Science Education: The voice of the learners

Contribution to the conference on Increasing Human Resources for Science and Technology in Europe
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Why Science in (compulsory) schools?

- Main focus is **not** on recruitment and preparation for academic studies, but...
- for citizenship, critical thinking, (Bildung!) Slogans: "Science for all", “scientific literacy” etc.
- **School science** is essential for perceptions of science, attitudes to science, appreciation, acceptance and respect for S&T
- and **may**, if properly done, lead to improved recruitment!
Learning from others: Comparative studies

- Studies like TIMSS and PISA are important, but...
- Focus is on **achievement** – *not* on interest, motivation and choice
- Even very able pupils opt out of SET – in particular girls!
- Young people do *not* choose SET careers because it is good for the national economy!
- But make choices based on their own values, motifs, interests and ‘self realization’.

The value of international comparative research

- Understanding that education is based on human, political choices and traditions
- Question the 'taken for granted'
- Seeing your own choices and challenges with new eyes
- Learning from others, understanding that things may be different...

- Needed: Not only theoretical, ideological deliberations – but *empirical evidence*
Pupils’ choices: Key factors

- Pupils’ **emotions:** interests, attitudes, values, future plans, perceptions of SET, prior experience with school science
- **Key words:**
  - **Motivation**
  - **Relevance** (personal, social etc.)

Pupils’ attitudes to science and technology. Summary (to be illustrated):

- **The positive side:**
  - They accept the importance of S&T for **society**
  - S&T will improve life
  - S&T will make work more interesting
  - S&T has more advantages than dangers
  - Young people love modern ICT:
    - They are great consumers!
**Pupils’ views, the dark side**

- They dislike S&T at school, S&T is difficult and boring etc.
- They are interested in ‘real science’ – but less in ‘school science’ (a ‘living fossil’?)
- The curriculum is overloaded with ‘correct answers’ – no room for creativity, fantasy etc.
- They are very hesitant to study S&T and to work with S&T
- They often have a negative perception of scientists as persons (no good role models?)
- Evidence to follow...

**ROSE: a cross-cultural comparative project**

**The voice of the learners**

ROSE details at http://folk.uio.no/sveinsj
Method and logistics

- Standard survey methods
- Target population 15 year-old, whole cohort, or defined sub-population
- Representative sample (one class per school, at least 25 schools, more if strata or groups are to be contrasted) N>650
- 'Original' questionnaire in English – translations to different languages
- Correspondence etc by e-mail and attachments
- Resources on ROSE home page

Method and logistics (cont'd)

- Data collection and data entry by national researcher in provided empty SPSS or Excel file
- Return to project organizers
- Data cleaning, quality check, merging of files by organizers
- Only data that meets certain standards to be merged in joint file
EU conference on Increasing Human Resources…
Brussels 2. April 2004 Svein Sjøberg <svein.sjoberg@ils.uio.no>
ROSE Data file, March 2004

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ROSE Questionnaire: 7 Item groups

- In total 250 items, all on a 4-point Likert scale:
  - Disagree – Agree
  - Never - Often
- My out-of-school experiences
- What I want to learn about
- My future job
- Me and the environment
- My science classes
- My opinions about science and technology
- Myself as a scientist (Open written response)
"My opinions about science and technology"

- 16 items
- From 1 = Disagree to 4 = Agree
- (2.5 is 'neutral')

"Science and technology are important for society"

Children in all countries agree strongly that Science and technology are important for society.

'Neutral response' on scale 1-4

Girls

Boys

Mean G1. Science and technology are important for society
"Thanks to science and technology, there will be greater opportunities for future generation"

Children in all countries **agree strongly** that Science and technology will provide greater opportunities for future generations.

Japanese and Nordic children are less positive than other children.

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"New technologies will make work more interesting"

Girls and boys in most countries think that science and technology will make work more interesting.

Japanese children and and girls in some countries are less positive than other children.
”The benefits of science are greater than the harmful effects it could have”

Japanese children think about the harmful effects of science

Most children (and mainly boys) think the benefits of science are greater than the potential harmful effects.

ROSE (preliminary) results

- "My science classes"
- 16 items
- From 1 = Disagree to 4 = Agree
- (2.5 is ‘neutral’

Mean G6. The benefits of science are greater than the harmful effects it could have
"I like school science better than most other subjects"

In some countries, girls dislike science very much!

In some countries, mainly developing countries, children like science very much.

In all countries, boys like science better than girls.

"I would like to have as much science as possible at school"

In some countries, girls do not want to have science at school.

In developing countries, all children want have as much science at schools as possible.
"I would like to become a scientist"

In developing countries, all children want to become scientists (but boys much more than girls!)

I would like to get a job in technology"

Very few girls want to get a job in technology

Children in developing countries (and some boys in other countries) want to get a job in technology

Very few Japanese children want to work in technology

Mean F14. I would like to become a scientist

Mean F16. I would like to get a job in technology
"Important for my future job"

- 26 items
- From 1 = Not important to 4 = Very important

In some industrialized countries, boys are not interested in working with people.

In all countries, girls think it is much more important to work with people rather than things.
Important for future job: “Working with machines or tools”

In all countries, boys are much more interested in working with machines and tools, and the difference is dramatic!

ROSE: Further plans

- Data collection to be finalized June 2004
- Report on ROSE background, rationale, development and data collection: July 2004
- First reports to be presented at IOSTE (International Organization for Science and technology Education) symposium in Poland 25-29 July 2004 (8 national papers, three international)
- Data files accessible for joint research available September 2004
- Some 10 PhD students base their work on ROSE
- Research papers to be presented at coming international conferences and in journals