

Illuminated Devices: A Sociotechnical System to Broaden Access to Digital Assistance

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Abstract: User training and support are crucial factors in bridging the digital divide. The Illuminated Devices sociotechnical system, inspired by our experiences providing online support during COVID-19, will provide personal digital tutoring, accessible anywhere, even with limited prior technology experience. System development leverages a human-centered, design-based research approach. The project will culminate in a pilot rollout and evaluation at three community sites.

Continuous instruction and mentoring are essential but underemphasized components in our efforts to narrow the Digital Divide. Digital newcomers and other learners gain confidence and competence from personal, situated, interactive sessions with human tutors (Winstead et al. 2013, Woodward et al. 2013). Libraries and other community centers can provide means of access to this learning (Xie & Bugg 2009), but not all those in need have regular access to the physical locations of these institutions. Our goal is to reach learners in a ubiquitous fashion, whenever and wherever they need help. Our project *Illuminated Devices* seeks to make the personal, interactive nature of a community-based tutoring program available anywhere, by connecting learners to tutors directly through common digital devices. The Illuminated system is a sociotechnical framework, blending digital technology and human interaction. It comprises a portal application that allows an immediate face-to-face connection between the user and tutor, and a sociotechnical network of tutors and learning resources.

Since 2011, our group has run an outreach program that pairs technologically savvy students at our institution with community members seeking help in navigating computing technology (King *et al.*, 2013; Atkinson *et al.*, 2016). Wider-scope problem solving *strategies*, more transferable between tasks, are emphasized in our program. Strategies allow users to *explore* (understand the full space of affordances available to them) and *tinker* (understand how their actions affect the system state) in a safe, methodical way. Exploration and tinkering are enabled by a set of certain *attitudes* on the user's part, including confidence, creativity, attentiveness, and perseverance. Together these strategies and attitudes provide a foundation for lifelong, independent learning. *Social Cognitive Theory* (Bandura, 1977) provides guiding principles for our community program (Steelman *et al.*, 2017): Tutors model problem solving and exploration, work with learners to articulate goals, and put the learner in the driver's seat as much as possible to build self-efficacy.

The COVID-19 pandemic revealed both the limitations of our model and opportunities to extend its reach. Since we could no longer offer face-to-face tutoring, we pivoted to providing our program online through Zoom; we set up a phone-based "switchboard" through which we helped patrons connect to Zoom and then passed them to tutors in breakout rooms. Although an effective *ad hoc* tactic, the phone-based approach was not effective for those who need the assistance most: those without the knowledge or confidence to independently connect to the internet, download an app like Zoom, or join a meeting. At the same time, the new remoteness revealed opportunities. By reaching patrons in their home, we were able to help individuals in their own space and with tethered technologies such as printers, cable modems, wi-fi routers, and smart TVs, which have been challenging or impossible to address in face-to-face tutoring sessions. This inspired us to conduct a Design Thinking workshop among past and present community tutors to reimagine our program and how it is delivered. The concept of this current work emerged during that workshop.

Our Illuminated system has two components: the Illuminated Portal, and a social subsystem comprising the human tutors, community, procedures, and tasks associated with the tutoring program. The Illuminated Portal is a lightweight application that integrates video communication with a human tutor as well as access to common solutions that can help resolve problems independently. The Portal has a low barrier for access, requiring only a single button press to activate the device, connect to the internet, and initiate the Portal application and a face-to-face tutoring session therein. Once connected, the Portal will provide a continuous view of user activity across applications and convey tutor input to learners in a way that minimizes distraction and maximizes flow. Examples of tutor-learner interaction via the Illuminated Portal are depicted in *Figure 1*.

In developing the Illuminated system, it is imperative that we understand our users and define the system goals (Easterday, Rees Lewis, Gerber, 2014). We are following a human-centered research approach called *Design-Based Research*, which emphasizes producing theories of learning and teaching in naturalistic contexts using interventionist and iterative design approaches (Barab and Squire, 2004). Our partnering organizations in this process include two local libraries and an employment aid office helping local job seekers.

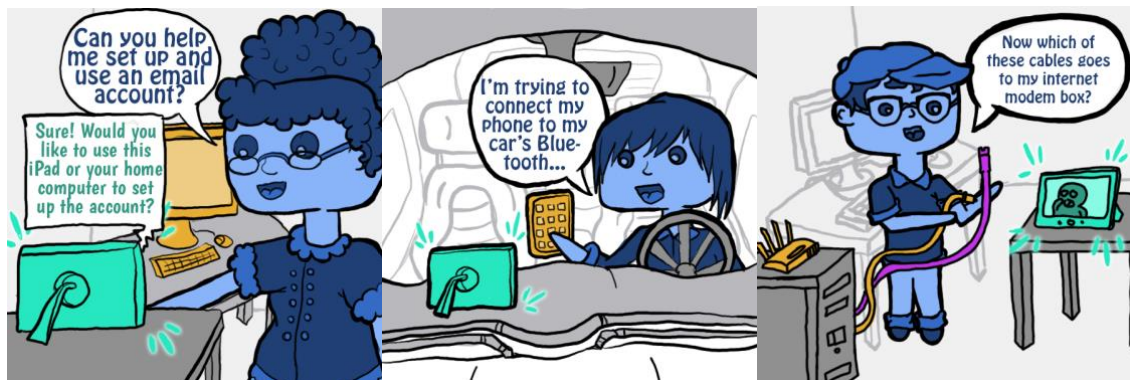


Figure 1: Use cases of tutor-learner interaction via the Illuminated Portal.

Beyond the technical aspects of the Illuminated system, what remains to be developed is the social component of the sociotechnical system. How can the Portal be put to use in ways that leverage our best practices from ten years of BASIC tutoring (Steelman *et al.*, 2017)? For instance, what does observational learning and modeling look like when tutor and learner are connected virtually rather than in person? How can goals best be negotiated without physical proximity? Physical distance necessitates putting learners in the driver's seat, but how then can tutors best handle the moments when in-person they would temporarily take the wheel? Libraries and other organizations will also need a protocol for how to connect tutors with learners. These support resources will be developed concurrently with the technical subsystem, informed by the consultants in our three partnering community organizations.

Our design-based research approach facilitates always thinking of next steps, next goals, and next improvements. As stakeholders navigate and suggest modifications to the technical system, these interactions can also inform aspects of the social subsystem that were previously hidden. Further, as the Portal is used across contexts, stakeholders and those learning with the Portal may identify key areas to direct future work. For example, while the Portal is meant to help with general technology literacy, specialized help for topics related to navigating employment or library services with a device may be frequently requested. Such requests may lead us to refactor the social subsystem with additional types of tutors, or methods for aiding with these specialized needs.

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