Enhancing Basic Skills in Modern Introductory Engineering Mathematics with High IT Integration

At a technical university, the freshmen meet technical textbooks and instructions that require mastery of basic pre-university mathematical skills. In this project we are testing these skills, and propose a curriculum redesign for introductory mathematics aimed for bridging the gaps. Mathematics 1 at the Technical University of Denmark (DTU), a course with high IT and Maple integration, now opens with a four-week paper and pencil course in complex numbers and functions. Since this topic is essential for the subsequent instruction in linear algebra and differential equations, we claim that this is a forward-looking and motivating method.

Online mathematics education: E-math for first year engineering students

We consider the technology enhanced learning of first year engineering mathematics and in particular the application of E-learning objects and principles in the course Mathematics 1 which has a yearly intake of 750 students at the technical University of Denmark. We show that with non-linear multimedia technology and e-learning principles it is possible to strengthen and enhance the students’ desire and ability to prepare for the teaching and to read and enjoy the textual representations of the course materials.
Constraints on reusability of learning objects: Didactic aspects of modular e-Learning in engineering education

It is the aim of this paper to discuss some didactic constraints on the use and reuse of digital modular learning objects. Engineering education is used as the specific context of use with examples from courses in introductory electronics and mathematics. Digital multimedia and modular learning objects have been proclaimed as important elements in e-learning for a long time, and there are good reasons to believe in the benefits of interactive multimedia as well as flexible and modular learning objects. Nevertheless the use and reuse of learning objects on a large scale seems to be a slow success. Constraints on reuse arise from the nature of conceptual understanding in higher education and the functionality of learning objects within present technologies. We will need didactic as well as technical perspectives on learning objects in designing for understanding.

The Impact of CAS Use in Introductory Engineering Mathematics

Læser mindre og forstår mere: - om ingeniørstuderendes studiever

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Læser mindre og forstår mindre: Om ingeniørstuderendes matematikstudievaner

Main Research Area: Technical/natural sciences

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Projects:

**HEROS in mathematics - a new way of learning**

Department of Mathematics

Department of Informatics and Mathematical Modeling

Period: 01/09/2008 → 31/08/2010

Number of participants: 3

Project participant:

Sendrup, Linda (Intern)

Schmidt, Karsten (Intern)

Project Manager, organisational:

Rootzén, Helle (Intern)

**Financing sources**

Source: Forskningsprojekter - Andre ministerier og styrelser

Name of research programme: Forskningsprojekter - Andre ministerier og styrelser

Amount: 3,122,478.00 Danish Kroner

**Matematicum: The mathematical inspiratorium at DTU**

This project is concerned with the theme of unfolding mathematical concepts and results for students and other mathematically curious visitors to Matematicum via hands-on experiments and stories. Each story and activity is ideally centered around a well-defined mathematical crux, which is then to be uncovered, unfolded, and applied to properly understand a given, otherwise non-obvious – or maybe even mysterious – phenomenon. For example: How can two circular rotations combine to give the linear motion of a pump? What are the rotors actually doing in the Enigma encryption machine? Why and how does a (good) boomerang return? How do we make a swarm of intercommunicating robots collaborate to solve a given task? How do the ants find or construct their shortest pathways? Which roofs pick up the most solar energy throughout the year? Concerning content and development of concept (as of December 2007): The Matematicum at the Department of Mathematics is a room which has now been arranged to receive up to 15 visitors at a time. A boomerang ‘story’ and a robot swarming ‘story’ have been implemented and tested. A 3D printer and 3D scanner have been installed. The printer is in full operation and supplies concrete models of geometric shape and function such as minimal surfaces and ingenious pumps. A fume cupboard is being installed for proper and safe post-processing of the 3D-printed objects. An original three-rotor German military Enigma machine has been purchased. We expect it to become the essential central ‘object’ for great ‘stories’ and activities in the Matematicum concerning the history and development of modern cryptology. Matematicum was officially opened at a reception at DTU Mathematics on March 6th 2008.

**Geometry**

Department of Mathematics

Period: 01/07/2007 → 01/12/2009

Number of participants: 5

Mathematical Inspiratorium

Project ID: 10109

Project participant:

Henriksen, Christian (Intern)

Schmidt, Karsten (Intern)

Knudsen, Lars Ramkilde (Intern)

Starke, Jens (Intern)

Project Manager, organisational:

Markvorsen, Steen (Intern)

**Financing sources**

Source: Forskningsrådene - SNF

Name of research programme: Forskningsrådene - STVF

Amount: 282,000.00 Danish Kroner

Source: Forsk. Private danske - Fonde

Name of research programme: Forsk. Private danske - Fonde

Amount: 100,000.00 Danish Kroner

Source: Udenfor rammen

Name of research programme: Ukendt
Amount: 500,000.00 Danish Kroner
Source: Uddannelse. Statslige. Andre statslige
Name of research programme: Uddannelse. Statslige. Andre statslige
Amount: 48,000.00 Danish Kroner
Project