

# Teaching informatics in high-school: what have we learnt?

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## I. Some history (and geography)

## Prehistory

Informatics has been taught (as an option) in French high-schools in the 80's and 90's

At that time a professional organization of teachers:

*Enseignement public et informatique* (EPI)

Removed twice (too expensive, too elitist, not a real science, ...)

More than ten years with no informatics in high-schools

## But a concern

Academy of sciences (Maurice Nivat: March 15th, 2005)

Absurdity of teaching the `while` loop to 19 or 21 y.o. students

Too many people saying too many stupid things (Hadopi)

2007

A letter from EPI (Jacques Baudé and Jean-Pierre Archambault)  
to all the candidates to the presidential election

An answer from the one who finally was elected

Creation of the ITIC group by EPI and ASTI

Gérard Berry's course in *Collège de France*

## Promises are sometimes kept

*Réforme Darcos: Informatique et société numérique*: an optional course in *Seconde* (10th grade) (very few mandatory courses, but a lot of optional courses)

But ... no *réforme Darcos*

*Réforme Chatel: Informatique et sciences du numérique*: a speciality in *Terminale S* (12th grade with a scientific flavor)

## Four (tiny) victories

2012: *Informatique et sciences du numérique* in *Terminale S*

10 000 students

2012: hiring of an *Inspecteur Général* who has a PhD in  
informatics

2013: *Informatique et sciences du numérique* in preparatory  
classes

2013: test of an option (mostly for *Terminales L* and *ES*) in the  
Academy of Montpellier (and possibly Versailles)

## A battle still to be won

Hiring teachers **with a relevant training**

Currently: teachers of another topic (maths, physics, engineering, ...) and continued learning (from 10 to 300 hours)

## Outside France

A very diverse situation (even in a single country where *Länder*, states, *cantons*, ... and even high-schools may have different policies)

In some places informatics continuously taught from the 80's

In others: teaching of informatics gradually been replaced by ICT in the 90's (text processing systems rather than `while` loop, then the web revolution) and a recent **second enlightenment**: UK, Switzerland, ...

II. What have we learnt?: what is informatics?

## United (e.g.) physics

A very diverse science: mechanics, electromagnetism, quantum physics, statistical physics, atomic physics, astrophysics, biophysics, ...

Power games

But physicists **always united** when speaking about teaching physics in high-school

## Informatics: a different situation

Informatics is what I do: data bases, lambda-calculus, ...

But more dangerous:

A **science**, nothing to do with technology: I cannot fix your computer (I cannot change a wheel), astronomy and telescopes

A part of **mathematics** (constructive, discrete, ...)

It exists only as an **industry**

It is **not autonomous**: always coupled with a mechanical system (e.g. in a car) ... complex systems

## Uniting informatics

Informatics as structured around four concepts: language, information, machine, algorithm (do not change every morning)

Informatics has both scientific and technological aspects:  
answering questions (is the halting problem decidable?) and  
building objects (programs, machine, ...) with a purpose

Informatics is a branch of no other science or technology, but has interfaces with other sciences mathematics, physics, ... and is one of the many technologies used to build objects (e.g. aircraft)

Learning informatics in three steps

## More unity needed

Robots: **machines**, process **information** (through sensors, ...), implement original **algorithms** (feed-back, analog to digital transformations, ...), led to (reactive) programming **languages**

**Thus** a part of informatics

Yet, some think robotics is not part of informatics

Interface with mechanics: an autonomous science

Same for numerical analysis

Broader **numerical sciences** (while informatics broad enough)

III. What have we learnt?: who are our enemies?

## Do we have enemies?

Our arguments are sharp, but things evolve **slowly**

Motion in a highly viscous medium

Useful to know who makes it viscous and why (very different people and very different reasons)

## Teachers of other sciences (e.g. math)

Why?: one minute for informatics is one minute less for the others

Strategy: informatics is the science of algorithms, there have been algorithms in math for ever (Euclide's algorithm, Gaussian elimination, Pascal's triangle, ...), hence informatics (i.e. algorithmic, i.e. the study of algorithms operating on mathematical objects) is a part of math

What about routing algorithms?

Teaching informatics will bring more students to all sciences

## Those who believe they know what informatics is

My kid has no problems with informatics: he spends a lot (too much?) time on his computer

I can use Google and I needed no training

I use computer everyday and I hate the IT guys

Those that fight against sciences and technology in general

New topics in middle- and high-school: *Éducation civique, juridique et sociale, Morale laïque, Histoire des arts, Droit et grands enjeux du monde contemporain* + more history and geography

Room for everything except science and technology

Ideological base: science and technology are not the way to know the world, just another narration

Consequence: sciences and technology are for lower-class boys (engineers) Others should focus on higher forms of knowledge (social sciences, art, religion, ...)

Include informatics in curricula, but empty it from any scientific / technological content (remember *Réforme Darcos*)

**Need for a unity of scientists and a defense of scientific values**

## Things change slowly but they change

*Informatique et Sciences du numérique* exists in *Terminale* and *Classes préparatoires*

The Academy of sciences published a report about teaching informatics at all levels

Industry is starting to consider the problem as central

Parents get worried about the illiteracy of their children

Many countries in the world are taking a similar direction

Many master students in informatics want to be teachers