Exploring How Parents in Economically Depressed Communities Access Learning Resources

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ABSTRACT
This qualitative study of parents in financially depressed communities in westside Atlanta examines parents' access to information technology and out-of-school learning resources through five dimensions of digital divide: technical apparatus, autonomy, social support, skill, and purpose. The context of this study is a broader research agenda to explore how technology impacts parents' knowledge and use of out-of-school learning resources for their children in low socioeconomic status neighborhoods. The findings contribute to a growing body of research on marginalized groups and provide a rich description of parents' digital access and technology practices in the context of education. Finally, we identify design implications that are specific to this community and can be extended to similar populations to support parents in finding more learning opportunities.

Author Keywords
Digital Inequalities; Digital Divide; Access; Informal Learning; Education; Social Capital; African American; Marginalized Communities; ICTD

ACM Classification Keywords
K.4.2. Social Issues

1. INTRODUCTION
I feel like good resources are always like a needle in a haystack. We always have to look for those resources. Like resources aren't out there being advertised like McDonald's - Maria (all names are pseudonyms)

This quote represents a problem many parents in financially depressed communities are facing when trying to find out-of-school, informal learning resources for their children. Parents are important facilitators for informal learning among their children [3], and how parents utilize technology to find resources and ideas for informal learning impacts a child's exposure and interest in education [16]. However, there is a gap in the literature about parents' use of technology in low-income families and their role as resource brokers for supporting their children's education.

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In this study, we focus on the access of African American parents in low-income neighborhoods in metro Atlanta, and reflect on the design opportunities to empower this audience to gain access to a broader array of educational resources for improving their children's educational attainment.

We propose that the first step towards understanding and designing for parents' access to informal educational resources is to move beyond a binary view of access (i.e., whether or not one has the technical means to access the internet). Instead, we seek to address this issue as a complex sociotechnical problem embedded in one's skill, practices, and cultural settings. Therefore, we adopt a multi-dimensional lens at digital inequality, as outlined by DiMaggio et al.'s five dimensions of access [13]. In their paper, authors argue that in addition to having the technical means of getting online, researchers also need to examine the degree of autonomy one has over their technology use, the social support they receive for continuous use, whether one has the required skills to effectively use the system to its full potential, and finally, whether they use it for the purposes that increase their financial, educational, or social capital.

Investigating the complex sociotechnical barriers of access through the lens of these dimensions, as well as investigating parents' roles in their children's education through interviewing 28 parents, this research provides insight on parents' use of information technologies, their everyday practices, cultural values, and the role of technology in finding learning opportunities.

Beyond issues of access, through the interviews emerged participants' current ways of exchanging information; the most significant of which was a close sense of community among parents and the focal role of parent-to-parent communications in finding and sharing information about the opportunities available.

We propose that a large portion of current informal learning resources and methods of accessing them have not been designed for the specific needs of low-income families who have traditions of low educational attainment. By investigating the design of accessible, culturally relevant sociotechnical systems that are specifically targeted at this audience, we seek to increase a more equalized access to the rich array of free and inexpensive informal learning opportunities.

While our research focuses on the realm of learning, it has broader implications for the Human-Computer Interaction (HCI) community. The main contributions of this paper are twofold:

1. We examine parents' access in financially depressed communities beyond a binary look at their "have" and "have-nots". Our findings contribute to a growing body of research on technically underserved groups and provide a rich description of their technology practices, cultural beliefs, and

perspectives on using technology as a way to access learning resources.

2. We argue that the design that would help increase parents' access to learning resources should be embedded in their current practices and needs. Our analysis of parents' technology-use along the five dimensions of access reveals several everyday practices woven in their local culture that can inform the design of new technologies. We identify design implications that are specific to this community and provide details for transferring the results to similar populations to support parents in finding learning opportunities.

We begin this paper by providing the motivation for our work and reviewing previous research regarding the digital divide, technology access among marginalized groups, and the role of parents in education and technology use. Secondly, we describe our research methodology and participants. Then, we present our findings through a framework of five dimensions of inequalities in access to information technology and emerging themes in parents' current practices. We conclude by framing the findings in a discussion of implications for the context of this paper: increasing parents' access to out-of-school learning resources for their children

2. MOTIVATION

Recently, there has been an explosion of courses and learning resources offered online. Khan Academy, Coursera, and Udacity are a few examples of Massively Open Online Courses (MOOCs) that have gained attention. There are also sandbox activities, educational games, and a broad expanse of news, blogs and other media that provide access to online play and discovery, important skills in shaping learners for the 21's century [23].

While these learning resources are frequently free, research suggests that due to unequal awareness of online informal learning tools, the way they are marketed, differences in cultural values of audiences, and their different levels of access, these free resources may be increasing the educational gap, privileging well-educated and the wealthy populations, and therefore, further broadening the gap between the rich and poor in terms of education and income [30,31].

However, there is a lack of research focusing on parents' role in facilitating access to these free learning resources for their children. We argue for the importance of addressing this topic since, while some audiences are able to navigate and critically evaluate online resources, the groups that may be in the greatest need (i.e., low-income and low-educational families), may have problems finding appropriate and effective learning resources [14]. We believe that this issue can be addressed through research on issues of access and technology use, and the design of systems that specifically speak to marginalized communities.

3. BACKGROUND

Access to information technology has gained attention from several different research areas. Social scientists have been reviewing the concept of digital divide for many years. Within the HCI community, researchers have sought to better understand access issues and their potential for impacting technology design among underserved populations. Parents, especially in the context of education, are among one of the most important emerging audience within the HCI research, and examining their technology use remains to be further investigated. In all of these contexts, social support and access to extended networks play an important role in shaping one's access to information technologies. In these sections, we reflect on some the previous studies along these lines and situate our work in the current research.

3.1 The Problem Formerly Known As The Digital Divide

Traditionally, digital divide has contrasted those who do and do not have access to computers with internet connection. However, this issue carries far more complexities [35]. By classifying technology users into one of these two groups, important factors such as context, language, education, community, and social resources are overlooked. The binary framing of the digital divide overemphasizes the presence of computing devices, instead of examining other important factors that contribute to the problem [35]. For example, in deploying low-cost laptop use in Mexican schools, HCI researchers found that creating the infrastructures needed to sustain the laptop use goes beyond simply providing the devices, and is dependent upon various sociotechnical issues around the context of community [8].

In their paper, *From Unequal Access to Differentiated Use*, DiMaggio et al. have framed digital divide by redefining the definition of "access" to include people's quality of information technology use from five aspects [13]:

1. *Technical apparatus* by which people access the Internet,
2. *Autonomy of use* when they get online,
3. *Social support* on which they can draw when facing technical difficulties,
4. *Skill* in effectively using the affordances of technology, and,
5. *Purposes* they use the technology for

This framework has been broadly adopted by social scientists and policy makers as a substitute for the previous binary view. Therefore, we positioned our research on parents' access through this lens as it provides a valuable tool in revealing hidden aspects of information technology use, especially among underprivileged communities.

Our work builds upon the existing research on underserved populations in the HCI community. Various researchers have begun to examine the effects of culturally relevant technology designs on marginalized communities both within the US (e.g., [26]), and in developing countries (e.g., [32]). In these cases, an in-depth analysis of the complex sociotechnical context of the community is crucial in the success of design. For example, when designing video games for children in rural India, Kam et al. [24] discovered that the game's design had to rely heavily on the values of the community in order for it to effectively engage the population. Additionally, this research emphasized the role that parents played in the adoption of certain games among their children.

Recent efforts have started to address the issues of digital divide by providing physical public spaces where young people can access computers. For instance, the Intel computer clubhouse network[1] provides access to computers and mentors to youth from underserved communities. The Come_IN project in Germany also addresses this issue by creating an intercultural computer clubhouse to provide physical access to computers for underprivileged social groups, particularly immigrant families [33]. Moreover, this project emphasizes the importance of integrating parents in the process as informal learning partners, for achieving a socio-cultural learning experience.

3.2 Parents Access to Information Technology

Parents play an important part in the kinds of learning opportunities children are exposed to. When studying children from suburban

[1] http://www.computerclubhouse.org

neighborhoods in the San Francisco Bay Area, Forssell et al. discovered that parents play a crucial role in supporting their children's adoption of new media technologies. Interestingly, the study revealed that, although parents may not be adept users of technological services, they still affect their children's degree of technological literacy [16]. However, constraints and attitudes toward technology differ among parents across different populations, further stressing the need for close assessment of variations in behavior and use [34]. For instance, in a study of teens' use of technology for informal learning, authors discovered that parents' distrust toward technology may restrain teens from finding informal learning opportunities in their extended networks [27]. Therefore, authors call for more investigations in parent's practices and values toward technology as a worthwhile research direction.

While parents are an emergent audience within the HCI community, to date research has explored parents' understanding and mediation of their child's digital lives [[1], [9], 38, 39] rather than their technology and information seeking practices to access learning resources for their children. In a study of parents acting as learning partners in the development of technological fluency, Barron and colleagues [3] found that parents play a critical role in creating learning opportunities for their children. Two parenting roles identified in the study, (1) *Learning Broker*, when parents seek learning opportunities for the child; and (2) *Resource Provider*, when parents supply resources beyond the family computer to the child, are closely tied to the parent's ability to effectively seek educational resources. Contrasting the findings from this research, which is focused on parents with high levels of educational attainment and income, with our findings on parent's access to informal learning resources in underprivileged communities, highlights the need to address differential access to online learning based upon education and income.

3.3 Social Support and Networks

The benefits of maintaining and drawing on a network of strong and weak ties have been well studied. Learning new information is more likely to happen through connections that are not embedded in one's close network [18]. This is because individuals within the same network are most likely to be exposed to the same sources of information. Therefore, establishing ties that would bridge the structural holes would increase one's chances of being exposed to new information and build social capital [18]. Social capital, commonly defined as benefits made possible by the existence of an aggregate social interactions and social structure, allows individuals to draw on resources from other members within their networks [11]. These resources can take the form of useful information, personal relationships, or the capacity to organize groups. Previous research has linked the ability to form strong and weak ties online to increased emotional and economic support [17]. Moreover, Burke et al. associate active use of online social networks with increased social capital and reduced loneliness [7]. In the context of learning, examining the effect of parents' social capital on their children's educational achievements shows that the ability to bridge social capital through parents' weak ties increases the opportunities available to children [14].

While some audiences are able to navigate and critically evaluate online learning resources, low-income and low-educational families' ability to access these resources is less explored. Thus far, neither research nor educational providers have deeply addressed these families' need to access online learning resources. A first step toward addressing this gap is to examine the issues of inequality beyond a binary view to unfold the cultural values and current technology practices present among parents.

4. METHODS

In order to study the detailed practices of this population, semi-structured interviews were conducted with parents attending different events at two different sites located in financially depressed neighborhoods in Atlanta. The locations, a middle school and a parent resource center, were visited during 2012 and 2013. We chose qualitative approach as this study was exploratory in nature. We wanted to examine parents' access to information technologies as well as their perspective and practices participating in their children's education. The five researchers conducting the interviews were all female and self-identified as white American, African American, or Middle Eastern.

4.1 Recruitment and Participants

Interviews were conducted with participants from similar populations at two locations. The first location was a public middle school whose population is 99% African-American and approximately 80% of them are economically disadvantaged. The second location was a parent resource center located in a public elementary school, where parents regularly dropped in to use computers, get information, and attend workshops. To recruit participants we introduced ourselves and asked if they would be interested in talking about their children's education and technology use for approximately 30 minutes. We informed them they would receive $15 in compensation. We interviewed 28 individuals who were acting as parents for children, but also included grandmothers and aunts. Of the 28 participants, there were 26 females and two males, all self-identified as African American. The greater number of female participants followed the same pattern of imbalance in parents' participation at the center and at school events. Recruited parents represented a diverse range of engagement level, from presidents of Parent Teacher Associations, to parents who rarely visited their child's school.

Interviews lasted between 20 and 90 minutes depending on the topics brought up by the participants, their availability, and interest in continuing the conversation. At the beginning of the interviews, participants were asked about the number of children they have and their ages. After this introduction, researchers asked a series of questions about technical access issues outlined by the five dimension of digital inequality introduced earlier. Participants were further asked a series of questions about their involvement in formal and informal education with their children, the role that technology plays in their child's education, and their expectations for their child's future. At the end of the session, we asked parents to answer a survey about demographic information such as their employment and relationship status, partners in parenting, and number of children.

Although we collected the data on the percentage of participants who were single or did not have a partner in parenting, we refrain from providing a numerical break down of this data. This is because during the interviews, we realized that the family structures and the division of parenting roles were often too complex to be captured by a quantitative representation. We realize that there is no single normal way to define what makes up a family, and therefore, believe that presenting the statistics may portray a flawed image of the community.

Interviews were audio recorded, transcribed, and coded based upon five aspects of digital inequality [12]. Table 1 outlines these five aspects of digital inequality with a description, an example of what qualified as an utterance relevant to that code, and the number of times that code was used in our analysis.

Title	Description	Example	# of codes
Technical apparatus	Talk concerning access to or limited access to technical means.	*"We really need another computer to get back online so he can get back to learning."*	122
Autonomy /Child Autonomy	Talk concerning institutional, social or parental limitations, or open use of technology.	*"So, he doesn't* [use Facebook] *because I know how to check."*	206
Skill	Talk concerning skill in using and trouble shooting problems with technology.	*"The computer has a different system you have to update. That gives me a hard time."*	167
Social Support	Talk concerning social support for using or trouble shooting technology.	*"They were real good with me, because momma's the dummy right here."*	115
Variation in Use	Talk concerning varied or limited purposes for using technology.	*"I might use it for shopping and just to look up general information."*	309

Table 1. Code descriptors for inequality in digital access

Two researchers coded, refined codes, and trained on coding reaching .80+ inter-rater reliability on 20% of the interviews. Inter-rater reliability is reported using Cohen's Kappa statistic—Cohen [10]. Landis and Koch [25], suggest that kappa values of: <.20 = poor agreement, .21-.4 = fair agreement, .41-.6 = moderate agreement, .61-.8 = good agreement, and .81-1.0 = very good agreement. The authors then reviewed the groups of excerpts for each code in order to identify patterns in the context of digital access.

5. FINDINGS

In this section, we first present our findings organized by DiMaggio et. al's five dimensions of digital access as a framework to investigate digital inequality among a community of parents in a financially depressed neighborhood. Then we move forward by reflecting on some of the emergent themes that came up in the interviews when we asked parents about the way they usually find out about out-of-school resources.

While our participants are all African American parents from the west side Atlanta, they represent a diversity of ages and levels of expertise regarding technology. Our findings serve to provide empirical evidence to present a rich and realistic account of the community's online practices, and help us avoid making assumptions about the community. These descriptions are presented to inform future design for financially depressed communities. It is important to note that all of the parents who interviewed with us, even when they did not or could not access learning resources, expressed a great desire to help their children, and education was a big part of the goals they had for their children. We would like to emphasize that our findings do not present a critique of parenting skills. Instead, we are trying to provide a realistic image of how technology practices impact a population's access to learning resources.

5.1 Technical Apparatus

DiMaggio et al.'s first dimension of digital inequality, technical apparatus, deals with the physical availability of suitable technical means that provide effective access to online tools. In this section, we examine the technologies currently in use by participants, their access to suitable hardware and software for connecting to the internet, and the speed and bandwidth of their connection. Examining this dimension reveals more than basic accessibility of technical means and provides us with insights into unique characteristics of the community, which are discussed in the following sections.

5.1.1 Technical Mediums of Access

One of the aspects of technical apparatus is having access to the necessary hardware to get online. Participants reported a widespread adoption of smartphones. Twenty-four (85.7%) of the participants we interviewed owned smartphones and twenty-two of them (78.6%) discussed having internet connectivity on their phones. Five participants mentioned connecting to the internet on portable devices other than cellphones (such as tablets); in these cases the portable device was mostly used by the children. Finally, all but three of the participants had a laptop or desktop computers at home (89%), although the device was usually shared among the members of the family (this is discussed in following sections).

Several of the participants mentioned a higher level of comfort and preference connecting to the internet on laptop or desktops. Issues such as difficulty of interacting with a small display were among the reasons mentioned. However, all three participants who did not own a computer at home owned smartphones with internet connectivity which they used as their primary means of connecting to the internet. In these cases, the smartphone was often used as a shared device for the family, specially the children who used the smartphone to browse websites or play games. One of the participants who shares her smartphone with her two preschoolers describes this issue in the following quote, and further explains that she is often forced to use the computers at the parent center as a result:

> *My kids will be on my phone trying to do technology, pull up games, YouTube, and all that other stuff… They're always on my phone.* (Quinn)

Interviews show that, cell phones, which are often considered a personal device, are frequently used as a shared device among participants and their families.

5.1.2 Technical Apparatus and Security

In addition to having access to physical means of connecting to the internet, access to effective software constitutes another aspect of technical apparatus. One issue that limited the use of internet services among many of our participants was the fear of cyber attacks and unwanted malwares. The fear of these threats was intensified by the fact that the majority of our participants did not have appropriate antivirus software to protect their devices against such threats. This concern often deterred them from visiting unfamiliar websites. This was especially important in situations where participants' families owned one computer system, a common situation for several families with low income. In these situations, the participant could not afford to lose their system, and therefore, restricted their use of computer to avoid possible attacks.

One example of this self-regulation of services can be seen in *Mandy*'s reflection on her activities online. Mandy is a mother of

five school-age children, she is working toward an online degree, and the whole family shares a desktop computer.

> *I have to be careful and mindful who's on my computer and what they're getting on in the internet, because my Norton Antivirus Protection is expired. I no longer take emails that I don't know anything about, because that's like the only computer we have.* (Mandy)

This example, and other participants' experiences, demonstrates the limitations that participants may impose on themselves and their children, even when the means for connection were available.

5.1.3 Internet Connectivity

The third aspect of technical apparatus is the quality of internet connection (e.g., speed or bandwidth). Despite the diverse age range and technical experiences among participants, the majority of them discussed having high-speed internet connectivity in their homes, and the majority of them used the internet on a daily basis. One participant also mentioned having a hotspot that they used to have internet connectivity in different places.

5.2 Autonomy

Although having the technical means is necessary for connecting to the internet, it does not guarantee an effective use. Autonomy of use refers to the degree of control and flexibility one has over their internet use. The more autonomy one enjoys, the more one has power over where, when, and how she wants to access the internet. Issues such as time limitations on a shared device, using public devices, and filtering on the kinds of services available on a network impose restrictions on one's autonomy.

5.2.1 Use of shared devices

Owning a device that is exclusively used by an individual increases one's degree of autonomy. Participants indicated that it was not always possible, due to financial issues, to provide personal devices for each member of the family. A majority of participants shared a computer (or sometimes their smartphones) with their children. This is inline with the findings of previous studies on the technology use of low socioeconomic status families [39]. Although all participants had the technical means to get online, only two parents had a computer they could use exclusively. Therefore, a majority of participants were not able to use these devices whenever and however they needed to. This issue was brought up in several of our interviews:

> *I'm like the odd man out. 'I'll get it when you all have gone to bed or I can use it when you're at school or something like that.'* (Tessa)

> *Everybody* [uses the computer]. *(Laughter) Family of six people!...(Laughter) It's a fight for it. The children use it more than the adults.* (Veronica)

These excerpts are a subset of numerous stories shared with us explaining the challenges and tensions cause by sharing devices among family members.

5.2.2 Use of Public devices

Several of the participants interviewed used the computers at the public spaces such as libraries or parent centers. This use of public devices was prevalent even among the participants who owned a computer at home. Using public devices enforces various restrictions on when, where, and how one is able to use online services, which consequently decreases the autonomy in use. This issue was particularly intensified in this community, as many parents do not own a car and rely on public transportation. Furthermore, most of the parents interviewed worked outside the home, which imposes further limitations on the time they can visit such facilities during their hours of operation.

Sylvia, a working mother of two, talks about the issues she faces using the computers at the library as she does not own a computer at home:

> *I do some time* [go to the library]. *It depends, you know, on what time the library closes… it is much better than on your phone*. (Sylvia)

Sylvia goes on to explain that she tries to go to the library twice a week and she is able to use the computers for 30 minutes each time. The issue of limited time was brought up by other parents as well. Sherri, a full-time working mother with 4 children, explains this issue in the following quote:

> *You go to Atlanta Public Library and you only get like an hour. So, you're maybe lucky to get maybe extended time at some periods of the day if people are not in the library waiting to use the computer* (Sherri)

However, not every parent is able to incorporate regular visits to public facilities into their busy schedules. For instance, Mandy has one computer at home, which she relies on for taking online courses. Therefore, she does not trust her children with her computer due to the danger of cyber attacks mentioned in the previous section. She explains that she often faces difficulty taking her children to the library to use the computer facilities:

> *If we have time, we go to the library. But normally, I call the teachers and say, 'Look, their access is limited,' because he has a lot of stuff he has to type up.* (Mandy)

In addition to the issues surrounding the accessibility of these places, participants face limitations while using the computers as well. Several online resources, including social networking sites and online games, are restricted on public networks at libraries or schools. This imposes further limitations on the autonomy of use among participants who rely on using these services to get online.

5.2.3 Limiting Children's Access

One finding from our interviews was the percentage of participants (75%), who shared the concern to limit their children's access to online services. Part of this was regarding their concern about the vulnerability of their children toward online threats and the desire to keep them safe, and the other part was due to the risks of viruses and malwares that could affect the performance of their devices. The following examples illuminate participants' feeling of mistrust towards different online services that are available to their children:

> *They really don't recognize the dangers that are out there as far as predators and things like that. . I'm pretty vigilant about walking past to glance and see what site they're on. If I'm unsure, I will even stop and take the mouse and navigate to see what's there.* (Teresa)

Olive, a working single mother of four, expresses her concern about viruses as her primary reason she does not allow freedom of use to her children regarding their only computer at home:

> *They have to come ask me first and tell me what site they're going on. So, if they want to play a game or anything, because viruses picks up easily*. (Olive)

However, the restrictions imposed on children due to these concerns were sometimes very broad:

> *I try to oversee the sites that they try to navigate on, from downloading material they know nothing about. I try to explain to them what a warning certificate is all about. I just had to get*

*rid of a virus twenty days ago. My whole computer crashed. So, it was one of those sites that offers all of these games or whatever. As soon as you clicked on it, the viruses just like, Boom! (*Teresa*)*

In these cases, participants restricted their children's access to a broad range of online services that would include several educational websites and games as well. This is inline with research on teens' use of internet and social media that shows parents' concerns toward technology may work as a barrier for some teens to reach into extended networks and support their informal learning activities [27].

5.3 Skill

In addition to technical apparatuses and autonomy, technical competency plays an important role in understanding online inequality. Having the right technical skills closely affects the degree to which people successfully find information online [19], in addition to impacting the types of activities they perform [20].

5.3.1 Identity and Technical Competency

Although the majority of participants used the internet on a daily basis and demonstrated technical skills in various tasks, most of them chose to identify themselves as "not a tech person" during their interviews. For example, Vanessa, a working single mother of one, uses online tools to find math problems for her fifth grader and is on both Instagram and Twitter. Although she demonstrates good search skills and often helps other parents at the center with computer-related issues, she does not think that she "knows much".

I'm the go-to person. Little does she (another parent) *know, I'm not even the one that actually knows much. But I just end up figuring it out all the time* (Vanessa)

This instance represents a common theme among the participants and help us understand the disconnect that may exist between participants' perceived technical literacy and their actual capabilities. This was particularly significant in using tools that carried a *high-tech* profile or was commonly associated with a younger user audience with a higher level of technical skills. For instance, Instagram was among the social networking tools several of the participants associated with their children and did not consider themselves capable of using.

In addition to Vanessa, seven other female participants who demonstrated strong technical skills identified themselves as novice users. However, we did not observe the same issue in either of the male participants. We had far too few male participants to draw a conclusion, but these findings are in line with prior studies that show women often have a lower estimation of their technical skills [21], which negatively affects their online behavior and the extent to which they use different online services.

5.4 Social Support

Social support is an important factor in continued use of online services. This is particularly important for non-expert users who may need help with the tasks they perform. In these situations, receiving help with technical problems may decrease participants' frustration and guarantee a rewarding experience that motivates them to continue using the technology. In this section, we examine participants' support with regards to this dimension.

5.4.1 Relying on Strong Ties and Peer Support

The majority of participants mentioned experiencing technical problems with their devices at some point or needing help with performing certain tasks. However, few participants mentioned seeking help from professional technicians. The majority of participants stated relying primary on their strong ties (i.e., family members including their children, or close friends) as their go-to-person when in need of technical support:

[About her children] *They're teaching me…they were showing me how to go to different websites. I was able to order some stuff, like I was able to get on that Walmart website and order something.* (Karin)

My older brother. I call him a lot. He's a programmer. So, anything that I need as far as technology is concerned I can call him. (Teresa)

However, the circle of immediate friends and family may not be enough to support participants, since they may have the same level of expertise. As Alicia, a working mother of one, puts it, "everybody's pretty much the same". This lack of support may result in frustration, and discourage parents to continue using services they have problems with.

I haven't even really looked into asking anybody for help. If I have an issue, it's just that I really don't do anything. I don't have anybody to go to. (Mandy)

However, it seems that the main source of support, outside the immediate circles, is drawn from other parents at places like the parent center.

[The parent center] *is just somewhere you would come like if you just need a little help with the computer.* (Pattie)

5.5 Variations in Use

Although individuals may have the same level of technical apparatus, autonomy, skill, and social support, they may use the internet for completely different purposes. Different uses of internet services vary greatly in the amount they increase or decrease one's opportunities. To this end, DiMaggio et al. put a particular emphasis on distinguishing between various uses that increase economic welfare and political or social capital, and those that are merely recreational.

5.5.1 Information Seeking and Education

Nearly all participants mentioned using search engines for finding information online. However, although all participants cared deeply for their children's education and expressed high educational and career goals for them, when asked how they found learning resources for their children, only a few mentioned searching for them online.

Based on the interviews, the number one source for finding new learning opportunities was through teachers at schools or via informal word-of-mouth through interacting with other parents and parent liaisons at the parent center. Thirteen participants (46.4%), mentioned educational websites such as *Study Island*, a school district endorsed website providing exercises, quizzes, and games categorized by subject and the student's grade level. Study Island was introduced to parents through the public school system as the primary online educational tool used by their children.

One of my daughters was having problems in social studies. I watched her grade improve a little. It's by her studying every day for an hour extra. So, that's what I really do, Study Island. It helps a lot with the kid. (Joyce)

Parent Portal, introduced by the Atlanta Public Schools system, is another tool for tracking children's performance at school. However, most of the parents seemed to lack motivation to use the portal regularly. In several cases, participants reported allowing their children to log on the parent portal instead and self-report their

grades. Alternatively, most parents preferred to monitor their children's performance through direct interactions with their teachers and asking them how their child is doing.

5.5.2 Social Networking Sites

Social networking websites play an important role in expanding one's social capital and exposing them to new resources. Studies have demonstrated that taking advantage of the ties on social networking sites may expose individuals to a broader range of opportunities [5], and research on teens' use of social media suggests the same pattern in the contex of informal learning resources [27].

A high percentage of participants (82.1%) used social networking websites, with Facebook being the most frequently used. However, their reported use of these sites does not indicate they are engaging in developing social capital. Many of the participants used social networks mainly for passive consumption of information.

> *I might just glance to see what's up. I'll be on there looking at what folks wrote down. I look at the people's pictures on Facebook. I look at everybody's stuff and I'll be like, "Okay."* (Quinn)

> *I just browse. I don't do anything with it, but I do have a Facebook page. Yeah. Go through and see what's going on.* (Olive)

Studies on the role of Facebook on social capital show that passive consumption of information has no effect on bridging social capital [6]. On the other hand, active engagement in these services has the potential to facilitate networking, expand one's social capital, and increase one's access to different opportunities. For instance, Yazmeen, a widowed mother of two, explained to us that she was able to find a job through Facebook, after three years of searching through job-searching websites.

> *I have my job websites linked up to my Facebook and they'll link jobs to me that they're not linking to my email or they're not posting.* (Yazmeen)

However, such uses of social media were very rare among participants. Studies on a similar population in Detroit also show the same under-use of social platforms for increasing financial mobility among economically distressed populations [12]. Authors suggest lack of social connections, or the mental model that would link these platforms to such uses, as possible reasons.

Among participants, there were multiple instances where parents wanted to advocate for their community. For instance, Tillie is very involved with her children's school and is concerned about the educational inequalities at school. She is often trying to figure out what services are available to the schools in more financially advantaged neighborhoods that are lacking at her child's school, and demanding them from the principals.

> *I could spend the whole day on the computer just checking. I'm one of those kinds of people that will email you to death! If something's going on at school that I see, I'll email the principal or his boss. My girlfriends have kids who go to school on the north side* [a wealthier part of the town]. *They have a whole different issue than kids on the south side of town. Why is that? It's the same school system.* (Tillie)

However, Tillie does not use social networking sites as a platform to reach out to the community about these issues.

> *I don't understand that whole concept* [of Facebook]*... Or that LinkedIn. They're just too much. When I see it, I just delete it. I don't even go check it.* (Tillie)

Similar advocacy incentives were mentioned by other participants, which closely match the affordances of social networking sites, yet there were not any mentions of such uses by participants.

5.6 Parenting and Education: It is a Collaborative Process

One of the main emerging themes in the interviews was the degree to which information about educational resources was received and shared through informal, often face-to-face, interactions with the members of the community. In this section, we reflect on this theme from two different aspects: the communication dynamics between parents and the school system, and the interactions among parents within the community.

5.6.1 Dynamics of Parent-Teacher Communication

As described earlier, teachers can serve as important resources for learning about educational tools. Most parents described having regular communications with their children's teacher to monitor their child's progress, which exposed them to educational resources for their children as well. However, a subset of parents indicated anxiety about communicating with teachers in the higher grades such as high school. Joyce highlighted this feeling by comparing her communication with her daughters' elementary school teachers and her son's high school teacher:

> *Well, my son is in high school. I'm not pretty much as hands-on as much as I am with the girls, because I just feel like I just can't have a relationship with some of his teachers because they're different to me than the elementary teachers.* (Joyce)

Parents suggested that one reason for this difficulty in communication is a perceived difference in education. Parents indicated they consider themselves to have less authority or knowledge than the teachers. During her interview, Tillie described this situation:

> [Parents] *get intimidated when they don't know. When the teacher's talking to them and they say certain words, they can't figure it out. Or the kid comes home with homework and they can't do it, and they can't figure it out, they don't know how to get the help.* (Tillie)

However, as demonstrated in the following section, these tensions were contrary to the feelings expressed regarding interactions with other parents.

5.6.2 Parent-to-Parent Ties

One of the characteristics we observed among participants was the close ties among the members of the community at the parent resource center. Several of our participants mentioned coming to or volunteering at the parenting centers at their children's school while their children were in class. Furthermore, participants were very welcoming toward outsiders like us and it did not take long before the researchers were receiving warm hugs upon each visit and getting invited to their workshops and neighborhood events:

> [The Parent Center] *is really like a family. We call it 'the house'. You do have that support system, because as we go through this thing called parenting, peer support is important... When it's another parent talked to a parent, we can relate on a whole different level.* (Amanda)

As Amanda, a working mother of six, points out, parents within the community value support from their peers. Peer-support and informal interactions are important ways participants learn about new resources available to them. Twenty-three participants (82.1%) mentioned learning about educational resources through offline word-of-mouth. Many participants mentioned exchanging parenting

advice, as well as technical support, with other parents they met through the centers. They were often eager to reach out to other parents to share their knowledge and expertise about issues that were of common importance to them.

6. DISCUSSION

The goal of this study was to provide a rich description of parents' access to information technology and learning resources in economically depressed communities in westside Atlanta. Using the framework for examining digital inequality in terms of technical apparatus, autonomy, social support, skill, and purpose, we not only gained insight into issues of online access, but also learned about participants' broader technical and educational needs. In examining the findings, we found significant trends that may help researchers design more customized resources for this, or similar, communities. In this section, we discuss some of these trends before moving on to the design inspirations they carry.

6.1 Technology and Trust

One of the most common trends observed among participants was the extent to which they limited their use of online services, as well as their children's access to different websites, not only because of the content of those services, but also because of their concern about unwanted viruses and malwares that could break their devices. These concerns were warranted because their devices were not robust and there is a high cost associated with losing a device. However, we did find that participants would utilize resources introduced to them through other parents or trusted entities such as their child's school.

For educational resources to become embedded in participants' lives, future designs should consider this sensitivity and incorporate features that gain the trust of the community. In addition to providing resources through trusted groups within the community, one possible solution for gaining trust is to model the design of online resources after the sites participants already use and trust. Ensuring that new services designed for participants will not damage their devices increases their willingness to adopt newly introduced resources.

6.2 Finding the Right Medium

We argue that finding the right medium of communication that closely matches the specific needs and the cultural values of the community is the key aspect in designing a useful and viable platform of communication that would be broadly adopted by the parents. Here, we examine this issue from two aspects: finding the right *technological medium* or platform, and finding the right *communication medium* that supports the type of communication needed or valued by the community.

Based on our analysis of parents' access, smartphones are among the most largely adopted devices within the community. In some cases, the smartphone is the only means of getting online and is used as a shared device among the family. This is inline with patterns reported among other low-income communities in urban areas [[26], 37]. However, despite this broad adoption of smartphones, an exclusive mobile solution might not be the right means of reaching this audience. While many parents had smartphones, few used them as their primary means of accessing information online due to the phones' smaller screens. Even among parents who did not own a personal computer, there was a tendency towards using computers at public facilities rather than a smart phone. Furthermore, mobile devices were frequently used as shared devices, hence they may afford limited autonomy, including less privacy than a computer system where one can create multiple individual accounts. This capability is usually not supported in mobile devices because they are designed for personal use. Therefore, while designing for a smartphone platform is promising because of the broad use, the information seeking practices of our audiences with smartphones and computers suggest that desktop computers have great potential as well and should not be overlooked by the designers for this audience.

Beyond technological medium of communication, the study brought forward the type of communication (the communication medium) that parents preferred when communicating about parenting. Parents expressed a strong interest to share and learn from each other about parenting. The parents also indicated they would prefer to communicate their parenting expertise in narratives and stories of their own experiences.

In many cases, the motivation behind this interest was to advocate for change for the community. Parents were invested in the prosperity of their community and saw sharing their narratives as a step toward solving community issues. This is inline with the critical role of story telling in similar social justice efforts [4]. Further evidence for a desire to share narratives showed itself through parents' enthusiasm to discuss parenting topics in our interviews. Several of the interview sessions lasted far longer than we anticipated due to the participants sharing stories about their everyday lives, reflecting on parenting, and the importance and challenges of being involved in their children's education.

In Come_IN clubhouses, similar interests in telling stories of the neighborhood were used to motivate engagement [36]. Future design within this community, and similar ones, should also build upon this interest for sharing narratives and provide a platform that supports collective story telling in a safe and collaborative environment. This may be an additional reason for the importance of personal computers in the design (compared to a mobile-only solution or app), as they may provide greater affordances for sharing long narratives for some users.

6.3 Motivation

As one of the parents puts it, "It's not as much the ease of the tool as the motivation behind using the tool". As described in the findings, parents were reluctant to check the parent portal on a regular basis. Further research is needed to find the reasons behind this reluctance; however, one possible reason may be that the parent portal is a one-way channel from schools to parents, which does not provide a channel for further interactions or deeper engagement by parents. Furthermore, Parent portal is frequently a list of assignments and grades that are sometimes weeks behind students' progress. The lack of consistent and meaningful content may contribute to limited engagement from parents as well. This is inline with previous research that shows community members must be active participants in content production in order for technology to engage low-income communities [29].

Another reason why the parent portal is not adopted broadly among parent could be parents' concerns with other, more basic aspects of the everyday life. As one of the parents puts it, it may be hard for parents to "focus on the things that they desire to do as opposed to something that they have to do" in an economically challenging situation. When one's mind is occupied with concerns about providing basic needs of their family, other things are inevitably pushed to second priority, no matter how important they may be. This is inline with the findings from a similar group of parents in low income families where researchers found that although parents perceive monitoring their child's social media use to be very important, they were often too constrained by first order necessities of life to put a high priority on the issue [39].

Therefore, designs for this and similar communities should put a great emphasis on two-way engagement and build itself around the everyday needs and practices of the parents and the values they hold. The parent center is a good model for this. It is a public school initiative with an academic agenda, but they offer much in terms of social services and resources to parents as well. This engages parents based upon their needs and interests, and further provides a space for them to share learning resources as well.

6.4 Mediating Teacher to Parent Communication

In addition to other parents, teachers constitute an important part of participants' social networks and are an important source for finding about learning opportunities. While many participants communicated regularly with their children's teacher, some also mentioned feeling apprehensive about this relationship. This was particularly true for communicating with high school teachers.

Similar to enhancing parent-to-parent communication, empowering participants to communicate with teachers may serve as a critical strategy for connecting parents with more learning resources. One possible strategy to enhance this communication may be to provide a platform that mediates information flow from teachers to parents and allows parents to engage in conversations with teachers and other parents in the community while being able to choose customized level of anonymity toward each group. Future research should address balancing the power dynamics by investigating platforms that provide parents with a safe and comfortable space to participate.

7. DESIGN INSPIRATIONS AND FUTURE WORK

In this section, we reflect on the design inspirations gained from our study, justify why they might address the specific needs and challenges this community is faced with, and elaborate on some of possible directions for future work. We believe that improving parents' access to a broader set of learning opportunities calls for technological interventions and design efforts from information retrieval experts and educational technology designers, as well as developing a platform for more systematic engagement from within the community where parents can find more information through story sharing and informal communications. We further elaborate on these two directions in the following sections as *top-down* and *bottom-up* design inspirations.

7.1 Top-down: The Role of Learning Providers

Most of the participants mentioned using search engines and social network sites on a regular basis, yet very few parents found educational opportunities through independent online searches or from their extended networks. While parents showed great investment in their role concerning children's education, in most cases, they were not seeking resources for out-of-school learning; resources that make up a critical part of children's learning experience [2].

While further research is needed to examine why parents are not taking advantage of resources out of their immediate network, issues of access indicate some factors. Previous research shows that low-income and low-educational families are not able to find the broad array of online resources for technical fluency, such as computer science related courses or programming languages, because the search terms they most commonly use are not the same as the terms that informal learning providers use in meta tags or keywords for their products [14]. This difficulty in finding related resources was reflected in interviews as well, such as the quote from Maria at the beginning of this paper.

These disconnections in vocabulary and communication highlight the type of changes that need to be made in the design of such resources. Design implications from these findings suggest investigating the search keywords parents are most likely to use when searching for learning resources for their children's interest, and creating custom tag labeling structures for online educational datasets that matches parents' keywords. This change would be top-down, in that it would be dependent upon developing a stronger communication among informal learning providers such as museums, afterschool programs, online tutorial providers, and educational technology producers. It would also be dependent upon a shared goal of reaching a diverse audience of users. We further see value in providing tools that would facilitate parents' search practices by automatically augmenting their keywords through suggesting terms that would provide them with a broader array of resources in their search results.

7.2 Bottom-Up: The Role of Community

Our analysis of this community shows that parents currently find learning opportunities through their relationship with the school system (e.g., teachers) or other parents within the community. One unique characteristic in this community is a close bond among parents. Particularly the parent center we worked with fostered a feeling of family among visitors and even toward us as outsiders. Many parents come to these centers to use the computer facilities, participate in workshops, or just chat to the other parents and parent liaisons at the center. Parents within the community are willing to both provide and receive advice and peer support about parenting related topics. While this openness to sharing parenting practices and receiving advice from other parents may be unique to this parent center, it serves as a model for culturally relevant design solutions with other parents who do not visit the center or other communities that have similar values.

Currently there is no specialized online community for these parents. An online platform could leverage the community ties and provide asynchronous and documented discussions that do not suffer from the shortfalls of relying on informal, accidental encounters for sharing information. In addition, an online community may reach more parents that are currently left out of offline discussions.

Based on the close bond among the community, and the willingness to communicate, we see a great opportunity for platforms such as online hyper-local networks that build upon the existing ties among the community. We envision a hyper-local network that is geographically based, serving as a way to increase parents' ability to create and utilize the affordances of weak ties, as well as enforcing their existing strong ties.

In recent studies of hyper-local social networks, such as Nextdoor (a social network for neighborhoods), researchers found that these networks have a positive role in enhancing existing community engagement already present among members [28]. Therefore, to support current gatherings and in-person interactions which are necessary for the strength of community, developing an online space where parents can share their stories and expertise with each other may help make the process more systematic and documented. Furthermore, it would reach a broader group of parents beyond those who participate in offline gatherings.

This solution may overcome the chaos associated with general-purpose social networking sites as well. Although having access to a wide range of information through the social networking sites such

as Twitter and Facebook is valuable and well studied, the abundance of information in these general-purpose social networks may be "just too much" for parents. A more specialized network focused on the issues surrounding the community may be more desirable. Studies have shown that using Whooly, "a web service that provides neighborhood-specific information based on Twitter posts" was both easier and more desirable for finding hyper-local information [22].

Moreover, the locality of information in a hyper-local network helps parents to find information that is geographically accessible, which is particularly important for low-income families with limited transportation access.

We believe that this solution may also address parents' concerns toward security and trust when interacting online. Based on our findings, parents are more likely to use the services that are introduced to them through other parents or the school system. In addition, research has suggested that the close match between the online and offline profiles in a hyper-local network provides a degree of accountability that may result in higher level of trust among the members [27].

The design and deployment of a local social networking site may conquer the deficits associated with school districts' current parent portals. An online community provides a two-way, interactive communication channel where parents can actively engage in conversations around parenting topics and contribute to them, as well as receive information from other members. This may provide a more natural setting as it is augmenting what is currently happening offline.

Studies on ways social capital can be fostered in low socioeconomic status communities where little or zero social capital exist underline the importance of connecting people with bridging ties to those with more resources [12]. In the context of our study, teachers and parent liaisons are among key people who know about a broader set of learning opportunities. As discussed earlier in the paper, there is already a great reciprocal motivation to connect and a high level of trust between parents and parent liaisons, but in some cases there are tensions communicating with school systems or vertical links with higher authority levels. Accounting for power dynamic issues in parent-teacher relations discussed earlier, the role and position of teachers should be further examined in this space. Teachers can provide a great added value to the quality of resources shared in the community and their presence in the online community may be of value. However, there may be trade-offs for teachers' participation that calls for further research.

Finally, to support for the needs and concerns of the community, the designed online community should provide an infrastructure for discussions around learning resources, and yet be flexible to be appropriated by parents for other discussions around parenting, community change efforts, and social services that may be of value to the community.

8. CONCLUSION

Access to information technology plays a critical role in improving one's educational attainment, economic status or social capital. It is often assumed that, beyond technical means, access to information technology is free; however, this is far from the case. The five dimensions of access to the digital world highlight that access can come at a high cost. Issues that surfaced in our analysis, such as reliability of technology, social support from strong and weak ties, and finding a medium matching the practices of their everyday lives, have design implications for our broader research goals as well as others working with similar communities. In addition to revealing significant trends that may contribute to design, the findings revealed that this population would greatly benefit from technologies that have been customized to meet their specific needs.

As all researchers and designers do, we came to this project with some biases and a goal, to develop an online resource built upon previous research and our experiences. In conducting this study many of our findings validate previous research with similar audiences and may not be surprising. In other cases, such as our original hunch that smartphones would be the centerpiece of the design, the findings such as the desire for narrative communication directed us to unexpected inspirations. We argue for the importance of both of these types of findings when designing for less traditional audiences and populations that have been historically understudied within the field of HCI.

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