

Climate Science, Data Science and Distributed Computing to Build Teen Students' Positive Perceptions of CS

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ABSTRACT

Providing learners with authentic interdisciplinary experiences is one strategy to foster positive perceptions of CS as a discipline that supports a breadth of applications. We designed a high school mini course using climate science as an interdisciplinary context, since it is of interest to today's youth and provides opportunities to engage with authentic applications of computing that leverage real data to examine issues. The course was designed to engage students in climate change, data visualization, distributed computing, and motivate the use of advanced data abstractions and practices. We used NetsBlox, an extension of Snap! that makes real datasets & Web services accessible through easy-to-use blocks. A paleoclimatologist led climate science discussions and research questions with students. Post-survey responses to questions probing insights students gained shed light on the positive impact on students' perceptions of CS through this interdisciplinary experience, and how it expanded their horizons for future STEM inquiry using data and computing. We share curricular details for use in high schools and takeaways to help promote rich programming experiences that improve students' perceptions of computing.

1 INTRODUCTION / PROBLEM

One of the goals of CS education in schools is to address the many misperceptions of CS among students while fostering an appreciation of how CS can be used for innovation, creativity, and addressing real-world issues. Authentic interdisciplinary experiences can help foster such beliefs and perceptions of CS. The new science (NGSS) standards promote intersections with computing and data science, new tools for integrating STEM and CS, and a need for building data literacy skills making this an opportune time to design authentic interdisciplinary experiences.

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2 BACKGROUND / RELATED WORK

This work builds on research on how perceptions influence judgement and actions [5]. It also draws on NGSS standards that promote data science and computing in science learning, as well as recent shifts promoting data centric computing education [2].

3 METHODS / RESULTS

The “Climate Change and Computing” mini course designed and facilitated by computer scientists and climate scientists was centered on climate change to engage a *majority female* high school group in climate science as well as several aspects of data science and trends to understand the climate crisis better. This was done through easy-to-use distributed computing features of NetsBlox [3, 4] to access web API's and data from real climate data sources. Students engaged in data analyses through coding data visualizations and working with multi-dimensional datasets. Surveys probing students' perceptions of computing suggested the positive shift fostered by this experience. Some students expressed a-ha's that computer science “*is more than making a character move and follow directions*”, and instead can be a “*useful tool*” to pull in a variety of real data to analyze and visualize and “*learn and discover*” real phenomena. The post-survey also probed students' ideas on how they would like to use computing. Responses suggested the many ideas—related to both, the many diverse aspects of climate change and other interdisciplinary topics—that this experience triggered for our teen students.

4 CONTRIBUTIONS AND FUTURE WORK

This work contributes to literature on how we can design rich interdisciplinary learning experiences that combine science, CS, and data science to improve students' (mis)perceptions of CS [1].

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