Coding and Programming: What Do Italian Primary School Teachers Think?

Isabella Corradini, Michael Lodi, Enrico Nardelli
isabellacorradini@themiscrime.com, michael.lodi@unibo.it, nardelli@mat.uniroma2.it

Motivations

- Computational thinking (CT) or computer science (CS) curricula are introduced in schools
- "coding" is used in schools, especially referring to introductory programming activities
- "computational thinking" sounds abstract and intimidating
- "programming" seems to recall the "boring and nerdy" professional activity
- "coding" can capture the interest of students, and "*also provides an element of mystery (there are hints of a secret code), and achievement (cracking the code)*" [1]
- the confusion induced by "coding mania" in the media can be very harmful

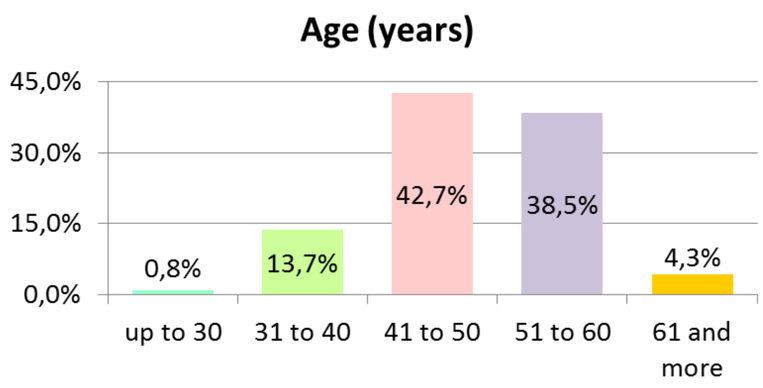
Research question

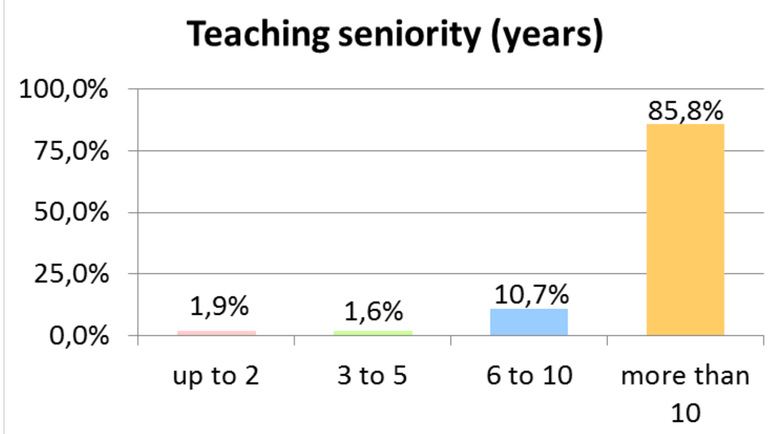
Which relation Italian primary school teachers see between coding and programming?

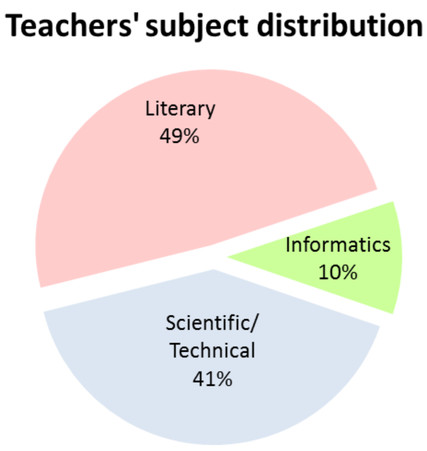
Q1 In my view coding is...
Q2 In your view is there any difference between coding and writing programs?
Q3 If you wish, explain why...

Sample description

N=972. Investigation done in the context of *Programma il Futuro* project (see poster beside).







Viewpoints

There is no agreement in the CSEd community about the relationship between coding and programming. Some authors use the two terms interchangeably as synonyms while others state both (e.g. write "programming/coding"). A few authors do not consider them as equivalent and analyzed their difference [1, 2, 3].
To Computer Scientists it is clear that "coding" and "programming" have a strict relation: they are tools to teach what matters (CS core principles). Giving excessive importance to "coding" may lead to the wrong idea that its value is greater than the CS scientific concepts themselves [2].

WHAT DO YOU THINK?

We would like to have your opinion on this subject and try to understand similarities and differences among countries and cultures

PLEASE FILL OUT THE SURVEY, HERE OR AT http://tinyurl.com/surveyPIF

Language

In Italian, the term "*coding*" is used "as is": untranslated.
On the other hand, the term "programming" is translated in "*programmazione*" or, more specifically, "*programmazione informatica*" ("informatics programming").
The Italian term "*programmazione*" has a very broad meaning (e.g. it is used for "schedules" like "movie show-times") and, in the context of schools, it is used to indicate "didactic planning".

Qualit. analysis: methodology

- filter irrelevant answers ($N \rightarrow 798$)
- first (independent) proposal of categories, grounded on definitions and on literature
- joint discussion and agreement on the proposed set of categories (labels)
- independent labeling of answers (and proposal for category modifications)
- joint discussion and final agreement and labeling (one or more labels per answer)

Q1 preliminary results

59% of answers had AT LEAST ONE label of the **Related** categories
41% of answers had NO label of the **Related** categories

Q2 preliminary results

($N \rightarrow 758$)
60% answered there is difference
40% answered there is NO difference
NB: Teachers who answered "NO difference" to Q2 answered to Q1 like the entire sample.

Q1 analysis: categories

Related (each category somehow "speaks" about writing programs)

`PROC` Specifying processes: devising an algorithm to solve a problem; providing a list of instructions to solve a problem; making an information processing agent execute a sequence of elementary steps
`PROG` Writing programs: using programming languages
`SIMP` Simplified programming: programming with simplified environments/ languages (e.g.: visually, blockly); learning the basics of programming

Unrelated

`ACTI` Being active towards information technology: creating computational artifacts instead of simply using them; being able to find creative or original solutions to problems
`COLE` Cognition and learning: reflecting about thinking or learning; program to learn; learning to learn; develop/ improve cognitive abilities; a method/ approach to teaching/learning
`DECT` Developing computational thinking: a way to teach/ develop/ apply CT
`ENGA` Engagement: doing playful/ funny/ attractive/ interesting/ inspiring activities
`LOCR` Logical/critical thinking: logical or reasoning or analytical skills; applying/developing critical thinking
`PROB` Solving problems: plan(s), design(s), action(s) or process(es) leading to solve a problem, to reach a goal, to face a complex situation (including splitting a complex problem in simpler subproblems to solve it more easily)
`TRAN` Transversal competence: e.g. fourth skill, transversal skill, life skill, useful in other fields, of general use

References

[1] Duncan, Bell, and Tanimoto. *Should Your 8-year-old Learn Coding?* Proc. 9th Workshop in Primary and Secondary Computing Education, WiPSCE 2014.
[2] Armoni *Computational Thinking, Programming, Coding: The Anomalies of Transitivity in K-12 Computer Science Education*, ACM Inroads, vol.4
[3] Barendsen, Mannila, Demo, Grgurina, Izu, Mirolo, Sentance, Settle, and Stupurienė. *Concepts in K-9 Computer Science Education*. Proc. 2015 ITiCSE Working Group Reports (ITICSE-WGR-15)

Programma il Futuro

consorzio interuniversitario nazionale per l'informatica

Goal

- Spread awareness of informatics as a science
- Computational thinking (CT) as a key competence for modern education (parallel with physics, biology, chemistry, ...)
- CT as the "scientific core" of digital competencies

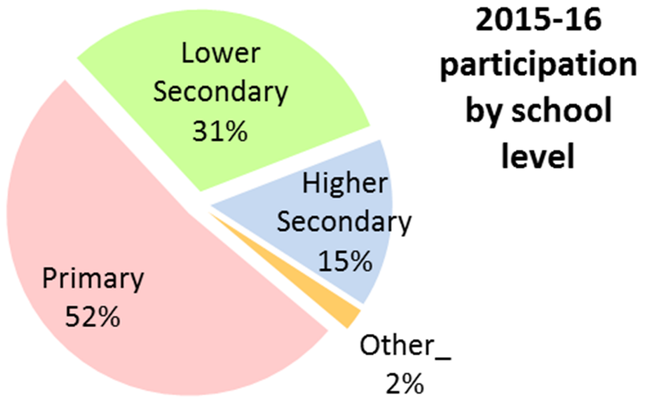
Actions

- Translation and adaptation (text and video)
- Support site (http://programmailfuturo.it) to enable growing an Italian community of users
- Detailed description for each course and lesson
- Videos with a step-by-step guidance to each lesson
- Users forums
- Social channels (YouTube, FaceBook, Twitter)

Organization

- Endorsed by the Ministry of Education, implemented by CINI.
- Financially supported by companies
- Started in school-year 2014-15
- Optional teachers' participation

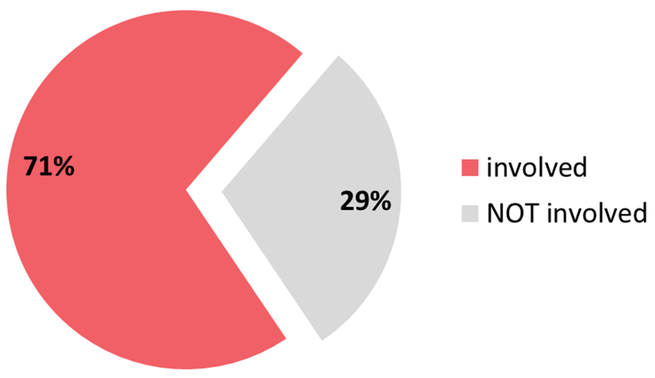
Distribution



Schools Target

At the end of the school-year 2016-17

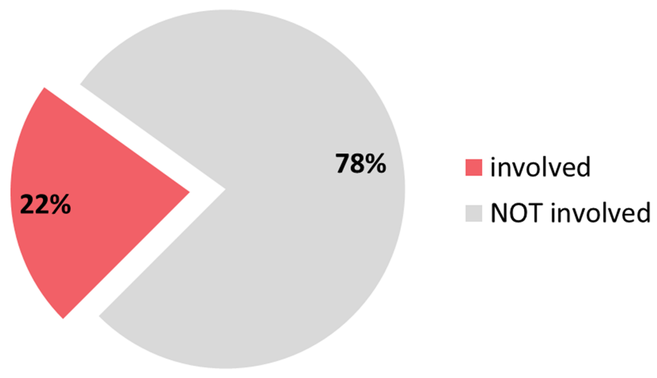
TARGET 1:
Involve at least 40% of 8,281 schools
RESULT 1:
Presence in 5,856 schools (71%)



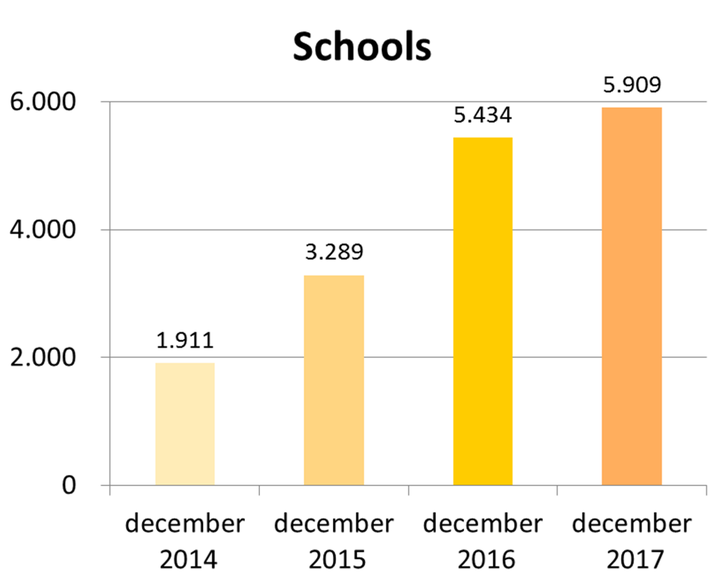
Classes Target

At the end of the school-year 2016-17

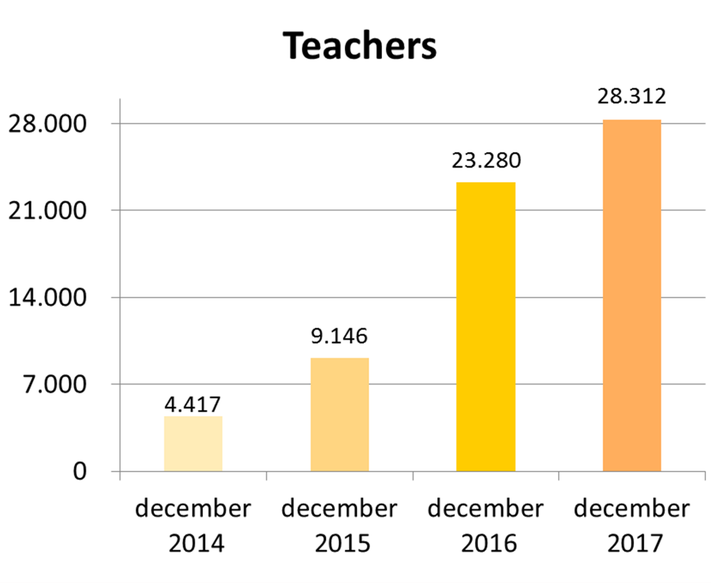
TARGET 2:
Carry out 10 hours in at least 9% of 370,597 classes
RESULT 2:
13.56 hours on overage in 83,101 classes (22%)



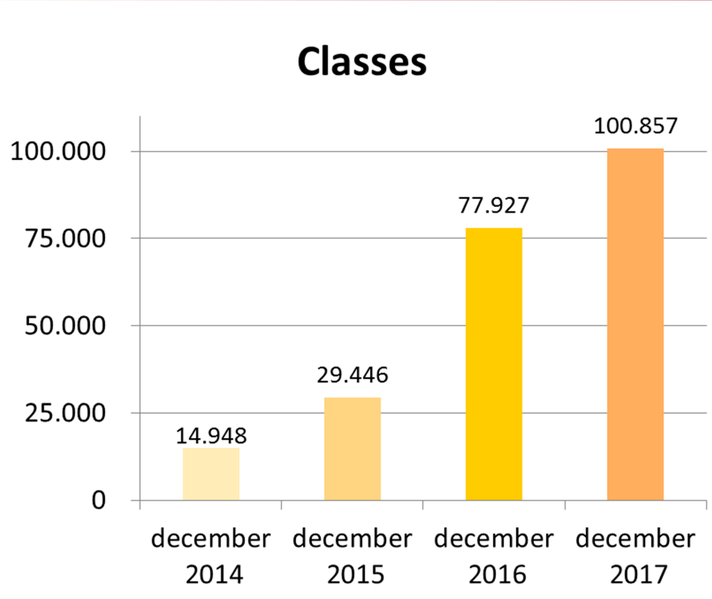
Schools



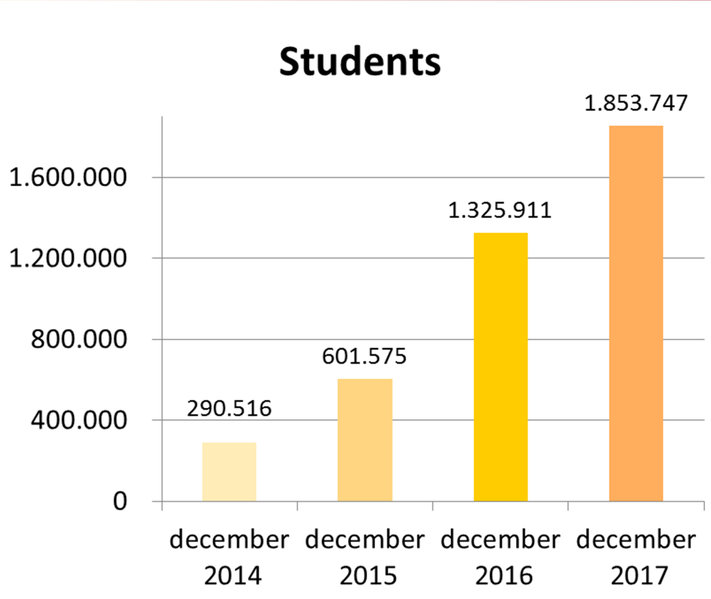
Teachers



Classes



Students



Teaching material

- Based on Code.org teaching material
- Accessible via web (hence scalable and flexible)
- Interactive (but also unplugged) and attractive
- Visual programming and self correcting exercises
- Slowly increasing difficulty and complexity
- Lesson plans and teacher dashboard

Support

Marco Belinelli, NBA championship winner

https://tinyurl.com/belinelliPIF

Italian Members of Parliament from the bipartisan group "*Intergruppo Innovazione*"

https://tinyurl.com/intergruppo

Research

Project results are described in more detail in the following research papers:

[1] Isabella Corradini, Michael Lodi, and Enrico Nardelli. *Computational Thinking in Italian Schools: Quantitative Data and Teachers' Sentiment Analysis after Two Years of "Programma il Futuro" Project.* In 22nd ACM Annual Conference on Innovation and Technology in Computer Science Education (ITiCSE-2017), Bologna, Italia.

[2] Isabella Corradini, Michael Lodi, and Enrico Nardelli. *Conceptions and Misconceptions about Computational Thinking among Italian Primary School Teachers.*, In 13th ACM Annual Conference on International Computing Education Research (ICER-2017), Tacoma, WA, USA.

Partners (school-yr 2017-18)

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