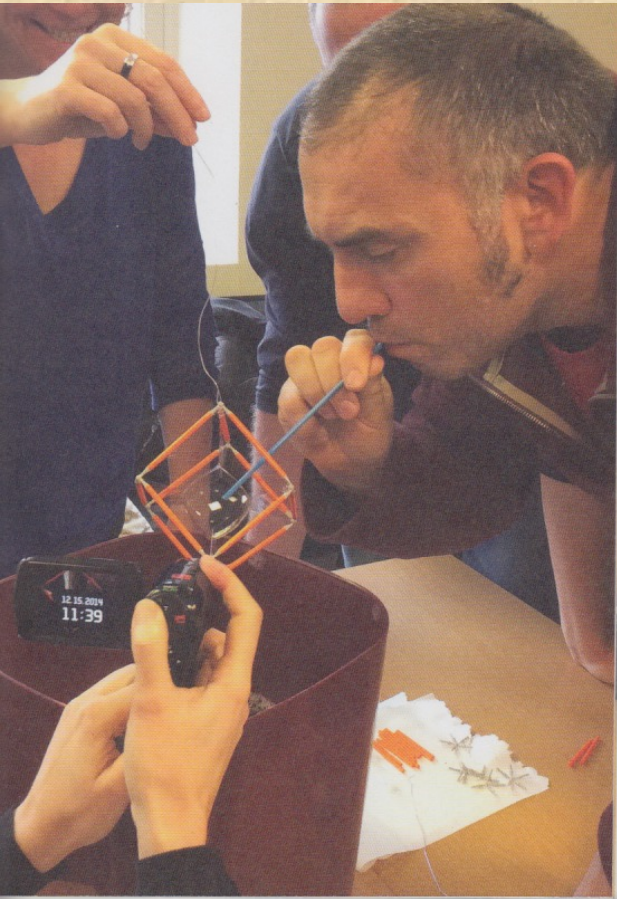


John Holman

# As a result of STEM leadership CPD, pupils in classes in my department / subject area:



# In France, impact of the *9 Maisons pour la science au service des professeurs* (2012-2015)



## Some titles from the 2015-2016 program

Matter to explore (Prim.)

Air, how inflated ! (P)

Wrath of nature (P)

Formation of landscape in Alsace (P)

To be or not to be... alive (P)

From Earth to Moon the art of measuring (Sec.)

Technology and Engineering : printing in 3D (S)

Using statistics : ethics and scientific integrity (P,S)

Informatics without a computer (P,S)

# Overview 2012-2015

## (Primary & Midle school Teachers)

- Nine Maisons in 9 Universities over France ;
- 700 actions, 15 000 teachers (60%P, 40%S)
- $\langle \rangle$  = 1.6 day + distance follow-up
- 950 scientists & engineers participation (no cost) ;
- 3200 teacher trainers (Paris Center) ;
- New topics : *history of science, epistemology, informatics, cognitive sciences, health education* ;
- MOOC on « Air » for primary (2015) : 1 400 teachers
- Several Assesments being carried.

# Science for children in Special education (2011-2015)

Faire des sciences en classe avec des élèves  
en situation de handicap,  
c'est possible... et c'est utile!

## Vivre et partager la science

Une ressource pour tous les élèves

Marie-Hélène Heitz  
Clotilde Marin-Micewicz  
Édith Saltiel



Institut national supérieur de formation  
et de recherche pour l'éducation  
des jeunes handicapés  
et les enseignements adaptés (INS HEA)  
Fondation La main à la pâte



33 classes

Multiple handicaps  
(physical or mental)

Inquiry

*Muchas gracias por su atención !*

# A curriculum

- Knowledge content
- Skills and competencies
- Building the human person

## The implementation

- A pedagogy (inquiry)
- A training of teachers
- An insertion into the local community
- A vision of students's connectivity to the global

- 1. Les langages pour penser et communiquer**
- 2. Les méthodes et outils pour apprendre**
- 3. La formation de la personne et du citoyen**
- 4. Les systèmes naturels et les systèmes techniques**
- 5. Les représentations du monde et l'activité humaine**