Creating a School-wide CS/CT-focused STEM Ecosystem to Address Access Barriers

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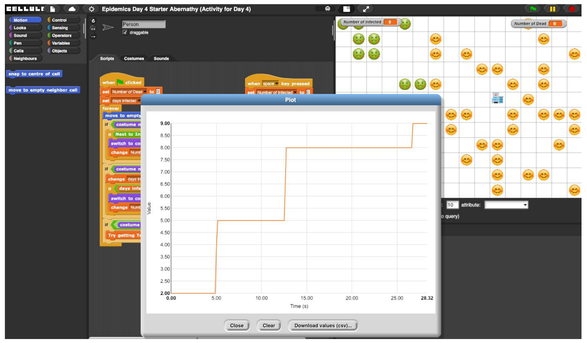
Introduction

- Data indicates that computationally-intensive fields are not representative of the U.S. population, as women and racial and ethnic minorities have been marginalized from participation.
- Efforts to broaden participation in these professions are essential to expand and diversify the talent pool.
- Middle school is viewed as a critical juncture to support and nurture students' interests and abilities in STEM and to promote those academic capacities tied to computationally-intensive activities.
- Exposing students to computer science (CS) and computational thinking (CT) through a variety of learning experiences within the school environment allows students to develop awareness, interest, and confidence to pursue future opportunities through high school, college, and careers.

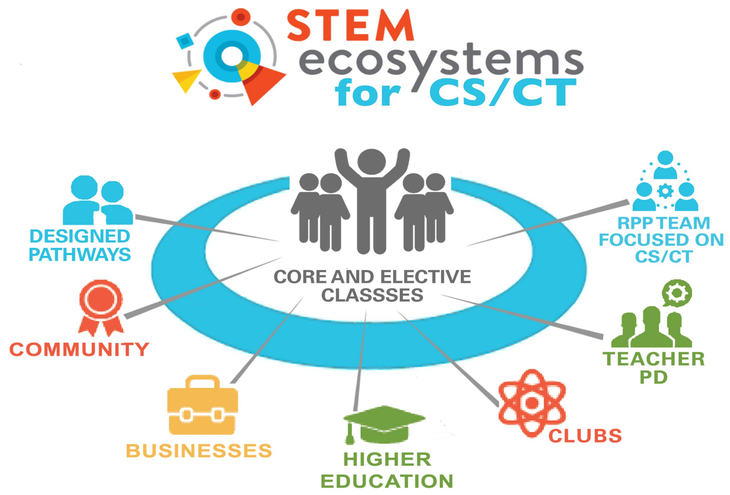


Research Questions

1. What are the barriers to developing a STEM ecosystem that supports CS/CT for every student through integration into middle school science and math courses?
2. What factors or interventions are needed to support the development of a CS/CT focused STEM ecosystem that supports everyone in a school?
3. What are the indicators of success for a CS/CT focused ecosystem in a school?
4. How does the ecosystem prepare and engage all students, especially those from underrepresented student groups, for CS/CT work in high school?

A CS/CT-focused Ecosystem

This NSF project addresses issues of equitable access to computationally rich experiences in middle grades. Utilizing a STEM ecosystem model and an RPP approach, the project seeks to infuse CS and CT practices across formal and informal offerings, especially in core math and science courses. The project team has been developing a school-wide approach to capacity building in Raleigh, NC.



Adapted from http://stemecosystems.org/

Research-Practice Partnership Approach

Using an RPP approach, practitioners and researchers collaborate to address key problems of practice related to broadening the participation of underrepresented populations in CS/CT academic activities. With a local middle school, we are:

- Identifying, co-developing, and iteratively refining processes, tools, curricula, and PD to ensure that teachers have the resources and preparation they need to integrate CS/CT into their teaching;
- Examining the extent to which new support processes and tools are leading to increased CS/CT access for underrepresented students.

Progress to Date

Over the past three years our partnership has accomplished the following:

	Year 1	Year 2	Year 3
Number of Teachers Integrating Lessons	4	5	18
Number of Classrooms Implemented	20	25	86
Number of Students Impacted	566	635	848

- Assembled a teacher leader cohort to shepherd CT and CS integration efforts including school-wide professional development;
- Formed a Digital Sciences team to plan and review CT professional learning to teachers as well as programs and activities for students and parents;
- Incorporated coding and CT projects into classes, such as computer simulations and data tracking, where researchers provide hands-on support to teachers in the classroom;
- Co-participated in outreach events, such as Hour of Code, magnet theme showcase, and STEM night.

Future Work

Future project goals include:

- More intensive and focused data collection and analysis;
- Address problems of practice related to equitable access and designing supportive pathways for students;
- Continue to support teachers through well-designed PD;
- Engage in an iterative process of reflection and analysis of key barriers and supports to inform the development of new strategies to bolster the ecosystem each year.

Acknowledgements & References

Support provided by the National Science Foundation under Grant DRL-1837439.

SFN, STEM Funders Network. (2018). STEM Learning Ecosystems, from http://stemecosystems.org/