

Proposer:

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Title:**Beyond CS Principles: Bringing the Frontiers of Computing to K12****Abstract:**

The AP Computer Science Principles (CSP) high school course introduces students to computer science and programming. What should motivated students study after successful completion of AP CSP? The AP CSA class teaches Java programming and it has traditionally not attracted students from underrepresented groups. We are working on an alternative, projects-based course that will teach cutting edge CS concepts, such as distributed computing, computer networking, cybersecurity, the internet of things and machine learning, in a hands-on, accessible manner. Such an approach enables students to work on problems that interest them making computing more relevant and the curriculum more engaging. We utilize NetsBlox, a collaborative, block-based programming environment that extends Snap! with a few carefully selected abstractions that open up the vast array of resources freely available on the internet for student programs. This demonstration will introduce the environment and highlight its utility in creating distributed applications such as a shared whiteboard app and projects that access public domain scientific data sources and visualize them in various ways using online services such as Google Maps or charting. Moreover, the tool enables students to work together on the same project remotely similarly to how Google Docs operate. More information is available at <https://netsblox.org>.

Significance and Relevance:

Distributed and cloud computing, artificial intelligence and machine learning, autonomous systems and cybersecurity, big data and the internet of things are some of the new frontiers of computing that are fundamentally transforming 21st century life. Computing is also transforming innovation in every discipline, becoming an integral tool that is spurring new ways of doing and thinking. Building on the foundation that AP CSP provides, our new course seeks to dramatically expand access to the most interesting and exciting frontiers of computing and the types of collaboration and 21st century skills required to productively leverage computational methods and tools in virtually every profession. The curriculum is designed to be relatable to high school students, and especially girls, by affording exploration of topics such as social justice, healthcare, and climate change, and emphasize project-based learning, collaboration and teamwork. The novice-friendly NetsBlox programming environment accesses publicly available data sources to allow exploration of these cutting-edge computing ideas. The demonstration will showcase the first module of the course: distributed computing and computer networking. After a brief overview of the project, the first part of the demo will focus on showcasing how to access online public domain data sources, such as up-to-date COVID counts and online services such as maps and charting. Other projects from the module include utilizing climate change data such as carbon dioxide and temperature estimates from Antarctic ice cores going back 800,000 years, an IMDB-

like movie database, and the geolocation services of Google. The second portion will present how message passing enables distributed programs. Specifically, we'll present a simple project that allows students to draw on each other's stage. Other projects that participants can explore on their own after the demo include distributed multi-player games, a chatroom and peer to peer networking. Online synchronous and asynchronous remote collaboration support will be also shown, a feature that has gained special significance in the era of remote learning.

Expected Audience:

- High school CS teachers.
- Education researchers exploring news ways to teach CS.

Other Presenters:

- Brian Broll; Research Scientist, Department of Electrical Engineering and Computer Science; Vanderbilt University; brian.broll@vanderbilt.edu
- Shuchi Grover; Senior Research Scientist, Looking Glass Ventures/Stanford University; shuchig@cs.stanford.edu
- Veronica Cateté; Research Scientist, Department of Computer Science, North Carolina State University; vmcatete@ncsu.edu

Expertise of Presenters:

All presenters have multiple years of experience making presentations and demos at conferences like SIGCSE and CSTA. They have led many classroom studies in various K12 schools and teacher PD workshops using NetsBlox or similar tools, such as Snap!

Agenda:

0-5 minutes: Brief overview of the course and introduction to NetsBlox. Q&A

5-10 minutes: Demo of online data access: geographic COVID data visualization. Q&A

10-15 minutes: Demo of message passing: distributed hello world and shared whiteboard. Q&A

15-20 minutes: Q&A

Virtual Requirements

None