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Standardizing Facilitator Development for Exploring Computer Science Professional Development

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Abstract—A key strategy for broadening CS participation in the Chicago Public Schools (CPS) has been the enactment of a high school CS graduation requirement. The Exploring Computer Science (ECS) curriculum and professional development (PD) program serve as a core foundation for supporting enactment of this policy. The CAFÉCS researcher-practitioner partnership provides support for ECS implementation in CPS. An important part of the sustainability of the ECS PD model in CPS is the development of local workshop facilitators. Potential facilitators have generally been selected based on the CAFÉCS team's personal familiarity with active ECS teachers. Once selected, teachers engage in a two-year apprenticeship program to become facilitators. However, in the three years since the enactment of the policy, the number of ECS teachers and students has grown significantly. This rapid expansion of the CS teaching force has strained the ability to confidently identify new facilitators from a large pool of teachers and ensure consistency of workshop implementation. As a result, CAFÉCS is exploring how to supplement the ECS Facilitator Development Model through a proactive recruitment model and explicit support for the mentoring process.

Index Terms—high school, Exploring Computer Science, professional development, facilitator development

A key strategy for broadening CS participation in the Chicago Public Schools (CPS), where a majority of students are Hispanic or African-American, has been the enactment of a high school CS graduation requirement in 2016 [1], [2]. The Exploring Computer Science (ECS) curriculum and professional development (PD) program serve as a core foundation for supporting enactment of this policy [3]. ECS seeks to contribute to broadening the participation of women and minorities and increasing equity in the field of computer science through activities designed to engage students in computer science inquiry around meaningful problems [4].

The genesis of the work that led to the graduation requirement started four years earlier in 2012. A partnership of CPS administrators and teachers, educational researchers at The Learning Partnership, and CS faculty at DePaul University, Loyola University and University of Illinois Chicago brought the ECS curriculum and PD program to Chicago [5]. Starting with an initial cohort of 27 teachers, the program grew to include 75 teachers teaching ECS in the year before the graduation requirement. In the current 2018–19 school year, there are 181 teachers teaching ECS. The number of students taking ECS each year has likewise grown significantly to almost 12,000 students in 2018–19, with the demographics of participants reflective of the diversity of the district as a whole.

Shortly after the enactment of the graduation requirement, the partnership was formalized into a researcher-practitioner partnership (RPP) called the Chicago Alliance for Equity in Computer Science (CAFÉCS). The RPP was formalized to study the impact of the graduation requirement and use the research to inform future work in the district and improve the district's approach to implementation. CAFÉCS research has provided evidence that ECS is a viable strategy for broadening participation as teachers are achieving equal outcomes for students independent of race and gender [6]. A significant factor in the success of students in the class is teacher participation in the professional development program, which provides a preparation for ensuring all students have a chance to be successful in the course [7]. The PD program includes a one-week summer institute prior to teaching the course, quarterly one-day sessions during the academic year, and another one-week institute in the second summer [8].

Thus far, the expansion of ECS within CPS has been possible through the expansion of professional development opportunities in CPS. These professional development activ-

ities have been led by experienced ECS CPS teachers, who have undergone a minimum two-year apprenticeship program to become ECS workshop facilitators. This ECS facilitator development process has been standardized by the ECS developers and has been implemented in cities through the United States [9].

I. THE ECS FACILITATOR DEVELOPMENT PROCESS

The ECS Facilitator Development process has provided a backbone for the development of new ECS facilitators in CPS. Teacher participants that exemplify the qualities that are desirable for future facilitators use good listening skills to learn from others. They are reflective on their own instructional practices and can identify deep-level connections between lessons. They make instructional choices that use computational thinking.

The facilitator development process is a hands-on approach that outlines five stages of development: Introduction, Apprentice, Novice, Veteran, and Mentor [10]. At each stage, facilitators take on increasing responsibility and leadership in training new cohorts of ECS teachers. They move to the next step upon recommendation of a veteran or mentor facilitator who has worked with them at a particular stage.

1) **Introduction:** Teachers who have fully participated in the summer and school-year ECS teacher workshops and have demonstrated leadership capacity are invited to serve as observers during their participation in the second summer workshop.
2) **Apprentice:** Faciltators at this level serve as an apprentice facilitator for a full cycle of PD. They observe teacher-led ECS lessons using a set of guidelines to help them develop questions that would be useful in a teacher lesson debrief. Apprentices take on an increaing roll in first co-leading and then leading the lesson debriefs.
3) **Novice:** Novice facilitators are paired with a veteran or mentor facilitator to co-plan and co-lead the ECS PD for new teachers, participating in reflective conversations with their partner veteran/mentor facilitator.
4) **Veteran:** Veteran facilitators take the lead on planning and conducting the entire PD while training the novice facilitator that they are paired with. Veteran facilitators periodically receive feedback on their growth from a mentor facilitator.
5) **Mentor:** Similar to veteran facilitators, mentors lead PD sessions with another facilitator. They also serve as mentors for apprentices and novices and monitor the progress of veteran facilitators.

II. IMPLEMENTATION CHALLENGES

The rapid expansion of ECS implementation in CPS has created two primary challenges for faithfully implementing the ECS Facilitator Development process. First, the current informal process of identifying and inviting teachers to become facilitators is not scalable. Over the last two summers, the increase in the number of both new ECS teachers and active ECS teachers has meant that using the CAFÉCS team's personal familiarity with ECS teachers is no longer sufficient. Asking for volunteers is not a successful strategy to identify effective PD facilitators. The "personal familiarity" process has not resulted in a sufficient number of facilitators to meet the PD demands for CPS. In addition, the demographics of the current facilitators does not fully reflect the demographics of CPS students. Having a dynamic personality, strong leadership skills, and good teaching practices are necessary, but not sufficient, characteristics for being an effective PD facilitator. An effective ECS facilitator is also constantly reflecting and learning. We hypothesize that many well-qualified, underrepresented minority teachers don't necessarily see themselves as potential facilitators. As a result CAFÉCS is exploring the development of a systematic and scalable process to identify potential facilitators that compiles the experience of all veteran and mentor facilitators. The model will supplement the informal process by taking a proactive approach that uses teacher demographics and implementation data to identify potential candidates. Teachers identified either through the informal or proactive approach will be invited to apply. Potential facilitators from the applicant pool will be observed and interviewed by veteran and mentor facilitators.

Having multiple sections of ECS PD to accommodate the influx of new ECS teachers means that apprentice and novice facilitators will most likely be partnered with different veteran and mentor facilitators over the course of the summer and school year workshops. As such, mentor facilitators can no longer use informal approaches to keep track of teachers in the ECS facilitator development pipeline. There is a need for formal processes to document the experiences and progress of the apprentice and novice facilitators. In addition there is a need to support new mentors in guiding and providing feedback to the apprentice, novice, and veteran facilitators. This mentoring process includes feedback checks to maintain program consistency over multiple years of workshop implementations.

The development of effective facilitation skills is a complex process that cannot be rushed. Key to effective ECS facilitation is focusing on supporting teacher reflection through carefully crafted questions. These questions provide the scaffolding for new teachers to identify improvements they can make in their own instructional practice. ECS facilitators need to avoid suggesting specific instructional choices or explain how they as teachers have implemented lessons in the past. Developing effective facilitation skills is a process that occurs at a human-relationship scale over the course of many workshop implementations and with ongoing feedback from veteran and mentor facilitators. Experienced mentor facilitators can effectively guide daily debriefs with apprentice and novice facilitators to discuss how the facilitation process itself is going. However, for new mentors, there is a need for explicit reflection guides and recommendations on sequencing of opportunities for apprentices to lead components of ECS workshops. The resulting recruitment model and mentoring supports will be useful contributions to other school districts looking to scale up ECS within their districts.

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