

Computing at School in Sweden

Computational Thinking in Swedish Education - Where are we and where are we going?

Fredrik Heintz

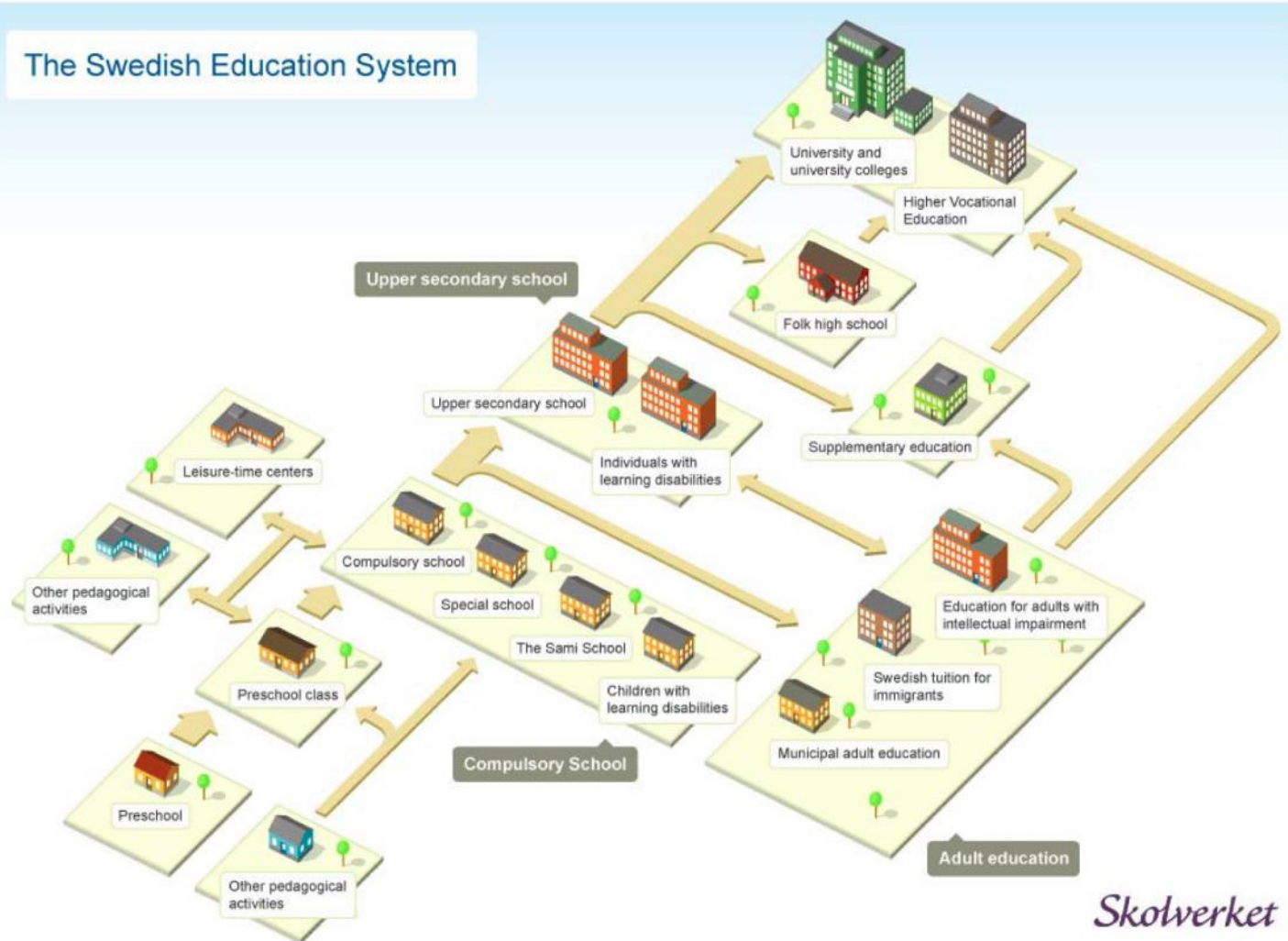
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Take Home Message

- Today **computing, programming**, or similar is **not part** of the **national K-9 curriculum**.
- **Only one profile** of one of the 6 higher education preparatory **high school** programs has **mandatory programming**.
- The **national debate** is largely focused around **programming** and the **PISA** results.
- **Computational Thinking** is becoming more **widely accepted** as more important than programming.
- **The National Agency for Education** (Skolverket) is currently developing a **national IT strategy for K-12 education** which should **introduce programming** into the **curriculum**.
- The **major challenge** is pre-service and in-service **teacher training!**

The Swedish Education System



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Bebras in Sweden

- International problem-solving competition in computational thinking arranged annually in November.
- Initiated in Lithuania 2004, Sweden has officially arranged the contest since 2012.
- Fun and challenging 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	767	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



The Role of Programming? My View

- **Programming** is a **pedagogical tool!**
 - Makes things living and concrete
 - Can be integrated in many subjects
 - Not only an answer – explore! What if...?
- In **K-9 programming is a means** to develop **computational thinking, not an end** in itself.
- In **high-school programming and computer science** ought to be **subjects of their own.**

Activities in Sweden



Luleå

- Luleå University of Technology in close collaboration with Luleå Municipality.
- 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.



Peter Parnes
Professor, LTU



Agneta
Hedenström
Principal

Stockholm

- 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.
- Big differences between areas.
- Techindustry great possibilities.
- Many initiatives to support girls in tech; Geek Girl Mini, Tech Girl, Girls Code, MakerTjej, Tjehack and the Tekla Festival.



Karin Nygårds
Sjöstadsskolan



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



Fredrik Heintz
Assoc. Prof., LiU



Linda Mannila
Researcher

Lund

- LTH Science Center "Vattenhallen" started 2012 a project called **"Programming for everybody"**
- **10'000+ young learners** have experienced programming using our **challenges** in Kojo and Scala during visits to our science center.
- **150+ teachers** have passed our programming 2-3 day courses
- Teachers **share their experiences** with each other, based on their specific subject curricula and wrt existing assessment criteria.



LUNDS
UNIVERSITET
Lunds Tekniska Högskola



Björn Regnell
Professor, LTH



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.
- Getting pre-service teacher training schools to include computing is very hard!
- **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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Computing at School in Sweden – Experiences from Introducing Computer Science within Existing Subjects



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