



Projectbased Education



Practical examples

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• **Interdisciplinary teaching enables students to:**

- **be able to use and combine methods from more than one subject when dealing with a topical problem**
- **obtain competence to see the limitations of one subject and the methods used in this subject**
- **develop competence to use knowledge from more than one subject to evaluate complex problems**

Project based teaching

Students' work comprises:

- Choice and description of a topic
- Listing of the questions that it rises
- Search for information
- Experiments that illustrate the topic
- Evaluation of sources
- A project report
- A presentation to their class



FOTO: STRINBERHALD

Advantages in this way of teaching

- Enhancement of student motivation
- Moving from reproducing facts to understanding and evaluation of complex topics
- Competences in oral and written presentations
- Preparation for further education

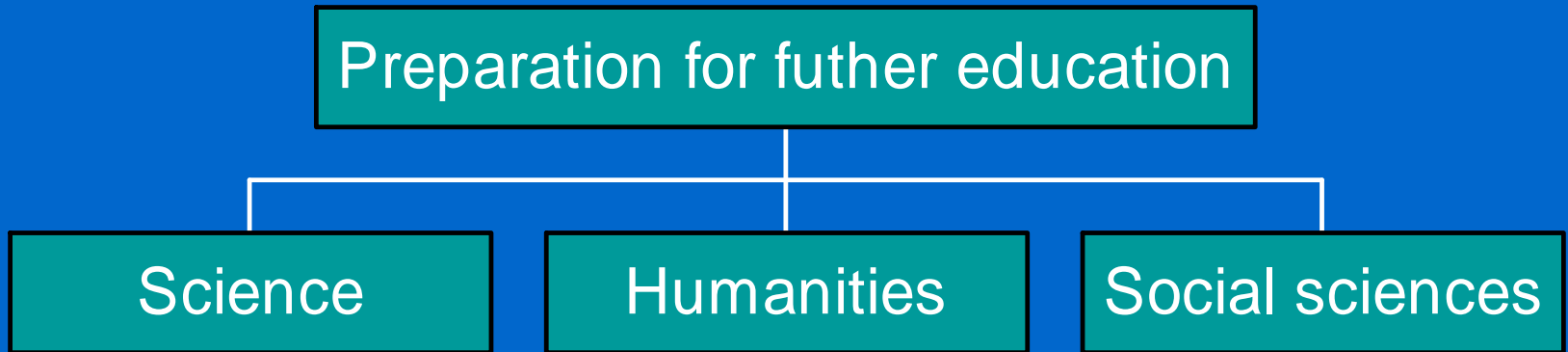
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Danish higher secondary education

- C-level
- B-level
- A-level

- preparation for further education

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10 - 20% of the students' time for education



PRACTICAL EXAMPLES



**Greve
Gymnasium,
Denmark**



C-level

- Young reporters:
- Organic farming

- Biology
- English
- Chemistry

- Newspaper article



Young reporters for the environment:

- The purpose of the project was to compare the organic way of production with the conventional way of production, and besides to describe the future of agriculture in Denmark according to national and international points of view. Our class was split into groups, and each group worked on a specific area of farming.

Sources of information

- The Green Line (a organic market garden)
- A conventional farm with pigs
- Nitrate in water samples
- An organic farm
- A professor of biochemistry
- A vet's views on the use of antibiotics
- A questionnaire for consumers
- A comparison with Greece

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Danish pigs



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- **In the beginning of our project we hardly knew what N stood for. Now, at the end of our school year and our project, we can view needs of nitrate, how it circularises, and the consequences if we abuse it in farming. We conclude that organic farming is the way to get a healthy environment for the next generation. For organic farms to survive we the consumers have to start buying organic food instead of food from conventional farms. It is impossible for all farming to be organic, but we think that it is a goal we should strive to reach!**

- **Written by 1y Greve Gymnasium Denmark**

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B-level

**Biotechnologi - sustainable developmet -
life cycles in production**

Enzyme production in NOVOZYMES

- Chemistry
 - Social Science
 - Philosophy

 - Scientific reports
 - Role playing - debate
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- **Presentation of important terms to other classes**
- **One day with lectures by a philosopher, a chemist and an economist from Novozymes. Summaries**
- **Students acquire specialist knowledge about their subject**
- **Presentation of specialist knowledge to other students.**
- **Roleplaying: Meeting of board of directors in Genolac A/S.**

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Principle of application:

You don't understand acquired knowledge unless you can use it in different, but similar situations

- **Chemistry:**
- **To obtain an understanding of what biotechnology comprises**
- **To carry out experiments directly related to the production of Novozymes**
- **To work with core terms of chemistry in connection with a real production**
- **To gain an understanding of environmental problems related to a production**
- **To gain more insight by combining methods from three subjects**



Students' evaluation:

- Liked independent work in groups
- Felt a lack of time
- The board meeting made everything meaningful
- The board meeting showed clearly what contributions the three subjects could give
- Sometimes it was difficult to understand how all the different items could come together in the end

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A-level

- Individual student project
- 3 months of preparation
- One week to finish report
- 15 pages
- External evaluation, part of final exam
- Demonstrate in-depth knowledge and understanding of a specific topic

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Possible ways of cooperation:

- real time experiments
- site visits
- topical lectures
- debates
- access to research results
- communication via e-mail
- internet resources
- text books

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Advantages:

- student interest
- active learning
- interdisciplinary approach
- students' own experience
- bringing the world into the classroom and the students outside

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Obstacles:

- time for planning in advance
- tight school weekly and annual plans
- level of knowledge
- money
- students' jobs



Project proposal

Risoe and Greve Gymnasium

Topics:

- C cycle
- Greenhouse effect
- Global warming



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Experiments:

- Changes of CO₂ concentration in a classroom
- CO₂ production by yeast fermentation
- CO₂ uptake in photosynthesis
- Factors affecting soil respiration

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Contacts with research activities:

- Soroe field station
- Growth chambers with enhanced CO₂ levels
- Field manipulation experiment with enhanced CO₂, temperature and drought
- Small topical lectures
- Access to real-time meteorological and flux data