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An international benchmark study of K-12 computer science education in schools


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An International Benchmark Study of K-12 Computer Science Education in Schools

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ABSTRACT

There has been a growing interest and increase in work shared about national K-12 Computer Science Education (CSED) curriculum and implementation efforts around the world. Much of this work focuses on curriculum analysis, country reports, experience reports and case studies.

The K-12 CSED community would benefit from an international strategic effort to compare, contrast and monitor K-12 CSED over time, across multiple countries and regions, to understand pedagogy, practice, resources and experiences from the perspective of teachers working in classrooms. Furthermore, there is a need for validated and robust instruments that can support comparable investigations into the current state of K-12 CSED in schools around the world.

Through a collaborative effort, this Working Group will develop a validated teacher survey instrument and collect data about CSED implementation and practice in K-12 classrooms. The authors will

pilot the survey with K-12 teacher cohorts and analyse, compare and contrast survey findings across countries.

CCS CONCEPTS

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

KEYWORDS

ITiCSE Working Group, K-12, Computer Science Education, Informatics Education, Schools, Survey

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1 RELATED WORK

A number of country and regional reports have been produced, detailing K-12 CSED curriculum and initiatives across Europe [1, 7] and the UK [15, 16]. The International Conference on Informatics in Schools (ISSEP) have also welcomed country reports, resulting in publications about the state of K-12 CSED in the United States (US)

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[8], Wales [12] and Poland [14], among others. The ACM Transactions on Computing Education (TOCE) dedicated two volumes for a special issue that covered a range of countries as case studies in K-12 CSED (see Vol. 14, no. 2, 2014) [9] and increasingly researchers have published works about their country curricula and/or initiatives, including in France [5], the Netherlands [2], Australia [6] and England [4], to name a few. Researchers have also performed comprehensive curriculum analysis across countries and resources to identify the emergence of common K-12 CSED topics and concepts to inform future curriculum developments and research [3, 17].

Related to this Working Group topic, in 2011 a Group [11] undertook the process of collecting and evaluating research findings about secondary CSED from different countries, and in the process developed a category system (Darmstadt Model) to support future research activities and comparison of results across regional and national boundaries. Expanding this work, a Working Group applied the Darmstadt Model to analyse, compare and extract insights from the articles published within two K-12 CSED special issues for TOCE [10]. This work sought to understand CSED topics taught in schools, goals and competencies, programming languages and tools adopted, assessment practices and teacher training, however, the authors acknowledged that a limitation of the study was that it was restricted to the analysis of selected journal publications.

In 2013, a Working Group formed to investigate trends of CS as a subject in schools by inviting CSED and teaching professionals worldwide to complete an online questionnaire about the current state of K-12 CSED in their country [13]. Experts from 22 countries responded, addressing CSED topics and goals covered across K-12 as well as teaching methods, however, a limitation being that results were based on a small group of experts.

Prior work has set a strong foundation for understanding the state of K-12 CSED curriculum and implementation efforts, however, there is an opportunity to further expand this work to focus on what K-12 teachers are doing in classrooms. There is also a need to develop instruments that are robust and reliable for use in longitudinal, multinational studies for comparisons across countries.

2 OBJECTIVES

The broad objectives of the Working Group are:

- To build an international research collaboration and strategy for investigating K-12 CSED in schools.
- To initiate a scalable, collective effort for a deeper investigation into what is happening in schools, based on the experiences of educators in classrooms.
- To develop an open source teacher survey instrument that can be implemented across countries.

This Working Group will build on prior work to develop a validated instrument for surveying K-12 teachers about their experiences and approaches to CSED implementation in the classroom, including demographics, self-efficacy, teaching methods, experiences, use of resources and curriculum topics implemented.

The Group will review and draw on earlier work to guide the development of a validated and reliable instrument that can transcend boundaries and be used for consistent, ongoing data collection. The authors will pilot the survey with K-12 teacher cohorts in their locations and the group will collectively analyse, compare and contrast

the survey findings. The report will describe the survey instrument and present the survey findings. The group will make the survey instrument available as open-source.

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