Selfies for Science: Collaborative Configurations around ScienceKit

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Abstract

In this paper, we detail our initial analyses of the ways in which youth engage in collaborative learning using ScienceKit, a mobile, social media application designed to support scientific inquiry in informal learning contexts. We focus on the ways in which ScienceKit orients small groups in different configurations of collaborative work, as they engage in informal learning activities.

Author Keywords

Scientific Inquiry; Mobile Learning; Informal Learning; Collaborative Learning; Social Media.

ACM Classification Keywords

K.3.1 [Computers and Education]: Computer Uses in Education.

Introduction

Mobile applications are key interactive components in the daily lives of young people, as they engage in a diverse ecology of media participation and learning opportunities [5,8]. Although there is a growing body of research that explores both mobile and social media designs to support learning in both formal and informal contexts [1-5], more work is needed to understand how children collaborate in blended environments where technology-supported interactions (e.g. social media participation) and face-to-face activities (e.g. learning

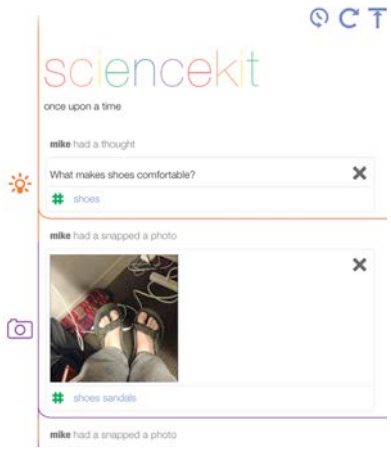

Figure 1. A screenshot of ScienceKit.

Figure 2. Two participants take "selfies" of themselves as they interview each other and learn to use ScienceKit on the first day.

situations) interact to create novel cases of collaborative work. In this paper, we detail our initial analyses of the ways in which youth engage in collaborative learning using ScienceKit, a mobile application we designed to support scientific inquiry. We deployed ScienceKit in an informal, science learning program, and we observed learners configuring themselves in collaborative orientations that uniquely blended the affordances of ScienceKit and the physical learning environment. We posit that these novel configurations relate to the learners' developing skills in shared scientific inquiry practices.

ScienceKit and Kitchen Chemistry

ScienceKit is a social media app that we designed to allow young people to log observations of their everyday lives and contribute them to an online community. Through several iterations of development, we conceived of ScienceKit as a design experiment to leverage the media sharing activities seen in popular tools such as Instagram, Pinterest, and Facebook as a way to guide learners to consider their everyday lives as a broader endeavor in scientific inquiry [1,10]. For example, in ScienceKit a child might snap a picture of their cooking at home, but contribute this entry as a question or hypothesis about their activity that is posed to the broader community. As referenced in the title of this paper, the children in our study enjoyed taking "selfies" (pictures or videos of themselves) using ScienceKit, but these media contributions were often couched in the service of explaining a scientific practice (making an observation, posing a hypothesis etc.).

We deployed ScienceKit in an informal, science learning program called *Kitchen Chemistry* (KC). In KC, learners (ages 9-11) engage in scientific inquiry through cooking [3,4]. Through cooking activities, learners become familiar with scientific inquiry practices such as measurement, observation, posing scientific questions, hypothesizing effects, and conducting experimental procedures to test out their cooking ideas. Facilitators work closely with KC learners in small groups to support their engagement in scientific inquiry through the pursuit of their personal interests and goals. Learners use ScienceKit to make observations, pose new questions, and develop claims backed by evidence. ScienceKit enables learners to share these data with their KC peers using photos, videos, drawings, or text.

Theoretical Grounding: Affinity Spaces

Our study builds upon design-based research on mobile, social media platforms that support scientific inquiry in informal, blended learning contexts [1-4]. We situate KC participants (child learners and adult facilitators) in terms of affinity spaces [6]. An affinity space serves as an alternative to the notion of a "community of practice" (CoP) [9] in that it emphasizes the *spaces* in which people interact rather than *membership* in a community. Both CoPs and affinity spaces allow newbies and masters to interact together in pursuit of common interests, using common language and shared tools. However, by viewing KC as an affinity space, we acknowledge that learners may not *yet* view themselves as members of a scientific CoP, though they are afforded many routes to participation and multiple means to contribute as they develop scientific skills and dispositions. Thus, KC is an affinity space because our child learners are novices in scientific inquiry, but can still engage in scientific learning and ScienceKit activities throughout the program. In our analyses we are interested in observing their *development* from interested novices to deeper notions of themselves as individuals who "do science" (e.g. deeper sense of identity and

Figure 3. One child "photobombs" a picture that a facilitator is taking of their cooking experiment.

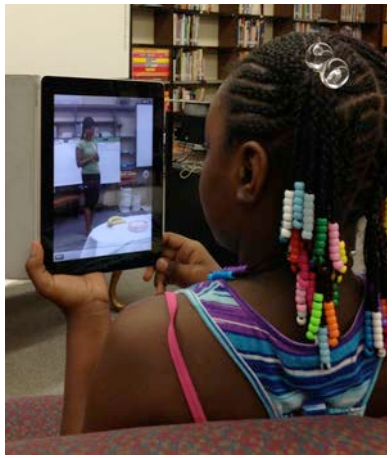

Figure 4. Participant records entire talk of facilitator as she presents.

membership to a CoP). An initial step in this research agenda is observing how the child learners interact with their physical and technological environments in ways that further their engagement in activities and their group. Our goal in this study was to attune to the ways in which the child learners collaborated in novel ways, including how they: related to each other, configured cooperative work during learning tasks, and configured their technological and physical tools as they learned together.

Methods

We collected multiple types of data throughout the larger KC research program, including video-recordings of learning activities and whole group discussions, artifacts produced by the learners themselves within ScienceKit and short (~2-3 minute) personal videos in which learners were asked to reflect on their activities of the day and identify themselves as scientists, chefs, or investigators (or any other role they might choose to add). For this paper, we focused our qualitative, case study analysis primarily on video data of the learners as they worked in small sub-groups.

Collaborative Configurations

We present three examples of how learners configured themselves in collaborative situations that illuminate how technology and face-to-face affordances combine to create cooperative arrangements during learning.

Configuration One: Play and Socialization

We observed ways in which the children appropriated ScienceKit to engage in playful expression, but also importantly integrate this play with the learning tasks they were asked to do in the program. In Figure 2, two girls show a common activity we observed: taking selfies and interviewing their friends as a way to learn about the technology (e.g. how to use ScienceKit) but also to engage in explaining their scientific experiments. The children in KC often enjoyed inserting themselves into pictures (e.g. "photobombing") that they contributed, even when these posts were about learning tasks such as the observations they made during experiments (Figure 3). We posit that these playful interactions are profoundly important as ways for children to orient themselves to peers, become part of the emerging group dynamic, and integrate self-identity with scientific or learning practices [3].

Configuration Two: Recording as Scientific Practice

We also observed how our youth exhibited varying media and scientific practices with ScienceKit. One clear observation was the differing ways that children recorded their environment. All the children in KC were enamored with video recording. Some decided to record very long entries such as in Figure 4, where the child is recording the entire facilitator's presentation. Other times, children were selective in recording important parts of their scientific inquiry process (Figure 5). We posit that these practices – rapacious vs. selective recording – also relate to learning processes. In selective recording practices, individuals must cognitively decide and assess the importance of a media entry, and this selective attention and mental organizing are also important cognitive practices for novices to develop into experts in a learning domain.

Configuration Three: Emerging Collective Practices

A final example (Figure 6) highlights how emergent media practices and learning norms began to emerge through the combination of ScienceKit and KC (our affinity space). In this picture, the facilitators guided the children in a chemistry experiment that tested how hot water interacted with various ingredients such as baking soda vs. cream of tartar. The children spontaneously huddled together to record the results of

Figure 5. Selective observation and recording.

Figure 6. Children huddle around and record an experiment about bubbles using baking soda, cream of tartar, and hot water.

this experiment and their observations. These types of collective practices emerged through the combination of technical (the design, affordances, and use of ScienceKit) and the social or learning environment (KC and its focus on scientific inquiry).

Conclusions and Future Work

Our initial findings highlight how ScienceKit acted as a boundary object that orients learners in a variety of collaborative configurations. Boundary objects represent concepts and artifacts that both define and reflect shared practices of a CoP [9]. As such, boundary objects help individuals from different backgrounds to communicate and build common ground and shared practices.

For this study, we situate ScienceKit as a boundary object that orients KC learners to shared scientific inquiry practices. The children in our deployment used ScienceKit to relate to each other, teach each other the practices of this *emergent group* (affinity space), enact scientific practices such as observation and explanation, and began to develop collective norms of a community such as group logging of experiences. Our future analyses will delve deeper into the different collaborative configurations that arose when our youths used ScienceKit and begin to develop connections between media practices and learning behaviors. Research in CSCW and HCI highlight the novel ways that children use media to share and connect with each other [7]. Our work aims to show how these technology-mediated interactions play a deep role in the development of affinity spaces and communities for collaborative learning.

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