Framework for Assessment of Scratch

Research Questions. Our research will investigate how Scratch can support the development of technological fluency. Our research will focus on the following three areas:

Engagement. We will study how young people become engaged in programming activities and what keeps them interested in pursuing more complex projects.
- **Entry points:** How do young people become interested in using Scratch? What aspects of Scratch do they find most engaging?
- **Activities:** What types of projects do they choose to develop?
- **Persistence:** How does youth interest in Scratch evolve over time? What supports are needed to keep them involved in projects?

Learning: We will study what programming concepts and abilities youth learn as they work with Scratch, and what factors support and impede their learning.
- **Concepts:** What computational and related concepts do youth learn through use of Scratch?
- **Capabilities:** How does work with Scratch further young people’s abilities to engage in sustained reasoning, debug problems as they arise, break complex problems into simpler parts, express their ideas in new media (developing ideas from initial conception to completed project)?
- **Reflection:** In what ways do young people talk about their programming projects, both online and in person?

Community: We will study how programming knowledge is built and shared within and across after-school centers.
- **Sharing projects:** What types of Scratch objects and artifacts do youth share with one another? What do they share with friends and family outside the center? How does the availability of handheld devices influence patterns of sharing?
- **Sharing ideas:** How does use of Scratch spread over time within and across sites? What types of programming techniques and strategies do youth share with one another?
- **Support:** What are the supports and barriers to the sharing of knowledge within and across sites? What role do staff and mentors play? How do youth support one another?

Research Approaches. To address these research questions, we will use several approaches for collecting and analyzing data. We have chosen methods that are most appropriate for informal learning settings, where participation is self-directed and voluntary.

Participatory Design: We will use a participatory design approach (Schuler & Mamoika, 1993) to inform the design of the Scratch programming environment. This process will guide the iterative development of interfaces, features, and activities that are accessible to youth and resonate with their interests.
- **Cooperative Prototyping Sessions:** We will engage in rapid prototyping of Scratch programming environment based on bi-weekly interactions with youth at each Boston and Los Angeles Clubhouse research site. Researchers and youth will cooperatively explore each prototype and discuss possible changes to help facilitate use of the tool.
• **Project Storyboarding:** We will discuss project ideas with Clubhouse members using a low-tech prototyping approach (Scainff & Rogers, 1998). We will use our scenarios as conversation starters to explore possible digital-arts project activities.

**Case Studies:** We will use case studies, conducted in the ethnographic tradition, for two purposes: to study engagement and learning by individual Clubhouse youth, and to study community knowledge-building within and across Clubhouse sites. Our study of how individual youth develop fluency with Scratch will be based on a framework and interview protocol developed by the Center for Children and Technology (CCT, 2002). The Clubhouse-wide studies will construct portraits of the use of Scratch and related technologies over time, based on the work of Oakes & Margolis (2000). The portraits will allow us to compare and contrast the use of Scratch at different Clubhouse research sites.

• **Baseline data.** At the beginning of the study, we gather baseline data (through field observations and interviews) on youth interests, relationship and experience with technology, patterns of technology use, and level of technological fluency prior to introduction of Scratch.

• **Field observations:** Researchers from the project team will visit each Clubhouse research site in Boston and Los Angeles on a weekly basis, using observation forms to record what activities and tools are in use, types of Scratch activities, and differences in girls and boys’ choice of activities.

• **Participant observations** will include interactions with members and report more closely on the kind of activities and on-going conversations at the clubhouse. We will pay particular attention to ways in which Clubhouse members deal with learning new Scratch features, debugging situations, and providing explanations and help to others. These observations will be documented in field notes.

• **Participant interviews:** We will talk with Clubhouse youth about their Scratch projects to better understand what aspects of Scratch activities they find most engaging, and to assess their evolving understanding of computational concepts and development of technological fluency, based on the CCT protocol. We will also interview Clubhouse coordinators to gain a fuller picture of youth engagement and learning, and how Scratch fits into other events and activities in the Clubhouse.

**Analysis of Network Activity and Digital Artifacts.** We will study the artifacts created by Clubhouse youth, sharing of artifacts among youth, and online discussion about Scratch projects.

• **Individual Development:** We will study individual member’s portfolios, from initial starter projects to more complex digital-arts projects, to analyze the evolution in the complexity and expressiveness of their projects, and the development of their programming and design skills.

• **Collective Knowledge Building.** We will study the evolving database of projects across the Clubhouse Network, to analyze how new techniques and project ideas spread within individual Clubhouses and throughout the extended Clubhouse community. We will also study how the introduction of new devices (including handhelds and mobile phones) influences the spread of projects and ideas.

• **Evaluation by Peers:** In addition to “expert” analysis by project researchers, the team will also seek young people’s evaluation of programs created within the community. We will study which kind of digital-arts projects are held in high esteem within the Clubhouse community and ask members for their rationales.