Social Dimensions of Computing Education

Karen Brennan
Harvard Graduate School of Education
karen_brennan@gse.harvard.edu

“Things and People”

In his 1971 text Deschooling Society, Ivan Illich argued that the central activities of educational enterprises were misdirected.

The planning of new educational institutions must not start with the question, "What should someone learn?" but with the question, "What kinds of things and people might learners want to be in contact with in order to learn?" (p. 71)

To support this shift in focus, Illich proposed four models of learning networks (or learning “webs”). The first learning web emphasizes access to objects – the types of materials, equipment, and spaces that are needed for various intellectual explorations. The second learning web emphasizes establishing connections between those with greater expertise and those with less expertise, a form of “skill sharing” that derives from apprenticeship traditions. The third learning web emphasizes connections between those with similar levels of prior knowledge and expertise, with an emphasis on learning motivated by shared goals and aspirations. The fourth learning web emphasizes the value of people who are skilled at scoping and sequencing the learning experiences of others, as pedagogical consultants.

For the past hundred years, school has been assumed to be the primary site of learning. But increasingly, school is no longer the only place of learning, a trend particularly supported by the use of computer networks (Collins & Halverson, 2009; Ito et al., 2009; Thomas & Brown, 2011). Network technologies move beyond needing to “funnel all educational programs through the teacher” to “provid[ing] the learner with new links to the world” (Illich, 1971, p. 73) – and to supporting learners’ opportunities for accessing resources, sharing skills, learning from and with peers, and consulting with pedagogical coaches.

These types of opportunities for supporting the social dimensions of learning are underemployed in computing education – and, as such, serve as a potential source of questions for further significant research. I think several research questions deserve careful attention:

- What kinds of access to others support people’s learning goals?
- How might social approaches to learning encourage the participation of people who are not already interested in computing?
- What learning pathways do learners pursue after initial experiences with social approaches to computing education?

In the rest of this document, I provide a brief summary of sociocultural perspectives on learning, followed by a brief summary of my own research in this area.
Sociocultural Perspectives

Although learning and development have important individual components (as articulated in constructivist theories of learning, such as the Piagetian tradition), they are also deeply social processes. Vygotsky extended Piagetian framings of the individual’s cognitive processes by introducing the notion of the zone of proximal development (ZPD), defined as “the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (1978, p. 86). Vygotsky’s notion of the ZPD expanded the boundaries of individual cognition, including other people and their abilities as part of an individual’s capacities for taking on challenges of increasing difficulty (Cole & Wertsch, 1996).

Theories about communities of practice and situated learning further extend thinking about how others support learning, in particular, how community settings can provide access to other learners and artifacts (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991; Rogoff, 1994). In this literature, apprenticeship is a recurring metaphor for the type of learning that can take place, introducing new ways of thinking about the learner and the people around the learner who are helping them (Collins, 2006; Lave & Wenger, 1991; Wenger, McDermott, & Snyder, 2002). Learners are gradually folded into relationships with other learners, understandings of the enterprise of the learning, and familiarity with the objects and practices of the community – learning from those with greater experience and expertise, in a process that Lave and Wenger (1991) described as legitimate peripheral participation.

More recent research has described the ways in which the social nature of learning serves as essential motivation and support for young people’s participation in computational culture, particularly in the context of online interactions (Buckingham & Willett, 2006; Ito et al., 2009; Jenkins et al., 2006). Whether hanging out with friends or playing games or remixing media, having access to others makes for better participation, as young people are able to support each other in understanding practices and norms. Bruckman’s (1998, 2006) work described the cognitive, social, and psychological benefits that an online community provided for individual learners in constructionist activities. From technical support to emotional support, having access to others bolstered individuals’ capacities for creative work. The social nature of learning is not reserved for young learners – teachers as learners can similarly benefit from access to others (Fishman & Davis, 2006).

Communities of Learners in Practice

For the past six years, I have been studying the social dimensions of computing education, using the Scratch programming environment as particular case. Developed by the Lifelong Kindergarten research group at the MIT Media Lab, Scratch – which is both an authoring environment for programming interactive media projects and an online platform for sharing those projects – has served as a rich context for studying both the substance and the processes of learning in computational culture. Since Scratch’s launch in May 2007, hundreds of thousands of young people have downloaded the Scratch authoring environment, developed more than 4 million interactive media projects, and shared their creations with other young learners via the online community.
I have used a mixed-methods approach to studying young people’s participation in the Scratch online community, using both qualitative methods (primarily online observation and semi-structured interviews) and quantitative methods (analysis of demographic and participation data). I have been observing young people’s participation in the Scratch online community, drawing on a key ethnographic principle of “learning through immersion” (Hine, 2008, p. 259). Based on this observation work, I have been writing field notes and memos about Scratchers’ activities, and saving artifacts of their work – primarily Scratch projects, but also other electronic artifacts (such as forum posts, emails, and blog entries). Observation helps make sense of what people do, but provides limited insight into how people think about their actions and behavior. As such, I have also been conducting in-depth interviews with kids in the online community. The interview protocol includes several questions about the role of others in kids’ creative activities and learning experiences. The observation and interview data illustrate the significance of others in kids’ development as creators of computational artifacts – from asking for help, to studying projects as examples, to remixing projects, to working with others in collaborative or cooperative construction, to helping others’ learning (Brennan, 2013a; Brennan & Resnick, 2012).

Scratch is increasingly being used in formal learning environments such as K-12 classrooms, across a range of ages and across a variety of curricular areas. In response to this nascent use and to broaden participation with Scratch, I developed the ScratchEd online community (http://scratch-ed.org). Teachers interested in or already actively working with Scratch can use ScratchEd to share stories, exchange resources, ask and answer questions, and find other educators (Brennan, 2013b). ScratchEd made its public debut in August 2009. Since then, in its first three years, more than 9,700 educators from around the world have joined the community, and have contributed more than 220 stories, 610 resources, and 4,000 discussion posts. Over the past year, the site has received an average of 62,000 page views from 11,000 unique visitors per month, predominantly from the United States.

The stories, resources, and discussions that educators have posted to the ScratchEd online community have been rich sources of data about teaching practice – what people describe doing and the resources that they create or seek in support of their goals. In addition to observation and artifact analyses in the ScratchEd community, I have also conducted interviews with educators working with Scratch in K-12 school settings. This work has surfaced the complexities of teaching approaches that emphasize the social nature of learning in formal learning environments. For example, teachers appreciate the positive impact of pair programming or the value of building on others’ work through remixing, but are stymied by individual-centric assessment approaches.

**Supporting and Researching Social Approaches**

The three questions outlined at the beginning of this document –

- What kinds of access to others support people’s learning goals?
- How might social approaches to learning encourage the participation of people who are not already interested in computing?
- What learning pathways do learners pursue after initial experiences with social approaches to computing education?
– are grounded in cultural and attitudinal changes regarding the social dimensions of learning, changes that invite a range of research activities.

These research activities will include developing and testing curricular resources, professional development opportunities, and assessment tools. This development and testing work will necessitate describing and measuring the impact of the development work with learners, particularly across a range of settings (e.g. formal, informal, urban, rural), learner demographics (e.g. age, gender, socioeconomic status), and learning goals and trajectories (e.g. professional pathways, foundational computing knowledge).

Ideally, research motivated by these questions will ultimately equip learners and teachers with much-needed strategies and habits of mind to serve their explorations of computing – moving toward the vision of computing for everyone, computing with everyone.

References


