Informatics for all students
A Computational Thinking Approach

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Informatics (CS) versus ICT

- Informatics (CS) is concerned with designing and creating informatics ‘products’ and ‘tools’, such as: algorithms, programs, application software, systems, methods, theorems, computers, ...

- ICT – applications of CS (computing) – concentrates on how to use and apply informatics and other information technology tools in working with information; can be also creative
History: 1965 – …
computers in education

1965 … 1985 …
Informatics curricula and teaching – computer science – there was no information technology

beginning of 90’s
moves in education:
computer science → information technology
constructing computer solutions → using ready-made tools
computer science for some students → information technology for all

recently: informatics for all – computational thinking
The Education System in Poland

1st stage
- Pre-school year
  - 6
- 1st stage integrated
  - 7-9
  - 6

2nd stage
- Primary education
  - 10-12
- Secondary education
  - 13-15
  - 16-18
- Tertiary education
  - 19-18

Informatics as a mandatory subject has been in the curricula in Poland since 1985 !!!

Informatics for all students, 1h
Informatics adv. – elective, 6h

Informatics – mainly ICT with elements of algorithmics

Computer lessons (ICT)
Informatics education approach

- *60’ – 90*’: algorithmic thinking when creating programs, programming – there was no ICT

- *90’ – ICT era*: step back: basic computer literacy – the capability to use today’s technology

- *beginning of 2000*: fluency with ICT – the capability to use new technology as it evolves

- J. Wing, 2006: computational thinking – competencies built on the power and limits of computing: 3R + computational thinking

Shift: algorithmic thinking to computational thinking

informatics for informatics to informatics for all
Computational thinking (J. Wing, 2006) in informatics for all (and in other subjects)

Includes a range of mental tools: originated in computing

- reduction and decomposition of complex problems
- approximation, when exact solution is impossible
- recursion: inductive thinking
- representation and modeling
- heuristic reasoning

Influences other disciplines – in mathematics:

*the purpose of computing is insight not numbers*

[R.W.Hemming]

Applies to other disciplines
We use computational thinking approach

Computational thinking is the thought process involved in formulating problems and their solutions so that the solutions are represented in a form that can be effectively carried out by an information-processing agent (a person or a computer).

Operational definition of CT:
- Formulating problems in a way that enables us to use a computer and other tools to help solve them.
- Logically organizing and analyzing data.
- Representing data through abstractions such as models and simulations.
- Automating solutions through algorithmic thinking (ordered steps).
- Identifying, analyzing, and selecting possible solutions to achieve the most efficient and effective combination of steps and resources.
- Generalizing and transferring this problem solving process to a wide variety of problems.
What next?

Road map for 2014-2015:

- proposition of changes to the National Core Curriculum on informatics (computer science) including programming for all students in K-12 – to be accepted by the Ministry
- Introduction of teachers preparation standards in informatics (computer science), then used by teachers and teachers preparation institutions
- new centers for teachers preparation (blended learning)
- systematic evaluation of teachers (in schools) and teachers preparation institutions (universities, in-service courses)
- pilot projects with teachers, students, schools – public and non-public institutions