

European First Year Experience 2016

4 - 6 april 2016, Ghent - Belgium

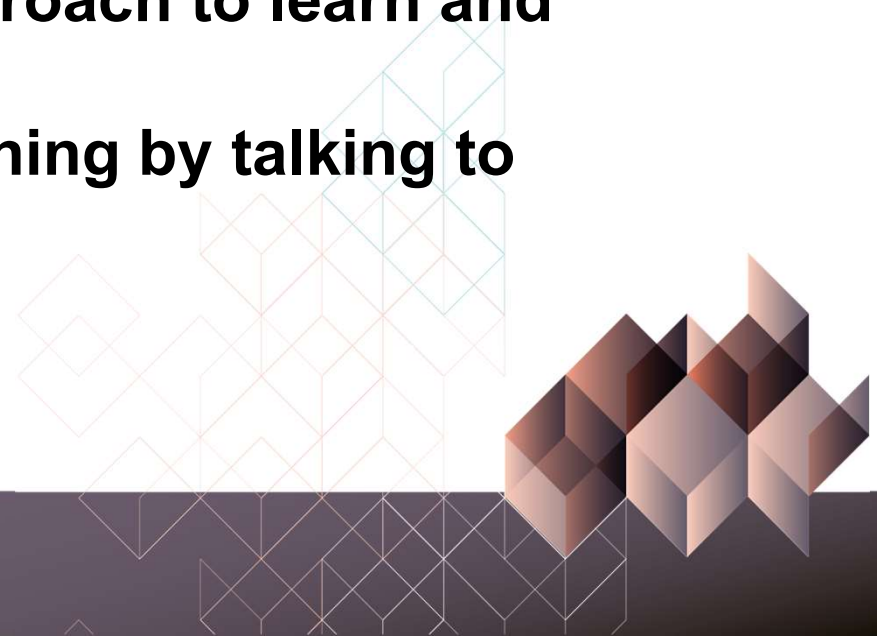


HØGSKOLEN
I BERGEN

BERGEN UNIVERSITY COLLEGE

Math-talk, an effective approach to learn and understand To promote culture of learning by talking to understand mathematics

EFYE 2016 – Ghent 4-



Background

Keywords

- Lack of motivation
- To activate the less motivated students / freeloaders
- The importance of lecturers' roles in dealing with first-year students and their academic needs
- Cover students' needs both academically and socially
- Students are not concentrated in classes and forget easily what we have taught.

Case study

- Mathematics for Subsea Students (MAT100 and MAT107)

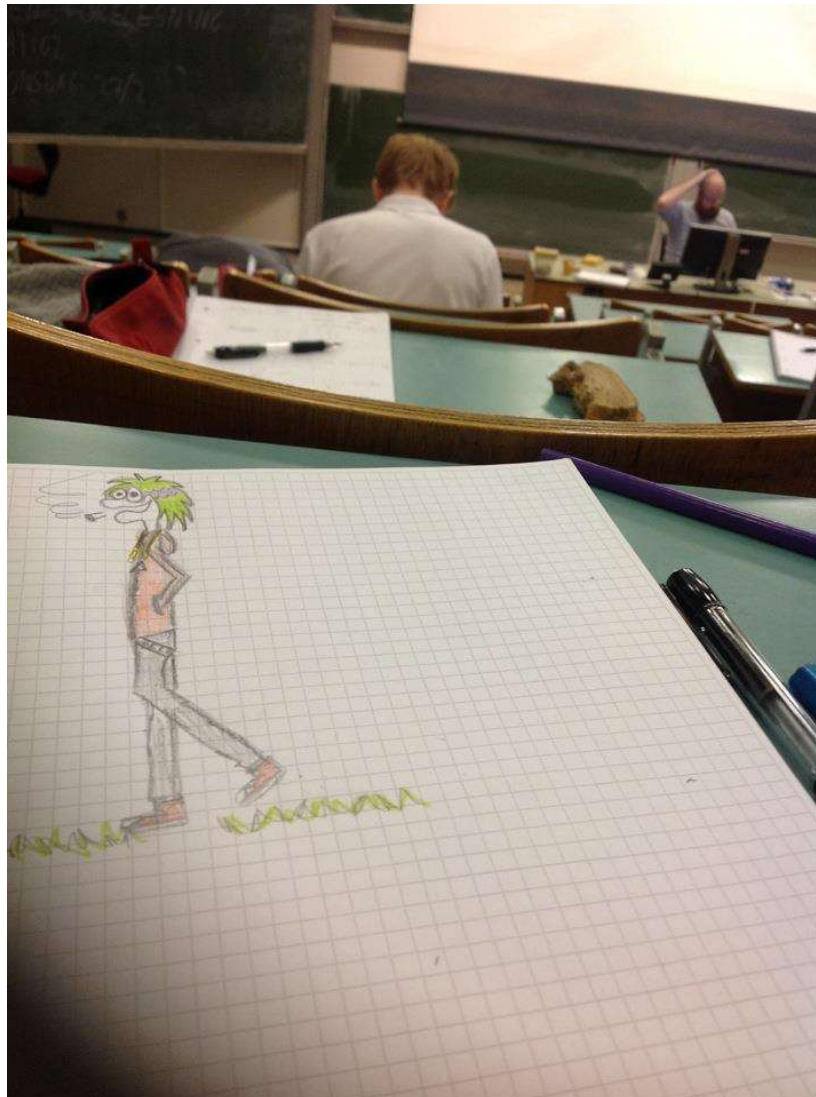
Our challenges as lecturer

- Less motivated students
- Less active students
- Less concentrated students
- ...
- And much much more!!

Our challenges as lecturer



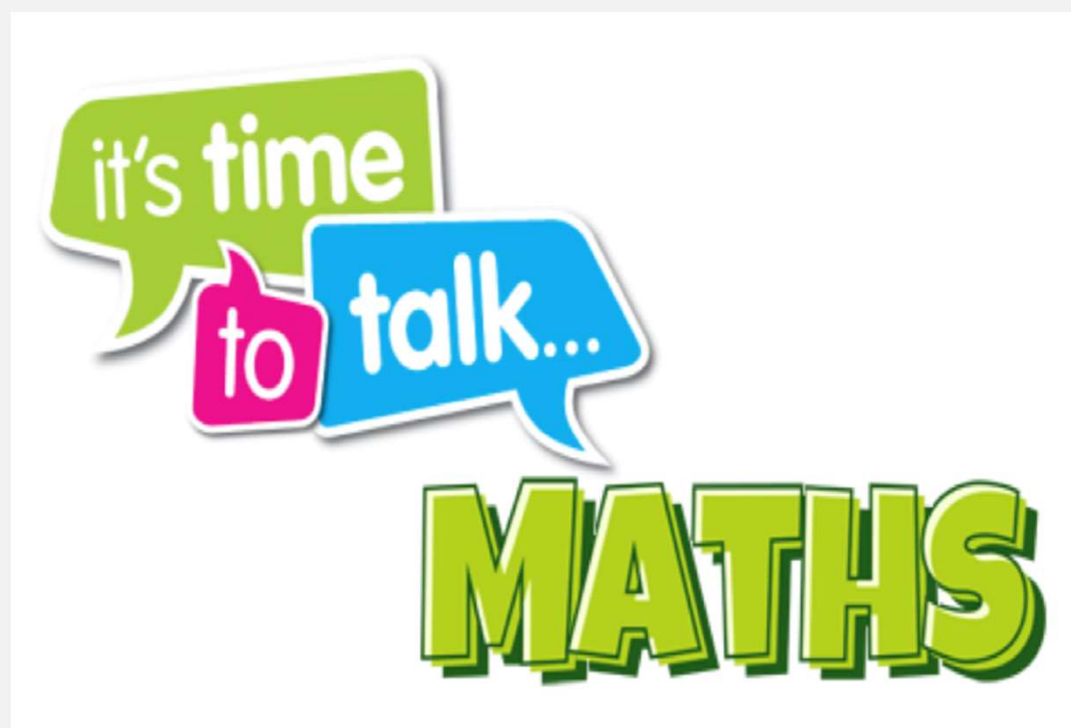
How can we attract less concentrated/motivated students?



Case study

- The purpose of this case study is to understand the effect of team-based problem solving (TBPS) on changing the culture of learning and knowledge building in mathematics.
- Lecturer presents a new subject, is lectures and students **can make the subject their own by talking about and on the subject and explain for the others in their small groups.**
- The method was adapted for Subsea and Marine technology engineering students at Bergen University College during 2009-2015 and experiences reveals that students can build a better understanding on mathematics.
- This method has also been implemented in teaching students from various engineering disciplines.

Mathematics + Talks



Talking the Language of Maths – Part 1

Students can further develop their group sessions by using the following methodology:

- Read the problem twice and make notes to fully understand the problem at hand.
- Each student is provided 2 minutes to explain the problem to their colleagues (this assists students to understand the problem better). Students then characterize the problem and suggest a solution method.
- Students take 5-7 minutes to solve the problem individually and if they think they have found a reasonable answer, they share the solution as well as the method. If several fellow students have the same answer, students share their method and let the others who have not solved the problem a few more minutes to answer.
- One of the students can solve the problem on the board in the group room and can discuss their views and ideas with their fellow students. Students explain the reason for their choice of method and summarize their understanding.

Talking the Language of Maths – Part 2

Students should remember to:

- Talk using simple terms, be precise and be short – so the approach remains focused.
- Listen to others and their views – in order to fully engage with the process.

Talking the Language of Maths – Part 2

Be short, presis and simple!

- Student can practice using the following statements in their group sessions:
- *I agree because ...*
- *I like the proposal as ...*
- *I disagree because*
- *I do not believe ...*
- *I like your method because...*

Talking the Language of Maths – Part 2

- *Lecturers should remember to:*
- Makes good questions / problems which lead students to understand definitions and theories with a stronger emphasis.
- Listens to the students and try to give them guidance on how they can be:
 - › more simple and effective;
 - › identify problems easier; and
 - › avoid misunderstandings and wrong methods.
- Ensure students understand the correct method to apply for certain problems.

Talking the Language of Maths – Part 2

The study provides a good basis for improving students' learning process. This has had positive effects on students' motivation and desire to attend teaching activities and learn effectively.

The talk method contributes to learning by:

- Talking simple, short, precise
- Read more effective
- Listen to others and respect their views

Talking mathematics supports:

- understanding and misunderstanding.
- robust learning by boosting memory.
- deeper reasoning.
- language development.
- the development of social skills.

Choose of questions and problems

- The result of this case study over seven years indicates that verbal learning process can assist engineering students' knowledge to step from informative knowledge to integrate knowledge. Choosing of the questions and problems are essential. PBL and TBPS approach are vital and effective methods to improve their learning abilities and develop their educational identity and professional skills [6]. The students' ability to gain and retain mathematics knowledge is key factor for success in their studies.

Choose of questions and problems

- Choosing of the questions and problems are essential.
- Elearning projects:
- Webpage with course notes, summary, videos, and
<http://prosjekt.hib.no/mat100>
<http://prosjekt.hib.no/mat10x>
- Control Questions
- Control *Problems*

Control questions and problems

- Control Questions

Questions that reflect on principles, theorems and definitions.

- Control Problems

Problems that are developed from simple problems to more difficult and challenging ones to ensure that students have understood the subject.

Problem-Based Learning

One must reconsider what students really need to learn and the environment in which they learn. Much of the enthusiasm for the problem-based approach to learning comes from instructors who feel revitalized by the creative energy it releases.

Hal White, "'Creating Problems' for PBL"

How to use the webpage



Studietips-studieteknikk

Her finner du

A) Oppsummeringer:

i) **Oppsummering** av deler av hvert kapittel i pensum

ii) **Kontrollspørsmål**: Korte spørsmål som prøver å ta frem de viktigste delene av definisjoner og teoriene i hvert kapittel.

iii) **Kontrolloppgaver**: Oppgaver som er valgt til å gi deg gode erfaringer og regneferdigheter.

iv) **UKEOPPGAVER** fra arbeidsboken

Kontrollspm. (refleksjon) \longleftrightarrow **Kontrolloppgaver(fordypning)**

Studietips:

1) Les teorien fra læreboken/forelesningsnotatene.

2) Les kontrollspørsmålene raskt for å se om du må lese en gang til teorien. **Kontrollspørsmål** \longrightarrow **Refleksjon**

Les teorien og se/regn gjennom eksemplene en gang til

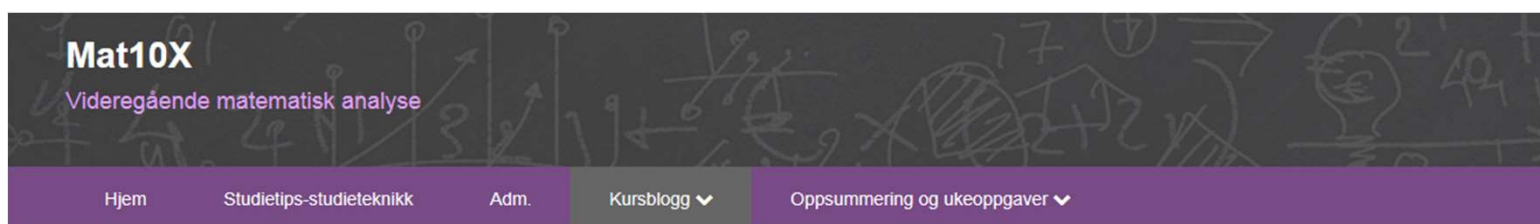
3) Regn gjennom kontrolloppgavene uten å se på fasit før man har prøvd seg. **Kontrolloppgaver** \longrightarrow **Fordypning**

Kontrolloppgavene kan du bruke som Lekse eller Ukeoppgaver.

4) Svar nå på kontrollspørsmålene!

5) Regn så mange oppgaver som mulig fra arbeidsboken

Control questions and problems



Blogg 1: Tallfølger, rekker og konvergens

Uke 1:

Notater: Konvergenskriterier Oppgaver m/fasit Oppgaver-rekker Oppsummering: Oppsummnotat-rekker

Spørsmål må du kunne vare når du har lest ferdig notatene.

- 1) Hva er tallfølge og hvilke tallfølger konvergerer?
- 2) Hva er en uendelig rekke og hva vil det si at en rekke konvergerer?
- 3) Hvordan kan vi finne ut om en rekke konvergerer eller divergerer?
- 4) Hva er konvergenstest og forklar litt om konvergenstestene og når og hvordan de kan brukes?
- 5) Hva er Leibniz-test og når kan brukes?

Tallfølger

Hva er en tallfølge?

Når konvergerer tallfølgen $\{a_n\}$?

Må $\lim_{n \rightarrow \infty} a_n = 0$ for at $\{a_n\}$ skal konvergere?

Rekker

Hva er en uendelig rekke?

$$a_1 + a_2 + a_3 + \dots + a_n + \dots = S_n + \dots = \sum_{n=1}^{\infty} a_n$$

- Hjem
- Studietips-studieteknikk
- Adm.
- Kurslogg
 - Blogg 1: Tallfølger, rekker og konvergens
 - Blogg 2: Potensrekker og Taylorrekker (Maclaurinrekker)
 - Blogg 3 - Fourier-rekker
 - Blogg 4: Kompleksetall
 - Blogg 5: Differensligninger
 - Blogg 6: Lineær algebra
- Oppsummering og ukeoppgaver
 - Tallfølger, rekker, potensrekker og Taylor-rekker.
 - Fourierrekker
 - Komplekse tall
 - Differensligninger
 - Lineær algebra

Control questions and problems

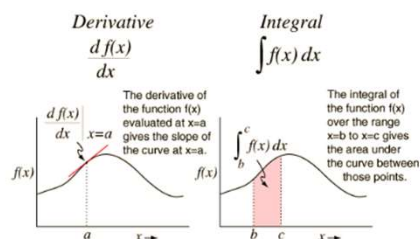
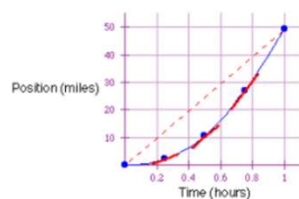
Administrasjon ▼ Kursmateriell ▼ Eksamensoppgaver Kurslogg ▼ Evaluering - MAT100

Integrasjon og anvendelser



Integrasjon

I matematikken studeres et objekt ved først å dele det opp i **små biter** ved **derivasjon** ($f'(x)$) kan beskrive stigningstallene til tangentene til hvert punkt på kurven) og deretter å **sette dem sammen** igjen ved **integrasjon**: $\int f'(x) dx = f(x) + C$.



By talking mathematics:

- Students learn how to formulate their thoughts in a short and precise way.
- Students learn to use diagrams and simple figures to understand and present ideas.
- Students better absorb mathematics as their own knowledge and find ways to explain simply complicated problems
- Students' comfort level in small groups increases as well as their knowledge base. It gives them greater confidence in their capacity to learn and make sense of mathematics.
- The talking method can provide a forum for broader interpretations and an opportunity for students to clarify their understanding.
- Students learn to listen to and respect each other's solutions and evaluate different viewpoints.

Improvements (attendance and grades)

The failure rate for engineering students in first course mathematics is usually around 20-30%.

I have incorporated this method when teaching students from various engineering disciplines.

- The mathematics talk application has contributed to reducing the failure rate to 5-10%.
- Students had a greater enjoyment in attending classes and what could have been long and boring classes turned to be exciting and explorative.
- Students achieved very good results in exams. (more than 50% of students obtained A and B grades).

Conclusions

- The result of this case study over seven years indicates that verbal learning process can assist engineering students' knowledge **to step from informative knowledge to integrative knowledge.**
- The choice of questions and problems are essential.
- PBL and TBPS approaches are vital and effective methods to improve students' learning abilities and develop their educational identity and professional skills [6].
- The students' ability to gain and retain mathematics knowledge is a key factor for success in their studies. The study confirms the importance of student to student interaction for a deeper and more meaningful learning process.



Thank-you for listening

- Are there any questions?