Centre for Computing in Science Education at the University of Oslo

Integration of computing to renew basic education

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Vice Dean of Studies
Computing will change society

- Mathematical calculations have always been essential in natural sciences
- Computers permit calculations which were previously impossible to perform
- Big data can be treated, visualized and stored
- Impact on entire society
Integration of computing will change science education

Natural sciences depends on mathematical problem-solving
Can only solve carefully selected, simple problems using traditional mathematics
Has shaped the *contents* and *form* of the educations
- separated education from relevance
Requires a *redesign of the curriculum*
- opening new pedagogical challenges and opportunities

- Computing allows us to solve practically any problem
- Contents and approaches can be chosen for pedagogical or motivational reasons
- Students can learn robust, powerful methods
- Links research - education
- Builds generic competence
Faculty vision

Our aim is for our students to succeed academically and professionally
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<th>Field</th>
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<th>SFI/FME</th>
<th>Nordic SFF</th>
<th>ERC</th>
<th>Strategic initiatives</th>
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InterAct
Culture for teaching and learning

Learning environment
Program development
Science didactics and school interaction
Teaching culture

Education management

Informatics
Mathematics
Astrophysics
Physics
Geosciences
Chemistry
Pharmacy
Biosciences
Technology systems
Long term initiative

- Established after the Quality Reform 2003
- Implemented in 4/16 Bachelor Programmes
- Annual Faculty CSE-seminars from 2004
- Implemented in Faculty Strategy 2006
- Established as Faculty Brand by the Faculty Board 2013
- Implemented in all Science Bachelor Programmes 2017

Awards & Funding

- UiO’s Education Award 2000 + 2011 + 2012 + 2015
- NOKUT’s Education Award 2012
- Funded 1.25 MNOK from KD 2013
- Olav Thon’s National Price for Excellent Teaching 2015 + 2016 + 2017
- Olav Thon’s support for National Education-related Research Projects 2015 + 2017
- Centre for Excellence in Education by NOKUT 2016

NOKUT's evaluation of UiO's quality system 2013

«Fakultetsstyret har i 2013 vedtatt at CSE skal være et varemerke for de kandidatene som utdannes ved MN-fakultetet. Komiteen merker seg den dynamikk og endringssvilje som er dokumentert ved dette, og oppfordrer til videre satsning. Fakultetet bør også vurdere hva som skal til for å løfte prosjektet ytterligere videre fremover.»
Aims and vision of CCSE

The Centre for Computing in Science Education aims to become an international hub for research-based integration of computational methods in science educations in order to:

• Renew teaching in science and technology - according to needs in research and industry
• Allow students to engage in realistic and research-near problems - at an early stage in the curriculum
• Prepare students for an interdisciplinary workplace
• Form basis for excellent research
https://dl.dropboxusercontent.com/u/688419/tilSolveig/Computational%20Science%20at%20the%20University%20of%20Oslo.mp4
Selection process

Process managed by Vice Dean of Studies

Department Heads involved

Faculty criteria

Administrative support
(i.e. project economist, research support, student administration)

Selected 2 of 3 applications
Why this process?

The Centre will:

- impact most of the study programmes at the Faculty
- influence Faculty strategic decisions for 5-10 years
- influence economic priorities for 5-10 years
Success criteria of CCSE

- Based on long term, highly awarded, Faculty project
- Initiated by excellent scientists (3 SFF)
- Collaboration with excellent science didacticians
- Fulfils the education strategy
- Established as Faculty brand from 2013
- Successful student involvement
Students are engaged in all levels of the educational reform

Participate in study program development
Participate in educational research
Participate in scientific research

Develop material
(texts, problems, apps, blogs)
Teach
Support teaching faculty
Evaluate

Are strong supporters
- internally and externally!
CCSE - research subjects

1. Research-based development of teaching material
2. Research-based development of methods and approaches
3. A culture for teaching and learning
4. Student-driven activities
5. Dissemination, dialogue and communication through partnerships
Education Centres

At the Faculty
- CCSE- Centre for Computing in Science Education
- Norwegian Centre for Science Education
- Competence Centre for Teaching in Science and Technology

At the University
- Centre for Learning and Education
Innovations in education

Computing will change science education
- a unique opportunity to renew the curriculum

Computing opens for new pedagogical approaches
  – research-inspired and realistic problems
  – collaborative, creative and active learning

CCSE will provide the basis to develop, research and disseminate a new curriculum across disciplines