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Computing at School in Sweden - Experiences from Introducing Computer Science within Existing Subjects

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Bebras in Sweden

- International problem-solving challenge on computational thinking arranged annually in November. <u>Category Participants Teachers Schools Citie</u>
- Initiated in Lithuania 2004, Sweden has officially arranged the contest since 2012
- Fun and motivating tasks, aimed at raising interest in computer science among children and youth aged 8-18
- 2014: 925 000 participants from 35 countries (Sweden: 7 059)



Category	Participants	Teachers	Schools	Cities	Boys	Girls
Mini	1148	61	42	37	565	583
Benjamin	1499	54	51	41	7 <mark>67</mark>	732
Cadet	2045	62	60	43	1116	929
Junior	1701	39	37	31	924	777
Senior	666	22	22	20	561	105
TOTAL	7059	189	150	92	3933	3126







Linköping

- Innovation project on Introducing Computational Thinking in K-9
 - Developed a two-part workshop for teacher training
 - Developed teacher activities in 4 different subjects together with the teachers
 - The municipality is very active and interested
- CoderDojo
 - Voluntary initiative to provide creative and fun programming activities for kids 7-17 where the kids drive their own learning with support from mentors
- Kodcentrum
 - Private initiative providing a programming course to kids based on Scratch
- EU Code Week
 - Cooperation between the university, the municipality and the local science park





Luleå: Background

- Luleå University of Technology in close collaboration with Luleå Municipality.
 - Professor Peter Parnes and Principal Agneta Hedenström
- Goal: Get more teachers, principals and school leaders involved in digitalization in schools through:
 - Hands-on work and peer-learning
 - Mixing Maker Culture, Computational Thinking and Entrepreneurial Learning
 - Focus on the gender issue and getting more young females interested in ICT and STEM.





Lulea: Examples of Activities

- Pedagogical Pubs with TeachMeet
 - Inspirational talks and teachers presenting to each other
- Open Educational Workshops, CS4HS Luleå 2014
 - Give educators hands-on experience with modern technology
- Student Inspiration EU Code Week, Hour of Code and School Visits
- Making in Schools Luleå Makerspace and the Skaepiedidh Project
 - Create meeting places for Making in schools and collect good examples on a national platform for making: <u>www.skapa.how</u>.
- Develop teachers' educational programs with Computational Thinking and Making



Lund

- LTH Science Center "Vattenhallen" started a project called "**Programming for everybody**" (PfE) in 2012, funded by LTH and a donation from the LMK foundation.
- The project develops a free and open pedagogical concept including a series of progressive challenges using turtle graphics in the modern & professional Scala programming language and the open source programming tool Kojo for young learners. [See links in the paper]







Lund

- Since the PfE project started, more than
 10'000 young learners have experienced
 programming using our challenges in Kojo and
 Scala during visits to our science center.
- More than **150 teachers** have passed our programming courses comprising **2-3** half-days with assignments in between to try out **programming in class using Scala & Kojo**.
- Teachers then **share their experiences** with each other, including new challenges that they develop in relation to their specific subject curricula wrt existing assessment criteria.



Computer Science



FACULTY OF ENGINEERING, LTH

Stockholm

- Despite the high rate of tech companies in Stockholm, the city is not very progressive when it comes to development of IT in schools.
- Sjöstadsskolan started to explore the possibilities with CT within the curriculum in February 2013.
- Pilot project initiated by politicians within the City of Stockholm, on how to scale up programming in schools on a larger level just started.
- The big differences between areas is a challenge.
- The possibilities are great with a lot of knowhow in tech.
- Many initiatives to support girls in tech; Geek Girl Mini, Tech Girl, Girls Code, MakerTjej, Tjejhack and the Tekla Festival.





Lessons Learned

- A lot can be done with limited resources!
- The concept of computational thinking is very well received. More than programming.
- We mainly advocate introducing programming as part of the existing subjects.
- Private and voluntary coding clubs are becoming popular but can't meet demand.
- Leverage science centers and leisure time centers to reach a wider audience.
- Grass root activities, both from teachers and others, have a large impact.
- The next step is to turn the grass root initiatives and into national policies.
- We have a vision and some pretty good ideas on how to proceed.
- The challenge is to provide the research foundation for computing in school, scale up, and reach out to most schools, teachers and pupils.



Ways Forward

- Establishing the term "Datalogiskt tänkande" as the Swedish term for computational thinking.
- Engaging as many schools as possible in Bebras, in order to stimulate the interest for computational thinking.
- Supporting informal activities such as CoderDojos, and Maker Spaces which play an important role in giving students hands-on experience with, for instance, programming.
- Collaborating with municipalities wanting to introduce computational thinking at a larger scale.
- Supporting teachers in developing concrete example activities and lesson plans on introducing different aspects of computational thinking in a variety of subjects.
- Designing concrete suggestions for professional development for teachers on computational thinking, for instance, in the form of a nation-wide MOOC supported by local study groups.
- Engaging in continuous discussions with teacher education programs in order to introduce at least one compulsory course on computational thinking for all preservice teachers.
- Developing suitable means for assessing computational thinking, for instance based on Bebras activities.



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