The Techne-Mentor

Megan Finn

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Abstract: This Paper examines patterns in the adoption of personal communication technology in the lives of Berkeley Freshmen. I argue that these students' technology adoption was influenced by techne-mentors, who were usually peers or family members. Techne-mentors are individuals that support technology adoption in certain social contexts, but are learning from other techne-mentors in other social contexts. Thus, the role of the techne-mentor is fluid and context dependant.

Introduction

This paper is dedicated to explaining the patterns around technology adoption – when students adopted technology, who might have introduced it to them, and under what circumstances. I specifically focus on the idea that many students' adoption patterns were influenced by their social networks. This document is part of a series of reports on one research project, FreshQuest. The overall goal of FreshQuest is to provide a better understanding of how Berkeley Freshmen use communication technology to support their social networks. I would like to both understand this age group in greater depth, and stimulate further research questions.

Summary

We analyzed the data from Freshquest, particularly paying attention to adoption of technology. The study specifically examined personal communication technologies such as the mobile phone and email. I examined technology adoption across several different themes including cost, motivations for adoption, and patterns of adoption. This document specifically examines patterns of technology adoption – in other words, what are the general patterns of diffusion of communication technologies throughout these student's lives.

First, I describe different aspects of technology adoption, namely adoption of a technology, adoption of a technology practice, and support for technology adoption.

Next, I explore different ways of explaining the different trends we saw in technology adoption drawing from the work of Everett Rogers. Next I describe a new model for

understanding technology diffusion in the lives of Berkeley Freshman – the role of the techne-mentor. Finally, I identify next steps for research.

Methods

I[1] completed this research using both qualitative and quantitative methods. Based on the previous research in the area, we knew that to understand more about why students used technology and what they actually did with it, we would have to be multi-method[2]. Two primary sources of data were collected.

First, we had participants complete a survey to gather a broad view about how they use these technologies. We generated a list of technologies that students use primarily from our six survey pre-test subjects. The final version of the survey is included in Appendix A, and asked questions covering when the students began using technologies, how often they use them, who taught them how to use those technologies, and if they had ever done a set of technology related activities[3]. After completing the survey portion of our research, we invited all 80 freshmen from the random group who completed the survey to participate in a 90 minute interview. We selected the interviewees on a first come, first serve basis, via email. This introduces a self-selection bias into our data. Students whom we interviewed were those who were willing to be interviewed about their technology practices, who were willing to respond to an online survey, and the students who respond to email promptly.

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[1]   This research was completed as part of my master's thesis project, FreshQuest, with my project partner David Schlossberg.

[2]   See Peter Lyman's report to the MacArther Foundation

[3]   The survey takers were recruited by email in two groups. The first group was recruited from former students of Megan Finn's who in turn recruited their own friends to take the survey, henceforth called the "snowball group" (we had 160 respondents from this group). The second group was recruited from a random list of 500 freshmen provided to us by U.C. Berkeley's Office of Student Life, which we will refer to as the "random group" (we had 80 respondents from this group of students).

We interviewed 22 freshmen students. The purpose of the interview was to detail further their communication technology habits, feelings, communications, and history. The interview was largely open ended, guided by technologies that the students said were important to them. Because we had survey results for all of the students whom we interviewed, we were able to connect information from the survey about students' backgrounds, to more rich information from the interviews. This also allowed us to validate some of our survey data. This multi-method approach allowed us to see some trends from the students from the surveys, and to understand students in more depth from the interviews.

In this document, we present the stories of many of the students whom we interviewed. All of the students are referred to only by pseudonyms we have assigned to them.

Aspects of Technology Adoption

Through our interviews with students, we identified three different aspects of technology adoption. For each aspect of technology adoption, I will examine it from the perspective of students as they adopted instant messenger[4]. We found that each aspect of technology adoption was supported by student's social networks.

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[4] "Instant messenger" as defined by wikipedia, "is a client which allows instant text communication between two or more people through a network such as the Internet... Instant messaging differs from email in that conversations happen in realtime. Also, most services offer a 'presence awareness' feature, indicating whether people on one's list of contacts are currently online and available to chat." Contact information for an individual is in the form of a screen name. On their chat client, students have a list of potential contacts, and this list is sometimes referred to as a "buddy list." Every student we spoke to adopted instant messenger at some point during their teen years, to different degrees, and all the students had used AOL Instant Messenger (AIM).

1. *Adoption of a technology.* How do students hear about technologies they adopt?

   When do students decide to adopt a technology?

By adoption of technology, we mean that students (or their families) acquire a

technology. Adoption of technology is meant to specifically address essentially how

students adopt a technology.

Instant messenger was pervasive amongst the students that we spoke to. Most had heard

about instant messenger from another peer, though some had heard about it from a

sibling. One student to whom we talked was a relatively early adopter of instant

messenger compared to most of the other students to whom we talked gave us his

perspective on the adoption of instant messenger by him and his peers.

> [I first IMed with] two or three friends; one of my friends would always be
> online... I used IM because it was kind of a novelty. Within a period of one
> and a half years I was talking with a lot more friends… all of a sudden I
> would be getting IMs from people that I didn't know were in my classes.... by
> eighth grade people would meet someone and want to get to know them a
> little bit more and say, 'oh, do you have a screen name? (Ben).

Luke's story about the first time he used instant messenger is quite typical, and illustrates

how instant messenger spread, as Ben described it. "[I first saw IM] Long time ago,

probably in seventh or eighth grade. I think friends had it first and I saw it over there and

then I got it a couple of months later" (Luke). One student adopted ICQ, an instant

messaging client, after hearing about it from people playing a video game. "I played

Earth 2025 and it's one of those online games where you form clans… I joined this clan

where everyone has gotta have ICQ. This is the standard for that game. So I started

using that" (Kim).

2. *Adoption of a technology practice.* How do students adopt a technology practice?

In this section we distinguish between the "adoption of a technology" and the "adoption

of a technology practice." By adoption of technology practices, we mean that students

adopt a way of using a technology. Usually when students are motivated to adopt a

technology, they are also adopting a technology practice. Sometimes, a new technology

practice will be adopted by a student.

Different technologies had different norms for how they were expected to be used, and

these norms varied over time and between different social groups. In the case of instant

messenger, students adopted a stylistic communication norm, in order to use the

technology within some social circles.

Many students alluded to the fact that adopting instant messenger is not just a matter of

having the technology, or using the technology, but adopting instant messaging lingo as

well. One student who had lived abroad for part of high school, and who didn't use AIM,

and instant messenger client, her senior year gave some insight into the AIM lingo: "On

AIM there are happy face things and there is different AIM lingo... You don't write

'never mind,' your write 'nm' …or ' brb (be right back). There is a million different

things, that and I am only right now really trying to pick it up because I never used it

[AIM] that much… I have been out of the loop" (Anita). AIM has somewhat of a code

language that students use to communicate. Obviously some of the abbreviations are

more efficient, but Anita adopted AIM lingo to adhere to many social norms. Another

student said that in her school there was also status associated with using the application,

and even in how students used the application. "I guess people used that [AIM] because it was probably cool.... You could... talk to people and use abbreviations and cool little things. The more you abbreviated, the cooler you were" (Joan). Other students acknowledged the language used on AIM, but explicitly tried to avoid using it. "I think it's kind of silly.... I think "LOL for Laugh Out Loud" seems strange... I prefer to type out all words" (Luke). The ways of using AIM could be highly individualistic, and expressive about students' views about social norms.

3. *Support for technology.* How do students ensure that when they adopt a technology that they can keep using it?

This essentially is support for the adoption of technology, however, it is fairly critical for technologies to be fully adopted into students' routines.

Many students have a peer, or family member whom they rely on for technical support when they have technology related problems, and assist the student at adoption level three.

> My roommate, even though she spends so much time on IM, is even less
> technological that I am. So, she has a friend who will come over and help her
> out and I will get tips too… Like last month there was a thing where calmail
> was changing it's security standards and you had to check things and I didn't
> really know what's going on but …Her friend came over and helped her and
> helped me too (Betsy).

Students have a range of skills when it comes to trouble shooting or passing on information about technology, and students were aware of where they fell relative to their friends, and which of their friends they can go to for aid. "I am in the middle because I

have friends don't know what's going on, don't know very simple things. Then I have friends who are like, 'oh that's easy you can just re-program it'. I have friends from both sides" (Laura). Additionally, students are often very aware of their peer's skills and know who in their social network can help support certain technology use. "Internet…my roommate is definitely, is the one to go to.... But as far as like smart cards or palm pilots and stuff, I am…but that's mostly because of my dad" (Anita). Student's social networks are important sources of technical support that enable students to adopt technologies and use them. Students have a variety of ways to contact their social networks.

The different aspects of adoption were most often facilitated by someone in the student's social network. The rest of this document is dedicated to exploring the "someone" in the students' social network that assists with the diffusion of an innovation. In the next section we describe some frameworks for understanding diffusion of innovations and propose another framework.

Models for Diffusion

The S-curve

Everett Rogers spends a considerable time in his seminal book *The Diffusion of Innovations*[5] describing the S-curve. The S-curve explains the rate of adoption of a technology, which is the "relative speed with which an innovation is adopted by members of a social system" (Rogers 1995). Rogers uses the S-curve to explain the rate of adoption of most technologies "Most innovations have an S-shaped rate of adoption" (Rogers 1995). Some technologies have steeper curves than other technologies

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[5]   Rogers, Everett. 1995. *The Diffusion of Innovations.* 4th ed. NY: Free Press.

In addition to the S-shaped curve, Rogers describes different adopter categories. The adopter categories explain who is adopting an innovation at specific point in time. Initially, innovations are adopted by innovators, then early adopters, and so on.

FIGURE 1

The S-curve of adoption of an innovation
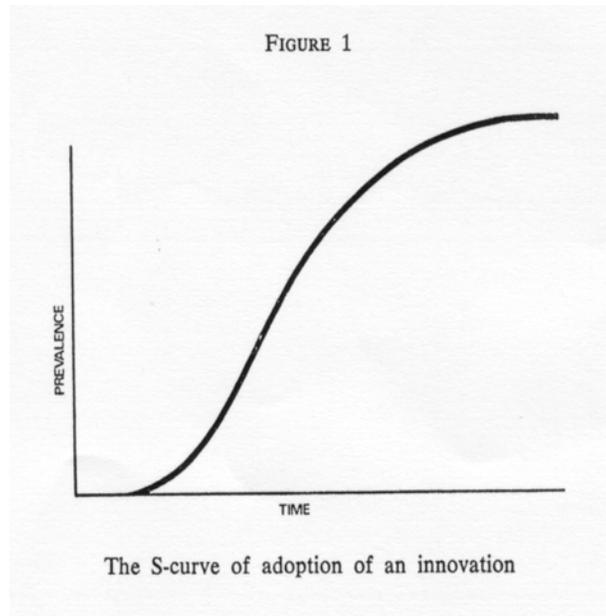
While the S-curve and the accompanying adopter categories explain rate of adoption for a large population of individuals, for the purposes of this study, it was not particularly helpful to understand the pattern of adoption amongst the students we studied. If anything, our data somewhat contradicted Rogers' hypotheses. "Diffusion research shows that members of each other adopter categories have a good deal in common. If the individual is like most others in the late majority category, he or she is of low social status, makes little use of mass communication channels, and learns about most new ideas from peers via interpersonal channels" (Rogers 1995). Despite the diversity of participants in our survey we found that almost none of the ethnic or socio-economic indicators (with the exception of father's level of education) correlated strongly to when the students adopted a technology. For more detail on Adoption as a function of cost, please see Appendix A.
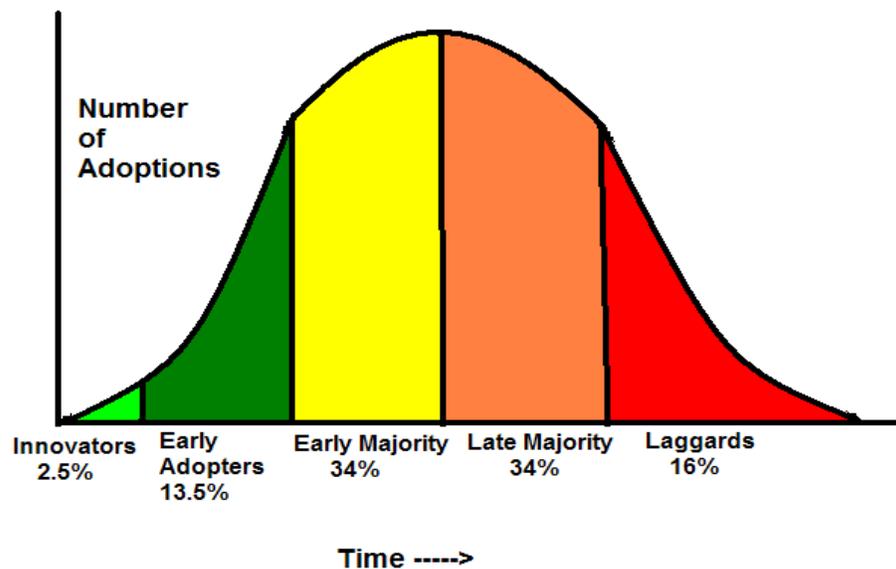
Furthermore, regardless of a student's socio-economic status indicators, for the most part, the students heard about technology from people in their social network. Perhaps this is because young people may not have the same access or interest to mass media communication channels. Therefore, to help explain adoption of innovations with the students we studied, we need a model that accounts more explicitly for social connections.

The Opinion Leader

Rogers says that at the point of the S-curve where the rate of diffusion increases rapidly, "opinion leaders adopt and tell others about the innovations" (Rogers 1995). He describes opinion leaders and the role that they play in influencing their communities' adoption of innovations. "Opinion leadership is the degree to which an individual is able to influence other individuals' attitudes or overt behavior informally in a desired way with relative frequency" (Rogers 1995).

In many of the interviews we conducted with the students, they acknowledged the role of something like an opinion leader in their adoption of technology, or we recognized the students themselves to resemble an opinion leader. However there were two major issues with the concept of an opinion leader in explaining technology adoption with respect to the data set.

1. *The opinion leader operates in a large community.* The problem with the idea of an opinion leader, at least as described by Rogers, is that an opinion leader generally influences a larger community of people. "The most striking characteristics of opinion leaders is their unique and influential position in their system's communication structure: They are at the center of interpersonal communication networks" (Rogers 1995). Based on the data set of our interviewees, people who influenced technology adoption in our study acted as opinion leaders generally only seemed to influence a few people in their close social network. Opinion leaders generally could influence adoption of technology, and perhaps adoption of technology practices, but rarely could they overtly support or enable adoption directly, purely because of the volume of people they would have to support. Thus, we are addressing opinion leadership on a micro-level.

2. *The opinion leader is always an opinion leader, regardless of social context.* Additionally, the opinion leader, as described by Rogers, is a somewhat static position within a specific social network. "Opinion Leaders are members of the social system in which they exert their influence" (Rogers 1995). We saw again and again in our interviews that someone might not be an opinion leader in the context of one part of their social network, such as their family, but as they learned

from their brother, they could go forth and be an opinion leader to their friends.

The Techne-Mentor

I will refer to these fluid, micro-level, opinion leaders as *techne-mentors*. Technology is partially derived from the Greek word, *techne*, which means craftsmanship. *Mentor* is a figure in the *Odyssey* who advised both Odysseus and Telemachus, and is the source of the modern use of the word, mentor. Additionally, Athena took the form of Mentor on several occasions. Techne-mentor essentially described a role that someone plays in a specific context, but it is not a permanent role (such as father).

Our interviewees referred to techne-mentors who were technology experts in the students' lives. The students went to the techne-mentors for help when a technology wasn't working. The techne-mentors influenced students to adopt a technology, or adopt a certain practice with a technology. The relationship of a student to a techne-mentor was a complex one. Sometimes a student would have one person who was a techne-mentor in their lives, and that student would pass on the information about a technology to another group, where the student would act as the techne-mentor. The role of techne-mentor depended on a student's social context. There is a constant flow of information about technology between the student's social networks, all of which makes the role of techne-mentor fluid and context dependent. Sometimes the students themselves were techne-mentors to the people in their lives, and learned about technology from a reference website or text.

In many cases, the idea of techne-mentors is about adoption patterns, but it is also a story

about informal learning in social networks. The techne-mentors were an integral part of informal learning about technology for a student – they informally taught students information that would allow them to be techne-mentors in another social context. In informal settings, the techne-mentor can take on the role of a teacher about technology.

Techne-mentor examples

Students' families have an immeasurable influence on students' adoption of technology, whether it is from imitating influential older siblings, or the judgments parents make about which technology to have around the house. The parents' technical frame, even if they were non-adopters of certain technologies, was important in influencing their kid's view of the technology. We observed that most students seemed to have a techne-mentor within their families, and frequently it was one of the kids, but sometimes it was the student's father. In some families, the students had a relative who was in the technology industry and the family was able to rely on that person. Oftentimes students used information that they picked up from siblings and parents and disseminated it amongst their social network   While families played an important role in helping students discover, adopt and use technology, for many students their peers played an equally important role. Families tend to influence more about the values of a technology, and early on, the adoption of technology, but later on, it seemed that students' peers were more responsible for the adoption of technical practices. While some peers were the techne-mentor in the lives of some students, other students were influenced by their peers as a group. While it was easier to identify the techne-mentor in relatively static social groups like families, it was more difficult to identify techne-mentors amongst peers, because of the volatility of peer groups during teen years. Friends are harder to identify

because they change. A friend plays a role in the life of one of the students for a limited time. The role of evolving friend networks in technology adoption is a topic that demands further research. Below I present examples of the role of the techne-mentor in seven students' lives.

Raj

Raj had a peer techne-mentor that allowed him to be a techne-mentor to his family. While most students didn't cite that there was a specific techne-mentor amongst them, a few students acknowledged a specific individual who influenced their adoption of technology and technology practices.

> I found out MSN... because a friend of mine started using it. He was a tech savvy guy, I think his dad was a computer analyst for a telecommunications company.... He would have all these little gadgets. He said in high school, 'why don't you try this [MSN] and we can talk to each other back home?' Oh, I thought, 'that's a good idea'.... I found out about IRC from the same friend.... So I used it [IRC] strictly to talk to him and then he'd slowly show me tricks... I found that we never talked about anything but technology. So when I saw him get into a hardcore programming and I was like 'Why don't I try something like that?' (Raj).

Raj then acted as a techne-mentor to the rest of his family. Students not only learned from getting advice from their siblings, but watching them as well.

> From me it [IM] spread to my brother. He's a younger brother so he pretty much does everything I do. Or I like to think so. After a couple of years, I got my parents on it [IM] because I was going away [to Berkeley]. It's an easy way to keep in touch with them... [my brother] discovered from me things like chat programs, websites" (Raj).

Raj explicitly taught his parents, but his sibling learned by watching him. Perhaps Raj was an techne-mentor to his brother on more than technology because of their sibling relationships. Raj was even a little disparaging that his brother didn't try to pick up more of the "constructive" activities, like creating websites, that Raj took part in.

Sandra

Sandra's brothers were techne-mentors, and she was a techne-mentor to her peers. Sometimes older siblings were not only opinion leaders, but they played a protective role as well, guiding students about how to use technology. "I have two older brothers and they're both more interested in computers than I am.... I think my brothers found ICQ first and started talking with their friends. They realized I was talking to complete strangers so they got me hooked up with ICQ and I started talking to their friends" (Sandra). Sandra's brothers guided her to adopt the practice of instant messaging with friends, and not using chat rooms. Because of Sandra's brothers' expertise, she was able to help her friends with technology and be a techne-mentor amongst her friends. "I hooked up a couple of my friends with AIM. One of my friends got AOL, and I helped her choose a screen name. She would ask, 'how do I add a buddy or how do I look up this person?' I got all the help from my brothers and passed on information" (Sandra).

Joan

Joan learned about technology on her own and acted as a techne-mentor to her family and friends. At Berkeley, her colleagues act as techne-mentors, and she passes on the information to her peers. Once students figured out how to get rid of a virus, they would often help the people in their social networks get rid of the virus.

> We got this one [virus] on AIM actually. It was on your user profile so whenever you clicked info, it would say, 'ha, ha, ha, I found the picture of insert your name here' and you would clicked on the link and then you would get this spyware.... it took me a day to figure it out... Then I got rid of it for all my friends. It's kind of like a little game... It was a challenge, especially the first virus... I just started getting into [computer] stuff (Joan)

Many student were often driven to learn about technology on their own, when they encountered problems with the technology and did not have other support. Joan

explicitly directed her siblings about how to use technology. "Oh, I would teach them [my siblings]. Not so much in middle school but in high school, they're usually, 'do you know how to use Photoshop?' I'll say, 'Yeah, do this'... Or, 'Do you know to how to get rid of this spyware?' ... for my brother at least, my sister has her own tech guy" (Joan). While Joan was the techne-mentor for her brother, her sister had her own "tech guy." It seems that everyone had some sort of "techne-mentor" in Joan's family.

Once Joan started at Berkeley, she started working for a computing help desk. Through her colleagues at work, Joan picked up a lot of information. She uses this information from her work colleagues to help her friends.

> I know more about computers and like most of my friends so.... if I see that they are using it [AIM]... [I say,] 'Your AIM starts playing a movie trailer with audio every half hour and it's just annoying.' [My friends say,] 'My god, I want to get rid of that can you help me?' and so I'll go on like a downloading site and download like GAIM or DeadAIM (Joan).

<u>Laura</u>

Laura originally learned about technology from her sister, but as she got older, she took the role of techne-mentor in her family. Laura is able to be a techne-mentor in her family because she has a peer group of techne-mentors. Students have a range of skills when it comes to trouble shooting or passing on information about technology, and students were aware of where they fell relative to their friends. "I am in the middle because I have friends don't know what's going on, don't know very simple things. Then I have friends who are like, 'oh that's easy you can just re-program it'. I have friends from both sides" (Laura).

Sometimes students draw on their family networks to show them how to do something that they might have heard about in school. "They [my friends] were just like 'oh, just set it up this way'.... She [my sister] said 'no, you are doing it wrong.' So I can say that my sister and friends, showed me how to set up my first email account" (Laura). Laura's peers and her sister acted as techne-mentors.

Interestingly, it seemed very important that students had at least one "techne-mentor" in the household. If one techne-mentor moved out, another family member would take over.

> My sister is a more of a technology person. She would figure out what was wrong on computer. So I am sure we had viruses, I just don't know about it.... Whenever we have some new program, we would just leave it to her to figure it out. When we got an answering machine, she sat with the manual and figured it out how to use it.... I was young.... Times were changing and I now know more about computers than she does. This summer I am going to set up the wireless router and disconnect the phone line and connect it to DSL line. I have friends who have built their own computers, so if I am having a problem I can just ask them... In the past, when we have something new that needs to be programmed, 'okay, sis can do it.' I don't know if it because I was younger and they never trusted me but I never was the one to do the programming (Laura).

Part of the reason that Laura was able to take over as the techne-mentor was that she had a social network of friends that are going to be able to support her as the opinion leader within her family. Laura's family's need for a techne-mentor implies even more fluidity in the role of techne-mentor. If a family needed a techne-mentor, they would just pick the most talented member of the family technology-wise. Additionally, this could imply that there is a necessity for having someone in the role of techne-mentor in the family.

Ben

Ben's father was his teche-mentor early on in his life, and with this information Ben

would act as a techne-mentor to his friends. However, Ben's father moved out, and Ben,

who was passionate about being a techne-mentor to his friends, started learning about

technology on his own, online. For example, early on, Ben's dad taught him about how

to use technology.

> "I mean as soon as the two people in my class were using e-mail I wanted to
> figure it out. So I went home and asked my dad about it, and I kind of figured
> it out from there and also taught people how to use it… He [dad] just told me
> some things, like AOL - that was the program that we used. And we signed on
> to that, and he showed me an e-mail and he explained that when you send an
> e-mail to someone's e-mail address, then they'll get it instantly because it
> travels over cable lines, information lines. So, that was kind of exciting for
> me, actually. WOW, some one gets it immediately. That was cool" (Ben).

Ben was able to learn from his dad, and disperse his knowledge within his social network.

However, Ben's parents got divorced and his father moved out and Ben lost his techne-

mentor in his family.

> My dad moved out… and I guess it shows a little shift – my dad basically
> stopped knowing what we were doing on the computers in 7th grade… we
> were making all these images in photoshop… I could sign onto different
> newsgroups and my dad wouldn't be afraid about us getting viruses because
> he wasn't there (Ben).

Ben was very passionate about being a techne-mentor to his friends and started learning

about technology on his own.

> We went to the library and used the computers; usually using the computers
> was playing games on the computers, but sometimes people would want to
> understand the actual usable, the workable, I don't know how to really say
> this, the productive components of a computer, I guess I should say… And
> when people had questions about e-mail, then I took over, looked at it, tried to
> understand, and make an answer out of it…that is the way I liked doing
> things. Or even today, I love answering questions about how to fix something
> on the computer (Ben).

Sarah

Some students' parents taught them about technology. "My dad works in computers so he

introduced us to... everything technology related.... We have a lot of technology around the house... I have had many, many computers and laptops and digital gadgets just because of my dad." (Sarah). In fact, Sarah's dad had a family FTP server where they could post family pictures and documents. Sarah attributes her technical savvy to her dad's teachings and the availability of technology around the house. Sarah was then the techne-mentor within her social network and taught other students about technology. 'In terms of technology, I usually know more than most [students at Berkeley] and I fix just about everybody's computers and ... how to use your cameras or how does set things up like a TV, computer, like that…" (Sarah) Sarah's father taught her about technology, and she passed her knowledge on to her friends.

Anita

Techne-mentor parents influenced their children's technology adoption, sometimes not by explicitly showing them how to use a technology, but by having a lot of technology around the house. Anita developed a curiosity about technology watching her father dismantle and assemble computers and other projects. "I remember when I was little out of all our computers there was always one that would be apart. Dad would take a computer apart and put it back together just for the hell of it.... He [dad] used to make smart cards, and we had them around the house. I always knew how to decode them…. If I had a question I would ask [my dad]" (Anita). Anita was curious about how things worked, and that pushed her to learn about technology. "I think it was just because I was curious about it, so I was kind of just attracted to see how things work" (Anita). Additionally, students are often very aware of their peer's skills and know who in their social network can help support certain technology use. Anita is the techne-mentor in her Berkeley social network about with the types of devices she was exposed to at a young

age. "Internet…my roommate is definitely, is the one to go to…. But as far as like smart cards or palm pilots and stuff, I am…but that's mostly because of my dad" (Anita).

Discussion

The data set that this research is based on is a somewhat unique group of people – they are young, and presumably, as students at Berkeley, of above-average intelligence. I would like to repeat this study with students at community colleges in order to see if the role of techne-mentor exists in these students' lives. Additionally, I wonder if the role of techne-mentor is exclusive to a younger population of people who do not yet have large weak-tie networks, and are just now becoming part of the grown-up mass media world.

There is a question in my mind as to whether this model of the teche-mentor represents an alternate model to Rogers, or whether it further explains Rogers' model in a smaller scale. I would like to go into a community and see if I can identify the opinion leader as Rogers describes, and see whether the opinion leader then acts as a techne-mentor to others. My qualm with this idea is that the opinion leader obviously learns about a technology from someone else, and thus suggests that the idea of opinion leader is also fluid. Perhaps then, opinion leaders are just techne-mentors that influence larger groups of people.

I would also like to further explore how the fact that we were studying communication technologies impacted our findings. For example, if a student uses a communication technology such as instant messenger, it is in their interest to help their peers with whom they wish to communicate, to get on instant messenger. One can imagine that if a student

adopted a digital camera, there would not be as much of an incentive for them to entice other students to adopt a digital camera, because having another student with a digital camera doesn't significantly impact the first student's use of their camera. Perhaps the techne-mentor is an idea that is most useful for explaining technology diffusion and adoption of communication technologies.

Appendix A - Adoption as a Function of Cost?

Below we present one case where we examined the adoption of the technology as a function of the cost of that technology: the computer, and in Appendix A we include a case study of the phone. Not coincidentally, the computer connected to the internet and the mobile phone were some of the only technologies that we studied that actually cost something. Technologies such as IM, email, blogging and social networking software require internet connections but no investment as long as students had an internet connection.

We found very little information that substantiated a "digital divide" theory in the population when we looked at the age of adoption of technologies versus the age that students adopted technology. Our survey asked students to state when they first got a technology in the following age ranges: 0-5; 6-10; 11-13; 14-17; after 18; or never. Based on our pretest survey we chose those age ranges because they roughly correspond to pre-elementary school, elementary school, middle school, high school, and post high school. If these age ranges were smaller, we might have seen a stronger correlation between age of adoption and income level. After our interviews, we feel more confident that the survey reflects trends accurately. We also acknowledge that asking students about their parent's household income is difficult because many students do not know this, or are not sure. In fact about 25% of the students said that they didn't know their parent's income. To help mitigate this problem we asked about household income using the same income ranges that the Berkeley application did, so we hoped that students would remember the income range that they filled in on their application.

Computers and the Internet

Based on our survey data from students born in 1985 and 1986, there was no correlation between reported family income and how old the students were when they first got computers or the internet. Because we had survey results for all of the students that we interviewed, we were able to connect information from the survey about student's backgrounds, to narratives about when and why students got computers. While having a computer didn't depend on the parent's income, the reasons for getting a computer in higher income families was more frequently for parent's work, while in lower income families, parents got computers and the internet for the kids.

Most students remember getting a new computer as being an exciting event for their family. "I remember we got our get a brand new computer when I was in third grade. I think it was a Dell and, i was pretty excited because we could kind of had an old one.... I remember when we got it my brothers and I were crowding around it, and my dad was trying to work" (Sandra).

What we found in the interviews confirmed the trends that we saw in the survey. "I got a computer when I was five. We didn't have that much money… we lived in a little apartment and with a twin bed, and my dad insisted on getting computer" (Kim). It

seemed like many students felt that their parents adopted computers so that they could keep up with other kids. "I got a computer in 5th grade -- I think they were teaching us how to use it in school. My dad though it was a really good thing if I had one. I used it mostly for word processing because I didn't really know how to use anything else" (Eliza).

Joe recounted how his mother was frugal about many technologies, however some, like computers were deemed important for their children's future: "Because both of my parents finished fifth grade, they realized given a new opportunity, they should make the most of the opportunity and allow me to stay on par with other kids. So my mom was said, 'if you really need it then we can get it'" (Joe).

Likewise, other students recalled that while they didn't have much technology around the house, they did have a computer. "My family just barely got a DVD player a year ago and we don't have a cable TV at home. Computers, we always had, because my brother is a computer geek. We always had a computer. Our very first one was very old, it had a black screen with DOS prompt" (Erin).

However, all access was not equal access. Many students had dial-up access at home in high school, while others had broadband access, and this influenced their use of the computer because they had to tie up the phone line to use the computer. It also influenced the use of some applications. "I didn't use [downloading applications] often because we had a dial-up connection. It was 30 minutes per song so I only downloaded it if I really, really wanted it" (Erin). This seemed to make a significant difference in computer use with respect to downloading, especially multi-media files. "Back home I didn't really have like fast internet until may be like a year before I left. So I never really got the chance to download as much as some of my friends were doing" (Raj)

Some families had one computer that everybody shared which often greatly limited the ways that a student would use a computer, "Sharing the computer was a moderately big deal... I could only IM between eleven and midnight. We had one main computer and a laptop that doesn't really work that well" (Angus). Families had multiple computers, but still had to deal with sharing because they had slower, older computers.

> We got a computer when I was in fifth grade, and it was really slow by the
> time I was in seventh grade. By eighth grade I started needing to do more stuff
> on the computer. So we got two [computers] and I guess by tenth grade my
> little brother wanted a computer too and so by then we had three. Especially
> now that the computers are getting older and they are getting slow, there is
> still fight over like the one computer or like when you go back home (Eliza).

There was a perception that wealthier families had more computers. "People at my school were very, very, very rich. They would say, 'Yeah I have three or four computers at home" and I am like, 'Wow'" (Kim). Students from lower income families sometimes had hand-me-down computers. "My brother brought home a computer from school, the school library was getting rid of it. It had a stack of floppy disks that had games on them. You could only get like one or two in the work because you needed the path name" (Luke).

Students from higher income families often had their own computers for their school work.

> I think the computer was more for the parents when they used it for managing things like, I guess they used excel a lot.... [The computer] was in my parent's room. We got a new one so that we could just work in our room in ninth grade, for study of course. So then, so then we had a computer in our rooms and me an my sister didn't need to compete for the office (Danielle).

Students from higher income households often had a computer in the house as a result of their parent's work.

> We've always had a computer. Yeah, ever since I can remember we have had a computer because my dad worked for Mitsumi which was a technology based company so he had a computer. I remember playing on the keyboard, like he would disconnect the keyboard and I was three…I would think it was so cool (Jenny).

Moreover, several of the students grew up in households where one of the parents worked in technology and grew up with a lot of technology in their houses.

> My parents have always been really into technology. My mom used to work for AT&T as a computer specialist in the late 70s. So we have always been around technology. I was the first kid to get computer... so at home we have six or seven computers and 3 laptops, and we have like 3 phone lines and we have DSL and back in New Zealand we were the first people to get a T1 line (Eve).

Meanwhile, lower-income families often bought computers or the internet specifically for their kids, where other families got the internet for the parent's work. "We got AOL because my mom's boyfriend was saying how everyone is using internet and we should learn how to use it, and it is a good thing to know" (Eliza). Sometimes parents would not even be the people who were aware of the internet, but needed suggestions from their children to get online. "I got the internet at home in, I think I was in seventh or eighth grade.... It was probably on my prompting, I probably told them I needed it for school research and they obliged." (Luke).

We speculate that this might not be a national trend. Perhaps students at Berkeley come from homes which place a very high value on education.

Mobile Phones

Many students from higher income families saw their parents, specifically fathers, have mobile phones for work before they thought about owning one. Several students laughed recalling their fathers with the large bag phones. Based on our data, we determined that students got mobile phones at the same rate regardless of economic status. Interestingly, according to the data that we have, income was not very predictive of who adopted

phones within the age ranges we looked at. We suspect that many parents felt that the phone was either a necessity for their children's safety, which overrode the cost of the phone. Or parents, regardless of income level, determined that it was the financial responsibility of their children. Students reacted with mixed feelings. Some were more than willing to pay for the service on their own, others deemed it a necessity that they supported.

Some students that we spoke to said that their parents wouldn't pay for a mobile phone because they could not afford it. Kim recounted that many of her friends didn't have phones because they had just moved to the US and couldn't afford new phones.

> I guess you would call them FOBS (ed: fresh off the boat). They were new to the country so they didn't have money for a cell phone.... One of them just got a cell phone recently. The called me like, 'Oh my God, I finally got a got a cell phone.' And I said, 'Congratulation, you are like a generation late' (Kim).

Eliza described the first people who got cell phones in her school, "It was probably the people with money because it [mobile phones] started off really expensive" (Eliza).

Sometimes parents refusal to pay for a mobile phone was related to social beliefs, as well as costs. Jenny's parent's wouldn't let her have a cell phone for a variety of reasons including that they thought that it was a waste of time. Another reason for their anti-cell phone stance was they thought the cell phone was not worth the money students spent on it. "They think it's really annoying how people are constantly on the cell phone and they've lectured me on... how most conversations are just appointment conversations and it is a wastage of money" (Jenny). Despite her parents feelings about mobile phones, Jenny saved money for her own mobile phone: "Why did I get my cell phone? I just had like money saved up for something and I figured that I should just invest in something. It was a fun thing that it was just cool. … my friends thought it was pretty cool that they could find where I was at all hours" (Jenny).

Many students who had to pay for their own phones had jobs to support this. Interestingly, some parents bought their children cell phones when they went to school as a cost savings device, "I first got a mobile phone, because going way to college and therefore you don't have long distance costs and also my parents have the same carrier, so we call free and also it is convenient" (Sarah).

Despite the fact that mobile phones were fairly pervasive for students, even in high school, some students thought that the cost of a mobile phone justified the expense, while others didn't.

> My mom was always against cell phones, and I had to pay my own cell phone bill.... And all my friends were looking at me like, 'Ben, you're like the technology guy, why don't you have a cell phone.' I'm like, 'my mom's not paying for it and you just gonna have to call me at home'... And then I finally got one, and I don't know I was cheap and was going to the free, old phone (Ben).

Eve was another student who couldn't justify the cost of the cell phone herself, and

developed a philosophical mantra to justify not having the phone. "I was the only one who didn't have a phone and I created this whole, 'I'm anti cell phone' thing… Really it was just because I didn't wanna start paying $50 a month" (Eve). One student we spoke with even said that he had a cell phone, but stopped the service because the expense was not worthwhile. "Yeah, I had one [cell phone] for a couple of years, just I gave it up when I came to Berkeley. I figured... I don't know as I guess I wouldn't need it. And it was kind of like an unnecessary expense. But I'm probably going to get another one" (Luke). Luke was particularly unusual, and used calling card to make calls. Another student, Eliza had a mobile phone from her mom, but she gave her mobile phone to her little brother who is still in high school. "I figured once I got a job I would get it. But I kept putting it off and I don't want to spend the money... when I explain it to other students they usually understand because their parents pay for theirs" (Eliza).. Eliza also commented that "besides my mom would probably call me on it all the time."

The use of text messaging seems to be a direct function of the cost structure of American calling plans, and the length of time it takes to text message. Text messaging is sometimes used less frequently, or stopped all together because students find it too expensive. "Last year, I did [text messaging] a little too much, all my paychecks were going towards texting. It's fun, you know it's just like, your classmates can talk to if they like, 'Hey what are you doing, I am bored,' probably I'd say after that, 'Yeah, I am bored too'" (Kim). Many students had the unpleasant experience of getting a bill that was too expensive because of their texting. Jenny curtailed her texting habit mainly because of she went over her limit one month. "One month I went over my text limit, and so I stopped... I had seen my bill and I was a poor high school student... and my parents got mad at me, so I stopped" (Jenny). Angus said that text messaging was not worth the cost. "I text messaged once or twice but it wasn't really worth it. Like it took too long, and you had to pay for it" (Angus).

Raj went to high school in New Zealand and compared the differences in the pricing plans in the US and New Zealand and how that influence his text messaging habits.

> In New Zealand, everyone texts, no one calls... But here in the U.S I very rarely text. Just because everyone here has a calling plan. So because everyone here has a calling plan, you are using like, you are paying for minutes, right…So why pay extra like an additional 20 cents when you can call.... So in that respect like I don't even, I have no use for like text messaging (Raj).

The cost structure in New Zealand made calling prohibitively expensive, while the cost of text messaging in the US makes texting an unappealing communication choice.