CS education in Europe and Italy: CECE and Eurydice reports

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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.

23-24 CECE/Eurydice

… 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

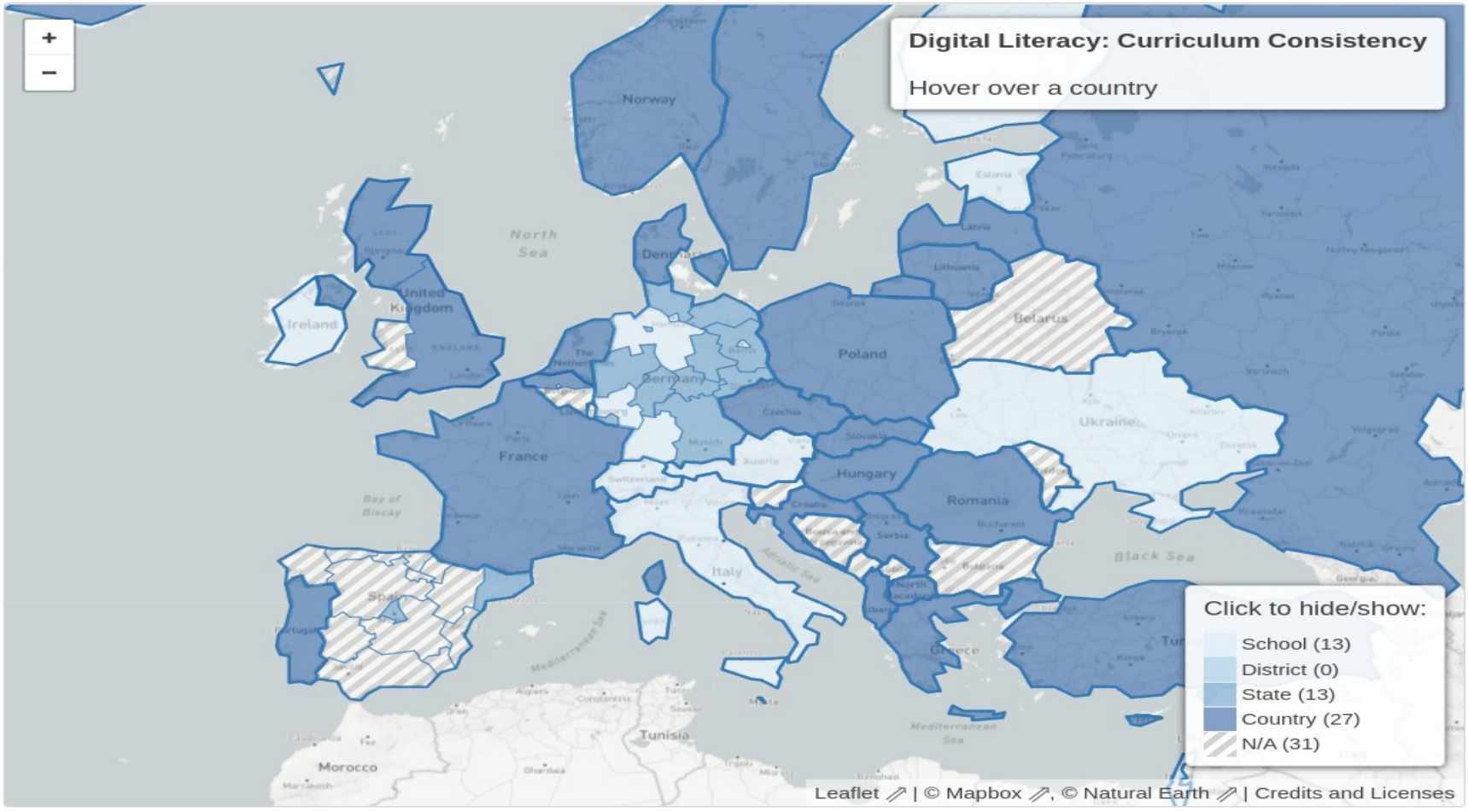
Which countries have provided data? How well are we covering Europe?

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



rydice

Italy

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

The "Piano Nazionale Scuola Digitale" (from 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!)

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**

Proposed 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	

News from EU:
Informatics education at school in Europe - Eurydice report

New report photographing the state of teaching Informatics in Europe

Analysis of 39 education systems in 2020/21:

10 core topics: (lost in translation: Digital Creativity!!!!)

Data and information	Algorithms
Programming	Computing systems
Networks	People–system interface
Design and development	Modelling and simulation
Awareness and empowerment	Safety and security

Starting age: Primary schools

Almost 1/3: 1st grade

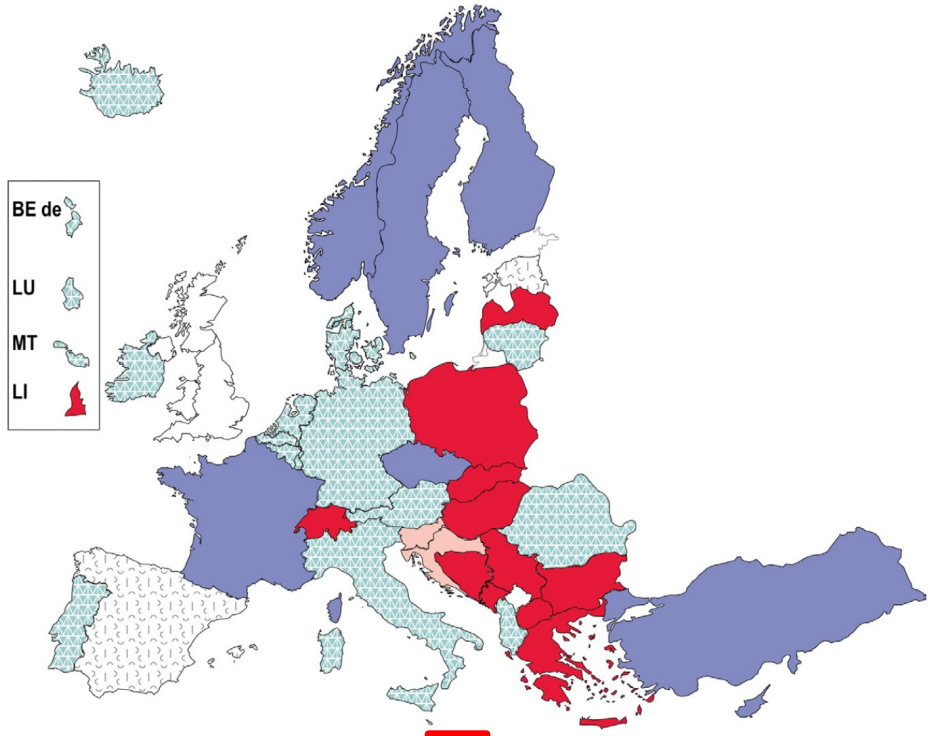
More than 1/3: 3rd - 5th grade

Almost 1/3: later (e.g. Italy)

Some countries:
separate subject

Others:
with another subject

Figure 1.1: Informatics in the curriculum of primary education (ISCED 1), 2020/2021



Source: Eurydice.

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(*) Grade

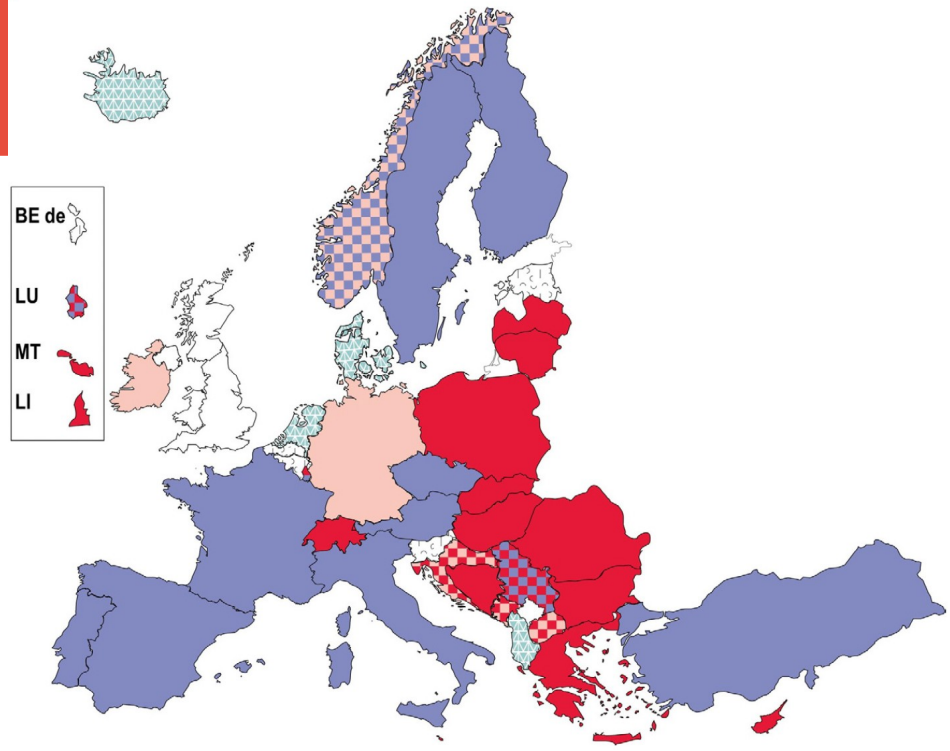
● Separate, compulsory subject ○ Separate, optional subject ◊ Integrated into other subjects α Local/school autonomy Not ISCED 1

Lower secondary

Italy:

- **mean school**
- **with another subject**

Figure 1.2: Informatics in the curriculum of general lower secondary education (ISCED 24), 2020/2021



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10						–			○								●																–				◊○			

(*) Grade.

● Separate, compulsory subject ○ Separate, optional subject ◊ Integrated into other subjects α Local/school autonomy Not ISCED 24

Upper secondary

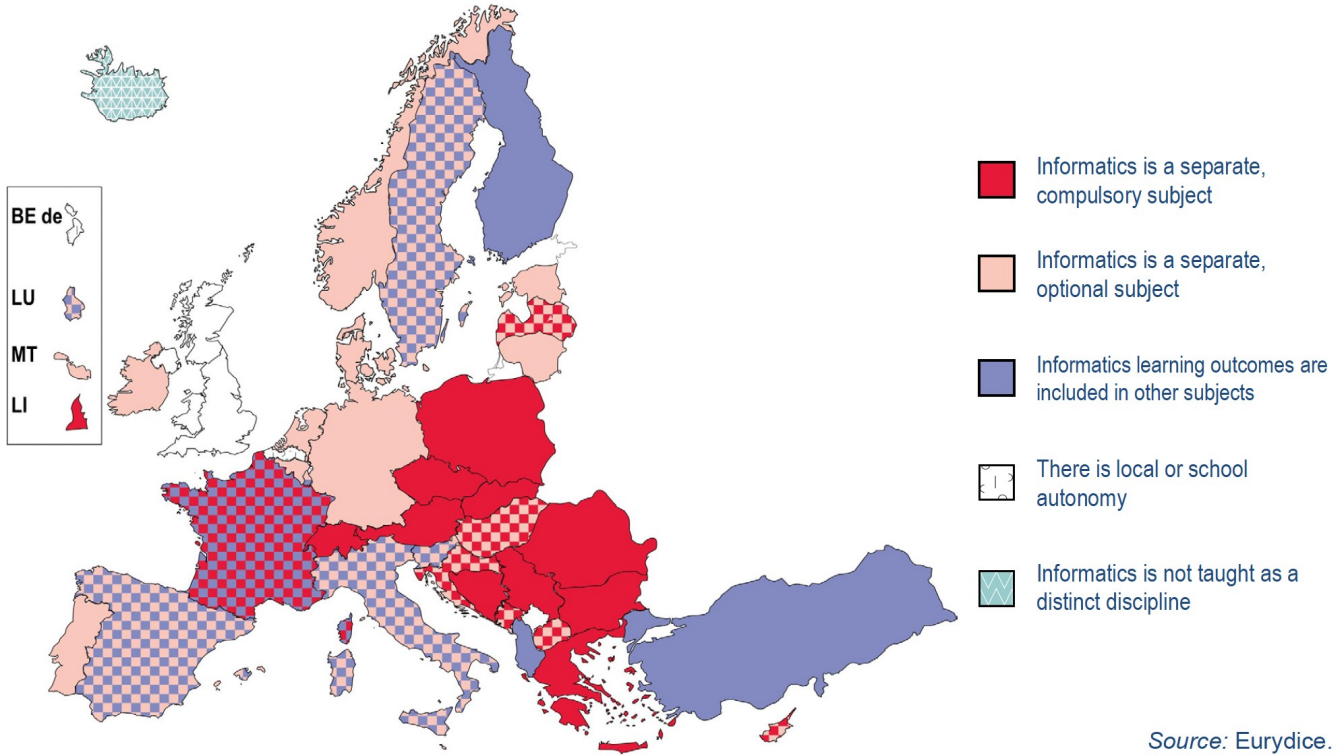
Italy:

- high school

- separate, compulsory

- or with another subject

Figure 1.3: Informatics in the curriculum of general upper secondary education (ISCED 34), 2020/2021



Source: Eurydice.

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13					●α	○	○							⊙				⊙◊							●	○	●α				●		–		○	○	○			

(*) Grade

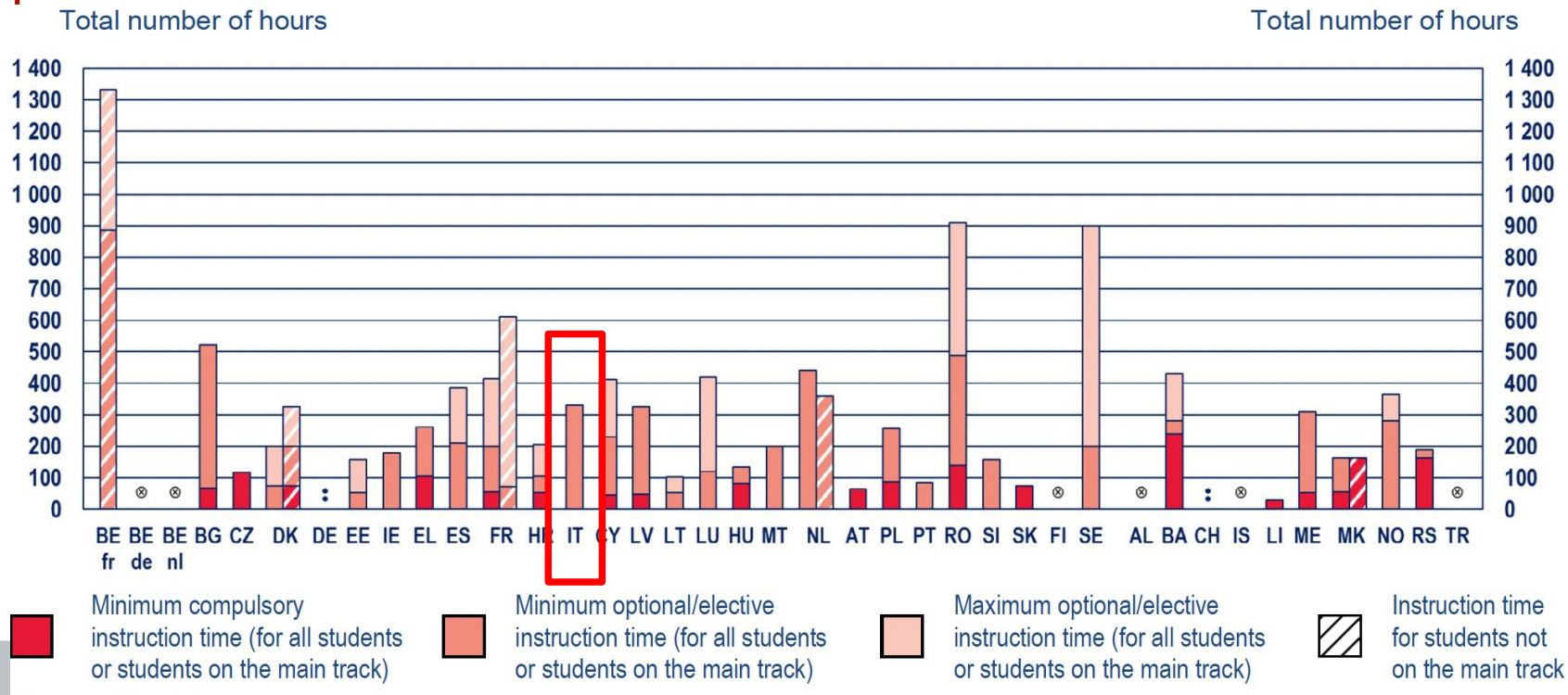
● Separate, compulsory subject ⊙ Separate, compulsory subject for some students ○ Separate, optional subject ◊ Integrated into other subjects α Local/school autonomy Not ISCED 34

How much time spent studying Informatics?

Italy

- 320 hours

Figure 1.4: Instruction time for informatics as a separate subject in general upper secondary education, (ISCED 34), 2020/2021

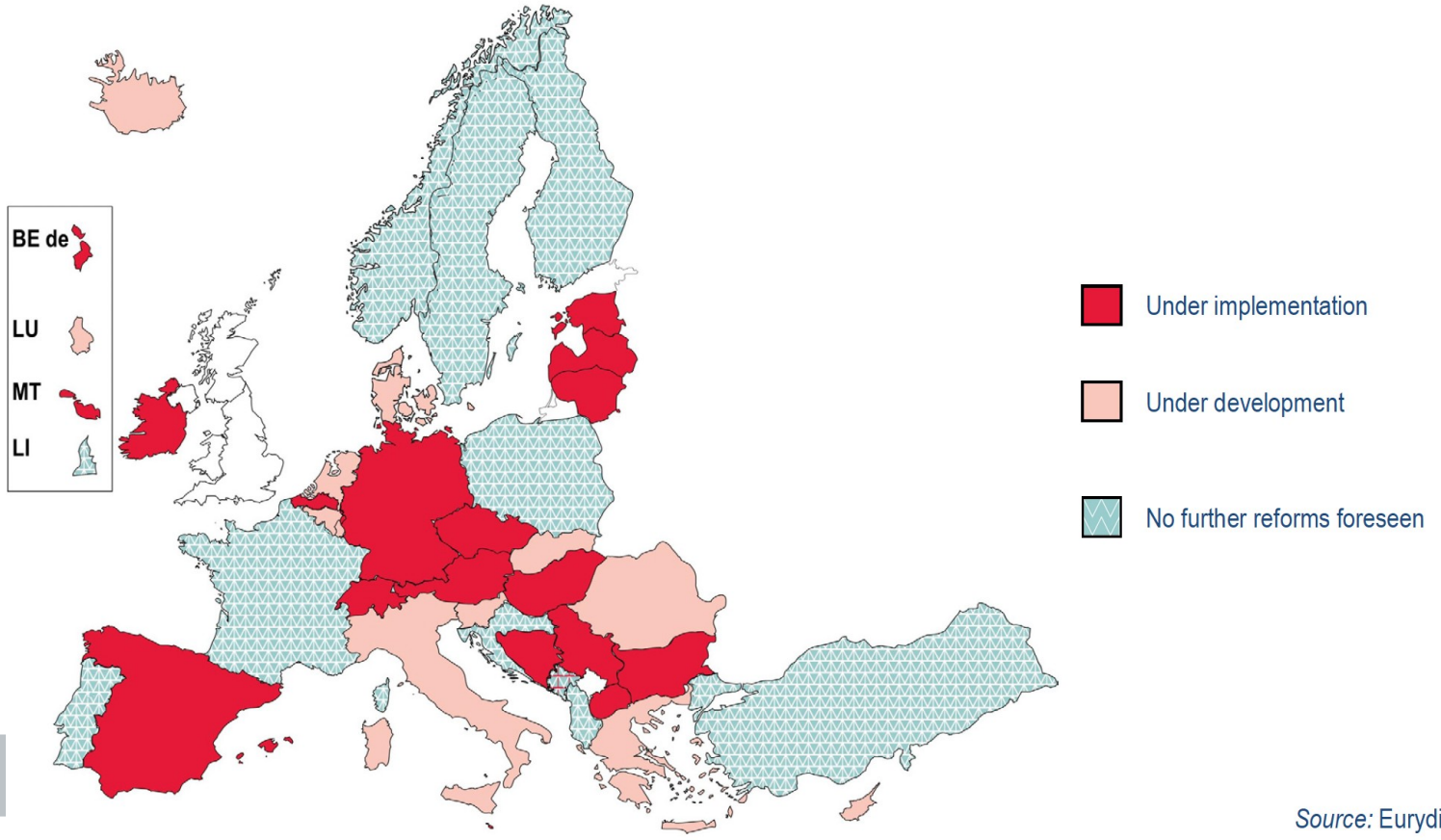


Source: Eurydice.

Work still in progress?

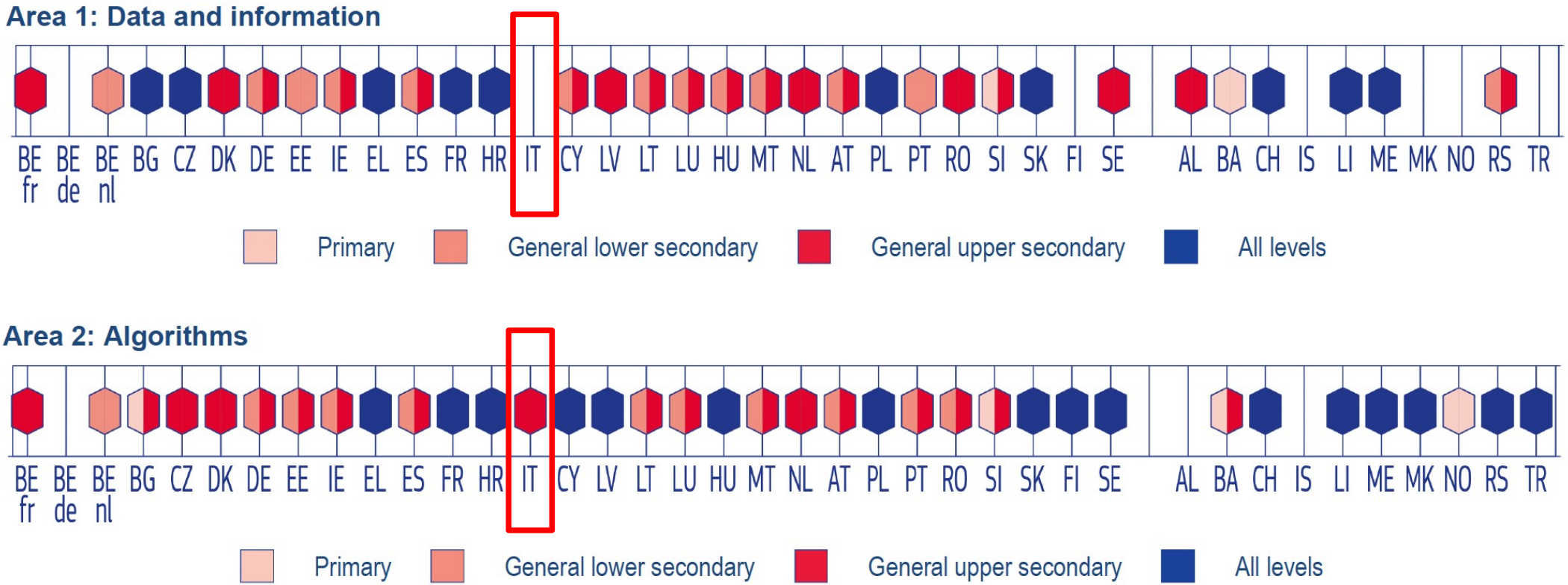
Italy: YES

Figure 1.5: Foreseen curricular reforms for informatics in school education (ISCED 1, 24 and 34), 2020/2021



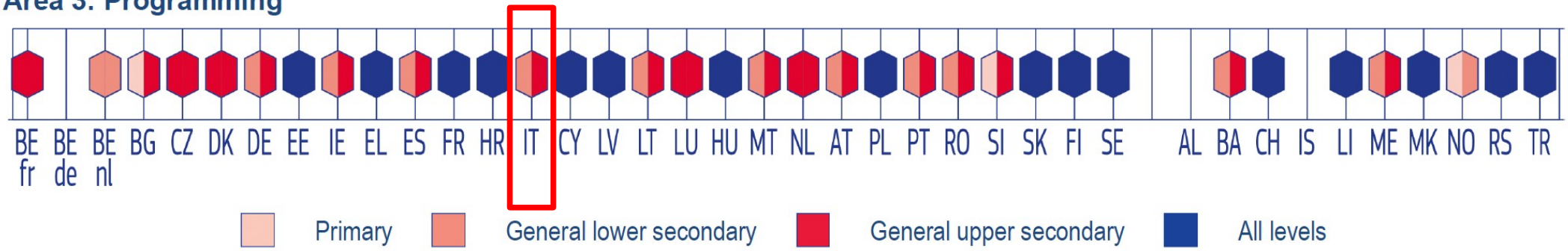
Source: Eurydice.

10 main topics: when are they taught?

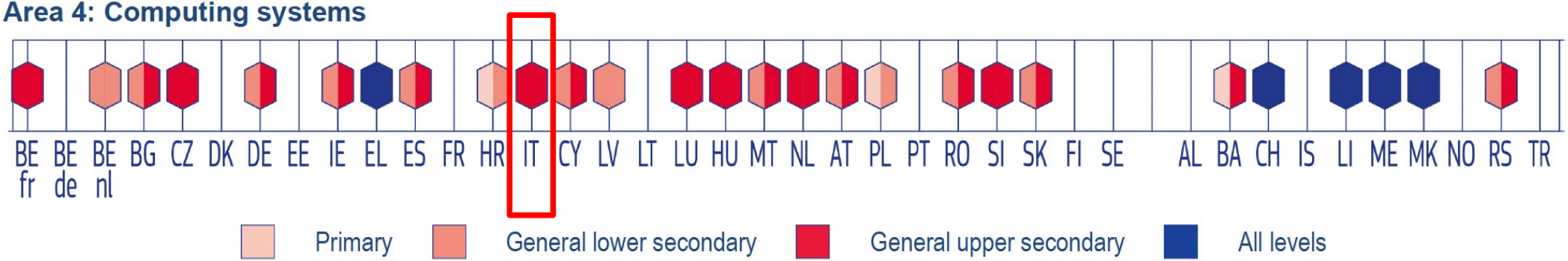


10 main topics: when are they taught?

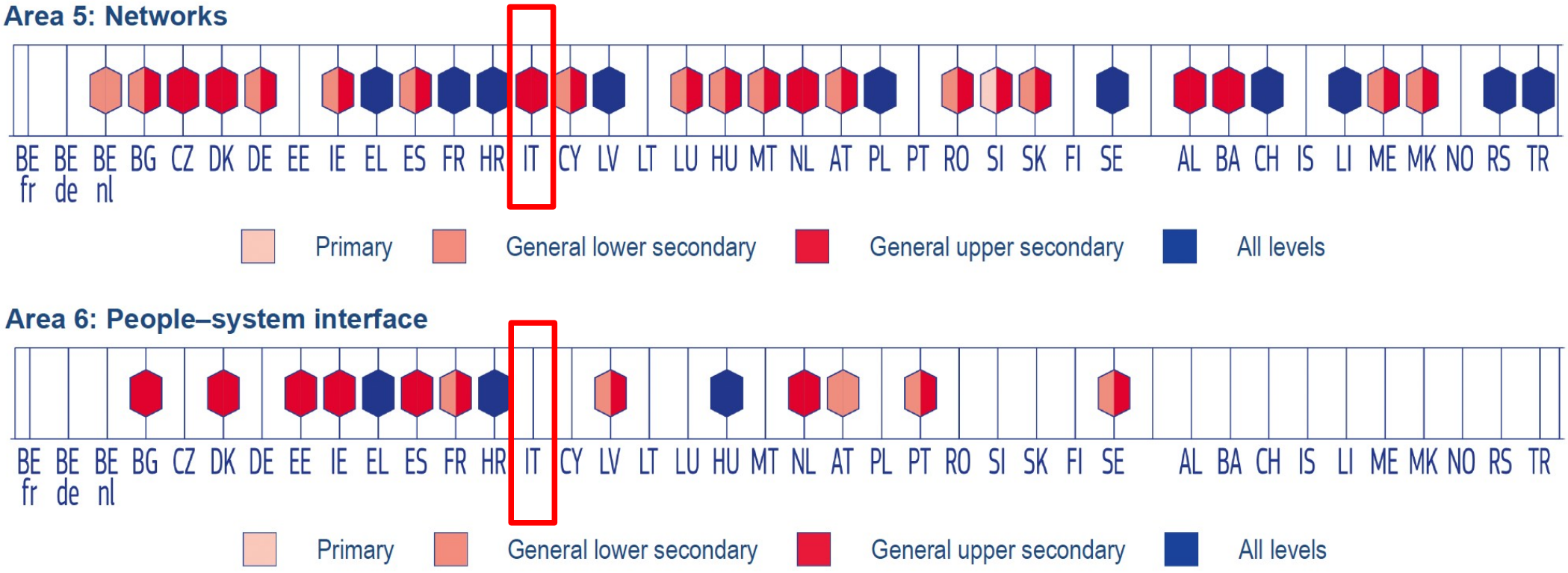
Area 3: Programming



Area 4: Computing systems



10 main topics: when are they taught?



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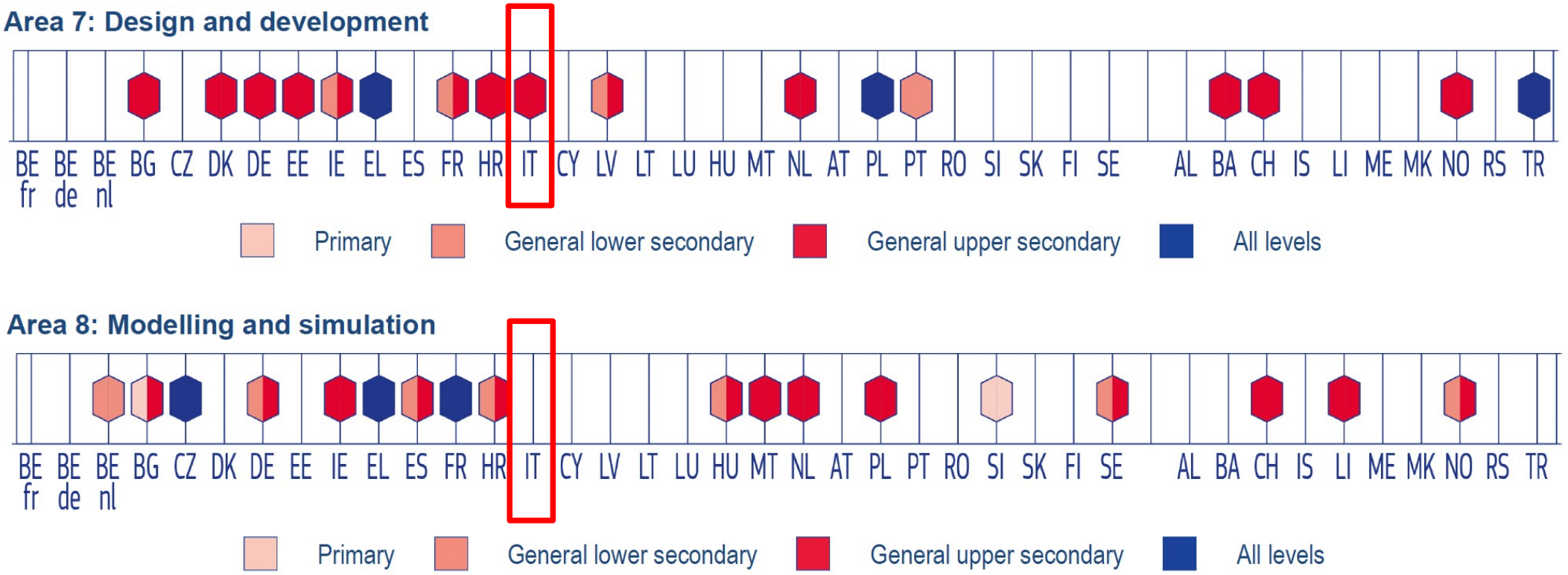
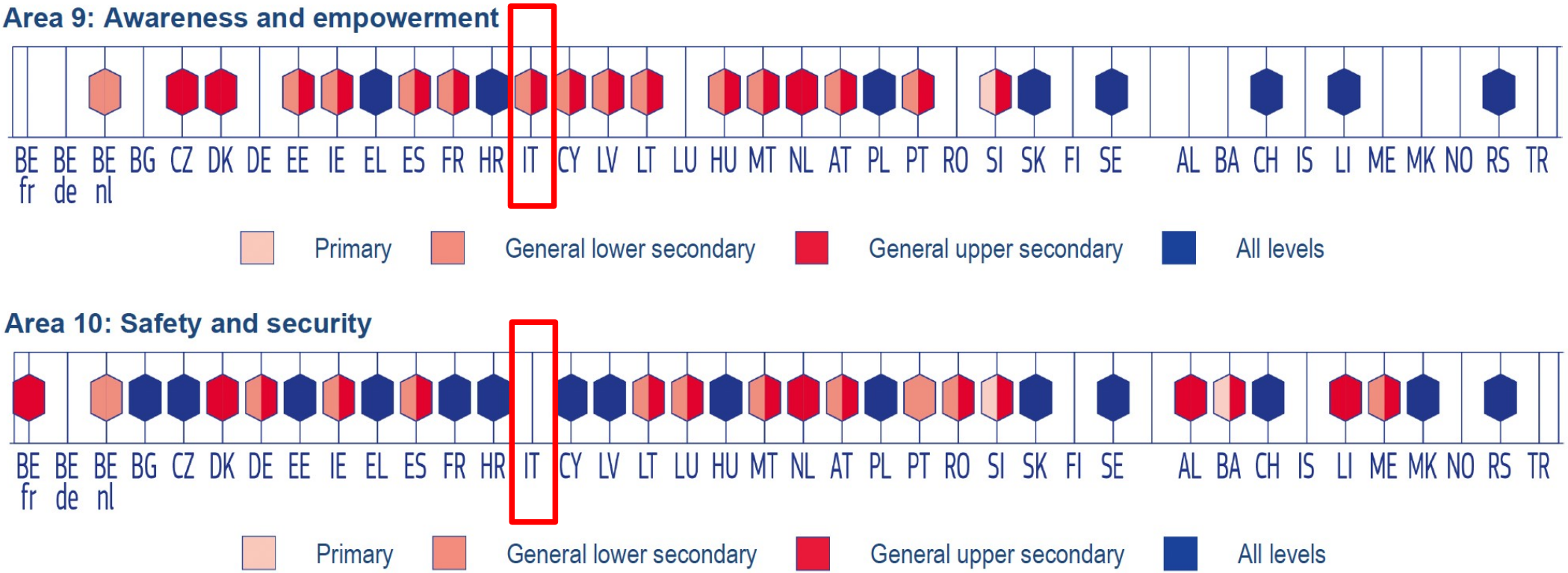
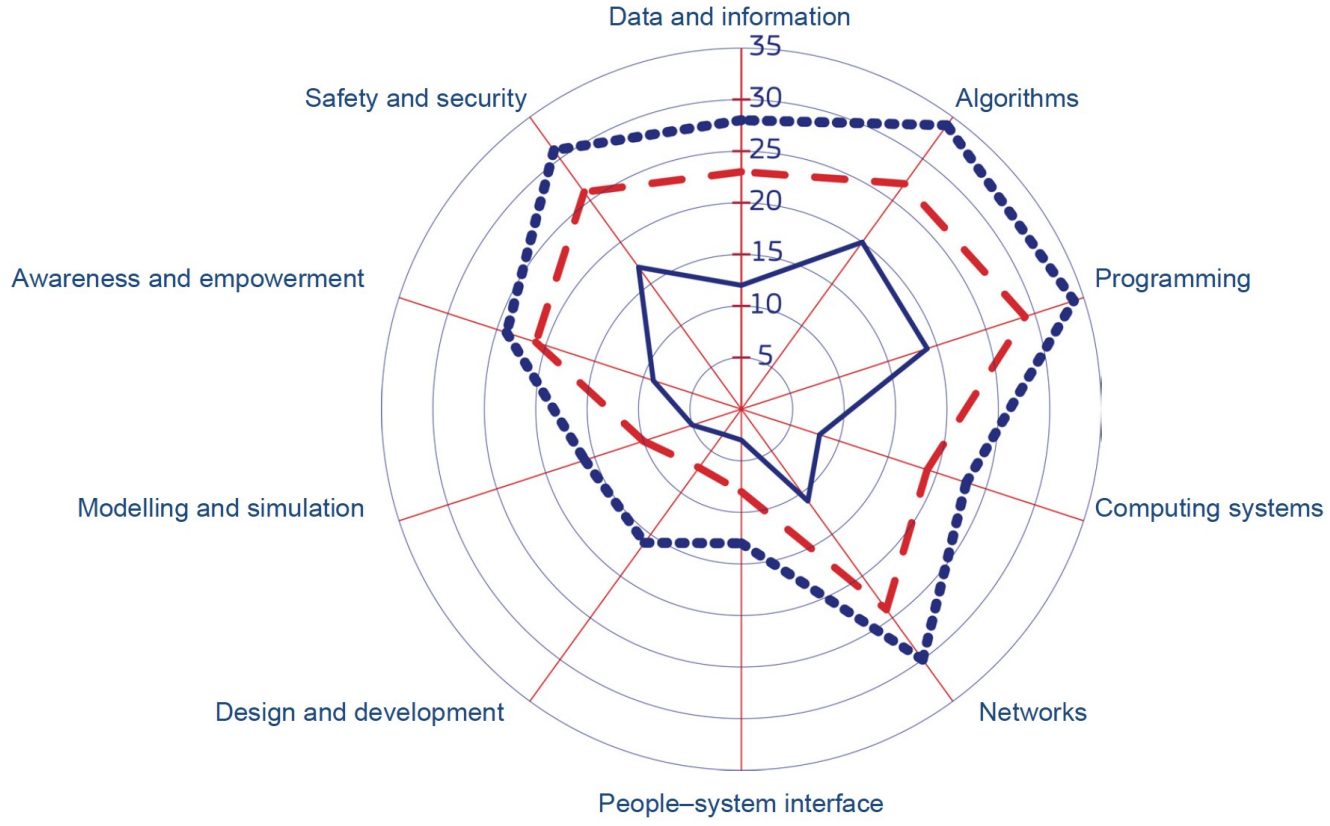


10 main topics: when are they taught?



How many countries cover the 10 areas?

Figure 2.2: Coverage of informatics-related areas by European education systems in primary and general secondary education (ISCED 1 to ISCED 34), 2020/2021



Source: Eurydice.

Areas covered in Italy

Primary | General lower secondary | General upper secondary | All levels

Data and information	NO	Algorithms	YES
Programming	YES	Computing systems	YES
Networks	YES	People–system interface	NO
Design and development	YES	Modelling and simulation	NO
Awareness and empowerment	YES	Safety and security	NO

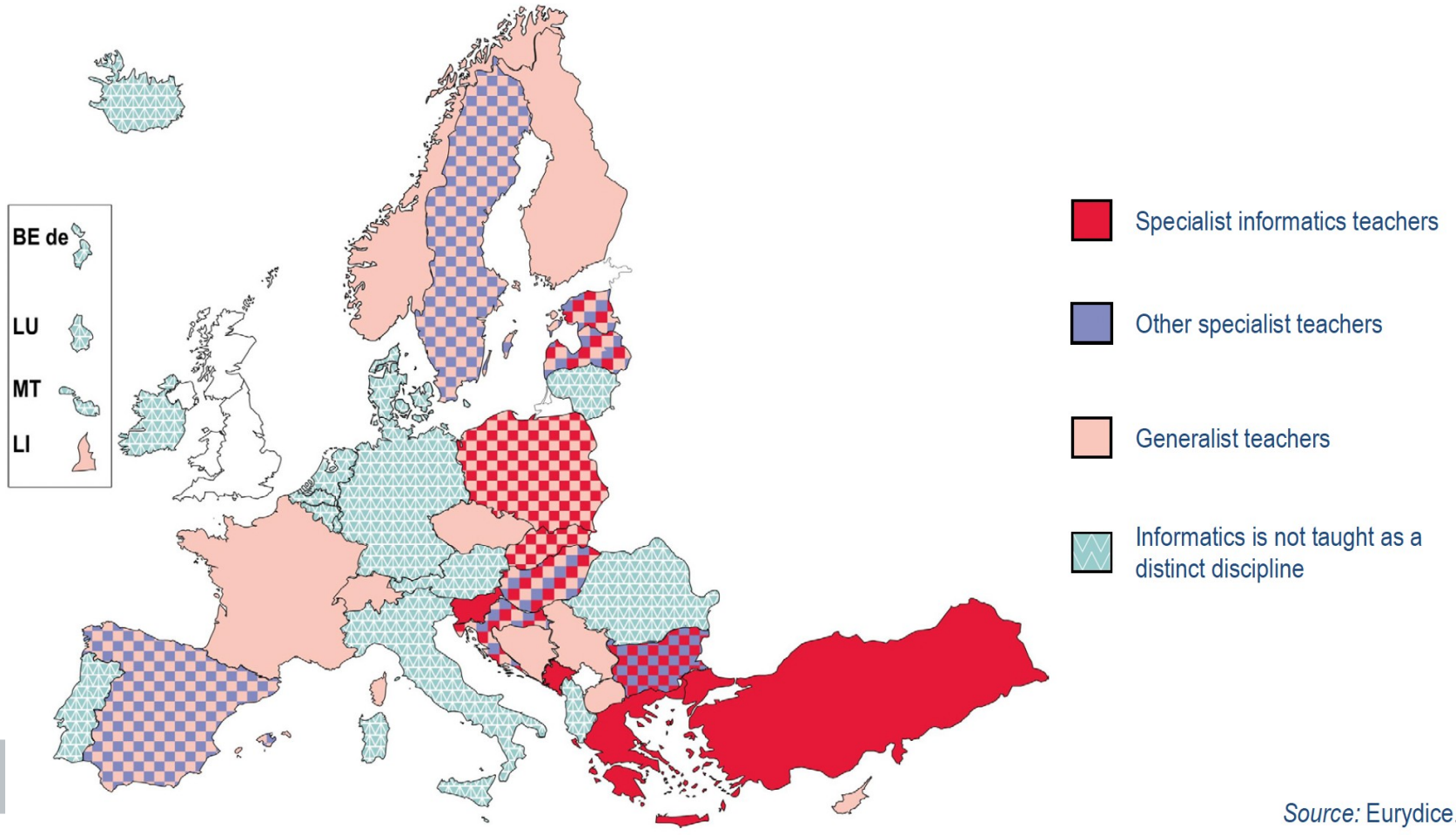
TEACHERS in Primary education

Figure 3.1: Professional profiles of informatics teachers in primary education (ISCED 1), 2020/2021

Italy:

- **Informatics is not a separate subject**

- **Taught by a teacher of another subject**



Source: Eurydice.

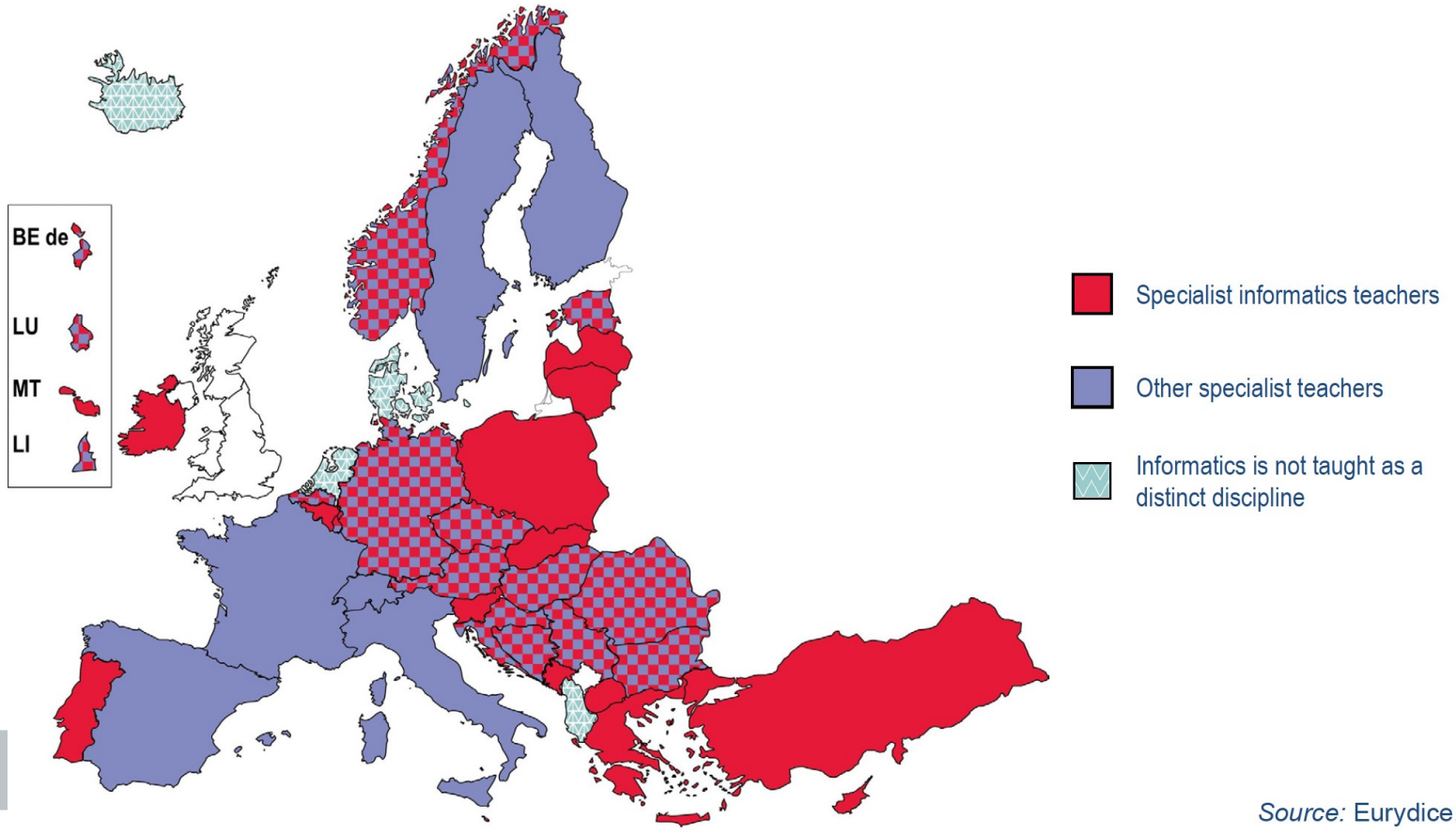
TEACHERS in Lower secondary education

Figure 3.2: Professional profiles of informatics teachers in general lower secondary education (ISCED 24), 2020/2021

Italy:

- **Informatics is a separate subject**

- **But is taught by a teacher of another subject**



Source: Eurydice.

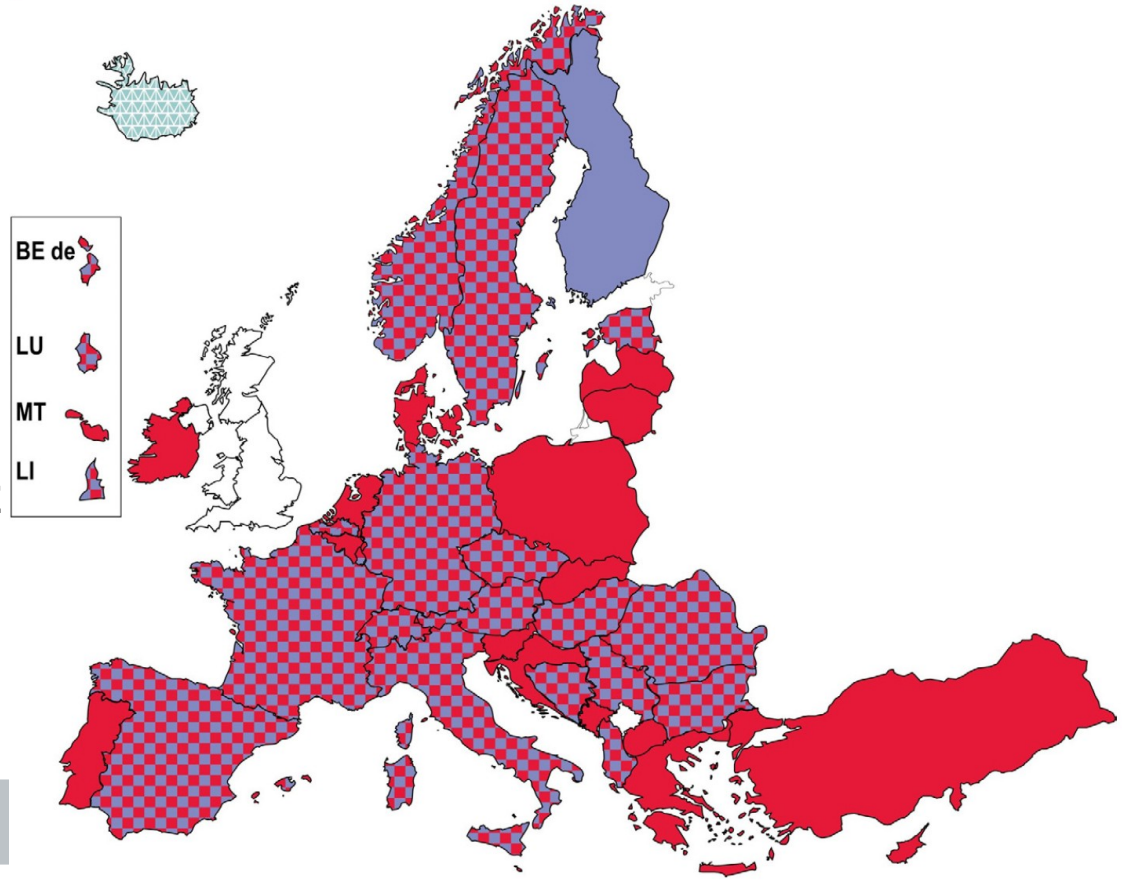
TEACHERS in Higher secondary education

Italy:

- **Informatics**
  - **is a separate subject**

- **Is taught**
  - **either by**
    - **a teacher of another subject**
  - **or by**
    - **a specialist teacher**

Figure 3.3: Professional profiles of informatics teachers in general upper secondary education (ISCED 34), 2020/2021



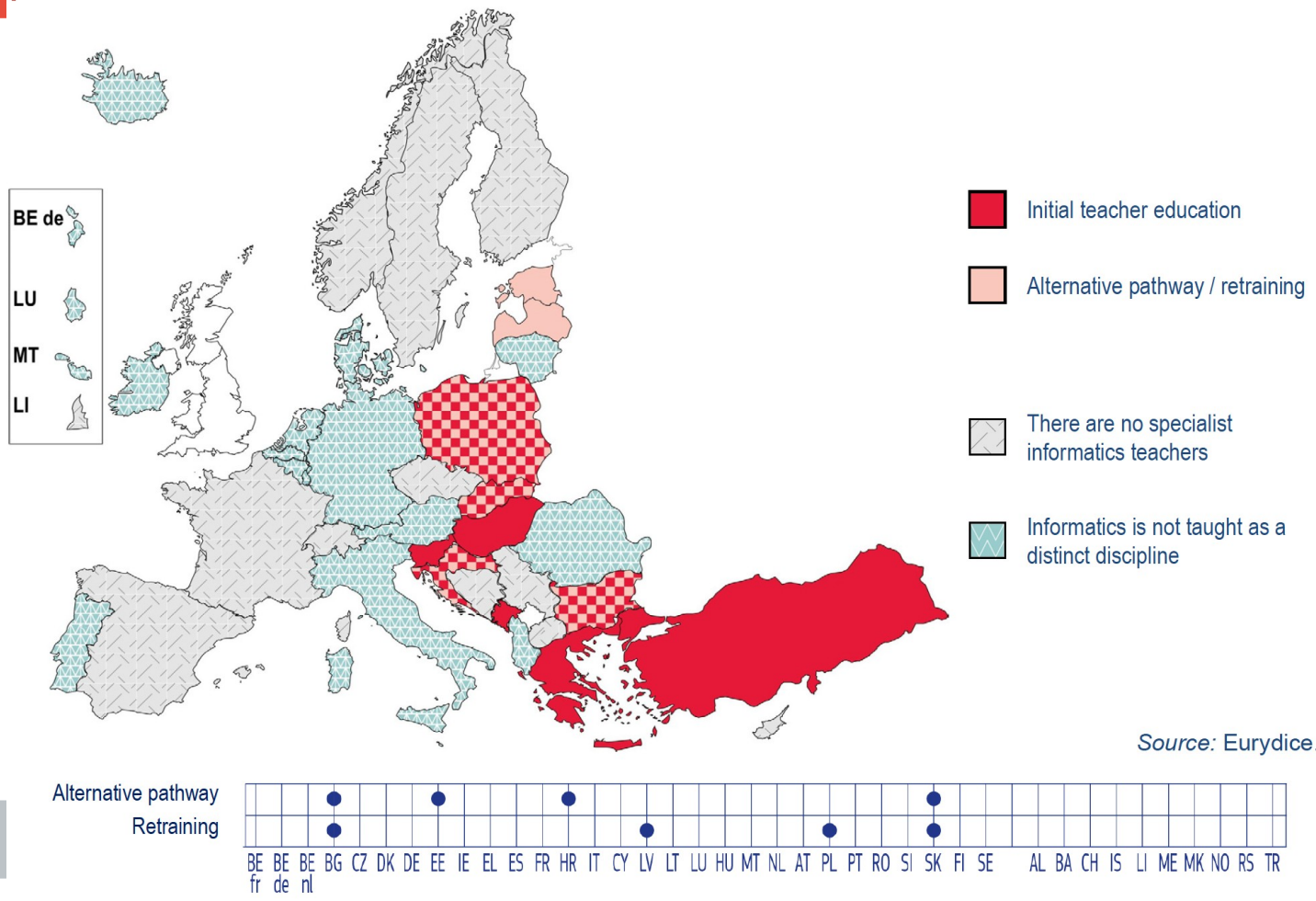
Source: Eurydice.

TEACHER specialist training for Primary education

Italy:

- Informatics is not taught as a separate subject

Figure 3.4: Training specialist informatics teachers for primary education (ISCED 1), 2020/2021

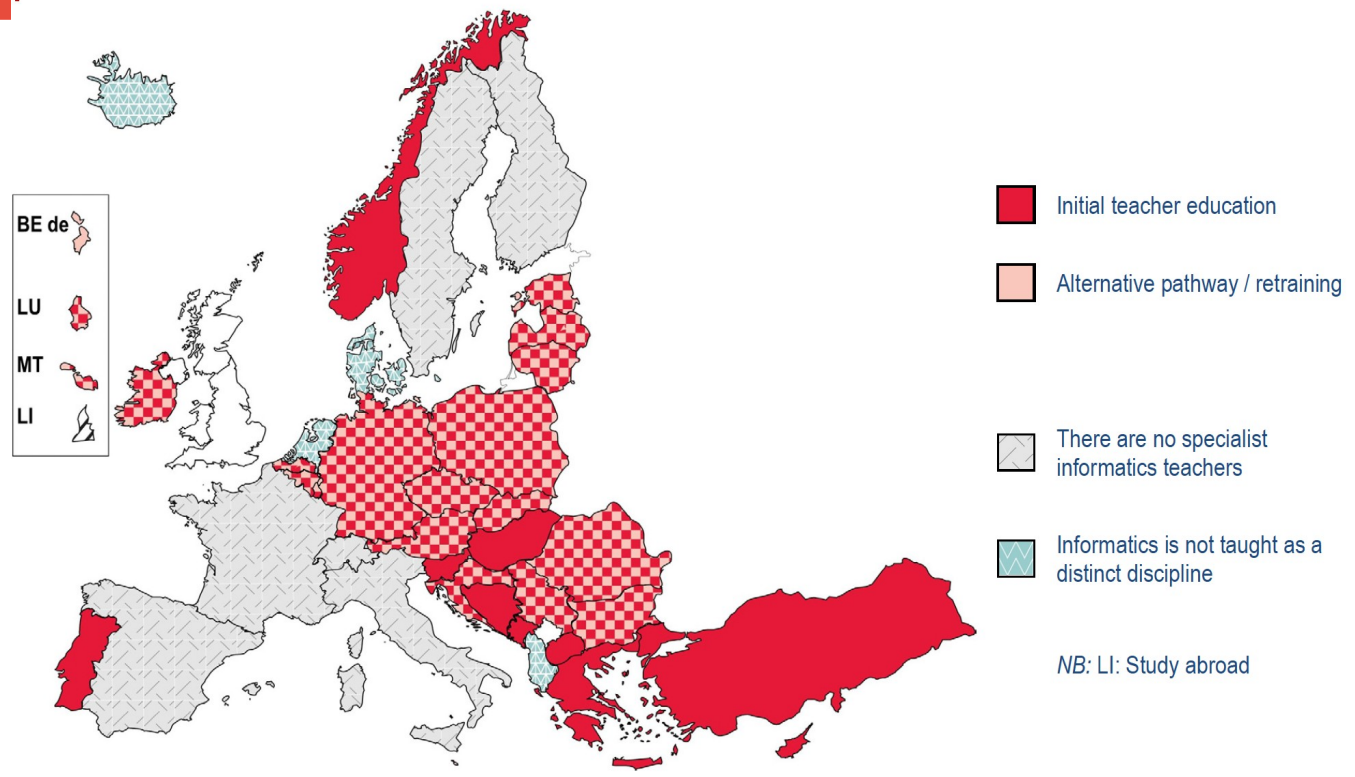


TEACHER specialist training for Lower secondary education

Italy:

- no specialist Informatics teachers

Figure 3.5: Training specialist informatics teachers for general lower secondary education (ISCED 24), 2020/2021

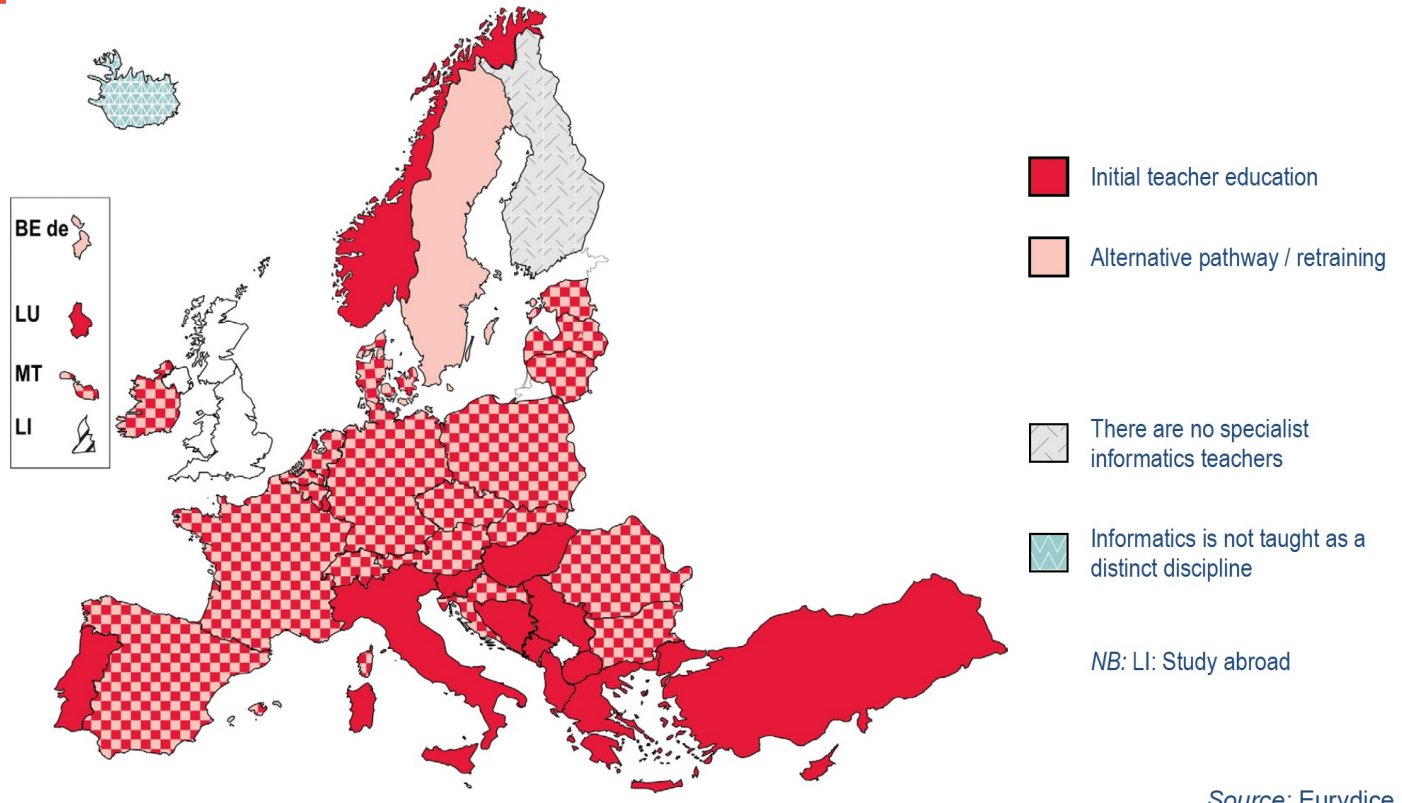


TEACHER specialist training for Upper secondary education

Italy

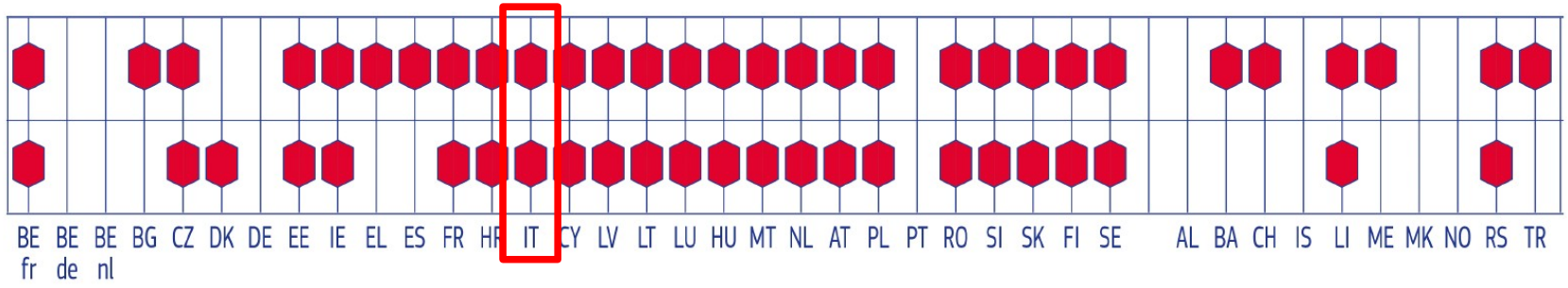
Initial teacher education

Figure 3.6: Training specialist informatics teachers for general upper secondary education (ISCED 34), 2020/2021



Support for teacher training

Figure 3.7: Support measures for in-service informatics teachers (ISCED 1, 24 and 34), 2020/2021



Source: Eurydice.

Italy:

- Targeted training

- Teaching materials