

Cultural and educational
background for Human
Resources in S&T

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The cultural background for a knowledge based economy

- An American economist Joel Mokyr has underlined in his book “The Gifts of Athena”, Princeton University Press 2002, the importance of the cultural context and intellectual factors in the history of the “European miracle” the industrial revolution in the 18th century and subsequent progresses.
- He says these factors, neglected by economists, are too important to be left to the historians of science and technology.
- There are complex ways in which social and cultural factors determine technological outcomes.

Public Opinion and Science

- Public opinion about S&T is constructed mostly by the media and influential thinkers or political leaders.
- Since the 18th century the opinion in Europe is divided between the followers of the Enlightenment who support technological progress and people attracted by the defence of the concept of Nature, embodied in the Romantic movement, who are not so confident in progress.

A society open to science and technology

- A society where the roles of science and technology are fully appreciated in a democratic context is important, if not essential, for a knowledge based economy.
- However the political action in this field is difficult as it covers potentially a wide area from media to culture to education ... to finance and economics.

Pre-school knowledge of science

- **Although some analysts believe that « the origins of the declining interest among young people for science studies are found largely in the way science is taught in schools », (from the report by Michel Rocard 2007) this is not so obvious ..**
- **Youngsters do not come into first contact with science in schools. They are influenced at an early age by the children's declination of the show society especially all forms of comics either printed or on TV(including japanese manga).**
- **Scientists appear in comics as good or bad guys but always associated with POWER and using an impressive technical array of machinery, science fiction like or fantasy.**
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Effect of the exposure to products of the show society

- Science and technology are basic components of many productions of the show society where real science, science-fiction, and fantasy, are mixed for a public who cannot tell too much the difference. The results of the ROSE study (on children aged 15) reported in the 2004 report « Europe needs more scientists » (pp 128-132) can be also understood by reference to the difference of the degree of exposure to the productions of the show society between developed countries and third world. Many youngsters in our countries are not interested in science (especially girls) whereas they are much more interested in developing countries.

The image of science and technology

- The image of science and technology was the promise of a bright future in the novels at the beginning of the 20th century. The productions of today describe in many cases a grim future driven by irresponsible characters. It cannot seduce youngsters. Moreover it is illustrated by events in the « real world » from new frightening arms to genetic engineering to pollutions. A positive image of science was in the past supported by the cultural background this is rarely the case today. Today, positive heroes may act against scientific and technological powers ...(to defend nature for instance), ... but afterall they may be scientists ...

Role models

- To dream to become a scientist, that is to begin to have a vocation, playing role models is important. But the way science is presented today in the different components of the cultural spectrum from books to TV is not very suggestive. Although creation stories produced by prehistorians or astrophysicists do create vocations, but in fields that schools almost ignore and with no economic outcome ... It is very important to learn with pleasure and curiosity.

Science studies are difficult and ... risky

- The study of science at school and University is a difficult task when the different disciplinary fields have to be learned from their basis. It needs dedicated and well trained teachers. But also the students have now a sense of usefulness and want their studies to be profitable and an investment for a secure job in the future, and they watch the market ! An economical crisis in an industry may induce a diminution in the number of students (see the case of chemists in Germany in 1997) « creating anticyclical effects on human capital » (Europe needs...p.34-39)

Project oriented education

- To ease learning science, methods have been proposed by the pedagogical community. They all call for a more direct involvement of students
- Especially the « project oriented education ». Called « inquiry » in the US, this method has been introduced in schools on a large scale following a US Academy of Science Study in 1996.
- In his recent report (2007) Michel Rocard just propose the same solution for Europe to improve science studies.

The situation in the US

- « Congress has mandated that the National Center for Education Statistics (NCES) produce an annual report : *The Condition of Education* »
- The report for 2007 states that « in 2004 more high school graduates had completed advanced courses in mathematics and science than in 1982 in particular in calculus, chemistry and physics »
- It is difficult to know if this progress is due to the introduction of the inquiry's methods.

An Observatory for Education in Europe ?

- It will be interesting that Europe had a way to observe what is going on in Education across the Members' states and produce the kind of Annual Report the US facility is offering

Project oriented education in Europe

- Project oriented education has been introduced in Europe since a long time sometimes from outside pressure. There is a large number of associations which organise events for classes implying work on projects, there are exhibitions national or international. Public incitation may be very important such as the *Ciência Viva* Project in Portugal or « *La main à la pâte* » in France. The systematic introduction of IBSE (inquiry based science education) will imply more involvement from official authorities in schools in those projects and some modification in curricula ... It is probable it will meet resistances from teachers ...