Design methods to study learning across networked systems, co-located spaces, and time

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Abstract: The 2013 CSCL conference theme—investigating learning across levels of space, time, and scale—has becoming an increasingly important issue with the proliferation of new types of networked learning environments. In this paper we share our approach to studying and designing for learning across settings and time, grounded in an investigation of a citizen science program that takes place in the classroom, outdoors, and online.

Introduction

Networked technologies have made new genres of learning environments possible, at least for schools that have access to the Internet, computers, and professional development opportunities for teachers. Online learning communities that connect participants with one another have generated the need for new design frameworks. In particular, how we can best design systems to capture learning-relevant interactions, take advantage of tools, and develop design approaches that consider how varied users feel about the online spaces and how these feelings relate to their own biographies. In our project we develop both teacher and student learning biographies as we know that even when access to tool and networks are provided, variability in how teachers and young people use technologies at home may influence how tools are taken up at school (Forsell, 2012; Warschauer, 2008). In this paper we share our approach to studying and designing for learning across settings and time, grounded in an investigation of a citizen science program where learning interactions take place in the classroom, in outdoor settings, and in an online community.

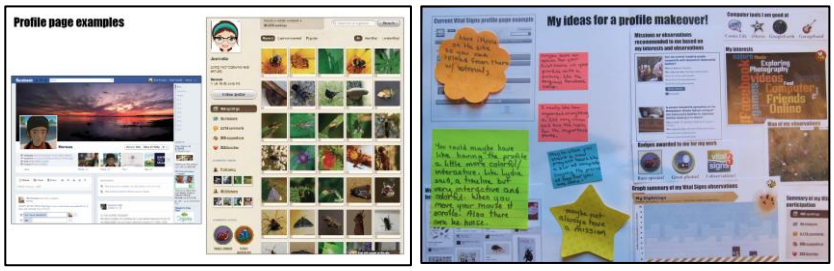
Methods

To do this work, we partnered with Vital Signs, a networked citizen science project involving middle school students, teachers, and amateur and professional scientists. During the classroom unit students go into the field and use digital cameras and GPS receivers to monitor freshwater, upland, and coastal ecosystems for native and invasive species. The website is designed to help students organize, upload, and analyze their data and to connect them with scientists who confirm or question their investigations. Four science teachers were recruited to represent a range of engagement with the Vital Signs work and school economic profile.

Our multi-method study is guided by a learning ecology framework (Barron, 2006). Expanding our notion of spaces for learning requires that we broaden our units of analyses to track a learner's participation in learning activities not only in school but at home, in the homes of friends, in neighborhood contexts, in community based organizations, and increasingly in online environments that offer new forms of activity and resources for learning. We used four main empirical strategies to understand and contrast the system at multiple levels: (1) Cohort studies using quantitative survey measures (N=217); (2) classroom case studies, using in class and online observation; (3) individual teacher (N=4) and student (N=16) case biographies documenting interests, family life, and Vital Signs experiences; and (4) co-design methods that asked learners (N=27) and their parents (N=11) to react to and redesign components of the Vital Signs online site. Due to space constraints, we focus on our co-design methodology and share select findings to illustrate our approach.

Co-design methodology

Co-design methods are frequently used in human-centered software design (e.g. Norman & Draper, 1986). We set up a collaborative model of design where groups of parents and students worked together on a design and used this data to guide our understanding of the networked system and the people who use it (similar to "personas" in co-design work by Pruitt & Grudin, 2003). A small group after school workshop was developed to invite youth as partners in the redesign of the original, rather basic, Vital Signs profile pages. Students from our focal cohort attended and case learners participated in a later session with their parents. Materials included paper-based profile page examples and blank profile templates (see Figure 1a) to guide discussion. Paper profile page elements were generated based on student interviews about interests and behaviors online, including a tag cloud of interests, a map of individual investigations, and visual documentations of work. These were cut out as separate pieces and each student was given a set. Each group was provided post-it pads, markers, and glue sticks. Groups discussed profile pages and likes and dislikes of particular features, then brainstormed their own ideas, and sorted through the pre-designed features and pasted their choices onto their new profile designs with additional ideas and annotation (see Figure 1b).



Figures 1a and 1b. Co-design workshop materials, including sample profile pages (1a) and a completed profile page "makeover" designed by a student (1b).

Results and an example of co-design partners: Laura and her mother

Our cohort data revealed students, on average, to be regular Internet users: 97% reported home Internet access and frequency-of-use is similar to recent national surveys: at least once a week, 89% used the Internet to find information, 68% used a social network site, and 56% played computer games. Although the majority of students (63%) reported that they looked at plants around them differently after the Vital Signs unit, few revisited the website community after they submitted their investigation (12%). We were able to learn more from individual interviews. The Vital Signs program was intentionally developed to engage students in a scientific community of practice, but students saw the site as "an adult site, like adults would go on." Our student design partners revealed a desire for a more personalized and social space, sparking ideas about the development of more interesting and engaging profile pages. During the profile page design workshop, we learned still more. Some students were on multiple social networking sites, but 22% of participants were not involved in any. Ninety-four percent chose to have badges on their profile page to represent what they had done in Vital Signs and 89% wanted their profile to include a geographical map of their investigations.

One co-design case student, Laura, lived with her parents and three siblings in a rural setting. She reported that she definitely could not see herself becoming a scientist when she grew up. Other indicators, however, such as her stories about looking closely at the natural world around her, suggest a more complicated picture of the role of science in her life. Laura enjoyed taking digital photographs and using Instagram. Some of her design ideas for Vital Signs profile pages sites utilized photo-sharing site features such as, "different kinds of filters." and "be able to adjust lighting + contrast to make photo clearer/better!" Others called on social network components such as being able to "post on other people's walls like on Facebook" and "compare to other people like you." Laura's mother had compelling ideas as well. Given a need for quality summertime childcare and financial constraints, she suggested a free virtual camp where youth could collect and discuss observations in their backyards and connect to scientists and resources.

Summary and implications

In this paper we argued that biographical and co-design methods are critical for understanding participation in networked learning opportunities and for generating new ideas for the design of such environments. We shared our approach to show exciting potential for learning within authentic activities as part of hybrid school-online programs like Vital Signs and the importance of finding multiple ways to connect to learner interests and families through cyberlearning.

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