The CECE Report: Creating a Map of Informatics in European Schools

Michael E. Caspersen
It-vest – networking universities
Aarhus, Denmark
mec@it-vest.dk

Judith Gal-Ezer
Department of Computer Science
The Open University of Israel, Israel
galezer@openu.ac.il

Enrico Nardelli
Dipartimento di Matematica
Univ. of Rome "Tor Vergata", Italy
nardelli@mat.uniroma2.it

Jan Vahrenhold (moderator)
Department of Computer Science
WWU Münster, Germany
jan.vahrenhold@uni-muenster.de

Mirko Westermeier
Department of Computer Science
WWU Münster, Germany
mirko.westermeier@uni-muenster.de

CCS CONCEPTS

• **Social and professional topics → K-12 education**;

KEYWORDS

K-12 Education; Digital Literacy; Informatics; Computer Science; Teacher Training

ACM Reference Format:
Michael E. Caspersen, Judith Gal-Ezer, Enrico Nardelli, Jan Vahrenhold (moderator), and Mirko Westermeier. 2018. The CECE Report: Creating a Map of Informatics in European Schools. In *Proceedings of SIGCSE '18: The 49th ACM Technical Symposium on Computter Science Education, Baltimore, MD, USA, February 21–24, 2018 (SIGCSE '18),* 2 pages.
https://doi.org/10.1145/3159450.3159633

1 SUMMARY

Recent years have seen an increase in activities geared towards making Computer Science courses available to all K-12 students. However, due to administrative regulations, such activities and their implementation often need to be localized on a national or even local context; these constraints, often paired with subtle but important terminology differences, hinder those wanting to compare the status quo across the boundaries of administrative units and to draw on experiences made elsewhere.

To address this, we plan to publicize the data, findings, and recommendations of the 2017 report "Informatics Education in Europe: Are We All In The Same Boat?" [3] and to engage the community in a discussion. This report was produced by the *Committee on European Computing Education* (CECE), a committee jointly established by ACM Europe and Informatics Europe in 2014. The report summarizes the status quo of teaching Computer Science (or, as Europeans would say: Informatics) and Digital Literacy in school and the status quo of corresponding teacher training. Being similar in thrust to previous reports [2, 4], its scope is widened to include a large number of different educational systems. In this, the report follows up on the earlier "boat report" by Gander et al. [1] and provides extensive data coverage across Europe (including Israel).

While data was gathered from 55 administrative units (countries, nations, and regions) across Europe, we believe that the report is of interest to non-European policy-makers, researches, and educators. The report shows the difficulties of introducing mandatory curricula even in countries with a long tradition of teaching Informatics in secondary school; discussions about this are in part impeded by terminology issues which the report intends to clarify. Also, it makes a universal case for breaking the vicious circle of a shortage of Informatics classes and a shortage of Informatics teachers and advises against hiring teachers that have not been exposed to a proper subject-matter and didactic training.

As part of the session, we will introduce the interactive web-map (http://cece-map.informatics-europe.org) designed during this project. This map can be used to visualize the data collected and to compare the status quo relative to a given region of interest.

2 SESSION OUTLINE

We break down the session into four parts: (1) Terminology and Methodology, (2) Digital Literacy, (3) Informatics, and (4) Teacher Training. In the first part, we discuss how terminology varies across different countries and the implication of this regarding unified calls to action to policy-makers. We also present the project's data gathering methodology and the infrastructure used for assembling, verifying, and presenting the data. In each of the three latter parts, we first present data, findings, and recommendations of the report. We then use five-minute round-table group sessions to jump-start a discussion about the implications of the report's findings to the non-European audience.

2.1 Terminology and Methodology

Unifying the variations found, we use the following terminology [3, p. 6]: *Informatics* is a distinct scientific discipline, characterized by its own concepts, methods, body of knowledge, and open issues. It covers the foundations of computational structures, processes, artifacts and systems; and their software designs, their applications, and their impact on society. *Digital Literacy* covers fluency with standard software tools and the Internet.

For obvious reasons, educational policy documents and curricula are written in an administrative region's official language. Give

SIGCSE '18, February 21–24, 2018, Baltimore, MD, USA

ACM ISBN 978-1-4503-5103-4/18/02.
https://doi.org/10.1145/3159450.3159633

the variety of European languages, the committee used their professional networks for assembling and verifying the data. For this, an interactive web map was developed whose interface allowed for conducting a semi-public verification of the data quality prior to going fully online. The map can be used to visualize the data across one of the 26 dimensions for which data has been collected. Moreover, users can select an administrative region and display the values of a given data dimension relative to all other administrative units; this may be helpful to support policy discussions. To ensure data quality even after the publication of the report, the map allows to report changes in the data which, after having been reviewed, can be integrated into the data base. The underlying data model as well as the visualization is not tailored to a particular geographic region and, hence, can be extended to include administrative units beyond the scope of the report.

This part of the session is scheduled to last 15 minutes (presenters: J. Vahrenhold and M. Westermeier).

2.2 Informatics

Gander et al. [1] recommend that "all students should benefit from education in Informatics as an independent scientific subject, studied both for its intrinsic intellectual and educational value and for its applications to other disciplines". When considering the impact that the digital revolution has had on all aspects of society it would be natural to expect Informatics to be taught at least at the secondary school level, though elements of the foundations of Informatics could be taught at a much earlier stage.

We aimed at learning when Informatics, if at all present, is first introduced in the schooling system; what are the de facto opportunities students have for properly learning the subject; and what is the situation regarding the preparation of teachers of the subject. We also sought an understanding of the policy landscape regarding curricula and education policies. The main findings [3, p. 5] are:

- "The evident lack of compulsory, or at least elective, Informatics courses in schools across Europe shows that Informatics is not regarded as being on par with other scientific disciplines."
- "In several countries/regions, students can graduate from secondary schools without ever being exposed even to the basic principles of Informatics."

This part of the session is scheduled to consist of a presentation (eight minutes, presenter: M.E. Caspersen) followed by five minutes of group discussions and five minutes of public discussion time.

2.3 Digital Literacy

Another key recommendation of Gander et al. [1] was that "all students should benefit from education in Digital Literacy, starting from an early age and mastering the basic concepts by age 12". The goal is to enable students to (1) Select and effectively use standard software, e.g., word processors, presenter tools, web browsers, and spreadsheets (act, process, and communicate with these tools); (2) Critically retrieve and filter digital information; and (3) Evaluate ordinary user aspects of digital security, privacy, and credibility. The main findings, as stated in the report [3, p. 5] are:

- "Digital Literacy is accepted as an educational subject across Europe. Teaching of this subject starts early, very often in primary schools."
- "There are rarely stand-alone curricula for teacher training in Digital Literacy. Thus, there is the danger that the subject is taught by teachers who do not have the appropriate subject-matter knowledge."

This part of the session is scheduled to consist of a presentation (eight minutes, presenter: E. Nardelli) followed by five minutes of group discussions and five minutes of public discussion time.

2.4 Teacher Training

Teachers are the key to the success of the implementation of any curriculum. That is while teachers certified to teach any subject should have a formal relevant education, they should get the opportunity of professional development while on job, especially in the area of Informatics, let alone digital technology. In addition, teachers of all subjects should be familiar with the specific pedagogy and methodology of the subject they teach. These can be acquired in special certification programs or in professional development workshops. This is crucial when introducing Informatics in elementary school. The report's main findings [3, p. 5] are:

- "In general, provisions are in place to train Informatics teachers in the same way as teachers of any other discipline."
- "In many European countries/regions, low-level re-training requirements, if any, for teaching Informatics undermine its recognition and adoption as a foundational discipline."

This part of the session is scheduled to consist of a presentation (eight minutes, persenter: J. Gal-Ezer) followed by five minutes of group discussions and five minutes of public discussion time.

3 EXPECTATIONS

The session's intended audience is composed of both policy-makers on all levels of influence and researchers working in the K-12 space.

4 SUITABILITY

The crucial factor of involving the non-European community in a discussion about the implications of the report and calls to action would be difficult to accomplish in the other available formats. Also, inviting the community to carry on with similar projects or to continue to contribute to the map created would be less effective without the individual hands-on interactions that will be made possible during the group breakouts.

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