



Science education for all students Status and challenges

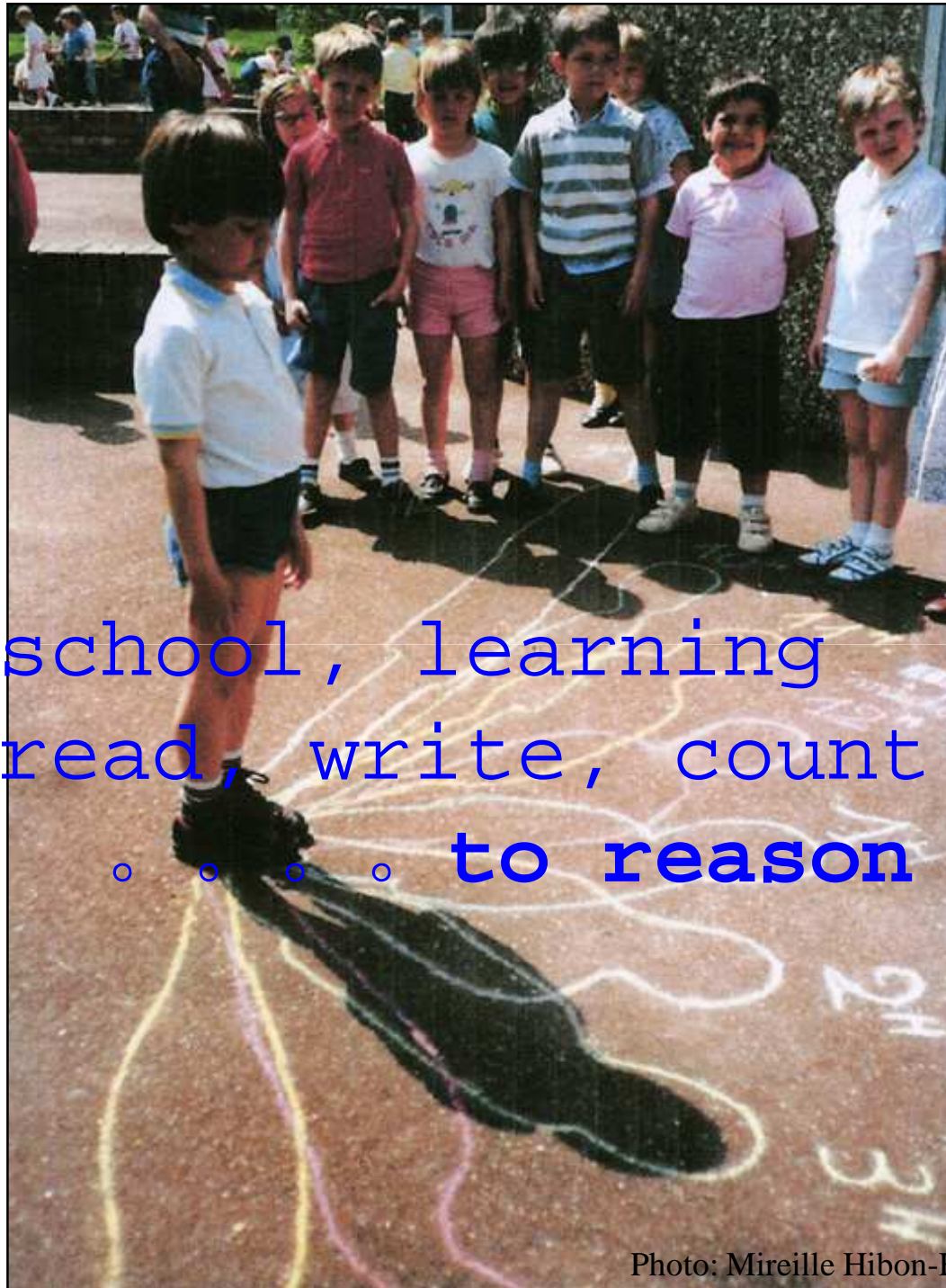
Pierre Léna

Académie des sciences, France

Président, Fondation *La main à la pâte*

www.fondation-lamap.org

World Science Forum - Rio-de-Janeiro, Nov 25-27, 2013



In school, learning
to read, write, count
and . . . to reason

*From 2000 onwards,
science education for all becomes a global concern*



SCIENCE EDUCATION IN DANGER?

Encouraging Student Interest in Science and Technology Studies

Global Science Forum

OCDE 2009

全民科学素质行动计划纲要

(2006—2010—2020年)

China 2006

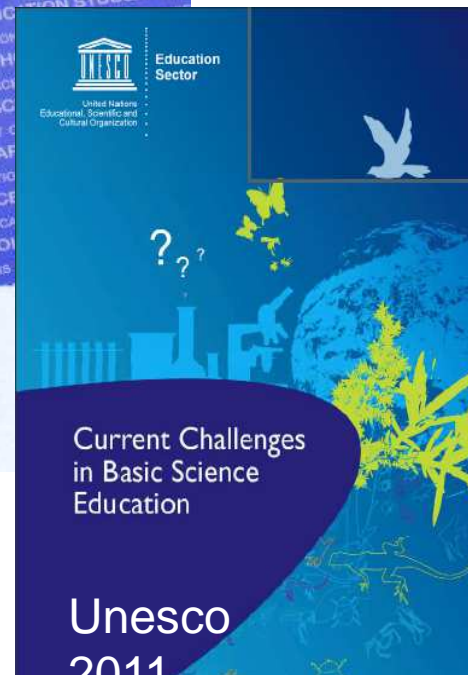
Program to convey scientific culture to the whole people



Groupe Interacadémies sur des questions internationales (IAP)



Rapport du Groupe de travail sur la Collaboration Internationale pour L'Évaluation des Programmes D'Enseignement Scientifique Fondés sur L'Investigation (ESFI)



Science education for all students

- A global goal making **consensus**, worldwide ;
- **Grounds** : development and skills, justice and equity ;
- **Challenges** for schools :
 1. To begin early (ages 6 to 12) ;
 2. To teach real and interesting science/technology ;
 3. To address all students ;
- A **pedagogical revolution** :
 1. Convincing education authorities ;
 2. Teacher preparation ;
 3. Ressources for the classroom.
 4. Role of scientists / engineers ;
 5. Opening the school : parents and community

1995-2013 across the world

- *A wealth of pilot projects*

- *Mao na massa*, Brazil (ABC et al)

- *做中学*, China (Wei Yu et al)

- *Pequenos Científicos* Colombia (Ducque et al)

- *Ensensenza Ciencia* , **A renewal of science education**

- *Haus der kleinen Forscher* **in Europe**

- *Primary connections*

- *Innovec*, Mexico (Ferreira)

- *Engineering is elementary*

Views and Actions of National Academies

Analysis of surveys conducted in 2010 and 2011

- Academies move through Europe

A report of the ALLEA Working Group Science Education

(IAP Science Education Programme Regional European Council)

Inquiry based science education (IBSE)

*Inquiry is a term used both within education and in daily life to refer to seeking knowledge or information by **asking questions**. It is sometimes equated with research, investigation, or 'search for truth'.What distinguishes **scientific inquiry** is that it leads to **knowledge and understanding** of the natural and made world around, through **methods** which depend on the **collection and use of evidence** .*

- **Universality of curiosity and science ;**
- **Diversity of cultures, languages, educations**



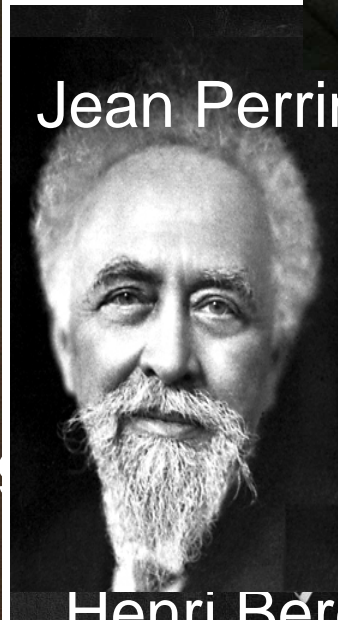
Jan Comenius 1592-1670



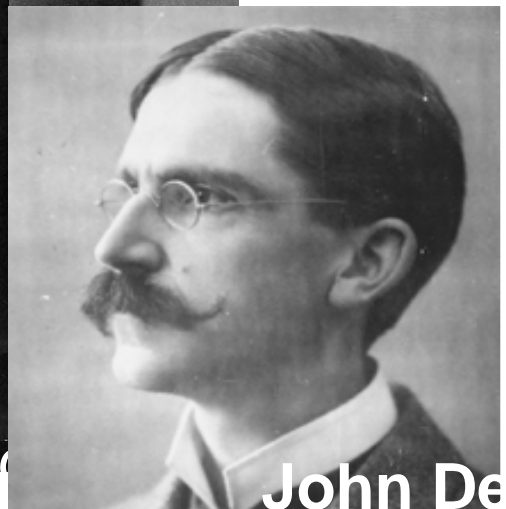
Maria Montessori



Georges Charpak



Jean Perrin 1870-1942



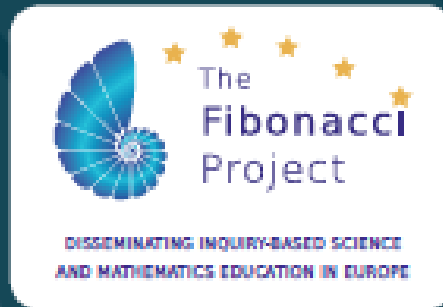
John Debye



Frank Oppenheimer 1912-1985



Pierre Curie 1896-1906



BACKGROUND RESOURCES FOR IMPLEMENTING INQUIRY
IN SCIENCE AND MATHEMATICS AT SCHOOL

INQUIRY IN SCIENCE EDUCATION

Harlen W, in The **European Fibonacci project (2009-2013)**,
www.fibonacci-project.eu/

What we need (R Millar, 2012)

- Greater clarity about intended learning outcomes in science/technol.
 - together with validated **tools for identifying achievement**
- A model of science teaching and learning taking seriously the fact that 'core' science
 - is a body of accepted knowledge
 - which uses a framework of ideas and concepts
 - which **do not emerge solely from a study of phenomena**
 - indeed, in many cases, are deeply counter-intuitive
- This is not an argument for a 'transmission model' of instruction
 - but rather for one that recognises the need for, and the place of, episodes of **teacher exposition to real science and technology.**

**Assessment
& Inquiry-Based
Science Education:
Issues in Policy and Practice**

Wynne Harlen

Editorial Committee:

Derek Bell, Jens Dolin, Pierre Léna, Shelley Peers,
Xavier Person, Patricia Rowell and Edith Saltiel

Global Network of Science Academies (IAP) Science Education Programme

***Tools for identifying student's
achievements***

A Guide issued by the
*IAP/Science Education
Program,*
after the Helsinki Conference
2012

Available on the IAP Website

Chinese

English

French

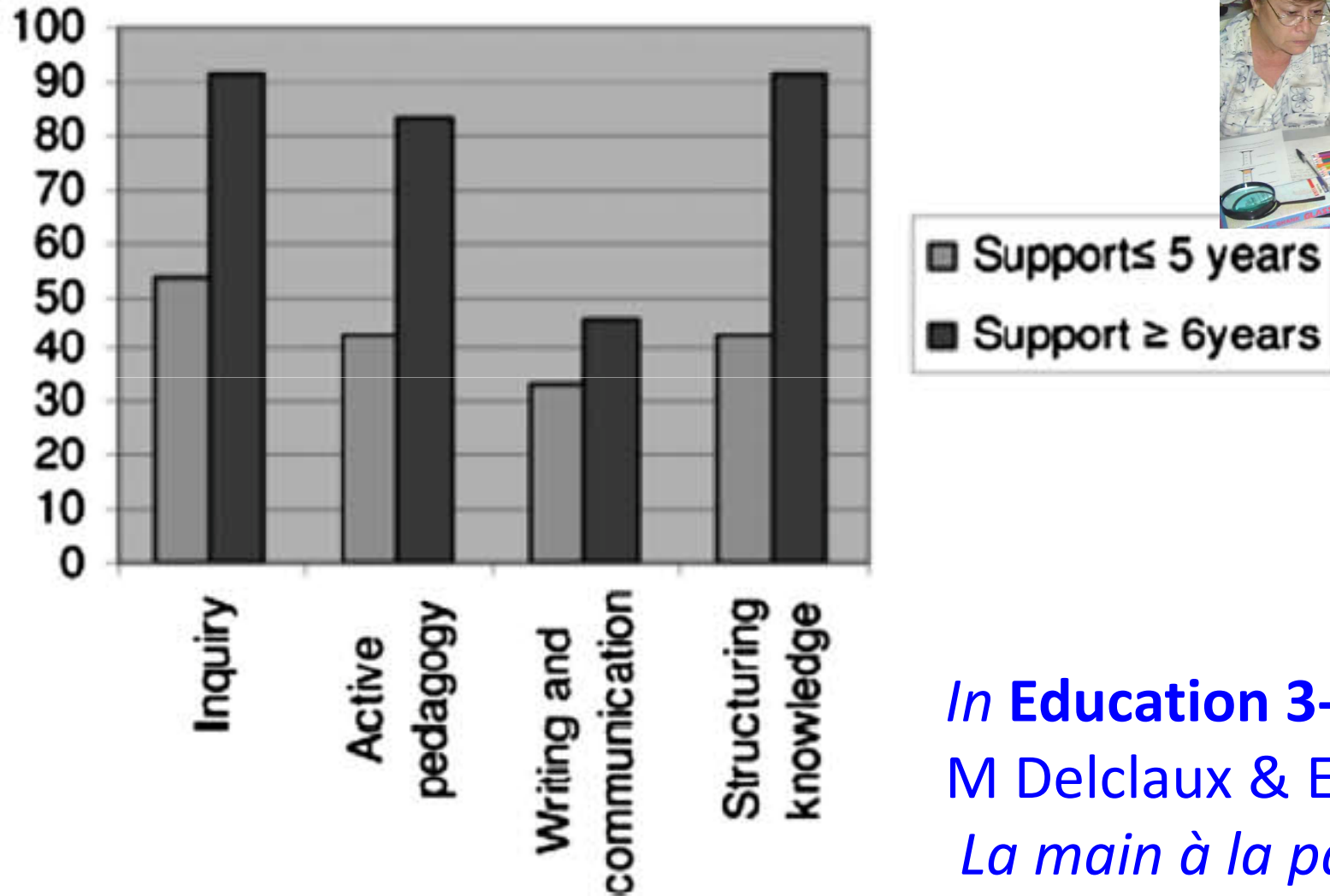
German

Serbian

Spanish

Changing teachers to IBSE takes time...

Exposing teachers to science and inquiry



In Education 3-13 (2011)
M Delclaux & E Saltiel
La main à la pâte, France

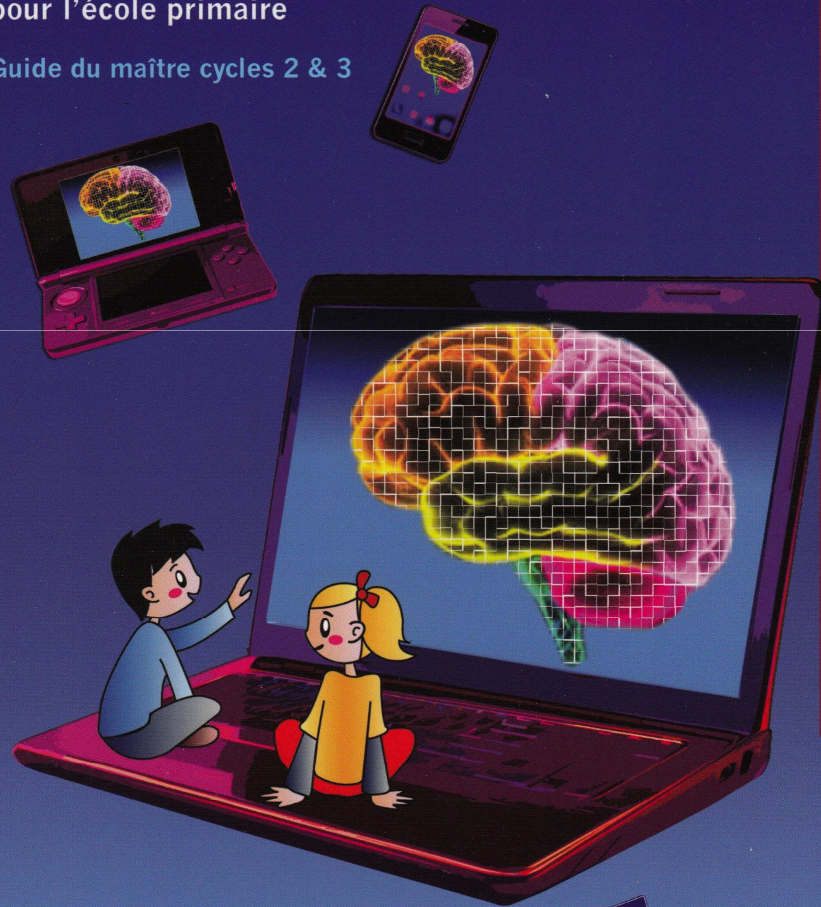
<http://dx.doi.org/10.1080/03004279.2011.564198>

Elena Pasquinelli, Gabrielle Zimmermann,
Anne Bernard-Delorme, Béatrice Descamps-Latscha

Les écrans, le cerveau... et l'enfant

Un projet d'éducation à un usage raisonné des écrans
pour l'école primaire

Guide du maître cycles 2 & 3



la main à la pâte

Screens, Brain and the child

[ÉDUCATION LE POUSSIER !]

*Example : Lamap module
for teachers,
grades 1 to 7*

A transdisciplinary theme ;
A rigorous scientific
content for the teacher ;
A set of classroom
sequences ;
Methodological inquiry
indications.

Dissemination by coaching teachers in Europe

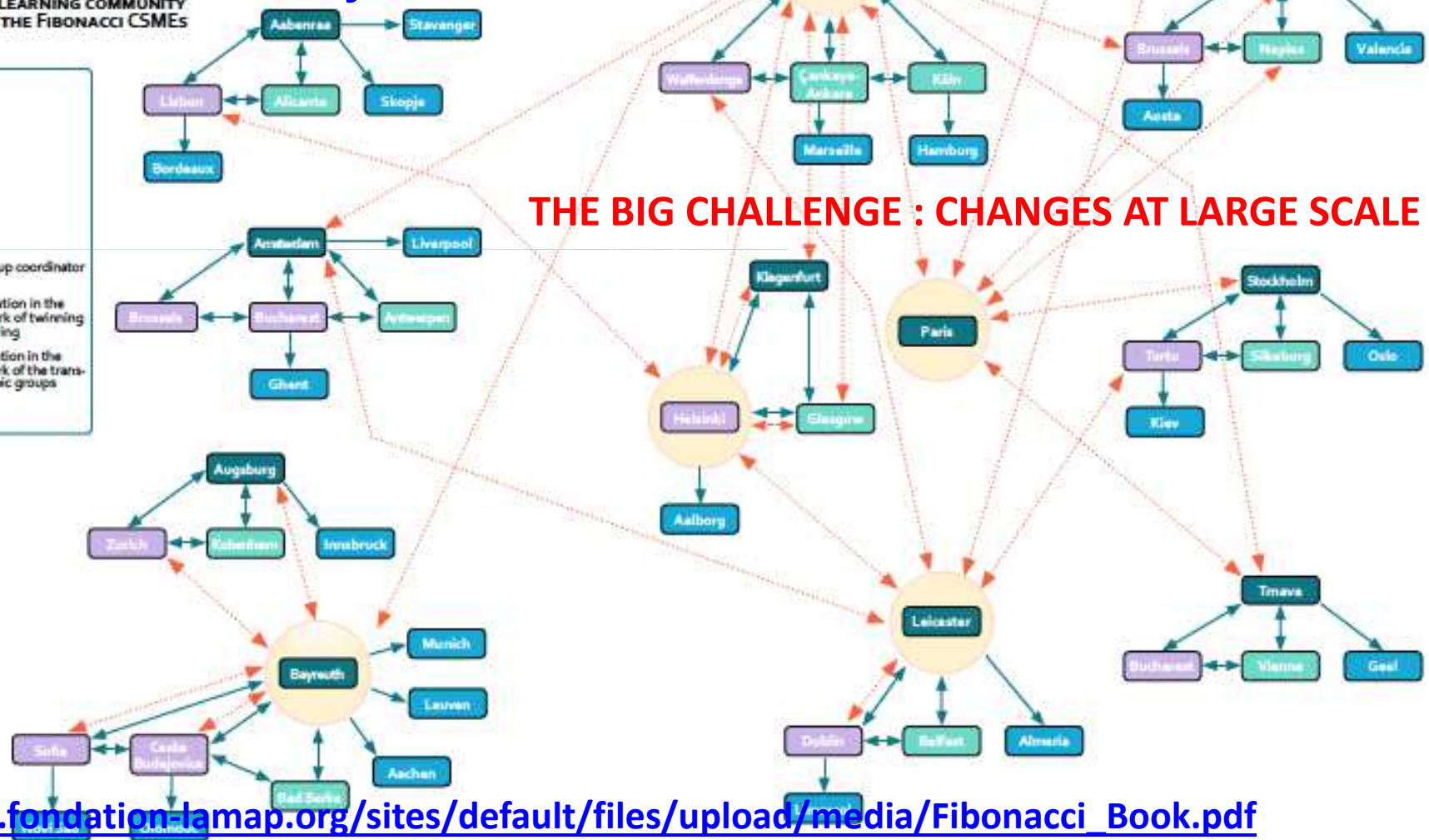
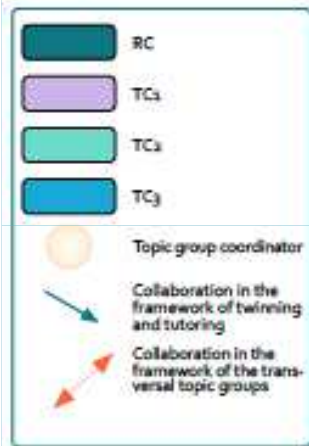
2009-2013

6000 teachers, 300 000 students

Math & Natural sciences

Fibonacci Project

FIG. 5. EUROPEAN LEARNING COMMUNITY
FORMED BY THE FIBONACCI CSMEs



THE BIG CHALLENGE : CHANGES AT LARGE SCALE

*Dissemination in places where **teachers**
and science meet : UK, France, SE Asia*



FRANCE

*9 Maisons pour la science
au service des
professeurs
2012 - 2018*



UK

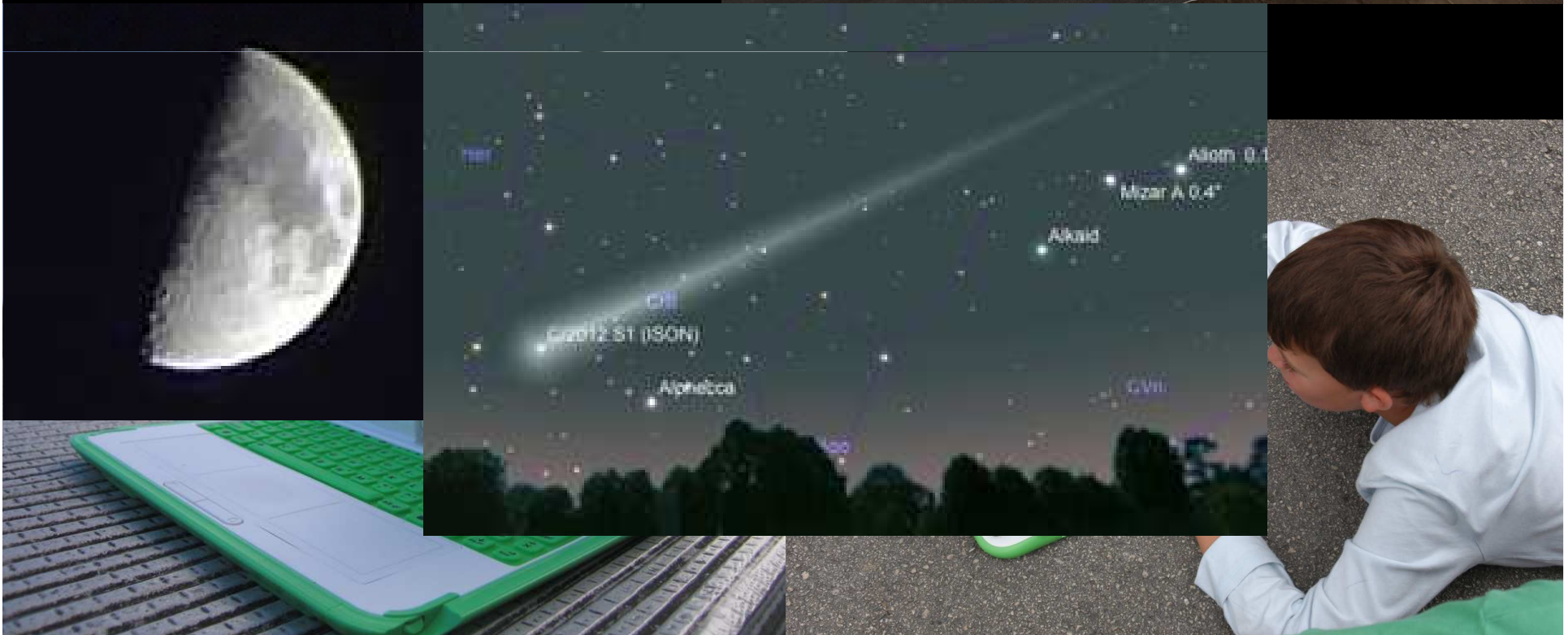
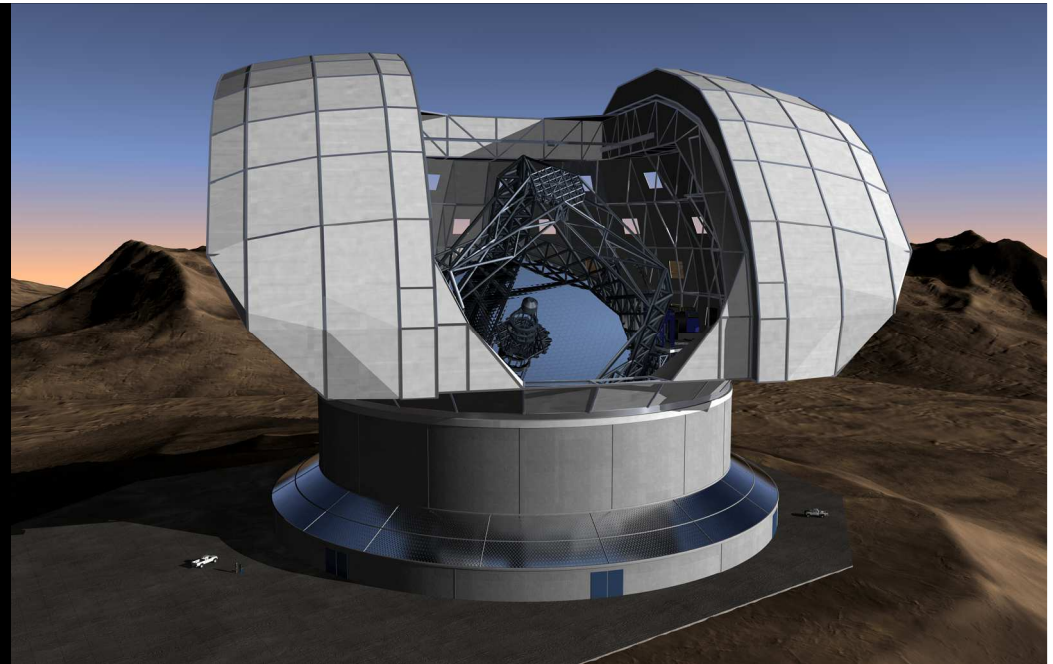
Sir John Holman
*9 National Science
Learning Centers
2006 - 2015*

*Open questions
for the future : science/technology
in basic education*

- Core of *big ideas* ; interdisciplinarity
- Engineering vs. science ;
- Cognitive development of teenagers ;
- The school in the digital world ;
- Social status & salary of teachers.

I have no more pressing obligation than to remain passionately curious

Albert Einstein



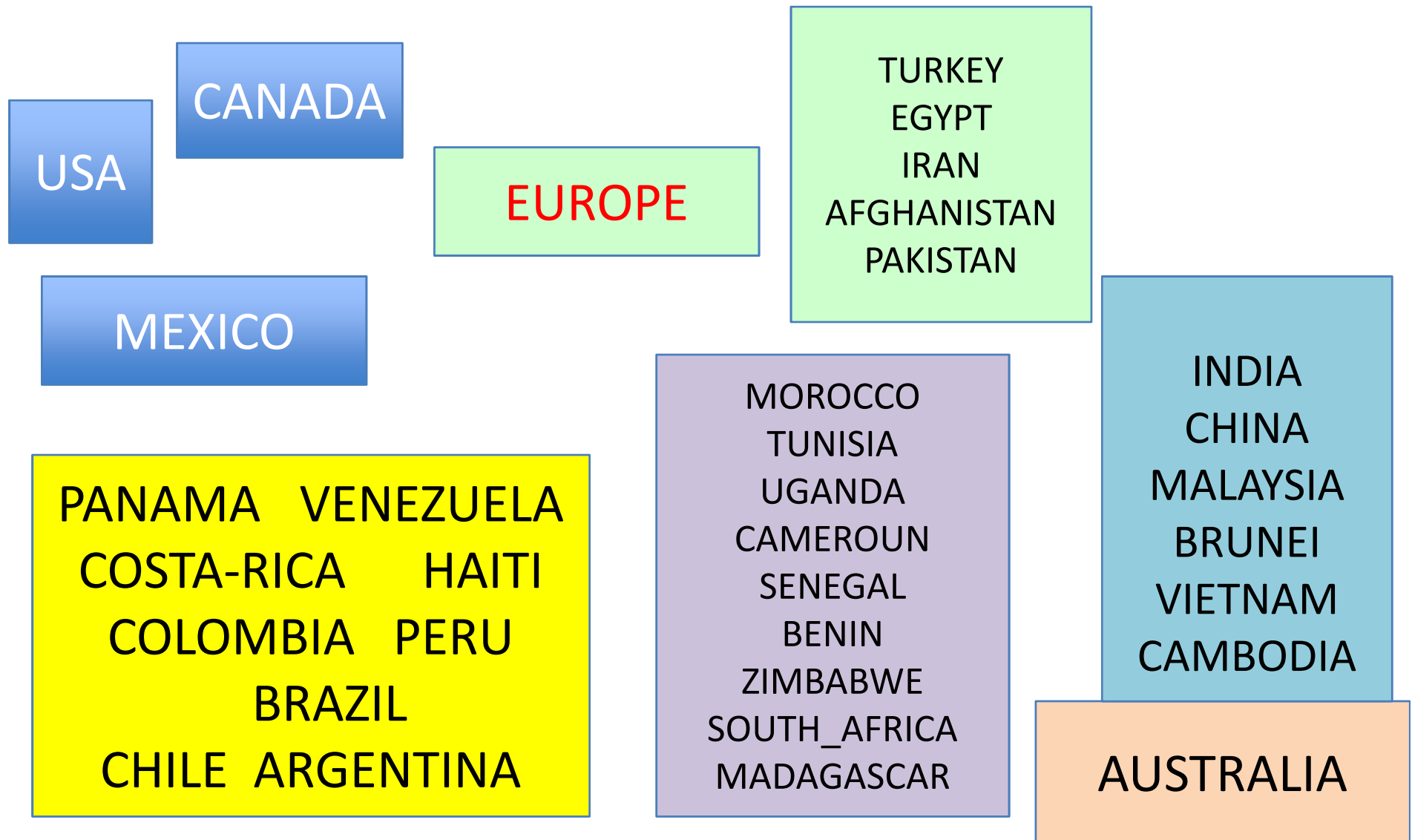
1996 – today

La main à la pâte in France

1. Primary school : from 3% (1996) to 50 % ;
2. Middle school : from disciplines to integrated (interdisciplinary) science ;
3. Key role of Académie : political and practical ;
4. Teacher is key
 - Science/engineering are more than facts to learn ;
 - Opening the school : parents, community, industry ;
 - Coaching the teachers: www.fondation-lamap.org
5. Dissemination and international exchanges

IBSE 2013 worldwide : millions of children..

teacher training, resources, websites..



Collaborations of *La main à la pâte*

Booklet with full details on

www.fondation-lamap.org/fr/9511/action-internationale



La démarche d'investigation



1. Questionnement



2. Hypothèses



3. Expérimentation(s)



4. Conclusions et communication