

# 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:

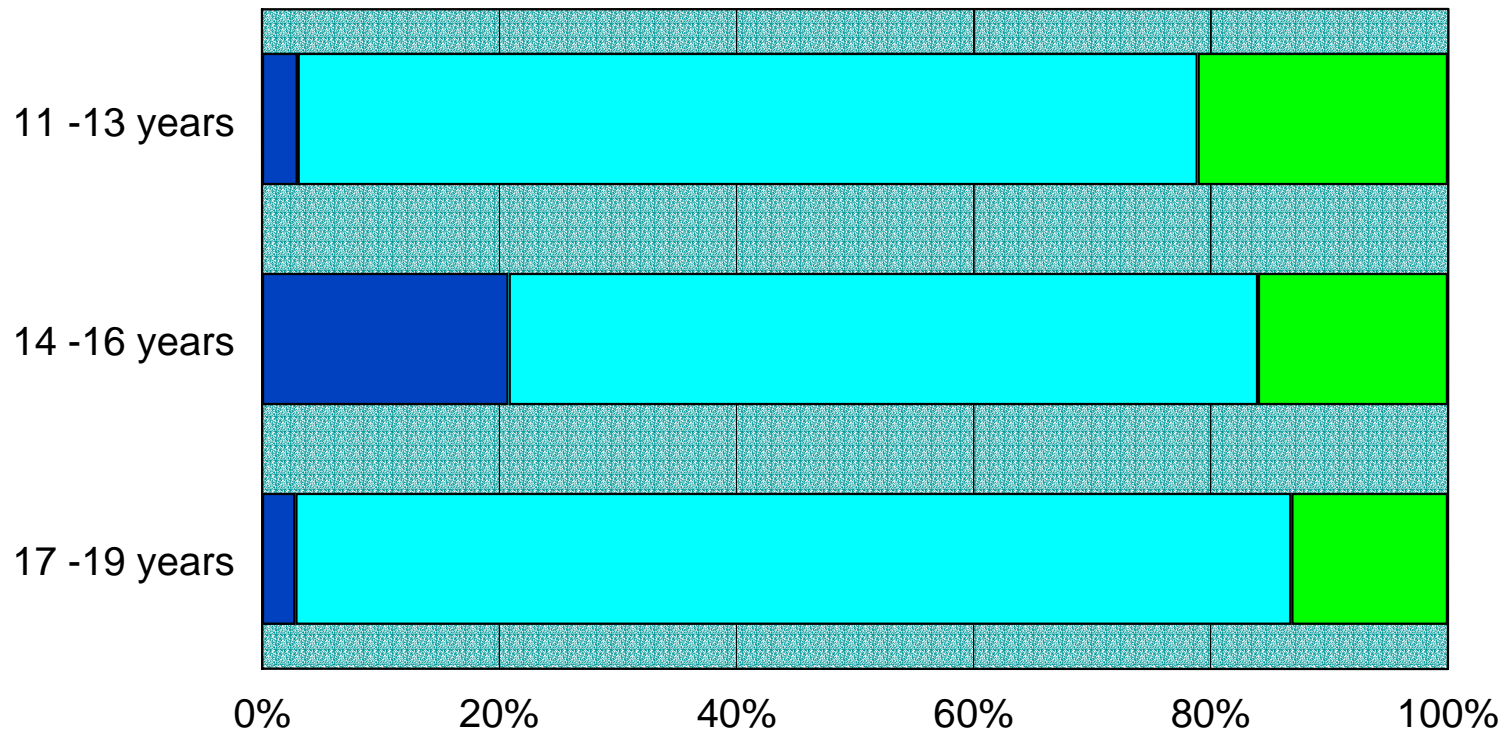
- To identify and take into account the difference between technological approach and problem oriented approach for solving problems
- To use – besides factual and instrumental knowledge – ethics as a means of reflection

<b>Scientists and engineers should be the ones to decide on future applications of biotechnology / genetic engineering, because scientists and engineers are the people who know the facts best.</b>	
Your position, basically: (Please read from A to J, and then choose one.)	
Scientists and engineers should decide:	%
a) because they have the training and facts which give them a better understanding of the issue.	3.8
a) because they have the knowledge and can make better decisions than government bureaucrats or private companies, both of whom have vested interests.	3.0
a) because they have the training and facts which give them a better understanding: BUT the public should be involved – either informed or consulted.	27.4
a) The decision should be <b>made equally</b> . 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.	23.1
a) The <b>government</b> should decide because the issue is basically a political one; BUT scientists and engineers should give advice.	2.5
a) The <b>public</b> should decide because the decision affects everyone; BUT scientists and engineers should give advice.	15.4
a) The <b>public</b> 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.	4.1
a) I don't understand.	2.2
a) I don't know enough about this subject to make a choice.	8.2
a) None of these choices fits my basic viewpoint.	2.5

# Students' view:

## A workshop for the future should ... regular classes

■ prepare ■ complement ■ be independant of





# Basic structure of our research and development approach

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Field research

approaching schools

agreeing upon mutual educational aims

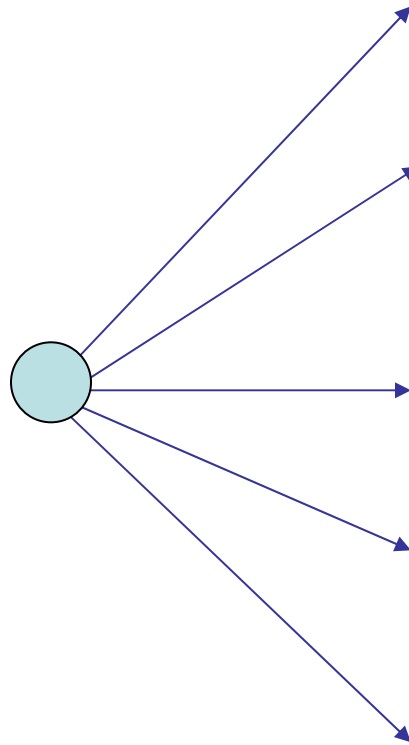
Mode of intervention

initiation of project work

integrating researchers into the learning environment  
termination of project

evaluation

communicative validation

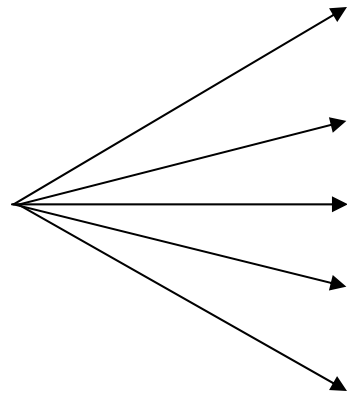


# Realisation of project work at Gymnasium Bammental near Heidelberg (Lifelong Learning)

Project time-line



5 teachers



Mathematics	Physics
English	Ethics
German	Music
Biology	Chemistry
German	French

33 students  
grade 11

## 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?

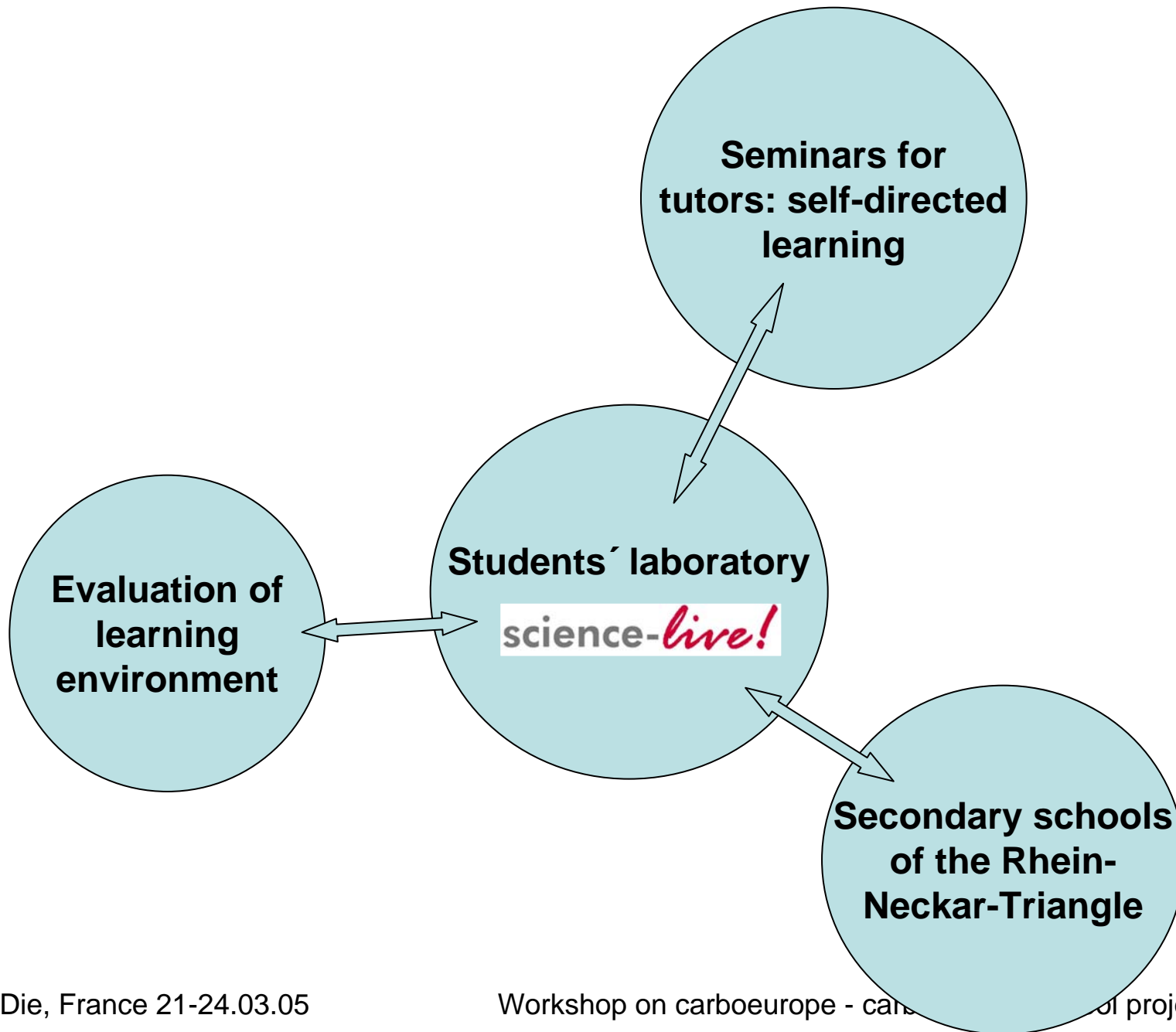


**What will be the climate in the year 2050? And how can we make people feel it?**

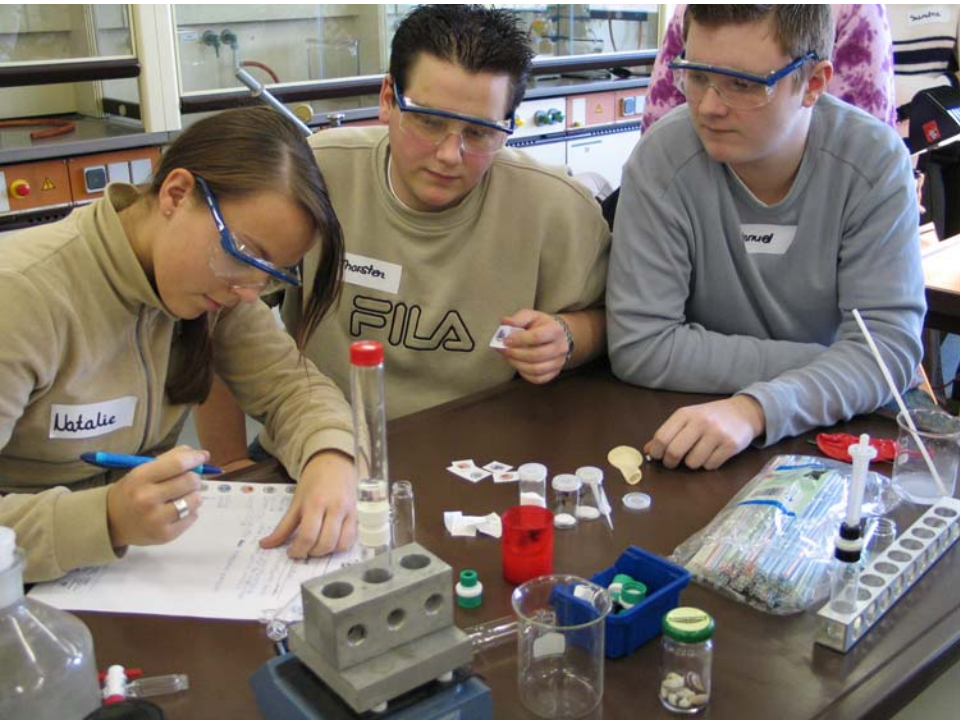


Die, France 21-24.03.05

Workshop on carboeurope - carbooceans school projects







# 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