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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Computers on high schools

- 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

Israel

- 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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Summary

- 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)