PK–12 Computing Teacher Interactions in an Online Professional Learning Experience

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Abstract: Online professional learning experiences can support computing teachers in developing content knowledge and expanding professional networks. Within the context of an 11-day online professional learning experience for computing teachers working with Scratch, this study explored interactions between participants and facilitators with varying levels of Scratch familiarity. Findings describe how facilitators and participants with lower and higher levels of Scratch familiarity interacted with one another, which can inform the design of professional learning experiences that support teacher collaboration.

Introduction

Broadening access to PK–12 computing education requires supports for teachers, and yet computing teachers report limited opportunities for professional learning (Yadav et al., 2016). While some scholars have argued that professional learning experiences should vary for teachers with different levels of prior experience (Qian et al., 2018), teachers can benefit from opportunities to interact with others of varying expertise (Penuel, Sun, Frank, & Gallagher, 2012). In this study, we explore the following research question: *How did teachers with varying prior Scratch familiarity interact when participating in an online professional learning experience?*

We take a situated learning approach (Sentance & Humphreys, 2018) and draw on Lave and Wenger's (1991) conception of *learning as participation* to understand computing teachers' experiences in Getting Unstuck, a 2020 11-day online professional learning experience that aimed to support PK–12 computing teachers' developing familiarity with Scratch, a widely-used introductory programming language and online community. Participation in this context includes not only creating projects, but also receiving and sending comments on projects. Each day of Getting Unstuck, participants received an email with an invitation to create a Scratch project in response to a prompt, share their projects with others in a studio public to the Scratch community, and reflect on their daily work. Five facilitators (elementary school teachers and university researchers) modeled interactions by leaving comments on participants' projects.

Method

1,009 participants signed up through an introductory survey to receive the daily emails with the project prompts. 298 participants created and submitted at least one project across the 11 days. 168 of the 298 participants (56%) completed 10 or more projects, and we collected participants' 10,576 comments and associated metadata across 2,251 projects submitted to all 11 studios. We then grouped the sample into three categories: lower familiarity (LF), higher familiarity (HF), and facilitators. In the introductory survey, participants self-reported their familiarity with Scratch across five categories: "I've never used Scratch before," "I've seen others use Scratch," "I've made a few projects," "I've helped others make projects," and "I'm well-acquainted with the ins and outs of Scratch." Participants were also asked to self-report prior participation in a 2018 pilot of Getting Unstuck.

Participants who placed themselves in the first three categories *and* did not participate in 2018 were grouped as lower familiarity (LF). Participants who placed themselves in the last two categories *and/or* participated in 2018 were grouped as higher familiarity (HF). Our sample of 298 participants included 69 (23.2%) LF users, 224 (75.2%) HF users, and 5 (1.7%) facilitators. We sought to understand interactions between participants with the same degree of familiarity, over time. Our analysis adopts Krackhardt & Stern's (1988) measures to evaluate the relative proportion of in-group and out-group ties within a social network, visualizing the evolving network with directed graphs and calculating a normalized index to quantify the extent to which participants interacted within or outside their group. We then track how these measures evolved throughout Getting Unstuck to identify and compare participation trajectories for LF and HF teachers.

Findings and discussion

Participants engaged in substantial and consistent interactions with others. Across the 11 days, 45 out of 69 LF teachers (65%) and 185 out of 224 HF teachers (83%) made at least one comment. Though the number of

participants decreased over time, participants remained consistently engaged with others' projects, leaving an average of 4.1 to 6.0 daily comments per project (cumulative average of 4.7 over all days).

Figure 1. Directed comment interactions among HF teachers, LF teachers, and facilitators.

We found evidence of different trajectories of participation between HF and LF teachers (see Figure 1). We calculated the difference between HF and LF teachers' externally directed comments per person (i.e., across groups) and internally directed comments per person (i.e., within groups), dividing by the sum of these metrics to reach a normalized index of externality and internality, which has two poles: -1, indicating engagement only within the group, and 1, indicating engagement only outside of the group. LF teachers began Getting Unstuck with a moderate tendency to interact with HF teachers and facilitators (EI = 0.23), rather than interacting with one another. Over time, however, LF teachers strengthened interactions with those who had similar levels of prior Scratch familiarity (EI = 0.19 and 0.01 in studios 4–7 and 8–10, respectively). On the fifth day, for example, one LF user debugged another LF user's project: "I remixed it and I think I got it to work!" HF teachers also began Getting Unstuck with a moderate tendency to reach outside of their group (EI = 0.24) but exhibited an opposite trajectory of participation: as they progressed, they engaged more often with facilitators and LF teachers (EI = 0.40 and 0.48 in studios 4–7 and 8–10, respectively). In Studio 6, an HF user asked an LF user about the project they had made: "You need way less code than I did. Do I understand it correctly that you use a broadcast block to change the color of the clones and that all clones that need to change color do so when that message is broadcasted?" The LF user responded, "Indeed, every time a clone is clicked it sends a message to all the others and stores its value on a shared, temporary variable."

Teachers' interactions with one another in Getting Unstuck offer evidence for how participation in an online community can evolve, even within a short timeframe. These opportunities to learn from and with others may also support teachers in deepening their own familiarity with Scratch. Understanding how teachers engage with the work of others with varying computing backgrounds can inform the design and facilitation of professional learning experiences that create opportunities for teacher collaboration. Future work could examine the substance of participants' comments as well as the role of skilled facilitators, offering directions for the design of future professional learning activities.

References

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