CS education in Europe and Italy

Andrea Sterbini – sterbini@di.uniroma1.it

CECE:
Committee on European Computing Education

Born from Informatics Europe + the ACM Europe Council

"Are we all on the same boat?" report on the state of Computing Education in Europe (may 2017)

(similar to "Running on empty" a report on USA C.S. Education)

Goal: understand how Computing Education is approached in the different countries, at student, teacher, school, regional and state levels.

Topics covered by the report: INFORMATICS

First contact

When do European pupils have their first contact with Informatics?
When does the road to mastering the science that makes the digital world possible start?

Availability of courses

Is Informatics offered as a subject in secondary schools?
If so, do all students have access to Informatics courses?
Is Informatics a compulsory or an elective subject?

Curriculum geographic consistency

Have European countries implemented a nationally consistent Informatics curriculum?
Is it uniform across different schools in the country?

Enrolment

What percentage of students are enrolled in Informatics courses at secondary schools in different European countries?

… DIGITAL LITERACY

First contact

When do European pupils have their first contact with computers?
When does the road to Digital Literacy start?

A separate subject?

Are students in Europe learning how to use computers in specialised school classes or is Digital Literacy integrated with other (scientific) subjects?

Curriculum geographic consistency

Have European countries implemented a nationally consistent Digital Literacy curriculum?
Is it uniform across different schools in the country?

Enrolment

What percentage of students are enrolled in Digital Literacy courses during the first two years of secondary education?

… TEACHER TRAINING 1

Special qualifications

Are special qualifications required for teaching Informatics in secondary schools in different European countries?

Number of subjects

Are secondary school teachers (in any area) qualified in more than one subject?

Entry requirement

Do teachers at secondary schools need a degree to teach?
What are the requirements in each European country?
Where do teachers need a university degree, a specialisation, or even a Master degree?

In-service length

Is practical experience required for secondary school teachers?
How long is this stage of training in different European countries?

… TEACHER TRAINING 2

Stand-alone digital literacy curriculum

Which countries have a established and adopted a stand-alone Digital Literacy curriculum in teacher training?

Stand-alone Informatics curriculum

Which countries have a established a stand-alone Informatics curriculum in teacher training?

Typical path availability

Is the typical training path for a secondary school teacher also available in Informatics?

Professional as teachers

Can a professional (e.g. a Software Engineer) with working experience but no educational degree be a teacher of Informatics in secondary school?

Professional experience

Can professional experience can be used to waive the formal subject qualifications typically required?

… TEACHER TRAINING 3

Could teachers from other subjects teach CS? (and how well?)

- Mathematics
- Physics
- Business
- Engineering
- Others

Security of employment

Do secondary school teachers have permanent or tenured jobs?
See the differences across Europe.

… OTHER

Educational Policies

At which administrative level are educational policy decisions being made?

Learning Objectives

At which level are learning objectives being defined?

Data Availability

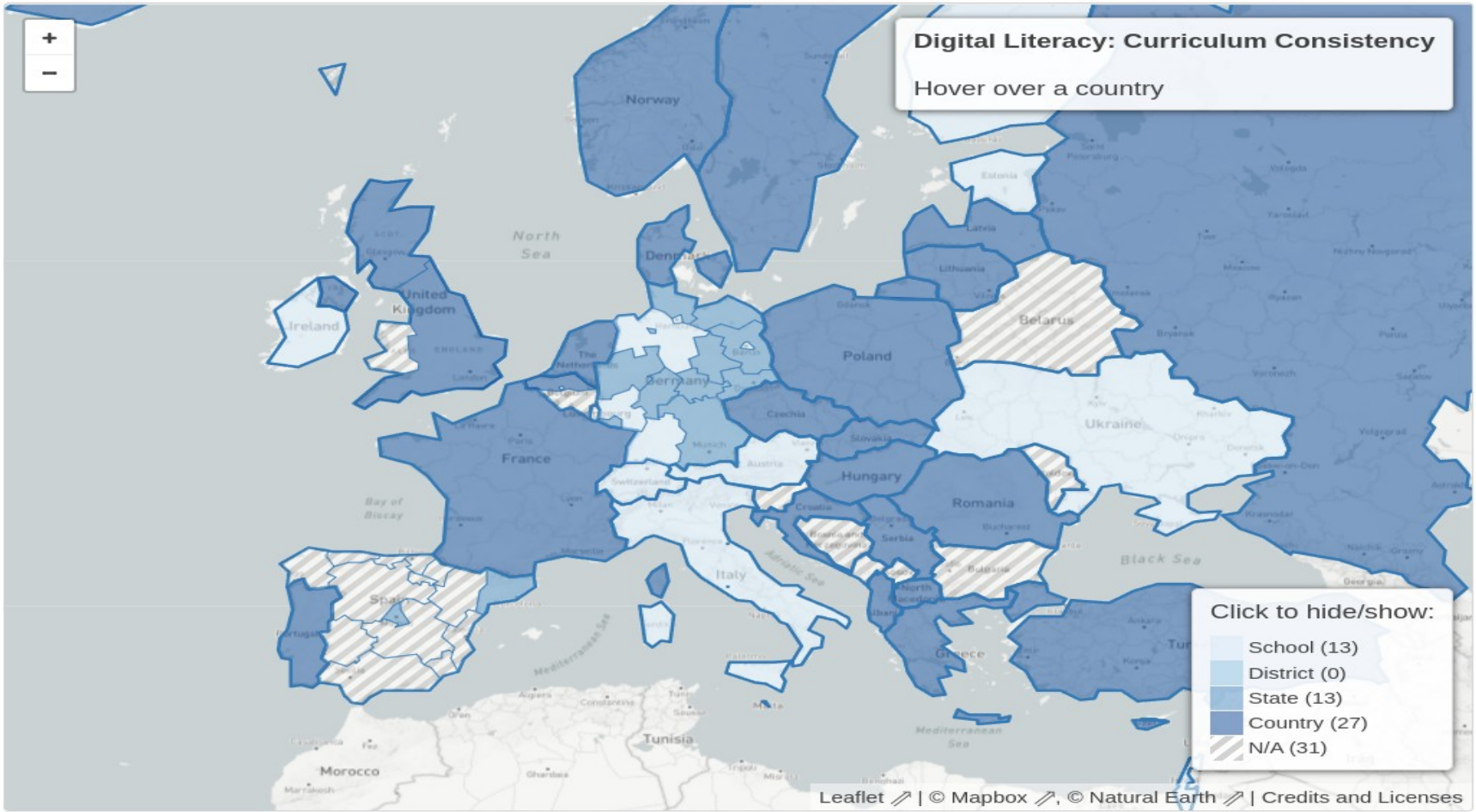
Which countries have provided data? How well are we covering Europe?

Missing?: are schools and homes ready for Computer education?

- schools connectivity
- students connectivity
- educational LMSs
- digital devices for the students

CECE Map: an interactive data exploration tool

Digital Literacy: Curriculum Consistency



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Italy

C.S. Education: Programma il futuro (based on code.org, 2017)

The "Piano Nazionale Scuola Digitale" (from the Ministry of Education and Merit)

- 70% of classes are connected (part with poor connection)
- 42% has interactive whiteboards (LIM)
- 36% of teachers ask for specific update courses
- 62% of teachers are 50 years old or more (w.r.t. 35% in Europe)

Goals:

- Wideband connectivity
- Digital learning environments
- BYOD (Bring Your Own Device) !!!!!
- Digital portfolio
- Teachers' "digitalization" (limited support for low-income families!)

The COVID emergency has somewhat "forced us" to do some part of this plan

Planned actions: CONNECTIVITY

Goals:

- Network access for all schools
- Right to use Internet for all students
- Enable digital teaching

Action #1 – Ultra wide band fiber optics

Action #2 – Internal network wiring for all schools

Action #3 – Right to use Internet: some subsidies for internet for low-income families

Planned actions: ENVIRONMENTS & TOOLS

GOALS:

- Enable schools for digital innovative environments
- Give students the tools for digital learning
- Build laboratories for emerging new job types

ACTIONS:

#4 – Digital integrated didactic environments

#5 – Challenge Prize for digital school

#6 – Guidelines for BYOD

#7 – Plan for Practical learning

#8 – Single sign on system

#9 – Student's digital profile

#10 – Teacher's digital profile

#11 – Digitalization of administration procedures in schools

#12 – Electronic registry

#13 – Data strategy for the school

Planned actions: COMPETENCES & CONTENTS

GOALS:

- a common framework of digital competences
- help teachers to be facilitators of innovative learning paths
- Motivate students through “Goal oriented” learning
- Curricula innovation

ACTIONS:

#14 – A framework for digital competences

#15 – Innovation in digital competences

#16 – Research unit for digital competences

#17 – Computational Thinking in primary school

#18 – Update the Technology curriculum

#19 – New curriculum for (digital) entrepreneurship

#20 – Girls in Tech & Science

#21 – Plan for Digital Careers

#22 – Minimal Standard for LMS

#23 – Build open educational resources

#24 – School Libraries for alphabetization

Planned actions: PLAN MANAGEMENT

GOALS:

- Give all schools access to information society
- Make “Right to internet” a reality
- Work on all levels to enable a digital school

ACTIONS:

#25 – Teacher’s continuous professional update

#26 – Technical assistance for primary schools

#27 – Teacher’s formation on teaching innovation

#28 – A Digital expert in every school

#29 – Agreements with local communities

#30 – Stakeholders’ Club for digital schools

#31 – Good practices gallery

#32 – Give voice to networks of practice

#33 – Digital School Observatory

#34 – Scientific Committee for the Plan

#35 – Continuous Monitoring of the Plan

Proposals at EU level

In the meantime the Informatics Reference Framework for School is proposed by the Informatics for All coalition (2022):

- ACM Europe Council
- CEPIS Education Committee
- Informatics Europe
- IFIP TC 3 Education

Goals

At the end of high school the student will:

- Use digital tools in a conscious, responsible, confident, competent and creative way
- Understand the phenomena, concepts, principles and practices of informatics and the multifaceted ways of applying them to model, interpret, and operate on reality
- Analyse, design, frame and solve problems by devising representations, designing algorithmic solutions and implementing these in a programming language
- Develop computational models to creatively investigate, understand and communicate about natural and artificial phenomena and systems
- Identify, analyse and discuss ethical and social issues associated with computational systems and their use as well as their potential benefits and risks

Core topic areas

Data and information	Design and development
Algorithms	Digital creativity
Programming	Modelling and Simulation
Computing systems	Privacy, safety and security
Networks and Communication	Responsibility and empowerment
Human-computer interaction	