

MatRIC Centre for Research,
Innovation and Coordination
of Mathematics Teaching



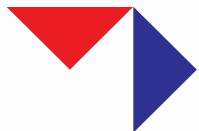
Centre of
Excellence in
Education

Development of new content in mathematics for pre-calculus students using STACK at University of Agder

Morten Brekke

University of Agder

STACK Conference, Furth 15. November 2018



MatRIC Centre for Research,
Innovation and Coordination
of Mathematics Teaching

Morten Brekke

Professor

University of Agder

Department of Engineering

Teacher of Mathematics, Statistics
and Physics

MatRIC (40%)

Coordinator for MatRIC's

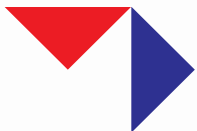
- Video network
- Digital assessment network



**Første meritterte underviser i
Agder**



Centre of
Excellence in
Education



MatRIC Centre for Research,
Innovation and Coordination
of Mathematics Teaching

Outline

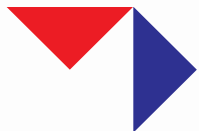
- MatRIC
- Background
- Why STACK
- Abacus
- How?
- Challenges



UiA at a Glance

Facts and figures (2017)

- 6 faculties + Teacher Education Unit
- 20 departments
- 1 museum
- 13,000 students
- 58% women / 42% men
- 9,688 bachelor / 3,138 master
- 234 PhD
- 409 outgoing exchange students
- 318 incoming exchange students
- NOK 1.5 billion in total budget
- 863 academic staff and 511 administrative staff
- 670 publication points



MatRIC Centre for Research,
Innovation and Coordination
of Mathematics Teaching

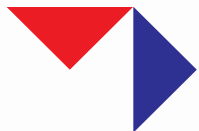


Centre of
Excellence in
Education

MatRIC - www.matric.no

Centres of Excellence in Higher Education (SFU) in Norway

MatRIC's vision is of students enjoying transformed and improved learning experiences of mathematics in higher education.



MatRIC Centre for Research,
Innovation and Coordination
of Mathematics Teaching

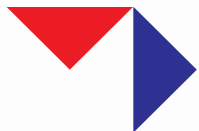


Centre of
Excellence in
Education

MatRIC - www.matric.no

Centres of Excellence in Higher Education (SFU) in Norway

MatRIC's vision is to be a national centre for better teaching and learning of mathematics within natural sciences and professional education at university/university college level.



MatRIC Centre for Research,
Innovation and Coordination
of Mathematics Teaching



Centre of
Excellence in
Education

MatRIC - www.matric.no


Centres of Excellence in Higher Education (SFU) in Norway

Sign up for the MatRIC Newsletter at
www.matric.no

Background

Teaching Mathematics to engineering students is a challenge.

With:

- High failure rate
 - Large student-groups
 - Large curriculum
 - “pass pressure” from stakeholders and students
- 

Background

Admission requirements for attending a bachelor programme in engineering can be divided into four groups:

1. From upper secondary school, **with** Mathematics and Physics.
2. One-year preliminary course for engineers.
3. From upper secondary school, **without** Mathematics and Physics.
4. Students with vocational certificates (carpentry, electronics ...)

Background

40% of our students comes from group 3 and 4 (no math).
(Bachelor in engineering)

- They have a 6-week pre-course in Maths before 1. semester
- About 50% of these students either do not pass or drop out
- We need to do something about this high failure rate.
- We received a grant of 20.000 euro to improve students performance

Background

Our plan was to extend the pre-course in maths to 9 weeks .

- This was not possible (or not allowed)
- But the planned changes for the teaching goes on
- Use of videos and STACK will be implemented



Why STACK

We have decided to use STACK for training and testing our students.

- I have used other CAA-tool for several years
- I see STACK as “the most sophisticated” tool
- We do have collaboration with STACK (Sangwin)
- It is free of use and you can share/copy existing problems
- We have become part of **Abacus**

WELCOME TO ABACUS

Abacus is a material bank for STEM education. We seek to produce, share and host high-quality educational material between collaborators. Our goal is to provide maintained and ready-to use material for lecturing and exercises. We specially focus on material utilizing the automatic assessment system **STACK**, but we are open to material making use of other formats and platforms as well.

The project was founded in early 2015 by the seven Finnish universities providing MSc education in engineering. Abacus was part of a pilot project concerning mathematical education, but has since grown in range of topics as well as partners. Interest towards the project has increased worldwide, and we look forward to including more collaborators.

Questions about the Abacus project or discussion about granting your institution membership should be directed at **Dr. Antti Rasila (Aalto University)**, the coordinator of the project.

The contact person and the site administrator for German language Abacus materials is **Dr. Michael Kallweit (Ruhr-Universität Bochum)**.

Current partners:

- Aalto University, *Finland* Coordinator
- Åbo Akademi University, *Finland* Initial partner
- Lappeenranta University of Technology, *Finland* Initial partner
- Tampere University of Technology, *Finland* Initial partner
- University of Oulu, *Finland* Initial partner
- University of Turku, *Finland* Initial partner
- University of Vaasa, *Finland* Initial partner
- Häme University of Applied Sciences, *Finland*
- Ivano-Frankivsk National Technical University of Oil and Gas, *Ukraine*
- JAMK University of Applied Sciences, *Finland*
- Julius Maximilian University of Würzburg, *Germany*
- Lahti University of Applied Sciences, *Finland*
- Metropolia University of Applied Sciences, *Finland*
- Polytechnic Institute of Leiria, *Portugal*
- Ruhr Universität Bochum, *Germany*
- Tallinn University of Technology, *Estonia*
- Tampere University of Applied Sciences, *Finland*
- TTK University of Applied Sciences, *Estonia*
- University of Agder, *Norway*
- University of Eastern Finland, *Finland*
- University of Edinburgh, *United Kingdom*
- University of Helsinki, *Finland*
- University of Jyväskylä, *Finland*
- University of Tampere, *Finland*
- Vaasa University of Applied Sciences, *Finland*



<https://abacus.aalto.fi/>

How

Our aim is to use video and “high quality” STACK questions to improve our students performance in Mathematics.

- Copy our project “Numbas for Economy”
“Done by PhD student Ida Maria Landgärds”
- Before entering (from 1. June) students do a “mapping test” – to see if they are “ready”
- If not – do “diagnostic tests” – get help with online resources

Before entering

I am ready
divided into three
modules

The
take a
diagnostic

I need more of

Limits of
functions,
the
derivative

I need more of

Quadratic
functions and
basic algebra,
logarithms

I need
more of

Linear
functions
and
equations

1. Summer course

The course in mathematics and the exam

How

Our aim is to use video and “h
improve our students perform

- Copy our project “Numbas
“Done by PhD student Ida Maria La
- Before entering (from 1. Ju
to see if they are “ready”
- If not – do “diagnostic test

Andregradsfunksjoner del 2

Andregradsfunksjoner kan skrives som $f(x) = ax^2 + bx + c$ der a , b og c er konstanter.

For eksempel hvis $f(x) = x^2 - 4x + 3$ så er $a = 1$, $b = -4$ og $c = 3$.

Vi skal nå se på hvordan finne nullpunktene ved hjelp av regning. For å finne nullpunktene til $f(x)$ må vi løse ligningen $x^2 - 4x + 3 = 0$. Dette kan gjøres ved hjelp av **ABC-formelen**. Det kan være lurt å se følgende video frem til minutt 09:22 for å lære hvordan man skal bruke ABC formelen. Etter dette går videoen inn på hvordan formelen utledes, noe som som også kan være interessant, men det viktigste er å kunne bruke den.



ABC formelen:

Andregradsfunksjonen $ax^2 + bx + c = 0$ har løsningene der,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}, \text{ når } b^2 - 4ac \geq 0.$$

Løs andregradsligningen $x^2 + 8x + 15 = 0$

Bruk ABC formelen og finn begge løsningene. Løsningene er $x_1 = \text{input}$ og $x_2 = \text{input}$

(regn ut med penn og papir, du vil få 2 svar på ligningen, rekkefølgen du setter opp svarene på har normalt ingenting å si, men for at dataene skal bli tolket riktig må du fylle inn det laveste tallet først (x_1).

Show steps (Your score will not be affected.)

Submit part

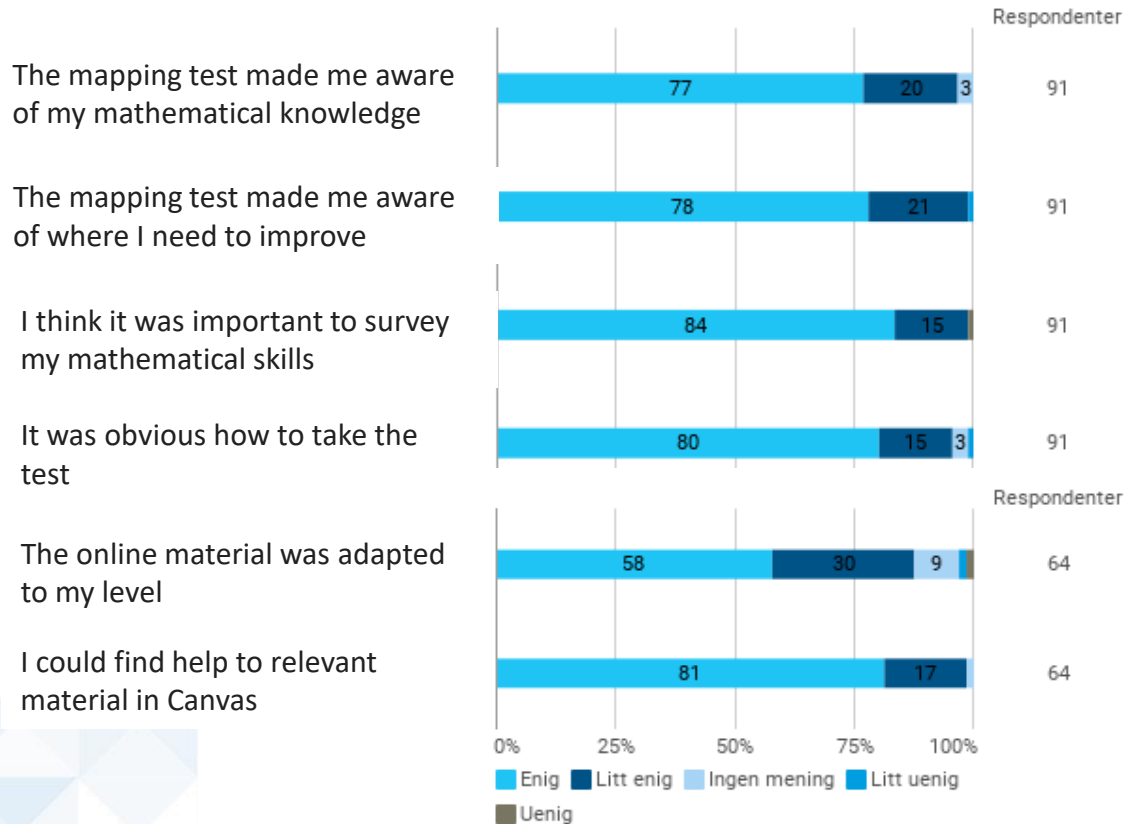
Submit answer

Score: 0/2

Try another question like this one

Reveal answers

Feedback from economy students



Preview question: Lukio_derivaatta_1

[FI/SV/EN/NO]

Question 1

Not yet answered

Marked out of 1.00

[Tidy question](#) | [Question tests & deployed versions](#)

Calculate the derivative of the function $f(x) = x^8$. Laske funktion $f(x) = x^8$ derivaatta. Bestäm derivatan av funktionen $f(x) = x^8$. Bestem den deriverte til funksjonen $f(x) = x^8$.

Example: Expression $3x^2 + 5x + 1$ is written as $3*x^2+5*x+1$. Esimerkki: lauseke $3x^2 + 5x + 1$ kirjoitetaan $3*x^2+5*x+1$. Inmatningsexempel: uttrycket $3x^2 + 5x + 1$ skrivs $3*x^2+5*x+1$. Eksempel: Uttrykket $3x^2 + 5x + 1$ skrives $3*x^2+5*x+1$.

$f'(x) =$

ematics" into

Preview question: Derivasjon_1

Potensfunksjon

Start again

Save

Fill in correct responses

Question 1

Not yet answered

Marked out of 1.00

[Tidy question](#) | [Question tests & deployed versions](#)

Bestem den deriverte til funksjonen $f(x) = x^4$.

Eksempel: Uttrykket $3x^2 + 5x + 1$ skrives $3*x^2+5*x+1$.

$f'(x) =$

Start again

Save

Fill in correct responses

Submit and finish

Close preview

How

We are currently producing material in STACK

- Translating the course “Abacus Bridge Mathematics” into Norwegian (autumn 2018)
- Produce new material adapted to our courses (spring 2019)
- Set up courses, videos, online material etc...



Challenges

- Manpower
- We need to improved authoring skills in STACK
- How do we “force” new students to do the tests?

- **Thank you for your attention!**

