The “Comadre” Project: An Asset-Based Design Approach to Connecting Low-Income Latinx Families to Out-of-School Learning Opportunities

Alexander Cho

Department of Informatics
Connected Learning Lab
University of California,
Irvine
Irvine, CA USA
choa8@uci.edu

Roxana G. Herrera[†]

University of California,
Irvine
Irvine, CA USA

Luis Chaidez[†]

University of California,
Irvine
Irvine, CA USA

Adilene Uriostegui[†]

University of California,
Irvine
Irvine, CA USA

ABSTRACT

Participation in out-of-school learning programs has been shown to generate significant academic, social/emotional, and institutional benefits for young learners, and today’s wealthy families are disproportionately reaping these benefits. This paper presents the results of an asset-based/human-centered design research process and pilot aimed at connecting low-income families in a Southern California city with local low-cost out-of-school learning opportunities. Based on background research including qualitative interviewing, home visits, technology inventories and use walkthroughs with 40 low-income, majority Latinx families, we created and piloted a free subscription SMS service that automatically pushes bilingual SMS messages with curated information on local low-cost enrichment learning opportunities to low-income families. We framed our human-centered design process through an intersectional, “asset-based approach,” which recognizes that marginalized communities have already developed robust, culturally-specific social practices to enable them to navigate the world, seeks to amplify them, and refrains from imposing a top-down or pre-conceived “idea” of intervention.

KEYWORDS: Human-centered design; Hispanic; SMS; women; education; informal learning; asset-based; appreciative inquiry

[†]Undergraduate research assistant.

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1 Introduction

Recent research in the fields of education and learning science has focused on the value of after-school or out-of-school informal learning environments—venues or programs such as robotics clubs, coding camps, fashion camps, maker spaces, or even online affinity spaces [1, 2, 15, 29, 73, 67]. These types of learning environments and activities are important because, as opposed to the traditional rote dynamics of a classroom setting, the most resilient and effective learning involves activating the learner’s individual interests as well as their social supports. These educational experiences enable what has been called “connected learning,” a model of learning that is socially-embedded, interest-driven, and oriented toward educational, political, or economic opportunity [37]. Unfortunately, in the United States, out-of-school learning programs of this sort are precisely where we see an exponentially-widening equity gap—wealthy families are outspending low-income families at quickly-increasing rate, and their children are outpacing low-income children in this experience [37]. This has powerful future implications, as the “21st century skills” that these experiences develop in young people have been shown to be crucial for future academic and career success [78].

In this paper we describe a blended design process aimed at discovering and amplifying a low-income community’s assets in relation to their connections to local brick-and-

mortar informal learning organizations with the hope of increasing families' participation in them. Rather than view these families and communities as inherently deficient, we structured our design research process around identifying organic, community-specific assets that we sought to understand, replicate, and amplify using digital tools [35]. An "asset-based" model of designing for equity recognizes that marginalized communities have already developed robust, culturally-specific social practices to enable them to navigate the world and refrains from imposing a superimposed idea of what an intervention should look like [50, 19]. Although some aspects of this approach have long influenced traditions of human-centered design, such as leveraging existing mobile device use for dissemination of health information [49, 38, 28], this study represents a new contribution to CHI literature since, to date, very few studies or pilot ICT deployments have explicitly engaged with the "Asset-Based Community Design" framework as borrowed from the field of community development studies [43]. Additionally, this work, including this blended methodology, directly responds to Yardi and Bruckman's call to the CHI community as one possible way to better understand how to design for minority groups in the US [71] and Schlesinger et al.'s call for Intersectional HCI [63, 69].

Accordingly, throughout our asset-based/human-centered design process, we resisted the idea of designing for a generic "low-income" user or a generic "parent." Instead, we take into account intersectional aspects of identity, such as gender, race/ethnicity, and language, in addition to income [18]. Given the specific community in which our team and institution is based, our recruitment of low-income families who were nevertheless succeeding to various degrees in connecting their children to out-of-school learning meant that our participant population and design audience was primarily Latina women, the primary information seekers and logistical managers of their children's informal learning activities, who were first- or second-generation immigrants, and spoke either Spanish or English with varying levels of proficiency.

The women who informed our study were moms who shuttled their kids to after-school classes and camps, the moms who managed the family schedules, who made sure everyone was where they needed to be when they needed to be there, who interfaced with their children's schools and teachers, and who navigated the sometimes confusing and decentralized landscape of information in their effort to identify the best possible and most affordable enrichment learning activities for their children.

Our design outcome, internally-codenamed "Comadre," is a novel SMS subscription service that periodically pushes text messages with information on free or low-cost local out-of-school learning opportunities to low-income Latinx parents. The 10-week pilot deployment showed strong promise in helping to connect these families to out-of-school connected learning opportunities. We also believe that anyone looking to design HCI-related interventions for specific communities can benefit from considering an asset-based approach.

2 Related Work

2.1 Asset-Based Community Development, Appreciative Inquiry, and Human-Centered Design

A main contribution this paper makes is its outlining of a blended design approach to building tech for equity in the field of informal learning. We call this an asset-based/human-centered design approach, geared toward discovering and amplifying existing community assets. This process draws from three bodies of literature on research and design method. This literature shares a commitment to ethnographic work; primary attention to the person and their interrelationship with others; and an appreciation of successful existing practices.

2.1.1 Asset-Based Community Development

Asset-Based Community Development, or "ABCD," has emerged in the community development field in the last several decades as an alternative to "needs-based" approaches to development as a way to address persistent inequity in US depressed urban areas [50, 43]. A "needs-based" approach usually involves a mapping of a community's needs or deficiencies that is framed in a negative light, casting its members as dependents or "clients." A community might be identified as "needing" perennial subsidy, such as a free iPad for every child [79]. As McKnight and Kretzmann, the originators of the ABCD approach, put it, this can have "devastating consequences" such as undermining community leadership [43]. ABCD describes a way to address pressing issues that focuses on assets the community already has which may be underutilized due to resource scarcity or invisible to outsiders due to institutional, cultural, or class bias. ABCD can be a sustainable approach precisely because it taps into existing "community adaptive strategies and local knowledge" [25]. This approach resonates with Moll et al.'s work with Hispanic families in the Southwestern US that uncovered "funds of knowledge" that formal institutions may ignore [53].

ABCD practitioners emphasize that each context is different and resist a standardized “blueprint.” Nevertheless, key tools in this approach include: “the collecting of stories of community successes and analyzing the reasons for success; mapping community assets; building relationships among local assets for cooperative problem-solving,” and more [50]. “Asset” is also purposefully broadly-defined and can include skills of community members as well as physical resources such as buildings, organizations, and technology [35]. Frequently, the most significant asset a community has is its relationships: “By treating relationships as assets, ABCD is a practical application of the concept of social capital” [50]. This is where our design process fits. An end-game view of “asset-based” development understands the resultant program or initiative as firmly in the hands of the community itself for longevity.

Although elements of this approach have permeated human-centered design methods for research and tool-building within CHI settings (see section 2.1.3), the CHI and larger ICT communities have not to-date explicitly articulated with the growing ABCD literature and method, with the exception of two very recent studies that leave room for further exploration. Xu and Maitland describe a detailed process for community asset mapping on a relatively large scale across a major Syrian refugee camp in Jordan [70]. However, once these assets were mapped, the researchers’ endeavor stopped before these assets could be mobilized by the community. In a short paper, Irani et al. describe the initial findings of a prototype app for refugee communities in the US that builds on assets such as tech (smartphone prevalence and competence) and social ties [35].

We see great potential for mutual enrichment between ABCD (an orientation toward assets-as-insights) and established methods of building in HCI that bring these insights to concrete prototype. A weakness of the ABCD approach is precisely its resistance to legislate a standardized course of action based on the assets it uncovers, especially in regard to tool-building; this is where we see robust HCI methods stepping in, as many ABCD endeavors eventually involve the deployment of digital technology at some point. We respectfully hope this paper is a small step in helping to bridge this gap.

2.1.2 Appreciative Inquiry

One specific technique described in the literature on ABCD is “appreciative inquiry” [25]. First conceived as a method to improve organizational business processes, “appreciative inquiry” relies on interviews to engage the community at hand to define themselves based on successes rather than

problems or deficiencies using a combination of memory and imaginings. This is a subtle but important shift from a needs-based orientation. Instead of (or in addition to) asking parents, “What is preventing you from accessing learning opportunities?” we might ask, “Can you describe a time where you were successful in discovering a learning opportunity?” or even, “What is your son/daughter really passionate about learning?” with clarifying follow-up questions. We describe our particular approach in more detail in section 3.

We cite this here for two reasons. We were inspired by the same values that ABCD practitioners have identified: an affirmative rather than negative or societally-pessimistic approach to interacting with community participants; a commitment to honor the real lived experiences and achievements of our community participants as instructive and exemplary (a “they teach us what works” approach); and a belief in what Elliott has called the “heliotropic principle,” [25] or the concept that communities, groups, and individuals will work toward the most positive image they have of themselves (instead of negative ones), inspired by the phenomenon of plants turning toward the sun. We believe that this approach is one tactic to address what Erete et al. identify as the need for intersectional “best practices” in designing for marginalized communities who may be not served well by traditional research methods [26], and Maestre et al.’s call for alternative methods to conducting research with stigmatized groups [48].

2.1.3 Human-Centered Design

A full review of human-centered design (HCD) literature is space-prohibitive here; instead, we focus on similarities and differences between core HCD principles and methods and the asset-based approach we borrow from community development literature. An HCD approach places the human as the focal point for a design endeavor to tailor a solution for that particular person or type of person’s needs [17, 31, 44]. At its core, much like the ABCD approach, is a respect and empathy for human difference and situational context. There is an investigation (or “inspiration”) phase in which the design researcher conducts a variety of exercises and observations to immerse themselves in the role of the target user to understand their lives and needs. Then there is an ideation phase, in which researchers generate concepts and prototypes, followed by an implementation phase. However, there are subtle but important differences between these approaches. Primarily, HCD is focused on uncovering an array of “needs” [76]. While this is ideally done with empathy, we worry that it has the potential to rehearse the pitfalls of the “needs-based” approach contested in ABCD, slipping into a “Here’s a strange new

technology we came up with that you’ve never used before but really need” mentality despite the designers’ best intentions. Also, HCD often, and by necessity, reduces its scope of inquiry to a singular “user” for whom to design. This contrasts with ABCD’s approach of understanding webs of networks or communities as sources of communal assets. Our blended approach to design in this project combines these orientations, starting with an asset-based approach founded on appreciative inquiry and discovering assets, chiefly in terms of social capital. It then incorporates key elements of an HCD approach such as personas and design sprints to mobilize these insights and produce a service to amplify existing community assets. We see this synthesis as filling the gap between ABCD’s recognition of intrinsic and organic practices for community development and HCD’s usefulness in putting real tools out into the world.

2.2 Families, Informal Learning, and ICT

“Informal learning” refers to learning that takes place outside of standard curricular instruction in educational institutions. It may take place in after-school extracurriculars, out-of-school venues such as camps or community organizations, within families, and in online spaces such as YouTube or DIY.org, to name a few possible settings [46, 62, 56, 4, 6, 36]. A related framework, “connected learning,” suggests that learning should be interest-driven, peer-supported, and oriented to academic, civic, or career-oriented achievement [37]. Often, connected learning happens in informal interest-driven environments such as the ones described here. This framework is supported by evidence that the most effective learning happens when the topic is interesting or relevant to the learner, which generates intrinsic motivation [61]. ICTs are crucial in this arena both as tools for discovery of opportunities as well as mediums for learning, themselves. For example, Barron et al. have created an exhaustive online database for the city of Chicago of local enrichment learning opportunities [10]. Roque has shown that families as a whole can be engaged in informal creative learning as a way to address STEM equity issues [60].

There is increasing evidence that this form of learning is vital to future success in education and career [59, 78]. In the US, wealthy families are drastically outspending low-income families on “enrichment expenditures,” a gap that grows wider each year [37]. Parents play a fundamental role in arranging these informal learning opportunities for their children [11, 41]. Parents may have multiple functions in this process, including teaching their children directly; being “learning brokers” (connecting their children to

opportunities); and “resource providers,” supplying equipment such as books or online accounts [11]. However, DiSalvo et al. found that parents of lower socioeconomic status (SES) are less apt to seek out informal learning opportunities (even online, free ones) than more affluent parents, identifying three concerns: parents’ perception of their own technical skills, trepidation around “saving face” or fear of embarrassment, and access to social networks [20]. They recommend that a design intervention in this space for low-income parents must heed these concerns.

This last concern, access to social networks, is especially important for the formation of social capital, which is in turn important for finding these opportunities. Social capital is generally defined as the beneficial value of connections to others for resources, information, or opportunity [16]. “Weak” ties (connections to others who are outside of one’s immediate networks, which are “strong ties”), have been shown to be important for gaining access to new information or opportunity [32, 24]; parents with lower SES have less diverse social networks and therefore are exposed to a less diverse range of opportunities [22]. Indeed, Wong-Villacres et al. found that “informal spaces” for parent connection, both physical and online, were key for successful parent engagement in schools [68]. ICTs have the potential to help expand these networks of information and opportunity. For example, in the health ICT space, interventions such as apps and SMS messaging have shown promise in disseminating crucial health information [49, 38, 28]. In our design sprints, we were particularly inspired by the success of the Text4Baby free SMS service in the US, with the goal of increasing pre-natal health knowledge among low-income moms [27]. However, while CHI researchers have found that parents (especially moms) have developed robust social information sharing practices using ICTs [14, 3, 54, 55], there is still a relative gap in the literature regarding the potential for ICTs to aid low-income parents in access to learning opportunities for children, specifically.

Absent robust weak-tie/diverse-network social capital, it may simply not be enough for low-income parents to be “Google-literate” to find opportunities on their own. One study showed that, surprisingly, common online search queries for CS-related online informal learning opportunities did not yield in their results the many free learning platforms that exist online [21]. Additionally, this work focuses chiefly on parent awareness of online learning platforms; there is very little work about awareness and access to local community learning opportunities.

In the design research and pilot study outlined here, we take to heart Roshan et al.'s recommendations that a design process to help low-income parents access informal learning opportunities must be grounded in everyday practices as well as tap into the potential of strong parent networks [41]. In keeping with social capital theory, and in conversation with the method and development literature outlined above, we see these practices and networks as *assets*.

2.3 Latinx ICT

By virtue of our commitment to engage low-income communities local to our home institution, the parent population in our design research and pilot phases demographically trended Latinx, usually first- or second-generation immigrant. (Here, we use “Latinx” as a non-gender-specific term to refer to US-based populations with lineage from Latin America [58]; however, we use “Hispanic” if used in the cited literature.) We did not enquire on specific country of origin or ethnicity; however, our conversations revealed that many traced roots to Mexico.

Latinx ICT use is a growing area of research that has to date surfaced several themes. One is a concern about language and representation. For example, one design of a tablet-based app aimed at educating Hispanic women about cervical cancer modeled a virtual human agent who appeared to look Hispanic, to which users responded positively [52]. In the US, limited English proficiency can be a barrier to ICT use among immigrant communities [30]. Another theme is the prevalence of mobile phone use. US Latinx users are more likely to own smart phones and rely on them to access the internet than other groups [42, 65]. Baron and Gomez found that Hispanic day laborers rely heavily on mobile phones to navigate different aspects of their lives, including remaining connected to their families and employers [7]. One recent study showed that new immigrants to the U.S. (of which approximately 50% of participants were Hispanic) “have embraced mobile technology to an extraordinary degree,” sometimes arriving in the US having greater familiarity with mobile technology than the average US user, with immigrants from Latin America being especially proficient in mobile banking and bill pay [77].

Emotional barriers such as fear, anxiety, and lack of confidence are significant considerations for some Latinx ICT users. To overcome emotional barriers, Gomez et al. developed a set of portable instructional cards that teach

basic computing skills to “extremely marginalized” Hispanic day laborers [30]. From a trust and privacy standpoint, research shows vague-at-best understandings of surveillance risk that ICTs carry despite this population's heavy reliance on these technologies and significant concern about privacy [33, 7]. We understand that any intervention in this space needs to place issues of trust or other emotional concerns at the forefront.

First-generation Latinx immigrant parents in the US often rely on their children to act as translators, both of language and culture, often leveraging media to broker these connections [39]. Pina et al. have shown that this practice extends to intergenerational and bilingual co-searching [57], which can be thought of as an asset practice. Similarly, Latinx communities have developed innovative ways to use digital tools to translate texts, stay connected, and support interests [40, 45], and research in the field of informal learning with Latinx families has advocated for educators to embrace and build on these cultural “contexts for tinkering” [64].

3 Asset-Based/Human-Centered Design Research Process

Our asset-based design research process was based on a synthesis of the three methods outlined above and consisted of four main phases: ethnographic research with low-income parents with attention to discovery of assets using appreciative inquiry; synthesis of this data in a hybrid mode of charting assets across all our participants as put through a human-centered design persona creation process; design sprints using these various personas; and participatory community validation and input.

3.1 Asset-Based Ethnographic and Qualitative Work

Our “asset-based” research process spanned multiple years of work in our lab. We approached “asset” discovery in three phases: selectively oversampling for low-income parents in the local community who were already successful in enrolling their children in out-of-school enrichment learning programs; conducting asset-based appreciative inquiry with these families; and then using an HCD persona approach to highlight these assets and mobilize them in design sprints.

In the first phase, Brough recruited parents from 40 low-income families whose children participated in informal learning programs such as photography programs, robotics programs, and digital video programs. Brough conducted interviews regarding parental mediation of their children's digital media use as well as daily routines and involvement in informal learning [13]. Brough

completed a report to a local school district about a popular afterschool IT program she observed, with recommendations for parental involvement [12].

In the next phase, approximately eight months later, our team reached back out to all 40 of these families for follow-up design-focused interviews, which are the basis of the work presented here. 18 of these families agreed to this second round of interviewing with a different set of investigators. As in the previous phase, these interviews usually took place at the family's home, and each family received a \$30 gift card incentive for participation. We ensured that if the family preferred to be interviewed in Spanish, we had one native Spanish speaker as part of the interview team. 17 were ethnically Latinx; one was a multiracial white/Asian non-Latinx family. During our family visits, we let the families decide whom we would speak with. We spoke three times with a mother only, once with a father only, and the remainder with both the mother and father together. It became clear that the mother was usually the chief arranger of informal learning opportunities.

In this round of interviews, we engaged the participants along principles of appreciative inquiry with the focus of understanding how these families were able to successfully broker informal learning opportunities for their children. A secondary goal was to get a detailed picture of the role of tech such as mobile phones and internet use in their daily lives. These interviews were semi-structured and open-ended. ABCD suggests that storytelling is a powerful way of surfacing community assets; this dovetails with a long tradition in cultural anthropology of asking open-ended “guided tour” questions [66]. Examples of asset-based and/or appreciative questions from our flexible protocol included:

- What is your daughter/son passionate about? Who or what introduced them to that?
- Can you tell us about how you found out about After School Program X?
- What is the most important device you use on a daily basis? Can you walk us through the last time you used that device?
- What were you doing and thinking about at 9:30 am yesterday? 3:30 pm? 7:30 pm? What did you need to get done at that time, and did anyone or anything help you?

We kept these interviews very flexible and conversational, and, as shown above, included follow-ups to most questions in a manner designed to uncover specific assets and networks. Furthermore, not all our questions were asset-related. We wanted to get a sense of a day in the life

and understand what their frustrations were, to ensure a fuller picture of their lives. We also conducted tech inventories, and, based on the background literature on mobile phone use, we asked specific questions about mobile phone models/plans/providers, internet service providers if they had home internet, and monthly cost.

3.2 Assets as Inspiration: Human-Centered Persona Creation and Design Sprints

How do we chart this interview data into something useful for design? Here, we departed from traditional ABCD approaches in which the community conducts the asset analysis. One significant reason for this was that the ABCD approach demands a massive amount of time from community members. The families we interviewed are incredibly busy, and ethically, we didn't feel we could ask much more of them without a significant incentive. Instead, we applied techniques from the tradition of human-centered design, including the creation of one or more target user personas [17]. Personas are amalgamations of insights on specific kinds of users gleaned from multiple interviews and observations. Personas were particularly valuable for this study because they allowed the design team to step outside of our own frame of reference and understand the assets (and needs) of users in our study.

We followed Kim Goodwin's method of persona creation [31], in which we generated a list of relevant variables such as “Connected to out-of-school learning,” “Involved in school,” and even simply “Doing well and thriving.” We then plotted all of our participants on spectra of these variables—which participant was more connected, which was less, for example. In this way, personas become a kind of asset map unto themselves, as modulated over various different potential design audiences.

One cluster of participants had good social ties and had successfully discovered opportunities for their children and enrolled them, but seemed stretched thin in their daily routines. We used this group in aggregate as inspiration for one of our personas, whom we called “Monica.” Based on a particularly poignant story we were told by one of our participating moms, our persona “Monica” commuted over an hour across the city every day to her job as a hotel housekeeper. She used to be well-connected and involved in her children's educational lives, but new demands, including caring for her aging mom, put a damper on her available time. Nevertheless, despite these extreme demands on her time, Monica made it a priority to connect her children, especially her eldest son, “Angel,” to after school learning opportunities.

From a technology standpoint, Monica personified most of our families: heavily reliance on mobile phones and mobile

internet; itinerant or non-existent home internet; an aging laptop computer; and perhaps a tablet. Despite her low wages, Monica spent a significant amount of money on mobile phone plans, lamenting that she had to upgrade to all-unlimited minutes and text messages because her children would incur costly overages otherwise. Monica did use mobile phone apps, but they were limited to basic communication and information—the calendar for logging her mom’s medical appointments, Facebook for communicating with family both here and in Mexico, mobile internet browsing, and SMS, the chief method she used to communicate with family on a daily basis.

We chose Monica as our primary persona for design ideation because we believed she had a good mix of assets to amplify and yet would be most receptive among our different personas to some sort of help. Our research team used two design sprint techniques, “How might we...” and “Crazy 6’s” to quickly iterate on possible ways to help Monica connect better with out-of-school learning opportunities, keeping her needs, assets, and daily routine in mind. “How might we...” is a design sprint in which we quickly iterated on versions of that sentence that would solve needs and build on assets for Monica... “How might we...” make it easy for Monica to connect to afterschool programs? “How might we...” amplify or strengthen Monica’s community networks? “Crazy 6’s” is a design sprint in which we take a need or observation and each person quickly sketches six possible ideas that are solutions to that need or observation.

One idea that stuck was the observation that many of our moms relied heavily on informal, interpersonal, neighborhood or school-based “mom networks” (*assets*); these were usually moms who came from a similar socioeconomic and immigrant background. Most of the moms in our study were adept at navigating the school setting (*asset*) and some were heavily involved. However, they expressed suspicion and frustration at the massive bureaucracy of the public school district and knew they had to rely on other sources of knowledge to secure the best opportunities for their children. They traded knowledge often. What if we created an SMS system that delivered well-curated opportunities to moms that mimicked these mom networks, perhaps their greatest asset?

This idea resonated with our persona, Monica, who used SMS as her chief method of communication (*asset*) with trusted local family and friend networks, but who was simply stretched thin with her heavy family care demands. Monica preferred Spanish but code-switched when appropriate. Based on our tech inventories, the participants who informed the persona Monica had mobile phones with

a generous SMS allotment and looked up information on their phone’s mobile internet browser (*assets*).

One of our team members, a first-generation college student/ undergraduate research assistant, came up with the internal codename “Comadre” to describe this idea. This roughly translates in Spanish to “Godmother” but also colloquially has the polite meaning of “the other friendly mom that you know from your extended networks, with whom you share much in common.”

3.3 Community Participatory Design and Validation

Before we decided to invest time or resources into building a prototype, we brought our ideas back to the community for their input in a participatory design and validation process. We conducted three focus groups at a community space in Southern California inviting back several of the families from our first and second round interviews. Five families in total participated, with a total of 10 participants. We felt it was important to invite the whole family as a unit and have two families, maximum, at each focus group to allow for manageable conversation. Eight participants were Latinx; two (a mom and her son) were African American (they declined to participate in our follow-up background design interviews but did decide to participate in focus group). We conducted these focus groups in English with Spanish translation provided by a member of our research team. Each participant received a \$30 gift card to Target (children’s gift cards were distributed to parents).

Focus groups were divided into three parts. First, an opening worksheet that captured the families’ demographics and familiarity with out-of-school learning, which also functioned as conversation starters. Then, we distributed a number of scenario cards to each family. Though our design approach was couched in assets, these cards and resulting discussions were our “process check” to make sure that we had accurately understood what barriers may have existed, if any, to informal learning opportunities. These were ranked by the families in terms of applicability to their specific family, and this was used to generate discussion.

We then introduced a second set of cards that explained the proposed SMS system and showed various types of sample messages (in English or Spanish depending on the family’s preference). They were asked to rank different kinds of messaging in terms of how appropriate they were to their own family. Conversation included whether they felt that they “had that covered” or if they needed help.

Figures 1-3. Focus group “barrier” and sample messaging cards. Illustrations: Chelsea Hostetter.

We emerged with several important pieces of information and suggestions from our focus group families:

- Families told us that high-school age was too late for interest introduction. Those children already had developed their own array of after-school activities and they were far more concerned with next steps to college or career.
- Families explained that middle school seemed to be the appropriate age for interest introduction.
- Parents consistently ranked the “I’m too busy to do this” “barrier” card (Fig. 2) last in importance. They explained that if they found an opportunity that was affordable and appropriate, they would do anything to get their child there.
- Families were very enthusiastic that the service be offered in Spanish and English.
- Families stated that “several times a week” was an acceptable frequency for these sorts of messages.
- All families expressed no reluctance to receiving SMS messages, though they were highly concerned with privacy.

We used these findings to influence the pilot: the service must be offered bilingually, we would seek out opportunities that were geared toward middle-school-aged children, and we would ask for no identifying information except for phone number, stored anonymously in our secure database. We would signpost as much as possible in recruitment and messaging that this was an academic study conducted by a local university with an obligation to protect participant information, and give very clear instructions about how to stop participation via SMS.

4 Pilot

We piloted the “Comadre” service in the summer of 2017 over 10 weeks. We enlisted an undergraduate student programming team from the Informatics Department at our home University to build the system for us. The system consisted of two components: an automated SMS sign-up protocol and an internal-facing Web app hosted on our server. In the SMS protocol, users were asked to send a “hello” SMS message to a pre-determined local phone number. The service automatically returned a greeting message and guided the user through a series of queries: preferred language (English or Spanish), home ZIP code, ages of children, and children’s interest areas (science, arts, sports, or all of the above). Upon successful completion of this protocol, these user preferences were stored in a SQLite database on our internal servers. We would then use our password-protected internal Web app, which had a dialog box to compose SMS messages and the ability to select target ZIP codes, ages of children, and interest areas, to segment these messages and deliver them to corresponding

members of our user database. The system used the API for Twilio, a third-party SMS delivery system, to deliver the messages to the users' phone numbers.

Our target number of pilot participants was approximately 30. Seeking to replicate the demographics from our background research, we outreached to a local school district in Southern California with a similar demographic profile to our target persona and background design research. We were invited to explain the project, rationale, and pilot process at the district-wide end-of-year parent volunteer breakfast. We offered a \$30 Target gift card incentive to users who enrolled, received messages for the complete 10 weeks, and completed one in-person exit interview. We obtained informed consent from and signed up 30 parent users at the meeting.

Because all our participating parents were part of a relatively dense urban school district, they clustered in approximately six ZIP codes. Our research team then used a combination of internet searches, community contacts, and phone calls to create a list of potential out-of-school learning opportunities within 10 miles from these core six ZIP codes. We limited the selection of the opportunities we broadcast to those with a maximum fee of \$50. Across the 10 weeks, we sent two to three messages a week regarding various timely local out-of-school learning opportunities as well as institutional knowhow, to the appropriate segments of our database. All messages were sent in both English and Spanish, depending on user preference.

Figure 4. Sample actual message sent (contact info redacted).

We had a team of three internal Spanish language “peer reviewers” who were part of our lab to ensure that the Spanish translations of our English messages were as natural-language as possible.

After the second week, we experienced what some have called a “success disaster” [72]. We did not realize that each SMS message actually takes a fraction of a second to send; we noticed that our program that initiated the send of each message started timing out because it initially was not written to have a cycle long enough to accommodate all the time needed to send a large volume of SMSs in rapid succession. Curious about the high volume of outgoing messages, we opened our database and found that we had accumulated over 70 users (including 40 new, unsolicited signups). We were surprised to see this, as we had done no additional outreach. We called several of the new numbers in the database and found out that these were other parents who signed up by texting to the number because their friends had recommended it to them, unbeknownst to us. In one extraordinary moment of parent networking, one mom told us that she found out about our service through a flyer in her elementary school’s summer parent take-home packet. We did not do any outreach to this school; we were told that a parent from the parent breakfast had taken one of our informational sheets and photocopied it for her entire school. We were able to tweak the program with a longer time window to enable all target recipients to receive our messages.

In week seven, we sent out a mid-course survey via one of our SMS messages. This was delivered as a link to a brief SurveyMonkey survey that was optimized for interface through mobile phone internet browsers, and it was administered in English or Spanish depending on that user’s message preferences. Questions included whether the respondent had found any messages useful, whether they actually pursued any opportunities we sent, and a “net promoter” rating question asking “Would you recommend this to a friend?” Of our 41 responses, all 41 said that they would keep subscribing if offered and 19 had already actually pursued or attended the one or more of the opportunities we sent. Our “net promoter” score (NPS) was 89 for Spanish users and 79 for English users. Though benchmark net promoter scores vary from industry to industry, according to anonymized and aggregated data in a SurveyMonkey report on their own clients’ usage, 31 was the average net promoter score across all industries [75].

After our ten weeks concluded, we reached out to all enrolled phone numbers to schedule exit interviews. 31 users responded. Over the next month, we interviewed each of these 31 parent users in person, either at their home or at a place of their choosing, such as a coffee shop or park. Each interview started with a brief one-page questionnaire that captured anonymous demographic information (household income, household size, gender of participant)

and information on that family's previous experience with out-of-school learning opportunities. Our questions ranged from specific ("Which opportunities, if any, did you pursue? Why or why not") to broadly evaluative ("What would you suggest we change to make the service better?").

5 Findings

5.1 Reception

In our exit interviews, 25 out of 31 families stated they looked up information on the opportunities we sent and, of those, 14 families actually pursued opportunities, such as enrolling their child in a class or attending an event. All of our participants told us they would keep subscribing, if offered, even if they hadn't actively pursued any of the opportunities—they just liked getting the information. In fact, a number of our interviewees were disappointed that the pilot phase had come to an end and that the service was shutting down. (We discuss our response to this in section 6.) Though we explained that the work was paid for by a grant and that the timeframe was winding up, they were adamant that it should continue. Several parents told us that they and their children looked forward to receiving the text messages, as they learned about local community programs and organizations that they didn't know existed. One mom told us that her daughter, upon hearing the mom's phone beep with a text message, would ask "Is that a new message from UC Irvine?"

5.2 Barriers: Income and expenses

A majority (53%) of our exit interview participants stated a household income under \$35,000 a year. 34% stated \$0-\$20,000 a year of household income. For comparison, the "low-income" threshold in the region for a family of four in 2017 was \$84,000 a year. Our participant families were thus on the very low edge of the income spectrum. We found that, for them, even our internal cap at \$50 for fees for selecting out-of-school learning programs to broadcast to them was out of reach. This was compounded by another fact that our parent participants told us: they all have multiple children, so it was not fair (or even logistically feasible) for them to bring one child to an opportunity and leave the others behind. Should they find an opportunity that was a fit for multiple ages of children, or should they find separate opportunities geared toward different ages, the cost would still be multiplied times two or three or more. As a comparison, a normal fee for iDTech, a well-established nationwide computer programming day camp (that does not include lunch), hovers around \$900 a week. To this effect, many parents told us in exit interviews that they were only able to pursue opportunities we sent that

were completely free and that were accommodating to multiple ages. Some highlights were a local heritage museum's hands-on free open house day with special exhibits on dinosaurs and traditional blacksmithing techniques; the Home Depot's community craft day in which free supplies were given to all attending children to build a "bug house"; and several free summer-long library programs centered around experiential STEM learning.

5.3 Ancillary Asset-Based Benefits

We realized during our home visit exit interviews that there were ancillary benefits to our broadcasting of local, age-appropriate out-of-school learning opportunities to our participant families. Even if the receiving family did not pursue the exact opportunity we sent them, the simple act of obtaining new information about community resources itself was valuable. For example, when we arrived at Florencia's house for an exit interview, we observed her daughter in the living room reading a book on her tablet. In the interview, Florencia told us that she did not pursue the opportunity we sent regarding a 3D printing workshop at a science and tech library in a neighboring city. However, she was curious about the institution itself, called them, and was surprised to find out that even though she was not a resident of that city, she could fully use all of the library's resources. She was additionally surprised to find out that there was a large selection of children's eBooks that she could check out and have sent directly to her family's home tablet. This was, in fact, what her daughter was reading when we arrived. This sustainable knowledge of and connection with a community institution is a hallmark of the asset-based approach.

Even if the family did not pursue the opportunity we sent out, many parent participants told us that they still found the messages valuable because they made them aware of local institutions and programs that they may not have known about. Additionally, almost all parents told us that they shared the information we sent with other parents in their personal networks. One parent, who, at the end of an emotional interview, disclosed that she was undocumented and therefore couldn't bring her children to many opportunities because her family's lawyer advised her against driving for fear of arrest and deportation, estimated that she shared information on the opportunities we sent to no less than fifty other people in her personal networks.

6 Discussion

Our exit interviews and high net promoter scores lead us to believe that the Comadre service was well-received by

its pilot userbase. Here, we contextualize successes and missed opportunities and provide a roadmap for next steps.

6.1 The Heliotropic Principle

Roshan et al., in their work with low-income African American families and access to informal learning opportunities, identified much the same guiding principles for design that we did: they recommend an approach to design that honors existing everyday practices (in our case, SMS), as well as takes advantage of robust social networks [41]. We further contextualize this in terms the “Heliotropic Principle,” as explained above in our discussion of appreciative inquiry, or the tendency of an organization or community to work toward the best image of itself [25]. Part of our decision to pilot the Comadre idea over others that came up in design sprints was to honor the good work that we observed our background research participants do every day. We were inspired by a positive image of *that* engaged mom, the one that is always passing on the good info, the one who seems to know the ins and outs of the system, who has been there before, the one that spreads the useful gossip; not a negative image of a mom without resources. This positive approach resonates with Moll et al.’s foundational work on identifying the “funds of knowledge” that Hispanic children and families in the Southwestern US carry with them into educational environments that may be unaware of these assets, clouded by negative stereotypes [53].

Still, we were surprised by power of this approach, as reflected in the story of the mom from our initial pilot recruitment who ended up passing the information regarding the pilot to everyone at her child’s elementary school. The heliotropic principle also supports the accounts we heard over and over again in our exit interviews of moms selflessly sharing information with other moms even though their own children weren’t interested or the appropriate age, or even if they knew another mom who was able to afford an opportunity that they couldn’t.

Additionally, from an interview standpoint, we noticed that interviews simply yielded richer responses when we approached questions affirmatively. The answer to “Tell us about your child’s passions” will probably be more substantial and have more color than “What is preventing you from enrolling your child in learning opportunities?” We believe that CHI communities will find a conscientious focus on asset-based, heliotropic approaches to design research useful.

6.2 Mundane Tech as an Asset

We have strong convictions about leveraging everyday tech as a significant asset, even though this may seem obvious or non-innovative. We were committed to amplify the asset network that our successful moms relied on, and the tech tool they used to do this was SMS. We purposefully did not create an app or a novel platform. Our persona “Monica” was an app user, but not a heavy one, in comparison with her level of SMS use. One thing she didn’t need was another app to figure out, especially given the literature that reveals that extremely marginalized Latinx users are not confident in novel tech use [30].

For example, one unanticipated benefit to creating a system that revolved entirely around existing everyday practices was that users could easily forward the messages to anyone in their phone contacts with a few presses using their phone’s native SMS program, which they were already very comfortable using. Had we designed a novel app or asked them to join a platform, this would not be possible without the next recipient also first downloading the app or joining the platform; this would also involve a learning curve, download data, and simply the time and energy to devote to a brand new service and interface—time and energy that “Monica” simply does not have in her already incredibly busy life.

6.3 Latina Mom Users

Katz [39] has observed that Latinx immigrant youth often play a brokering or intermediary role in translation between parents and institutions such as schools. On one hand, this may lead to increased levels of intergenerational communication and trust. However, there may be drawbacks, as well. For example, in our exit interviews, one mom started talking about her elder son’s next steps after high school, lamenting that he was not college-ready. We explained that one of the messages we sent included a link to a breakdown of the “A through G requirements,” or academic subject area classes in high school that all California public universities require for admission. She seemed stunned, told us she didn’t remember that message, and that this was the first she had heard of these requirements. She brought her son into the kitchen and demanded to know if he knew about them and whether he was meeting his A through G requirements. He admitted that he *did* know about them but had strategically withheld that information from his mom. She resolved to follow up with the school’s counseling office. Though this mom

missed our initial message, the Comadre service could have the effect of leveling the playing field in terms of intergenerational transfer of institutional knowhow or even simply increasing intergenerational conversation around these topics, especially for families with recent immigrant parents who are not familiar with US educational requirements.

Because a majority of our participants were well under the low-income threshold for a family of four in our area, we recognized in our exit interviews that even a cap of \$50 on our screening process for potential opportunities to send via our service was far too high. This was compounded by the fact that many of our families had multiple children, and the moms in our exit interviews did not feel it was fair to pay for only one of their children to pursue an opportunity. Thus, a \$50 class could easily become a \$150 class if the parent sent multiple children. By far the most popular opportunities we sent were the opportunities that were free and accommodated multiple ages of children at once. In fact, we worked together with a few local organizations once we realized this barrier to advocate to extend scholarship windows for our subscriber base. We suggest that education providers heed these constraints if they want to reach low-income communities, or develop innovative programming such as free weekend workshops in order to expose low-income families to their presence in the community, which could lead to families marshalling resources for more intensive learning activities later on.

6.4 Next Steps

As we mention in section 5.1, our pilot userbase was disappointed to hear that the trial period was over and that the funding for the project only permitted a short window of use. As such, we did not want to end the pilot without careful closure. We collated a list of all the messages we sent to all ZIP codes over the course of the 10 weeks and hosted a web page that listed this message inventory with all contact information for all organizations mentioned. We sent this link in one of a series of closing messages to all subscribers. In another closing message, we sent links to an array of free online learning platforms such as Khan Academy or DIY.org so that our families could continue interest-based learning online. Nevertheless, we understand that the impetus of the ABCD approach remains unfinished in this phase. To fully realize the promise of this asset-based intervention, we are planning next steps, including creating a Web portal so that local organizations themselves can post their own opportunities, thereby lowering the amount of labor needed to discover them. We are beginning to ideate ways to make the Comadre system reciprocal among

users to encourage even greater community participation and ownership.

7 Conclusion

We believe that CHI is enriched when human-centered design processes synthesize with asset-based approaches borrowed from community development literature. Throughout our process, we aimed to honor and amplify organic community relationships in fostering connection to local informal learning opportunities for low-income families. This asset-based approach reaped dividends in our pilot study which we did not anticipate, including growing perennial relationships between families and community institutions they were otherwise unaware of. We appreciate the flexibility in the approach outlined here and its ability to be tailored to unique situations and contexts, even beyond the realm of access to educational opportunity.

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