

PBL: the missing piece of the jigsaw puzzle for international STEM learning

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Presentation Aims

1. Reasons for the project
2. PBL and our curriculum
3. 2023 projects
4. Methodology for 2024
5. Student evaluation
6. Teacher evaluation
7. Challenges and Solutions

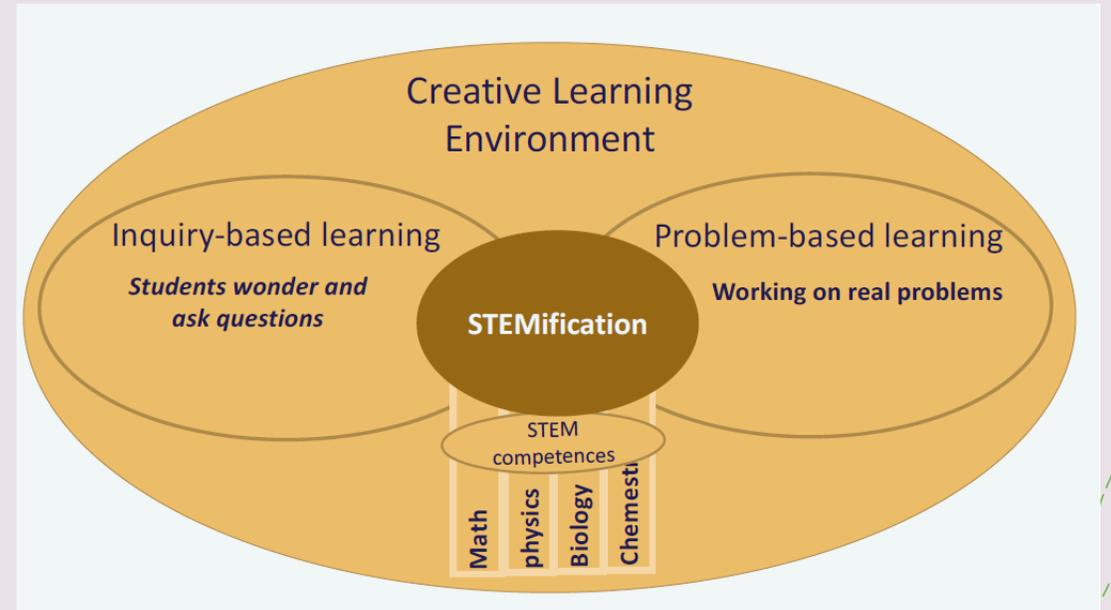


AAU PBL

- + international recognition
- + work on real life problems as a group
- + students learn how to learn independently
- + apply theory to a problem they choose
- + better communication and cooperation

(Aalborg, 2015)

STEMification



(Hansen, 2023)

PBL supports our STEM curriculum

- + Skipper Clement International 9th grade (& 8th)
- + Cambridge International General Certificate of Secondary Education IGCSE
- + enquiry based learning and use of scientific method
- + individual practical exam
- + STEM skills part of curriculum
- + **BUT no requirement for group project work**

- + PBL prepares our students better for high school

01

interest in
science

02

scientific
method

- relevance to everyday life

IGCSE Chemistry practical exam



+1 1/4 hours, 2 experiments, 1 plan

How PBL supports our curriculum

+ “Our aim is to emphasise small group self-directed learning around a problem Skipper Clement ninth grade students have chosen to solve related to a theme.”

2022/23 environment

+ how can we make our school more eco-friendly?

2023/24 health and technology

+ how can we use technology to have a healthier lifestyle?

Example project 2022/23

Problem: Paper waste

- Printing too many copies
- Throwing useful paper out

Aim: use less paper and reuse the ones already used

Research Question: How can Skipper Clement School reduce paper waste?

The screenshot shows a PowerPoint slide titled "Fixing the problem". The slide content is as follows:

Fixing the problem

Possible solutions :

- Print less, print double sided
- Keep extras for next year

What we did:

- Survey – to see teachers' habits
- Posters – spreads awareness
- Scrap paper box – reuse paper
- Art projects with scrap paper

In our class

The slide includes two photographs. The first is a blue bin labeled "SCRAP PAPER" with a handwritten note "Only paper from 1st lesson!". The second is a poster with the text: "DID YOU KNOW? 85 BILLION TONS OF PAPER IS THROWN AWAY EACH YEAR! THAT IS 2 BILLION TREES!" and "FOR EVERY 400g OF PAPER RECYCLED, 140 LITRES OF OIL IS USED!!". Below this, it says "THE AVERAGE TEACHER USES 10,000 SHEETS OF PAPER A YEAR!" and "85 BILLION TONS OF PAPER IS THROWN AWAY EACH YEAR! THAT IS 2 BILLION TREES!".

Scrap paper

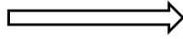
Scrap paper box

We just saved 15kr in 3 weeks!



40 classes in the school = 600kr in 3 weeks

Scrap paper box results after 3 weeks (170) !!!!!



Art using scrap paper



How to save money

- 1 piece of paper = 0.08kr (cheapest option)
- 1 teacher = 10,000 pieces each = 800kr a year
- 80 teachers in the school = 64,000kr a year
- To save money print doubled sided = only 32,000kr a year = save half of money
- 1 class saves 170 pieces of paper in 3 weeks
- 40 classes = 6800 pieces of paper
- 40 weeks (1 school year) = 90,667 pieces ≈ 8000kr can be saved
- Total ≈ 40,000kr per school year
- This money can then be used for other things in the school like making the labs, playground, classrooms or the teacher lounge better, improving the facilities in the school, maybe using that money to provide sports clubs at the school?



Survey results

- Teachers mostly print out 1 – 3 extra copies
- Most teachers will use scrap paper boxes

● Ja / Yes 12
● Nej / No 2
● Måske / Maybe 3

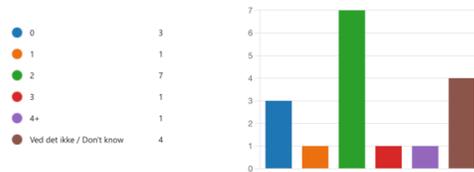


- and the paper in it

● Ja / Yes 14
● Nej / No 1
● Måske / Maybe 2



- But, in majority, there are only two classes that have scrap paper boxes.



So...seeing what has happened in our class in three weeks, what will happen if scrap paper boxes were in ALL classes?

Conclusion and Evaluation - Paper Project



Evaluation

- What we could have done better
 - A before and after survey (for comparison)
 - Scrap paper box in other classrooms Make sure everyone from the class and the teachers know about the scrap paper box
 - Increase awareness of paper use in other ways
- Other ideas
 - Figured out other ways to use scrap paper
 - If have extra handouts, could have a folder to keep for next year
 - All digital notes/work

Conclusion



Tackling the problem from the source = great idea

Printing less
Printing double sided
Using online solutions



A scrap box would be a good no money solution, decreasing the amount of paper waste



The school will be saving lots of money – which then can be used for other things



- Everyone needs to have the intention of saving paper for project to work
- Enlarging the scale of the project would produce more visible results

2023/24 methodology

Students

- + Groups of 3 or 4 students
- + 2 ½ months
- + session to learn PBL skills
- + seventeen 35 minute lessons
- + 5 homework times
- + final group presentation

Teachers

- + 6 teachers
- + 2 hour training on AAU PBL
- + 4 + 2 two hour meetings
- + SH AAU accompanying project

Assessment Criteria

At the end of each lesson the teachers will evaluate how your group has worked.

- 0, 1 or 2 marks each lesson. Cooperation, teamwork, participation of all members (10 marks max)
- 0, 1 or 2 marks each lesson. Creativity and problem (how group generated ideas) (10 marks max)
- 0, 1 or 2 marks Quality and depth of research experiments/models (5 marks max)
- 0, 1 or 2 marks Presentation with all aspects covered, all members present participating (5 marks max)
- **Total out of 30 marks**

- All will receive a Skipper STEM project certificate and the best idea /team score will win pizza for lunch

Project Timetable

	Session aim	Date and time	Staff involved	Location
	Intro Session	Monday 27/11/2023 12:10 - 13:40	RS & TM	Chemistry in F/K lab
	Group Skills	Wednesday 29/11/2023 8:10 - 9:40	JN & RS	English room 33
	Project 1	Wednesday 6/12/2023 13:45 - 15:15	RS	Bio/Chem room 33
	Project 2	Tuesday 12/12/2023 8:55 - 11:25	RS & NM	ICT/F&N room 33
	Project 3	Tuesday 9/01/2024 13:45 - 15:15	TM	Phys/Maths room 33
	Review	Thursday 11 or 18/1/2024 Team meeting	STEM Senior, JN, SH	Bio lab
	Project 4	Wednesday 17/01/2024 9:55-11:25	TM	F/K lab
	Project 5	Thursday 25/01/2024 12:10 - 13:40	RS	Biology Naturvid. lab
	Presentation	Friday 9/2/2024 8:10 - 9:55	RS/JRT/BG/TM RS requires S7 cover	Maths S10 Science S9 Auditorium
	Evaluation	Thursday 14/3 STEM Team meeting	STEM Senior, JN, SH	Bio lab

Student evaluation

- + a good break from regular class
- + did something we were interested in; relevant topic
- + work independently
- + could chose our groups
- + liberty to chose some things about the project
- + could be creative
- + cooperative
- + not enough time x 4
- + more budget x 2
- + staff were reluctant to help
- + instructions were slightly unclear
- + guidelines too open
- + no follow-through
- + restriction of subject x 2

Teacher Evaluation

- + benefits of structured time to work in groups
- + develop leadership skills and confidence in group work
- + communication and presentation skills
- + break from normal routine for students and teachers
- + evaluation and feedback on skills
- + Use our STEM committee time for something other than eating cake

Challenges faced & potential solutions

- + teachers' culture of working as individuals
- + opgaveroversigt limitations
- + lack of experience and confidence
- + one teacher driving change
- + some have negative mind-set



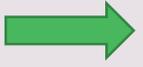
- + extra STEM team meetings for 5 teachers



- + school & AAU financial support



- + Søren Hansen training & accompanying process



- + some team-teaching agreed



- + inclusion and patience ...

PBL is not a magic bullet

“problem-solving only becomes relatively effective when learners are sufficiently experienced”

“the way an expert works in his or her domain (epistemology) is not equivalent to the way one learns in that area (pedagogy)”

(Clark, Sweller, & Kirschener, 2006, p. 80 and p.78).

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