



Problem Based Learning and Link with Industry

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ELITE
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Aalborg University (AAU)

- Established in 1974
- 13.000+ students
- 1250 Scientific Staff
- Problem Based Learning since 1974
- High degree of cooperation with society and private companies – students and research
- Unesco Centre in PBL – <http://ucpbl.org>



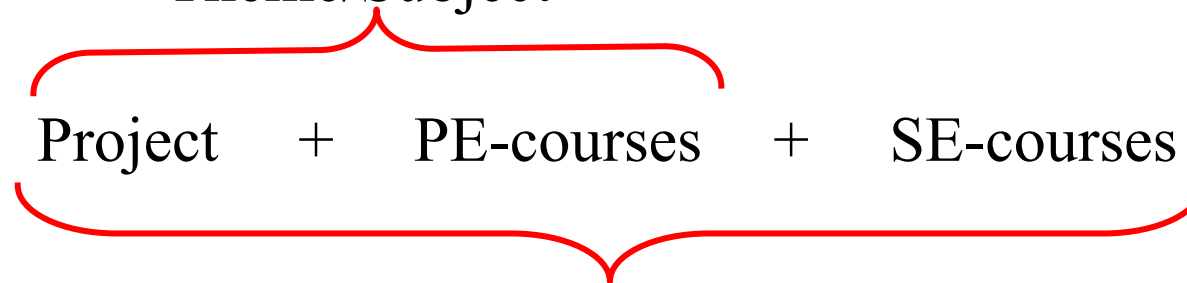
Basic teaching Model

- Focus on competences – not disciplines
- Problem Based Learning
 - based on real-life engineering problems
- Project organized team working
- Group studies
 - teams of maximum 6 students
- Interdisciplinary
- Integration of theory and practice



Semester Structure

Theme/Subject



One Semester = 900 hours of work = 30 ECTS

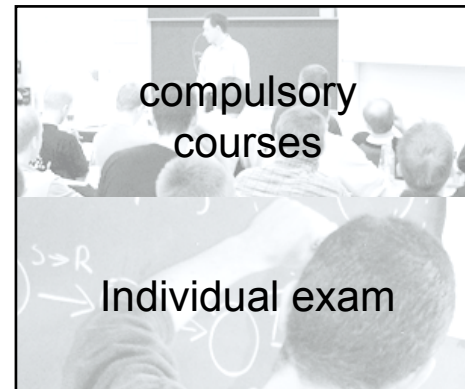
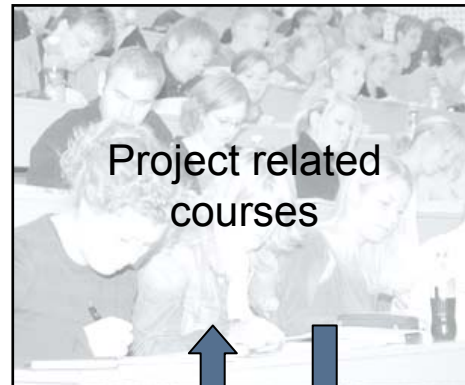
Project work > 50 % of semester

PE courses > SE courses

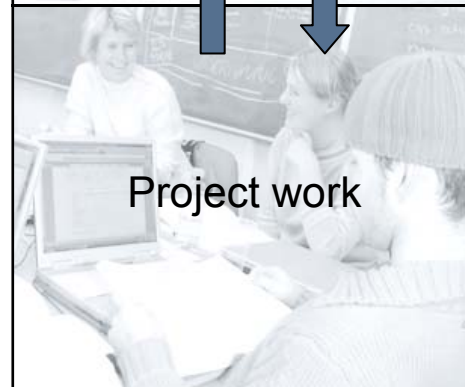


PBL at AAU

**50%
courses**



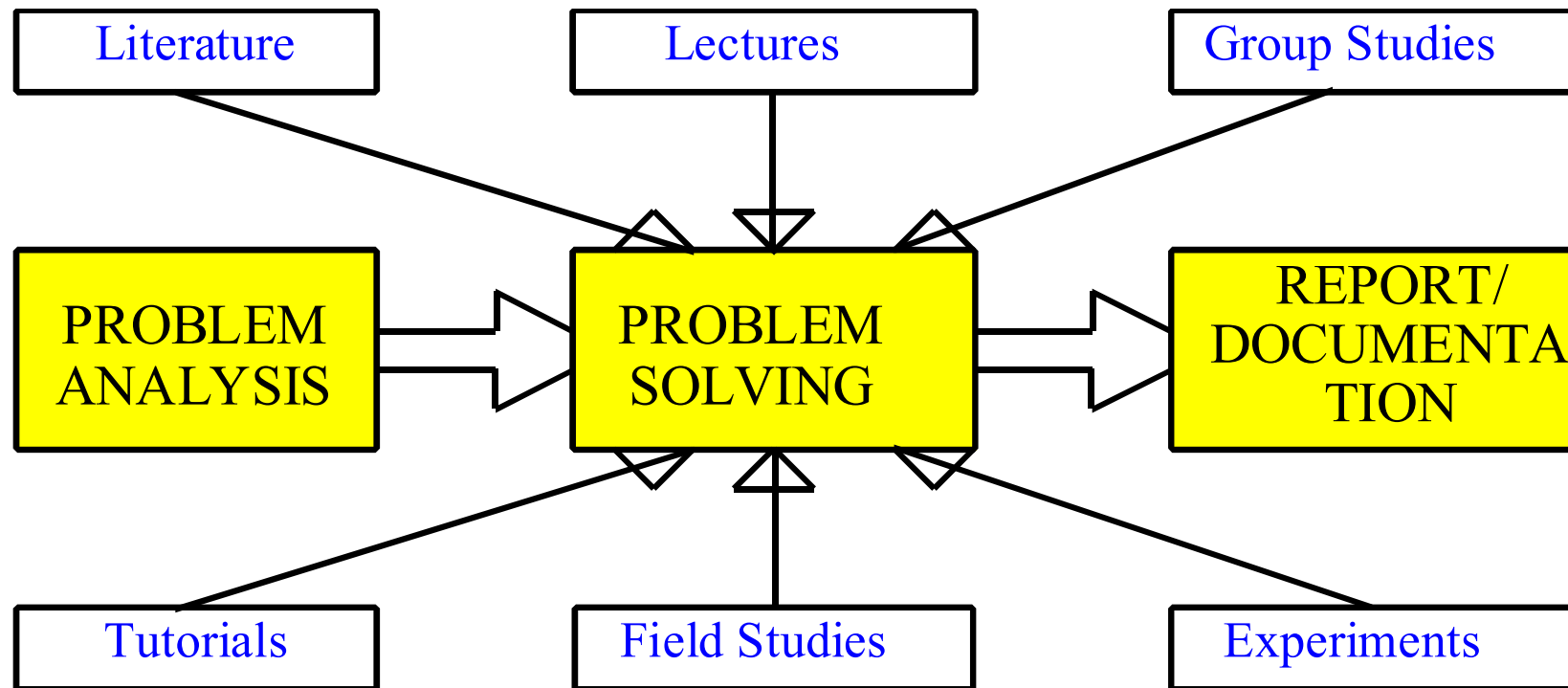
**50%
project**



Model from *The Aalborg PBL model - Progress, Diversity and Challenges*
Anette Kolmos, Flemming K. Fink & Lone Krogh



Problem Based Learning





Semester Plan

Period 1	Period 2	Period 3	Period 4
Project work	Project work	Project work	Private study & Examinations
Courses	Courses	Courses	

Period = 5 weeks

Fall semester: September 1 - January 31

Spring semester: February 1 - June 30



Week plan - example

	Monday	Tuesday	Wednesday	Thursday	Friday
8.15	Project work	C++ programming	Stochastic Math.	Scientific English	Project work
12.00		Calculation Exercises	Calculation Exercises	Calculation Exercises	
12.30	Lunch	Lunch	Lunch	Lunch	Lunch
	Digital Signal Processing	MATLAB		Project work	Project work
16.30	Calculation Exercises	Calculation Exercises			

One-week time table for each 5 week period



Projects

- Fundamental topics
- Feasibility study
- Industrial development topics
- Research topics

- Projects proposals from
 - Teaching/research staff
 - Research projects
 - Industry
 - Students



Basic Wireless Communication Technology

Objective:

- To obtain knowledge about basic wireless communication systems
- To obtain knowledge about the qualities of present wireless communication principles
- To be able to use methods and theories for analysis and design of functional wireless communication systems.

Content:

The project work is based on a specific problem where wireless communication technology gives a possible solution. The problem is analysed according to communication needs including quality service. A number of wireless communication technologies are compared with the identified needs and a technology is chosen for further processing. As a solution to the problem a distribution system is designed based on the wireless communication technology chosen for the purpose.

A small number of elements are implemented, enough to be able to demonstrate the abilities of the established communication facilities. Tests are carried out at module system level and accept



Project based assessment

On team basis (all present – partly!!)

Presentation from each student (< 1 hour in all)

Questions / discussion (< 6 hours in all)

Question must be based on project content

Individual marks

Official appointed external examiners

mainly from industry

Supervisor/examiner decide

Who to ask about what !!!

How long time to continue?



Project example 1

Hearing aid for profound deaf children

Problem:

Profound deaf children can hear something up to 800 Hz, but they need speech information up to 2000 Hz to understand speech.

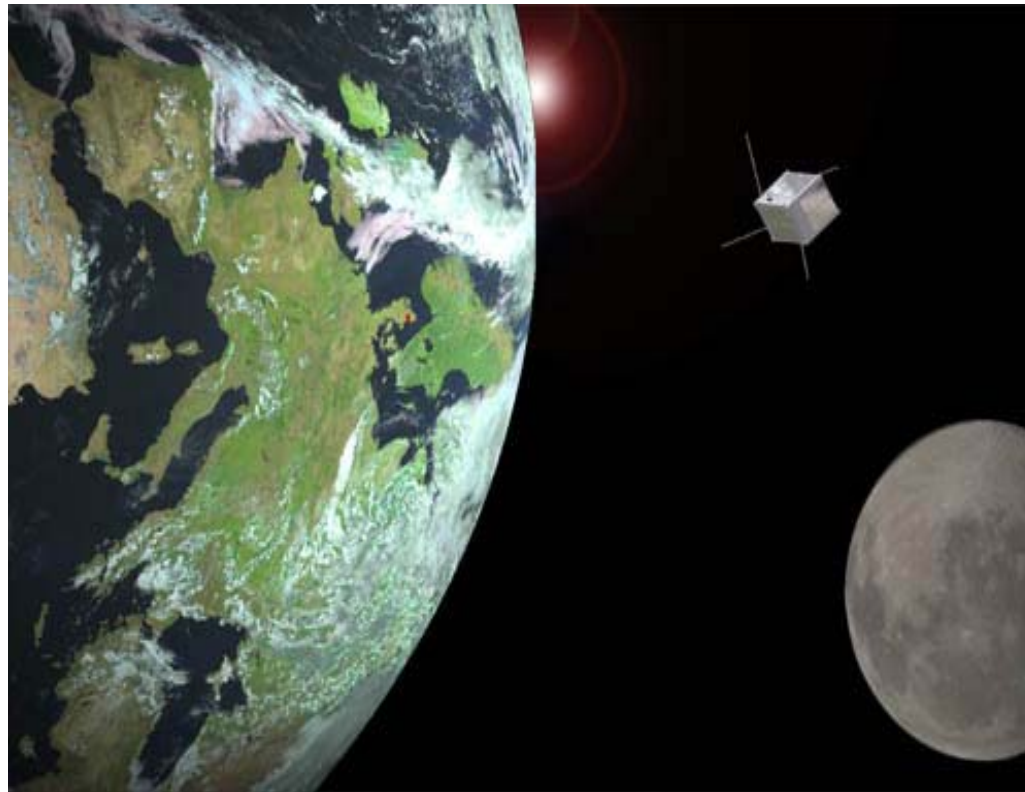
Can the speech information needed to understand speech be extracted and presented for the children below 800 Hz ?

A team of 3rd year students developed and tested a prototype with good results.



AAUSAT II

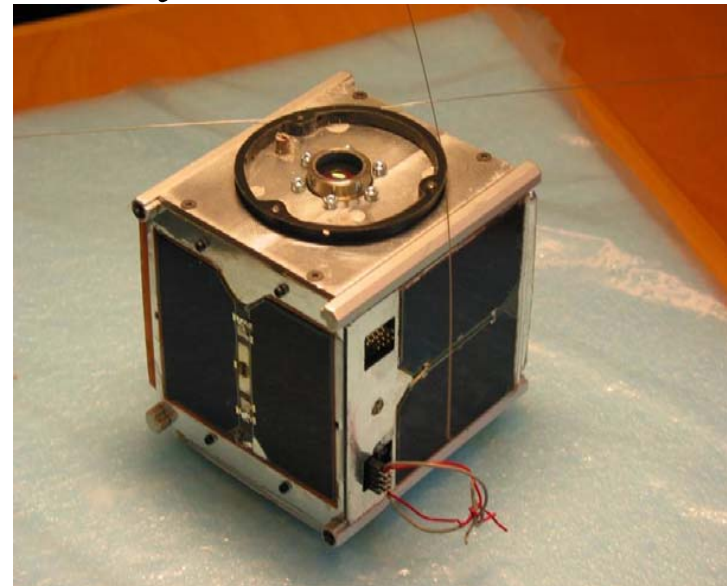
A student Satellite - Build in Aalborg





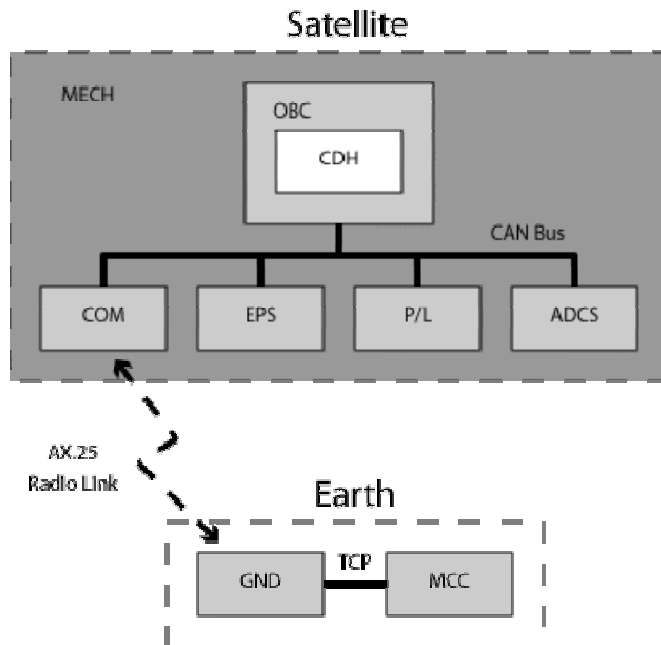
Cubesat Concept

- Originating from Stanford University USA
 - 1 kg
 - 10 cm x 10 cm x 10 cm
 - Piggy riding on a real launch
-
- AAU launched AAUSAT I/Cubesat in 2003
 - A succes – communication obtaned





STRUCTURAL OVERVIEW for AAUSAT II



- MECH - Mechanical construction
- OBC - Onboard Computer
- COM-Communication(435MHz)
- EPS - Powersupply and Security
- P/L - Scientific Payload (gamma quant sensor)
- ADCS - Attitude Determination and Control System
- GND - Ground Station(in Aalborg)
- MCC - Mission Control Center



Cooperation

- Inside the team (as usual)
- Between teams (PBL² !)
 - Different semesters (4-10)
 - Different specializations
 - Control, Radio Communication, Mechanical, Power electronics,...
- Not seen before !
- It works – students acts like real prof engineers
- Students are 90% in control of project !
- Invisible Management Guidance only when needed



Result of Pedagogical Concept

- Safe social surroundings
- Learn professional argumentation
- Learn to apply theoretical material
- Learn to work with engineering problems
- High completion percentage
- Lower average study time
- Bigger working load on teachers
- Need for training the teachers



Conclusions on PBL

- Ranked by Danish Industry to be the Best !!!
- Group organized PBL gives experience in
 - team-work and co-operation
 - applying theoretical material in engineering
 - problem definition
 - problem solving
 - documentation and presentation
- Industry is very interested in co-operation
 - with projects at all levels
 - with scholarships and other funding for students



PBL ~ FWBL

Problem Based Learning

PBL

On campus education,
organised in teams
Courses + project
Application of courses

Learning is the goal
Problem is a tool

Facilitated Work Based Learning

FWBL

Company based work
Often team organised
'Courses' + work
Application of courses

Problem solving the goal
Knowledge is a tool



Learning ~ Engineering

Learning by problem solving

- The problem is a tool
- Learning is the goal

Engineering problem solving

- Professional skills are the tools
- The goal is to solve the problem