ÖRESUNDSDAGEN OM GRUNDUTBILDNING I MATEMATIK PÅ UNIVERSITET OCH HÖGSKOLOR

Program with abstracts

09:30 - 09:55 Registration with coffee/tea and cakes

09:55 - 10:00 Opening remarks

10:00 - 10:45 Reforming Mathematics and Science Education

Knut Mørken, Universitetet i Oslo.

Calculations is at the core of both mathematics and science, and modern computers' ability to perform calculations has profoundly changed scientific research. In spite of this, computing has generally not had much impact on the teaching of science at the elementary university level. At the University of Oslo we have tried to remedy this by including a unified computational perspective in the elementary education, coherently across all the mathematically oriented sciences and for all students. The result is that students can be exposed to serious research problems already in the first semesters. The primary challenge is not scientific, but rather to establish broad collaboration with a common goal across disciplines and courses. This talk will attempt to provide motivation for this kind of change, describe what we are doing in Oslo, and identify key factors for success.

10:50 - 11:20 Peer Instruction experiences in culturally varying pedagogic environments

Alexandros Sopasakis, Lunds Tekniska Högskola.

In this talk we present and discuss initial findings of the differences and similarities experienced while applying the Peer Instruction teaching methodology in university classroom environments both in the USA and Sweden. Comparisons are drawn specifically from a limited application of Peer instruction at the University of Massachussets as well as at Lund University in Sweden.

Peer Instruction typically relies on students reading ahead of time the new material. The instructor interacts asynchronously with the students as they communicate questions they had about what they read through a web based service. The instructor then uses these questions to access students' weaknesses and understanding of the new material. During class the students work in teams to answer carefully designed questions posed by the instructor which should re-enforce,

deepen and at select instances challenge students' understanding of the new concepts. All this is achieved using Just In Time methodology and web based real-time feedback technology.

Peer Instruction is most effective when student participation levels are high. Achieving strong student commitment however is always a challenge. In many cases students in Sweden are not even required to perform any class related work at all. That is in sharp contrast from US based systems. As a result one of the most important features of Peer Instruction, preparing and reading in advance new material for instance, becomes much harder to motivate in Sweden.

Cultural differences are only one of the reasons that the Peer Instruction method must be adjusted. Substantial differences in the pedagogic system itself for each country make it necessary for alternative teaching strategies as well as systemic changes to be tried in order for the Peer Instruction method to be effective.

11:30 - 12:00 An experiment with "Just in time teaching"

Jan-Fredrik Olsen, Lunds Universitet.

"Just in time teaching" is a methodology designed to encourage deep learning in students by requiring the students to complete reading assignments. The student responses are collected a few hours before class using an online learning platform. The idea is both to make students prepare more efficiently for class at home, and to offer a diagnostic tool for the teacher to assess the understanding of the students prior to class.

In this joint work with Kristina Juter (Högskolan Kristianstad), we split an undergraduate class in Calculus into several groups and applied JiTT over the course of two weeks to one of them. We measured the effect of the treatment both on a quiz given a few weeks after the treatment and on the final exam. The results of the study, as well as practical aspects concerning the implementation of the methodology, are discussed.

12:00 - 13:30 Lunch at Moroten och Piskan (Kårhuset).

13:30 - 14:15 The impact of CAS and E-learning objects in introductory engineering mathematics.

Karsten Schmidt, Danmarks Tekniske Universitet.

Highlights from the ongoing development project at Mathematics 1, DTU. We consider two front lines in our effort to optimize the learning for the students from 15 very different study programmes: the integration of an advanced CAS (=Maple) and the introduction of E-learning objects and principles. We contend that it by these methods is possible to increase the students motivation for mathematics not only by giving them a true touch of real world applications but also by bringing the concepts and basic mathematical ideas in focus at the expense of rote learning and tricky calculations.

14:20 - 15:05 CAS and first-year mathematics education

Niels Grønbæk, Københavns Universitet.

In superconductivity, one observes in certain regimes the emergence of densely packed point vortices forming perfect hexagonal lattice patterns. These are named Abrikosov lattices in physics. It turns out that the same should be true for points in 2D logarithmic interaction at least at zero temperature. In joint work with Sylvia Serfaty, we introduced a "Coulombian renormalized energy" and showed that it arises as a next order correction term in the energy expansion of the Hamiltonian of a Coulomb gas (or log gas in dimension 1), and governs the fluctuations of the points.

We also apply our result to the statistic mechanics problem, i.e., with temperature, which contains as specific cases the GUE, GOE and Ginibre ensembles of random matrices.

I will present the renormalized energy, examine the question of its minimization and its link with the Abrikosov lattice and weighted Fekete points. I will describe its relation with the statistical mechanics models mentioned above and show how it leads to expecting crystallisation in the low temperature limit.

15:10 - 15:40 The transition from high-school to university mathematics

Laura Fainsilber, Göteborgs Universitet/Chalmers/Mattebron.

Many of our first-year students taking university courses in mathematics have difficulties with them. There has been some research the last 10 years outlining factors that contribute to these difficulties. There are gaps in the curriculum between what is taught at high-school and prerequisites for university, but more than recognizable gaps, there are differences in how students are expected to know mathematics, and in how they are expected to learn. Teaching methods differ, learning resources (e.g. the teacher, the book, the Internet, fellow students) play a different role, examination has a different form and different goals.

In Sweden, the government has, since 2006, tried to bridge the gap with the project "Mattebron", which from the start included local projects to stimulate contact between university and high-school teachers of mathematics, transition courses where students kan repeat material from high-school, and two national one-day conferences per year, usually in Stockholm in the Fall and i Göteborg in the Spring. The coming conference will take place in Stockholm November 18, 2013, More information can be found on http://mattebron.ncm.gu.se/

The audience will be invited to give feedback on what Matteboron can do which would be of interest for university teachers.

15:40 - 16:10 Coffee/tea break with sandwiches and cake.

16:10 - 16:40 Integration of different web-resources using a learning platform

Tommy Gustafsson, Göteborgs Universitet/Chalmers.

16:50 - 17:35 Can undergraduate students learn mathematics with the internet?

Carl Winsløw, Københavns Universitet.

The classical model of university instruction in mathematics is based on texts which consist, roughly speaking, of

- "material to acquire" (theory, examples, and perhaps some background remarks on how the topic arose and what's the use of it)
- "material to interact with" (exercises).

Only advanced students need to visit the library (if it is still there...). Everything is supposed to be in the canonical text (book or lecture notes). There is no doubt one can learn quite a lot from this set-up! We all did up to some point. The model is even quite economical wrt. time and effort. It will surely not disappear. Yet, in my talk, I will share some reflections and examples to argue that a broader model for undergraduate students' study of mathematics is both desirable and feasible in the internet age.

17:35 - 18:00 Final remarks and discussion.

19:00 - Informal dinner at the restaurant "Mat och Destillat" in Lund.

Please notify the organizers as soon as possible if you wish to join the dinner and you have not already indicated this in an email.