Climate change global challenge

An interdisciplinary project in biology

2g Bi/3

Greve Gymnasium

The Class

The class

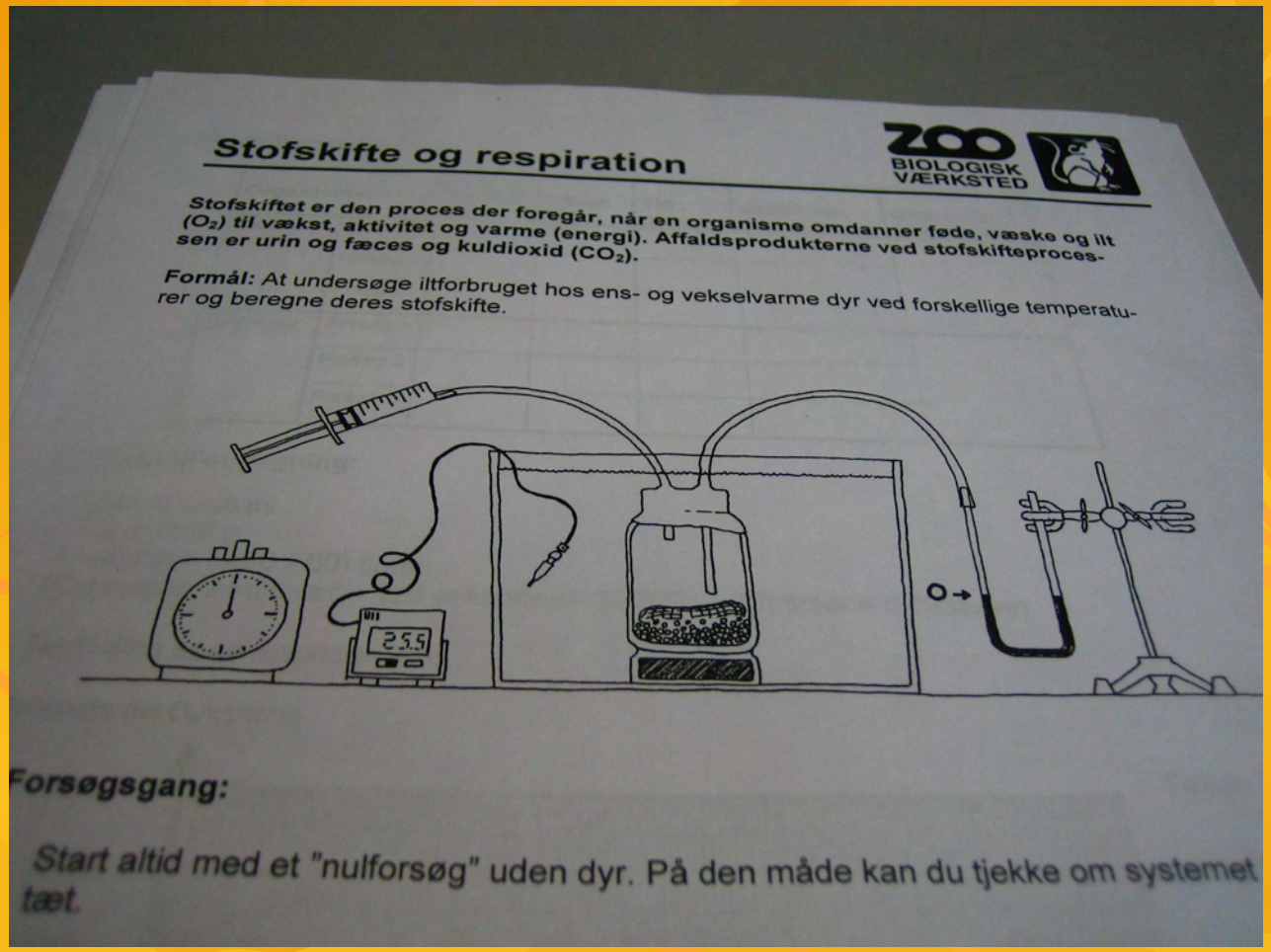
- 2nd year of high school
- 24 students (approx 17 years old)
- Biology, English, Danish, History
- Obligatory interdisciplinary project

Biology at an intermediate level

- Focus on CO_2 through human physiology
- Simple experiments with photosynthesis and respiration in plants
- Measurement of respiration on humans

Measurement of animal metabolism

Diagram of experiment



Stofskifte og respiration

ZOO BIOLOGISK VÆRKSTED

Stofskiftet er den proces der foregår, når en organisme omdanner føde, væske og ilt (O_2) til vækst, aktivitet og varme (energi). Affaldsprodukterne ved stofskifteprocessen er urin og fæces og kuldioxid (CO_2).

Formål: *At undersøge iltforbruget hos ens- og vekselvarme dyr ved forskellige temperaturer og beregne deres stofskifte.*

Forsøgsgang:

Start altid med et "nulforsøg" uden dyr. På den måde kan du tjekke om systemet tæt.

The five phases

I	Biological background
II	Interdisciplinary project
III	Bio fuels
IV	Presentation at primary school (not all class)
V	Changes in biodiversity

Phase I
Biological background

Classroom studies comprising:

- **Carbon cycle**
- **Green House effect**
- **Ecosystems**

Phase II
The interdisciplinary project

Interdisciplinary projects enable 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

An Inconvenient Truth I

- What artistic effects are being used in the film to underline Al Gore's point of view?
- Discuss the scientific focus of the film. Are all the consequences presented scientifically sound, and is anything left out?
- Give an account of the rhetorical patterns of speech used in the film

An Inconvenient Truth II

- Give an analysis of the film and genre to which the film belongs
- How are the basic values of the American society reflected in the film?
- Give an analysis of the relationship between facts and beliefs in the film

Presenting their project

Student Conclusion

- Fascinating lecture/show
- Audience spellbound
- Doesn’t include other opinions
- Maybe there is more than one inconvenient truth?

Students playing ”Keep Cool”

Phase III
Special study area

- Fermentation
- Bio fuels
- Bioethanol

Lecture by scientist

Bioethanol in Brazil

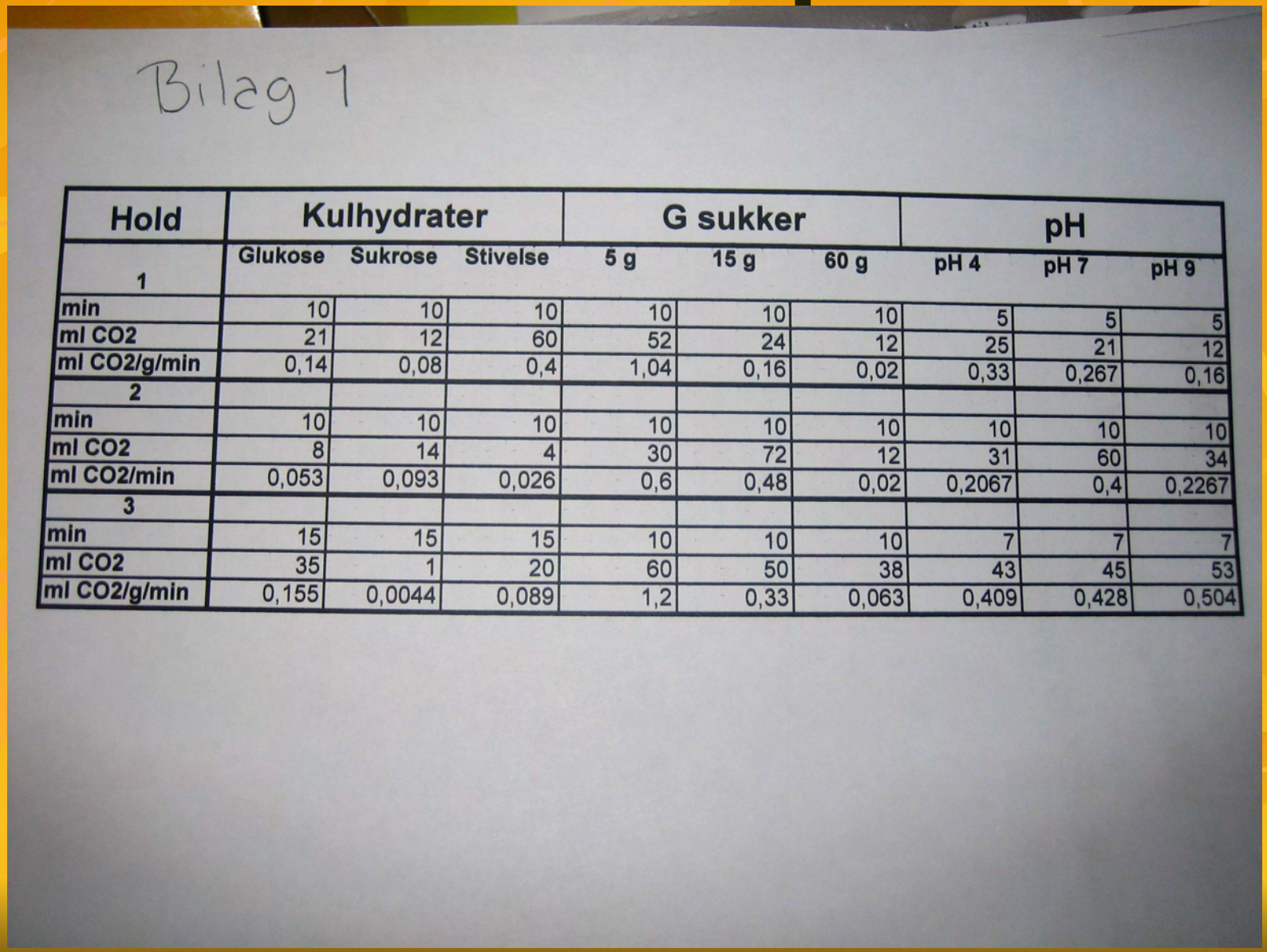
Nature is the source of new enzymes

- Pectinases
- Cellulases
- Amylases
- Protease
- Laccases
- Catalases
- Lipases
- Peroxidase
- ...

Experiment

Search for knowledge on the internet

Scientific reports

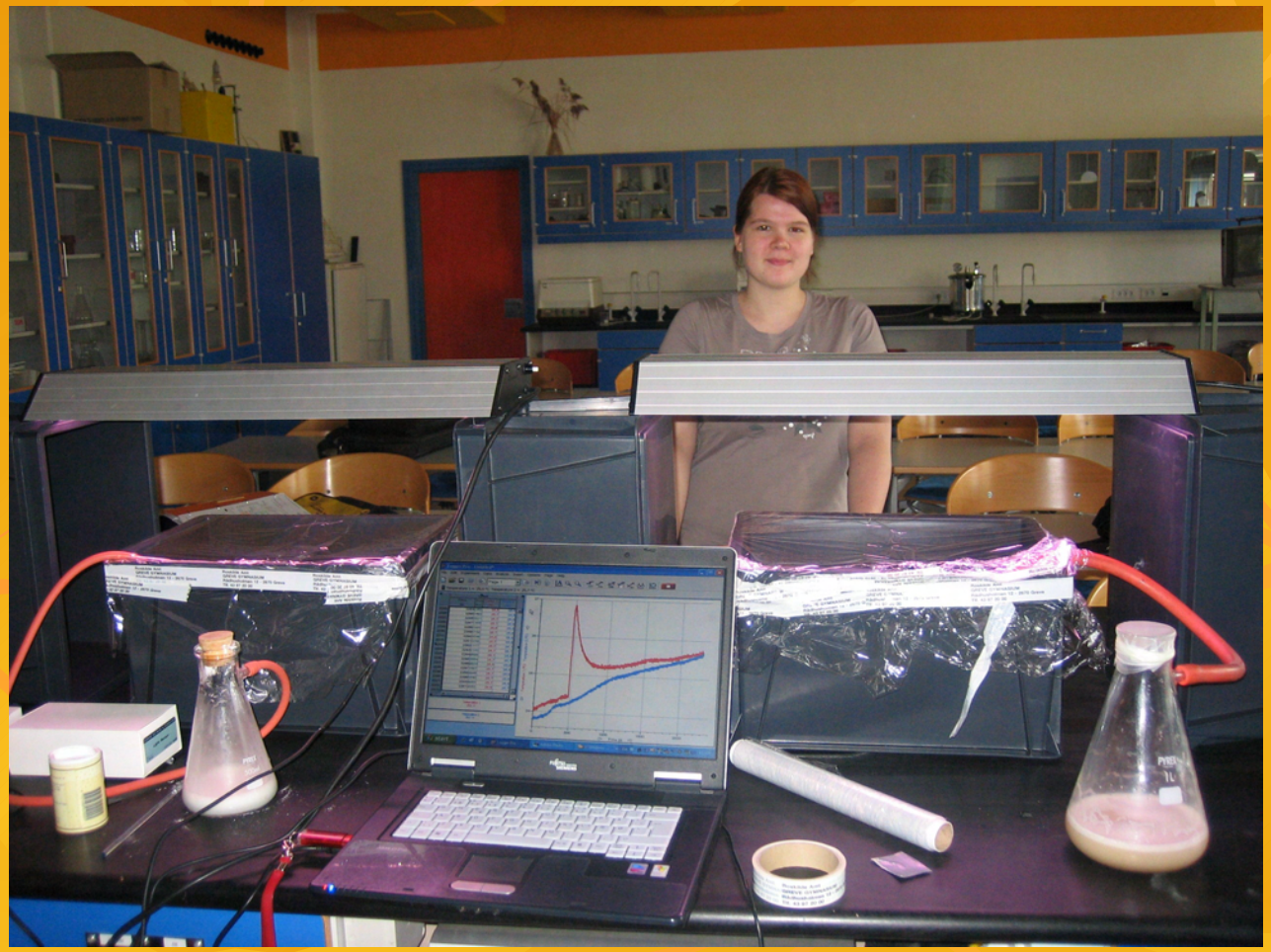


Bilag 1

Hold	Kulhydrater			G sukker			pH		
1	Glukose	Sukrose	Stivelse	5 g	15 g	60 g	pH 4	pH 7	pH 9
min	10	10	10	10	10	10	5	5	5
ml CO2	21	12	60	52	24	12	25	21	12
ml CO2/g/min	0,14	0,08	0,4	1,04	0,16	0,02	0,33	0,267	0,16
2									
min	10	10	10	10	10	10	10	10	10
ml CO2	8	14	4	30	72	12	31	60	34
ml CO2/min	0,053	0,093	0,026	0,6	0,48	0,02	0,2067	0,4	0,2267
3									
min	15	15	15	10	10	10	7	7	7
ml CO2	35	1	20	60	50	38	43	45	53
ml CO2/g/min	0,155	0,0044	0,089	1,2	0,33	0,063	0,409	0,428	0,504

Visit from minister for climate and energy, Connie Hedegaard

Phase IV
Peer education



Hvad kan du gøre?

Reduktion i kg CO_2 pr. år

- Skru en grad ned for radiatoren. 110
- Udskift almindelige elpærer med sparepærer. 100
- Sluk helt for elektroniske apparater i end at lade dem stå på standby. 75
- Tag mobil opladeren ud af stikket, når den ikke bruges. 10
- Aflevere sodavandsdåser i automaten i stedet for at smide dem i skraldespanden. 10
- Gå eller tag cyklen 2,5 km. I skole i stedet for bilen. 150

Phase V
Biodiversity

- Lake ecosystems
- Invasive species
- Consequences, local and global

Field Work (May)

Visit from scientist 7/5

Restauration of lakes

Putting everything into perspective

3 lessons of 50 minutes

Will that be enough?

Exam

- 24 hours of preparation
- Articles, results of experiments
- Student's talk 10 - 15 minutes
- Examination

Achievements

Students:

- ✓ **Gain a real insight into scientific methods**
- ✓ **Understand that many topical issues need to be viewed from different angles**
- ✓ **And that global action is called for**

Obstacles

- Interdisciplinary cooperation
- 24 students
- Money for excursions and lecturers
- School timetable
- Student interest – don’t overdo it

Future plans/ Visions

- Students able to plan their own project and contact scientists
- Interest of local society and authorities

But most of all International cooperation