Preparation of High School Computer Science Teachers: The Israeli Perspective

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Abstract
This special session examines frameworks for the preparation of high school computer science (CS) teachers from the Israeli perspective. Specifically, several Israeli CS teacher preparation programs and their components are presented. The presentation includes both a general overview and a detailed description of the actual implementation of such programs. This bipolar presentation, we suggest, provides practical guidelines with respect to CS teacher preparation, both for policy makers and for faculty members who wish to establish a CS teacher preparation program at their universities.

Categories and Subject Descriptors
K.3.2 [Computers and Education]: Computer and Information Science Education – Computer science education, Curriculum.

General Terms
Management, Performance, Human Factors.

Keywords
Computer science education, computer science teacher preparation, Methods of Teaching Computer Science course, practicum in computer science, tutoring in computer science, computer science education in Israel.

1. OVERALL OBJECTIVE OF THE SESSION
This special session addresses high school computer science (CS) education in Israel from the perspective of teacher preparation. Specifically, it describes the Israeli nation-wide infrastructure for CS teacher preparation programs, and using specific examples of courses and activities, illustrates the spirit, organization, and practice of these programs. The special session is organized around three short presentations followed by a discussion with the audience.

The importance of this special session derives from (a) the worldwide recognition of the importance of high school CS teacher preparation [10]; (b) the strength of the Israeli national-wide high school CS curriculum [2, 6, 11]; and (c) the implementation of various models of teacher preparation programs in Israel [3, 7, 8].

In most cases, teacher preparation programs are taught in universities or colleges. The prospective CS teachers study for a Bachelors degree in CS and at the same time attend teacher preparation program courses (which are equivalent to one academic year). The contents of these programs correlate with the statement that “beyond the mastery of core CS material, good CS educators should also be familiar with a significant body of material that will expand their perspectives on the field, and consequently, enhance the quality of their teaching.” [1]. A typical teacher preparation program includes general pedagogical courses (e.g., psychology and educational philosophy), basic teaching skills, and specific pedagogical courses related to CS education, such as the Methods of Teaching CS course and a practicum in real high school CS classes. Two examples of CS teacher preparation program are described in [3] and in [8].

Accordingly, in addition to an overview of teacher preparation programs in Israel, we elaborate in this session on two of the main components that focus on CS teaching – the Methods of Teaching CS course and tutoring and practicum in high school CS classes.

We would add that CS teacher preparation programs usually serve also in-service teachers by offering them ongoing training on topics included in the curriculum, teaching methods, and the development of CS as a scientific field.

2. OUTLINE OF THE SESSION

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<tr>
<td>15 min. Overview of high school CS teacher preparation programs in Israel</td>
<td>Judith Gal-Ezer</td>
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<tr>
<td>10 min. The Methods of Teaching CS course</td>
<td>Orit Hazzan</td>
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<td>15 min. Tutoring and practicum</td>
<td>Noa Ragonis</td>
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<td>30 min. Open discussion</td>
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In what follows, we elaborate on each part of the special session.

2.1 Overview of High School CS Teacher Preparation Programs in Israel
This part of the special session reviews the role, importance, and contribution of CS teacher preparation programs to the establishment of a nation-wide CS curriculum. It is partially based on the analysis of the structure of the Israeli high school CS education system [6] (see Figure 1).

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Based on this analysis, we present a model for high school CS education. The model consists of interrelationships among four key components:

- A well-defined curriculum (including written course text books and teaching guides);
- A requirement of a mandatory formal CS teaching license;
- Teacher preparation programs (including at least a Bachelors degree in CS and a CS teaching certificate study program);
- Research in CS education.

It is proposed that each of these components, as well as the relationships among them, establishes the solid infrastructure of the Israeli high school CS curriculum, strengthens it and makes it one of the leading high school CS curricula in the world.

### 2.2 The Methods of Teaching CS Course

In this section, we present several possible frameworks for the Methods of Teaching CS course together with their implementations. We emphasize that the suggested frameworks and implementations are not limited to a particular curriculum, programming paradigm, programming language, or level of students. Additional details about the Methods of Teaching CS course can be found in [4, 7, 8].

### 2.3 Tutoring and Practicum

This part of the special session focuses on practicing CS high school education in two frameworks: the practicum carried out in high schools CS classes and tutoring programs.

The practicum is carried out in several ways. Some programs require a full year’s participation in school activities; others require that the practicum be performed for a specific, shorter period of time. In all these cases, however, the main objective of the practicum is to let the prospective teachers experience what real teaching is before becoming CS teachers. For more details about the CS practicum see [5].

We also present a tutoring model, whose objective is to develop and establish the pedagogical-disciplinary knowledge of prospective CS teachers with respect to guiding learners in problem-solving processes. For more details see [9].

### 3. Summary

As the above session timetable and outline indicate, the special session provides an overview of CS teacher preparation programs in Israel, on the one hand, and on the other hand, outlines details of specific components of these programs. Therefore, the special session is of interest both to policy makers regarding CS teacher preparation and to practitioners who wish to establish a CS teacher preparation program in their institute.

### 4. REFERENCES


