Science education: a personal perspective

• The issue: science in society
• Educational attainment targets
• Research findings
• Experience from project work
• Toward future activities
Position of science teaching: thoughtful decisions

• Not only do we wish the students to "know that"
• and know "how we know that"
• but also "know what to do after knowing that"

thoughtful decisions: decision made while being consciously aware of the guiding values and current knowledge relevant to the issue

Aikenhead 1980; 1985
Position of pedagogy/psychology of learning:
Self-directed learning

- "a process in which individuals take the initiative, with or without the help of others, to diagnose their learning needs, formulate learning goals, identify resources for learning, select and implement learning strategies, and evaluate learning outcomes"

Knowles 1975
Position of ethics in the sciences: decision-making and ethical reasoning

• Scientists are especially qualified and have a responsibility to make statements about new technological developments because they father them and therefore have a greater understanding of them.

• However, to value aims, goals and consequences with regard to their desirability or acceptability scientists have by no means greater competence or authority than other citizens.

B. Skorupinski 1999
Understanding Science is:

- To recognise science as a methodical endeavour for knowledge and a social system for acting
- To recognise problems in the field of new technologies as interdisciplinary problems which could be solved only in an interdisciplinary effort
Understanding Science is:

- To identify and take into account the difference between technological approach and problem oriented approach for solving problems
- To use – besides factual and instrumental knowledge – ethics as a means of reflection
### Scientists and engineers should decide:

<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>a) because they have the training and facts which give them a better understanding of the issue.</td>
<td>3.8</td>
</tr>
<tr>
<td>a) because they have the knowledge and can make better decisions than government bureaucrats or private companies, both of whom have vested interests.</td>
<td>3.0</td>
</tr>
<tr>
<td>a) because they have the training and facts which give them a better understanding: BUT the public should be involved – either informed or consulted.</td>
<td>27.4</td>
</tr>
<tr>
<td>a) The decision should be <strong>made equally</strong>. Scientists are especially qualified and have a responsibility to make statements about new technological developments because they father them and therefore have a greater understanding of them. However, to value aims, goals and consequences with regard to their desirability or acceptability scientists have by no means greater competence or authority than other citizens.</td>
<td>23.1</td>
</tr>
<tr>
<td>a) The <strong>government</strong> should decide because the issue is basically a political one; BUT scientists and engineers should give advice.</td>
<td>2.5</td>
</tr>
<tr>
<td>a) The <strong>public</strong> should decide because the decision affects everyone; BUT scientists and engineers should give advice.</td>
<td>15.4</td>
</tr>
<tr>
<td>a) The <strong>public</strong> should decide because the public serves as a check on the scientists and engineers. Scientists and engineers have idealistic and narrow views on the issue and thus pay little attention to consequences.</td>
<td>4.1</td>
</tr>
<tr>
<td>a) I don’t understand.</td>
<td>2.2</td>
</tr>
<tr>
<td>a) I don’t know enough about this subject to make a choice.</td>
<td>8.2</td>
</tr>
<tr>
<td>a) None of these choices fits my basic viewpoint.</td>
<td>2.5</td>
</tr>
</tbody>
</table>
Students’ view:
A workshop for the future should ... regular classes

- Prepare
- Complement
- Be independent of

Die, France 21-24.03.05
Workshop on carboeurope - carbooceans school projects
Basic structure of our research and development approach

Field research

Approaching schools
Agreeing upon mutual educational aims
Initiation of project work
Integrating researchers into the learning environment
Termination of project

Evaluation

Communicative validation

Die, France 21-24.03.05

Workshop on carboeurope - carbooceans school projects
Realisation of project work at Gymnasium Bammental near Heidelberg (Lifelong Learning)

Project time-line

09/02

07/03

5 teachers

Mathematics

Physics

English

Ethics

German

Music

Biology

Chemistry

German

French

33 students grade 11

Die, France 21-24.03.05

Workshop on carboeurope - carbooceans school projects
Lifelong Learning: climate change

1. Chemical experiments „climate conservation“
2. Climate change: models and calculations
3. Comparing the US and GB in dealing with the Kyoto protocol
4. Canada und France – how are the francophone countries dealing with the topic?
5. Regional aspects: What do our fellow citizens know about the Kyoto protocol, and how do they deal with the issue?
What will be the climate in the year 2050? And how can we make people feel it?
Toward future activities....

• organising a discourse
  open to schools, Institutions, scientists, industries, ...

• identification of relevant themes
  differentiation for various age groups/ types of school

• project work
  authentic learning outside the class room

• constituents for teacher education
  materials for science and ethics teachers