Computer Science Competences in Italian Secondary Schools

a preliminary study

Silvio Giaffredo
Luisa Mich
Marco Ronchetti

2nd (up to 3) year

PhD student

(21 years CS teacher in technical 2ndary schools)

@ D.I.S.I.

(Information Engineering & Computer Science Dep.)

ICT Doctoral School

Information and Communication Technology

Overview

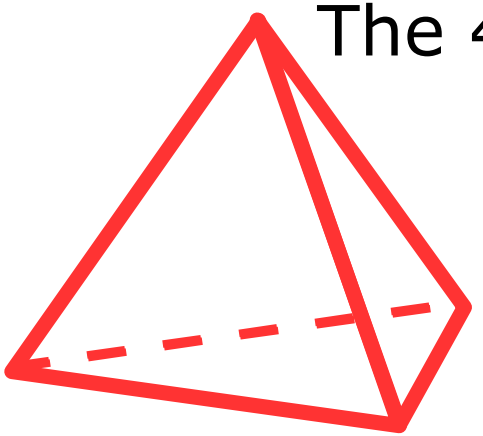
Competence-based (CB) approach to education (just 2 slides)

Adoption of CB approach in secondary schools in Italy (a first, local survey)

Current research work

Competence-based approach (1)

- grounded on the pedagogical theory of constructivism
- several reference models, e.g. holistic model



The 4 dimensions of competence:

- Cognitive (**K**nowledge)
- Functional (**S**kills)
- Social (~**A**ttitudes)
- meta-competence

[Le Deist, Winterton, 2005]

- recommended by institutions (European and national)

Competence-based approach (2)

Key or General competences, the main focus of the European institutions

≠

Subject-specific competences, focus of our research

and here the specific discipline is Computer Science (Informatics, Informatica)

Grades in Italian schools

						Secondary							
School	Primary *(elementare)*					Lower *(primo grado)*			Upper *(secondo grado)*				
Year	1	2	3	4	5	1	2	3	1	2	3	4	5
Grade	1 – 5					6 - 8			9 - 10		**11 - 13**		
Age	6 – 11					11 - 14			14-16		16 - 19		

Secondary schools in Italy

Organization structure (since year 2010)

Technical schools

Vocational schools

General education

Secondary schools in Italy

Organization structure (since year 2010)

Nuovi Istituti *Tecnici*
2 Settori - 11 Indirizzi

Technical schools

Nuovi Istituti *Professionali*
2 Settori - 6 Indirizzi

Vocational schools

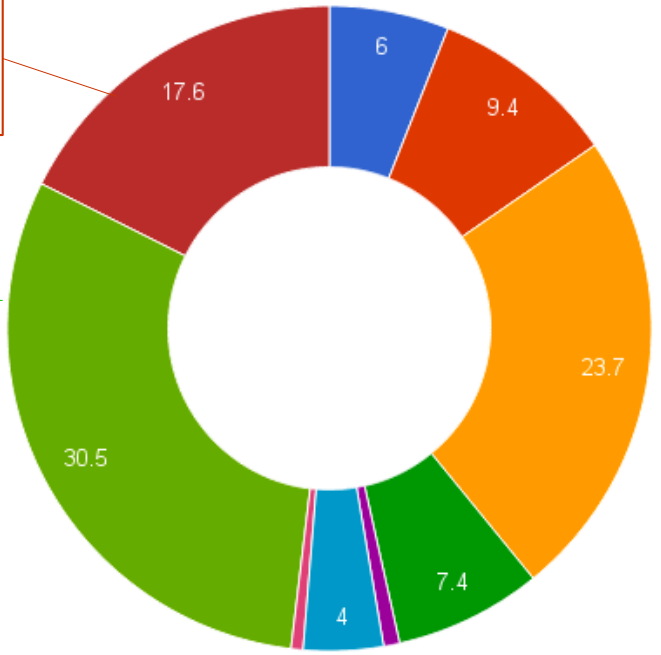
Nuovi *Licei*
6 Nuovi Licei

General education

Students choices for schoolyear 2015/2016

17.6%
Vocational

30.5%
Technical



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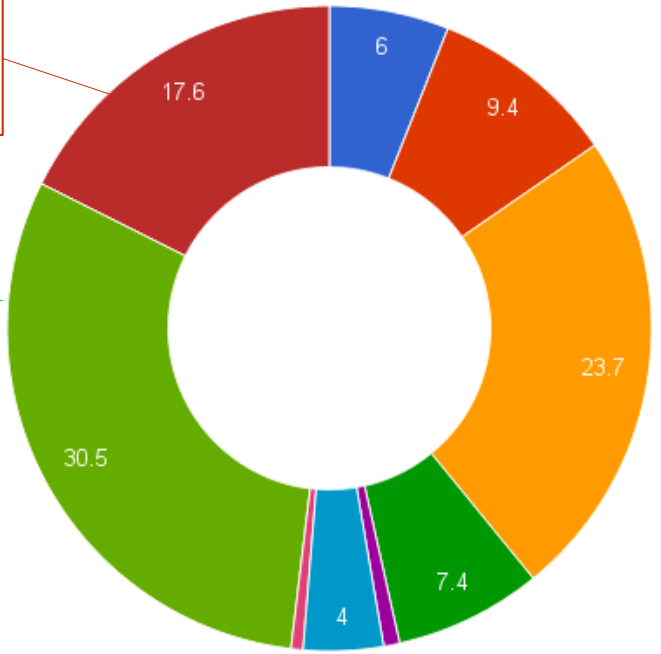

Competence-based approach adoption in Italy (FORMAL)

	Type of school		
Subject	***Technical***	***Vocational***	***General (Liceo)***
History	Comp. 1 (*T*) Comp. 2 (*T*) .... (*T*)	Comp. 1 (*V*) Comp. 2 (*V*) .... (*V*)	Comp. 1 (*L*) Comp. 2 (*L*) .... (*L*)
Mathematics	Comp. 1 (*T*) Comp. 2 (*T*) .... (*T*)	Comp. 1 (*V*) Comp. 2 (*V*) .... (*V*)	Comp. 1 (*L*) Comp. 2 (*L*) .... (*L*)
	Comp. K		
.....	.....		

Official CS competences: an example

Technical school - technological sector – last year (grade 13)

Developing applications for local networks or remote services

Possible abilities (skills)

- Develop web-based applications, also accessing databases

- Design & develop applications which use databases

Possible knowledge

- Techniques to create dynamic web pages.
- Languages for server-side programming for applications.
- Languages and techniques for querying and manipulating databases

Competence-based approach adoption in Italy (in REAL classes)

Are the formal definitions applied in daily school-life?

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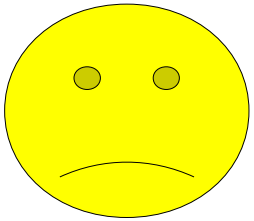


No official/institutional survey

No quantitative analysis

Towards a qualitative study

- ✔ Evidence from Italian literature (Pellerey, Bottani)
- ✔ Contacts in the territory (local research Institute)
- ✔ Our QUALITATIVE researches:
  1) Brainstorming groups (different subject teachers)
  2) a set of interviews (only CS teachers)

Our qualitative results

Brainstorming groups (~60 teachers)	Interviews (7 CS teachers)
• Lack/fuzzines of Guidelines • Lack of trust on competence proponents	• Distance from institutional competences
• More work and efforts required	• Bureaucratic mission as time-consuming
• Resistance to change	

Competence-based approach acknowledged as relevant

Project-based learning (PBL) is commonly used

We suspect ...

… an OCCASIONAL use of competence-based approach

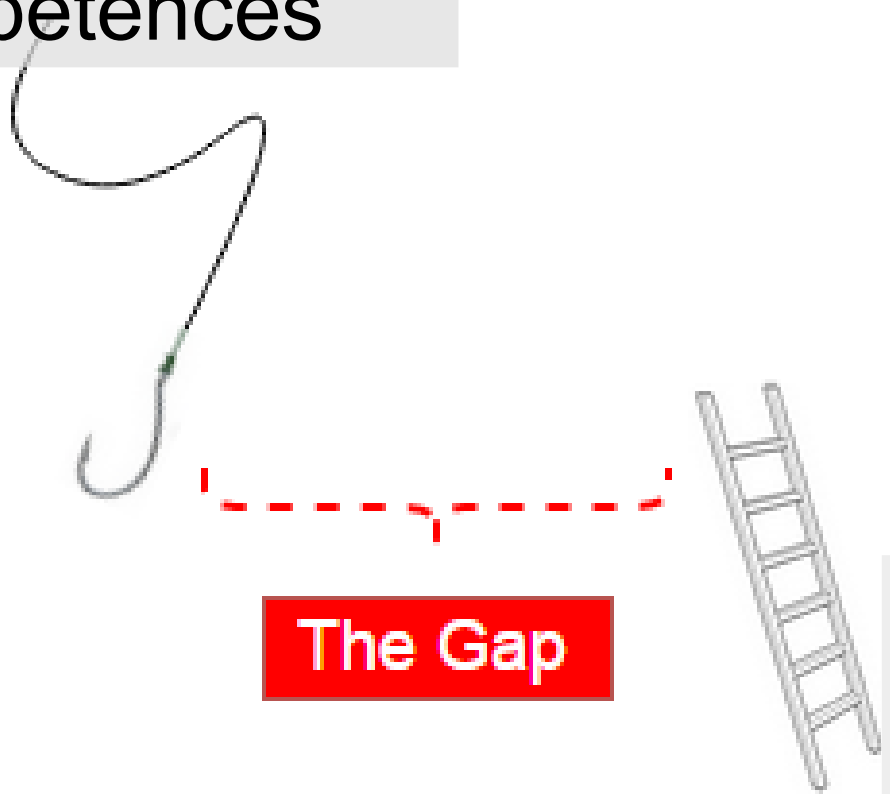
The observed Gap

Institutional definition of competences

Limited adoption of competences in teaching

The observed Gap

Institutional definition of competences

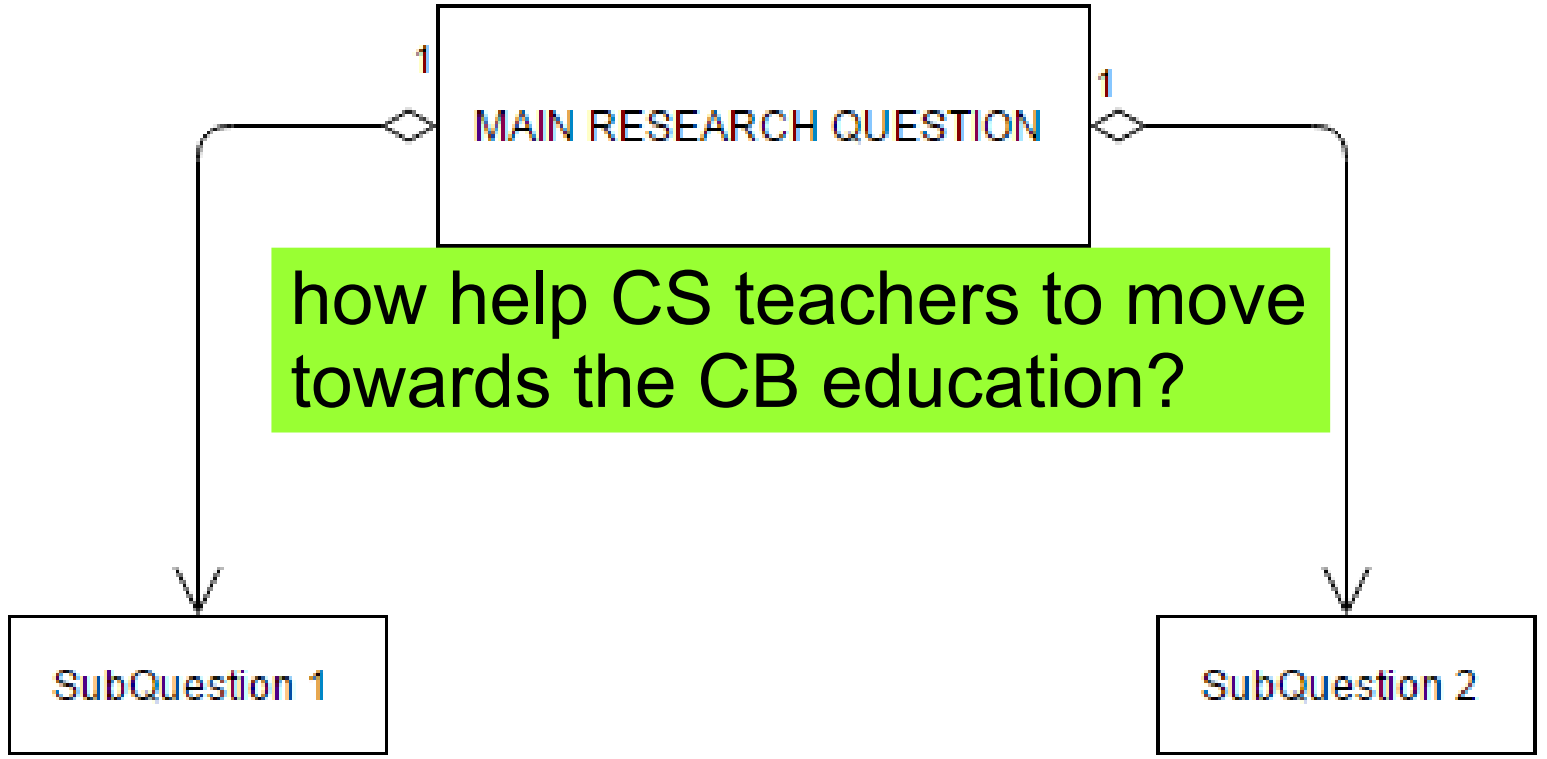


Limited adoption of competences in teaching

Research question

How help CS teachers
to move towards
the competence-based education?

Research question

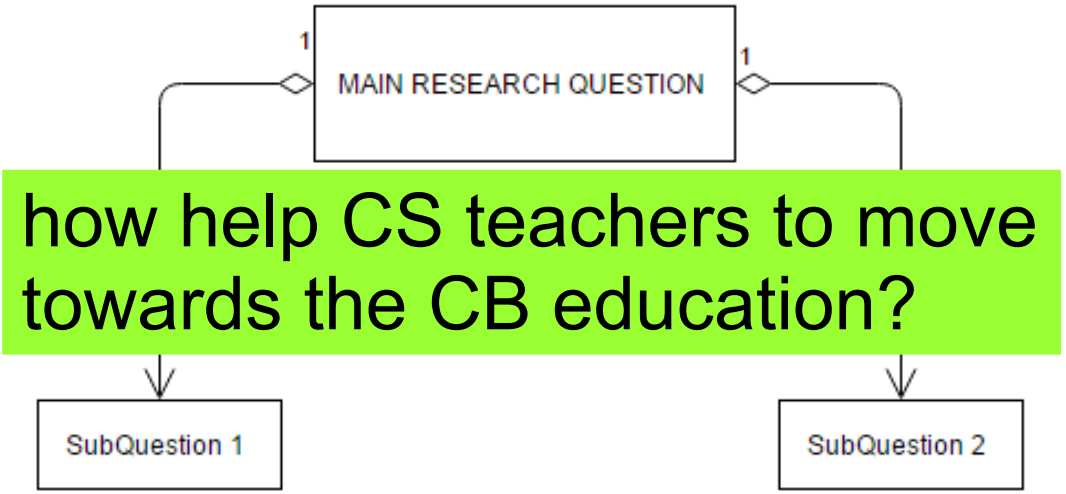


how help CS teachers to move towards the CB education?

which **methods** to support the adoption of the CB CS teaching?

which **repertory** of competences is suitable for CS teachers?

Research question (bis)



which **methods** to support the adoption of the CB CS teaching?

which **repertory** of competences is suitable for CS teachers?

Software application supports

OPLA'
(Projects support for learning labs)

CoMak
(Competence Maker)

Subquestion 1

which **methods** to support the adoption of the CB CS teaching?

Goal 1

Verify the project-based learning method (if it can motivate towards a CB approach)

Goal 1
Verify the project-based learning method

iprase
Apprendimento Ricerca Innovazione

An action-research training course:
- around 20 CS teachers
- 2nd ary schools
- technical sectors
- the 3 last years

(1st meeting: 19th October 2015)

Progetti e competenze per Informatica

Goal 1
Verify the project-based learning method

Teachers attending the course are required to:

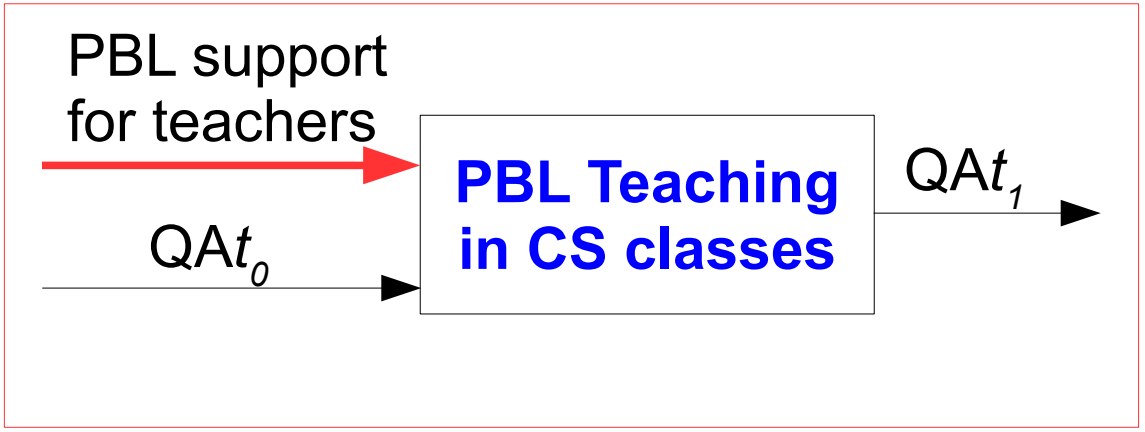
- conduct a learning project w/students during the school-year
- document the plan and the execution of the whole work
- using the sw OPLA'
- accepting the tutoring by the (observing) researchers
- share their experiences and materials
- take an initial and a final test

Goal 1
Verify the project-based learning method

TEST for teachers – the main question is:

Describe a learning project to develop with one of your classes

Teachers in an action-research training course



QA: „quantity“ of adoption of competence-based approach to teaching

QAt_o: QA at time t_o (course start)

QAt_1: QA at time t_1 (course finish)

Goal 1
Verify the project-based learning method

The sw OPLA' can support:

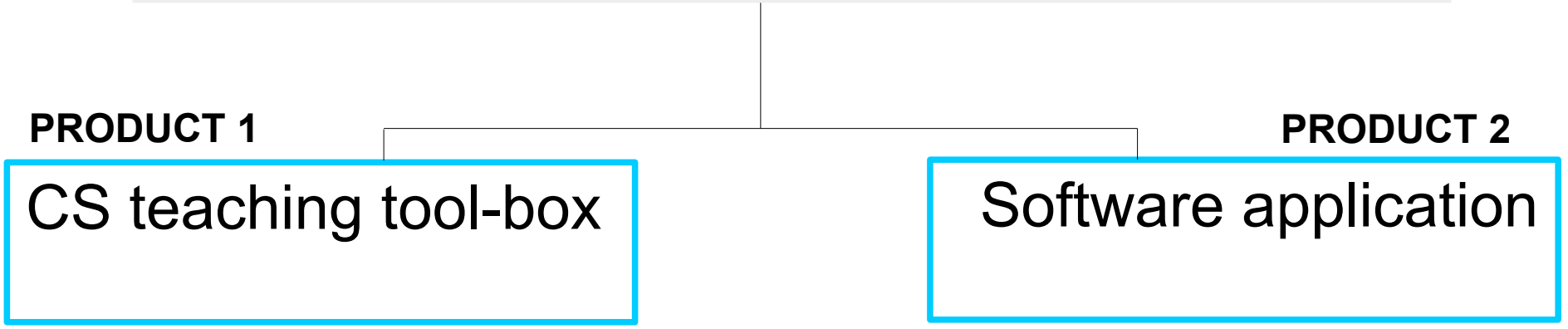
- the definition of the learning project
- the activities plan, even in details
- the choice of the competences, developed through the project
- the definition of the rubrics (for the process & the product)
- the assessment of the competences for every students
- the multi-teachers projects

Subquestion 2

Which
repertory of competences is
suitable for CS teachers?

Goal 2

Create a teaching environment
to support the adoption of CB approach



Goal 2

Create a teaching environment to support the adoption of CB

PRODUCT 1

CS teaching tool-box

- Learning Units examples
- Competence repertory
- Methodologies

PRODUCT 2

Software application

Goal 2

Create a teaching environment to support the adoption of CB

PRODUCT 1

CS teaching tool-box

PRODUCT 2

Software application

- Learning Units examples

Learning unit description:
+ Activity in classes
+ Students' evaluations

- Competence repertory

- Methodologies

Goal 2

Create a teaching environment to support the adoption of CB

PRODUCT 1

CS teaching tool-box

PRODUCT 2

Software application

- Learning Units examples
- Competence repertory
- Methodologies

Definition of competences &
+ Knowledge
+ Skills

Goal 2

Create a teaching environment to support the adoption of CB

PRODUCT 1

CS teaching tool-box

PRODUCT 2

Software application

- Learning Units examples
- Competence repertory
- Methodologies

+ Guidelines
+ Examples

Goal 2

Create a teaching environment to support the adoption of CB

PRODUCT 1

CS teaching tool-box

PRODUCT 2

Software application

- Support to the CS teaching tool-box

Conclusions

- (of a preliminary work?)

- Institutional definitions of competences can be formally correct but sometimes are limited used by the teachers

- Can the teachers adoption be improved:

  - by Reflecting on the use of an inductive method of learning (e.g. PBL)?
  - by Defining best-fit competences?

Thank you

Questions are warmly welcomed

silvio.giaffredo@unitn.it