



*la main  
à la pâte*

**Strategies to link scientists and teachers for  
an effective professional development project**



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## Primary education

- 61 000 primary schools
- 350 000 classes
- Kindergarten: 99.5% of the 3 – 6 years old
- Elementary: 100 % of the 6 – 11 years old

## Primary school teachers

- Polyvalent teachers (same teacher for all subjects)
- Recruited at levels high school +0 (1960s) to high school +5 (1993)
- 80 % literary

## ⚙️ Situation in France in 1995

- Focus on reading/ writing/ counting
  - 4 hours/week for
    - Science
    - History/Geography
    - Civic education
- **Sciences in < 3% classes**
  - Often biology
  - Frontal pedagogy
- Rare in training sessions
- No experiment material at the school
- No link with scientific community



## ☛ 1995 – 1996

- **Georges Charpak**, the *Académie des sciences* and the *Ministère de l'éducation nationale* begin a **small scale experimentation** in 344 classes called *La main à la pâte* (based on Hands'on)

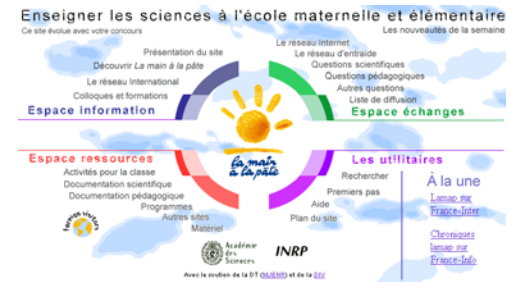
## ☛ 1998

- Publication of the reference **10 principles** as a simple guide for teachers.
- Launch of the *La main à la pâte* **Website**



## ☛ 2000

- The experimentation has expanded to over 5 000 classes
- The Ministry launch an **official Plan** for quality science/technology teaching in all schools (**350 000** classes) inspired by *La main à la pâte*



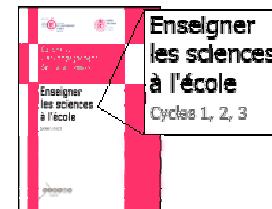
## ☛ 2002

- **New official Curriculum** inspired by *La main à la pâte*



## ☛ 2003

- **Book of 7 examples** for teachers



## ☛ 2004

- New data : **~ 50 % teachers teach science, mostly with an active pedagogy**

- ⚙ Scale and stability problem
- ⚙ The main issue = teacher training and coaching
- ⚙ Bridging the gap between teachers and scientists
  - Class & school scientific partners
  - Internet consultation of scientists
  - Teacher training
  - Joint sessions on science topics

## ⚙️ « I don't know / I'm not a scientist »

- Afraid of doing experimental work

## ⚙️ Using active pedagogy

- changing their position in the classroom
- Afraid of saying « I do not know » to children
- Afraid of losing the control of the classroom:
  - allowing the children to speak
  - putting the children in groups
  - Keep things in order, buying material...



## ⚙️ Hierarchy is not always convinced that science teaching is useful

- ⚙ Teacher's interest for science is high
- ⚙ Conception of science often primitive, sometimes negative
  - Results from teacher's secondary education
  - Broken in narrow disciplines, without integrated view
- ⚙ Possible to change if dialog open
  - find the right structure
  - Essential role of scientific partnership

## ⚙ Who is the partner?

- Scientist, engineer
- **Science student** spends a few month in schools. Agreement with:
  - Grandes Ecoles:
    - Ecole polytechnique
    - Ecole des mines de Nantes
    - Ecole Nationale Supérieure des Arts et Métiers
    - Ecole supérieure Paris
    - Ecole Supérieure de Physique et Chimie
    - Ecole centrale de Lyon
    - INSA de Lyon
  - Universities
  - Graduate schools
  - Museum National d'Histoire naturelle

⚙ For all these students, school partnership is supervised and, ultimately, validated as a module for there degree



## ⚙️ What is the role of the partner?

- Accompany the teacher (ideas, information, advises...)
- without interfering with the responsibility of the teacher in the class!

## ⚙️ Advantages

- helps teachers to set up scientific activities in class
- Gets gradually teachers self-sufficient
- Paints an accessible picture of science (for teachers and children)

Simbad, 11 years old,  
has never practiced science at school



*un scientifique est souvent fermé et incompréhensible.*

"A scientist is often  
uncommunicative  
and incomprehensible."

Nathacha, 11 years old,  
regularly practices science at school  
with a scientific partner



*Les scientifiques c'est de faire les choses par exemple étudier  
l'eau aussi de faire l'électricité ou de faire de la chimie.*

"Scientists are doing things  
like studying water and  
making electricity and chemistry."

Source : ESPCI, Paris & Ecole Jeanne d'Arc, 2002

## ⇒ Charter for scientific partnership at school

- First draft by La main à la pâte in 2000
- National reflection about partnership in May 2004 (colloquium at ENSAM Paris)
  - Objectives
  - Different types of partnership
  - Rules
- Adoption of this charter by the Ministry of Education



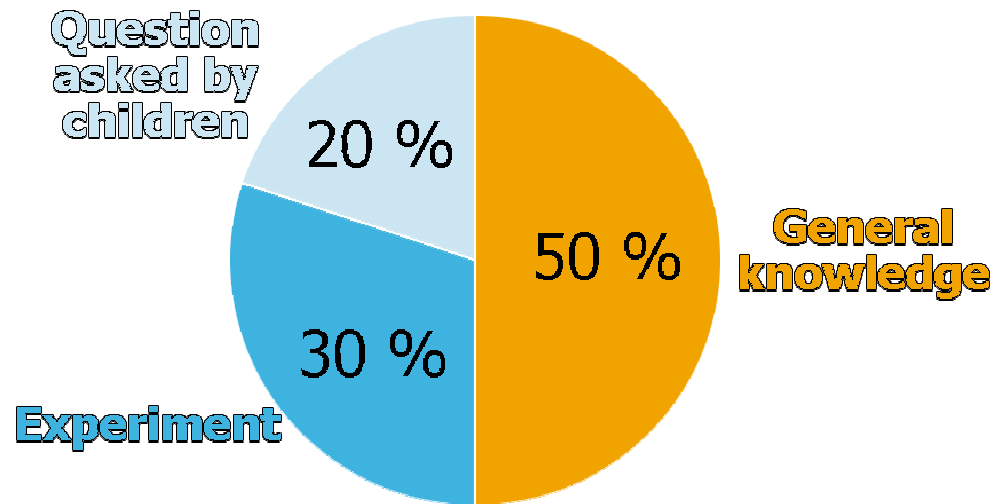
Direction  
de  
l'enseignement  
scolaire

texte de référence

⚙️ Not always possible to have a personal scientific partner

⚙️ ⇒ On *La main à la pâte* Website

- 200 consultants
  - 100 scientists
  - 100 trainers
  - On a voluntary basis
- 200 questions / week
- 2 moderators

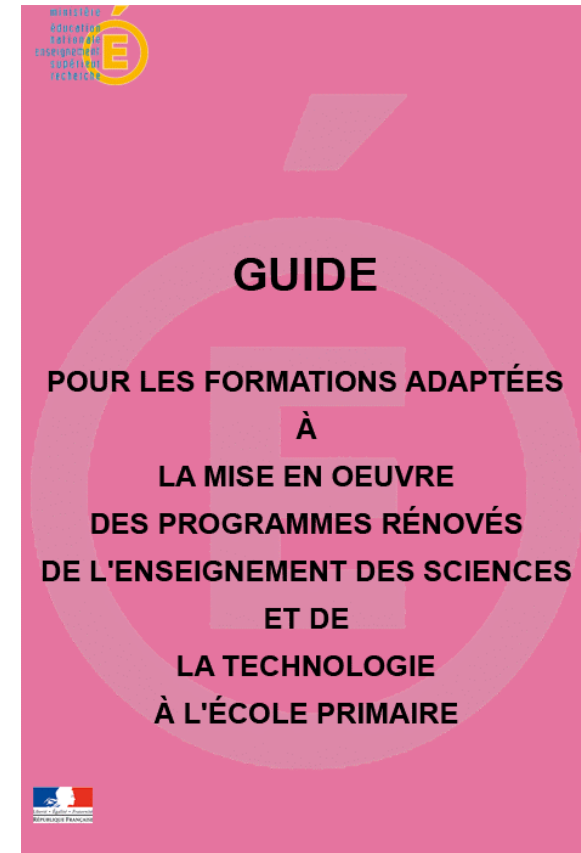


⚙️ More details on next talk (Friday morning) !

- ⚙️ 2 aspects :
  - teaching practice
  - scientific concepts
- ⚙️ Involve trainers & scientists
- ⚙️ To train teachers as children will be taught
- ⚙️ Involve in resource productions (class sequences, books, Websites...)



- ⚙️ Difficult for *La main à la pâte* team to expand at full scale level
- ⚙️ Issue : to convert the institution to this kind of training
  - IUFM trainers network
    - 1 correspondent / region
    - 1 workshop / year
    - Diffusion of information from *La main à la pâte* to IUFM and *vice versa*
    - Not so active
  - Writing of a common guide for teacher training (collaboration *La main à la pâte* / Ministry of Education)
- ⚙️ Lack of exchange between trainers because too few opportunities for it



## ⚙ Summer school dedicated to teacher training

- Trainers
- Scientists
- Organization: Académie des sciences

## ⚙ Program in July 2004 (French trainers)

- Inquiry based science teaching
- Teacher training on inquiry based method
- Tutoring devices (coaching, training follow-up)
- Resources for training

## ⚙ Next session (10-15 July 2005) for European trainers and scientists

## ⚙ Why ?

- Make teachers discover pleasure of practicing science for itself (not only for teaching !)
- Make teachers learn scientific concepts, adopt scientific method, and understand how science is practiced in laboratories today
- Make teacher's conception of science evolve

## ⚙ Who ?

- 30 teachers / trainers : 1 per French region + a few from foreign countries
- 8 scientists (physicists, biologists, mathematicians, astronomers...)
- 3 members of the *La main à la pâte* team

## ⚙ When ?

- Each year (in October)
- Autumn university during 1 week

## ⚙ Where ?



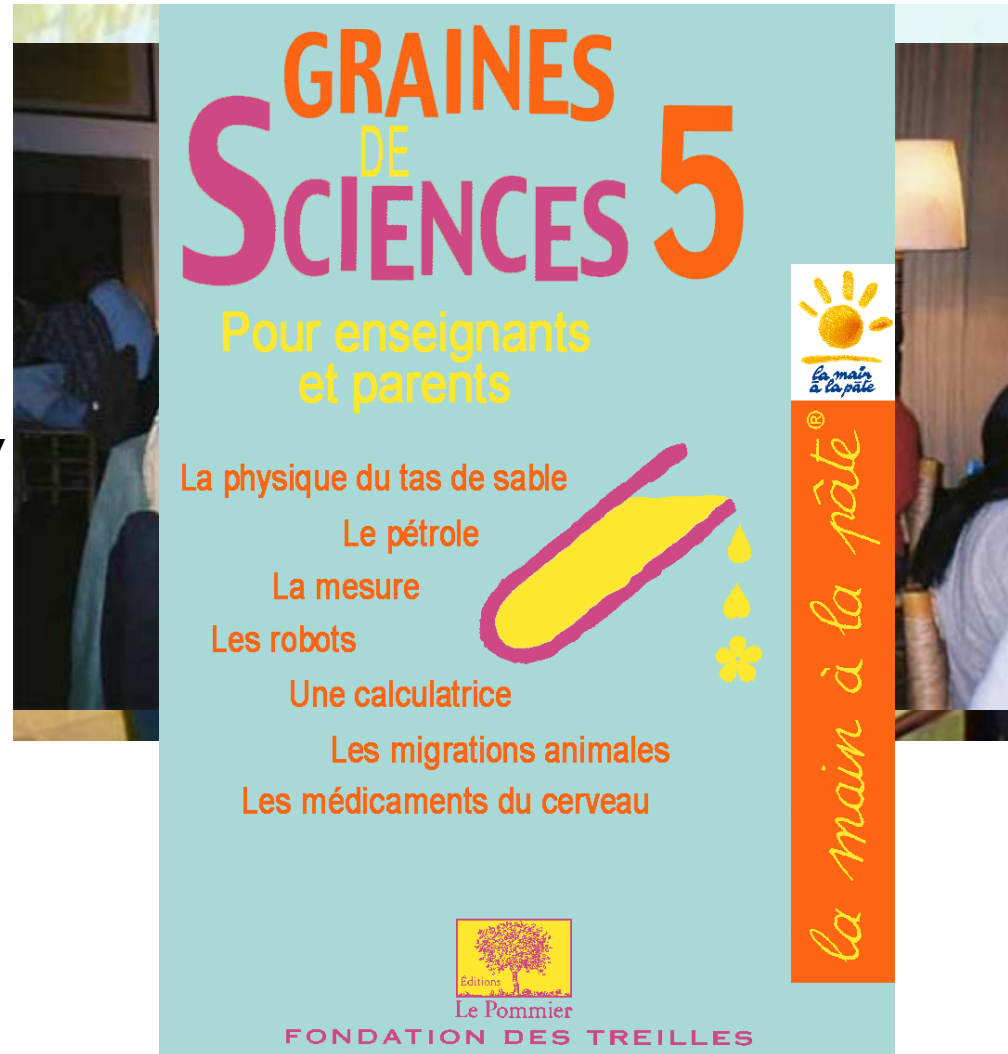


## ⚙️ During the session

- Each scientist leads an informal workshop (3 hours) close to its research subject
  - Actual or historical research
  - Effort for scientific popularization
  - Inquiry based workshop (interrogation, experimentation, collective construction of knowledge)...
- Many occasions to exchange about science, pedagogy...

## ⚙️ After the session

- Scientists and teachers write together the book "Graines de sciences"
- Collaboration via *La main à la pâte* Website
- For teachers, trainers, parents...



## ⚙️ 2 steps

- synchronous training: face to face
- asynchronous collaborative work: through Internet

## ⚙️ Results

- Long-term partnerships (several years)
- Long-term implication of scientists
  - other *Graines de sciences* sessions
  - Conferences
  - teacher training
  - Internet consultants...
- **Professional development of teachers**
  - Scientific and pedagogic acculturation
  - Career advancement
    - reference teacher for sciences
    - Trainer
    - School inspector
    - ... even member of the *La main à la pâte* team !

Handover  
⇒ **Impact**  
**increases**

- ⚙ In 10 years : science in 3%  $\Rightarrow$  50% classes
- ⚙ Teacher training and coaching is the main issue for generalization
- ⚙ **Scientist** can play an essential role, by:
  - Accompanying teachers
    - directly in classroom ( $\sim$  science students as partners)
    - trough the Internet ( $\sim$  researchers as scientific consultants)
  - Training
    - teachers
    - teacher's trainers
  - Taking part in writing "official" books (guides for teachers and for trainers)
- ⚙ For an effective impulsion and coordination, **Academy of sciences, Ministry of Education and local authorities** have to work hand in hand