Computer Science Education on High Schools

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Week of Doctoral Students
Outline

- Introduction
  - Terms
  - Aim of our research
- Our situation
  - Curricular reform
  - CS in the new programme
- Situation abroad
  - Israel
- Summary
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Informatics in education may refer to:

- Teaching how to use ICT
  - Computer, digital or informational literacy
- ICT aided education (of unrelated subjects)
- ICT infrastructure in the building
- ... 
- ... 
- Teaching programming and software development
- Teaching computer science
Computer science

- How do we process information?
  - Obtain, create, transform, transmit, store...
  - Describe, measure, secure...
- How can a machine do it instead?
  - How can we describe what to do?
  - How can we compare algorithms?
  - Are there limitations?
- What *is* information?
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Aim of our research

What about teaching computer science on high schools?
Aim of our research

What about teaching computer science on high schools?

- Why?
- How?
- Results?
  - Positive?
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Curricular reform

- Unique school programmes based on the National programme
  - Loads of paperwork
  - Autonomy
- Goal shift: knowledge => (key) competences
  - Subject as an instrument
- Classical subjects structure (seems) reworked
Curricular reform: Summary

- Some brilliant ideas
- Spoiled implementation
- Balance?
- Positive thinking: The reform is an opportunity...
- Negative thinking: ...to destroy what is left.
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CS in RVP: Educational areas

- **ICT**
  - Informational literacy = capability to use technology
  - Mentions computer science
  - Marginally: Algorithmics, programming
  - Compulsory!

- **Other areas**
  - Combinatorics (and other mathematics)
  - Languages
  - Entropy
  - Nucleic acid, genetics
  - Evolution, life
  - Cartography
  - Learning, psychology
  - Law
  - First aid, emergency cases
CS in RVP: Key competences

- Problem solving
- Communication
- Learning
  (Social and personal competence)
  (Citizenship)
  (Business)
ICT panel

- Expert group to improve ICT teaching (and usage)
- Meeting every 3 months, since 2008
- Publishing
  - On its existence
- Results?
CS in school leaving exams

- May 2010, better than the previous version, still not good
- Aimed on computer and digital literacy

- Basics from information theory
  - Binary coding, compression
- Programming basics
  - Use basic structures, explain OOP
  - Simple algorithm development (i.e. max of a list)
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Abroad

- Netherlands
  - Focuses on usability in life, work and business
  - IS, data modelling, relational databases

- USA
  - Sophisticated K-12 curricula
  - Algorithmics and programming

- Russia, Slovakia, Hungary, New Zealand...
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Israel

- 1990 (!)
  - Implementation includes piloting curricula, educating teachers, developing textbooks...

- Computer science as a science
  - Computer literacy from grammar school (!)

- Modular system
  - The basic module is compulsory (!)

- Both theoretic and experimental approach
Keyword: Algorithm

Also includes (intuitive level):
- Complexity
- Recursion
- Automata (as language acceptors, incl. TM)
- Non-determinism
- Computer graphics
- Logic programming
- Graphs
- ...
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CS has no direct support in curricula

However, with a closer look...

- Basic algorithmics
- Key competences
- Possible extensions

Enough abroad experience available

- Content
- Methods
  - (Organisation)