



Digital Competencies

From a School Technology Subject Perspective

-

More Than Programming

Trippel Helix Conference on Computational Thinking and
Digital Competences in Primary and Secondary Education

STOCKHOLM 8 SEPTEMBER

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I will talk about...

- ... why "Digital Competence" is easier to embrace than "Programming" in Tech Ed. given approx. 200 hrs available.
- ... the Tech Ed landscape and the Swedish position for Technology Education, in an international comparison.
- ... the distinction between Tech Ed and Ed Tech.
- ... some personal impressions.

Field of tension between rhetorics and practice

Rethorics Understanding the ever-changing Digital World
Consequences, opportunities, ethics,
"Nothing has happened" ... - Vocational Ed
Democratic empowerment,
Developing general skills

Practice In-service Ed days with Scratch-programming,
bee-bots, blue-bots, arduinos, Raspberry Pies,
Lego EV3, Code.org etc.

Technology Optimists (Embracing) – Technology Pessimists (Hesitant/Resistant)

Research based, Evidence based – or Hope based curriculum change?
In many countries it has been a rapid process! Nervous...

The government's mission



REGERINGEN

Utbildningsdepartementet

Regeringsbeslut

I:2

2015-09-24

U2015/04666/S

Statens skolverk
106 20 Stockholm

Digital competence, ICT, Programming

Uppdrag att föreslå nationella it-strategier för skolväsendet

From the government mission

The proposals should include the following common parts for the strategies:

- when necessary, **changes in curricula, syllabuses or subject plans** to clarify the school's mission to strengthen students' digital skills and innovative ability to prepare them for active participation in an increasingly technology-oriented work and social life and for enhanced entrepreneurial learning,

The proposals for the elementary school and corresponding school forms shall also contain:

- **Changes in curricula** and syllabi to reinforce and **clarify programming** as an element of teaching.



IN

DigiTech

Hackers

KomTek

Maths

SciCentres

Makers

Dojos

ICT/MIK

NAS/Vpn

Tech

LAN-party

"Afrer School Centre"
Soc media

(Compulsory)

SCHOOL

FREE TIME

Civ.Sci

PTA

source criticism

Around the
kitchen table

Technology

ABOUT

DigiTech



The NAE proposition for a National Digital Strategy

(U2015/04666/S) Dnr 6.1.1-2015:1608

If our pupils shall be able to develop an
"adequate digital competence" –
then **Technology is the right subject!**

Raise your hand in the air!!

It was already a part of the present curriculum!



Digital competence, ICT, Programming

EU Key Competencies, The Code Wave, Digital Maker Movement, Hacks, Software Industry...

How does this relate to other countries comparable Tech subjects?

UK, Ireland:	D&T (GCSE)
Scotland:	Technological Ed (Upper Sec)
US of A:	Technology (Different States)
France:	Technologie (upper sec, Lycée))
Germany:	Technik, Technologie, Arbeitslehre – different in each Bundesland
Australia:	D&T
Norway:	Not – but aspects in 3 other responsible subjects
Finland:	Sloyd, but no Technology, Digital Competence overarching
Denmark:	No Technology

Optional/Compulsory/No

Early/Late

Including ICT or not

In this "landscape" Digital Competence can not be handled the same way - and it has not.

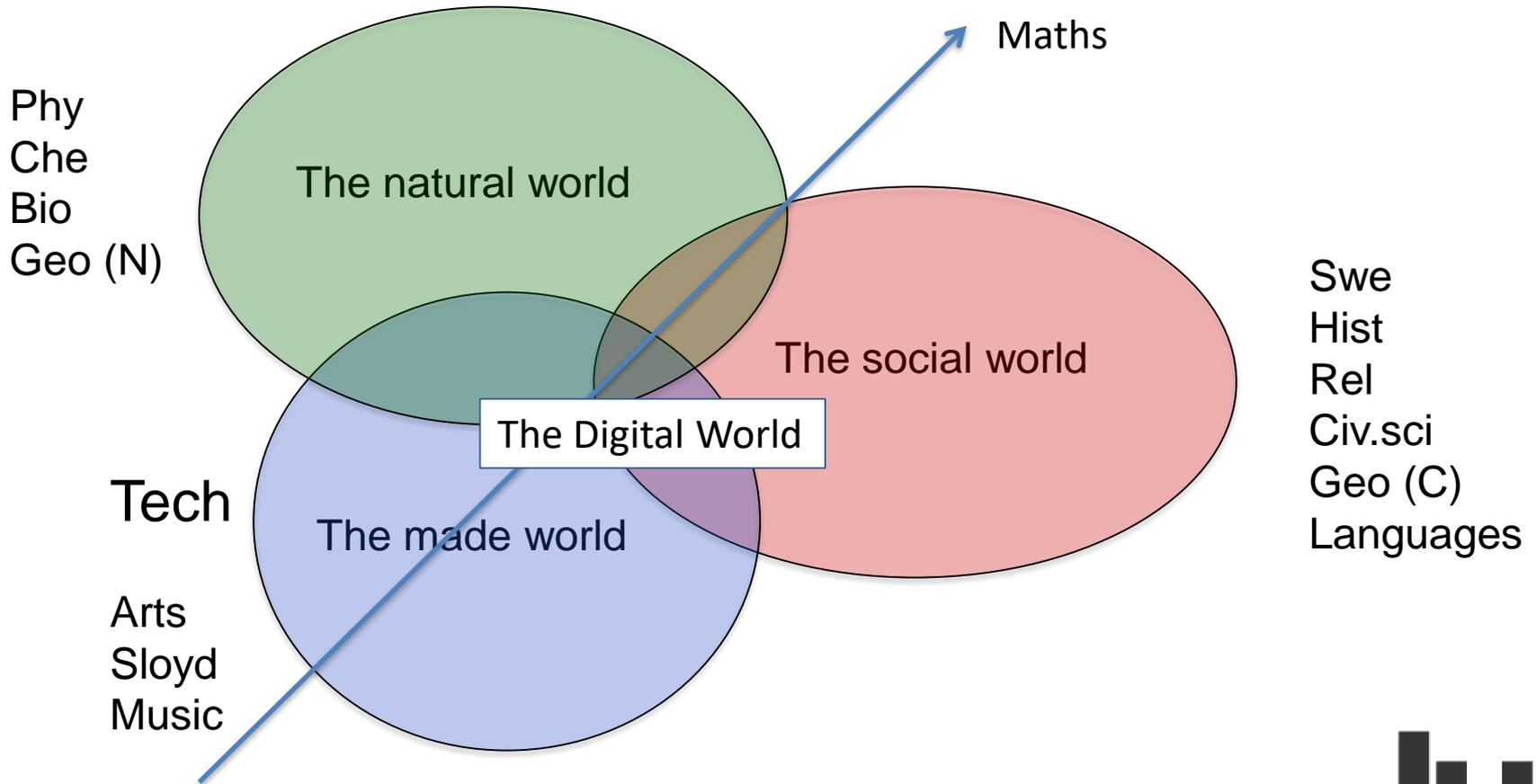


What kind of school subject is Technology in Sweden?

How do Digital Competencies, ICT and Programming fit in here?



Two worlds became three
"The two cultures" became three
School subjects were (re-)constructed





Technology and Engineering – a still developing culture

The Royal Society - 1660

L'Academie Royale des Sciences - 1666

The Royal Swedish Academy of Sciences - 1739

The Royal Swedish Academy of Engineering Sciences - 1919

Royal Institute of Technology, SWE - 1827, 1877, **1927**

Chalmers, SWE – 1827, **1939**

National Academy of Engineering, USA - 1964

Royal Academy of Engineering, UK – 1976

L'Académie des technologies, FR - 2000

Post WW II: Technological educations and the Philosophy of Technology strengthen

A brief history of Swedish Tech Ed in Compulsory School

National Curriculum Characteristics

Lgr 62 and Lgr 69

Optional in Lower Sec. **Vocational** focus.
Machines, electrical devices, production.
For **boys** to the industry and construction works.

Lgr 80

Technology for all – boys and girls.
Compulsory in Lower Sec. Class and gender.
Part of the Science Curriculum. Sloyd?

Lpo 94

Subject in its own right from Y1 to Y9. Curriculum.
Motives: **copng daily life, democracy, recruiting!**
Technological "bildung"

Lgr 11

Principally the same. Modernized.

2017

Adding digital competencies, programming

An international comparison

Trends in General Technology Education

- Leaving the prescriptive
- Favouring strands, frameworks and standards
- Towards "**Technological Literacy**"
- The Nature of Technology (Phil)
- The Democratic aspects of Technology
- Making, modelling, designing
- Digitalization
- STEM inclusion (S&M)

National curriculum endeavours, particularly in the 1990s and thereafter, have seen a shift away from approaching technology education through "different technically oriented syllabi and piecemeal inclusion of technological aspects within science and social sciences" (Compton, 2009, p. 24), to national curricula and standards that address technological literacy.

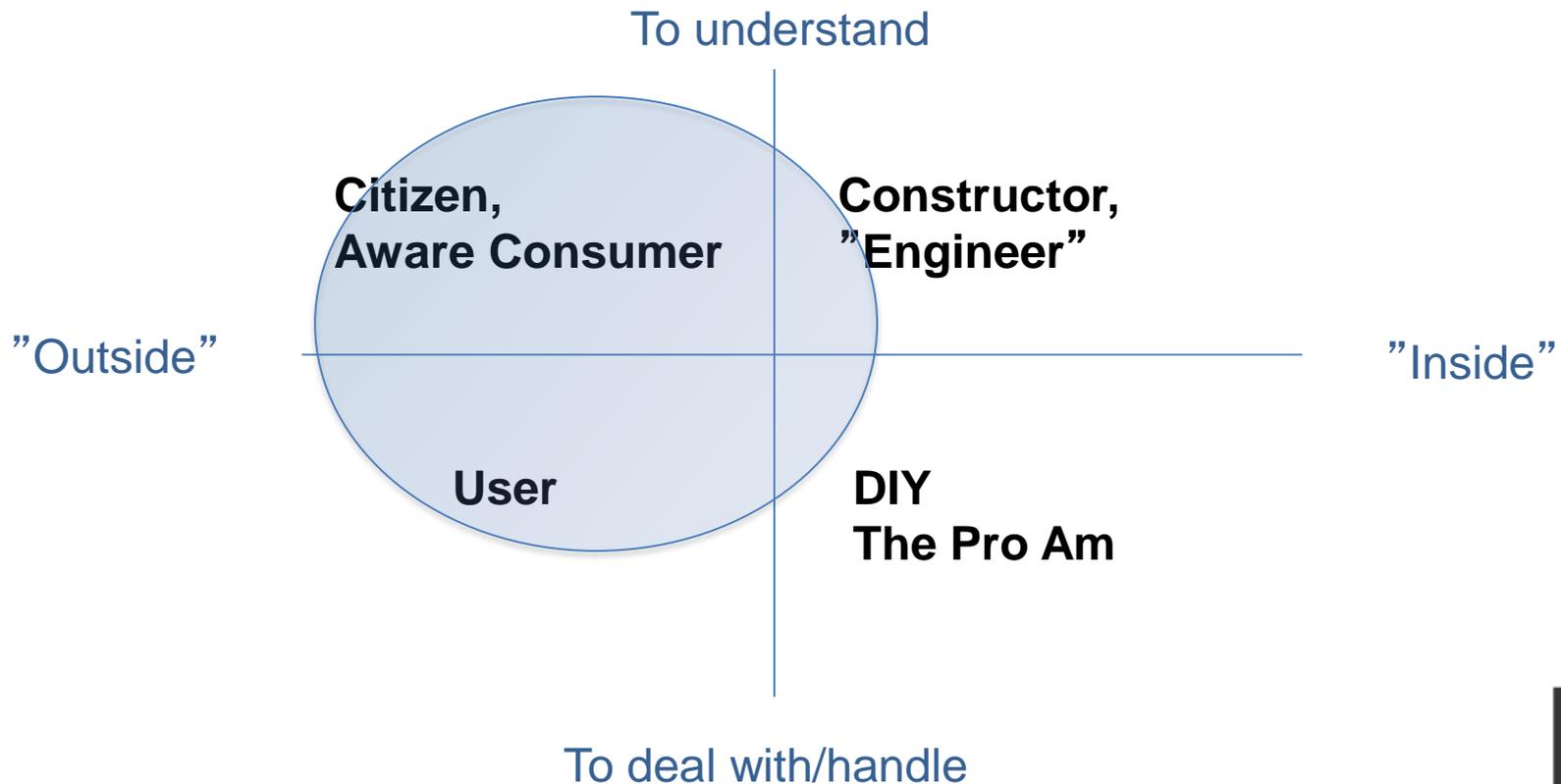


From 2000 and onwards: influential research, stronger community, handbooks and standard literature, "Didactics of Technology"



Who needs to know what?

The "blue ball" of Tech Ed has moved during the decades.
But there is also a difference between Curriculum and Classroom.





NC Technology 170701

Not changed: The five main aims for Y 1-9

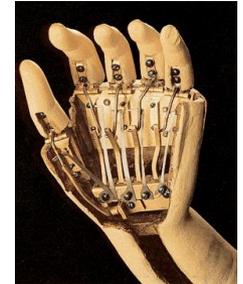
Through the teaching in the subject of technology, students will in summary be given the opportunity to develop their ability to

- identify and analyze technical solutions based on purposefulness and function,
- identify problems and needs that can be solved with technology and draft solutions,
- use the concepts and forms of expression of the technology area,
- evaluate the consequences of different technology choices for individuals, society and the environment, and
- analyze the driving forces behind technology development and how technology has changed over time.

The NAE proposition for a National Digital Strategy

(U2015/04666/S) Dnr 6.1.1-2015:1608

Raise your hand in the air!!



It was already in the curriculum!

- Controlling – one of technologies four main functions
- Problem solving – a technological repertoire
- Design Process
- Optimizing – towards often counteracting demands
- The relation between Technology-Society-Individual-Environment
- A systems approach
- Technological change – driving forces, patterns, consequences
- Values towards Technology (ethical, gender, interest...)

Digit
CHECK



Adequate digital competence

In compulsory school "**adequate digital competence**" concerns more than programming/coding and ICT e.g. helps children act and answer questions about:

- For what can digital technologies be used?
- How does society change due to digital technology?
(Patterns, Driving forces, Consequences...)
- In what ways are our everyday life, our work, and free time affected by this? +/-
- What do we want to achieve? How can we do it?
- Discussions of Technological determinism and Autonomous Technology in relation to innovativeness and entrepreneurship.
- Understanding of changes in technological systems.
- Being able to handle and create digital and material solutions.
- ...

The 2017 Curriculum Changes for Technology in respect to Digital Competencies

- Adding a special focus on how digital tech affects society, the individual and the environment
- A sharpened systems approach
- The technological roles of electronics and how it can be used in programming
- From computer to internet – benefits, risks, digital security
- More explicit content concerning programming for controlling technological solutions
- Strengthened focus on Communication – e.g. digitally transferred
- Technology relevant ICT support for the subject's aims



One of the
critiques:
An archetypical
picture of what a
computer is. (IoT)



Technology Education vs Educational Technology

Different eras, driven by different technologies (Radio, TV, Video, Computers, Blogs, VR/ER...)

From approx. 1995 and onwards:

Suggestions or proposals that the Technology subject should deal with the ever-new ICT (Ed Tech).

On the curricular level we have been reluctant.

Regarded it as an ongoing common enterprise for the whole school.

- Hardware
- Software
- Infrastructure
- Maintenance/Support

Even Tech Ed should benefit from Ed Tech progress.

200 hours in compulsory school

Technology education in all school years Y 1-9

Description, aims, central content and attainment criteria.

A **broad curriculum** demands broad teaching!

The Government has proposed that the time plan for Technology should be at least

- 47 hours at Lower Primary
- 65 hours at Upper Primary
- 88 hours at Lower Secondary



Utbildningsdepartementet

Promemoria

2016-08-23

U2016/03475/S

**En stadiindelad timplan i
grundskolan och närliggande frågor**

Conclusion

A broad curriculum

- Critical Thinking
 - Analytical Thinking
 - Systems Thinking
 - Designerly Thinking
 - Computational Thinking?
-
- Problem Solving Process
(Design Process)

Try programming

There is no time to build teaching around practicing certain techniques or technologies!
Neither mechanics or electric solutions – nor programming!

Digital Competencies
Important! We would need curriculum development and support to reach the aims in Technology.

TMW incl. TDW

In-service training for **the whole subject!**
More hours to Technology?



Thank you for
listening!

James Boyle, Spokane, Washington State
Filed 18 September 1895 and published as US 556248

(No Model.)

2 Sheets—Sheet 1.

J. C. BOYLE.
SALUTING DEVICE.

No. 556,248.

Patented Mar. 10, 1896.

Fig. 1.

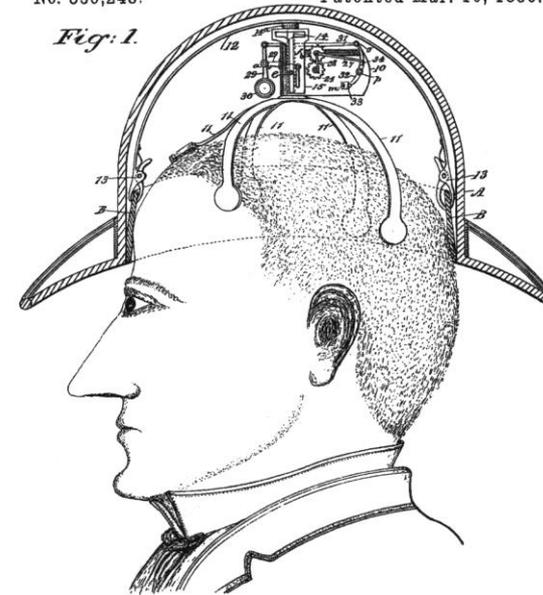


Fig. 2.

WITNESSES:

Wm. L. Patton
Lukard A. Sharp

INVENTOR

J. C. Boyle

BY
Mumford
ATTORNEYS