Cultivating Computational Thinking: Developing Computational Identities Through Scratch and Apps

Provocation: How do we increase youth participation and inquiry in coding literacies? What identities are youth afforded by participation in Scratch and App development?

Discussant: Ricarose Roque

Engaging Children in Creating, Thinking, and Learning with Data

Sayamindu Dasgupta, University of Washington

In this presentation, we will describe our work on Scratch Community Blocks,an extension to the Scratch programming language that lets children in the Scratch online community to programmatically access, analyze, and visualize data about their participation in the community. Through Scratch Community Blocks, we aim to shift the role of children in online creative communities from being objects of data analysis to being doers of data analysis. Through illustrative examples, we will show how children using Scratch Community Blocks (i) analyzed data and created visualizations in ways that connected with their interests, experience, and aesthetic sensibilities, (ii) self-reflected upon their own learning and social participation in Scratch, and finally (iii) engaged in critiques that mirror some of the current critical scholarly debates around data science, reflecting on issues such as privacy and algorithmic bias.

Benjamin Mako Hill, University of Washington

Gender Differences in Patterns of Project Sharing on the Scratch Online Programming Community

Emilia Gan, University of Washington

Although research suggests that sustained participation in online learning communities can support young people in learning to program, it also suggests that their participation is typically short-lived. The under-representation of women in online learning environments focused on coding –and in computer science more broadly –has been attributed to disproportionately high rates of attrition among female programmers.

One challenge with empirical research on participation is that the decision by learners to not participate is typically unobserved. In this presentation, we describe a quantitative analysis of a unique dataset of 5 million shared and unshared projects from the Scratch online programming community. Our analysis shows evidence of a complex relationship between gender and rates of participation as measured by public sharing of programming artifacts.

Although girls in Scratch are indeed less likely to share their initial projects, their likelihood of sharing increases more quickly than boys' as they create additional projects. After creating 20 or more projects on Scratch, girls become more likely to share their creations than boys (~37% sharing rate for females, compared to a ~30% sharing rate for males). Our presentation will also discuss how expressions of positive feedback by other users is associated with subsequent sharing rates and how this relationship differs between boys and girls on Scratch.

Benjamin Mako Hill, University of Washington, Department of Communication
Sayamindu Dasgupta, University of Washington, eScience Institute

Supporting Youth in Harnessing their Interest in Computer Coding to Envision Careers in ComputerScience

Crystle Martin, Digital Media and Learning Hub

Coding creates opportunities for youth to develop interests and to envision potential avenues for those

interests. There remains a persistent gap in the participation of African-American and Hispanic workers in computer science fields (NCWIT, 2015; NCSES, 2015), and particularly coding. A starting point to address this gap would be to facilitate early opportunities for underrepresented youth to explore coding and envision future coding careers. This presentation will illustrate ways in which youth who are underrepresented in computer science, can be exposed to coding through interest and how this exposure when supported by peers and adults impacts their process for envisioning future computer science careers.

I present empirical findings from interviews with youth who participate in the online coding community Scratch. The interviews focus on participants' entry into coding through Scratch, and how using the tool prompted participants to envision careers in coding. I contend that entry into coding with support from peers and caring adults, can create sustained participation and deepened interest.

This study begins to map how underserved youth envision coding careers from participation in coding as an interest, and the types of supports that are needed. Determining what type of support is most effective to help youth connect between coding and an envisioned future or career, will require more research. Enumeration of specific barriers youth face in entering into or connection beyond an interest, and designing solutions to overcome these barriers will also require more exploration. Tracking youth with an envisioned career in coding and computer science to learn the barriers they face while pursuing this future would also be useful in determining the longer term barriers that youth face moving from coding as an interest to coding as a career. This research demonstrates that by understanding essential practices for supporting underrepresented youth, educators and parents can make targeted efforts to support connections from coding to envisioned future careers in computer science.

Empowering Youth Through Mobile Computing with MIT App Inventor
Mike Tissenbaum, Massachusetts Institute of Technology

Since computational thinking (CT) entered the mainstream over a decade ago, there has been a growing recognition for the need for everyone, not just computer scientists, to develop CT. While there is no single shared definition of CT, there is general consensus that CT encompasses the ability (i) to understand the role that computation plays in our world, and (ii) to recognize problems as opportunities that can be addressed through computational means.

With the growing influence of computation on our daily lives, there is a growing call to support young learners in developing CT fluency. Central to this is the objective that young learners see themselves as active designers of their digital lives rather than solely consumers. As such, we advocate for two key elements for supporting youth in developing computational thinking: Computational Identity (CI), which encompasses youths' identities as people who can think computationally and who are members of the computational community more broadly; and Digital Empowerment (DE), which reflects youths' recognition of their personal ability to affect the world around them through computational means. The latter builds on Papert's (1972; 1987) description of learners as self-aware, empowered, intellectual agents who are capable of making their own learning decisions, posing their own questions, and finding answers to those questions (i.e., driving their own inquiry).

In response, we have developed a blocks-based programming environment called MIT App Inventor, which allows learners of all ages and diverse backgrounds to quickly and easily develop fully functional mobile apps. Through App Inventor, learners can take computation beyond computer labs and into their lives and communities, which instills a sense of empowerment that they can effect real change in the world.

This talk will demonstrate the many ways that App Inventor has already achieved this goal of youth empowerment through exemplar cases from across the world. We will also illustrate several new App Inventor features, including Internet of Things (IoT) functionality, that further advance young learners'

relationships with their world through everyday objects and develop learners' empowerment and make meaningful impacts in their communities.

Mike TIssenbaum, Massachusetts Institute of Technology
Josh Sheldon, Massachusetts Institute of Technology
Hal Ableson, Massachusetts Institute of Technology