Theory in Secondary Education: Increasing Accessibility

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Abstract: Computer science courses for high schoolers and beginning undergraduates often focus exclusively on programming. This BOF will explore options for introducing aspects of theoretical computer science, including algorithms and complexity theory, to such an audience. This BOF will provide a platform for discussing methods to make ideas from algorithms and complexity accessible to a wider audience, which is of particular interest given the understanding of algorithms that the proposed CS Principles course hopes to convey. This BOF focuses on methods to make these concepts accessible to students at all levels, independent of programming knowledge. We hope to discuss fundamental algorithms, the P vs. NP problem and NP-completeness, and other aspects of complexity including the notion of reducibility.

Significance & Relevance of the Topic: High school and beginning undergraduate computer science courses focus on programming; typically, an introductory course that highlights the methods and techniques of program design followed by a course in basic algorithms and data-structures. However, many vital aspects of the theory of computation such as analysis of algorithms, formal languages, and the theory of NP-completeness are often ignored until the third or fourth year of instruction. Therefore, this BOF hopes to prompt a discussion surrounding ways to include this topic in high school and beginning undergraduate courses, and attract more individuals to the underlying theory of computation.

Expected Audience: The audience is expected to consist of a number of secondary and undergraduate-level computer science instructors who are interested in making topics within theoretical computer science accessible to a wider audience. The audience is estimated to be between 10 and 20 attendees.

Expertise of Discussion Leader(s): Baker Franke is an experienced high school computer science teacher, and has taught a broad range of students at the University of Chicago Laboratory Schools. Specifically, he's included aspects of formal algorithm analysis (including definitions of $O/\Theta/\Omega$ notation and formal analysis of sorting algorithms) in his AP Computer Science course. Rahul Mehta is a senior at the University of Chicago Laboratory Schools who has conducted research in the area of graph algorithms (specifically the max-flow problem); the student perspective in this matter is important as well, in our opinion.

Special Requirements: No additional materials will be necessary.

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