

PROJECT SUMMARY

OVERVIEW

This two-year small RPP proposal in the High School Strand addresses ***two long-standing challenges in scaling up access to high-quality secondary computer science (CS): the lack of high school CS course offerings and the lack of qualified CS teachers. We propose to explore the reciprocal benefits of designing solutions to both these problems at the same time.*** Through a process of design-based implementation research (Penuel et al., 2011), stakeholders from the university and the high school will design a preservice CS teacher residency partnership and will also design the school's CS curricular pathways. We hope to show that a community-based, justice-oriented approach surfaces mutually-beneficial solutions to increasing all students' access to CS course offerings and training the teachers who will bring them to life. This proposal focuses on three research questions:

- **RQ1: What was the design of the teacher residency partnership?** What needs were identified and what solutions were developed?
- **RQ2: What was the design of the CS curricular pathway?** What needs were identified and what solutions were developed?
- **RQ3: Did the two design processes support each other?** If so, what were the mechanisms of reciprocal support? For example, were there complementary roles, shared knowledge building, or reconfigured relationships between university, school, and community?
- **RQ4: How did community involvement affect the design processes?** What factors promoted or hindered the distribution of community power and what were the effects?

Keywords: CS teacher preparation, teacher residency, participatory design, design-based research

INTELLECTUAL MERIT

There is widespread consensus amongst researchers, policymakers, practitioners, and families on the importance of expanding access to K12 computing education (Gallup, 2020). However, among other challenges, prior research clearly shows that implementing secondary CS curricular pathways (Goode & Margolis, 2011) and hiring qualified CS teachers (Shein, 2019) are major barriers, particularly in schools serving marginalized populations and in those disconnected from networks of CS practice. Research also suggests that equity- and justice-oriented approaches to each of these challenges requires meaningful community involvement (Gorlewski, et al., 2021; Proctor, Bigman & Blikstein, 2019).

This proposal would explore the hypothesis that there are benefits to designing solutions for both problems at the same time, based on the key insight that ***both problems depend on building a broadly-shared vision of how and why computer science will become part of the school.*** One outcome would be new knowledge about how to prepare preservice CS teachers, an area in which we have very little scholarship or research capacity (Mouza, Yadav, & Ottenbreit-Leftwich, 2021). Additionally, this project would test Kafai & Proctor's (2021) argument that school communities need to be involved in building local understandings of CS by studying the role that community education and community participation plays in designing a school's CS curricular pathways. Finally, this project would contribute to research on equity in K12 computing education by positioning questions about how CS should be defined and designed in the complex ecosystem of a high school community.

BROADER IMPACTS

Training teachers and cultivating communities of high-quality teaching practice is expensive and slow. But having a high-quality teacher is the most important factor in predicting a child's academic success and no shortcuts (e.g. emergency credentials; MOOCs, automated tutors) have proven effective. This proposal has a strategic focus on the current disconnect between undergraduate CS students interested in becoming educators and the schools whose communities stand to benefit the most from the introduction of computing education. The resulting knowledge, models, and research capacity would directly support the establishment of a regional community of K12 CS practice in western New York while offering models and design processes which can be replicated elsewhere. This proposal would equitably broaden participation in computing by including marginalized communities in envisioning the role computing will have in their childrens' futures (Santo, Vogel, & Ching, 2019).