

## CAREER: DRK-12: Spreading Computational Literacy Equitably via Integration of Computing in Preservice Teacher Preparation

Computational literacy is quickly becoming a skill that affects all citizens' personal and professional lives (Smith, 2016; Wing, 2006). The power to understand and create computing solutions enables people to be safe, resourceful, and inventive in our technology-infused world. To empower our society, the education system is making great efforts to offer computing education (e.g., computational thinking, programming, and cybersecurity) to every child in America (White House, 2017; Code.org, 2018). However, many of these opportunities are optional. Because teachers and students must elect to engage with them, they can perpetuate existing inequalities in computing education.

To spread computational literacy equitably in K-12 education, we must treat it like other foundational literacies and require it. Based on the current American education system, the most sustainable way to require computing education is to integrate it with other required subjects. Integrating computing into other subjects, in addition to increasing computational literacy, can improve teaching practices in those subjects by giving teachers powerful tools for learning (Kale et al., 2018). Existing initiatives for computing integration have successfully and simultaneously taught subject area and computing content (e.g., Schanzer et al., 2015), but they tend to work with in-service teachers. Working with in-service teachers makes computing integration optional, which can again lead to inequity. To build upon these existing initiatives, we should include computing education in all preservice teacher preparation programs so that computing integration activities are part of every teacher's practice.

Starting last year ('18-'19) at Georgia State University, I am leading an initiative to integrate computing into all our preservice teacher programs. Through this initiative, all our preservice teachers, from elementary to high school and in all subjects, will 1) learn foundational computing concepts, 2) engage with computing integration activities appropriate for their grade band and subject area(s), and 3) practice applying those activities through practicum or student teaching. The proposed project will use this context to study the implementation and effect on literacy of computing integration in preservice teacher preparation programs. These research activities will feed directly into the teaching objective of this proposal—to provide computing education and computational literacy to all preservice teachers.

### **Intellectual Merit**

Preservice teacher programs are loaded with subject area, pedagogy, and licensure requirements, which is why they are often overlooked for computing integration initiatives. Therefore, research needs to examine the most sustainable methods for including computing content and integration activities in preservice teacher programs. Research should explore 1) how to connect computing concepts and integration activities to teachers' subject area knowledge and teaching practice to build upon teachers' existing knowledge and 2) which computing concepts are most valuable for a general computational literacy. Because computational literacy is a relatively new literacy, the computing education community still debates which concepts are foundational and which concepts should be reserved for more advanced education and applications (e.g., Grover & Pea, 2013; Kafai et al., 2019). By studying computing integration in a range of grade bands and subject areas, I am uniquely positioned to explore which computing concepts are most universal and applicable in a wide range of subjects.

### **Broader Impact**

The proposed project's ultimate goal is to spread computational literacy equitably. This goal is achieved by preparing all preservice teachers to engage with computing integration. Moreover, conducting this work at Georgia State particularly serves groups that are underrepresented in computing education. As a minority-serving institution, Georgia State serves primarily future teachers of color. Furthermore, because we are located in downtown Atlanta, many of our teachers find positions in Atlanta, a majority-minority city in which most students in the school system are also of color. As a major urban center, the school system includes families from a diverse range of socioeconomic statuses. This project will contribute to all of the children in local school systems improving their computational literacy.