

# The Sharing of Wonderful Ideas: Influence and Interaction in Online Communities of Creators

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
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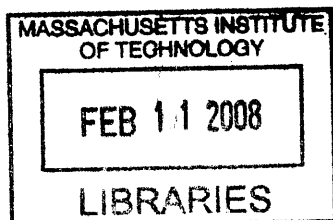
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
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# The Sharing of Wonderful Ideas: Influence and Interaction in Online Communities of Creators

By Elisabeth Amy Sylvan

Submitted to the Program in Media Arts and Sciences,  
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## ABSTRACT

This thesis presents a new framework for understanding how communities of creators share work, influence one another's creative processes, and learn from one another. I introduce the concept of Online Communities of Creators (OCOCs), which are online communities where the core activity is sharing personal creations. These communities can play an important part in the development of the Creative Society by providing venues for people to encourage each other's creative processes and output. By fostering each other's desires to create and share, these communities help individuals to experience the joy of designing, creating, and sharing. Through these explorations, people develop skills important to their personal development and their ability to participate in the modern workplace.

I analyze how ideas spread through OCOCs using the framework for diffusion of innovation developed by Everett Rogers. I map specific behaviors in OCOCs to Roger's five stages of adoption of innovation: awareness, interest, evaluation, trial and adoption. Within OCOCs each of these stages represent deepening understanding of other community members' work.

Using a mixed-methods approach of ethnography and social network analysis, I study two

specific OCOCs: the Computer Clubhouse Village and the Scratch online community. Both of these communities are designed to facilitate learning with computers. The Village enables members of network of socially-supported computer clubs to share their work, their concerns, and their selves. The Scratch site is a new web community for people sharing work created with the Scratch programming environment.

The thesis focuses on four topics: forms of participation, network diffusion of ideas, individuals' adoption of ideas, and identifying influentials. I report on how different social and project-related participation support the communities. I discuss how a particular technology I developed diffused through an OCOC. I analyze which community members' projects enter the "trial" stage of adoption. Finally I describe what creator and project factors predict influence in OCOCs.

As I considered the various research topics this thesis addresses, I created technologies and developed some design guidelines for OCOCs. I introduce two of these technologies –the Village Profile Survey and the Village Visualizer– and describe the motivation, design, and impact of these tools. I also describe a design philosophy that motivates these and other projects I have worked on and outline both design principles and ethical concerns for the development of OCOCs.

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# INTRODUCTION

## Motivation

I believe that –given the permission to explore their own ideas and some structure in which to develop them– children are naturally curious. This curiosity will fuel them throughout their lives, allowing them to explore new ideas, take risks, fail, and try again. I believe this curiosity is behind our contributions in all disciplines, be they arts, humanities, or science. We may all yearn for pleasure, comfort, and safety, but I believe the richest lives also yearn for newness, for making connections between ideas and experiences (Maslow, 1998). Every child –and every adult– deserves to have this richness in their lives.

The desire to explore, explain, and create comes from within. As adults we have experience that helps us to identify what ideas are important and how children can learn them. By contrast, a child works, plays, learns, and creates from her own motivation and desires. We can teach facts and techniques and present ideas in inspiring ways that motivate children; we can nurture them as they grow, but we cannot make a child want to learn.

I believe that we can influence children’s desire to create and learn by providing them with tools and environments that are stimulating and supportive (M Resnick, 1996; Papert, 1980b).

These tools and environments can take many forms (Bers, 1999; Rick Borovoy et al., 2001; Bruckman, 1997; Eisenberg, 2003; Resnick, 1990; Scardamalia & Bereiter, 1994; Seitinger, Sylvan, Zuckerman, Popovic, & Zuckerman, 2006); different children may fare better with different materials and support. Though some children will do wonderfully on their own, I believe most people do better with mentoring and a supportive social environment (Paley, 1993). Many schools, families and communities provide such environments (Bielaczyc & Collins, 1999; Hesselbein, 1998), but, in the modern world, technology can provide a broader, even global community (Hesselbein, 1998; The North American Council for Online Learning and the Partnership for 21st Century Skills, 2006c). Thus, it is critical that the technologies we build support communities that scaffold and support children's (and adults') personal development.

At different stages of development, children and young people require different kinds of stimulation. A young child may have simple needs: to manipulate basic objects; to learn how her body interacts with the world; and to watch people, animals and things that move (Leach, 1997; Winnicott, 1971). As she gets older, she may develop narratives about her fantasy play and build objects that reflect her ability to understand and enjoy greater complexity (Leach, 1997; Winnicott, 1971).

As children get older and understand more about their world, they can look increasingly beyond

their initial environment for new ideas and experiences (Carpendale, 2000). Their worlds broaden as they develop their minds, explore the abilities of their bodies, and identify first with their family and then their friends. As the scope of their world grows, they are curious about their place in it, and they try to find that place.

For adolescents, the desire to create goes hand-in-hand with the desire to express the self. Their creations often take the form of explorations of the self and how they fit into the world. Adolescents searching for their own identity may be acutely aware of the identity of their peers (Csikszentmihalyi & Larson, 1984). They may try to conform to their friends' beliefs and self-presentation. For many adolescents, defining their identity *is* their primary creative activity. They may express and explore their identity through their clothes, their friends, their favorite mass cultures icons, their speech, their activity, as well as what they create and learn. Increasingly they express themselves online (Lenhart & Madden, 2007). More than half of online teens are content creators (Lenhart & Madden, 2005). One third share their creations online (Lenhart & Madden, 2005). Twenty-two percent keep a personal webpage and 19 percent have created an online journal or blog (Lenhart & Madden, 2005).

## Preparing for the Workplace of Today and Tomorrow

*Nothing endures but change.*

-Heraclitus, 540 BC - 480 BC

Heraclitus may have said this many lifetimes ago, but his words are as appropriate now as they ever were. The workplace that young people enter today is a far cry from that of their parents and grandparents. Those with the best jobs have more flexibility now. Company hierarchies have flattened. The workplace is both more informal and collaborative. Telecommuting is increasingly common. The workforce is more socially, culturally, and demographically diverse.

But, as we all know, this flexibility comes at great cost. The job security of previous generations is gone. Modern workers spend long days on the job and often have long commutes. More people have college degrees than ever, but a degree does not guarantee a good job. Manufacturing jobs are decreasing in the developed world and professional jobs are increasingly outsourced. The global market is more competitive; security is not guaranteed. Not only are pensions disappearing, but people no longer expect to stay at the same job for long. Layoffs are common, even in the most desirable jobs. The increased diversity of our modern workplace requires that people have greater cultural understanding and adaptability

(Crane et al., 2006). They must learn to collaborate with people different from themselves and work in open, collaborative workplaces that are neither private nor quiet.

As the most interesting work increases in complexity, many work groups become interdisciplinary (The North American Council for Online Learning and the Partnership for 21st Century Skills, 2006a). Working together is not only important to professional and financial success, but also to personal development. For many people, working with others makes the job more fulfilling. We learn from each other's knowledge and solidify our own understandings when explaining or justifying to others. And creative work is often of a more stimulating and more personally meaningful nature (Schön, 1983).

Preparing people for this new workplace is not just a matter of identifying particular needed skills and providing appropriate training. Skills are important but a wide range is needed. More importantly, workers will be more confident in the workplace if they know that they are able to adapt and learn. When a group of people learns together, their knowledge may be situated not only in their own minds, but also in the common language they develop, the environment they work in, and the tools they use (Brown, Collins, & Duguid, 1989). Thus, today's workers need to be able to work together and communicate well.

Many people do not have the skills to participate in this new workplace. When asked what they need from workers, employers say the three most critical skills are work ethic, teamwork, and critical thinking or problem solving (The North American Council for Online Learning and the Partnership for 21st Century Skills, 2006a). In fact, employers suggest that they value these more than basic knowledge, such as reading comprehension and mathematics (The North American Council for Online Learning and the Partnership for 21st Century Skills, 2006b). Meanwhile 70% of employers say that creativity and innovation is going to “increase in importance” as time goes on (The North American Council for Online Learning and the Partnership for 21st Century Skills, 2006b). These employers describe high school graduates as “deficient” in writing, reading comprehension, mathematics, and critical thinking and only “adequate” in information technology, diversity, and teamwork. They describe college graduates as better prepared for entry-level jobs, yet still “deficient” in writing and leadership.

Looking forward, we can expect these trends to continue. More and more people will compete in the global market. Physical location will matter less, while ability, access, and cost will matter more. People who can innovate and create will have an advantage.

Though the “3 R’s” are clearly important, they are not sufficient for success in today’s

workplace. To participate and succeed, workers need to be able to troubleshoot, problem-solve, innovate, communicate, and work in groups with different kinds of people. People will have these abilities as adults if they are exposed to similar environments when they are young. We need to support today's youth to ensure their success explore as members of tomorrow's Creative Society (Resnick, 2003).

## **Learning By Designing**

Over the last decade the learning research community has supported “learning through designing” as an excellent way to develop the very skills that are so important in the workplace (diSessa, 2000). Learning through designing means conceiving, designing and building creations: from arts and crafts, to science experiments, to computer programs (Resnick, 2006). The learning occurs through the iterative process of creation.

When learners are designing creations that other people will observe or use, they must consider how their audience will respond to what they make. In addition, these projects are often collaborative. Learners may explicitly build together, look for advice when they are stuck, or be inspired by what others have designed.

Thus, learning through designing can support an understanding of other people that leads to the ability to communicate and work with others. This type of learning is often iterative; learners may try out one idea, refine their design, and build upon what they have learned (Kolodner, Crismond, Gray, Holbrook, & Puntambekar, 1998). Learners are often faced with challenges along the way. In meeting those challenges, they engage in the creative problem-solving that employers say they need. They also learn that they *can* figure things out on their own, that they are capable and able to adapt. They may find they like to create, explore, or tinker, which, to me, is one of the most important traits we can foster in our children.

## **Online Communities**

As modern work is changing and people consider how to prepare the next generation for the work world, the web is also going through a second revolution. It can push and pull, and more importantly, connect people and their ideas in more significant ways. Online software tools are profoundly more social than before and more like how we work and interact in the rest of our lives (Preece, 2000). Though online communities have existed in various forms for many years (for example, The Well), communities like MySpace and SecondLife now include a large percentage of the population and inhabit the collective consciousness overall.

Some of these online communities, such as MySpace, focus on friendship and presence. Others,

such as Facebook, are social in nature but instead of focusing on individuals building their networks, they are designed to facilitate existing communities (in this case, school communities). Others are professional networking tools, such as LinkedIn and Ecademy. Still others are built upon specific areas of interests, such as Harmony Central, Broadjam, and Sonicbids for music or YouTube (video), Blogger (blogs), and Flickr (photographs).

Online communities are increasingly popular, particularly among youth (Lenhart & Madden, 2007). It is no surprise that adolescents are interested in them. Online communities may appeal to this age group, in part, because they provide opportunities to explore identity and express it to their peers through personal expression. These communities allow adolescents to reach outside their family and community to the broader world. They provide environments in which children and youth learn some of the important skills for the modern world such as cultural understanding, collaboration, and ability to communicate and work with others through computers. Members of online communities can engage in a range of enriching activities from chatting, getting support, and finding voice to sharing personal creations.

## **Online Communities of Creators**

This thesis focuses on a specific type of online community that I call *Online Communities of Creators* (OCOC). I have coined this term to describe the subset of online communities in which

the core activity is to share personal creations. Personal creations are objects that people make as a form of personal expression and can include content such as photographs, music, stories, songs, and computer programs. In an OCOC, a network of people is brought together by the projects they share. Participants in OCOCs may post their creations in public forums, comment on each other's work, and tag their projects to describe their meaning. In some communities they may download the work of others, manipulate it, and then upload it for review.

At the core of OCOCs are the objects that people share and create. When members post projects, they reveal themselves. Through their work, they create a public self for others to reflect upon. Thus, they are conscious of what they share, the attention it might garner, and how they hope others will react. To be accepted by their community, they develop relevant skills and unusual perspectives that stimulate the community. Participation in the community encourages and supports learning. Participants develop abilities that the communities value such as programming, storytelling, image-making, or scientific questioning. Through these relationships and supported by their creations, they build online relationships with other members.

An Online Community of Creators has three core attributes:

- The ability to share creations
- The ability to comment on and discuss each other's work
- The ability to associate particular contributions with the people who make them

The core issue in OCOCs is their ability to support people in sharing and being influenced by one another's work. As members of an OCOC become more engaged in a community, they participate more, and in deeper ways.

When people first discover the community, they may surf others creations. If they like some of them, they may try the projects out or forward them to their friends. People in OCOCs come to know each other in no small part through their respective projects. By viewing each other's work, they have a deepening understanding of who the other people in the community are.

Later, as members feel more engaged, they may create an account or leave comments on a project. They may even create their own project, inspired by a particular project or by the community as a whole. If they are deeply affected by someone else's work, they may study the creation in more detail to learn from it. All the while, this deepening adoption helps them to understand the community –its work and its members– and how they themselves fit into it.

Many well-known community sites can be described using the OCOC model. Flickr, a site for photography sharing, allows people to comment on each other's work, create basic profiles, and join groups (Figure 1).

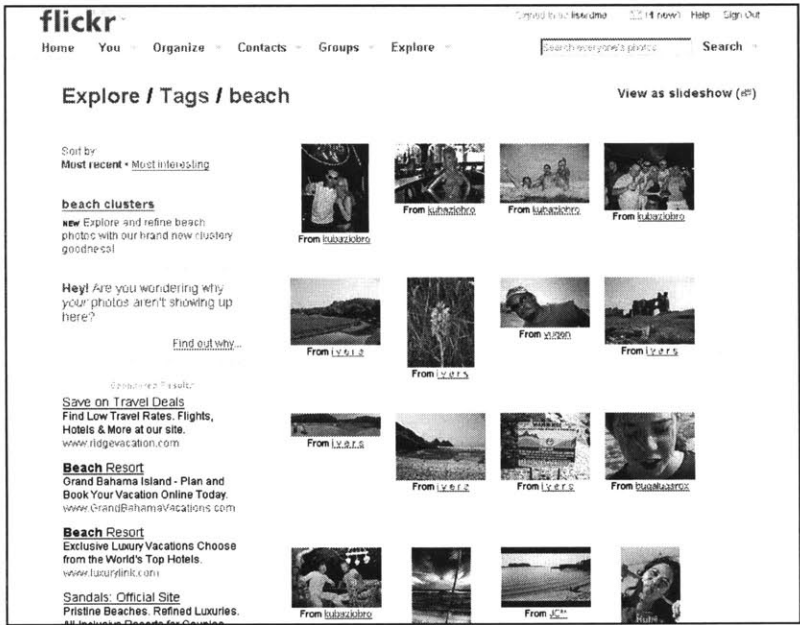


Figure 1: flickr, a photo-sharing OCOC

Jumpcut and vSocial (Figure 2) are similar sites, only for video sharing. Blogging sites, like Blogger and Blogdex, support communities of people blogging. OpenStudio is a community art-creation site that allows members to create, modify, and sell their work (Figure 3).



Figure 2: Vsocial, a video-sharing OCOC

As these sites become more popular and more sophisticated, the lines between different online communities (OCOCs or otherwise) are blurring. People can embed their vSocial videos on MySpace and can import media from flickr or Facebook into Jumpcut.



**Figure 3: OpenStudio, an art-making community site**

Many of the popular social network sites today have elements of OCOCs, but are not entirely focused on sharing creations. YouTube is one example of this mixed-use category because people share videos they create but much of the content consists of other people's videos and commercial content. In these environments, users can easily remain consumers or audience members of the content, and never become creators. This limited level of involvement

reinforces the status quo of mass culture: that culture is something we receive from polished, often well-funded, sources with values and goals that may or may not reflect our own.

Well-designed OCOCs can encourage members to explore each other's creations and inspire them to create. When users create a site's content, other users are more likely to feel that they too can participate. It helps if the creation process has some transparency (such as Blogger, which provides clear instructions describing how to get started with creating a blog.) It helps if the interface is simple to use. It also helps if the community is a supportive one with limited negative behavior such as flaming and spamming. Designers can create tools that support people in finding their own way and being in approaching these challenges with confidence.



Figure 4: Blogger's front page makes it easy to learn how to use the site

## Introducing the OCOCs Studied in This Thesis

The web communities described in this thesis –The Intel Computer Clubhouse Village and the Scratch site– are both OCOCs. The Village is a site created for the Intel Computer Clubhouse, a network of after-school learning centers where youth can use computers to learn in over 100 physical Clubhouses around the world. The website is an intranet for Computer Clubhouse

members to share their various computer creations, to discuss issues that concern people, and to express themselves, and to connect with others around the world (Sylvan, 2006).

The Clubhouse's goal is to empower youth through creative expressions with computers and through experiences with other people (Resnick, Rusk, & Cooke, 1998), the site has been designed to support flexible dialogue and social interactions, along with the sharing of projects. Members often create elaborate MySpace-like profile pages and participate in ongoing discussions about a range of issues. The many different types of projects are the glue that binds members into a community.

The Scratch site is targeted to a single purpose: to support people in sharing Scratch creations. Developed by the Lifelong Kindergarten Group at the MIT Media Lab, the Scratch software is a visual programming environment that lets users create their own animations, games, and interactive art (Maloney et al., 2004). It aims to create a programming culture that empowers people to express themselves fluently and creatively with new technologies. On the Scratch web site, people can play each other's projects in the browser and download the source materials to learn how the projects are made. In addition, they can comment on each other's pages. Scratch has fewer mechanisms for social interactions than the Village.

Although these two sites are designed for different purposes, they both are fully OCOCs. They engage the participants in sharing their creations. They are designed to support members' ability to have a dialogue about the projects and other relevant topics. They also provide an ability to associate particular content with people. This is important for two reasons. First, individuals know that their authorship and ownership is understood. Second the community gets to know one another by relating the content people create to the creators. These features support people's ability to go from being observers or audience members to creators. All these features taken together allow the communities become places for collaboration, sharing, and learning.

## **Framework for studying OCOCs**

To understand how ideas are adopted in OCOCs, I look to a body of research that allows researchers to understand social connections and how ideas move through a network. Everett Rogers called the process of ideas spreading through a network as "diffusion of innovation" (Rogers, 1995), defined as the "the process by which an innovation is communicated through certain channels over time among members of a social system" (Beal & Bohlen, 1955). This process is enabled by four elements: the innovation itself, the communication channels, the social system, and time. Table 1 lists the elements that enable diffusion of information. The right column shows how I have mapped these elements to OCOCs.

**Table 1: Elements of Diffusion of Innovation and How They Map to OCOCs**

ELEMENTS OF DIFFUSION OF INNOVATION	HOW THESE ELEMENTS MAP TO OCOCs
Innovation	Creations
Communication channels	Ways of viewing, linking, and downloading community work
Social System	The network of members
Time	Time

Rogers distinguishes between diffusion of innovation and individuals' personal adoption. The diffusion is something that happens through an entire community and has the four elements described above. An individual is within the broader community but goes through a personal process of adoption. An individual's personal adoption goes through five stages: awareness, interest, evaluation, trial, and adoption.

I suggest that these five stages are relevant to how people incorporate idea from one another in a learning situation and that this model can be extended to the learning sciences. I propose that in an OCOC these stages are revealed by specific behaviors (Table 2). Examples for all stages involve sharing. As an individual progresses through the stages, the type of sharing deepens and each of these stages can be seen as indicating a deepening understanding of other

community members' work. The first three stages —awareness, interest and evaluation— demonstrate attention to the other members' work. In the last two stages, trial and adoption, members learn from each other by deeply exploring each other's work. For OCOCs, I make an important distinction in the type of adoption. Ideas can either be copied or assimilated. If a community member simply copies another member, this does not indicate that the person has necessarily learned from one another. But if someone fully adapts and assimilates another person's ideas into his or her own work, then that person has learned from another.

**Table 2: Rogers Stages of Adoption and Related OCOC Behaviors**

ROGERS' STAGE	ROGERS' DEFINITION OF STAGE	OCOC BEHAVIORS CHARACTERIZING STAGE
Awareness	Member is exposed to idea but lacks complete information.	Surfing projects
Interest	Member is interested and seeks additional information.	Exploring, revisiting, linking to, forwarding projects
Evaluation	Member thinks about how the idea relates to his or her current state and evaluates whether to use it.	Leaving comments on someone else's work or talking about the idea when interviewed.

Trial	Member fully employs the idea.	Trying out ideas from the project
Adoption	Member decides to continue to use idea.	Using specific concepts or files in his or her own work, particularly on multiple occasions.

By building, sharing and being influenced by each other’s projects, community members in OCOCs build the relationships that create a community. Some relationships within OCOCs can be quite strong, but weak ties provide important connections as well. For instance, some people view each other’s projects, but don’t communicate personally. Different types of social ties that people have in their lives provide different kinds of support. We may get ongoing emotional support through our strong ties, such as our families and friends. Still, these strong ties provide less diversity of information than do the weak ties that someone might have with coworkers and acquaintances (Granovetter, 1973).

It is likely that a person’s closest ties may know one another and may be tapped into similar networks. More distant relations, or weak ties, can provide more connections to different communities with varying values and knowledge. These weak ties provide a variety of important supports for individuals. For instance, when weak ties connect a person to others

with high status, they can be a means of getting new jobs (Lin, 2001). In the context of OCOCs, having many weak ties increases the chances that an individual has greater access to receiving new project ideas from others and can disseminate ideas through the community. By describing who knows whom in a network of creators, one can tell who is influential, who is in a good position to have diverse social resources, and who is well positioned to receive new ideas.

Some OCOCs may emphasize these attributes in different ways. For instance, one community might allow members to comment on specific projects, whereas others may form groups focused on particular topics for discussions. Some may have more extensive social expression and connection by supporting detailed profile pages or chat. Some OCOCs may support members in meeting face-to-face as well as communicating in the online world. Different sites may make different design choices depending on what is being shared and who is participating.

To prepare children for the modern world, we need to understand how working groups create shared understanding, how they develop a common language for collaboration, and how they learn as individuals and as members of a group. With this information, we can design Online Communities of Creators that empower, are pleasing to use, and that encourage the skills needed later in life.

## Content of this thesis

### Research Problem

Little attention has focused on how Online Communities of Creators share and adopt each other's ideas. These communities can play an important part in the development of the Creative Society by providing venues for people to encourage each other's creative processes and output. By fostering each other's desires to create and share, these communities help individuals to experience the joy of designing, creating, and sharing. Through these explorations, people develop skills important to their personal development and their ability to participate in the modern workplace.

In this thesis I *introduce* the concept of Online Communities of Creators and *address* how these communities support sharing, learning and understanding of relationships among the members and their work. I *frame* how learners in the communities adopt others ideas with Rogers' work and through this framing, provide an extension to his work. I *predict* who in the communities are influential. Finally, I *discuss implications* for researchers, the designers of the communities, and the communities themselves. The thesis focuses on four topics:

- Forms of participation
- Network diffusion of ideas

- Individuals' adoption of ideas
- Identifying influentials and understanding influence

To address these topics, this thesis focuses on specific aspects of two OCOCs, the Clubhouse Village and the Scratch website:

- I describe the communities, who they are, what they do and how they interact;
- I describe the structure of the two networks, how people are connected with one another and how they participate in different ways;
- I demonstrate how ideas diffuse through these networks, the pathways the ideas flow through, and the people who receive ideas;
- I look at which of these ideas are tried by others and are incorporated into new work and learning;
- & I predict influence within the communities.

### **Relevant Literature**

I frame these communities within several bodies of literature. *Constructionism* provides the foundation for how people learn through making things, why this method is important, and how to develop tools that support these types of learning. The field of *Computer-Supported*

*Collaborative Learning (CSCL)* provides both theory and examples of how computers can be used to support people learning together, critical to *Online Communities of Creators*. *Legitimate Peripheral Participation*, a research topic that influences CSCL, describes how the social engagement of a community of practice evolves over time and how members with different levels of experience contribute in different ways. It also contextualizes *Diffusion of Innovation* research from a learning research perspective. The field of *Social Network Analysis* provides the tools to discern how large networks of learners interact. It also shows how diffusion of innovation theory can be applied to how learners share ideas and where their ideas travel in a network.

## **Research Approach**

I attend to all of my research with a mixed methods approach. I take this mixed-methods approach because I believe that each area informs the others. I am interested in understanding how people work and so I am interested in research, purely for its own sake. But I also like to apply this knowledge as directly as I can to the development of technology. And by developing technologies, I can directly impact the communities that I work with and care about.

I take two methodological approaches in my study of OCOCs, specifically: ethnography and social network analysis. This mixed methods approach provides a unique way of addressing the

complexity of online communities. I used ethnography to describe how a small co-present clique in an OCOC (an after-school Scratch Club for 6<sup>th</sup>-7<sup>th</sup> graders) interacts and works with Scratch, allowing me to provide a richness to the research that the other methods cannot. The social network analysis provides an overarching description of the shape of the community and broad trends in how people interact and share. Finally, by developing technologies and observing how the communities react to them, I explore how particular design choices appear to influence the communities. From my explorations of the communities, my interactions with members, and my experiences developing technologies for them, I discuss design implications.

### **Technology development**

As I considered the various research topics this thesis addresses, I created technologies and developed some design guidelines for OCOCs. I introduce two of these technologies (the Village Profile Survey and the Village Visualizer) and describe the motivation, design, and impact of these tools. I also describe a design philosophy that motivates these projects and the Scratch project and suggest some design principles for the development of OCOCs.

## BACKGROUND

This thesis builds upon several bodies of research in the Learning Sciences and in Social Network Analysis. Specifically, from the Learning Sciences, it references Constructionism, Computer Supported Collaborative Learning, and Legitimate Peripheral Participation. This thesis is also built upon findings in Social Network Analysis itself, along with research in the Diffusion of Innovations.

### Constructionism

Constructionism is a framework developed by Seymour Papert, describing both how people learn and how to present materials to support learning (Papert, 1980b). It is based on the Constructivism of Jean Piaget, whom Papert worked with (Papert & Harel, 1991).

Constructivism suggests that learning is not something that one person passes to another; rather it is a process by which a learner organizes and builds information. Piaget believes that two primary ways people construct knowledge are through *assimilation*, the process by which learners expand their existing beliefs to incorporate their experiences, and *accommodation*, the process by which learners reframe their beliefs based on new, often surprising experiences (Ackermann, 2001).

Papert goes further, suggesting that not only is learning an internal process; it works best when the learner creates something external. He describes the difference between the two theories:

"The word with the v expresses the theory that knowledge is built by the learner, not supplied by the teacher. The word with the n expresses the further idea that happens especially felicitously when the learner is engaged in the construction of something external or at least sharable"(Papert & Harel, 1991).

In his work, Papert describes how he has observed children build understanding by working over time with objects that inspire them (Papert, 1980a). Because the external tools to think with are an important component of Constructionism, Papert discusses in detail how learners use these external tools, how to design these tools, and how computers can be revolutionary in changing how learners progress, particularly with complex ideas. With well-designed tools, learners have access to the "Big Ideas" that excite them and fuel their learning through play, experimentation, and design.

## **Computer Supported Collaborative Learning**

Computer Supported Collaborative Learning (CSCL) is a field focused on how communities learn together and how to build technologies to support collaborative learning. In many CSCL

communities learning *is* the goal. Researchers study the ways in which learning communities communicate, and share knowledge. They also build systems that support learning in different ways and on different subjects areas from general knowledge-building to experiments in scientific fields to communal writing and arts.

One early example of a CSCL environment is Computer-Supported Intentional Learning Environments (CSILE), (Scardamalia & Bereiter, 1994). The CSILE tool focuses on the ongoing improvement of group knowledge. Students can collect and share data, explore it together, and develop an understanding of topics they choose. CSILE provides an infrastructure for knowledge-building discourse in the classroom. This project gave rise to the Knowledge Forum, an environment for supporting knowledge-building communities by connecting people including communities for K-12 students and older students. It also inspired much of the CSCL work that followed.

Some subsequent CSCL projects have focused on exploring particular subject areas. CoVis was an environment that high-school students used to work on project-based science projects through collaborative science notebooks (Edelson, O'Neill, Gomez, & D'Amico, 1995). Another science-related application, BioKids, supports children in engaging in a variety of ecological topics including global warming, biodiversity, and weather (Songer, 1996). Other applications

focus on other topics such as writing. For example, Moose Crossing, which provides a community where children engage in creative writing while learning to program, is one such community (Bruckman, 1997).

### **Legitimate Peripheral Participation**

Moving from less central to more active roles in a community has always been an important part of transferring knowledge and culture, and it is particularly relevant to CSCL environments. Legitimate peripheral participation describes the process by which newcomers become experienced practitioners (Lave & Wenger, 1991). The peripheral participation of a newcomer is legitimate in that it contributes to the broader community and engages newcomers in the culture of the community (Lave & Wenger, 1991). Their contributions may be less substantive, but still important. Peripheral participation is key to an OCOC. After all, people present their work in public to have an audience. And when the audience responds (say, through comments), creators know they have reached their audience.

As a newcomer gains more experience and better understands the values and culture of the community, their contribution becomes more central. In the context of an OCOC, a member might first explore other people's projects, then comment on projects, then build a few themselves, and read and ask questions in forums to address what they wish to learn. As they

become more engaged and more central in the community and as they become more knowledgeable about its culture and practices, they may post advanced projects, answer novices' questions, and engage in deep dialogue with other experts about the fundamental issues of the community and its creations. These deepening forms of engagement parallel the ones I describe as OCOC adoption behaviors. I relate these behaviors to diffusion of innovation in Table 2.

## **Social Network Analysis**

A small but growing group of CSCL researchers apply social network analysis (SNA) to learning environments (Job-Sluder, 2006; Nurmela, Lehtinen, & Palonen, 1999; Reffay & Chanier, 2003). Social network analysis uses statistical methods to analyze and understand the structure of people in groups (Marsden, 2000). The general shape of the network can be described numerically or graphically, specifying who is connected to whom, how strong the connections are, who contacts others via intermediaries, and how ideas move through a network. The basic data needed to perform these types of analyses are represented as nodes (individuals) and edges or arcs (connections between the individuals) (Marsden, 1990). An edge might simply represent whether a person knows another, how well they know each other, or whether an idea has moved from one person to another (*ibid*).

Social network analysis provides not only theories about how information moves through a network, but also provides methodologies that can be applied to how people work together (*ibid*). By tracking who contacts whom, who creates what, and where ideas are sent, researchers interested in learning can develop new understandings of how learners collaborate and learn from one another.

Studying the network structure may provide insight into learning networks. These include important issues such as how much learners rely on each other versus teachers or mentors and the role of older children in younger children's experiences. Analysis of the flow of innovation can help researchers to understand how ideas catch on in a community of learners, how the structure of the network influences who adopts when, the factors that influence widespread adoption, and perhaps the structure of how people learn from one another.

## **Where SNA and CSCL intersect**

A few CSCL researchers working with social networks focus on students in school, either face-to-face interactions in more traditional classrooms or in ones supported by online communication. Palonen & Hakkarainen, consider interactions among school students using CSILE (Palonen & Hakkarainen, 2000). McFarland studies formal and informal structures in classrooms and student defiance (McFarland, 2001; McFarland & Pals, 2005). Reffay & Chanier

model collaboration in distance learning groups (Reffay & Chanier, 2003). Aviv, Erlich, Ravid, & Geva found that structured asynchronous learning networks had more students bridging and triggering discussions than unstructured ones (Aviv, Erlich, Ravid, & Geva, 2003).

Other researchers do not work in the learning science per se, but their social network research involves key issues for learning and OCOs. Gloor studies Collaborative Innovation Networks (COINs), (Gloor, 2006). COINs are groups of self-motivated people, enabled by technology and inspired by charismatic leaders, who work innovatively with each other and with related Collaborative Learning Networks (CLNs) and Collaborative Interest Networks (CINs).

Some researchers create computerized systems to allow users to explore complex social networks. Borovoy et al create activities with communicating nametags using IR (Richard Borovoy et al., 1998). These systems allowed users to share information with one another, see commonalities between individuals, and track patterns of exchange and commonality overall. Through sharing, the community could learn about how it functions. A variety of visualization tools have displayed different social information online such as chat data (Donath & Viégas, 2002), email history (Viégas, Golder, & Donath, 2005), and social networking sites (Heer & Boyd, 2005).

## TWO COMMUNITIES STUDIED

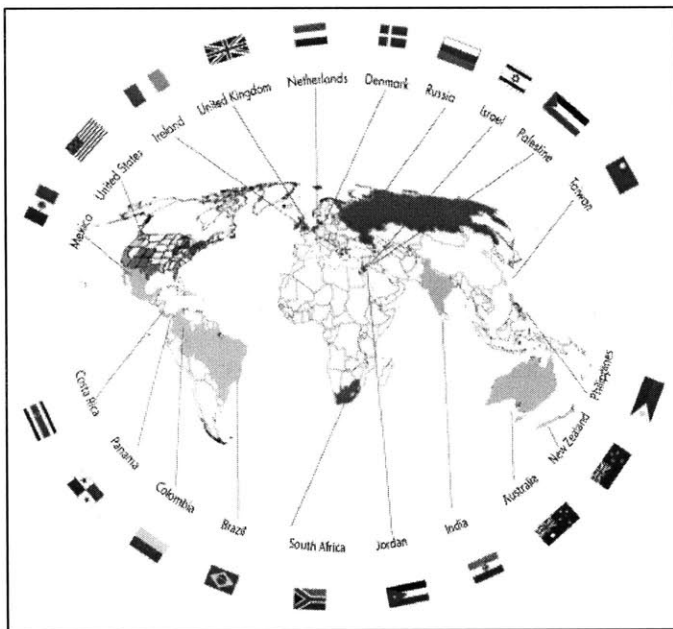
In this thesis I study two different communities: The Computer Clubhouse Village and the Scratch user community. In both cases participants are located all over the world and they participate in these communities through the web site (though some meet in person as well). Still the two communities addressed in this thesis are characteristically different. They were designed for different purposes, are composed of members engaged in different activities, and have divergent cultures. The Village is the online presence of an extensive network of after-school computer learning centers located around the world. The Scratch site is primarily a virtual place, though many schools and organizations use it, including one that I studied in person.

### **The Computer Clubhouse and Its Village**

The Computer Clubhouse was cofounded in 1993 by the MIT Media Lab in collaboration with the Computer Museum (which is now part of the Museum of Science in Boston). Intel Corporation provided funding that has allowed the network to create many Clubhouses all over the world. Today the Intel Computer Clubhouse Network (ICCN) provides tens of thousands of young people with ongoing opportunities to express themselves through computer technologies in a supportive, mentored environment. The focus of the Computer Clubhouse is to provide opportunities for people to develop technological fluency on their own terms, working on

projects they enjoy. It is a profoundly social and playful environment full of collaboration, discussion, and fun work. ICCN not only provides access to technology, but also is a place where youth's voices are heard through their work and through who they are as people.

There are more than 100 Computer Clubhouses located in underserved urban and rural areas. These Clubhouses are located in the United States, Ireland, Northern Ireland, the Netherlands, Denmark, Germany, Israel, Palestine, Jordan, South Africa, India, Taiwan, the Philippines, Australia, New Zealand, Mexico, Costa Rica, Panama, Columbia, and Brazil (Figure 5).



**Figure 5: Computer Clubhouses are located around the world**

A central organization coordinates activities, goals, and information across the network, but within this network structure, each learning center functions independently, and is run by its own Clubhouse Coordinator (Figure 6). Thus, each Clubhouse has its own distinct flavor.

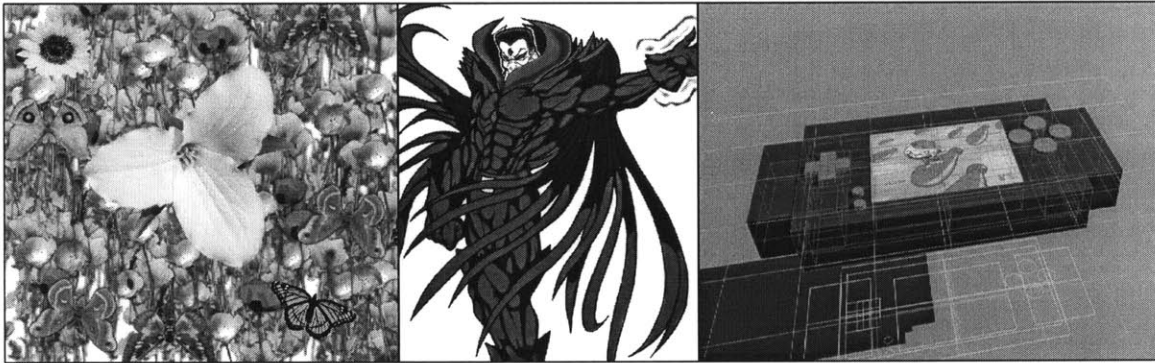


**Figure 6: Computer Clubhouse Interior**

Along with the Coordinators, the support of volunteer mentors is key to the success and spirit of Clubhouses. Mentors can be of any age or background. Though they often have computer skills, they don't need them to be a good mentor. A mentor provides inspiration and support for members as they create their projects. They encourage and listen to the members and foster a spirit of exploration and personal expression.

At Clubhouses young people create with computers, producing self-portraits made with

Photoshop filters, robots built with LEGO Mindstorms, 3D worlds created with Bryce, or games built with Scratch (Figure 7). Because Clubhouse youth members are themselves designing and inventing, they have a great sense of control and ownership of their projects.



**Figure 7: Three Art Projects by Clubhouse Members**

At most Clubhouses, youth can drop in at any time, emphasizing that the Clubhouse is for the members who can come when they wish and work on what they are passionate about. On average 50 members visit a given Clubhouse a day; 55 percent of these members are between the ages of 13-18 (

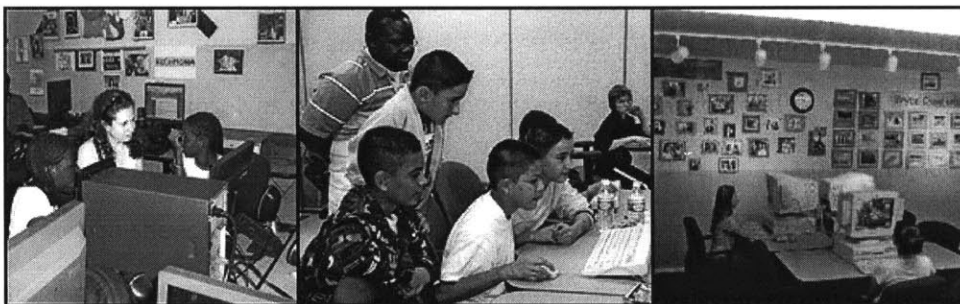
Table 3). A total of about 20,000 youth come to Clubhouses every year.

**Table 3: Clubhouse Use Data**

<b>MEMBERS VISITS PER CLUBHOUSES (3<sup>RD</sup> AND 4<sup>TH</sup> QUARTER 2006)</b>				
	Mean	SD	Median	Normalized Mean
Daily number of Members	50	111.63	25	33
Daily percent female Members	42	17.23	44	43
Daily percent of teen Members	55	25.69	55	55
Weekly number of Mentors	4	4.90	3	2
Total number active* Members	237	231.34	175	183
Total number active* Mentors	8	10.77	5	6
(From the 2006 ICCN Assessment & Planning Report Summaries)				
* Active = attended at least once in the last 6 months				

Each Clubhouse has its own style, developed by the interaction between the Coordinator, the mentors, the host organization, and the community (Figure 8). Because various members are working independently or together on different projects, the atmosphere at many Clubhouses is dynamic. The walls of the Clubhouse may be covered with years of members' work and suggestions for current projects to try, "how-to cards", and software to work with. A group of young people may be discussing game rules for the Scratch game they are making. Members

may be discussing the roles they are taking in the music video they are creating and how one person's artwork will fit with another's music. Some members may be working independently on the desktop computers around the perimeter of the room. Members could be creating portraits of themselves with a crazy Photoshop filter background or with their head on the body of a sports figure. One member might lean over to her friend's computer to see the Flash animation she is creating. A group might be coordinating a short movie with a mentor team filming one member with a Digital Blue camera while another member creates tracks in i-Movie. A boy may be quietly scanning photographs of his family to make a present for his father. Some members might be huddled together in the ever-popular music studio, recording tracks, singing, rapping and mixing. Perhaps they are working a submission to the Village Radio Show. Inevitably people will be clustered around the "green table" in the middle of the room, where people share and talk about their work and their days and make physical things.



**Figure 8: Activity at different Clubhouses**

A challenge -and an opportunity– for ICCN is to maintain what works in each individual Clubhouse, while encouraging the flow of communication and dissemination of information across Clubhouses. The Village, created with funding from Intel Corporation, helps people in different Clubhouses to stay in contact. The Village can be used to share the youth’s creations, suggest activities and ideas to inspire the new projects, communicate across Clubhouses, disseminate programmatic information, and coordinate events. The original Village went live in April 2004 and a complete visual redesign with some improved functionality went live in August 2007 (Figure 9).



Figure 9: New Village Home Page

The Village has these main sections (Figure 10):

- The *Projects* section includes all the projects people have shared, along with *Things to Try* and *Galleries*.
- *People and Clubhouses* features a home page for each Clubhouse along with links to photo albums and profiles. From their profile pages, Villagers<sup>1</sup> can post photo albums, galleries, write profiles of themselves, and email one another.
- *Software Studio* lists all the software available at the Clubhouses, along with help. *Talk* contains discussion groups and chat.
- *Topic Tree* is a wiki-like editable repository of Clubhouse-related information. It includes information on various Clubhouse issues such as sustainability, tutorials, digital photography, web design, and gender equity.

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<sup>1</sup> Youth at the Clubhouse and on the Village are referred to as “members.” I have continued with this convention and use the term “Villager” to refer to all people who use the Village, including members, staff, coordinators, and mentors.

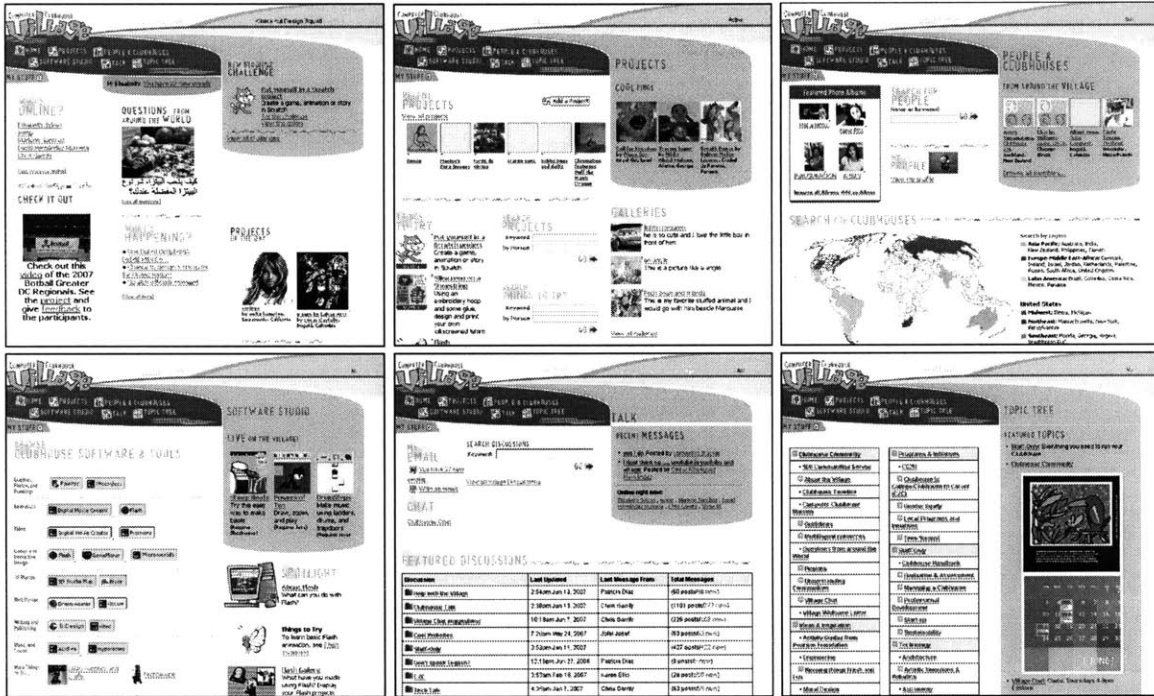


Figure 10: Village sections (from top left) – Home, Projects, People and Clubhouses, Software Studio, Talk and Topic Tree

It is critical to mention the importance ICCN gives to the privacy and safety of its members. When the original Village was designed, many choices were made to ensure that the Village would be a safe online place. These choices can be seen throughout the Village, but a few are worth noting. The only way to get a Village account is having a Coordinator, Assistant

Coordinator or staff member create one for you. Second, content –including chats, discussions, and comments– is carefully monitored. Problematic content is addressed in a highly personal way. Staff generally contacts coordinators who talk to the member individually and in person. Every time a member receives an email, they see a note at the end of it saying “If you get an email that is mean, has bad words, or makes you feel uncomfortable get help from village-help@computerclubhouse.org.” The Clubhouse and its Village does as much as possible to protect its members because they are at a vulnerable age and may have a lot of challenges in their world.

Through the Village, Clubhouse members can get involved with new projects and interact with others outside their Clubhouse in ways unimaginable without it. They post their projects, leave comments on them and ‘cool ping’ projects they like. They create highly personalized profile pages with photos, music, and videos. They discuss issues important to them. And they email one another. The Village is an Online Community of Creators that supports and connects existing physical communities located around the world. By connecting members in a protected online space, it supports the overall goals of the Clubhouse: to empower youth in disadvantaged environments through mentored and supportive experiences with creating technologies.



Though some Clubhouses have other thriving cultures, such as communal interest in the music-studio, no equivalent programming culture developed. This is unfortunate because programming is an important way that people can develop technological fluency (Resnick et al., 1998). It demystifies how technology works and allows people to create technologies themselves. But many programming languages and environments are daunting because the tools are difficult to both start and master. The material and related activities available may not resonate with many young people. As a result, they may feel that programming is for other people with special interests and skills.

Scratch makes programming more relevant by allowing users to create software that is interesting to them. Young people using Scratch make interactive media that reflect what is most interesting to them on computers today, such as games, animations, and artwork. They can share these creations and try out other people's creations online, just like they can view online games, Flash animations, and other materials appealing to children. Scratch removes many of the boundaries to getting started with programming, such as setting up a programming environment and figuring out how to compile code. It also eliminates some of the unhelpful and frustrating challenges of programming, such as misspelling or typos that cause syntax errors. (If you've programmed in a traditional environment, chances are you've spent hours trying to figure out what is wrong with your code, ultimately realizing that you've forgotten something

mundane like a semicolon.)

To program in Scratch, users drag jigsaw puzzle-like elements from the *Blocks Palette* into the *Scripts Area* and observe what happens in the *Stage* area. The elements in the *Blocks Palette* are grouped by category —*Motion, Looks, Sound, Pen, Control, Sensing, Numbers, Variables*— with each category corresponding to one color. Because code elements will only fit together in certain ways, the shapes indicate how to build programs in Scratch. Thus the color and shape organization of program elements implicitly demonstrate concepts in programming. To run the program, a user can click on the *Green Flag* and watch what happens in the *Stage*.

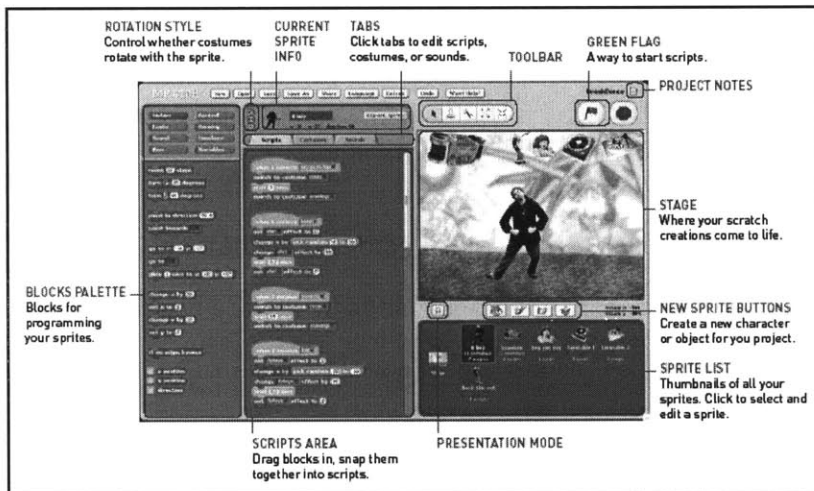
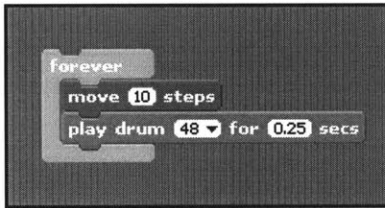


Figure 12: Scratch Major Features

Regardless of the conveniences of the environment, Scratch maintains many of the important and engaging challenges of programming. Users still need to decide what they want to do and decide upon a procedure to accomplish it. Simple things, such as moving a sprite or playing a sound, are quick and easy (Figure 13).



**Figure 13: Basic Scratch Program**

But it also supports a wide range of programming explorations, such as creating animations, games with levels, or virtual musical instruments (Figure 14).

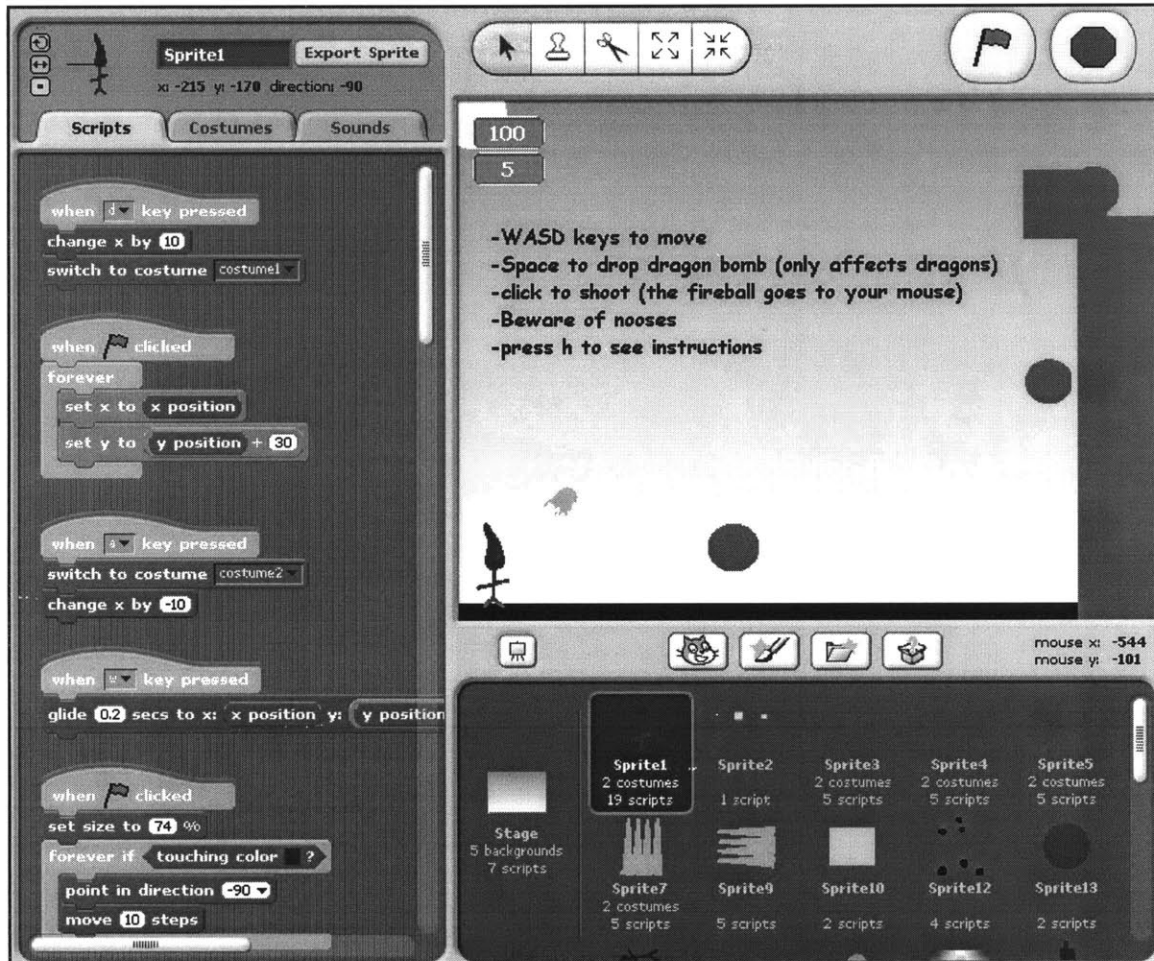


Figure 14: Complex Scratch game with multiple scripts for multiple sprites

The Scratch software download includes the software itself, along with help screens, 50 sample projects and a repository of media for use in projects, including 700 images, 100 sounds, and

30 sprites. Scratch is currently available for the Mac and PC. A Linux version is under development. People starting with Scratch can explore the sample projects to discover the range of possibilities they can create. They can look at the code and see how the projects were built. The images and sounds are scaled to suit the Scratch environment so that people have appropriate materials to work with. Scratch researchers spent significant time developing these support materials because we believe that having provocative examples and starter materials is as important to the hard fun of Scratching as the software itself.

Scratch is available for free on the Scratch web site at <http://scratch.mit.edu> (Figure 15).

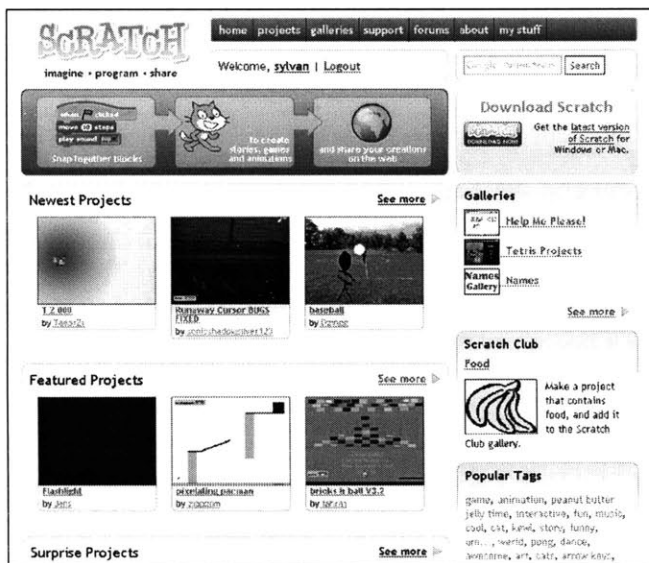
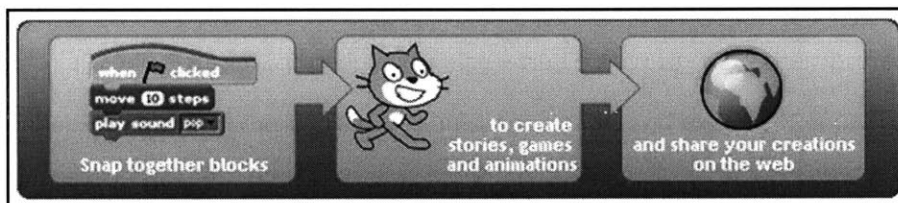


Figure 15: Scratch Front Page

People can do much more on the web site than download the software. The site’s primary goal is to provide a forum for people working with Scratch to share their projects and ideas. It is an online community where creators can share, learn, and explore. People can play Scratch projects natively in the browser using a custom JAVA applet. Any member can upload and share their Scratch files, put their projects in galleries, join groups, and have a profile page. The web site is designed with many of the features of online communities, such as friend lists, project comments, tagging, project appreciation flags, and inappropriate content flags.

A first-time visitor to the site might notice the graphic that describes the basic process –you can “snap together blocks to create stories, games and animations and share your creations on the web” (Figure 16).



**Figure 16: Scratch site front page graphic that explains what Scratch does**

From there, they likely will look at other people’s projects. They might start with the newest projects or perhaps the featured ones and then surf the work of recent visitors. From there, we

hope that they download the software to try out Scratch for themselves. Anyone who comes to the site can view art and animations, play existing scratch games, download Scratch and become a Scratch online member.

Figure 17: Projects highlighted on Scratch Front Page



The Scratch site is composed of these seven sections:

- Home
- Projects
- Galleries
- Support
- Forums
- About
- My Stuff

Home is the front page (Figure 15) and includes a variety of mechanisms for highlighting project (Figure 17), along with links to three featured galleries, recent visitors, newest users, popular tags and news. The *Projects* page is a list linking to the most recent projects. The *Galleries* page is a list linking to the galleries organized by creation date or title.

The *Support* section provides a variety of materials including a Getting Started Guide, a FAQ, a Reference Guide, Help Screens, Scratch Cards, and tutorials. The Scratch cards provide simple starter projects with sample code and ideas for what to do next. Beginning users may find certain materials useful such as the Getting Started Guide. More advanced users may use materials such as the Reference Guide to learn details of all features. Educators may be particularly interested in the support materials because they can be used to supplement their programs and classes.

The *Forums* section is a user forum with the following sections (Figure 18):

- *Announcements* where LLK researchers post information about new releases, but where members cannot post;
- *FAQ* where LLK researchers post answers to common questions and users can respond;
- *All About Scratch*, the most widely used section, where members request help with problems they are having, pose questions about the software, and express concerns about what they see happening on the website;
- *Educators* is a section where educators post commentary on Scratch for education, curriculum ideas, and problems and successes using Scratch in various educational contexts;

- *Suggestions and Advanced Topics* where people can suggest new Scratch features and request changes to the web site, as well as ask more advanced questions of experienced users.
- *Troubleshooting* is for members to post bugs in the software or on the web site.

Scratch Forums			
Forums Home Search			
You are not logged in.			
Scratch			
Forum	Topics	Posts	Last post
<b>Announcements</b> Watch here for the latest releases of Scratch, and other announcements.	3	3	2007-05-13 09:13:34 by johnadmin
<b>FAQ</b> Frequently Asked Questions	24	71	Yesterday 09:50:09 by teefal
<b>All About Scratch</b> Questions about Scratch? No question is too basic!	224	1025	Today 10:33:44 by fab_programmer123
<b>Educators</b> Discuss how you're using Scratch in education.	33	192	Today 08:06:00 by natalie
<b>Suggestions and Advanced Topics</b> Advanced questions or comments? Ideas for the next version of Scratch? Post here.	193	877	Today 10:16:19 by Spaceman
<b>Troubleshooting</b> Problems with Scratch? Think you've found a bug? Post here.	158	643	Today 10:23:15 by Spaceman

Newest forum user: <a href="#">maddy_ohnovoudidnt</a>	Total number of forum users: <b>3108</b>
Registered users online: <b>2</b>	Total number of topics: <b>635</b>
Guests online: <b>8</b>	Total number of posts: <b>2811</b>
<b>Online:</b> <a href="#">magicpenny</a> , <a href="#">SoftScience</a>	

Figure 18: Scratch web site forums

The final section of the Scratch web site is *My Stuff*. Each member has his own My Stuff page

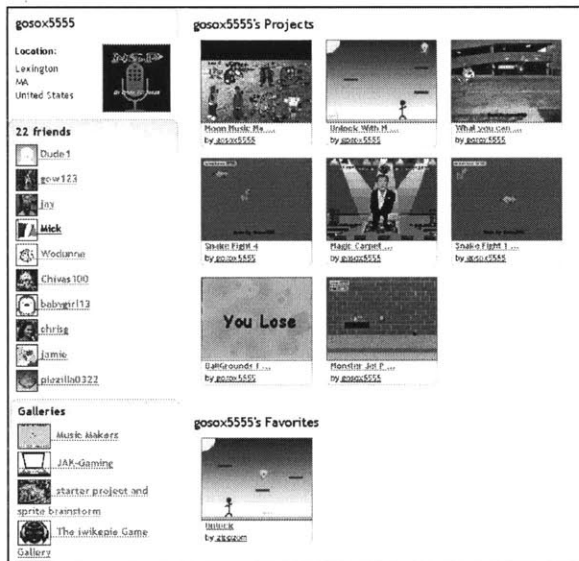


Figure 19: Example of a My Stuff page on the Scratch web site

that looks a little different to her than it does to everyone else. When a person visits someone else's MyStuff page, they see the user's personal information including his avatar, the projects he made, his favorite projects, his friends, and the galleries of which he is a member (Figure 19). When

members go to their own pages, in addition to the information everyone else can see, they have the ability to add and remove content including their picture, projects, and favorite projects. Other sections of the site look a little different when a member is logged on as well. When users are logged on, they can ask other members to be their friends and invite them to galleries.

Every Scratch project has its own page (Figure 20). It features the project running in the browser. In addition, any member can download the source code. Creators can include project notes that explain their motivation, problems they are having, or simply how to use the project. Any member can tag the project or comment on it. If the creator has made additional

projects, they appear on the project page as well.

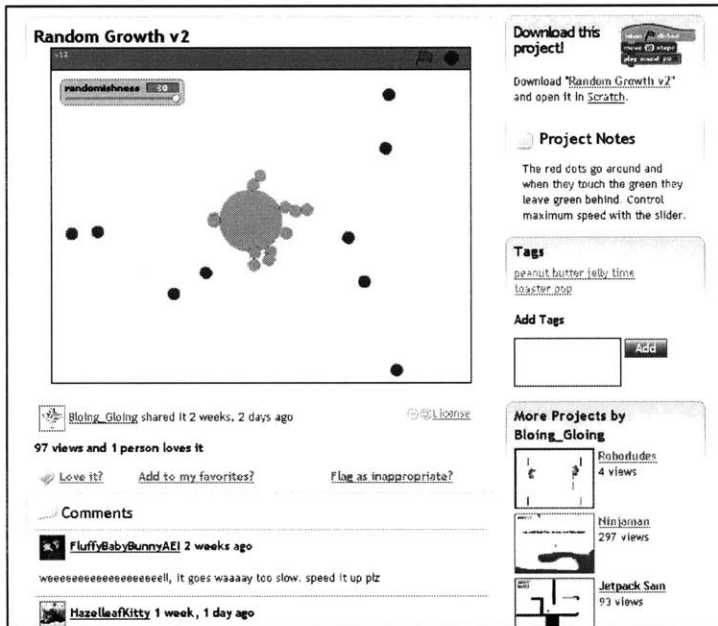


Figure 20: Scratch project page with project notes, tags, more projects by the member, and comments.

On its own, the Scratch software provides a rich environment to create and learn about interactive media through programming. Scratch researchers and others have been doing just that for several years in workshop settings with people of different ages, cultures and goals. Scratch can be used by people working alone and by groups of students who learn and share

with one another. Still the Scratch community web site brings a new dimension to the Scratch software. It provides a *raison d'être* for people working with the software. First, it allows a broader release of the software. The many children and adults who use the site provide the “evidence” for visitors that Scratch resonates and is possible for many people to use. For people working alone, it provides a social context and community. For educators, it provides a place to share teaching, and curriculum ideas and concerns about how to adapt the material to the classroom.

# RESEARCH APPROACH

## Some framing

My undergraduate and master's training is in psychology and its methods. I learned how to ask an answerable research question; to design and implement controlled experiments, surveys; and observational studies that address specific issues; and to frame my work within a greater research community. These still have provided an invaluable intellectual and methodological foundation for me. It is a set of tools I think with daily.

Since becoming a PhD student, I've run many workshops, facilitating groups of people interacting with each other and technology. As I've watched people working and learning together in workshops, I've realize that the experimental, observational, and survey research methods that I've used in the past, for all their strengths, do not capture much of the richness of the environment. Rather, they rigorously address specific components of how individuals affect one another.

As a PhD student, I have been searching for alternative approaches. I have become particularly interested in two fields: social network analysis and ethnography. I believe that SNA provides me with the overall picture of groups interacting as a whole, very different from what I have

done in the past. And ethnography provides richer descriptions of particular interactions.

In this thesis I have already described two online communities, what people do there, and how the technologies support different behaviors and activities. As part of my research I engaged in an in-person ethnography of a group of people who are part of one of these communities. I studied how the culture developed and changed over time and how this culture was part of the children's experience with the software and online community. Finally I used social network analysis to address issues, such as the structure of a group, how groups of people transfers ideas, as opposed to summarizing how individuals in the group worked, as I had in the past.

## **Ethnography**

I participated and observed a weekly one-hour after-school Scratch Club over the course of one school year. The Club, located at a local middle school, started in October and ended in June. At the Club I took on multiple roles—that of a facilitator, a catalyst (a term I found in (Resnick, 1997), and an observer. All of these roles were supported by simply 'hanging out' with the kids, getting to know them and their work, helping when needed, and prompting them to experiment. As one of the Club facilitators, I helped to plan activities and answered members' questions when they were having a problem using Scratch or their computers. As a catalyst, I suggested ideas for their projects, asked them what they were working on and what

they would do next, and encouraged them to think about the trajectory of their work.

As an observer, I *watched* what the children worked on, who they worked with, where they sat from week to week, and who they socialized with. I also *spoke* with the children about their lives and the work they did at Scratch Club and what that work meant to them. During the Clubs, I *took field notes* on what was happening, primarily key events and quotes, which I would then record in more detail immediately following every Club session. In May and June of the school year, I *interviewed* nine of the children. Because I knew the children well at this point, the interviews were more of a conversation than a formal interview. Still, I have a set of questions that I covered in every interview regarding what inspired them to create, how they were influenced by their peers and the web site, their design philosophy, and their interests and family life (Appendix A).

### **Ethnography Research Topics**

When I approached the ethnography, the goal was not to test particular hypotheses or address particular theories of how the children would interact. Rather, the goal was to describe, in detail, the ways in which ideas developed and caught on among a small group of Scratch learner-programmers. As a result the observation, field notes and interviews were guided by these research questions, but no hypotheses:

- How do the children's personalities, background, and beliefs affect how they approach their work with Scratch?
- What is the social structure of the Scratch Club members and how does it change over time?
- How do the children support one another's project development and learning?
- How do particular ideas catch on?
- How does the introduction of the Scratch OCOC affect the Club, idea generation and diffusion, and the work and social practices?

## **Social Network Analysis**

My approach to the social network analysis is different than my approach to the ethnography. I began with a set of hypotheses that I tested using inferential statistics. Then I performed further post-hoc analysis, exploring the data particularly through network graphs. Each hypothesis relates to the research issues I described above, including understanding the network structure, the diffusion of ideas through the network, and the influence of OCOC members on each other's project development.

In my network analysis, I focused on these areas of inquiry critical for understanding how

OCOCs function and support learning:

- Who participates and in what ways
- The diffusion of ideas through those networks
- The adoption of ideas by individuals
- The influence of OCOC members on each other's project development.

Because the Village and the Scratch community sites have different technological design, members, and activities, the network analysis of each focused on slightly different areas of my research topics. The Village has more examples of measures that characterize the early stages of adoption, whereas Scratch has more examples of the later stages that I believe address the social influences of learning.

### **Topic I: Forms of Participation**

Participation in Online communities of Creators is fundamentally both social and creative. As educators or designers, we may want to especially facilitate project creation and discussion. However, the social context in which this occurs is both critical and a natural component for these communities. As a result:

*I hypothesize that on the Village, participation in social activities (emailing) will be positively and significantly related to project-related activities (posting projects).*

*I hypothesize that on the Village, participation in social activities (emailing) will be positively and significantly related to higher hit counts on profile pages (by other members).*

The Scratch community site has fewer mechanisms for socialization. The primary way to connect socially is to 'friend' other users and comment on projects. Since 'friending' is not combined with other mechanisms of participation, I do not believe it will be related to project-related activity. Because commenting is a more core activity, closely related to exploring the work of others, I believe it will be related to other project-related activity:

*I hypothesize that on the Scratch web site, people who post more projects will also comment, tag, love other's projects, make friends and post in galleries more than those who post fewer projects.*

In other online communities, participation is not evenly distributed across demographics. Typically, older girls participate more in social activities than younger children and boys such

as chatting, commenting or blogging (Lenhart & Madden, 2005). This is important because active participators affect the tone and direction of the community, the types of ideas that will be supported and popular, and, as a result, the types of work and learning that are most likely to occur. I expect to find similar patterns of behavior in the highly social Village as in other highly social communities. Specifically:

*I hypothesize that on the Village, older members will email significantly more than younger ones.*

*I hypothesize that on the Village, girls will email significantly more than boys.*

Scratch is a very different kind of site that emphasizes programming more than social empowerment. The Scratch software's design provides a broader entrée into programming that may serve to encourage girls and women to participate. However, programming is still perceived as more for males than females. As a result, Scratch is up against some strong gender stereotypes.

*I hypothesize that on the Scratch community site, males will post more projects than females.*

## **Topic II: Diffusion of ideas**

I next address how ideas spread through a network. On the Village, I study one particular new technological feature, the Profile Survey, (described in more detail later). Most people who adopt the survey first discover it on other members' profiles. By studying this feature, I describe both how this idea catches on and how it addresses who is influential in the network. I imagine that people who are more engaged in the Village and its activities are more likely to try out the survey and to be more central to the survey network.

*I hypothesize that members who have more recent last-visit dates will be significantly more likely to complete the Village Profile Survey than those with later last visit dates.*

*I hypothesize that members who have more recent last-visit dates will be significantly earlier Village Profile Survey completion dates.*

## **Topic III: The Adoption of Ideas**

Previously I outlined how behaviors in OCOCs generally map to Rogers "Stages of Adoption." Here I outline how specific variables, seen in the two communities I study can describe

different stages of adoption (Table 4). Many of these measures are found in other OCOCs as well and could prove to be interesting to study on these other sites.

**Table 4: OCOC Stages of Adoption and Related Measures**

ROGERS' STAGE	OCOCS BEHAVIOR CHARACTERIZING STAGE	MEASURES
Awareness	Surfing projects	Village and Scratch: Page hits of projects, Page hits by user
Interest	Exploring, revisiting, linking to, forwarding projects	Village: 'Cool pings' Scratch: Favorite projects, "love its"
Evaluation	Leaving comments on someone else's work or talks about the idea when interviewed.	Village and Scratch: Project comments
Trial	Trying out ideas from the project	Scratch: Project Downloads
Adoption	Using specific concepts or files in his or her own work, particularly on multiple occasions.	Scratch: Project uploads based on previous project

On the Scratch site, members can view each other's work online, but to see the source code,

they must download it to their local machine. When people download each other's code, they generally do so because they want to see how the code works. When people download each other's projects, they generally want to try out someone else's idea. This is Rogers' 'trial' stage of adoption (Table 4). I believe, when viewed from a learning perspective, this behavior exemplifies reaching out to learn from another user. Thus it describes one mechanism by which learning happens in a social context.

From a social network perspective, I imagine the most influential projects will be ones that are more easily accessible to the most people. Influence could stem from what the site promotes or through the social network itself. In terms of the site promotion:

*I hypothesize that on the Scratch site, projects that are promoted as "Featured Projects" will be downloaded more often than those that are not promoted.*

In terms of projects that are popular in the network:

*I hypothesize that on the Scratch web site, popular projects (ones with higher rates of "love-its" and favorites) will be downloaded more than less popular projects.*

## Topic IV: Predicting Influence

Finally I consider what predicts influence in an Online Community of Creators. I define two types of influence critical for these communities. The first is *Project Influence*, in which the community recognizes people's work. The second is *Social Influence*, in which the community recognizes an individual as being an influential community member. I imagine some users may be influential in one way but not the other, while others are influential in both ways. Still what makes people influential via their work and social connections? This is the question I address through multiple regressions for each of these two types of influence. I operationalize *Project Influence* as the number of times a user's projects are downloaded by others. I operationalize social influence as *betweenness centrality*. *Betweenness centrality* is how much a person is a social bridge between otherwise unconnected groups. This is a measure of influence that considers the social structure of a community.

## Social Network Analysis Data

The Village provides network data: whole network data (email), diffusion of innovation data (profile survey diffusion), and user description. My Village analysis focuses on network structure, identifying influence in that structure and comparing the structure to one particular diffusion of innovation: the Village Profile Survey. The Scratch web site also has network

structure data (tags, comments, and friends lists) diffusion data (project downloads and uploads) and user behavior. In addition it has data that addresses influence on learning (Table 1). As a result the topics addressed in the Scratch analysis focuses more on diffusion and influence on other people's project development.

**Table 5: Data used in network analyses**

NETWORK	DATA	TOPIC ADDRESSED
Village	Email	Network Structure, Participation, Influence
	Profile Survey diffusion	Network Structure, Diffusion of Ideas and Influence
	User Description	Network Structure and Diffusion of Ideas
Scratch	Tags	Network Structure, Participation
	Comments	Network Structure, Participation
	Friends list	Network Structure, Participation
	User Behavior	Supports Network Structure, Diffusion of Ideas, and Influence on Project Development
	Project Download	Diffusion of Ideas and Influence on Project Development
	Project Upload	Diffusion of Ideas and Influence on Project Development

## VILLAGE

### *Email*

The whole network data addressed in this thesis is email. Email messages were logged from Sept 2005 to April 2007. For each message, the following information was recorded: the sender, all receivers, and the date and time. For privacy reasons, no email content was ever logged and for safety reasons, youth members can send and receive Village email only to other Villagers. As a result, every email can be studied with other information about both the sender and receiver, such as their Clubhouses, genders and countries.

For example, the first line of the log file is a test message that my cohort, chrisg, sent to me and to herself:

```
2005-10-18 09:46:13, chrisg@computerclubhouse.org, sylvan@village-  
talk.computerclubhouse.org, chrisg@computerclubhouse.org
```

The format of the file is timestamp, sender, receiver, receiver... and so on until all receivers are listed. Note that the *village-talk.computerclubhouse.org* and *village.computerclubhouse.org* are actually the same domain, for the current purposes.

### ***Profile Survey Diffusion***

The diffusion of innovation data contain detailed information about how a new innovation spread through this network, allowing me to describe how ideas move through the whole network over time. The spreading of ideas will be addressed on the Village through a study of how the Village Profile Survey catches on. The Village Profile Survey is a new feature I built with a combination of python scripts, html templates, and sql calls. It was added to the Village in June 2006 and contains 19 questions:

- Where did/do you go to school?
- What are your favorite classes or subjects?
- Where do you live?
- What places would you like to visit?
- What type of projects do you like to create at the Clubhouse?
- What do you like about the Clubhouse?
- What software or other technology do you use?
- Which of those software or technology do you know best?
- What software or technology would you like to learn?
- What software or other technology really annoys you?
- What type of job would you like someday?

- What languages do you speak?
- What is your favorite music?
- What are your favorite sports?
- What are your favorite TV shows?
- What are your favorite books?
- What are your favorite movies?
- What are your favorite games?
- What are your favorite foods?

When a user completes the survey, it appears on his profile page. Each answer is linked to another page that lists everyone else who included that same answer, along with links to information about them such as their profile pages and their projects.

Every time a user answers a question from the Village Profile Survey, the following data is stored (Table 6).

**Table 6: Village Profile Survey data structure**

USER	QUESTION	TIMESTAMP	ANSWER	REFERRER	REF'S ANSWER
chrisg	10	20060705145102	Spain, Utah	sylvan	Spain

In this case, chrisg changed her answer to question 10 to “Spain, Utah.” She got to her survey edit page from sylvan’s page whose answer to the same question was “Spain.” Thus the survey data available includes the answers to each question with timestamp, any changes to the answers with timestamp, the user whose home page the current user was viewing when he created or modified his survey, and the viewed user’s answer.

### ***User Description***

Whenever a Village account is created, information is stored in the Village SQL database about that user. This includes their:

- Location: city, US state (when applicable), and country.
- Affiliation: Clubhouse, region, and organization.
- Age
- Gender
- Type of account: member, mentor, Coordinator, alumni, Clubhouse staff, etc.
- Primary language
- Length of membership

Information about the Villagers’ use of the site is recorded over time such as

- Last login
- Profile hit count

## *SCRATCH DATA*

### *Project downloads*

The Scratch web site database has been designed to archive previous states of the system so that all contents including project binary files that are deleted from the web site remain on the server. Whenever another user downloads the uploaded file, this information is recorded in the web site's SQL database.

### *Project uploads*

The Scratch data include a history file (Appendix B). The history file is a text file, which includes the creator, the save history, the upload and download history, and a summary of the file's code. Whenever a user uploads a project to the Scratch web site, the date and time of the upload is recorded in the history file.

### *Tags and Comments*

Scratchers can add tags to their projects and to others' projects. They can comment on their projects and others. They can also create galleries and invite others to join them. Each new use of a tag, comment, or gallery creation is recorded with a timestamp in the database so

that I can study how tags are added and changed over time.

#### *Friend lists*

Scratchers can list other members as friends. When they do, the other user receives the request and can choose to accept or deny. Even if they deny the request, the first user can include that person as a friend in his or her friend list. Scratchers can also delete friends. All friend requests and responses are recorded with a timestamp in the Scratch web site database.

#### *User Behavior*

Popularity of a project can be described in several ways: number of views, number of people who label it as a favorite, number of people who say they love the project, and the number of people who bookmark it. All of these measures are stored in the web site's database.

### **Social Network Analysis Materials**

To analyze the network data, I first needed to convert it from the formats it is stored in into appropriate formats for the software packages I use for analysis. The network data is stored in several formats (Table 7).

**Table 7: Original Data Source Formats**

<i>COMMUNITY</i>	<i>TYPE OF DATA</i>	<i>DATA FORMAT</i>
Village	Email	Text log file
	Profile Survey diffusion	SQL dump file
	User Description	SQL dump file
Scratch	Project Download	SQL dump file
	Project Upload	Scratch project binary file
	Tags	SQL dump file
	Comments	SQL dump file
	Friends list	SQL dump file
	User Description	SQL dump file

I built a parser that outputs data in three formats, appropriate for three software packages: Condor (social network analysis), Pajek (social network analysis), and SPSS (statistics.) I created large local archives of the data and then parsed the data into these formats for the three software applications.

**Table 8: File formats for software used in social network analyses**

SOFTWARE	FILE FORMAT	FILE INCLUDES
Condor	SQL database	<p>A <i>chars</i> table containing people and their attributes.</p> <p>A <i>comm</i> table containing all communication</p> <p>A <i>datasets</i> table containing the different datasets, e.g. the 'Village' database has three datasets: 'Buddies,' 'Survey Diffusion,' and 'Email Log'</p>
Pajek	Custom text format of multiple formalized lists	<p><i>Vertices</i> (people)</p> <p><i>Arcs</i> and <i>edges</i> with measure of <i>tie strength</i> (relationships)</p> <p><i>Partitions</i> (discrete grouping attributes such as country) <i>Vectors</i> (continuous values such as age)</p>
SPSS	Tab-delimited text imported as spreadsheet	Various including spreadsheet with one row for each user and her attributes

Condor is a software program developed by Peter Gloor and his company, galaxyadvisors LLC. It creates visual maps, movies and many graph metrics of different kinds of relationships such as social networks, web site link structures, online forums, and e-mail networks. It can analyze

a variety of data including Web mailing lists and online forums, Web links, and flat files. Condor stores data in a MySQL database. Its strengths include its ability to create static (images) and dynamic network graphs (movies) with descriptive data overlaid on the output. It also provides a variety of tools that allow you to view, sort and categorize content (such as discussion groups.)

**Pajek** is a network analysis and visualization software package designed specifically for large networks. It is a freeware software project developed by Vladimir Batajeli and Andrej Mrvar at the University of Ljubljana in Slovenia. Its strengths include the ability to break large networks into smaller substructures in a variety of ways. This is particularly helpful because large networks are generally hard to visualize. It can also work with time-event data, which not all network analysis packages can.

**SPSS** is a commercial statistical software package developed by SPSS Incorporated that is commonly used in social science research. Besides running statistics tests such as descriptives, ANOVA, T-tests, regressions, etc, SPSS can create graphs and manipulate data.

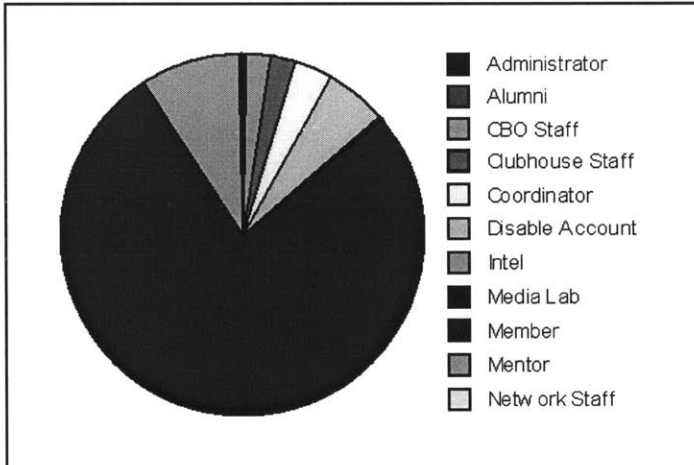
## **THE COMPUTER CLUBHOUSE'S VILLAGE**

Before the Computer Clubhouse Village had an OCOC, it was a network of disparate after-school computer learning centers located around the world, often hosted by larger centers such as Boys and Girls Clubs. The first Clubhouse opened in June 1993 at the Computer Museum in Boston (now part of the Museum of Science). Six more Clubhouses opened between 1993 and 1999. In 2000 Intel funded the Intel Computer Clubhouse Network. Over the next five years the network grew to more than 100 Clubhouses worldwide.

As the network grew, a desire to link these Clubhouses grew as well. The Village went live in April 2004, allowing members of the Computer Clubhouse to connect at last with other members all over the world.

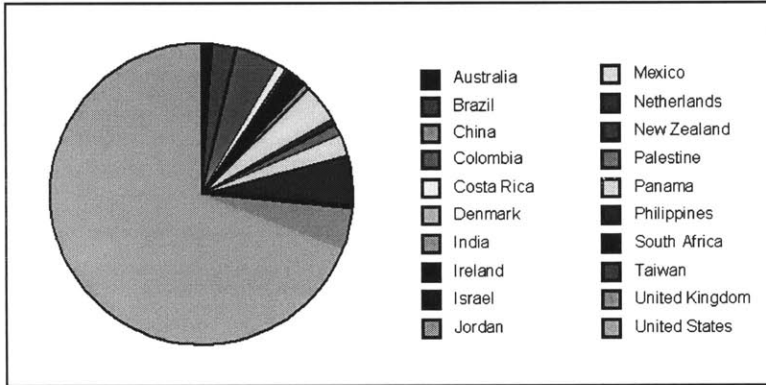
### **Who Uses the Village**

As of April 2007, the Village community was composed of 6099 people, including approximately 5059 active youth members, 461 mentors, 168 coordinators and assistant coordinators, along with various other staff (Figure 21).



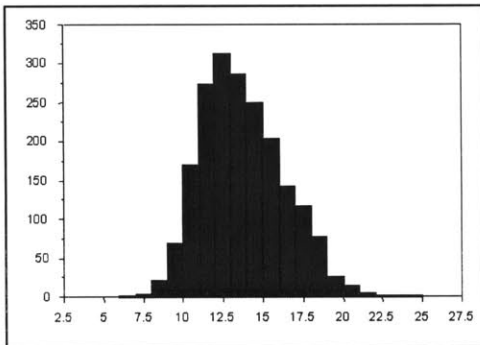
**Figure 21: Village Members' Type of Accounts**

Sixty-three percent of the youth members are from the United States, six percent are from the Philippines, four percent each from Columbia, Mexico, and Northern Ireland and the remaining are from Australia, Brazil, China, Costa Rica, Denmark, India, Ireland, Israel, Jordan, the Netherlands, New Zealand, the Palestinian Territories, Panama, South Africa, and Taiwan (Figure 22).



**Figure 22: Country of Villagers**

The mean age of the members is 15.28 (Figure 23) and 48% of youth are female.



**Figure 23: Age of Members on the Village**

Seventy-five percent of the youth describe their primary language as English, 17 percent Spanish, 2 percent Filipino, and the remaining 4 percent all other languages including Chinese,

Danish, Dutch, German, Hebrew, Hindi, Kannada, Portuguese, and Russian. Menus are available in many languages and much content is either written in Spanish or translated into it. Still most of the content of the Village is in English.

## What People Do On The Village

Just as people engage in a variety of activities in a physical Clubhouse, Villagers have a range of opportunities on the Village. Overall there are three areas of activity among the creators on the Village. First they can create and share **projects and project-related information**. Second they can create an **online presence or representation of self**. Finally, they can **socialize and discuss issues** important to them.

I doubt that members would categorize what they do in this way. They create because the Clubhouse supports it and they share because they can get recognition that may be difficult to attain in other aspects of their lives. Their audience consists of one another because, as adolescents, they look to one another for acceptance, recognition and to know who they are. Still, both design and use of the Village falls into these three categories. The Village was conceived as a place for members to share their work and themselves. Members use it this way.

## **Projects and Project-sharing**

The primary way people share projects in the Village is in the *Projects* section. Here members can post their projects, include their work in galleries, and “cool ping” other people’s work that they like. They can also find suggestions of things to try and opportunities to participate in network-wide challenges. This section tends to be a dynamic one, where contributions are added and different work is featured regularly.

Overall projects are uploaded to the site by 26% of Villagers. Uploading is a several-step process that requires more effort than emailing or posting to a discussion group or chatting. (The Village is currently being redesigned to make uploading projects easier.)

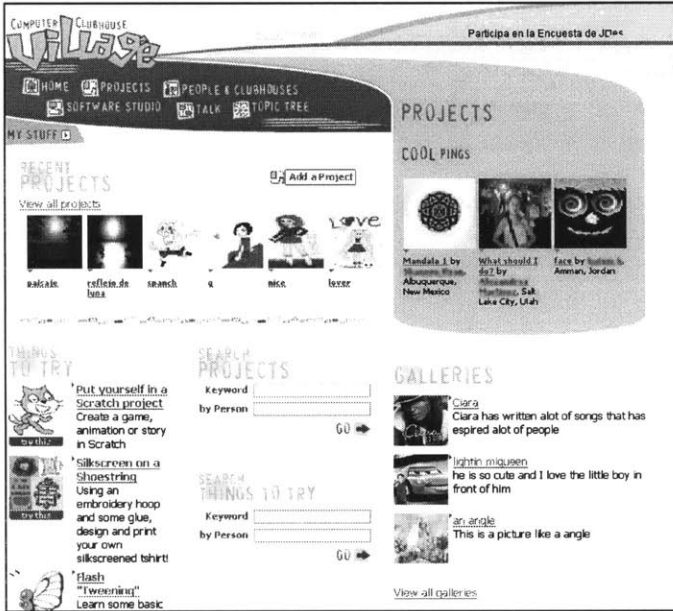


Figure 24: Village 'Project' front page

Photoshop projects are popular. Members often find images online or scan personal photographs and then run filters over the images (Figure 25.)



Figure 25: Three Photoshop Filter Projects by Alicia B.

Current trends such as popular music or animation characters may also inspire the content of projects (Figure 26.)



**Figure 26: Three Village Projects Inspired by Popular Culture**

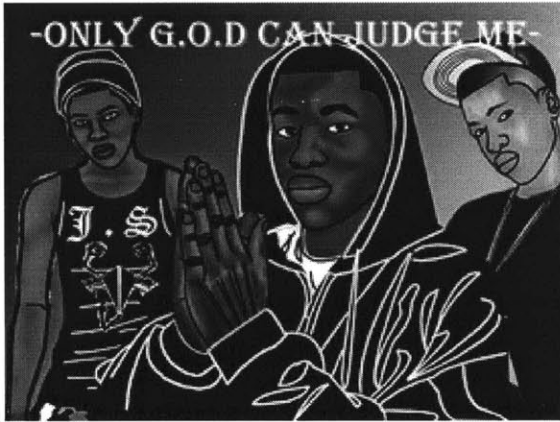
Projects can be quite personal and expressive, as seen in Figure 27, which was created by a coordinator for one of her members. She describes the project in the following way:



**Figure 27: A Project Created by a Coordinator for a Member**

I created this project for one of our Clubhouse members. We had a discussion on how he views himself as worthless. I wanted to show him that he wasn't, so I put his name on top of coal. Coal doesn't have a lot of value, but through intense heat turns into something beautiful, a diamond.

In Figure 28 a member expresses his spirituality through his Village Photoshop project, one that he drew himself:



**Figure 28: A Project Expressing a Paul L.'s Spirituality**

My name is Jonathan [S.]. And I'm 16 years old. I made this picture in the middle because I pray everyday and hope God hears them. I also created the other two pictures when I first started and I hope you like them.

Though Photoshop projects are quite popular, other technologies are used including Blender, Lego Mindstorms (Figure 29), 3-D Studio Max, GameMaker, and the ever-popular music studio.

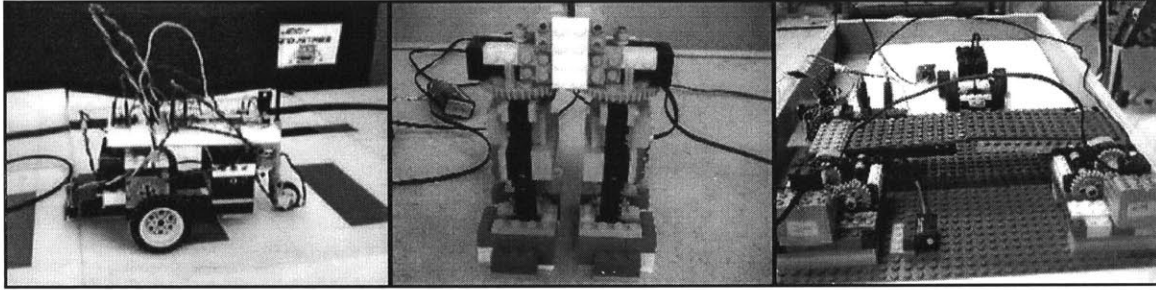


Figure 29: Three Lego Mindstorms Projects by Jimmy M.

### Online Presence or Representation of Self

Villagers can define their online presence and explore others through a variety of mechanisms. The *People and Clubhouses*' map of Clubhouses locations emphasizes the range of cultures represented. This page rotates through featured villagers and people's photo albums, giving a sense of who is in the community.



Figure 30: Village 'People and Clubhouses' front page

### VILLAGERS' PROFILES

On their profile pages, Villagers post photo albums and galleries and describe who they are.

Many profiles are extremely detailed representations of what the members do, who their

friends are, what music they like and what they create at the Clubhouse. Villagers may change and tweak custom backgrounds and music regularly (Figure 31).



Figure 31: Village member's profile with a custom background

Some profiles include photographs of themselves, their family and friends, or pictures of animals, music stars, and sports stars they like. Others add music videos (Figure 32), sometimes running multiple videos at the same time, creating a cacophony on their pages.



Figure 32: Village member's profile page with single video he made

Sometimes Villagers write introductions about themselves, such as this boy's:<sup>2</sup>

“Hey, I'm crazyllilguy and I am a member at the Planeterio in Mexico. I speak English

---

<sup>2</sup> Whenever I quote a community member, I remove or change any personally identifying information. Also I do not edit their text in any other way, nor do I note every grammatical error with [sic] or other signifier.

and Spanish. I like hanging out with my friends and having fun. I like different types of music but I only really like a song if I like the beat. I like horror, comedies, and action movies. I also think ninjas are awesome. I am a ninja so don't mess with me haha just kidding. I also like to play video games...a lot. I don't think they kill your brain or ruin your life, in fact, someone can make thousands of dollars by working in the video game industry. However they can ruin your grades if you play them when you're supposed to do be doing homework. Anyway my favorite games include many, many Super Mario games, Kingdom Hearts, Mortal Kombat, and The Legend of Zelda. Feel free to write me and I will get back to you as soon as I can.

Some introductions end with a proposal for others to email them such as this girl's:

Hey my name is sporty1996. I love to play sports like softball, basketball, ,footbal, and dodgeball! I guess you could say I'm a sporty girl. My friends call me Hot Dog and Cherries. I'm a hip hop dancer. I have the two bestest friends named [friend 1's name] and [friend 2's name]! I like to hang out with my friends, especially [friend 1], [friend 2] ,and [friend 3]. I like hip hop and R&B!!! go to the Chelsea Clubhouse!!! I have green eyes,I dress sportyish !!! I'm 5'1 and I'm very good at dancing! I go to Chelsea Middle School. So if you want to know more about me e-mail me! Oh and I'm a cool person to

know!!! Thanks :).

Others include information about their dating status:

I'm sweetiepiegirl! I can talk pig latin. I'm going to learn the others. For all the boys I'm free! So give me a hola! ... So I love to dance, sing and I love to make my own stuff its really cool. So don't be sared to e-mail me! Also I love Usher Chingy, Jay-Z, Beyonce, Bowwow, Caira, Missy-E, TLC, 3LW.

Just as this girl does, many members use their profile pages to broadcast interest in connecting with others. Since the Clubhouse and its Village are designed to empower members' voices, an important component of the Clubhouse experience is connecting and being heard.

### **Socializing and Discussing Issues**

A big part of what members do on the Village is to connect with one another through email, discussion groups, and chat. *Talk*, a popular section, is a place where Villagers can talk about what is on their mind through threaded discussion groups, email, and monitored chat sessions. Some topics are guided by administrators, such as help with the Village, multilingual support, and staff sections. But many are set up for Villagers around topics that interest them. In fact,

one discussion topic contains suggestions for future chats and a popular discussion area, “Clubhouse Talk” is dedicated to chatting about everything from Ramadan, krumping, Dance Dance Revolution to favorite sports and foods. Some posts reflect what members care about and what they wish to share about themselves such as this recent discussion:

**Member 1:** Lets talk about your greatest day in your life! mine was when I went to denver for hershy track meet i was in 5th place! That was very cool!

**Member 2:** When i kissed my boyfriend [name] at Skate City!!!

**Member 3:** well the best day in my life was when i was born

**Member 4:** my 13th birthday whats yours

**Member 5:** i met lia

**Member 6:** my best day would have to say the day when i met the most best friend in the world

**Member 7:** the better is know computer clubhouse

**Member 8:** When I gotin my firs relationship wit dis boy

This last member who was happy about her relationship with a boy also had bigger issues she wanted to discuss when she started this thread the previous month:

**Member 1:** I'm a rich girl/boy! :) If you had all the money on earth what would you do with it?

**Member 2:** help other people. build new schools and house but the thing I will do the most is help the poor

**Member 3:** help the people. will help the people that if i had the money

**Member 4:** would spend it on me ,homeless ppl, my family and my dog

Other threads reflect youths' understanding of the diversity of their community and their desire to communicate with one another:

**Member 1:** If you could go anywhere in the world, where would you go and why?

**Member 2:** ...there's two places i would go to: Japan and any beach in the world. I want to go to Japan because they make all the things I like such as anime and video games! I would also want to go to a beach because I really want to swim in the ocean.

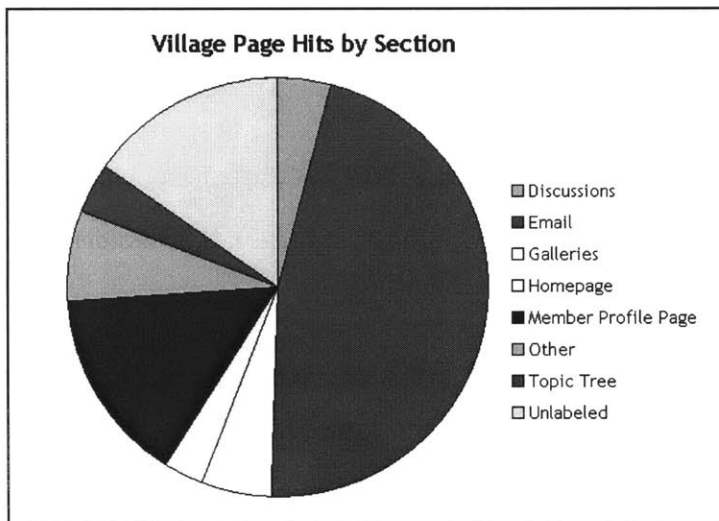
**Member 3:** ... love ya [Member 2]! but i would go to rome and amsterdam!! rome because i want to see the leaning tower of pisa, and amsterdan because i like the movie Deuce bigalo Part 2!

The way that youth members present themselves and the topics they want to discuss are

profoundly social. They are interested in connecting with their peers and how their peers perceive them. This builds a stronger community and one that can be a comfortable place to share one's creations.

### Popularity of Web Site sections

Villagers use all sections of the web site including areas focused on projects, online presence, and discussions, but they engage in some activities more often than others (Figure 33), and in some surprising ways.



**Figure 33: Village page hits by section pie chart<sup>3</sup>**

By far the most popular section on the Village was email at 47.52% of page hits (Table 9). This result is not surprising given that the community consists primarily of adolescents who are likely to be interested in connecting with other adolescents. The next most popular activity was viewing members' profile pages, which accounts for 15.40% of page hits. Members develop these pages to be noticed within the community and this finding indicates that, in fact, people are checking each other out. All other activities including the home page, discussion, galleries, topic tree have between 3% and 8% of page hits.

**Table 9: Percentage of page hits on different Village sections**

SECTION	PERCENTAGE OF PAGE HITS
Email	47.52
Unlabeled	15.77
Member Profiles	15.40
Galleries	5.24
Discussions	4.39
Topic Tree	3.78

<sup>3</sup> The "Unlabeled" category in this graph represents page hits the web analyzer could not identify.

Homepage	3.08
Other	7.25

But looking closer at which sections are most popular uncovers some surprises (Appendix C). People check their email far more often than they actually read messages. They send email even less frequently. One might imagine that looking at email boxes is both frequent and brief but, in fact, people spend just as much time looking at their email boxes as they do sending email. Additionally people spend almost two minutes on each profile page, which provides more evidence that people really are exploring each other's online presences.

The ways in which people use galleries was not what I expected. I imagined people would get ideas by exploring specific projects and be less interested in galleries. In actuality, people view the lists of galleries often (including the *Things to Try* gallery), but look at particular galleries less often and the details of particular projects rarely. Still when people do look at specific galleries and projects, they spend somewhat more time than they do on gallery lists.

Some sections, such as the *Home Page*, *Things to Try*, filling out the *Profile Survey*, and *Software Studio* are used less frequently but when they are used, people stay on that page for around two minutes. The *Home Page* contains rotating content that gives a snapshot of what is

happening on the Village. *Things to Try* provides project ideas that one must study to understand the ideas being presented. *Software Studio* and the *Profile Survey* both provide interactive activities on the Village.

By far, the most popular activity on the Village is discussing and socializing on the Village. Villagers also look at each other's profiles. In the next section, I describe ways to encourage users to engage with one another in meaningful ways.

## **Designing Technologies for the Village**

The goal of the Village is to connect people in meaningful ways: ones that are empowering, that involve the projects that are created at the Clubhouse, that involve real cultural exchange. An ongoing balancing act for the designers of the Clubhouse is to make the site both social and a place for work. The site is designed to help people meet the goal of meaningful connection on the Village. In this context, meaningful means both getting to know one another and doing so in a way that relates to the work people engage in at the Clubhouse. This isn't a site primarily for socialization like Facebook. This is an OCOC.

Over the last few years I have volunteered in the Clubhouse, watched what people do there and on the Village, and attended Village design team meetings. These experiences have helped

me think about the particular needs of youth-oriented OCOs, in general, and the Village specifically. I saw that some simple additions could improve the Village, making it more up-to-date for the MySpace and Facebook generation. Adolescents today expect to be able to connect with others easily and at any time.

### **The Village Profile Survey**

I noticed that one way Village members would augment their profile pages was by filling out detailed surveys. These surveys can be found on web sites that supported other mechanisms for people to “pimp” their MySpace, Friendster and hi5 pages by adding features such as style-sheets for special layouts, graphics, and videos. As a social scientist who has tried to get people to complete surveys in the past, I was amazed that adolescents were completing them voluntarily for fun.

I created the *Village Profile Survey* in response to what I saw. I thought that if the members were interested in these activities, the Village itself should offer it. I could design the survey in a way that appeals to both the style of the times and the values of the community. Since the Village hosted it, the survey could be integrated into the Village more thoroughly than surveys from outside.

I had other motivations as well. As a social scientist, I wanted to keep the data; as designer, I wanted to use the data to build other applications, specifically the *Village Community Visualizer*. It can be very difficult to collect this kind of data, unless there is a reason for people to give it. The Village profile survey has the added advantage of using this data to fuel my Village diffusion of innovation study and the *Village Community Visualizer*.

As described earlier, the *Village Profile Survey* is a survey of 19 questions that provides a snapshot of the member for the community (Figure 34). The questions focus on four areas:

- The member's location and school
- What she does and likes about the Clubhouse
- Which technologies she has experience with
- Her favorite things

Submit this form to put the survey on your village profile.  
**Put a comma in between your answers.**  
 Lea las preguntas en español.

<b>Where did/do you go to school?</b>	MIT, Carnegie Mellon, CMU, Simsbury High School
<b>What are your favorite classes or subjects?</b>	english, art design
<b>Where do you live?</b>	Somerville, MA, Boston, Massachusetts, USA
<b>What places would you like to visit?</b>	Galepagos Islands, Cook Islands, Spain, Mexico, New Zealand, the beach
<b>What type of projects do you like to create at the Clubhouse?</b>	photo albums
<b>What do you like about the Clubhouse?</b>	the people, music studio, mentors.
<b>What software or other technology do you use?</b>	email, photoshop, dreamweaver, digital camera, photography, word, powe
<b>Which of those software or technology do you know best?</b>	photoshop, dreamweaver, word.
<b>What software or technology would you like to learn?</b>	sound editing, php.
<b>What software or other technology really annoys you?</b>	microsoft, cell phones ringing, spam
<b>What type of job would you like someday?</b>	scuba diver, professor
<b>What languages do you speak?</b>	english, learning russian, some french
<b>What is your favorite music?</b>	everything, wilco, radiohead, van morrison, underworld, tom waits, stevie wc
<b>What are your favorite sports?</b>	yoga, watching baseball
<b>What are your favorite TV shows?</b>	project runway, nova, the simpsons, cooking shows, this old house
<b>What are your favorite books?</b>	kite runner, a prayer for owen meary, the little prince, oh the places you'll gc
<b>What are your favorite movies?</b>	wings of desire, LOTR, a room with a view
<b>What are your favorite games?</b>	the sims, zelda, pictionary, curse of monkey island, neverhood.
<b>What are your favorite foods?</b>	sushi, mango, dumplings, chocolate, berries, french fries, pizza
	<input type="button" value="Submit"/>

Figure 34: Village Profile Survey form

When a Villager completes the survey, it appears on her profile page (Figure 35).

**MY PROFILE SURVEY**

Schools	MIT Lake Oswego High School
Favorite Classes	art math
Lives In	Lexington MA
Places To Visit	australia new zealand egypt yosemite greece rome spain
Clubhouse Projects	images scratch programs village HTML
Clubhouse Likes	flexibility the village
Tech Used Most	photoshop dreamweaver scratch painter
Tech Knows Best	dreamweaver
Tech To Learn	flash
Tech Disliked	windows spam
Dream Job	the one I have
Languages	english french
Favorite Music	b52s talking heads oscar peterson miles davis wynton marsalis green day queen wall of voodoo
Favorite Sports	basketball tennis
Favorite TV	mythbusters junkyard wars (UK version) mystery monk nova iron chef good eats this old house whose line is it anyway? Doctor Who
Favorite Books	Lord of the Rings The Kite Runner Foundation
Favorite Movies	casablanca star wars
Favorite Games	Civ III Alpha Centauri elebits wii tennis
Favorite Foods	chocolate cookie dough ice cream berries tiramisu pizza






I found this survey on [sylvan's profile](#).  
**Answer this survey for yourself!**

**Figure 35: Village member's Profile Survey**

Each element in every answer is a hyperlink that goes to another page. The page lists everyone else who included this element in his answer to this particular question (Figure 36). This page shows each Villager's profile image thumbnail, their Clubhouse and role, their entire answer

(including the current element), and provides links to email them, add them as a buddy, and view their profiles, projects, and photo albums. Because of these various links, users have a new way of exploring their community and that community's work and interests.

**Tech Used Most: photoshop**

 Clubhouse: <a href="#">Piaoship</a> Role: Mentor <b>Answer:</b> <a href="#">email</a> <a href="#">photoshop</a> <a href="#">dreamweaver</a> <a href="#">digital camera</a> <a href="#">photography</a> <a href="#">word powerpoint</a> <a href="#">illustrator</a> <a href="#">picasa</a> <a href="#">scratch</a>	<a href="#">Send email</a> <a href="#">Add Me as a Buddy</a> <a href="#">View My Projects</a> <a href="#">View My Photos</a>
 Clubhouse: <a href="#">...</a> Role: Network Staff <b>Answer:</b> <a href="#">photoshop</a> <a href="#">dreamweaver</a> <a href="#">scratch</a> <a href="#">painter</a>	<a href="#">Send email</a> <a href="#">Add Me as a Buddy</a> <a href="#">View My Projects</a> <a href="#">View My Photos</a>
 Clubhouse: <a href="#">YWCA</a> Role: Mentor <b>Answer:</b> <a href="#">Photoshop (Adobe that is.)</a> <a href="#">DreamWeaver</a> <a href="#">Front Page</a> <a href="#">Adobe Image Ready</a>	<a href="#">Send email</a> <a href="#">Add Me as a Buddy</a> <a href="#">View My Projects</a> <a href="#">View My Photos</a>
 Clubhouse: <a href="#">Mott Community Center</a> Role: Member <b>Answer:</b> <a href="#">iTunes</a> <a href="#">Photoshop</a>	<a href="#">Send email</a> <a href="#">Add Me as a Buddy</a> <a href="#">View My Photos</a>
 Clubhouse: <a href="#">Bernalillo County Parks &amp; Recreation</a> Role: Coordinator <b>Answer:</b> <a href="#">Printshop</a> <a href="#">Photoshop</a> <a href="#">Brice</a> <a href="#">Logo Maker</a> <a href="#">I try to use a variety of software</a>	<a href="#">Send email</a> <a href="#">Add Me as a Buddy</a> <a href="#">View My Projects</a> <a href="#">View My Photos</a>

**Figure 36: Partial list of people who reported on the Village Profile Survey that one technology they use the most is Photoshop**

The way one finds the profile is by noticing it on other people's profile pages. When the *Profile Survey* first went live, it was listed on a *Village Talk* page called *What's Happening* and was featured on the home page. After that initial unveiling, the only way to find the *Village Profile*

Survey was from other people's survey answers. At the bottom of every completed survey is a link to "Take this survey for yourself." If the current Villager got the survey from someone else, it also says, "I found this survey on [Villager]'s profile."

The *Village Profile Survey* is explicitly designed to be a technology that diffuses through a community and it is explicit about this design choice to its users. Its design also allows users to explore the existing community content through the lens of their own personal interests by clicking through people's answers similar to the way people explore tags in other communities. As a result, I believe it brings an important ingredient to the Village; it feels more like a community site where real people with real interests and backgrounds come and leave their mark.

### **Visualizations for OCOCs**

As I worked on the survey, I thought about additional ways to get people interacting about their work. I considered the technological expectations of the age group and thought that they appreciate breaking away from the list-like representation of connections of survey users. I began to look at the various types of social visualizations. Different communities have different social purposes and, therefore, require that social visualizations highlight particular features.

Visualizations for OCOCs might emphasize who in the network cares about the same topics, how learners can get resources they need to learn, and what thoughts others have that might inform or inspire. Groups of learners who wish to collaborate could benefit from visualizations that combine who they know and who they can access with information about common interests and compatible, but different, skills.

First is it important that the visualization support positive identity development, such as understanding a person's own influence, without implicitly creating popularity contests. To this end, a visualization might differentiate between people who are isolated for different reasons, such as having unusual interests, being a social outcast, or being in a group of friends outside the data. It might also represent other data beyond who knows whom or who likes whom. This data might be of several different types. Social visualizations for communities of learners should emphasize who might aid the learning process. Who members know the best is one of many relevant factors. Other factors include common interests and current learning methods and goals.

If the goal of a visualization of a learning network is to foster collaboration, the emphasis would be a bit different. Communities of potential collaborators require working with people of similar interests but different and complementary skills or approaches to a problem. If I am a

programmer who needs to build an interface, I don't necessarily want to work with someone I know or another programmer. I want to work with a designer with a compatible work-style, but different area of expertise.

I imagine that a visualization of a learning network would not focus on purely social measures (such as buddy lists, who people email, who talks the most and to whom), but would combine these with common interests, compatible skills, and similar state of work. A visualization that combined these different types of data, would not provide a more supportive understanding of a learning network. This more nuanced representation may not only be helpful for learning networks, but also be helpful in other contexts as well.

In a learning context, it is far more important to support the building of deep exploration of ideas or of close collaborations between community members than to highlight existing social patterns. Social visualizations for communities of learners should emphasize who might aid the learning process.

### **Village Community Visualizer**

A concern for the designers of the Village is that members use it to connect in ways that both facilitate community understanding and the sharing of project-related ideas. It is reassuring

that to know that socializing happens alongside the sharing of projects. Still, even on a site where people can search each other's work via galleries, profile pages, and other features, it is sometimes hard to know who is similar to you in meaningful ways. I imagine that an adolescent who is genuinely interested in his Clubhouse work and wants to connect with others, would like to meet people with similar interests (soccer, hip-hop, art class) and who works on similar projects at the Clubhouse (using Photoshop, making portraits of friends.)

The *Village Community Visualizer* is a social network visualization tool that I developed for Computer Clubhouse Villagers. The goal of the *Village Community Visualizer* is to encourage members to understand their social space and to find others who have common interests, communicate about projects, collaborate, and find resources. Through such connections, members may come to understand how they contribute, or can contribute, to the Clubhouse community and be empowered to impact other communities that they are part of.

The *Village Community Visualizer* shows an individual user the other Villagers who have similar interests and projects. The system compares the user to each person in the social network based on criteria generated from past projects and answers to a set of survey questions. Since the tool uses the existing data that users have shared about themselves, it can build a detailed description of their interests, projects, and needs without requiring the participants to enter

large quantities of data. Users can explore their social space by looking at similar people's projects and personal and technological interests.

The *Village Community Visualizer* demonstrates how to address the needs of an OCOC in a social network visualization by emphasizing the following:

- Recognizing individual's contributions, such as creating projects and sharing ideas
- Finding peers to collaborate with by learning about what they do and what interests them
- Developing a personal understanding of who individuals influence and who they are influenced by
- Identifying potential learning resources

The work on visualizations of social networks has been well documented in the ACM literature c.f., by Heer and boyd (Heer & Boyd, 2005) and in the social network literature by Freeman (Freeman, 2000). Though visualizations explicitly for learning networks are new, social network analysis is starting to be applied to learning environments including addressing patterns of interactions in classrooms, online learning environments, online worlds for learning, and the learning community's knowledge development.

## The System

### WHAT THE USER SEES

The *Village Community Visualizer* provides each user with his own network diagram. Suppose a Clubhouse member accesses profile page. From this page, he will see a link to his own network. As the *Village Community Visualizer* program starts up, the member sees an animation of how the system works. Once the program has loaded, the user sees his own egocentric network diagram with himself in the middle (Figure 37).

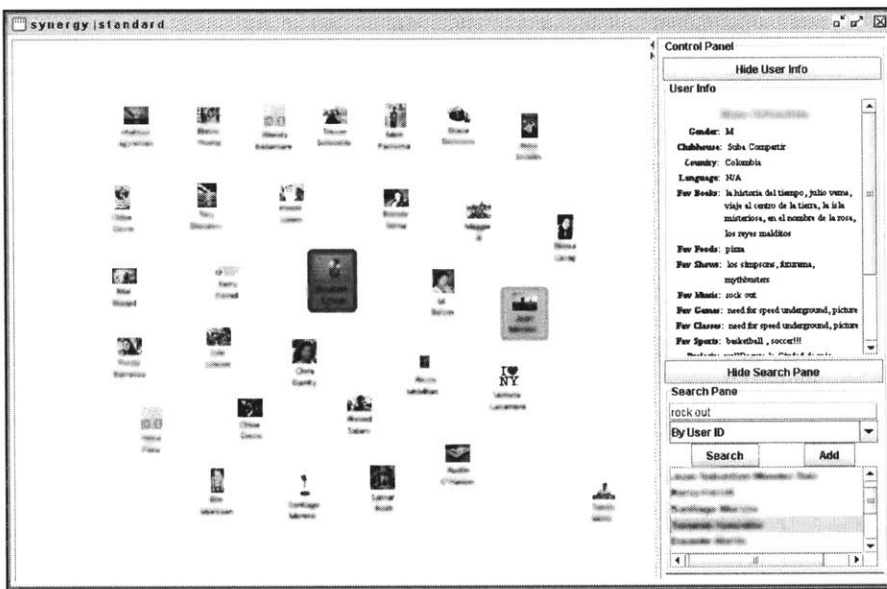


Figure 37: Village Community Visualizer, current member in the middle (blue) and other user selected (green)

Egocentric network diagrams often have lines between users that describe connections based on known measures of connection (such as liking or sending email.) To avoid making people feel less popular, this visualization does not display specific connections; instead it displays other users in concentric circles around the current user. The system does not explicitly show the number of emails or buddies, but rather encourages users to be inspired by each other's creations and connect with each other on topics related to projects and interests. The user probably recognizes some of the people around him but not everyone.

From the first view of the Visualizer, the user can explore his social space. He knows from watching the initial loading screens that he can click on people in the main panel. When he clicks on a thumbnail of a friend who showed up in his diagram, the other person's project thumbnails are displayed in the main viewing area, along with that person's interests in the Info Panel (Figure 38). He may learn things he didn't know about that friend.

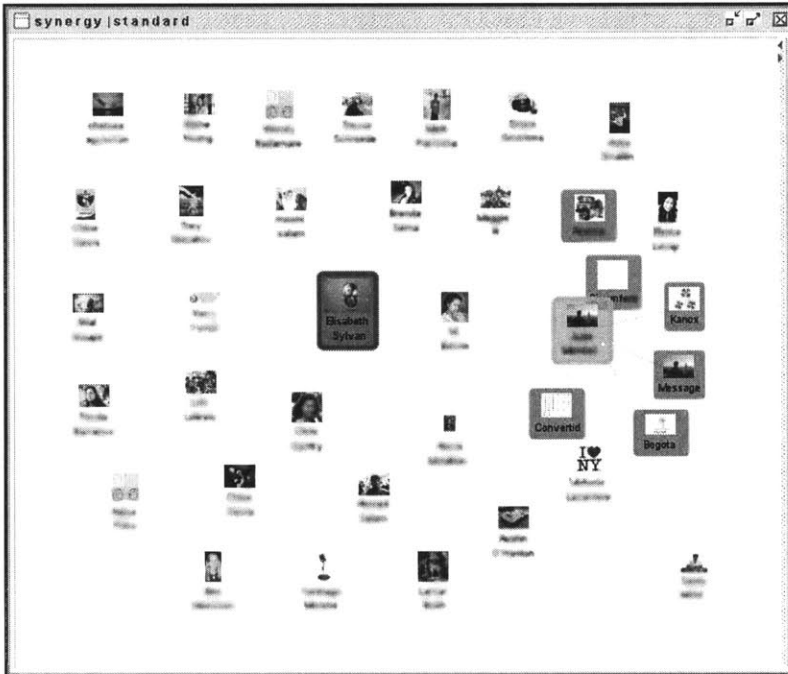


Figure 38: Village Community Visualizer Main Panel with selected Villager's projects open

Still he won't only see his friends. The software displays people that it believes are similar to that member. The group of similar people may overlap with the user's social circle and also includes some people he doesn't know. If he is thinking primarily about known social connections in his Clubhouse, who he emails, or who is on his buddy lists, the software matches results based upon projects and Clubhouse interests, may yield some surprises. He may find it worthwhile to explore users he doesn't know.

Then he might use another feature. When he right-clicks on people's faces or projects, their profile or project is opened in the Village web site. From there, he can explore the person's profiles and projects on the site. He can email them or comment upon that person's work. This may cause him to wander away for a bit. If he comes back, he might choose to explore the Info Panel. This panel provides a mechanism to explore the Village social space in more detail. When he selects a person's thumbnail in the main window, the User panel displays detailed information including interests, Clubhouse country, projects and other details about that person (Figure 24).

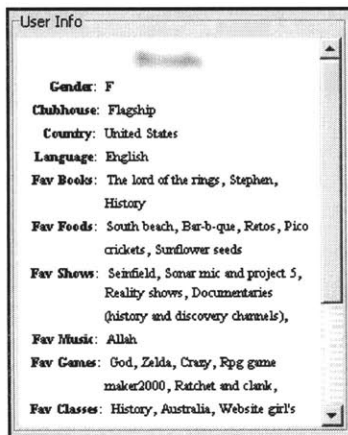


Figure 39: Village Community Visualizer User Panel

If he wants to find people beyond what the visualization recommends, he can do so in the Search Panel. If the user wants to find specific people, he can search for them by name or username. If he wants to find people who work on certain projects who have certain interests, he can search for those interests and then select users to display in the User Info panel.

Finally the user can modify his own visualization when he finds people she feels are a good match. He can modify his network by searching for other members in the Search panel. When he selects a person in the Search Panel, that person's detailed information is shown in the User Info Panel. The user can add anyone he finds to his egocentric network diagram by using the add button or by dragging the person's name into his display. He can also drag any person out of the display.

#### *HOW IT WORKS BEHIND THE SCENES*

The *Village Community Visualizer* compares the user to each person in the social network based on a set of criteria generated from past projects and answers to the Village Profile Survey. Each person in the social network is ranked and a number of the top candidates are shown in the user's visualization. The system places candidates in concentric circles around the user with better matches to the center.

Built using Java and Python, the project consists of three major components:

- The Visualization: the client side application (described previously), which handles the visual and interactive functionality.
- The User Data Aggregator (UDA): a server-side script, which gathers and preprocesses user data.
- User Correlation Generator (UCG): a client-side application component, which ranks each person in the social network using the UDA findings.

### *VISUALIZATION*

The Visualization handles user input and displays relevant information about each person in the user's egocentric network. Since the goal of the system was not to reinvent existing work in visualization, this component is built on the Prefuse visualization library (Heer, Stuart, & James, 2005) with standard Swing components, employing a Vizster-style layout (Heer & Boyd, 2005). The visualization itself is built from the Visualization class of the Prefuse library using custom Renders, Layouts and Force Simulators.

Though all Computer Clubhouses have newer computers, some have slow connection speeds. (A few share one cable modem across their entire Clubhouse.) As a result, the system is designed to optimize performance on the client side application and reduce load on the sever side. The

UDG is a server-side script written in Python that runs daily when the server load is lowest. This extraction is a large SQL call with many joins. As a result, running it less frequently drastically reduces server load and improves server performance. It extracts data from the user database and performs processing on the extracted data. The program reduces server load by combing the user database infrequently instead of each time a user requests their visualization. By doing data processing on the server side, data processing common to all users is not duplicated redundantly when each user runs the visualization. Finally, by outputting the data into an XML file, the Aggregator reduces the number of SQL calls from the client side and also allows a large amount of data to be downloaded quickly.

The UDG extracts two kinds of data from the Village SQL database: responses to the Village Profile Survey and descriptions of projects. Since members input the data on their own, misspellings, misinterpretations and formatting errors are common and relationships among text descriptions are not well defined. Server side processing addresses these issues so that strings can be reliably compared on the client side.

The Aggregator first extracts all text data in the database into memory. Each text segment is parsed and encapsulated in a ParsedString object that separates the string into tokens. For example, “basketball player” would be parsed into “basketball” and “player.” Each

ParsedString object is compared with other ParsedString objects to determine if they are related closely enough to be referring to the same idea. The algorithm uses a set of criteria including alphabetic composition, token length, and number of tokens.

#### ***User Correlation Generator***

The client-side User Correlation Generator parses the XML file generated by the UDG and applies the parsed data to rank each person in the social network. The ranking system begins by giving each person in the social network a correlation coefficient of 0. Each similarity between the user and a person in the social network increases their correlation coefficient. After all the correlation coefficients have been generated, the top thirty users are displayed in the visualization.

#### ***Ranking Algorithm***

Each person in the social network is compared to the current user by using each individual's past projects and each individual's answers to a set of survey questions. Each individual in the social network can be defined in terms of their similarities in interests, similarities in past projects, and proficiency in skills that are relevant to the current user. Therefore, the ranking algorithm compares individuals utilizing each of these attributes to arrive at a final ranking relative to the current user. The overall rank is thus composed of three rank components: **Interest Ranking, Project Ranking, and Resource Ranking.**

The **Interest Ranking** is calculated based on the interests of the current user and the individual who is currently being evaluated. The interests that users described in the Village Profile Survey are used to define the Interest Ranking. For each interest that is the same or similar between the user and the current comparison individual, the Interest Rating is increased. The number of interests of the user and the comparison individual also scales the rating.

The **Project Ranking** is calculated based on the past projects done by the current user and the comparison individual. Three features of projects are included: similarities of tools used, tags defining projects, and the number of projects that each individual has uploaded. This data is scaled so that individuals who have created many related projects do not skew the final calculations.

The **Resource Ranking** is calculated based on the proficiencies of the comparison individual and the needs of the current user. The needs of the current user are generated from software tools used in past projects and from the responses to the survey about what the user finds difficult. The proficiencies of the individual being evaluated are generated from software tools that he or she has used in past projects and the user's answers to relevant survey questions. Matches between the proficiencies of the comparison individual and the current user increase the Resource Rating.

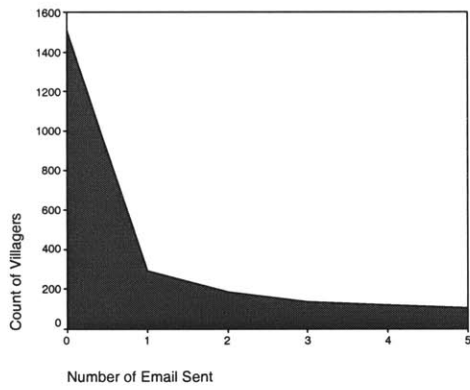
The final ranking of each individual in the social network is a function of his or her Interest Rank, Project Rank, and Resource Rank. These ranks are derived from a comparison of all the Interest Ratings, Project Ratings and Resource Ratings. Each ranking generates a weighted score that contributes to the overall ranking.

## **Studying the Village**

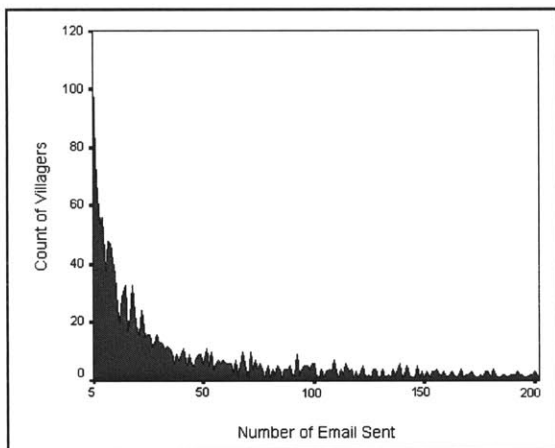
In this section, I analyze how Villagers use two features on the Village: email and the profile survey and the relationships of participation in these two features to other forms of participation.

### **Email**

Email is the primary mechanism for members to communicate privately within the Village. In the 31 months of email I studied, 83% of Villagers emailed at least once. Villagers sent a total of 422,114 emails with a mean of 100.05 emails per person and a median of 3.00. The maximum number of emails an individual sent was 7957 in 31 months or just over 8 emails a day. The distribution of number of emails sent is logarithmic (Figure 41). In other words, many users sent very few emails (Figure 40) and a handful sent a lot.



**Figure 40: Graph of the number of Villagers who sent between 1 and 5 emails**



**Figure 41: Graph of the count of Villagers who sent between 5 and 200 emails**

Many adults working at the Clubhouse have noted that members using email on the Village often use it similarly to how they might use an instant message client: rapid, short interactions back and forth between multiple other members. I have a similar intuition because when I am logged on to the Village, members often send me short emails, such as “s’up” or “hola.” Sometimes I receive more specific comments, such as particularly about my pets whose pictures I have posted on my profile page, for example, “hi; i like your cats i think there cute!!!” My personal experience is that Villagers reach out to others whom they don’t know, but is this true more broadly?

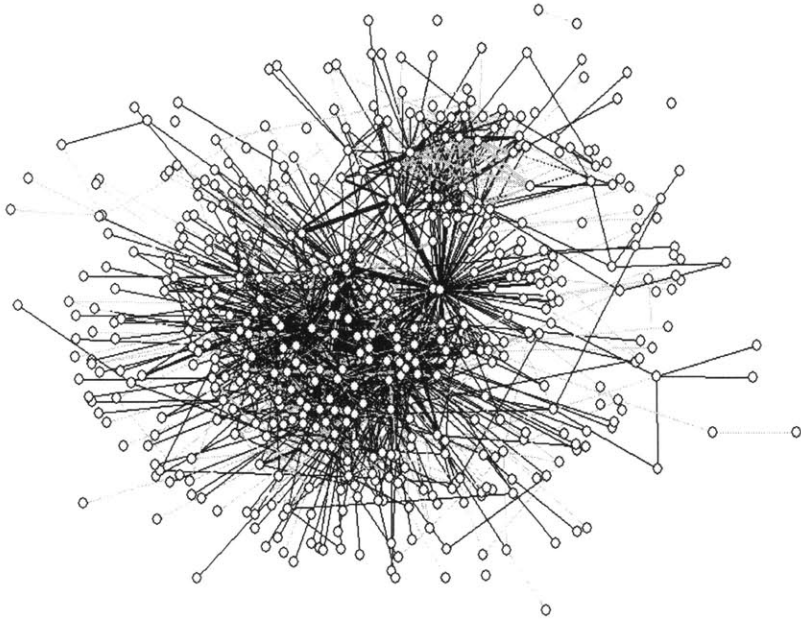
#### *EMAILING CLOSE AND FAR*

I explored the community overall using social network graphs. By looking at network graphs, I can explore features of a network all at once including who is connected and who is not, how strong the connections are, where geodesic (or shortest) paths lay and how different node characteristics (such as gender or country) are distributed throughout the graph. Throughout this thesis, I use the same network layout, *Fruchterman Reingold*, a commonly used algorithm that does a good job with laying out large networks while minimizing how much nodes overlap visually.

The first network graph shows all the connections in the email network (Figure 42.) Lines between members indicate that they exchanged emails. The relationships between the

different shapes indicate which members are more closely tied to others. From this graph we see two subgroups, one large cluster at the bottom left side and one smaller cluster near the top. We can see there are many members on the peripheries as well.

A gray line between two shapes demonstrates that emails were exchanged between two youths in the same Clubhouse whereas a black line indicates they are at different Clubhouses. Many ties, including strong ones, were made between members in different Clubhouses, including the ones connecting the two subgroups. From this graph it seems the Village is succeeding in its goal to connect youths with others outside their neighborhood Clubhouse.



**Figure 42: Villagers emailing between different Clubhouses**

What about connections made within Clubhouses? The graph reveals that many of the weaker ties (ones with fewer emails) on the extreme perimeters of the network are connections within Clubhouses. This result is hard to interpret. It is possible that these members simply emailed others who don't use the Village. Connections were also made within Clubhouses on the perimeters of the two subgroups whereas the center is composed of connections across Clubhouses. These ties may be instrumental in getting information through the network (Granovetter, 1973, 1983).

The next graph considers the same basic idea, connections across regions, only regarding countries instead of Clubhouses. Grey lines in Figure 43 demonstrate a connection within countries whereas black lines represent emails exchanged between countries. Each country is represented by the unique shape symbolizing its members. The large subgroup that we noticed in previous graphs is primarily composed of triangles, representing the United States. The other subgroup is composed of double triangles, representing the Philippines.

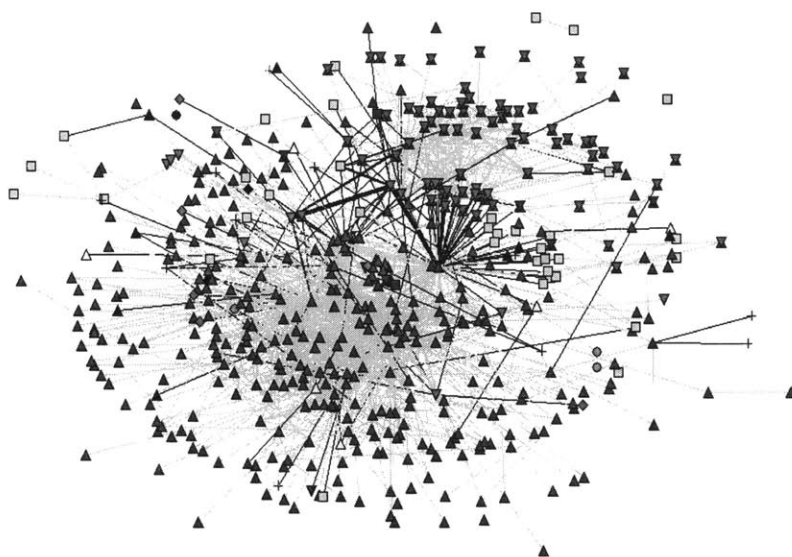
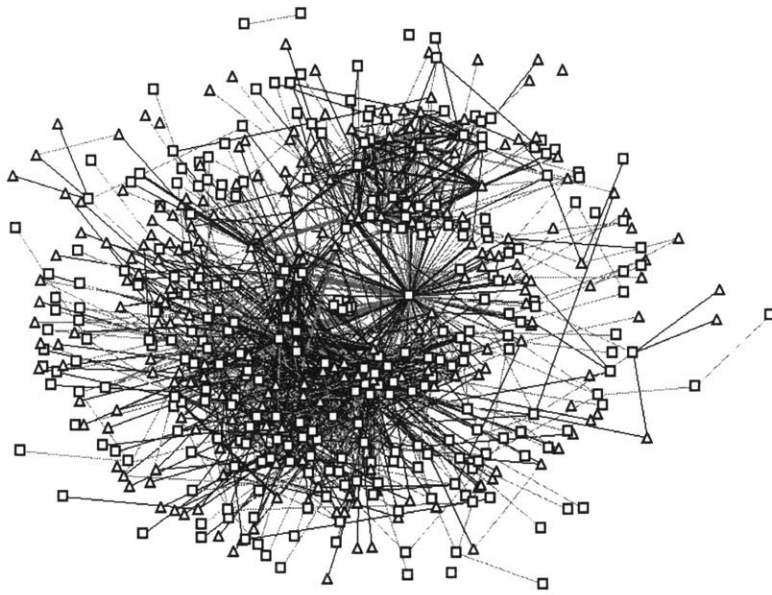


Figure 43: Villagers emailing between countries

As one would expect, there are far fewer connections between countries than there are between Clubhouses. Still a few connections are scattered throughout. In particular, the members that seem to traverse the two different subgroups are members from both the US and the Philippines. This is an unexpected finding and it will be interesting to see if this pattern continues over time and whether additional connections develop between the countries.

Figure 44 shows the gender of email communicators. Every square represents one girl and every triangle represents one boy. A gray line between two shapes demonstrates that emails were exchanged between two youths of the same gender whereas a black line indicates a connection across genders. From the graph we can see that between-gender communication is far more common than within. Perhaps we are observing flirting? We also see that girls email more than boys and are more centrally located than boys. The bridges between the two main subgroups are girls from the US emailing with boys from the Philippines.



**Figure 44: Gender of Village emailers**

From these series of network graphs we have a picture of what happens with email on the Village. Two subgroups emerged representing members primarily from the US and the Philippines. A few members connect these two groups. An encouraging amount of communication occurs across Clubhouses and even across countries. It is likely that the youths are emailing with others whom they have never met in person. It is exciting that some pairs email quite a bit and interesting that girls seem to email more, but cross gender communication appears more common than within gender.

### *GENDER, AGE, AND PARTICIPATION*

Gender and age are important for communities of young people. Communities that are overwhelmingly dominated by one particular type of member may be less attractive to those that are different. A community of mostly girls might not be attractive to boys and vice versa. Younger children may go to sites that are popular with older children, but the reverse is not often true.

In addition, different content and types of sharing are appropriate for different types of people. For instance, older children may understand some content that young children may find confusing or upsetting. Parents may be much more comfortable with their 18 year-olds viewing some content than their 10 year-olds.

In most online communities, girls, particularly older ones, engage in social activities more. As a result they are more likely to set the tone of an online community than younger people and boys.

The Village is composed of members from the ages of 10 to 18, along with adult mentors and staff, and approximately an equal number of girls and boys. Since in other online communities

participation rates are often higher for older children and for girls, I hypothesized that the same would be true for the Village. Girls would participate socially more than boys and older teens more than younger children.

I compared the gender of Villagers to the amount of email they send and receive using an unpaired t-test. An analysis of variance showed that an effect of gender on total number of emails sent,  $F(1,4217) = 14.97, p < 0.0001$ , number of emails sent,  $F(1,4217) = 3.96, p < 0.0001$ , and number of emails received,  $F(1,4217) = 3.76, p < 0.0001$ . In other words, Village girls email much more than boys.

A Pearson correlation was used to compare the age of youth Villagers to the amount of the email they sent. The correlation showed no relationship between age and total number of emails, number of emails sent, and number of emails received (

Table 10). In other words, overall no ages differences were found for email behavior.

Table 10: Pearson correlation coefficients for age and email

	Correlation	Count	z-value	p-value
Age, total email	.01	4219	.70	> .1
Age, sent email	.01	4219	.47	> .1
Age, received email	.01	4219	.93	> .1

On the Village, girls email more than boys but there is no age effect on email sending. But who is emailing whom?

#### *CROSS-GENDER COMMUNICATION*

In addition, I hypothesized that emailing dyads with the highest number of communications would be of mixed gender. I believed this would be the case because many of the members are in their mid to late teens and are at an age when they are interested in dating or having relationships. Using an unpaired t-test, I compared the same and mixed gender pairs of Villagers to the amount of email they sent. Gender matching of pairs is significantly associated with number of email sent,  $t(32,073) = -5.48$   $p < .0001$ . Mixed gender pairs send each other a great number of emails than same gender pairs.

### *EMAIL VERSUS OTHER ACTIVITIES*

During the Village design phase and throughout its ongoing development, the design committee, network staff, and coordinators have been concerned about what members do with it. Certainly there is nothing wrong with adolescents wanting to connect with one another; it is a normal part of development. Still the point of the Village is to empower through profound socially-supported experiences with technology and not to be, as some were concerned, “a dating site.” The Village is a place for members to express themselves through technology in a supportive, sharing environment. Though part of this purpose is to connect members, it would be preferable that when they connect with one another, they do so in a way that empowers them to create with technology. An online chat I had with Latin American coordinators summarized both the concerns and the ways of dealing with those concerns well. When I asked whether the social activity, particularly between boys and girls, is a problem, they said:

**Coordinator 1:** “The Village is channel for them to interchange ideas.”

**Coordinator 2:** “We have to limit the time on Village and we try to motivate them to upload problems and get news from network. I think it’s fine.”

**Coordinator 3:** “On the contrary, I think its good because they can contribute diverse visions. But we don’t see it as problems. It’s much better if they establish safe relationships within the network as opposed to on MySpace.”

**Coordinator 4:** “The Village is a valuable resource but we have to focus it positively.”

There is a tremendous range in how much email Villagers send. But are people who email a lot only socializing or are they engaging in other kinds of participation that is presence- or project-focused? As a member of the Village, I had similar concerns but felt that any form of engagement was likely to encourage other forms in a community that is so profoundly social. Therefore I believed that members who emailed at higher rates would also participate more in other ways. Specifically I hypothesized that

- Higher rates of email use is significantly related to more recent visits to the site.
- Higher rates of email use is significantly related to greater number of profile page hits (by other users).
- Higher rates of email use is significantly related to higher project posting rates.

The primary way that Villagers exhibit presence is through their profile pages. If all participation is interesting to active Villagers, those who email a lot should also update their profile page often.

A Pearson’s correlation was used to compare the last visit dates of Villagers to the amount of

the email they sent. Email sending is significantly associated with profile updating (Table 11). In other words, there is some evidence that Villagers who email a lot also update their profile more often than those who email less.

**Table 11: Pearson correlation coefficients for last visit and email**

	Correlation	Count	z-value	p-value
Last visit, total email	.20	4219	13.32	< .0001
Last visit, sent email	.20	4219	13.24	< .0001
Last visit, received email	.20	4219	13.37	< .0001

But do other users also view profile pages of email users more? A Pearson’s correlation was used to compare the email rates of users with their profile page hit counts. Email is significantly associated with profile hit counts (

Table 12). There is evidence that Villagers who email more also receive greater number of hits on their profile pages.

**Table 12: Pearson correlation coefficients for profile hit counts and email**

	Correlation	Count	z-value	p-value
Profile hits, total email	.19	4219	12.59	< .0001
Profile hits, sent email	.18	4219	11.85	< .0001
Profile hits, received email	.20	4219	13.32	< .0001

Villagers who email a lot also work on how they represent themselves online, and other people look at those representations more. Still all these activities are social. What about project-focused activities? Next I compare the number of emails people send to how many projects they post to the Village.

Overall, projects are uploaded to the site by 26% of Villagers. Uploading is a several step process that requires more effort than emailing or posting to a discussion group or chatting. Do those Villagers who email the most also post more projects? In fact, Pearson's correlation shows this is the case. People who email the most post significantly more projects than those who send a low number of emails.

**Table 13: Pearson correlation coefficients for profile hit counts and project posting**

	Correlation	Count	z-value	p-value
Projects, total email	.19	4219	12.59	< .0001
Projects, sent email	.18	4219	11.85	< .0001
Projects, received email	.20	4219	13.32	< .0001

This last finding is exciting because it addresses the concern that members are using the Village for purely social reasons. Of course, it still is possible and, perhaps likely, that email could be used to meet potential boyfriends or girlfriends online. However, this does not appear to be happening at the expense of the design goals of the Village. Members who participate in one way (email), participate in other ways as well.

Though there is a wide range of email usage, those who email a lot do not seem to be doing it despite their other contributions. Rather they email in addition to it. Thus it appears that these adolescents, concerned about who they are and how they fit in, may use their creations to reach out to others, along with creating their unique profiles, discussion groups, and other forms of text communication.

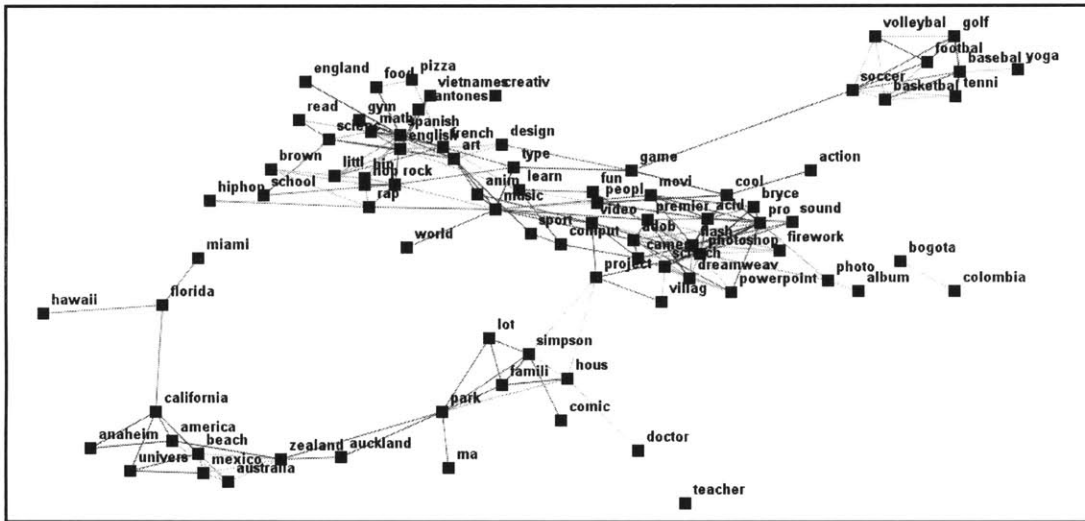
## Diffusion of Innovation

The *Village Profile Survey* is a technology that I introduced to the Village in July 2006 on a “What’s Happening” discussion page. People still can find a link to the survey there, though now it is buried deep in the list of discussions. They can also find it on each other’s profile pages. As of July 2007, 228 users completed the survey. Eighty-eight percent of them initially found it on other members’ profiles as opposed to on the home page and discussion group where it was initially advertised.

A core activity on the Village is visiting each other’s profile pages. Because the survey was initially broadcast and now can be found on profile pages, it is an excellent mechanism for studying how ideas diffuse through the Village. Perhaps people who are more engaged in the Village and its activities are more likely to try out the survey and to be more central to the survey network. We know that people who email a lot get more page hits on their profile.

First I look at what answers people give on the survey. In Figure 45 I show a network diagram of the relationships among answers that Villagers give to the survey. The largest cluster represents people talking about technologies, which is appropriate for the Village community. For example, Photoshop is popular at the Clubhouse and is central to the technology cluster in the graph. Also this cluster has words like ‘fun’, ‘people’, ‘game’, ‘projects’, so it seems that

these words are associated with social and fun activities by the Villagers. There is also a cluster of sports-related words on the upper right and a cluster of places that people could either want to go or be from at the bottom left.



**Figure 45: Network Graph of Survey Answers**

Next I address my hypotheses of who will complete the survey. I hypothesized that members who have more recent last visit dates will be significantly earlier in their initial completion of the Village Profile Survey. A Spearman’s rank correlation was used to compare the last visit dates users with their first completion of the *Village Profile Survey*. Last visit to the Village site is positively and significantly related to the survey completion day, ( $r=.299$ ,  $p < .0001$ ). That is, people who have logged on more recently tend to adopt the survey earlier.

# THE SCRATCH COMMUNITY

## Framing the Scratch Investigations

The Scratch investigation takes two forms: one up-close and very personal and another more quantitative and broad. The first, an ethnography of a Scratch Club introduces thirty-five children who work for one school year with Scratch, first on their own and later within the context of the Scratch community web site. I report on my school year with them, introducing some of the children, discussing how they used Scratch and how the local social network appeared to impact their development. The second investigation focuses upon the web site. In this investigation, I first introduce the community and describe some early experiences the development group had when the site first went live, including some surprises to us. I then describe who uses the site. Finally the bulk of the investigation is a social network analysis of who participates and in what ways, how ideas diffuse through the network, which ideas are adopted and in what ways, and who is influential in the network.

## Scratch Club ethnography

### Introducing the Club

This Scratch Club meets weekly at a local middle school in the suburbs west of Boston. I'll refer to the town as "Danesfield" and the school as the "Jeremiah Paine Middle School." Danesfield

is an old historic New England town with a population of around 30,000. Residents are about 85% white, 10% Asian, and around 1% Black or African American. The median income for families is over \$100,000 per year. It is known in the Boston area as being a town with good public schools and a highly educated population. (Over half of the children I interviewed have a parent who is a professor at a Boston-area university.)

The Jeremiah Paine Middle School has around 1000 students in 6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup> grades. Each grade consists of three teams that function independently of one another with all the children going to the same Math, English, Science, Social Studies and Physical Education teachers. Beyond these subjects, students are required to take some classes across the teams such as drama, art and music. They also have the option of taking electives with other students in their entire grades including year-long foreign language classes and additional art, music, and drama, along with economics, journalism, computer science, keyboarding, and reading classes. Each grade has its own guidance counselor that follows children throughout their time at the school. After-school activities such as sports and clubs are across teams and grades.

Scratch Club happens at the same time as sports teams. Certainly this affected who came to Scratch Club as these were students less inclined to participate in competitive sports. Some children came part of the year and then stopped coming when their sport was in season. I often

wondered how the club membership would be different had it not overlapped with sports practice.

Before visiting Paine, I had not been to an American middle school in many years. When I first entered, I was transported back to my own middle school experiences: the colorful lockers, the rapid shift between silence in the hallways and chaos when class left out, the crush of kids pushing their way back to their lockers with their friends, and the mixed sizes of adolescence: big kids and little teens.



The Scratch Club was started by a member of my research group, “Alex”, who is a mother of two in the town of Danesfield. In late September of 2006 Alex posted a flyer opposite the office in the school (Figure 46) with a signup sheet next to it. She was careful about the words she used in the flyer so that the advertisement would not sound too “geeky” and therefore not attract kids who don’t identify themselves that way, nor would it

Figure 46: Scratch Club flyer

sound too “boy-focused” so that girls would sign up as well. Over 20 children immediately signed up and the first meeting was in mid-October. The Club continued every week with breaks whenever school was out until the end of the school year in June.

At first the original 20 students attended the Club. As word spread and kids invited their friends, the Club size increased to around 25 after two months. By the end of the year there were between 30 to 35 children per session. Forty to forty-five members joined overall. The computer room we used was in a central part of the school between the library and classrooms, just down the hall from the cafeteria. As the group grew, we spread into a second classroom.

Scratch Club had around 35 regular members (including 10 girls), plus the adult club organizer, myself and –for portions of some meetings– our host teacher. Each Friday afternoon immediately after school, throngs of 12 and 13 year-olds children would come into the rooms with their friends, often running to get to their computers.

### **Five Individuals, Five Personal Styles**

Before describing the dynamics of the Club, I’d like readers to get to know some of the members a little better. I’ve chosen five members that I got to know well to be case studies. All were finishing 7<sup>th</sup> grade when I interviewed them, except for one who was finishing 6<sup>th</sup>.

Each child brings his or her own experiences to Scratch, relates to experiences Scratch in a different way, and brings a different value to the community as a whole. I start with Rick.

#### *A PROGRAMMER'S APPROACH TO SCRATCH*

Rick was quiet at the Club and had a small group of people he interacted with. From the beginning, he seemed to take Scratch quite seriously and made serious, detailed games. His first programming environment was StarLogo, "a long time ago" (four years). He also knows some BASIC from a summer day camp, a little Java, and a lot of perl. He takes an ongoing Saturday perl class at MIT and "when I have some spare time," he works on his perl encryption program that "transcripts a set of strings with a hash key" and then unencrypts it if you have the key. He says he "likes [encryption] codes quite a bit" because "I like the fact that only you know or someone else you want to share it with knows what it says." This summer Rick was going to "a camp for smart kids and people who aren't good at talking. For technology stuff but also to do outdoor stuff like playing 'Capture the Flag'." Rick has several other regular activities he does including playing oboe, fencing, Math Team, and Boy Scouts.

From the beginning of the Club, I found the sophistication of Rick's projects fascinating and wanted to learn about his process. I tried to reach out to Rick to talk with him but he responded with the briefest, most limited answers. For months I would ask him a question, he would answer briefly, if at all, and then I would leave him be. Eventually I stopped asking. A

few weeks after I stopped trying to engage him, the Scratch Club organizer spoke to Rick's mom about my research and I received email from her including this:

When we got home, Bob and I told Rick about our conversation with Alex, explaining that you are \*interested\* in how he gets ideas and how he builds off of other work. We asked him if he'd be comfortable talking to you away from his peers (as sometimes he can get funny about that).

He said he didn't realize that you wanted to know that kind of thing-- he made it sound as if he didn't want to bore you with the details. He also said he'd be happy to talk to you, now that he knows why...

From then on, Rick talked with me more openly at the Club (though still briefly), but he really opened up when I went to visit him at his home with his mom, dad, and brother around. I visited their home in Danesfield one Saturday in June and was warmly welcomed by both parents. The whole family, including both parents, Rick, and his brother, sat together in the family room and asked questions as I told them about my research group's work and my own, before I interviewed Rick alone.

Rick generally makes sophisticated games and continues to work on them until he perfects them. But he didn't start out that way. Because he programmed previously, he knew that learning a new programming environment requires some patience and time to explore:

For the first couple days, I didn't really try to make projects. I didn't save anything. I was just trying to figure out how Scratch works. Then once I knew a little, I started a project, 'Arrow Labyrinth.' That was something I actually wanted to make.

Rick's experience as a programmer and his patient attitude enables him to envision a trajectory with using Scratch. Here Rick describes how he was inspired by work he saw online. But he is not content to simply copy. He incorporates themes and makes them his own.

I work on [one project] for a while but I don't know how to do this particular thing so maybe I stop and I go back. Like 'Fortress Guard' (Figure 47.) You have all of these guys coming towards the tower and you have to defend them. I've seen some games that are just a bow so I thought why not make a game with a bow and gravity. Then later I added different levels and then more enemies coming. Then I wanted to make better gravity and I couldn't fix a bug that I had so I stopped working on it and came back later. So [generally] I start with something simple that I know how to do. Then I

add stuff that makes [the game] a little harder to do or a little better to use.

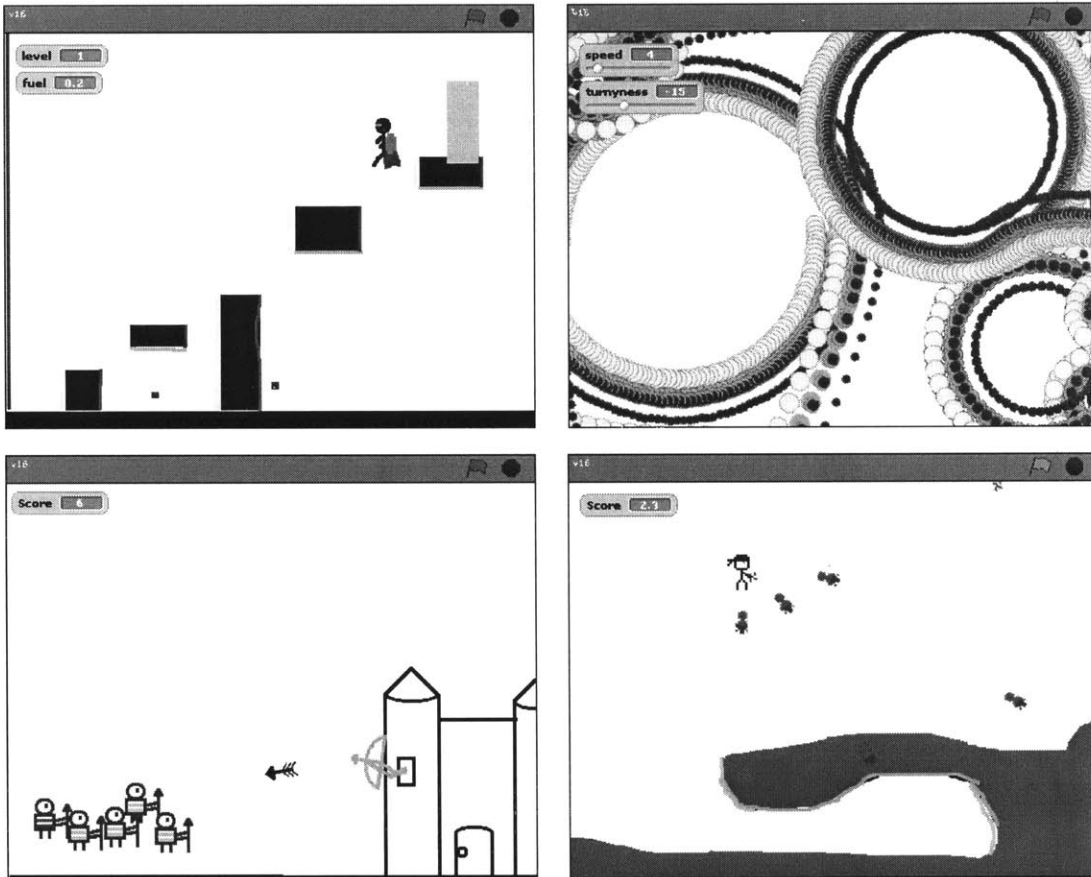


Figure 47: Four of Rick's Projects. *Eeep* is on the top right and *Fortress Guard* is on the bottom left

Rick made one game that is a notable exception to his usual genre of high-end games. One day towards the end of the club hour, he began to work on a project that was different from his usual projects. He describes the development of the project, “Eeeep” (Figure 47) in this way:

I’m bored, running out of ideas. I want to think of a project that won’t take long but will still look good. Hmm, what should I do? Maybe I can control how fast a line moves based on something. That could be good. Maybe use two different variables to keep changing it constantly. And make some cool graphics. And add some annoying sounds. Ok, that sounds good.”

The most distinguishing feature of this game cannot be found in a screen shot alone. As the line moves, a truly annoying rattling “eee” sound effect runs constantly. Rick recorded the sound into the microphone of the computer and then manipulated it to achieve the effect he wanted. As he got the project running in the Club, other members came over to check it out and to remark about the sound. As he worked on it further, other members began to complain about how annoying the sound is, first in jest, and then some quite seriously asked Rick to stop. He did turn the sound way down when it was clear that most of the room thought he should, but he seemed to be amused by the attention at the same time. Soon afterwards, he posted the

project to the Scratch web site, his third post after Fortress Guard.

This project became incredibly popular early on and its popularity became a discussion point for the group as a whole. Why was this project popular? Other members studied it and some copied (or *adopted*) some of the principles of the game to see if they could reproduce its popularity. Some thought the key issue was the attractive pattern. Others thought it was being able to manipulate the patterns. Some hated the sound, but wondered if that was the trick. When ideas are complicated and not just adopted but adapted, the key innovation is in the eye of the beholder.

Rick was pleased that the project was popular, but felt that it had been unfairly made more popular by his mom. He posted the following to the forums:

It appears, that after Scratch has been public for a little while, that someone \*coughmomcough\* has been giving me extra views by hitting the refresh button. Is there a way to make it so that views are only added for each time you view it from a different IP # or for each time you view it every half hour? Also, could you fix the number of views I had? Last time I checked before the refreshing, I had -6500.

Despite his irritation, there were no hard feelings here. Rick and his mom had a good laugh about this when I asked them about it. His main concern was that it was unfair for him to have a higher high count because of his mom. I later responded to his post:

I appreciate that you don't want your hit counts unnecessarily inflated, especially by someone who might possibly have alternative motives. :) I think the challenge with the IP address or time period restriction idea is that people legitimately use the same computer (family members, library patrons, school computer cluster...) and how would we differentiate? Though it isn't fair that your project is inflated now, it doesn't seem fair to not count legitimate page hits either. Any other ideas on how to deal with this? (You could post in the 'Suggestions and Advanced' area to see what other people think.)

At the next Scratch Club, Rick had thought about this problem and suggested linking the hit count to sessions, either by time, or who was logged into the site. By the following week, we had incorporated his original suggestion into the site as a first stage and when I told him this, he seemed pleased.

Rick often uses the forums on the site, occasionally asking for help, but more often helping others. Here he helps someone but also indicates what he feels is appropriate posting etiquette



```
if (right key pressed)
if (not touching <wallcolor>)
people who are learning
else
{change x by -1}
close if
close if
Try it!
```

This first interaction was with another child, but Rick responds to adults as well. In a different thread a community member begins with:

I'm looking for more information about broadcasting -- exactly what it is, what situations to use it for, and how to use it. I've searched for hours, and looked at the scripts of some projects that use it, but I still don't quite get it. I understand that there's no user guide for Scratch, which is a shame. Can anyone point me in the right direction for finding out more about this feature? Or to a comprehensive user guide, and not just lists of topics posted on a forum?

On a related note, I'd like to teach scratch to kids (I'm a parent and I'm active in my son's school). I wondered if there were any materials for educators to help put together a curriculum.

Other adult members respond to both issues in general terms before Rick responds more specifically:

You could make it so that the script works like this:

Script 1

when flag clicked

beginning stuff

forever

if level = 1

level 1 stuff

change blah by .5 (so it won't keep happening)

if level = 2...

close forever

Script 2

when I receive blah

change level by .5

But one adult who made a good general suggestion criticizes him:

You have put in forever loops to handle straight-line code.

This is both ugly and inefficient.

There are often workarounds for missing features---the goal is to have simple, useful constructs that make code easier to read and write.

Rick responds:

At least it works, though. I admit it's not very good. Oooh! I just thought of a way!

and adds the following to previous post:

EDIT: Better way!

When I receive blah

change level by 1

if level = 1

do stuff

if level = 2

do stuff

Few children contribute to the forums at all and Rick is the only one I know who makes such substantive contributions. When I asked him about this, he said he wasn't aware of people's ages and didn't seem to care either, nor does he seem to be bothered when an adult didn't like his suggestions. He is confident in his own abilities and is interested in participating and that is all that matters to him. Though Rick is not interested in friending and joining galleries, he does use other aspects of the web site besides commenting and posting in forums. He says that he will look at particular users 'My Stuff' pages to see what new things they've posted. "Sometimes if I want to find out what's happening on the web site, I just think of some username, like, 'whizzap.' Then I go look at what they've made." He'll also look for helpful projects when he is stuck and describes his beliefs about the appropriate way to try and adopt other people's ideas:

I could download other people's stuff but I'd rather figure things out on my own. That's

why it takes me a while sometimes to finish ideas. When I can't figure it out, I find something that does the same thing [and download it.] I don't use their code directly though. I look through it and then I do my own project. If I can remember it, I probably understand how it works.

Though Rick continues to enjoy programming in perl, he uses Scratch more and more because it is easier to realize sophisticated projects such as a game without creating as much infrastructure. "You need to do basically some [planning] and think about what you want to do. It's like other programming in that way. But you also have a list and Scratch tells you what to plug in where, which makes things easier and faster." At 13 Rick is already a programmer. He creates projects simply to try out new programming ideas and to build ever more refined projects with better game play, more levels, and unexpected behaviors from enemies. He will go back and tweak a project until it works the way he wants. His primary goal is not to show off (though he enjoys the attention), but rather it is to improve and expand his programming skills. For Rick, Scratch is a "Tool to Think With" that allows him to further his existing interests. Rick may not reach out much to other members, but he is receptive when others talk with him, and he is influential because his high-quality projects are noticed and his comments, forum posts, and assistance are substantive.

### *A SHOWMAN FINDS HIS STAGE*

Josh is an animated and expressive boy, culturally savvy and a natural storyteller. He tends to speak very quickly in a stream of his consciousness, and shares idea after idea in any given moment. He may become frustrated with you if you can't keep up with what he says. His father is a professor at a Boston-area university who Josh describes as being "very famous." His mom keeps 9 rescue parrots, 8 in an aviary and one African gray parrot in the kitchen. Josh is particularly fond of one cockatoo who was kept for three years in a cage before being rescued, but has recovered nicely since being taken in by Josh's family. When I spoke with him in his home, he asked his mother whether he could take the cockatoo out of the aviary and delighted in showing me how the animal would bob his head up and down and say "Night night, Rog." Josh has two younger siblings and many friends but he describes the cockatoo as his best friend. As he strokes his cockatoo, his speech and movements are unusually calm.

Josh is one of the organizer's son's best friends and he tried Scratch at their house before the Scratch Club even started. When the first Scratch Club was cancelled because Scratch was not yet on the school computers, Josh became upset and asked Alex whether he could come "play Scratch" at Tom's house. When Josh said that he wanted to "play Scratch" he is using the language of fantasy, not coding. This way of referring to Scratch is typical of the subset of Scratchers who are particularly focused on Scratch as a mechanism for telling stories and

creating fantasies.

Josh has created his own web site of "stuff he likes" and "a secret you have to find" created with a "much easier programming language," html. This is the only programming he has done before Scratch. He's generally allowed to play with the computer an hour a day on the weekends and he tries to get an hour on weekdays too though currently he isn't allowed to use the computer "for forgetting the date of a test." He describes his favorite subjects at school as "lunch" and "dismissal" though his electives reflect his personality: Drama, Art, and 'Speech and Debate'. At home he likes to read, play with action figures, and listen to music such as Linkin Park, Silverstein, and Breaking Benjamin. His favorite reading materials are comic books, such as Naruto, and novels, such as the Pen Dragon, Lost Years of Merlin, and other fantasy series, along with action-adventure series such as James Bond. He enjoys action adventure movies and comedies, especially Borat, whom he mimics well. He says he wishes that he could create a Borat project but he thinks any project he might make about the character would be flagged as inappropriate on the web site.

Josh describes himself as "very unique" and says that "some of my [Scratch] projects are unique. Some cross into empowered or envisionary [sic]. Some dabble in the category of disturbed or insane." He says that his projects are based on the first thought in his head and

before he can finish one, sometimes he has a new idea. When asked what projects he's working on he will generally list out a couple: "I do a lot of stuff. I'm always thinking about new projects. Like I was thinking about the new Fantastic Four movie and what if the Silver Surfer had a brother, 'the Not-Silver Surfer' who couldn't take off of the earth or something." Still Josh admits that he doesn't always finish his projects. He says that if he did finish all of his projects, he would have a huge number of things to post to the web site and he hopes that over the summer, he will finish many of his projects at home.

When asked why he comes to Scratch Club he says that "it is fun to program and work on that kind of stuff and it beats coming home and dealing with" his siblings. He says that although Scratch is easy to program and he can do it at home, he likes the Club because it is a great way to hang out with his friends and he can get help there. He says that he gets help from Alex and me but also the other kids such as Steve. He says that all of his friend who attend the Paine School come to the Club except one, who has used Scratch at home with him.

One day Josh asked whether he could have a character smoking a cigarette or whether it would violate school rules. Alex said it would be against school policy so he switched to a lollipop. I look at his screen and see a stick figure sitting behind a dark red desk. "What are you making?" I ask. "It's 'Stick Spade [like Sam Spade] and The Case of The ' I don't know what the mystery is

yet. It's going to be so appropriate that it's funny so instead of smoking a cigarette, he's smoking a lollipop [and smoke comes out] and he says, 'I either need a clue or a bagel. Get me a cinnamon raisin.' " He later asked me if there were arrows in the clip art that were a particular shape. I said that if he couldn't find them, he should go to google images and search for "arrow clip art." He did and found some that he put at the bottom two corners of screen. "It's an interactive book", he explains. When I go back, he's working on something else. I ask what happened to Stick Spade and he doesn't really answer the question, saying, "I'm working on this now. I'll go back to it later."

The following week I ask again about Stick Spade and Josh responded, "He's on hiatus. This is Fred. Most superheroes have names like Superman and Spiderman. Fred is just Fred. He's a hero or a villain. Your choice. He can morph into Wolverine or he can be Fred On Drugs.<sup>4</sup> This is Fred. This is Fred On Drugs. But I probably can't do that part [because it would be against school rules.]"

Josh is very frustrated by the school policies on inappropriate content. He thinks his projects are not dangerous or malicious and believes that the school is wrong not to allow them. He is also frustrated by how these restrictions impact his creative process. He can't always create

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<sup>4</sup> Josh is parodying an anti-drug campaign by Partnership for a Drug-Free America.

the characters or stories he envisions. These frustrations later extend to his experiences with the Scratch community site. As the site became more popular, the site administrators had to occasionally delete projects that were too violent, sexual, hateful or used bad language. This change affected what he will work on. At home he used to create the projects that the school wouldn't allow. Once the web site went live, he imagines how every project will work on the web site and that he would no longer build projects that he thinks will be flagged as inappropriate on the site. In Josh's own words: "I kind of like it-- now I kind of like it-- but it has kind of clogged up some ideas [for him because he has to be careful about being community-appropriate.] I didn't like flag as inappropriate. It's people's creative ideas. A lot of ancient art wouldn't be up because it had hunting and naked people. I think you are against the thing you want to support. Power to the people."

But the social aspects of the web site are great for a boy like Josh. He says "I'm a friendly person. I accept friend request when people ask and I always accept gallery request." He uses the social features to support his explorations of other people's projects. "Sometimes I keep closer tabs on people through my friends like whizzap and thezoz. I also keep track of the Naruto projects this way. I even made my own gallery, 'Parodies.' Say you like Aladdin and you make an Aladdin story or game, you can put it there." Josh, like many of the other Scratchers, spends time during every Scratch Club exploring other people's projects. He puts short

comments on projects that move him. "I put comments like 'boo' if it is something like don't like' or 'bwahahaha' if it something funny or 'how does this work?' or 'keep trying' or 'I don't get this.'"

Josh's love of Scratch is motivated not by a desire to program or explore technology, but by his unfailing storytelling spirit. Like drama or debate class, it is a change for Josh to be heard, but unlike his school classes, it is also a chance for him to present his own ideas. Because he enjoys this platform so much, he is distressed by any restrictions on his creative process. He resents them because he feels that as a creator, Scratch should allow him to express himself without restriction.

#### *AN INFLUENTIAL WITH A DESIGN PHILOSOPHY*

Stacey came to Scratch Club from the beginning with her friend, Liyan. Her twin, John, is a friend of the organizer's son and, as a result, before the Club started, Stacey had already "worked at home for a couple of months with my brother." With her playful and easygoing personality, Stacey is a natural leader among her friends. Every one of Stacey's friends who comes to the Club does so because she convinced them to do. Stacey is very convincing with her infectious laugh and bubbly personality. She has single-handedly stepped each of her friends through each stage of adoption of Scratch, from awareness to final adoption:

My friends come to Scratch Club. Yuan Yuan just came this week. I invited her. Liyan started out doing it. I don't remember when [but] Irine came the next we because we convinced her it is the funniest thing in the world. She doesn't come when she has track. Heather has it at home because I emailed her about it and I convinced her to come to the Scratch Club and to call her mom during Spanish class to see if she could come. We were on a field trip. We got my cousin to download it. He has an old version.

Stacey's friend, Heather, describes her in this way:

Stacey's very special and we all love her. She does stuff like standing by your shoulder until you call your Mom to ask if you can go to Scratch Club.

As more of her friends and John's friends came to the Club, the sibling connection provided a bridge between the group of girls and the group of boys. Stacey is a central figure who teased the boys and was teased back by them. This bridge allowed the two groups to share deepening stages of adoption of one another's ideas. I'll describe this in more detail later.

Like many of the other Scratchers, Stacey loves fantasy. She loves dragons, reading especially "long books and anime", books about dragons such as Eragon and Eldest and the Dragonsong

series. She knows a lot about anime and manga and can draw many of the popular characters very well. She also likes to play computer games, watch anime, and go on the Club Penguin site. In school she says that she likes “Science because the teacher is awesome” and “World Geo because the teacher is awesome.” Like, all her friends, she also likes art class and draws in her free time.

Stacey prides herself on being different, fun, and silly and her Scratch projects, and her thoughts on those projects reflect this view of herself. Here’s how she describes one project she made about a tiny buffalo who is mistaken for a “piece of poo” by a big buffalo (Figure 48):

I like it because it so so crazy and and completely random so it’s totally me. I got the idea by looking through the imports [library in Scratch]. There aren’t any other projects like this. Most people do games or long animations.

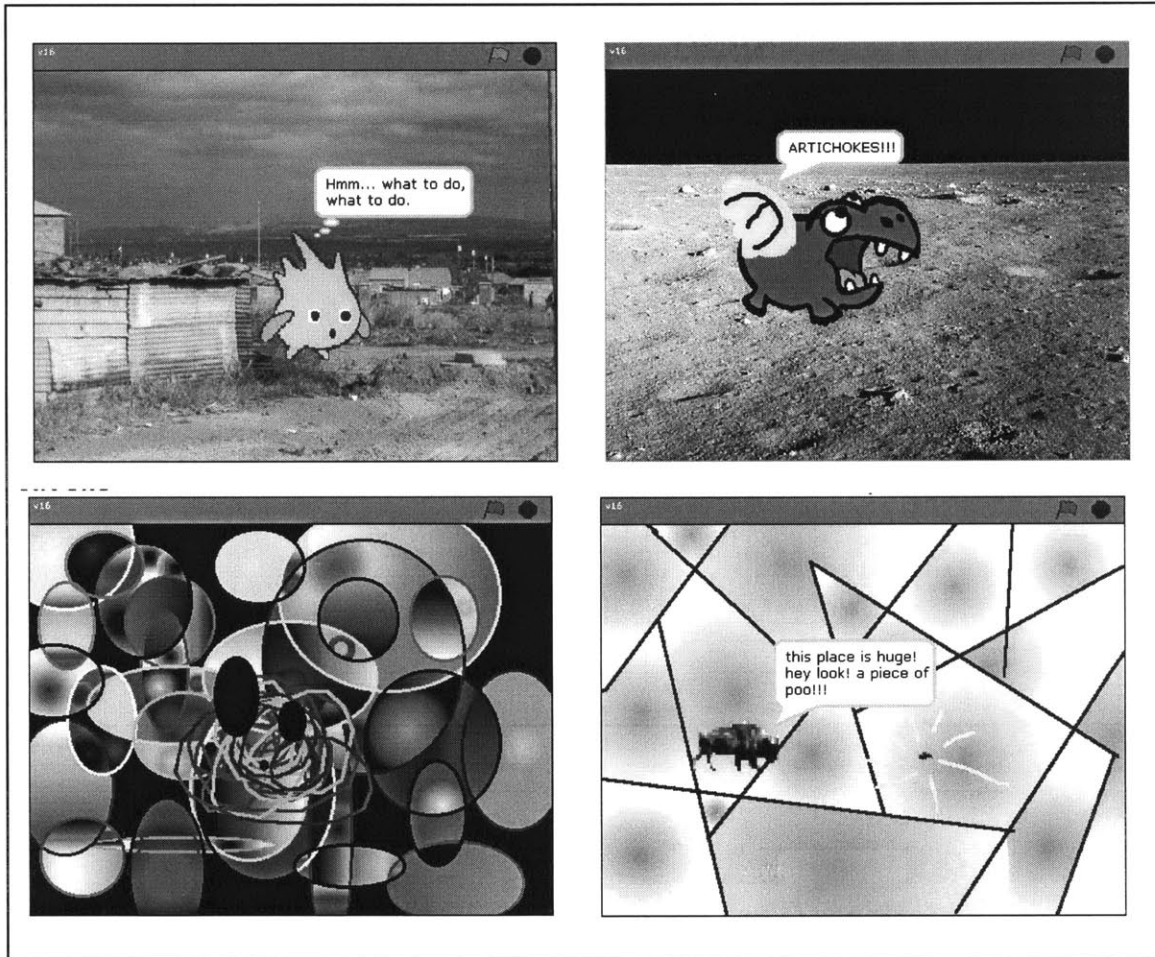


Figure 48: Four of Stacey's Projects. *Hippo Flies* is on the top right and *Wee Buffalo* is on the bottom right.

Stacey has a clear idea of what she works on, why she works on it and how her work is different from others. In her time working with Scratch, Stacey has developed a preferred type of project to make and a design philosophy:

Irine and I like to do short animations. I like to do short animations because 1.) they are very simple 2.) they are very funny and 3.) they are not complicated so people don't get confused how to do things. Because if you're on the Scratch site a lot of [the projects] don't have instructions or the instructions are something like "this is cool" and it is confusing. I like to make funny short things that are easy to use. I've never been a fan of making games.

Stacey is different from Rick or other serious technologists. She isn't intrinsically interested in programming or making projects that are hard or complex just for the sake of doing so. Being able to realize her creations with the computer is new for Stacey. Though she hasn't programmed in a text language like Logo, Basic, or python, she has tried creating with the computer before:

I've used Flash. I hated it. Flash sucks. It is really confusing. Me and my brother tried Flash and it is so confusing. We took a summer Flash class at the science museum. I

can't get it out of my head. [Can't get ideas out using Flash.] Flash is confusing and programming is confusing but [Scratch] is pretty easy.”

Stacey loves to realize her design goals, specifically, to make humorous, short, cute animations that people like and she will use other people's projects as inspiration. But when she does fully adopt others' ideas, she makes them her own:

Hippo Flies (Figure 48) was made after I made one just like this at home. At home my brother had a friend over and they were making a similar one with similar code. It used *when pressed a button* and *say*. It looked different and it wasn't as funny. 1 or 2 people like it. That's cool. But mine is really fun.

Though she will try to find an easy path first, she will work through programming problems when she needs to and feels confident in her ability to do so:

This is the most confusing one I did. It was confusing because I'm not used to doing forever and using buttons and stuff. [Yeah, we helped you with this one.] I could do it with help. I really like this one but it isn't popular on the web site. [I like this one too. I think it is really funny.] Yeah it is crazy. I like to make crazy things...I haven't seen

any like this one.

At first she tells me that there are some things that she still finds difficult about Scratch but as she explains what is difficult to me, she thinks through what she has learned:

...but still some things are confusing. Like *broadcast*. Well, that's not really confusing any more. Well, the *buttons*. No that's not confusing either. The *pen variables* are pretty confusing.

Stacey has always loved to create and entertain. She likes to make artwork, particularly about dragons and she loves to entertain her friends. This love of entertaining extends to how she uses the Scratch community site:

I comment on [people's] projects. I say funny things. I like to make people laugh. I like to be funny.

She is particular about the comments she allows on her projects on the Scratch site:

I get a lot of comments and delete the ones that I don't like. First someone just said

[Wee Buffalo] was weird and I deleted it but then Eddy said “that is really weird. But it is the cool type of weird,” and that is ok.

Like many of the Scratch Club members, Stacey doesn’t want to be friends with everyone who asks, but she will respond to people she knows, and, in other cases when there is a good reason to say, “yes” to a friend request:

I don’t like it when people want to be your friend. I like it when a person who just started who doesn’t have many friends or they’re your friend already. I say yes if they pick mine as favorites or if they put nice comments. ‘Sean’ said some good things about my work. So did ‘Lasertagger’. Oh! ‘Mub17’ is Mona?? [She had just said yes to this account because the person had few friends, but realizes Mona is a friend from school.] [Now that she’s looked at the user’s gallery] I just know it is her because her gallery is called Mona.

Though Stacey isn’t a showman like Josh, she does like to make people laugh. Despite wanting to entertain and bring joy, she has distinct ideas about what types of projects she prefers. Her projects may be built to amuse, but they are also elegant in their simplicity. She is a leader among her friends, not only because she is socially motivated, but also because she has a

strong sense of who she is. This sense of self, along with her relationships with the boys, made her a key figure in the spread of ideas through the Club.

#### *A TECHNOLOGIST TINKERS AND HELPS OTHERS*

At 13 years old Steve already knows more about hardware, software and programming than any of the other kids in the Club and most adults I know. He and his dad, a professor in a technical field, are learning python using university materials available online. His mother says that everything else about computers he has learned on his own and she says she is “glad you can answer his questions because I can’t.” On his own he taught himself to program in Basic with a book borrowed from the library and then learned Visual Basic. Along with learning python with his dad, currently Steve is teaching himself about Microsoft Access. He says that he works on Scratch from home, usually for a couple of hours after Scratch Club.

When the Club first began, he sat in the first room with his male friends, but sometimes sat between them and the girls whom he interacted with comfortably. At first he worked intently on his Robot Rampage project every week, saving it to his thumb drive. It was an impressive game with an opening animation sequence and five different levels. He's the first child I noticed creating a game with levels, which he figured out himself, and one of the first to start a game with an opening animation. In the game the user chooses which level she wants to start with. In actuality it always sends you through the levels in the same order because when

he made the game, he didn't know how to let you choose. (Later multiple members try to create levels and the Club as a whole determines how to do it.) In each level you have to point the crosshairs at the robot and then kill it. With this ambitious project, he learned how to maintain different background for different scenes. He asked how to hide and show health, which you can't do but I recommended he hide the health display with another sprite that looks like the background and he seemed to like that idea.

Sometimes he would come by to ask a highly specific question. Eventually I would what he was trying to do. For instance, he asked if it is possible to turn the counter on and off. I told him no, but he could hide and show it by putting something in front. He explained to me how he was doing it. The levels were impressive and, unlike a lot of the other game-makers, the game play, graphics, and interface are carefully crafted.

I told that he should backup his work elsewhere too because USB thumb drives fail. We had a long discussion about which storage methods were more or less likely to fail and I was surprised by how specifically he quizzed me on server space, home computer hard drives, and thumb drives. He didn't believe his thumb drive will fail. One day he said he couldn't get the file off of his thumb drive. I tried to help him but the file was corrupt. I told him that he could email me if his parents approved and I would try to fix it at my lab. But he didn't write and didn't

seem to be upset the next week that he'd lost a project he'd worked on for ages. I was more upset than he was.

At this point Steve started a couple of projects that he didn't finish. He didn't have something to focus in Scratch and was more concerned with what was happening in the room. One week, the lab's computers weren't working. Steve determined that restarting the computer fixed the problem and he began to restart every computer in the room and told other people to do the same. (By the way, he often would shut down all the computers and push in the chairs at the end of the Club time too. The computers would shut down on their own, but he knew that.)

Two computers weren't working even with restarting so he climbed under the desk to troubleshoot. He reported to me that a hub with a partially severed power cord sat on the metal shelf at the bottom of the computer desks. He knew what the hub, ethernet, and computer ports were and how everything works together to provide connectivity. I looked and, sure enough, he was right. I could see how the sharp edge of the shelf was sharp could damage the cord. We decided that hub was unsafe and unplugged it. He wouldn't do something like this on his own because he followed the rules scrupulously and often asked for clarification about them.

I was working with some other children when Steve informed me that only two computers were on the hub. He demanded to know why it was set up in this way, explaining that it didn't make sense to run a hub with only two computers on it when one had two ethernet plugs. I said that I agreed, that didn't make sense and I didn't know why it was done this way, but that we weren't in charge of the lab. He agreed, but repeated his chief complaint several times. He said that he plugged one computer directly into the wall and now it was connected but the other port was broken (part of the plastic broke off) so one computer was unfixable. He was concerned that someone would try to use the computer and that the technical staff wouldn't fix it. So I told him that I send an email about what he found and would also put a note on the computer. After I did this, he was satisfied. The following week he tested the computers before anyone could use them and informed me that the computers were working and the hub plug had been replaced.

Another day Steve said:

"excuse me, Ms Sylvan, excuse me."

I said "what's up Steve?"

"Do you know about Google Labs?"

I said that I do.

"Do you know about how you can build search into your pages so that it only searches your site? You can use that and have a good search engine. There isn't search on the Scratch site and you can just use this. You just have it do 'site:'?"

"Thanks Steve. I know. We are going to put search up really soon. We just have a lot of features to add at the moment. But you are right, we need to have something like that."

"But it's not hard to do. You can just put it up?"

"I know. It should be there soon."

"When?"

"I don't know exactly because I haven't talked with Andres about it. But really soon."(It

was up the following week before the next Scratch Club and Steve immediately commented on it.)

"Ok."

Steve was fascinated by all things technological and very careful about how he thought through computer problems, but he was also interested in people. Like the other boys, he would become overexcited and laugh with his friends when someone created or found a funny project. He often didn't work with Scratch at Scratch Club. He liked to know what was going on with everyone else and their projects. He didn't seem to concentrate on his projects while he was at the Club, though I know he must have been able to focus based on the projects he produced.

After Robot Rampage, Steve showed me an impressive program called "keypad," which he created because he "wanted to do something hard." Mark and Mack then adopted "keypad" to create another "hard" project, "pixelated pac man" which Steve was happy about. Steve then worked on a new project, one that he said was pacman-like and somewhat inspired by Mark and Mack. As he explained, he heard Liyan expressing confusion about how to add tags on the web site. He immediately excused himself to help her. Meanwhile, Heather, who sat next to

Liyan, had a bug in her project that she had posted to the site. Steve downloaded and examined the project and then asked if it was ok if he fixed it for her. He did so, then posted it on her behalf. The Project Notes started with

By Birdie

Edited by Codeman

Ultimately, Steve didn't create a huge number of projects but he did contribute a lot to the Scratch Club community. His interest in programming started long before he got to Scratch and his interest in computers goes beyond programming. I imagine he will continue to learn about computers, regardless of Scratch. Still, I believe Scratch allowed him to create some sophisticated projects much more quickly than other programs he works with. This allowed him to focus on topics beyond the actual code such as game play, game design, and complexity.

But for Steve, I think the social context of the Club is most important. He can wander a bit, as he likes to do, get an overall sense of how people are working with Scratch and each other, and then focus on particular issues that come up. He is personable and as long as he doesn't push too hard, people accept him and his help. He shines as someone who is knowledgeable and helpful. And this skill will help him should he continue with computers (and I think he will.) It

will make him a better designer, tech support person,, or manager.

*WHEN SCRATCH CAN BE A SAFE PLACE TO TRANSFORM, QUIETLY*

Liyan came to the Club from the beginning with Stacey. She was a quieter than some of her friends but joked and giggled with them. She was always open to talking about her projects and her inspirations, but generally had a negative attitude about her own work. When I talked with her about her work she would sigh and tell me what was wrong with it. She would still post her projects to the web site but introduces them with critical remarks in the Project Notes such as, “Sure, it's not very robotic, but it's one of my earlier pieces” or “This is an animation where you do some stuff. Press the up arrow and space to do two things. That's all it can do though...”

As I got to know her, I came to understand that she often felt this way about what she dis. When I asked her what she liked to do in her free-time or what her favorite classes were, she responded:

I don't have one thing that I'm really interested in. Everything I do I find I that I want to do it but I don't have a passion for it. Drawing is fun as a pastime but I don't feel passionate about it. I'm not great at it. Ching-Ching is great at it. There isn't any school subject that I really like. Math is fine, but there is no spark in it for me. I do school

because it will help me but I don't really enjoy it that much.

Liyan described her life as being highly scheduled and planned out:

I don't have a lot of free time. Sometimes it's really busy. Sometimes I work on my homework until 10. Plus I have Chinese Club on Saturdays and also a Chinese tutor. Also music lessons. So usually I don't have much time to do stuff like use the computer. This summer I am going to camp. It is a three-week overnight camp. It is not much of an outdoors camp. It is about cryptology. I think cryptology could be interesting. We'll see.

And beyond the Scratch Club, she had limited computer time, though it was unclear if this bothered her:

I'm not really allowed to use the computer much at home. We have one laptop and two desktops. My dad has five profiles on his machine so it's hard to know when I can use it. Plus he uses it a lot. I tried to use Paint but I failed because it is hard to draw really well with it and Word is kind of slow and it has all of these features that get in the way of actually writing.

She tried programming with her father:

My dad tried to teach me programming but it didn't work because he doesn't teach very well. Last time he tried he was making a web page, when I was, like, 6 and then again five or six months ago. He had me use perl or python.

After she started the Scratch Club her father downloaded the program for her:

My dad downloaded Scratch so I could use it but he prefers real programming. I think he thinks that 'real programming' is not so much drawing but more writing lines of code. I suppose he thinks this is immature and not for the future. I've never really enjoyed real programming. There are some really cool web sites out there but I couldn't understand how they are made. My mom is not with technology.

The one time she really lit up is when she talked about her love of books and fantasy in particular:

I love to read. I read a lot of fantasy. I like books about magic and adventure and quests, like Eragon and Eldest. I like books where the characters are changing

throughout the story and becoming more powerful, I guess. My parents aren't really big on me reading fantasy.

Her parents preferred that she read different material:

They want me to read my dad's old science textbooks, which is not too appealing.

Science is fun but I don't want to read textbooks in my free time.

Every one of her projects involved a character morphing from one form to another. In one project she created a forest scene in which a girl morphs into a fox. Even her love of foxes came from someone else; her friend Ching Ching loves them. I asked how she was doing and she sighed and said that this was really hard. She wanted to make a smooth transition between the girl and fox and said that the best way to do this was to have many costumes to move through. It took a long time to draw each one, so she wasn't crazy about this solution. I mentioned that she could use an image filter effect between the costumes, like what Stacey did with her genie project. But she persevered, taking a lot of time to get everything just so. No one else at the Club created such intricate transitions and her work was excellent. Still she didn't see her work positively. In her project notes she wrote "Okay, so it's a little jerky. But I worked really hard on it so too bad!" whereas an adult user on the Scratch site said this:

Like 'robot transform' [an earlier project of Liyan's], an interesting exercise in 'morphing'. This is a valuable animation technique and so it's worth downloading this little film to study the code and sprites.

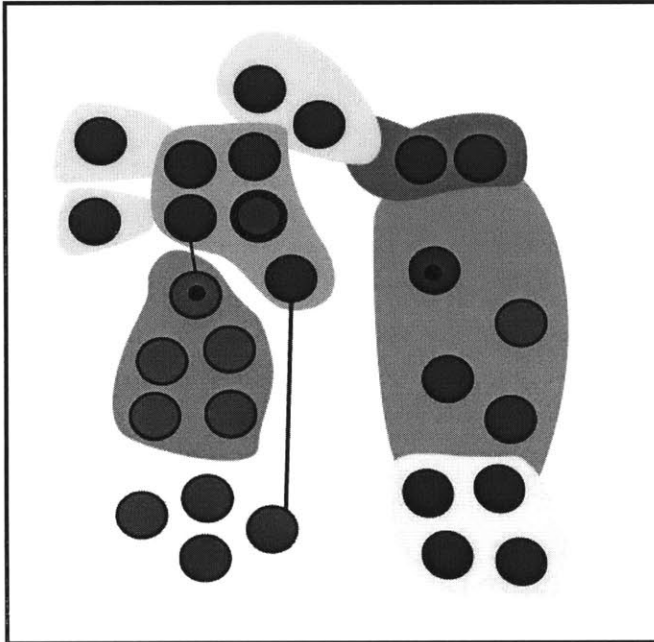
Liyan lived a highly scheduled and regimented life, which she accepted with a sigh. She felt pressure to do well in her activities. Both her schedule and the pressure made it difficult for her to take a risk and try something out for fun, to just see if she would like it, particularly if she might fail. Liyan liked books where people can transform and her projects also reflected an interest in transforming. I believe that in her own way, Liyan used Scratch as a safe place for her to escape. Scratch allowed her to transform metaphorically through fantasy. By carefully making characters who transform, Liyan had a place to explore her desires to reach out and find things to feel passionately about, and thus, envision transforming herself. Quietly.

## **Group Dynamics and Experiences**

### *MEMBERS' CLIQUES*

Though the Scratch Club developed a sense of a group community, the children divided themselves into five cliques (Figure 49). For the most part the cliques were based on existing friendships the children had before they came to the Club. Though there were plenty of

interactions between the different groups, each clique developed slightly different interests with Scratch.



**Figure 49: Observed Scratch Club social network including components**

Nine of the boys in the Club were the organizer's son and his friends, including Josh and Steve. This group is highlighted in green and was composed of five boys who were very close, two who were friendly but not in the core group (Josh and Steve), and another two who were friendly to

the larger group, but were close with one another (Mark and Mack who I discuss later.) Every one of the boys took Scratch programming very seriously and, as they worked with Scratch, each developed their own style of Scratch projects. They were quite aware of each friend's individual style, who made the best games and who was "catching up." They worked off of each other's ideas, sometimes using each other's code or sprites. One pair of boys, Mack and Mark, made many projects together and shared a Scratch web site account. These boys created a broader range of style of games than most of the other cliques, including many styles of games, interactive patterns generators, and stories.

Stacey is the twin of one of these boys. She came to the Club with four of her female friends including Heather and Liyan. At first just Liyan and Stacey came and over the course of the school year, the three others joined. These girls are all close friends and all were prompted to come by Stacey, who is a central figure in their circle of friends. This group was particularly focused on making animations, using a variety of programmatic approaches. Each girl had particular subject matter that interested her, such as foxes, bodily transformations, and funny creatures.

A second group of five girls came after the Club had been running for a couple of months. They were initially helped out by the first group of girls, but later broke out on their own to make

primarily stories, some interactive and some not. This group of girls stuck with themselves more than any other group and their work reflected this. Many of the stories were teasing caricatures of one another, full of inside jokes. They developed characters that multiple girls would use in their stories.

Two other groups of boys came to the Club. The first was particularly interested in playing video games and working with GarageBand, a music-making program that can also be used to create pod-casts and sound effects. As time went on, they began to make Scratch programs and used GarageBand to make the soundtrack for those programs, but their primary passion remained GarageBand.

A final, more amorphous group of five boys and one girl had many friendships with the GarageBand crew. This last group also included serious programmers and game-makers. Two of the boys had been close friends since kindergarten. They knew each other well enough that, as one of their dads put it, they can say one word or give each other a look and know what the other is thinking. In the beginning of the Scratch Club they sat with three other boys and one girl. Later they moved away from those children into the second computer lab. At this point the other members became friendlier with the GarageBand crew. The two best friends are Larry and Jimmy, headstrong and anti-establishment boys whose projects reflected their

attitude. Their work tended to be off-beat and humorous. By contrast, Rick, a more serious child, also had a taste for the unusual but tended to develop highly complex and detailed games. Harry, Jimmy and Rick all felt very strongly about Scratch: they loved using it and became upset when they thought the administrators were not doing what they believed to be best for the community. They have no problems expressing their issues in no uncertain terms. Harry provided a good example in a forum thread about projects that should be removed from the Scratch web site:

O, great admin inn the sky, please help us from these a\*\*\*\*\*es who have no talent and spam our beloved scratch server...

#### *FOUNDATIONS OF A COMMUNITY: SHARED BACKGROUND AND INTERESTS*

Coming into the Club, the children already had much in common. Of course, they all live in Danesfield. Though some children would enter alone and some children preferred to work solitarily at times, every member had friends in the Club. Many of the Scratch Club members had known one another throughout their childhood and their parents knew each other as well. From the beginning, the children could discuss issues about their school, which teachers were terrible and which ones they loved, funny things mutual acquaintances did or who got in trouble, and how much homework they had left to do. Many had shared interests. Overall fantasy of various kinds was very popular. Many liked Harry Potter and Naruto (a manga series).

Fantasy and other videogames were popular with the boys and the Inheritance Trilogy (a fantasy book series) and Club Penguin was popular with some of the girls. Certain videos on YouTube and elsewhere would become popular, with children crowding around computers to see. At one point, for example, one group of girls were watching Potter Puppet Pals, a physical and animation puppetry take-off on the Harry Potter books. They showed it to me because they thought it was hysterical. The following week, a group of boys (who are friendly with that group of girls) watched the same videos. As time went on, the same phenomenon occurred when someone made an impressive Scratch game. The room would notice, people would play the file over and over, laughing, reenacting it, commentating and critiquing as it ran.

There was a rhythm to each club session. All the kids would rush in, knowing what they wanted to work on, and starting as quickly as possible. Before Scratch Club would start, they were allowed to use the internet to play games, watch videos, or google around but many would go straight for Scratch. As facilitators, we did surprisingly little. In the beginning, Alex would start each Club with a tutorial on a topic. But it soon became clear that they were learning well on their own, with occasional assistance from us. Besides, the Club was their last school event on Fridays and the kids wanted to relax and play Scratch.

### *WHY THEY FIRST CAME: GETTING STARTED QUICKLY, HARD FUN, BEING WITH FRIENDS*

The children who come to Scratch Club are passionate about it. They came early and stayed as late as we allowed. On days when we would consider not having the Club, such as school dances or the day before vacation weeks, they would elect to come anyway. Many of them told me that they love Scratch Club, that they hope we have it again the next year because Scratch Club is so much fun. But why did they like it?

Part of what the children said they like about Scratch, particularly early on, was that it was immediately easy for them to see what they could do with it and they could make something they liked quickly. But soon they'd get another idea and move on to something harder.

Though starting is "easy," the other side of Scratch is the hard fun, the challenge of creating something yourself and the pleasure of that challenge. Jason experienced that when he was trying to get a creature to jump up and down, turn the right way when it goes down a step, and not walk through the hill he is standing on. This is a hard program to write. John, a Scratch developer, was visiting that day to see how these kids were using Scratch and helped him with the problem. They were stuck with a bug for a while and then finally they got the creature to step down one side of the hill. "My gd, it feels good when you accomplish something," Jason moans with his head back, "Oh my gd." "What happened?" another boy asks. "I just did

something really cool."

The social scene impacted their desire to come to the Club. They could spend time with their friends. Most of them signed up with friends and knew most of the other kids as well, often for many years. They were comfortable at the Club. They knew what to expect. They could be themselves, express their ideas as they saw fit (within the policy constraints of the school), and be together.

#### *INFLUENCING ONE ANOTHER: HELPING, COPYING, TEASING AND COLLABORATING*

Most weeks, the other organizer, Alex, and I would walk around the room, offering help, asking the children about their projects, and giving them ideas about how to approach their programs. Many of them would ask us for help, but they also looked to one another. Danesfield Scratch Club members supported one another by answering each other's questions and providing feedback (whether it was requested or not.) Sharing and helping occurred organically and regularly. "Hey, Josh, how did you make the health counter?" "Should I make this one layer or two?" The members of Scratch Club knew that they could get a lot of answers from each other, especially since they looked at each other's work and kept track of what others were doing. Often children would lean over to look at other screens. One time Stacey was having trouble with a project in which flowers would bounce around a garden. Liyan finished her flowers

graphics without a thought of who would get credit for the project. It was Stacey's. But as they worked together, they noticed sometimes the flowers got stuck and stopped bouncing:

"Where?" I asked, "In the corners?"

"Yes."

"Have you tried 'if on edge bounce'?" I asked.

"Yeah."

"Where is 'bounce on edge'?" Nikolai asked.

"It's at the bottom of motion" Stacey said while another boy between them explained "it's here" and pointed on his screen.

Some members, such as Bob, Josh, Nikolai, and Steve would walk around the room regularly to check out what was happening. This could be a great way to learn, as long as the person being observed didn't mind. However, sometimes members did mind. One day Liyan and Stacey were

working in their corner when Nikolai came up behind them and looked at their work as he is prone to do. At the time he was working on a messy blob of a creature on top of a giant banana holding a weapon, a project that on its surface had little in common with the “Retro Blob” project that Stacey was creating. Liyan said “What do you want?” “I’m just looking,” he said and walked away to look at someone else’s work.

Help sometimes was unwanted. Stacey worked on a project in which she used music for the first time and learned more about how to rotate objects. She had a creature that turned upside-down then right side up but wanted it to go in circles. First she had it turn 360 degrees, which of course made it stay in one place. I explained that she wanted it to turn less than that multiple times until it added up to 360. Steve sat next to her and told me repeatedly “I told her it would do that.” Stacey rolled her eyes.

#### *CLOSE COLLABORATION: A PAIR OF PEER PROGRAMMERS*

Collaboration was common in the Scratch Club. But nobody worked as closely as Mark and Mack. Mark was friendly with the organizer’s son through whom he got Scratch at home after the Club and Scratch site were well established. Mack is Mark’s next-door neighbor and best friend and soon after Mark got Scratch, Mack started using it with him. They made a project together and put it up with Mack’s account. This first project was ‘Castle’ and it took them a lot of time to get the boulder to go properly. It took them a while but they figured it out together.

From then on, they just shared their account.

Mark hadn't programmed before but he really liked computers. He had taken computer parts from different computers and installed extra RAM and an extra hard drive into his computer. This summer he is going to a computer day camp with Mack where they worked with Lego Mindstorms, Flash, and other technologies. Mack has been to the camp before and he said that the best part was working with Mindstorms. Mark has worked with Legos before at home and likes it so he is excited about that. Mack's Pixelating pac-man was based on Steve's keypad project and he asked him whether he could use it for Pixelating Pac-Man. They commented on other people's work a lot and sometimes got into comment wars, but then they'd delete the comments later.

They made some projects together, at Scratch Club and at home, but many of the projects they post were the work of one of the two. Still they helped each other a lot and copied each other's work. Even though they worked closely, they each had their own project style. Mark tended to make military or fighting games (such as 'Invasion', 'Bug Fight', 'Assault' (sic) and 'Jet Fighter'); Mack made visual programs and story-based or themed games like 'Robot Overturn', 'Crab Race,' and 'Feeding Frenzy'. Sometimes they inspired each other, such as when Mack made 'Random Lines' and Mark based 'Color Dots' and 'Color Squares' on it.

Mark said that he made cleaner graphics than Mack and that made it easier to tell whose work it was. In addition, I think Mark was more careful about his designs. He made his games easy to use and puts in more detailed program notes. Though they know whose project is whose, they have no problem sharing credit as one user. In fact, they don't seem to even think about it.

#### *THE CLUB CHANGES WHEN THE SCRATCH SITE GOES LIVE*

In the early days of the Club, everyone had a lot to learn and the Club organizer often presented materials to the group as a whole. As time went on, the group became more proficient with Scratch, but sometimes needed help deciding what types of projects to make. As they learned what they could do with Scratch and developed personal ways of making projects, the Club organizer and I planned fewer activities ahead of time and instead helped individuals as needed. The Club developed its own way of working. Members had many good and solving problems was often a communal effort. Those who had more difficult problems might ask Alex or me with help solving them or depending on the member and the problem, they might ask a friend. The room was a workroom for people who were Scratching, not a classroom where people were taught.

The Danesfield Scratch Club was one of the first groups to use the Scratch community site. At this point the online community was very small and was composed primarily of people whom

the Scratch team knew personally. The Danesfield children immediately understood what the site was for and how it could be used. Many members created accounts and posted projects right away.

By the time the children saw the site, they understood Scratch and enjoyed working with it. Though they would occasionally surf the internet, looking at videos or play games, most members used their Scratch Club time to work with Scratch. (There was a group of notable exceptions.) Often when someone used the Internet, they were looking for graphics or sounds to include in their project. They knew what their fellow members were working on and knew the fun distractions they could find on the Internet, but mostly they wanted to work and hang out with their friends. The children were focused on the work and their friends in that space.

The Scratch site infused new ideas into the Club. Suddenly the children had access to many more projects than before. They began to surf the Scratch site, exploring what they viewed as a treasure trove of new ideas, games to play, and animations to watch. When they explored the site, they would tell each other which projects were 'cool' enough to be tried out. It became common to see members playing Scratch games online rather than working on their own projects. It became common to see a row of children playing all the same game on the Scratch site.

As more and more of the children had accounts with projects, they began to run each other's projects more. In the early days, it was easy to watch over someone's shoulder as she demonstrated her project, but it was difficult to play her game on a separate machine. As a result, people explored each other's work very little. People would yell comments about other's projects from across the room and sometimes download each other's code to see how projects were constructed.

As they tried out each other's projects, the club members would leave comments. Many comments were compliments about the projects themselves:

**Matt to Larry:** OH MY FREAK'N GOD THAT WAS AWESOME!!!! it is SO worth the wait.  
that was like 23 f-ing mins of coolness!

**Heather to Mark and Mack:** it's cool. i like it!

and

**Mack to Steve:** I used [this keypad project] on my pacman game P.S. I gave you credit

Sometimes comments included updates on how they were using each other's work:

**Heather:** I love it!!! funny duckie... : ) But, uh, there's a tag someone added that needs erasing. You can log in and delete it.

**Irine:** Hmm...wonder who did that...

Other times members complained to each other when someone stole their project:

**Mark to John:** I know my games are good but next time you rip me off and only change the costumes please acknowledge that i made it first

just saying

**Josh:** you ripped off whizzap completely

**Mark:** and one of the planes doesn't even move

**John:** zipzom, I like ur work and i tried to make it harder but i guess it didn't work

**Mark:** its okay, it is very fun game

does he fall faster????

**John:** he falls at more of an angle depending on the stage

But sometimes comments extended the in-person teasing to a virtual form. One day after we had been using the web site for two weeks, people were posting projects, announcing what

they were doing so, and then commenting on each other's projects. Some of the comments were mean like "this project sucks" or "you're a jerk". Still within the Club, everyone knew that they were joking as always. They were not thinking about how these comments would look to the broader community. Aware of discussions the Scratch development team was having at the time, I said that the club members knew that they were just playing around, but people on the site and administrators on the site didn't. So some of the kids decided to delete the mean comments from their projects so that other kids wouldn't get in trouble. Stacey did this and explained, "I don't want Cole to get in trouble" despite the fact that he had been teasing her.

By the time the site went live officially, the Danesfield Club had been using the web site for several weeks. As the web community grew, the members spent more time exploring it. It was no longer their own private playground, but rather a place with many new people and projects. Surfing became more and more common at the Club. The members got to know people's projects outside of their Club and began to interact with site members from outside the Danesfield Club. For instance, Stacey and Liyan got to know a user in Moscow starting with this conversation between Liyan:

**Me:** Do you get a lot of comments [on your projects]?

**Liyan:** Yeah.

**Me:** What kinds of comments.

**Liyan:** They are usually good. Let me see"

Liyan opens *Stacey Documentary* and we scroll through various compliments until at the bottom we read through the one site user's comments:

**MyBlueSky:** (3 days, 11 hours ago): Cute

**MyBlueSky:** (3 days, 11 hours ago): I'm gonna watch it again

**MyBlueSky:** (3 days, 10 hours ago): Oh man, she lives in USA, how am I supposed to meet her?

All the girls burst into a fit of giggles and hypothesized which person MyBlueSky wanted to meet. The creator? The dragon? Stacey? I suggested it was the idea of Stacey from the project. Liyan wonders where the user was from. She clicks on the username and more giggles ensued. Moscow! Stacey then commented:

sorry... hows moscow???

Few of the Danesfield children participate in forums, but they often use comments in ways adults might use forums. They leave comments to exchange information about how to do

projects, not only with each other but also with people outside of the Club. Heather had this exchange with another web site user:

**Other user:** Hi

**Other user:** BRILLIANT!

**Other user:** I LOVE THE WAY THERE MOUTHS MOVE WHEN THEY TALK!

**Other user:** How do you make it switch to different scens like that?

**Heather:** it's just different backgrounds. i have the character that finishes the previous scene broadcast **"\*insert title of next scene here\*"** and set off a new thing with the controls. you can download it...

Rick, Larry, along with Mack and Mark (with the shared Scratch account) are the only members of the Club who post to the forums, a section usually used by adults. (A good friend of Mack and Mark who lives near them also posts to the forums.) When I asked Rick what he uses the forums for, he responded with the same clarity with which he approached his programming answered:

If you want someone to read something and otherwise to get information about something, forums are an obvious place to find something, some information, or to give some information.

As the Danesfield Club members became savvier about the site, their ways of using the site changed. Some became more aware of how they were presenting themselves to the broader community.

They also thought about which projects were popular and how to make a popular project. Once I asked Mark, Mack and Derek, "hey did you notice how many of Scratch Club projects are popular." "Yeah" they said as they opened the web site.

**Mark:** "Everybody likes Eeeep. Ours used to be the most popular but now Rick's is and we can't catch up. I don't get it. A lot of good stuff isn't popular.

**Mack:** "Yeah, like Robot Overturn [a project of theirs that is an excellent game.]"

**Mark:** "It's [the Eeeep project] annoying."

**Mack:** "People like annoying things."

**Me:** "Yeah like on YouTube. The most popular are often annoying. It has nice visuals too. I think people like nice visuals."

**Mark:** " Yeah me too. That's why I made some visual things.

**Me:** "Yeah what did you make?"

He shows me two: Color Snake and Color Dots.

"Oh I remember color dots. It's really good."

**Mark:** "Yeah but it isn't as popular. I don't get it."

Mark and Mack's projects were by no means unpopular. When I checked about six weeks later Rick, Mark and Mack all had popular projects in the top ten. Rick's "Eeeep" project slipped to the third most loved of all time while Mark and Mack's "Robot Overturn" was number 6, their "Unlock" game was 7, and Rick's "Jetpack Sam" was number nine of out over 15,000 projects on the site. So, in fact, all three programmers created projects that received attention. Still, once the site went live, many members Scratch goals change to making projects that would be popular on the site. This goal influenced their entire creative process. Many, though not all, children would select ideas they thought would succeed and would work more carefully on graphics and documentation. If their project didn't work on the web site, they would rework and re-upload until it did. Once they uploaded a project, they watched with great interest how many people looked at their projects, who loved their work, and what comments and tags people put on their projects.

The Danesfield Club changed once they had access to the Scratch web site. Though the site brought new ideas and new people to meet, it shifted the focus away from their earlier primary task of making cool projects for their own sake. Showing off became more important. Though the members recognized that to get attention it helps if you are good at Scratch, they

also knew that it took more than skill to make a project popular. The pleasure of hard fun remained, but a second external motivation was added. In Kenny's words:

I need to make games that are actually good to put on my internet file. That way everyone can see I can actually do something good.

#### *IMPLICATIONS FOR STUDYING THE BROADER SCRATCH COMMUNITY*

Getting to know these 35 children, coming to understand who they are, learning what their work and the Club means to them, and understanding where they get ideas has been illuminating in its own right. It's also influenced how I view the Scratch community web site and the interactions the site doesn't capture. The Danesfield Scratch Club members are people whom I know personally; I know how fit within the Club and what their influence is there.

The collaboration –the occasional answer, prolonged assistance with graphics, or closely-tied peer programming– is a big reason for members to come to the Club. The Club is a safe place to experiment, have fun and be with friends. This wonderful support system is not captured by the social network analysis I perform on the web site. Some of the club users make and answer friend requests, but many do not. (Rick comes to mind.) Many have friends outside the Club and school. Some have added projects to the school gallery that one member created but many productive members have not.

More important than the incomplete network data, however, is the lack of description of the richness of the Club. There is no way to capture who the children truly are, what they are thinking and feeling when they create their projects, how they interact with one another, or what their commingled personal histories are. The culture of the Club cannot be characterized by the network data and the culture is exactly what makes the Club fun and alive, independent from Scratch.

Some of the broader patterns might be evident in the social network analysis, albeit without the richness.<sup>5</sup> For instance, some of the members who are admired and productive (such as Mark and Mack), are influential in the online context because they post many projects that are well-made and popular and they have many friends. Other Club members like Rick make excellent, admired projects both on and off the web site that receive attention, but are not interested in friend requests. Other very productive members who influenced the Club (such as John) do not post many projects, participate in galleries, or have many friends listed. Locally influential members, such as Stacey, may have great projects and a good number of friends online, but still not be as influential online as they are offline.

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<sup>5</sup> At the time I wrote this section, I had not yet analyzed any Scratch web site data.

Of course, a single data point or a small number of data points may not describe overall data trends. Still, my concerns go beyond that. First, the social network analysis does not provide the richness that working with thirty-five children for a school year can. That's simply not what it is meant to do. More importantly, I believe that the web site data describes a fundamentally different set of phenomena. It does not describe what is happening in the physical space of the Scratch Club; it describes a second virtual reality that reflects the original, but, for a physical Club like the Danesfield Scratch Club, it is a copy with missing information.

## **Scratch Community Web Site**

The Scratch website is a very different web community than the Village. The Village is a profoundly social site, by design and –as my research shows– by use too. Like other online communities that support socially-focused projects, such as blogging, the Village has more girls and older children. In addition, on the Village, all forms of participation that I analyzed were correlated with one another.

The Scratch web site is focused on one goal: supporting creative expression through the use of a single technology. There is no large existing community like the Intel Computer Clubhouse Network (though there were existing pockets of serious Scratch users before the site went live).

An important design goal was to enable children to sign up safely without express parent approval. This allowed children to use the site at school or in other learning contexts and to sign up on their own. Because the designers had privacy and safety concerns, including complying with the Children's Online Privacy Protection Act (COPPA), the site has been more focused on project-sharing and social activities that explicitly support learning and sharing Scratch projects than on socializing and describing personal details. The site had no email or live chat and profile pages were limited to displaying friends, city and country with no personalization. As a result, I expected to see differences on the site than the Village. Still, there were many surprises along the way.

## **The Beginning: What We Thought Would Happen Versus What Happened**

### *MASSIVE INTEREST FROM THE START*

After a tremendous amount of work, Scratch alpha went live on March 5, 2007. A surprising number of users found it despite the fact that the site was not advertised or linked from on other web sites. For a while, we couldn't figure out how they found us. Some users reported they saw the url in a graphic on the official Scratch site. Later in the month, the alpha site was moved to the official Scratch location (<http://scratch.mit.edu>), but was still not officially released.

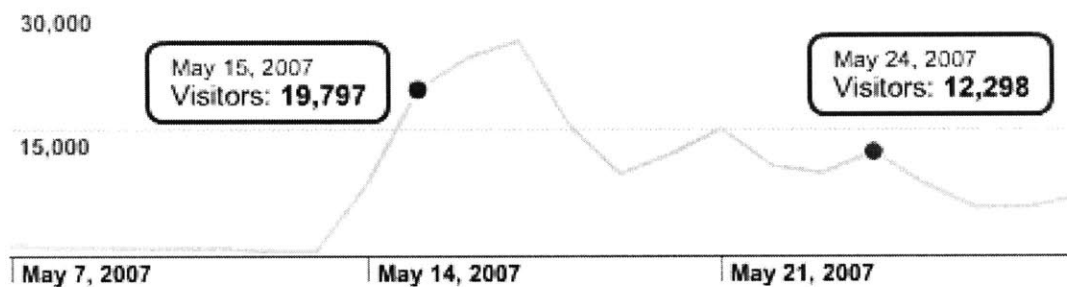
Within less than a week, the site had over 250 registered users and about as many projects. This included around a dozen Scratch developers and 25 students in a workshop that we were running locally. We were all surprised and overwhelmed by the quick response. I took the initial interest to mean that there were some groups of people, of known size, who really wanted something like Scratch. Was it the possibility of programming? Creating online games? Was it because it was a freely available Media Lab project? I wasn't sure what caused this level of interest, but it certainly was exciting. We were particularly excited to immediately see projects that were derived from other projects. I had been more than a little concerned that I would not see this type of activity before I graduated, but this was a promising sign.

In the first weeks, a common sight in our lab was Scratch developers gathered around a computer pointing out projects, amazed by what we saw. "Two pong games! And look at the background on this one!" "Look how this guy created perspective by scrolling an image." When Jay made a logic diagram program, we discussed starting a "Geek Projects" section, but soon discovered a middle school in Washington state had already created a "Proud to be a Geek" Gallery.

Scratch caught on much more quickly than we expected. While developing the site, we invited a few close collaborators and known Scratch enthusiasts to join. Still, as soon as the site went

live, people we had no connection with found it. We couldn't figure out how they discovered the site until we realized that a screenshot of the site hidden deep in our research development web site displayed the url in small print. People really had to search to start with Scratch and we were excited early on that some people put so much effort into finding us right in the beginning. By the time the site was up for a week, we had around 500 unique visitors and shortly before we publicly released it about 2 months later, we had 1000.

On May 15 2007, the site was officially released (Figure 50). That day news articles appeared on the BBC and the Boston Globe and high profile posts were made both to slashdot and digg (not by the Scratch development team). Not surprisingly, we were immediately hit with a large number of visitors. Then on May 24<sup>th</sup> an article appeared in the New York Times.



**Figure 50: Scratch web traffic before and after launch**

In addition, many people wrote excited posts to their blogs such as these:

Recently, the Lifelong Kindergarten Group at the MIT Media Lab released (or at least publicized) Scratch; After playing around with it for a little while this morning, it's obvious to see Scratch's roots in Logo. However, the creators of Scratch have also built an underlying social network for all Scratch programmers / programs / users. This is the hidden power –within five minutes of exploring I started to find all kinds of interesting programs that I could look at that helped me learn how Scratch worked. In addition, all the normal social network things applied (e.g. in “My Stuff” I have friends, requests, galleries, projects, and favorites.)

Learning how to program is hard. I learned on an Apple II in Basic and 6502 machine language. That impacted how my brain is wired since I was 13 at the time. Today, when I look at something like Scratch, I can see how the next generation of computer scientists (who are < 10 right now) are going to think about software completely differently than me. That's good. (Feld, 2007)

and

The beauty of Scratch is that it is like building with LEGO bricks, each block is a

behaviour or function - you just snap them together on screen, visually! rather than with complex strings of words and references - to create more complex behaviours and strings of functionality and moreover, you concentrate on WHAT you want the program to do rather than HOW to accomplish it. The how almost becomes an intuitive consequence of deciding what you want to do in the first place and kids all over the world are already embracing it, creating animations, games, movies all sorts of things from this great box of tools. A timely reminder of the fact that we should not get bogged down by our tools, but our tools should indeed be an intuitive interface to enact upon an idea. (Weckstrom, 2007)

Within two weeks of the official release we had over 7000 projects and 12000 members.

#### *EARLY SURPRISES*

During development the group had particular expectations about how the site would be used. We thought it would take a while to catch on. We thought Scratchers would play with each other's games, but download each other's code infrequently and upload projects inspired by these projects even less frequently. We didn't think that kids would talk much with each other about other people's projects. And we underestimated the need for monitoring and setting the tone of the community.

### *Downloading other people's work*

We also were skeptical (to varying degrees) about how much Scratch members would download each other's code. We did think that they would look at the site and copy each other's ideas. In actuality, people began downloading each other's code immediately. Within the first month, projects were downloaded over 1300 times. A few more active users created galleries of starter projects, projects for debugging, and files that included sprites, music, and code that other people could download.

Within a month, controversies developed about people "stealing" each other's code. Here is one comment that one member left on another's project:

This is an imposter! It is my game, [game name], with a fish theme!!! Please be aware that the original version of this game is [game name] by [original creator's username]. [inspired person's username] just opened my version in Scratch and changed the design to a FISH THEME.

A response from the "imposter"

sorry, I was going to say you made the original.=) By the way it was NOT a fish theme

just because the paddle was a fish. plus i fixed some bugs

Reviewing the code, the “imposter” did, in fact, fix some bugs. The original creator, clearly irritated, follows up:

In my project notes, I have added this: - - A SCRATCH user called [username] has taken this game, changed the theme and called it [new project name], and said that SHE created it, please note that IT WAS MY CREATION, AND I CREATED IT FROM SCRATCH!!  
[name] - Creator of [original project name]

The “imposter” understands why the site was designed the way it was:

this website is made for that to be possible. I also fixed the fact that the ball got stuck on the paddle. anyway, people copy my projects and change them a bit, but I don't call them imposters.

The originator is somewhat placated:

I don't mind if you copy, just give me credit for it.

And also, you didn't fix the ball and paddle problem

An observer then remarks:

Lol

This exchange was by no means a one-time event. It happened over and over again. We received this email from another Scratcher:

can there be a way to prevent copying of projects because [username] took my project edited it a bit and is taking all the credit and other scratch members have noted on [username] taking my work

Ultimately this topic was discussed in the forums (as the Scratch development team began an internal discussion about how to deal with the issue technologically). People engaged in heated discussions about who used whose materials and whether the way they used them was fair or whether it was copying.

#### ***Commenting as Multiple forms of communication***

Within the first month there were over 1100 comments that fell into five categories:

- Socializing
- Supportive
- Insulting
- Critiquing
- Requesting assistance, collaboration, or information.

Children commented more than we expected and in a range of ways. They used comments the ways adults might use to know one another and forums to request assistance or information.

Children were particularly interested in **socializing**. Because of the design constraints, email and chat weren't an option, so they turned to public commenting instead. They might say hello in a comment and ask the creator who they are. For instance, Liyan and Stacey used comments to continue their dialogue with MyBlueSky.

Adults and children both complimented each other. **Supportive comments** were generally short and sweet: like "nice work!" or constructive criticism such as "keep trying." But they also could be more substantive such as "Awesome! You are a great programmer. This is definitely one of my favorites" and "This has lots of possibilities! ... I downloaded your project and am anxious to look at the scripts. Thanks!" Sometimes people became creative with their

supportive comments such as the user who created a Scratch project award for a project he or she really liked.

**Insults** tended to be from children or young adults and also tended to be pretty simple and blunt. The most common one was “this sucks” but occasionally they could be more detailed such as “what a rip off do u have a life NOOB?” From the beginning of the site, we deleted comments that were simply insulting without critiquing and project creators were allowed to delete any comments they wished.

The most exciting comments were in the final two categories: **critiquing** and **requesting assistance, collaboration, or explanation**. Critique often came from more active users, both children and adults, and discussed what worked well and what didn’t, or suggested how to improve the project. It was common for a dialogue to result, such as this one:

**One user:** Talk to a grunt! You: “So, how are you today?” Grunt: “ Run away, RUN AWAY!”

**Second user:** I like it! and Llamalover has a great idea with using some other Halo characters.

Other times, users would request assistance or explanation such as “how did you get the movie or was it stop animation with a digital camera” or this set of comments from a gallery:

**First user:** can someone post a thing about vereibles

**Second user:** I can do some sort of scratch programming tutorial on request :)

**Third user:** It sounds like [First User] is interested in a tutorial on variables. That would be great if you could create one!

**Second user:** I am preparing a tutorial about variables which will explain what variables are how to use them and what they do. It will also show people how to use variables to make: a score, a timer, and a scrolling background all while demonstrating what is explained with an interactive demo. Ill be busy on the weekend so you may have to wait until Monday for this one.

**First user:** THANKS [Second User] !!!!!!!!!!!!!!!!!!!!!

Requesting interactions could be about collaboration, such as something simple like, “sweet, will ya put youre stuff in my gallery?” or “Umm... I'm sorta new to the whole scratch business but I think that I might be able to fix some of the bugs for you. And is it all right if I make an updated version? I won't change it all the way but I will try to fix the bugs. If you don't mind that is...”

### *Controversial and Mean content*

Controversial and mean content was a problem from the beginning. Insults are one form of this type of content, as is content that is inappropriate. This was a hard problem to deal with for two reasons. First, the volume of members and projects made it difficult for the developers to police the site. And even if we did catch a lot of problematic content, we couldn't always prevent people from seeing it before we could delete it.

Second, controversy is in the eye of the beholder. We have had many discussions about what to remove and, even within our research group, consensus was difficult. We iterated through multiple design solutions. In the first few days, a research group member who was on duty at the time checked every project. During this time, we developed policies for what could be posted and what couldn't. Eventually we developed criteria for inappropriate content:

- Personally insulted an individual
- Was sexually explicit
- Was excessively violent
- Used swear words
- Or was hate speech

These categories became more specific as time went on. We allowed shooting games as long as they were not gory. We allowed insulting of public figures as social or political commentary. But these distinctions were difficult to make and some users thought they were arbitrary.

Next we developed a flagging system that allowed users to indicate which projects they thought were inappropriate. This strategy helped us to identify projects more quickly, but didn't prevent people from seeing the content. This strategy also required us to review each flag individually. Because there was no reason not to flag projects, some users flagged indiscriminately, some had very strict ideas about content, and sometimes people clicked just to try out the new feature.

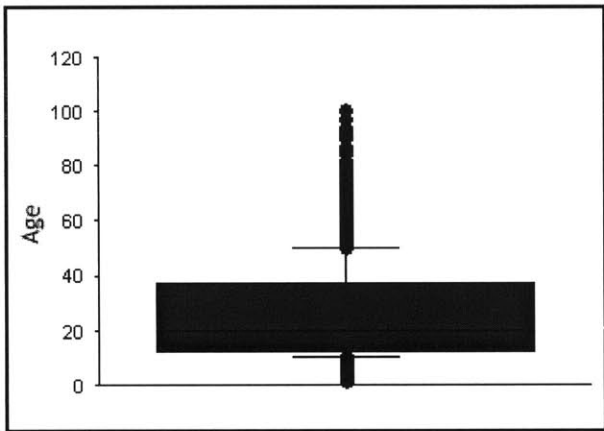
Currently the development group is designing a "karma" system, with which people can earn community credit for participation. If members flag projects unsuitably, they will lose karma points and if they flag well, they will gain them.

### ***The Site Continues***

These patterns and concerns continued as the site developed. They became points of discussion for both the community and the developers. I address ways of managing these issues in the discussion section.

## Members of the Online Community

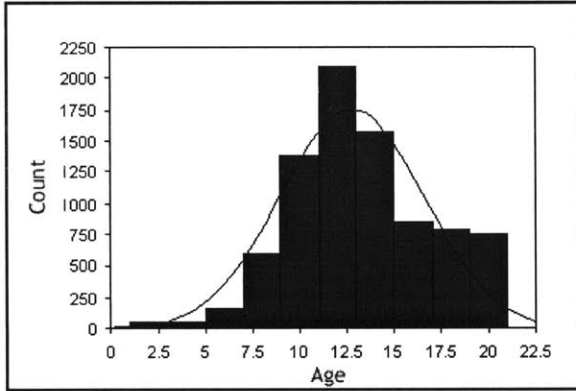
As of 15 June 2007 after the site had been live for about 4 months and public for two, Scratch had 16,478 users who had created 10,705 projects. The mean reported age of members 25.61 was and the median was 20 with a standard deviation of 16.29 (Figure 51).<sup>6</sup> Fifty-two percent report they were 21 or younger. For these members, the mean age was 12.76 with a standard deviation of 3.78 and the median age was 12 (Figure 52).



**Figure 51: Box plot of age of All Scratch members**

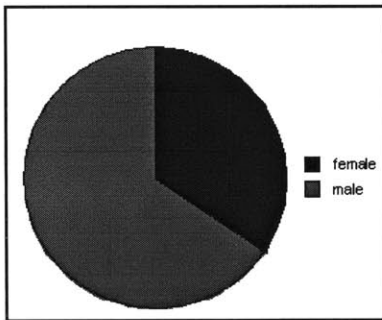
---

<sup>6</sup> All of the data in this section are what members report when they first create their accounts and may not be entirely accurate.



**Figure 52: Bar chart of Youth Age Range**

Twenty-nine percent of users described themselves as female (Figure 53).



**Figure 53: Pie chart of gender of Scratch site users**

Forty-six percent of users describe themselves as being from the United States, five percent are from India, and two percent each are from Australia, Canada, Costa Rica, Israel, Mexico, and Vietnam. Many other countries are represented in small numbers as well.

## Participation on the Scratch Site

### *WHO PARTICIPATES AND HOW*

I expected that participation on the Scratch site would be similar to that of the Village and other community sites, with a few notable exceptions. Because of the type of activity, I thought boys would use the site more. In fact, participation on the Scratch site was not what I expected.

### *Gender and Participation*

First I looked at gender differences. I had hypothesized that males would post significantly more projects than females. This hypothesis was not supported. An unpaired t-test was used to compare gender to the number of projects. There was no significant difference between how much males and females posted projects,  $t(22,629) = -1.681, p > .05$ .<sup>7</sup>

One might expect that females might use the more social aspects of the site more than males. I followed up on the previous findings by comparing gender to all possible social behaviors: commenting, tagging, loving other people's projects, making friends, or putting projects in galleries (Table 14). It is promising that females on the site participate as much as males, as the goal of Scratch is to open the world of programming up to all people. No significant

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<sup>7</sup> It is worth noting that p here is .09.

relationships exist. It is promising that females on the site participate as much as males, as the goal of Scratch is to open the world of programming up to all people.

**Table 14: Unpaired T-test results for Gender and Number of Comments, Tags, Love-its, Friends, and Galleries, respectively**

Behavior	DF	T-VALUE
Commenting	22,629	.056*
Tagging	22,629	-.729*
Loving Others' Projects	22,629	-.982*
Friending	22,629	.620*
Galleries	22,629	-1.006*

\* p > .1

***Patterns of Participation***

The Scratch site is designed to focus on sharing information about Scratch. Because the social activity is more closely tied to Scratching and based on the Village findings, I expected that multiple forms of participation, be they more social or more project-focused, would be significantly and positively related. Specifically, I hypothesized that project posting would be significantly and positively related to commenting, tagging, love-its, friending, and posting in

galleries, respectively. In fact, these relationships were highly correlated (Table 15). People who posted many projects engaged in the social activities at higher rates. This is consistent with the Villager participation findings. Since we want people to participate in a variety of different ways, this is a promising finding for the Scratch site development team.

**Table 15: Pearson correlations results for Projects Posted and Comments, Tags, Love-its, Friends, and Galleries, respectively**

Behavior	Correlation
Commenting	.340*
Tagging	.174*
Loving Others' Projects	.323*
Friending	.214*
Galleries	.131*

\* p < .0001

### Diffusion of Ideas

#### SCRATCH PROJECT DOWNLOADS

When someone downloads another person's work, they are likely doing so because they are

interested in how the project is built. I argue that this downloading behavior is evidence that the downloader is in the trial stage of adoption of the creators of ideas. If they wanted to play the project (which would be an example of the interest or evaluation stage), they could do so in the browser.<sup>8</sup>

I hypothesized that the projects that Scratch administrators featured would be downloaded more than those that were not featured. This hypothesis was supported (Table 16). I also hypothesized that more popular projects (ones with higher rate of “love-its” and favorites) would be downloaded more than those that were less popular. This hypothesis was supported (Table 16).

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<sup>8</sup> People might download projects for three additional reasons: 1.) by accident 2.) to experiment with the download feature in the web site interface, and 3.) to download a program that isn't running well in the browser. I imagine few users will accidentally download or experiment with the feature repeatedly. In the first two weeks the site was live, not all Scratch features were completely implemented in the Scratch Java player. Developers estimate that at that time about 10% of projects wouldn't play properly. This was a limited and short-term problem, but one worth mentioning.

**Table 16: Pearson correlations results for Downloaded and Featured Projects, Loved Projects, and Favorited Projects, respectively**

Behavior	Correlation
Featured projects	.305*
Loved projects	.482*
Favorited projects	.290*

### **Predicting Influence on the Scratch site**

I address two different kinds of influence: *project influence* and *social influence*. *Project influence* is influence that relates to how much an individual's work is recognized by and impacts a community. *Social influence* is influence related to how much a person's is recognized and impactful.

For project influence, I investigate how much a person's projects are downloaded. When people download other people's projects, they are in the "Trial" stage of adoption of ideas. This is an important stage because it is a necessary step in order to learn from another person. Presumably if your work is downloaded, then you are influential as a creator. Someone like Rick had this kind of influence.

Then I describe a second kind of influence, social influence, which I operationalize as betweenness centrality. Betweenness centrality is a measure of how much a person is a social bridge between otherwise unconnected groups. This is a measure of influence that considers the social structure of a community. It is the type of influence that Stacey has.

*PROJECT INFLUENCE*

Project download counts were regressed on gender, number of friends, number of comments, number of times a user’s project was featured, days since first project, days since last project, number of projects, date the user joined, and date of last login. These eight predictors accounted for a little more than half of the variance in the betweenness values ( $R^2 = .53$ ), which was highly significant,  $F(2781) = 392.73, p < .0001$ . All measures demonstrated significant effects on project download counts (Table 17).

**Table 17: Multiple Linear Regression on what predicts that users' projects will be downloaded**

Variable	Coefficient	T-value
Number of Friends	.07	4.28**
Number of comments written	.20	7.90**
Number of times project was featured	97.08	38.30**

Days since first project	.18	2.67*
Days since last project	-.22	-5.03**
Number of projects	.73	9.93**
Days since user joined	-.44	-4.38**
Days since last login	.45	4.78**

\*  $p < .008$ , \*\*  $p < .0001$

### *SOCIAL INFLUENCE*

For the social influence investigation, I studied users' betweenness values in the friendship network. This investigation includes all mutual relationships. In other words, as long as a friend request was accepted, it was included, regardless of which member made the request.

Betweenness centrality values for the friendship network were regressed on number of comments made, number of galleries the user participated in, number of "love-its" received, and number of tags added to people's projects. These four predictors accounted for over one-third of the variance in the betweenness values ( $R^2 = .37$ ), which was highly significant,  $F(5050) = 755.01$ ,  $p < .0001$ . All measures demonstrated significant effects on the betweenness centrality of the love-it network (Table 18). It is surprising that tagging had a negative effect on social influence.

**Table 18: Multiple linear regression for predictors of influence in friendship network as measured by betweenness centrality**

Variable	Coefficient	T-value
Galleries	1.51E-4	26.65**
Comments	1.61E-5	29.42**
Tags	-1.64E-6	-3.06*
Having projects “loved” by others	9.01E-6	9.51**

\* p < .005, \*\* p < .0001

I discuss the implications for these findings in the following section.

# THESIS CONTRIBUTIONS

My research contributions take on several forms. In this section, I outline the general types of contributions I have made in the forms of scientific findings, design implications, and sharing information with users. Then in the following two sections –*Big Ideas* and *Implications for the Design of OCOCs*– I describe the specific contributions in greater detail.

## Scientific Contributions

I extend the fields I focus on: the learning sciences and social network analysis, both in isolation and through combining features of both. My thesis makes several real scientific contributions:

- I introduce the concept of OCOC and describe why it is important to the learning sciences.
- I describe how the diffusion of innovations can be adapted to the understanding of how learning occurs socially and describe this process in terms of legitimate peripheral participation.
- I map each of Rogers' Stages of Adoption to specific behaviors in OCOCs and explain why this mapping is beneficial for both the fields of social network analysis and the learning sciences.

- I define how each stage of innovation can be mapped to particular, measurable behaviors in OCOCs. This mapping is valuable to both the learning sciences and social network analysis. Developing ways to test diffusion of innovation has been difficult in the past and worthy of additional research.
- I define two kinds of important influence, based on different forms of participation in OCOCs. Then I describe what predicts each form. This conception and analysis is valuable to the fields of social network analysis and the learning sciences and is also relevant to management fields.

### **Implications for Designers**

I feed these findings into the design of the communities I work with and OCOC overall. As I mentioned before I am a member of the both the Village and Scratch website design teams. I share my findings with other team members. We discuss what my findings mean for the site, what concerns arise and how we can address them through changes to the technology or through how we participate and encourage others to participate.

I share my findings with users both explicitly –by sharing my research findings– and implicitly –by designing technologies that reveal the concepts I am working with in ways I feel are most helpful for the community. It is important to note that I don't reveal my hypotheses as I am

working with people and share only some findings afterwards. I focus more upon this second way of sharing: engaging users in the ideas I am working in ways that are inspired by the research, but framed in ways most relevant for them.

In a following section, *Implications for Design of OCOCs*, I describe some particular design strategies for OCOCs overall. In addition, in *Ethical Considerations* I address some critical issues regarding how to use these findings for OCOCs in appropriate manner.

## Big Ideas

### Online Communities of Creators (OCOCs)

In this thesis, I described a type of community that I call an **Online Community of Creators** or **OCOC** (page 29). In these communities the core activity is sharing personal creations. This sharing is supported by additional functionality that allows members to discuss each other's work and associate particular contributions with particular creations. I believe these communities provide rich experiences that can support members' creative development and provide encouraging social environments where people can learn to work well with others. Both of these are key skills needed for success in the modern workplace (page 24).

## Forms of Participation

When I first starting thinking about how people might participate in OCOCs, I wondered what participation would look like. Perhaps people who posted projects would also participate in other ways, suggesting that all forms of constructive participation should be encouraged. Or perhaps certain people would come to socialize but not post projects while others would remain in the audience rather than actively participate on the site.

What I found was that the more project-focused and socially-focused forms of participation in both OCOCs were positively related. All participation counts in both of these communities. This finding is reassuring because it affirms the intentions and design approach of the Village and Scratch designers. The social forms of participation may sometimes distract, but overall they are related to participation of other kinds.

## Diffusion of Innovations for Learners

I described how ideas may be shared in OCOCs by describing *Diffusion of Innovation* research and relating it to the types of sharing that occurs in the communities I care about. Ideas diffuse over time through a social network via communication channels between individuals (page 38, Table 1). Each individual who adopts an idea goes through a personal process as well. This personal process includes five stages: awareness, interest, evaluation, trial, and adoption. I

propose that these stages are revealed by specific behaviors involving sharing in OCOC (Table 2). Within OCOCs each of these stages can be seen as a deepening understanding of other community members' work.

For OCOCs, I made an important distinction in the type of adoption. Ideas can either be copied or assimilated. If a community member simply copies another member, this does not indicate that the person has necessarily learned from one another. But if someone fully adapts and assimilates another person's ideas into his or her own work, then that person has learned from another. Because the assimilation of knowledge is not a simple binary process, learners may not take a linear path through the stages; rather they may jump around as they experiment and encourage ideas into their own understanding.

On the Scratch site when someone downloads another person's work, they are likely doing so because they are interested in how the project is built. I argued that this behavior represented the "Trial" stage of adoption whereas uploading project based on other people's represented the "Adoption stage." I found that projects that were most likely to be downloaded were ones that were featured by administrators. In addition, downloaded projects were also likely to be "loved" and "favorited" by others.

## Two types of influence

I define two types of influence critical for these communities. The first is **Project Influence**, in which members are influential because of the work they create. This kind of influence is the type that Danesfield Scratch Club members like Rick, Mark and Matt have (see pages 163 and 209). Their projects are admired not only for their content, but also for their programming complexity, and thus are downloaded. The second kind of influence is **Social Influence**, which is based on personal connections among members. I looked at is how much a person is a social bridge between otherwise unconnected groups. Someone like Danesfield Scratch member, Stacey, (page 181) had this kind influence because she was well-connected with many other members including those outside of her clique.

On the Scratch site **project influence** was operationalized by how many times a user's projects were downloaded. It was predicted by eight factors ( Table 17). By far the biggest predictor of having one's project downloaded was whether it was featured by the site administrators. This is a critical finding because it suggests that the administrators should be conscious about what projects they feature. Still it is encouraging that other forms of participation such as number of projects and comments added to the site are also important, as are having friends. All types of participation make a difference to how much a user's projects get downloaded. Not surprisingly, getting in to the site early is also a factor,

as can be seen by the impact of the days since first project, last project, user joined and last login.

Two other factors had a sizable effect on project influence: participating in galleries and writing comments. This finding is encouraging for Scratch site administrators because these two forms of participation are both social and project-related and depend on the members' behavior. Galleries are not commonly used. 11% of users who have participated in any way and 20% of users who have posted projects post projects in galleries. Still, many galleries, particularly the more popular ones, are set up for people to build off each other's projects or for people to pursue common interests (e.g., Naruto, Tetris games.)

Writing comments is a common way that members, particularly young members, connect with and get to know each other, so it is not surprising that that behavior is predictive. One might imagine that this is the case because people will reach out to those whose projects are commented or that people are more appealing if they make projects that are likely to be commented.

The next largest effect is from having projects "loved" by others. This is not surprising. Still we'd like influentials to be doing the loving because we believe it could strengthen the

community.

The factor that had the smallest effect is tagging. What is particularly interesting about this finding is that tagging has a negative effect on betweenness centrality in the friendship network. In other words, tagging predicts not being influential. This finding is surprising. Perhaps it is because Scratch administrators and other active adults tag projects but these members are not popular as young people. Still this is a wake-up call for the Scratch site developers who want young people to tag and the finding warrants further investigation. Who is tagging and who isn't? Are older people and administrators tagging more than kids? Do certain tags predict influence (e.g., "games") while others don't (e.g., "cool.")

On the Scratch site **social influence** was operationalized as the betweenness centrality of members' friend links. People who acted as bridges between friends would rate higher on social influence than those who rarely acted as bridges.

Social influence was predicted by four factors (page 244). The first two factors –participating in galleries and writing comment– had sizable impacts (Table 18). Both of these factors were also important for project influence as well. They tend to act as mechanisms for socializing and discussing work. Sometimes users create galleries without putting projects in them; instead they use them as a discussion mechanism.

As I describe earlier, comments are used for a variety of purposes including socializing, supporting, insulting, critiquing, and requesting assistance, collaboration, or information. All of these are mechanisms for building relationships so it is not a surprise that they predict social influence.

The third most impactful factor on social influence was having projects “loved” by others. What is particularly interesting about this feature is it is something that neither the individual member nor the administration controls. It is truly an artifact of the social network itself.

Finally tagging had a negative impact on social influence. The most socially influential people don’t tag as much as less socially influential people. This is an unexpected finding. If anything I would have guessed that tagging would have no effect because users cannot see who tagged what. I plan to investigate this finding further because Scratch developers believe tagging to be an important feature. Perhaps it is fine that it does not predict social influence, but, either way, a better understanding of what is happening here would be beneficial.

## **Implications for the Design of OCOCs**

My research findings have implications for those who design OCOCs. First, multiple forms of

participation are related to one another. As designers we want to support forms of participation that support the learning and sharing goals of the site and to encourage people to support one another in ways relevant to these goals, it is appropriate to give people flexibility about what is acceptable for them to do.

Administrative activity greatly impacts who is influential. Thus, administrators should be conscious of what they highlight and whether they are highly equitable. We should pay close attention to factors such as age, gender, location, race, and cultural backgrounds. In addition we should keep track of types of projects we highlight (e.g., music, games, images), the content they cover (popular culture spoofs such as Harry Potter, science, fiction), and types of contribution (thoughtful commenting, presenting new ideas in forum postings, quality of projects).

### **Technologies that support users exploring their social networks**

The **Village Profile Survey** is a technology I built that is designed to diffuse through the community (page 120). A concern for the designers of the Village is that members use it to connect in ways that both facilitate community understanding and the sharing of project-related ideas. Adolescents today expect online communities to make it easy for them to create an online presence and to support them in connecting with others easily and at any time. I

thought that since the members were interested in these activities, I could design the survey in a way that appeals to both the style of the times and the values of the community.

The Village Profile Survey is composed 19 questions on who you are, what you like, what you do at the Clubhouse, and what technologies you use. Villagers find the survey on other people's profile pages. When Villagers complete the survey it appears on their profile pages, along with a link to the profile page where they found the survey (Figure 35).

When Villagers answered the Profile Survey, the largest cluster of answers regarded the technologies people used with a variety of other words such as 'fun', 'people', 'game', and 'projects.' This is encouraging for me since I want the survey to encourage people to relate to one another as creators and potential resources. Location-related words were also common, suggesting that people liked to discuss where they were from and where they would like to visit. Again, I find this encouraging because it suggests that people may be finding commonalities across the globe.

As a social network researcher, I know how important making connections and sharing work can be and I wanted to share this understanding with Villagers. Still, I didn't want to teach them general principles and research findings about the Diffusion of Ideas. I wanted them to see

genuine similarities they have with other Villagers and encourage them to connect with these other Villagers. I imagine that an adolescent who is genuinely interested in his Clubhouse work and wants to connect with others, would like to meet people with similar interests (soccer, hip-hop, art class) and who works on similar projects at the Clubhouse (using Photoshop, making portraits of friends.)

The **Village Community Visualizer** is a social network visualization tool that I developed for Computer Clubhouse Villagers (page 127). It demonstrates how to address the needs of an OCOC in a social network visualization by emphasizing the following:

- Recognizing individual's contributions, such as creating projects and sharing ideas
- Finding peers to collaborate with by learning about what they do and what interests them
- Developing a personal understanding of who individuals influence and who they are influenced by
- Identifying potential learning resources

The Village Community Visualizer uses a variety of existing data including the Village Profile Survey data to create for each Villager their own egocentric network diagram (Figure 37). The

visualization connects them with people they may or may not already know personally and provides a variety of mechanisms to get to know other people and their work.

## **Managing Issues That Arise in OCOCs**

### *GO WHERE THE PROJECT TAKES YOU, (BUT STICK WITH YOUR CORE PHILOSOPHY)*

Though I have a design philosophy and a design goal, my development can take a while as I experiment with and revisit different ideas. For me, it is important to experiment and try out different ideas while keeping the core goal in the back of my mind. This approach may “waste” some time but it also can improve the end result. For example, when I started the Village Community Visualizer, I knew I wanted to present users with a visualization of some combination of social and project features. I experimented with being explicit about why certain people were suggested as connections, but this didn’t seem to help the basic interaction. I still think it might be a good idea to include a feature like this one, but it just didn’t work in this case. Perhaps in the next tool I design it will work.

### *SETTING A TONE AND EXPECTATIONS*

Every successful OCOC will surprise its designers with the ways in which members use the site in unexpected ways. (For instance, young people on the sites I have studied appear to use any

social mechanisms available to them to socialize. As I mentioned earlier, I believe the socialization seems to contribute to the cohesion of the team, in keeping with the spirit of the effort.) For designers, watching what users do with their site can be extremely exciting.

Inevitably some uses people come up with will disappoint or disturb the creators. This includes posting controversial work or mean comments. Then the web site designers and administrators have to decide what they want to do about it. As I described earlier, controversial or hurtful participation is in the eyes of the beholder and it is often difficult for administrators to know what kind of role to take and what to do about boundary examples.

Administrators have two obvious solutions: police or prevent. Policing all content is extremely difficult, if not impossible, in an active OCOC with more than, say, 100 users. Preventing people from posting bad content is also difficult and also runs against the values of OCOCs such as sharing, collaborating and supporting. Still they are both partial solutions that can help.

But administrators do have an additional option available to them. They can try to encourage certain kinds of behavior and engage their community as much as possible in these kinds of behaviors. One basic way to do this is to allow users to flag or delete inappropriate content. Perhaps a better way is to try to establish the tone of the community and what is acceptable

by creating a dialog about what the community values and what it doesn't. This doesn't mean the administrators know what is right and the community must respond. Rather it means that there should be a dialogue throughout the community and the tone will evolve over time.

Administrators can

- Participate in ways they hope others will pick up on and continue
- Start discussions in forums or chats about what the community values and how to support those values
- Highlight content that reflects those values
- Have levels of membership that identify which users are more involved

I believe that having expectations for young people's behavior who participate in OCOCs can be empowering for them. They can see that their behavior makes a difference to the community as a whole and that they may be role models for younger participants. This does not have to be done in a heavy-handed way, but can be done while still supporting the development of young people's voices.

*DON'T JUST LISTEN TO THE COMMUNITY, INTERACT WITH THEM*

The Scratch team knew our audience consisted of members of the Computer Clubhouse. We all

have worked in the Clubhouse context in various ways. In addition, the team involved Clubhouse members in early development and, as the software progressed, involved others in the process.

Once we had a design goal, our first step was to make some prototype. It was inevitably imperfect and incomplete. Then the whole team worked as participants/observers with a group of users to identifying what worked and what didn't. Since the tools were unfinished, the personal support was critical for the users, but it was also an important way to get feedback. Then we kept tinkering.

In the early development of Scratch, the team worked with members at a local Clubhouse for 9 months. Everyone went: the designers, the programmers, graduate students. Everyone led activities and helped with each other's projects. The team knew that we were always going to please some and not others. If an idea wasn't working, but they weren't sure how to fix it, they'd wait a week and see what we learned at the next weekly workshop.

From there an undergraduate class at MIT used the Scratch software and the team once again watched. They were quite different from the Clubhouse kids, older, confident and students and learners and (because of the class topic) interested in learning and technology. From this

experience, the team learned that having sprites talk directly to other sprites was confusing for the students. If this were so hard for the undergraduates, the team thought it wouldn't work in the Clubhouse.

This pattern continued as the team iterated the design and worked with different groups of people including two Clubhouses in California, museum staff in Minnesota and kids in their programs, and several different groups in teachers, both local and international. Since the workshops with teachers were local, the whole Scratch team came to that and learned about what teachers need: support materials, being able to justify using the software to administrators, and showing all the projects linked together in a presentation. Currently we are running Scratch activities through variety of local schools. By doing so we learn how kids use a more fleshed-out version of the software and which issues are raised with schools are interacting with the broader online community. We are also getting feedback from the web site by seeing what people do and what they tell us.

But, always, we are selective about how we use the feedback. Sometimes what people say they want doesn't improve the software and the goals we have for it. People may recommend ideas that we don't think we can do well yet or that we have tried to do, but don't seem to work. We will revisit ideas that didn't work previously if we think we have a new solution, but always

we remember our core goals for the technologies and the Big Ideas we hope children will explore with it.

#### *DEVELOPERS SHARING ROLES*

In projects that I have been involved with, people share roles and it is ok if someone who is not the designer says, “what about this layout?” This may seem unprofessional. People are supposed to have their roles on the team. But good ideas come from different places. We want to support a range of learning styles and, thus, have a diverse team who discuss details. (In fact, the types of learning environments I am advocating in this thesis are ones we practice day-to-day.) And everyone involved makes projects with the software. This can be incredibly important, for instance, when one designer/programmer made a music video early on, the team realized we needed better music support and timing. Since then, kids using the software have used these features a great deal.

#### *CONTROVERSY OVER STEALING VERSUS SHARING IDEAS*

As I described in the Scratch chapter of this thesis, one issue that can be a concern for OCOs is copying other people’s ideas. The Scratch site has been designed to make it easy for people to study and make changes to other people’s scripts and upload projects based on other people’s work. These features are critical to how the Scratch web site supports people learning

from one another.

Still, these features are not without controversy. When is imitation the highest form of flattery and when is it stealing? Is it ok if members credit other people's scripts that they use? What should be done about users who simply re-upload other people's work with limited or no changes?

Though this issue cannot be resolved completely, most people in the Scratch community believe that if one gives credit to the originator of an idea and explains what he or she did in addition, then modifications are flattery, not stealing. Many Scratch site members do this. Web site administrators can foster productive dialogues about these issues and support the community in developing practices that most members can support. In addition to establishing opt-in behavioral conventions, web site administrators can also use technological solutions by comparing files and noting how similar they are to other files.

#### *CLOSED VERSUS OPEN COMMUNITIES: BALANCING RELEVANCY WITH FLEXIBILITY*

One major difference between the Village and Scratch communities is that the Village is closed to everyone but Computer Clubhouse members and Scratch is open to everyone. This difference impacts virtually every design decision.

On the Village, each person is well known to someone else. Because a staff person creates every account, members' in-person identities are inescapable. Thus, it is difficult for them to drastically alter their online identity, steal other people's work, or act like trolls without being identified. On the Village at least one coordinator knows every single member face-to-face. If problems arise, the coordinator understands the child's background, culture, personality and life and can talk to the member personally.

Every member's parent signed a consent form when the member joined the Clubhouse, which allows the Village design freedom other sites don't have. The Clubhouse is extremely careful about the privacy of its members online and off, but within the closed Village community, the Village designers are not faced with the challenges that other sites for children are. As long as their coordinators allow them, members can share personally identifying information such as their full name and their location. They can post photographs of themselves, send email, and participate in discussions because every member is known and the community can be monitored.

Open web sites, particularly for children, are faced with very different design options. To comply with the Children's Online Privacy Protection Act (COPPA), they must either limit what

children can post or get verifiable approval from every parent. Sites, like Scratch, that are designed for children to use at school or through other organizations want to remain as open as possible and do not require parental permission. As a result, they cannot allow users to identify themselves personally, contact each other privately, or collect email addresses for those under 13. Ironically this makes monitoring the site much more difficult. Members create alternative identities or dummy accounts and use these accounts to participate in unpleasant or inappropriate ways such as leaving mean or even violent comments and posting graphic projects.<sup>9</sup>

Administrators have limited information about who the users are. When users do not have a valid email address or when they are under 13, administrators cannot contact them except by leaving private, generic messages for them on the web site. Even if they can contact members, they do not know them well and may find it difficult to know how to approach the member. For instance, many children play violent video games and see nothing wrong with posting graphic

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<sup>9</sup> I believe that COPPA needs to be redesigned because complying with it requires choices that make monitoring sites for children more difficult, which goes against the goals of the Act. If you have actually made it to this footnote, I would be interested in talking with you about this topic.

games on a web site, even if younger children will see them. Younger children and parents might disagree with this choice. These are cases where knowing a child, his culture and what he faces in life, could be extremely helpful.

The open community also has limitations about contacting individuals for positive reasons. Administrators cannot contact young people to help them develop their work or to ask thriving members to participate more. Thus they are limited in the ways they can engage people in positive ways.

The closed community approach has several drawbacks too. Young people today expect to be able to publish their work to anyone and everyone and don't want to have to make copies of their work, their buddies and all their content for every site they visit. A closed community may seem to them out-of-date and not worth bothering with. For instance, Village members, particularly older ones, sometimes link to their MySpace pages, rather than maintain their profile pages. They see no reason why their projects shouldn't be easy to link from the Village to other sites, a feature that a private closed community cannot support.

Though the feature has not yet been promoted on the site, Scratch projects can be embedded on other web pages the way YouTube videos or Flash games can be. Thus it is easier for people

to share their projects however they wish and, also, it is easier for Scratch to spread virally. Closed communities do not have the ability to spread virally, which can make them feel less exciting and more out-of-date.

#### *REAL (AND EXAGGERATED) SAFETY CONCERNS*

*“hay u look a lil older than me but i will still luv to become ur friend how old r u?”*

*-a Village member*

I received the above quote in a private email from a young Villager. A great deal of attention is given to safety of children on the internet. Predators can more easily contact children on the internet and children need to be protected. At some point in their lives four percent of children receive a direct aggressive solicitation, such as suggesting a specific time and place to meet (Wolak, Mitchell, & Finkelhor, 2006). This strikes me as unacceptably high, though perhaps lower than one would expect given the attention the problem is given. Since this issue has been greatly discussed, I will simply say that most children and teens report that they understand why they should not respond to these solicitations and use a variety of techniques to protect themselves. The best protected children and teens appear to be ones that have supportive social structures (particularly parents), which makes them less vulnerable by helping

them to be confident and assertive and by explicitly discussing how young people can protect themselves. I believe that the young people who are truly vulnerable are not the entire 4% of children who receive aggressive solicitations, but those who do not have the inner confidence and proper support to know how to deal with inappropriate contact. Catching as many predators as possible addresses this issue, but another effective strategy is to provide vulnerable children and teens with additional support at home, at school and online. This support includes emotional and social support, along with informational support about what issues face them and how to take care of themselves.

There is a second, less discussed, safety concern for young people that affects many children online: cyberbullying. One-third of young people who use the internet report receiving some form of cyberbullying, such as receiving threatening messages or having rumors posted about themselves online (Lenhart, 2007). This bullying could be brushed off as a natural continuation of school-yard bullying, but should be taken seriously. In some cases, the bullying may simply be annoying. Still the impact of the bullying is in the eye of the beholder. A mean comment might roll off the back of one child and traumatize another. Other comments that are more threatening and personal including ones that suggest targeting a child in person, need to be taken more seriously.

Web site administrators may not be well prepared to deal with issues around cyberbullying. It may not be possible to interact personally with either the bully or the receiver of the bullying. Even if it is possible to interact with them, without knowing them, it can be hard to know what should be said.

Many young people do not report cyberbullying and as a result, teachers and parents may not even know to intervene. If they do know, they may have dealt with bullying before and know what to do.

Teaching children and young people to recognize when someone hurts them through bullying and knowing that it is important to tell, especially when the person has threatened them, is one approach for teachers, parents, and other authority figures. But what should web site administrators, who may feel ill-prepared, do?

I believe that there needs to be clear guidelines about what administrators options are. Currently there is a lot of documentation for children, teens, parents, teachers and communities, but not for designers and developers. I also believe that web site designers and administrators should have access to consulting with sympathetic experts such as psychologists. If children are learning in OCOCs more and more, there should be experts available, similar to

school psychologists, who are trained to understand and help with these issues.

## **Ethical Considerations**

As a social scientist, I believe it is critical to note how sensitive feeding the kind of analysis I do into the design of the site. OCOCs and other web sites are constructed environments and their construction shapes the behavior that users exhibit. Thus, it is hard to extrapolate how users will behave on one OCOC from another very different one. Site designers certain would want to use the findings to inform their design choices. Still changing the site based on observations is difficult.

This research could be used to manipulate users in ways that are undesirable. Sites could be designed so particular people would be more influential. This, in turn, could be used to give them better access to social, intellectual, or financial resources. Similarly, software like the Village Community Visualizer, which connects people via undisclosed algorithms, could be used could be used to match particular people to other people, companies, or products. The same ideas I've outlined that I use to connect and empower could be used to bias and manipulate. A musician's site could emphasize their own band's work more than anyone else's. A video-sharing site could highlight work by people who pay more than those who don't. A blogging site could have a social network visualization that highlights people with their own political views

more.

Transparency is one solution to this potential danger. Site designers could explicitly say how they match people in clear language in a place on the site that is easy to find. Still, this risks allowing members to game the system. If they are told a particular form of participation will boost their influence, they may engage in that behavior more and change what that behavior is associated with and what predicts it. Still, for the safety of internet users, transparency is key. If it is not provided, internet audiences will need to expect it from legitimate web sites, the way they have come to expect reasonable privacy policies and universal design.

Education about social network findings is another option. Though I would not want to expose specific findings about particular communities, I do think it can be empowering and important to understand in general terms what a social network is, how it can provide resources for you, why certain people are influential, and the impact that being influential can have on a person. For instance, being connected to “social bridges” to those in power who might help you can be important in obtaining jobs and having a close-knit support system can be important for safety and security. For communities like the Village and Scratch sites where the goal is to empower, it makes sense to share this kind of information with users. This provides a potential design opportunity as well, which I describe more in the next section.

When sharing findings with users, a few ethical considerations are critical to address. Some considerations relate to preserving the research itself while others involve protecting the users. When a researcher introduces new information or new features to a system, she changes the system itself. Thus if I were to inform users of particular research findings, they may alter their behavior based on my findings and any future research would be vulnerable. As a result, I am very careful about what I share with users. For instance, I will not disclose my findings to the Scratch community on what predicts influence. Not only would doing so make any future research suspect, it would also not help them. If I tell users that certain behaviors predict influence, then I may cause them to change their behavior in ways that they otherwise would not do. This change, in turn, may invalidate the research results, defeating the point of telling them in the first place.

For example, the Village Community Visualizer is designed to bridge social and project-based forms of participation and to encourage users to explore their social network. I wanted to share what I learned from analysis of the survey diffusion with the kids themselves. The format I presented in this thesis is fine for discussion with staff, but is not suited to sharing widely with members. It would neither help them understand their role in the Village, nor would it encourage them to reach out to others in ways that could be empowering. I don't tell the users

striving for a high betweenness centrality will make them more influential and being influential can make them important to the network. Instead I provide them with a mechanism to engage with these ideas implicitly.

After studies, I sometimes share information directly with users, though I am careful about which information I share. For instance, the Village has a section in its Topic Tree called “Understanding Communities” that includes social network graphs of a small subset of emailers on the Village. But my work is presented alongside social science projects that Computer Clubhouse members created in workshops with me. Thus I am only one voice in the community addressing a given topic and members also address the same topic. In addition, it simply describes what is happen and does not suggest conclusions about who is participating, how they are participating and what their participation means. Thus I do not imagine that the information I provide will change people’s behavior.

## **FUTURE WORK**

### **On Forms of Participation**

Understanding how forms of participation relate to one another warrants more attention. One topic of particular interest is to investigate whether there are clusters of participators and whether some participators take on more central roles over time. If there were particular clusters of participators, this finding might help to understand how much of an OCOC is composed of “creators” versus “supporters” or “audience members.” If some more peripheral participators took on more central tasks over time, it would provide additional evidence and understanding for Legitimate Peripheral Participation.

### **On the Diffusion of Innovation**

In the introduction of my thesis, I described a new way of thinking about social learning by mapping behaviors in learning communities to Rogers’ Diffusion of Innovation framework. In my thesis, I focus on the last two stages only. I’d like to extend this work in two ways. First, I would like to refine my measures of trial and adoption to better reflect the exchange of ideas (rather than the exchange of files). This will be accomplished by looking more closely at the contents of projects. Second, exploring each stage in detail with data from multiple communities is the best way to understand how these processes work, how well they fit with

Rogers' model and my extensions to it. To accomplish this takes more than a PhD thesis; it is what I hope will be a major body of work in my future research career.

## **On Understanding Influence**

I suggest in this thesis that there are two primary forms of influence: socially focused and project-focused. Whether these are the best two is worthy of discussion and additional testing. Whatever the right conceptualization is, it will be interesting to see whether the findings from the Scratch online community will be replicated in other communities. In addition, it will be interesting to see whether these findings will change as Scratch website administrators make changes to the site's design.

## **Additional Communities**

I am encouraged by the direction and findings of this research. Still the work has focused on two communities. To understand better how well these findings address communities overall, these ideas and methods should be extended to additional communities focused on different learning topics and composed of different kinds of members.

## CONCLUSIONS

The mixed-methods approach I have taken to understand how Online Communities of Creators interact, share ideas, and help each other's learning processes is novel and has revealed some interesting patterns that were previously not well understood. I believe it has contributed to Computer-supported Collaborative Learning research and social network analysis, as well as be useful for those interested in influence (such as management scientists) online community and interface design. Looking forward, I plan to extend this work and continue to work with Online Communities of Creators, which I know will continue to captivate me.

# APPENDIXES

## Appendix A: Scratch Club Questionnaire

- Will you show me some of your projects? Why did you make this project? What inspired you to make this project?
- Does anyone else have projects like this one? Did their projects influence you?
- Have you put projects up on the Scratch site? (What is your username?) How did you decide to put projects on the Scratch site? Do you like having your project on the Scratch site? What else do you do on the site? What do you think of friending? What do you think of comments? Have you had experiences when you saw things your teachers or parents might not want to see?
- Have you gotten any comments? What were they like?
- What else do you do on the Scratch site? Do you know your friends usernames? Do you comment on their stuff? What kind of comments?
- Do you get ideas from your friends? Or from the Scratch site? Like what?
- Have you used any software that was like Scratch before? How was it like Scratch?
- Have you programmed before? What kind of programming?
- Why do you come to Scratch Club?

- How many of your friends come to Scratch Club? Do any friends or family outside of Scratch Club use Scratch? Who?
- Do you hang out with your friends at Scratch Club?
- What do you like to do in your freetime? What are you doing this summer?
- What classes do you take at school? What are your favorites?

## Appendix B: Sample Scratch History File

Project: BreakDanceLis(2)

Author: sylvan

Scratch: 1.0.2 (internal 29-Mar-07)

Notes:

I'm a b-boy and this is practically the first Scratch project I ever made.

### INSTRUCTIONS

Click the boombox and then the other icons at the top of the screen.

### HOW I MADE THIS

The boombox makes a beat and \*broadcasts\* messages to the dancer. The dancer responds by moving and whirling. I took pictures of myself doing k-kicks and ninja freezes and cut them out in photoshop. Then I made it so that when you click the icons at the top, the dancer busts out with a phat move.

### MORE IDEAS

It would be fun to add other dancers that respond to the broadcasts. Then there'd be lots of dancers at the same time.

History:

1/3/2007 7:18:04 pmold BreakDance.sb jay  
2007-3-30 12:21:27 save BreakDanceLis  
2007-3-30 12:21:39 share BreakDanceLis sylvan

Totals:

Sprites: 7  
Stacks: 14  
Unique costumes: 20  
Unique sounds: 7

-----

Sprite: Stage

Costumes (1):

Background1 (480x360)

Sounds (0):

No stacks.

-----

Sprite: Sprite1

Costumes (2):

costume1 (95x111)

costume2 (95x111)

Sounds (2):

pop (0:00:00)

meow (0:00:01)

No stacks.

-----

Sprite: B boy

Costumes (11):

kkick1 (180x200)

headspin1 (129x200)

headspin2 (64x200)

headspin3 (89x200)

headspin4 (58x200)

handspin1 (160x200)

handspin2 (78x200)

handspin3 (167x200)

handspin4 (147x200)

standing1 (140x200)

ninja1 (161x130)

Sounds (0):

Stacks (7):

when I receive "boom"

set "whirl" effect to 0

change x by pick random 10 to 30

change "whirl" effect by 90

wait 0.2 secs

set "whirl" effect to 0

end when I receive "check this out"

switch to costume "headspin1"

wait 0.3 secs

switch to costume "headspin2"

wait 0.3 secs

switch to costume "headspin3"

wait 0.3 secs

switch to costume "headspin4"

wait 0.3 secs

```
switch to costume "headspin1"  
wait 0.3 secs  
switch to costume "standing1"  
end when I receive "scratch1"  
switch to costume "ninja1"  
wait 1.5 secs  
switch to costume "standing1"  
end when I receive "scratch2"  
switch to costume "handspin1"  
wait 0.3 secs  
switch to costume "handspin2"  
wait 0.3 secs  
switch to costume "handspin3"  
wait 0.3 secs  
switch to costume "handspin4"  
wait 0.3 secs  
switch to costume "handspin1"  
wait 0.3 secs  
switch to costume "standing1"
```

```
end when I receive "hey ya ya hey"  
  switch to costume "kkick1"  
  wait 2 secs  
  switch to costume "standing1"  
end when I receive "tat"  
  set "fisheye" effect to 0  
  change x by pick random -50 to -10  
  change "fisheye" effect by 90  
  wait 0.2 secs  
  set "fisheye" effect to 0  
end when I receive "ting"  
  point in direction 90  
  turn 25 degrees  
  wait 0.2 secs  
  point in direction 90  
end
```

-----

Sprite: boombox

Costumes (2):

boombox1 (295x189)

boomboxOn1 (349x229)

Sounds (1):

pop (0:00:00)

Stacks (3):

when green flag clicked

    broadcast "start boombox"

end when I receive "start boombox"

    switch to costume "boomboxOn1"

    wait 0.1 secs

    forever

        change x by -10

        broadcast "boom"

        play drum 35 for 0.5 secs

        broadcast "tat"

        play drum 39 for 0.375 secs

        broadcast "boom"

        play drum 35 for 0.0675 secs

        broadcast "ting"

```
    play drum 44 for 0.25 secs
    change x by 10
    broadcast "boom"
    play drum 35 for 0.25 secs
    broadcast "tat"
    play drum 39 for 0.5 secs
end   when boombox clicked
    broadcast "start boombox"
end
```

-----

Sprite: hey yay yay

Costumes (1):

singer1 (50x47)

Sounds (1):

heyayay1 (0:00:02)

Stacks (1):

when hey yay yay clicked

broadcast "hey ya ya hey"

play sound "heyayay1"

```
switch to costume "singer1"
repeat 6
  change "brightness" effect by 10
  wait 0.2 secs
repeat 6
  change "brightness" effect by -10
  wait 0.2 secs
set "brightness" effect to 0
end
```

-----

Sprite: turntable 1

Costumes (1):

turntable1 (100x88)

Sounds (1):

Distraction1 (0:00:01)

Stacks (1):

when turntable 1 clicked

broadcast "scratch1"

play sound "Distraction1"

```
set "whirl" effect to 100
wait 0.6 secs
set "whirl" effect to -100
wait 0.6 secs
set "whirl" effect to 0
```

```
end
```

```
-----
```

Sprite: turntable 2

Costumes (1):

turntable2 (100x76)

Sounds (1):

distraction2 (0:00:01)

Stacks (1):

when turntable 2 clicked

broadcast "scratch2"

play sound "distraction2"

repeat 4

change "whirl" effect by 60

wait 0.1 secs

```
repeat 4
  change "whirl" effect by -60
  wait 0.1 secs
  set "whirl" effect to 0
end
```

-----

Sprite: check this out

Costumes (1):

checkthisout1 (67x120)

Sounds (1):

checkthisout3 (0:00:02)

Stacks (1):

```
when check this out clicked
  broadcast "check this out"
  play sound "checkthisout3"
  repeat 3
    change "fisheye" effect by 30
    wait 0.2 secs
  repeat 3
```

change "fisheye" effect by -30

wait 0.2 secs

set "fisheye" effect to 0

end -----

## Appendix C: Village page hits and time on page by subsection

SUBSECTION	PERCENTAGE OF PAGE HITS	TIME ON PAGE
Email Inbox	30.55	58
Unlabeled	15.77	51
Profile	15.40	110
Read Email	14.41	33
Gallery and Things to Try list	4.47	57
Discussion	4.39	78
Topic Tree	3.78	90
Home	3.08	100
Send Email	2.35	60
Things to Try	1.15	129
Photo Album	0.83	89
People	0.78	73
Clubhouses	0.54	39
Gallery	0.52	69
Admin	0.52	55

Clubhouse or Organization	0.43	44
Project	0.27	79
Chat	0.20	43
List Galleries	0.16	13
Address Book	0.15	30
Add Gallery	0.08	47
Fill out Profile Survey	0.08	165
Email Preferences	0.07	37
Software Studio	0.02	152

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