Gør tanke til handling
VIA University College

Engineering didactics and teaching materials for Danish primary and lower secondary schools

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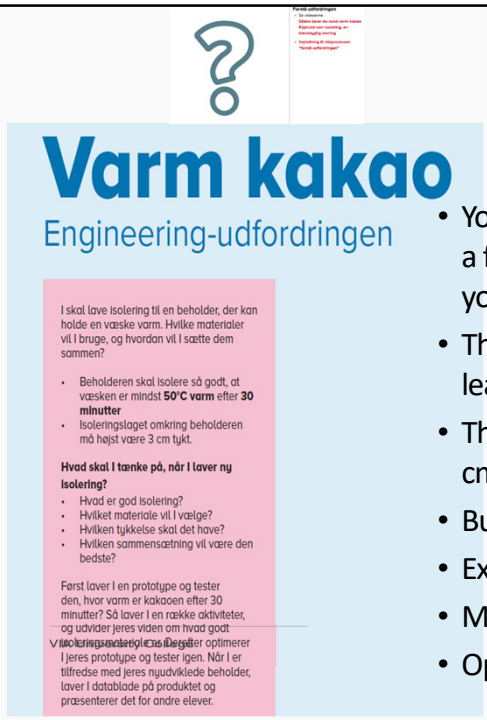
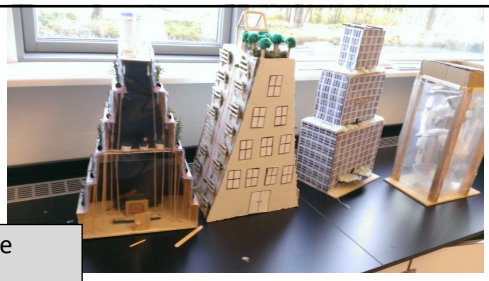
What is engineering?



Hot Chocolate The engineering challenge

- You must make insulation for a cup, that can keep a fluid hot. What materials will you use? How will you construct the cup?
- The container must be able to kep the fluid at at least 50°C after 30 minutes.
- The insulating layer must not be thicker than 3 cm.
- Build a prototype
- Expand your knowlegde on insulation
- Measure the cooling of the fluid
- Optimize and develop further

Workprocesses as design criterias



Understand challenge	Introduction and instruction, user dialogue
Ideas	Brainstorm, discuss
Research	Investigate, inquire, experiment, test materials, user dialogue
Plan	Sketch, plan work,
Construct	Build, software development, etc.
Improve	Asssess, reconstruct, change,
Present solution	Communicate, user dialogue

Students degrees of freedom-rubric

Proces	Structured	Guided	Open
Understand challenge	Groups work with teacher-formulated understanding of the challenge	Groups choose from a list	Groups interprete their own understanding of the problem
Ideas	The teacher direct the brainstorm	Groups choose how their brainstorm is structured	Groups organize their own brainstorm
Research	Groups work from precise instuctions about how to find knowledge about the challenge	Groups choose between strategies to learn about the challenge	Groups choose themselves how they will attain knowledge
Plan	Groups work from precise instructions	Groups choose between different planningstrategies supplied by the teacher	Groups plan their own designstrategy
Construct	Teacher determine materials, tools and constructionproces	Groups choose between materials, and tools supplied by the teacher. Teacher guide how groups construct the prototype.	Groups choose themselves materials, tools and construction proces
Improve	Teacher determine testprocedure and guide groups to assess their prototype	Groups choose between testprocedures and assess their prototype according to given criterias	Groups choose themselves how to test prototype and assessment criterias for improvement
Present	Teacher instruct groups how to present solution	Groups follow a template for presentation, but do their own planning	Groups choose autonomously media and format for their presentation.

	Starter	In transit	Completed	Exemplary
Understand challenge	I can sufficiently understand simple parts of the challenge	I have an uncertain understanding of the challenge	I have a good understanding of the challenge and its context	I understand the challenge completely and its relation to the societal context
Ideas	I can develop simple ideas for the prototype	I am uncertain about developing ideas and discussing possible solutions	I am confident about combining ideas to a feasible solution	I am very confident about combining ideas from others in my contribution for a possible solution
Research	My knowledge about the challenge is limited and I can do simple investigations	I am uncertain about doing investigations about parts of the problem	I have good skills and knowledge about invatigating my problem	I can with certainty investigate my problem and analyse data with a critical perspective
Plan	I can primitively outline for solving the challenge with materialchoices for the prototype	I am uncertain about choosing and processing materials for the prototype	I am certain that I can choose and process materials for the prototype	I can with great confidence choose between different materials for the prototype and argue for pros and cons of my choices
Construct	I can construct a simple prototype which does not work very well	I am uncertain about making a prototype that only solves the challenge partially	I am good at constructing a prototype that almost solves the challenge	I can certainly build a prototype that solves the challenge and shows pros and cons in my choices during the designproces
Improve	I can make a simple assessment of my prototype suggest simple improvements	I am uncertain about testing my prototype	I can combine testprocedures to test my prototype using given criterias	I can certainly test my prototype and discuss possible improvements with peers
Present solution	I can uncoherently present my solution and use scientific and technical language to explain functionality	I am uncertain about presenting my solution. I alternate between everyday language technical and scientific language when explaining the functionality	I can coherently choose between different presentationformats that are optimal for presenting the solution. I alternate between everyday language and technical and scientific language when explaining the functionality	I can make a well structured presentation using formats of my own choosing. I alternate with centainty between everyday language and technical and scientific language when explaining the functionality