Informatics for All
– A European Initiative

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European Computer Science Summit
Gothenburg, Sweden, 8th October 2018
Agenda

• Informatics for All: The Strategy
  – Background
  – Content
  – Recommendations

• Discussion
  – Content & Recommendations
  – Political action & Communication action

• Why this? – We need your help!
  – How can we help bring this forward in various countries?
  – How can we establish political (inter-)action with national ministries?
  – What can we do together/individually?
  – Recruitment of members to WG on Informatics Education
  – Interface between K-12 and university (entrance requirements)
Informatics for All
The strategy
ACM Europe & Informatics Europe
February 2018

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Informatics Education in Europe:
Are We All In The Same Boat?

Informatics: First Contact

Recommendations

Informatics (3)
Digital literacy (3)
Teacher training (2)
Digital Competences in the 21st Century

Informatics

Advanced
(‘for some’, ‘for career’, in-depth)

Fundamental
(‘for all’, ‘for life’, general ‘bildung’)

Specialisation
(as subject / study programme)

Integration
(in subjects / study programmes)

As radical, novel, and defining technology and way of working
(innovation of subjects)

Support

Technological, practical, pedagogical, and subject-specific

As subject-specific tool/media

E-learning and collaborative tools

Digital literacy (“ECDL”) – literate consumer of IT

Technology and infrastructure
In the new economy, CS is not an optional skill, it is a basic skill, right along with the three R's
Informatics
New aspect of 'bildung'
New basic competence for all

Informatics
Mathematics
Writing
Reading

Informatics
New basic competence for all

Informatics
Mathematics

Informatics is (primarily) the language of science
Informatics is (becoming) a language of all subjects
Computer Science For All

JANUARY 30, 2016 AT 6:05 AM ET BY MEGAN SMITH

CS For All

Computer Science for All is the President’s bold new initiative to empower all American students from kindergarten through high school to learn computer science and be equipped with the computational thinking skills they need to be creators in the digital economy, not just consumers, and to be active citizens in our technology-driven world. Our economy is rapidly shifting, and both educators and business leaders are increasingly recognizing that computer science (CS) is a “new basic” skill necessary for economic opportunity and social mobility.

The CSforAll Consortium is a hub for the national Computer Science for All movement that works to enable all students in grades K-12 to achieve CS literacy as an integral part of their educational experience.

A similar joint effort by a coalition of the major informatics organisations in Europe
Informatics for All Group

Chair
Wendy Hall

ACM Europe
Judith Gal-Ezer
Andrew McGettrick

Informatics Europe
Enrico Nardelli
Michael E. Caspersen

CEPIS
Bob McLaughlin
Austeja Trinkunaite

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Two-tier strategy:

Informatics

- as subject (specialisation)
- in all subjects (integration)

[ at all educational levels ]
Specialisation

Current change in public perception of Informatics:

"a useful tool and infrastructure to facilitate numerical, administrative and industrial processes"

"ubiquitous and a driver of innovation and development in all fields (professions, school subjects and research areas)"
Like professions and scientific fields, all school subjects are gradually transformed because of Informatics.

Through digital models, subjects can be learned in novel and more engaging ways, computational approaches will open doors to new dimensions of understanding and expression and radical new ways of learning subjects.
Recommendations

<table>
<thead>
<tr>
<th>Curriculum</th>
<th>R1: All students must have access to ongoing education in Informatics, preferably from primary school...</th>
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<tbody>
<tr>
<td></td>
<td>R2: Informatics curricula should reflect the scientific and constructive nature of the discipline...</td>
</tr>
<tr>
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<td>R3: Informatics courses must be compulsory and at least on a par with courses in STEM disciplines...</td>
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<table>
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<tr>
<th>Teachers</th>
<th>R4: All teachers at all levels should be digitally literate...</th>
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<tr>
<td></td>
<td>R5: Informatics teachers should have appropriate formal education...</td>
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<tr>
<td></td>
<td>R6: Higher education institutions should provide encouraging programs...</td>
</tr>
<tr>
<td></td>
<td>R7: Ministries should [...] establish national or regional centers for PD...</td>
</tr>
</tbody>
</table>

| Research                    | R8: Intensive research of three different facets, curriculum, teaching methods and tools, and teaching the teachers is needed to successfully introduce Informatics into the school system |
Informatics on a par with courses in STEM disciplines

Informatics at least on a par with courses in STEM disciplines

[ Informatics on a par with Mathematics ]
Two Challenges for our Community

To clarify and set direction
(outward)

To deliver
(inward)
### Our Grand Educational Challenge

**Expansion of Informatics (think math)**

<table>
<thead>
<tr>
<th>Educational level</th>
<th>Integration (in subjects/programmes)</th>
<th>Specialisation (as subject/programme)</th>
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</thead>
<tbody>
<tr>
<td>Higher</td>
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**New type of research group?**

Informatics Education Research

Curriculum  † Teachers (food chain) † Research
Wider role of Informatics in universities

Research
Study programmes

Working Session on Wednesday afternoon
Keynote @ ECSS 2015

Shifting Identity in Computing: From a Useful Tool to a New Method and Theory of Science
PAUL S. ROSENBLOOM

ON COMPUTING
THE FOURTH GREAT SCIENTIFIC DOMAIN
The Fourth Scientific Domain

Technical, natural and health science
Nature can be understood – measured and weighted
Study and manipulation of nature

Humanities
Study of humankinds cultural products and languages

Social sciences
Study of society and organisations

Informatics/Computing
The world (the real and the imaginary) is computable
Study and construction of (prototypes for)
computationelle structures, processes, artefacts and systems

Rich relations to and implications for
the three classical scientific domains
Computational X, for X =

- Economics
- Psychology
- History
- Chemistry
- Physics
- (Molecular) Biology
- Linguistics
- Musicology
- Archeology
- Literature
- Theology
- Journalism
- Social Science
- Education
- Chemistry
- Physics
- Ethnography
- Law
- ...
Computational skills in all study programmes, e.g.:

1. Problem framing
   From wicked to tamed problems

2. Data and data processes
   Collect, create, analyse, manipulate, transform and visualise data

3. Modelling and simulation
   Design, construct and evaluate computational models

4. Computational problem solving
   Algorithmic thinking, programming, computational abstractions

5. Systems thinking
   Understand, describe and define complex systems in terms of phenomena and their relations
Next steps

Wider role of Informatics in Universities
Research and study programmes
Working Session on Wednesday afternoon

PISA (OECD)
Mathematics: Computational Thinking (a hook)
Sciences: Physical, Life, Earth and Space, Digital

An event in Brussels (early 2019)
Representatives from EU, industry, academia, teacher organisations, ...
Two-tier strategy:

Informatics
- as subject (specialisation)
- in all subjects (integration)

[At all Educational Levels]

Specialisation

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Informatics

New aspect of 'bildung'
New basic competence for all

Art
German
Music
Technology
Economy
Social science
Design
Geology
English
Marketing
Geography
Spanish
Biology
History
Chemistry
Physics
Classical history
Literature
Chinese
Biotechnology

Reading  Writing  Informatics  Mathematics

Mathematics is (primarily) the language of science
Informatics is the language of all subjects

CS for All
Informatics for All

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by a coalition of the major informatics organisations in Europe

Expansion of Informatics (think math)

Educational level
Integration (in subjects/programmes)
Specialisation (as subject/programme)

Higher

New type of research group?
Informatics Education Research

Curriculum  ● Teachers (food chain)  ● Research
Discussion

• **Content & Recommendations**
  – Curriculum
  – Teacher Education
  – Informatics Education Research
  – Two-tier strategy at all educational levels

• **Political action and communication actions**
  – National level
  – European level

• **We need your help!**
  – How can we help bring this forward in various countries?
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