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ORIGINAL PAPER

How Do You Say Nature?: Opening the Design Space with a Knowledge Environment

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Abstract In this paper, we describe a design study on how families in Los Angeles experience nature, with a particular focus on how using alternative formats for research analysis and presentation can enrich a design research inquiry. Conducted in Pasadena, CA as a part of Super Studio, the year-long design research class emphasized knowledge building and sharing through design methods of analysis, exhibition, and concept prototypes. After conducting interviews and engaging participants with probes, the class built the results into an open-ended knowledge environment. The main observation from the exhibition – that Angelenos have a limited vocabulary for describing nature and their interaction with it – helped to define the opportunity for design intervention that created connection points between Angelenos and nature. There are few attempts to describe how probe returns evolve into design concepts. Showcased is a process that depends on the unique affordances of design as the vehicle for discovery and invention.

Keywords Design research · Probes · Knowledge environment · Transmedia · Pasadena (California) · Nature · Media design concepts · Design tools

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Introduction

This paper builds on observations from our work applying human-centered methods of inquiry. The observation we foreground is the need for a design-centered method of analysis that enables the translation of the rich data produced by probes into design proposals. Our design-centered process of analysis uses literal evaluation of returns, yet emphasizes the use of the elements of design to interpret and enhance the visual, tactual, and aural qualities of the probe data. This paper explores some of the more typical methods for analyzing probes and then presents a case study, Super Studio, a design methods and process class, given annually at Art Center College of Design in Pasadena, CA. The main message of this paper is how we use the unique affordances of design to guide a human-centered study throughout the entire cycle of inquiry, from a probe-based methodology to knowledge sharing to design outcomes.

Super Studio was devised in 2000 as part of the graduate Media Design Program to give the students a sense of what a start-up was like, but with the design

and social depth to encourage them to develop new transmedia systems to address important issues of the day. By 2007, the class has evolved design research towards the identification of opportunity areas that are rich for innovation by sharing insights and provoking new thinking through open-ended knowledge environments and concept prototypes. Super Studio functions as a studio in that it uses one room for a year, creating a shared space in which a group of designers identify, explore, and create design opportunities through a three-phase process. Beginning with a user study, usually through cultural probes (Gaver et al. 1999) and interviews, followed by the identification and visualization of design opportunities and ending with documentation and knowledge sharing.

Over the last few years, cultural probes have become one of the main methods designers use to identify insights into a community or subject's life using these results to explore new areas of design possibility. As Boehner et al. (2007) show, there is no shortage of probe types, including technology probes (Hutchinson et al. 2003), domestic probes (Gaver et al. 2003), empathy probes (Mattelmäki 2006), mobile probes (Hulkko et al. 2004), and urban probes (Paulos and Jenkins 2005).

Although the probes have gained lots of attention from design researchers, much less has been written about how to take the next steps from probe returns to analysis and design proposal. Characteristics to probing are the attitude of experimenting with and promoting new dialogues within the language of design. The making sense of probe returns or the analysis phase typically goes beyond requirement engineering. According to the literature, we can identify four approaches in analyzing the probes for design.

- *Inspiration*: Emphasis is placed on artistic ambiguity and gossip to inspire designers. The analyses are nontransparent, nonanalytic and not aimed at validity through transparency. The analysis is based on intuitively grasping, appealing insights and ideas that are inspired by the probes themselves or the stories they generate. The outcomes of analysis are design concept proposals. "Most of the time the relationships between Probes and proposals are...complex and difficult to trace...We freely admit that the responses they elicit are not necessarily accurate or comprehensive, and that they seldom give clear guidance to the design process" (Gaver et al. 2004: 56).
- *Information:* Emphasizes the scientific analysis to inform design. Probes are in the toolbox of user-centered methods, and they are applied as instruments for eliciting information from the members of user groups that are difficult to research by other means (Cheverst et al. 2003). In this approach, the outcomes of analyzing are reports and outlines.
- *Dialogue:* Emphasis is placed on a probe's ability to generate open dialogue and subjective interpretations to support design empathy and collaboration. Then the analysis is carried out typically in interpretation sessions either by making sense of the raw probes data or visual and narrative persona descriptions that are condensed from the data but are left open to allow personal insights, discussion, and empathy. The outcomes of analysis are thus persona descriptions as well as various kinds of workshop results and personal learning. (Mattelmäki 2005: 98)
- *Co-design:* It emphasizes the probes' role as part of design intervention and by embedding the probes into a co-design process. The designers can produce open-ended guesses about possible solutions, and the probes are applied to trigger users and designers to imagine and explore new kinds of opportunities, be those technologies or practices. They empower users to take part in exploring and design thinking (Mattelmäki 2006). The outcomes of probing are then design (or research) drivers and further elaborated solutions. As Paulos and Jenkins (2005: 343) note, "Urban Probes exploit methods of deep observation coupled with experimentation and concrete interventions in urbanism."

These approaches are based on different lines of reasoning. Clarity is needed to identify themes and patterns in the returns from your subjects as well as necessary to support the ability to communicate and provide evidence of your insights. We find the ability to replicate findings and see the reasoning that leads to design proposals just as valuable as scientists. After all, what is the point in doing a probe study if its analysis makes the process and its findings non-transparent?

However, as Gaver et al. (2004) and Boehner et al. (2007) have argued, a part of the specificity of the probes is in what they call "ambiguity." Building on situationist art theory, Gaver et al. (2004) have defended "the mysterious and elusive qualities of the uncommented returns" of probes. For example, in their view, probes do not reveal an "objective" view on the situation, but dramatize the difficulties of communicating with strangers. In another place, they tell that ambiguity in probes can spark insightful and valuable dialog with volunteers as well as helping volunteers see their own world in a new way (Gaver et al. 2004). In this approach, ambiguity becomes a key resource that makes probes inspiring.

In many ways, they are right: if one makes a straightforward step from the probes through "findings" to requirements specification, one is back in the traditional requirements engineering model. To avoid this, one has to maintain the tension between clarity and ambiguity, and make the step from probe returns to design proposals, a rich analytic process. Unlike other disciplines that conduct research, design is not singularly concerned with empiricism and the reproducibility of findings. This is not to be confused with a lack of structure in its inquiries, rather design recognizes the unique lens that it sees through and as such utilizes the elements of design as vehicles with which to organize and construct knowledge. A knowledge environment is constructed from the elements of design that foster communication and relationships between findings, interpretations, data, senses, and the material world. This kind of end discovery is seeded from the outset in our design research method.

Studying Biospheric Voices in the Lives of the (Los) Angelenos

In 2006–2007, Super Studio sought to learn how one generation prepares the next during a time of increased awareness of climate change and predictions of radical shifts in natures over the next 50 years. We captured responses from two generations in the Los Angeles area to learn about how they were preparing each other for this uncertain future. We observed gaps in their experiential knowledge with nature that were underscored by their extreme lack of vocabulary for nature. We believe these gaps can be generalized to other urban populations and can define areas for provocative design opportunities to facilitate awareness and foster behavior change.

Framing the study were three bounding terms: biosphere voices, the interplay between place and identity, and delight. Some of the questions we asked were: What biosphere voices, ranging from butterfly patterns to tsunamis to temperature readings to birds singing, are heard in LA? The interplay between place and identity is a known phenomena, so what happens when the earth as we know it changes? Can delight be a motivator for behavior change?

LA is a huge metropolis that has been one of the fastest growing American cities for the last 50 years. It's also one of the geographically largest metropolitan areas in the world, extending well over 100 km in most directions. Compared to the US East Coast, European, and Asian centers, it's not a particularly densely built city, but due to its sprawl and traffic driving beyond the outskirts of greater Los Angeles is neither convenient nor pleasant. However, small pockets of nature do exist within the city limits and are easily accessed by car. In addition, greater Southern California provides a diversity of biospheric experiences including ocean and bays, mountain ranges, and desert expanse. Probing biospheric voices in Los Angeles revealed the status of Angelenos' relationship with nature. In our analysis, we asked if a relationship with nature could be designed and, if yes, then could it be designed for families in LA.

The qualitative study included a suite of six probes, in-home interviews of 10 adults and 20 teenagers, photo documentation of participants' homes, and a webcam mounted on the roof of Art Center that recorded the day-to-day atmosphere (Fig. 1).

The Globe Probe consisted of 20 globes that had been spray-painted white, glue sticks, safety scissors, and a Sunday edition of *The New York Times*. Instructions directed participants to make collages of stories, text, and images to communicate the ways in which the world is speaking to us and how they view the world. *The Sounds You Hear* explored the sound environment around the home and participants' emotional reactions to this environment. The concept was to use the window as a conduit to hear the local soundscape, determine its origin, and capture differences between parent and teenage soundscapes. A large sheet of transparent acetate was taped onto a window for 3 days, participants were asked to write or

Fig. 1 The Los Angeles sprawl and portraits of participating families in Pasadena

draw on the clear sheet the sounds they heard through it. *Tree Rings* allowed interviewees to document their past by flagging milestones in their lives. Each interviewee wrote down seven defining events in their lives that would represent a ring in their tree. Besides variations in responses, the tree ring probes also showed generational differences in teens and parents.

Diary asked the participants to document their daily experience in their homes. The parent and teen participants were asked to identify where they were located; what they were eating, watching, and doing; what they saw, heard, and smelled; and what feelings they were experiencing at the time. These records were made eight times a day for 3 days. This documentation probe was designed to explore the relationships between the participant's emotions, place, and the influence of the outside world within their built environments. *Neighborhood Maps* explored the LA teens' local space. The camera packaging instructed the participants to photograph landmarks, views from a window in their home, nature, pets, and their favorite places. When the probes were returned, the photos and drawings showed both real world surroundings and the world through the teens' eyes. *Future Forecasts* required each participant to predict the Earth's condition over the next 40 years. The next day's instructions asked participants to forecast the next 40 years in the lives of their child or parent. The responses addressed changing times and looked into each individual's own impact (or lack thereof).

Delight Words was an exercise given at the beginning of the interview, and it explored how adults and teens perceive the term "delight" in general and its association with nature. Participants were given a list of more than 200 nouns, adjectives, and verbs as well as space provided for writing in additional words. They were asked to circle all the words that they associated with the term "delight." When completed, they were asked to circle, in a different color, all the words they associated with phrase "delight in nature." Then they were asked to select the most important word from each of the two categories. In addition, *interviews* were conducted at the participants' homes and recorded by video. Parents and teens were interviewed separately for approximately 60 min. Afterwards the home environments were photographed to capture each living space. Finally, *the Webcam*, installed above Art Center's MDP studio oriented viewers to LIVE video of the natural world right outside the studio's walls in a mediated fashion. Webcam moments revealed smoke from a burning fire, a grazing family of deer, and a spider crawling across the camera lens, all at once. The Webcam inspired greater interaction with the outdoors by acting as a natural clock, projecting the time of day through daylight. The Webcam also portrayed aspects of life that we failed to notice. It showed what natural occurrences are absent from the indoor experience at our studio. This motivated viewers to get up and walk outside.

Due to space, we cannot get deeper into how each probe and activity was analyzed, but one example shows the basic principles. The *Globe* probes were tagged with one of four prompts to solicit metaphoric and visual responses about the earth: Show us the future of the earth, if the earth could speak what would it say, the world through your eyes, and your ideal world. Participants used the surface of the white globes to create collages, by cutting and pasting text

and images from the *New York Times* Sunday edition. In our analysis, we compared the teens' and the parents' globes and created one pool of images for teens, another for parents according to each prompt. Next, we identified the main themes in these image pools and created new interpretive collages using these images. These interpretations were placed into two hemispheres, one for teens, another for parents. Four remixed interpretive globes were created (Fig. 2).

In all, the probing process consisted of five steps. These steps of the approach are explained in Fig. 7. The exhibition phase opened an ambiguous but transparent knowledge environment and enhanced exploratory design reflections.

Exhibition as an Open-Ended Knowledge Environment

The Super Studio probe methodology and analytic process described elsewhere (Nugent et al. 2007) provide the content for what we call the "exhibition" with the objective to inform and inspire design. The space contains all of the design-research artifacts, many of which are ambiguous and when exhibited together create an open-ended environment – a space that provides multiple ways of understanding research findings and artifacts rather than a single, didactic one. The exhibition approach also scales across disciplines by serving as a catalyst for knowledge sharing and inspiration among those of diverse backgrounds and interests. Although we chose to counter conventional research presentation formats with the exhibition format for our study, there are a range of possibilities to be explored that offer alternatives to these conventions.

The room as a knowledge-building tool took its clues from the fifteenth century *WunderKammer* and principles as described by Meadow (1992). The Super Studio exhibit consisted of analysis and interpretations that originated from the probes, interviews, and observations as well as video clips, a photography wall, personae, a relational database, a quote book, and a list of intervention ideas. It was filled with a range of media, artifacts in various degrees of "finish," found objects, personal notes, and finely articulated content (Figs. 3 and 4).

At first glance, the exhibit is a visual delight. It's a place to spend time and interact with the probe data

Fig. 2 The Globe Probe designed and analyzed by Yee Chan and Serra Semi. Top to bottom: blank globe and newspaper; one globe as it came back from the field; photograph of one side of one globe return; the magnetic wall prepared for the exhibition; final format used in analysis used globe sections that could be re-organized on the magnetic wall

and analysis. Discussion is encouraged as well as knowledge transfer through touch, listening, and reading. The juxtapositions in the exhibit are intended to create new associations and to trigger new ideas. The value of an open-ended environment is not always apparent and can run counter to the popular experience of an exhibition. The great value of a knowledge environment becomes apparent when visitors bring their own questions and curiosities to the exhibit as these are the things that activate the learning space. The room, then, was built to support

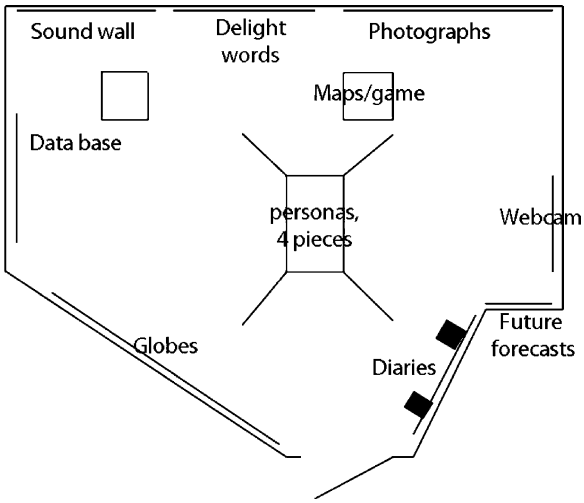

Fig. 3 The room layout

dialogue and exploration rather than to communicate the researchers' inferences to the audience. Importantly, this space is also "evocative," creating and calling forth juxtapositions that would not become available by simply browsing individual probes only.

What came out of the room – in the language of traditional science – was the following main observation. With few exceptions, Angelenos have a very distant relationship to nature. This gap goes deeper than just physical distance and the difficulty of accessing to nature due to LA's vast size. The main problem is in vocabulary. Angelenos have few words to describe nature and their interactions with it. For example, we realized a lack of vocabulary in:

- *Plant life*. The Angelinos made only few, elementary distinctions between different types of trees, grass, and even flowers.
- *Weather*. Obviously, the Angelenos do not have more than 20 terms for snow like Eskimos reputedly have, but they do not have a rich vocabulary for different types of rain, wind, and sunshine either.
- *Local animals*. They are unfamiliar with local animals, except pets – people may know the sound of the neighbor's dog, but lack the ability to distinguish various types of wildlife beyond the most generic descriptions.
- *Exotic animals*. They mentioned a desire to see exotic animals, but the animals mentioned were iconic and generic, e.g., giraffe and dolphin.
- *Types of nature*. Nature is equated with organic life but not, for example, with geological formations.

These observations were consistent. The lack of vocabulary characterized teens just as adults, spanned economic incomes, and included a range of urban living from near Downtown LA to those who live in more suburban areas and smaller centers of Southern California's metropolis. No doubt, there are other exceptions too, ranging from surfers who have a rich vocabulary for movements of water to dog breeders. However, these more specific vocabularies were related to hobbies, for example, one family studied as an exceptional case, grew organic vegetables and fruits as a lifestyle decision.

Due to the lack of vocabulary, the Angelenos studied by us have a limited means to enjoy the diversity of nature. For some, nature was scary while others thought it was inconvenient or associated it with feelings of nostalgia. If one does not know which snakes are dangerous, one fears every one of them. Similarly, nature may become just a matter of opinion, which is captured by one of the personas that emerged from the research. For this persona, the claim that the earth is warming due to greenhouse gases is a "crock of shit," and is just another opinion that takes place in mediasphere, worth as much as any other opinion (see Fig. 4).

The lack of vocabulary may easily translate into a lack of appreciation of nature both locally and globally. If the name of a migratory bird is unknown

Fig. 4 A view from the Exhibition, December 2006. The exhibition created surprising juxtapositions through the metaphor of the fifteenth century notebook. Here, two probes are shown. Front exhibit: interviews analyzed into personas. Back wall from *left* to *right*: the Sound Window Probe, the Delight Words Probe, and photography survey of participants homes

then how can its disappearance be discussed? If cloud formations and wind patterns are overlooked, then how is weather perceived? A lack of verbal and visual vocabulary hinders awareness and the development of cultural practices around environmental issues.

The design driver under which we collected these observations was "the lack of vocabulary." This was more than an interpretation, an outcome of the research phase. It was a name for design opportunity, identifying a promising area for design. The design task became: how to bring nature back to the lives of the Angelenos? How to make them care for the nature. How to give them a vocabulary to observe it and to create sensitivity to it? We cannot make them act in a responsible manner, but we can give them the means for the first step in forging a new relationship with nature.

Although there is a rich history of LA architecture that dissolves the boundary between indoor and outdoor spaces (e.g., Rudolf Schindler and John Lautner) as well as organized nature activities for youth (e.g., Boy/Girl Scouts), there is little innovation in and around media design that highlights the diversity of nature within the context of daily activity, climate change, and delight. We discovered an opportunity area that may help Angelenos and other urbanites foster a closer relationship with nature.

The opportunity area was identified through interacting with and through the exhibit; it did not build on any particular probe. When the results of each probe were installed in the room, there was no obvious way to arrive at any particular interpretation. The structure of the room eliminated the possibility of any straightforward leap from the probes to design. Due to ambiguity built into the exhibition, the leap had to be discovered through dialogue and the experience of the room itself.

The students developed two concept areas under which to prototype and explore a range of possible design proposals. These proposals spoke to the potential of the identified area and served as provocations for others to consider the space for their own further inquiry and design. The two concept areas included the "Unwall" which is situated in the suburban house and "Roam" which engaged teenagers in a game activity that created a link between local nature areas and public spaces such as malls. These two very different intervention areas demonstrate the wide range of possibilities this opportunity area provides.

Concept 1: The Unwall

The Unwall prototypes are designed to bring nature into the suburban home and dissolve the boundary of interior and exterior spaces. Our explorations show the possibilities of a wall as an interface for delight in and around the diversity of nature that's found in the suburban backyard. The unwall prototypes built on our hypothesis that a rich vocabulary including recognition of natural elements, plants, and animals is fostered through everyday, serendipitous experiences with nature.

In addition to study findings, the concept recognized two urban planning issues that shape Los Angeles suburbs. Levittown, New York, in 1947 was America's first suburb – the suburban lifestyle spread quickly, in particular in Southern California where it was taken to extremes. The suburban house represented a shift to housing as a manufactured commodity, parting ways with the concept and evolution of shelter and all its unique variations seen the world over in response to climate, geography, and culture. While not strictly post-war construction, the communities in which our participants lived are still based on this model of commodity. The second planning issue is suburban land use. Although a suburban lifestyle offers more open spaces for greenery than city living, suburbs are still tamed places in which the landscape does not reflect the local natural habitat.

Design opportunities emerged from our photo survey, portraits, and probes. For example, we saw:

- Underutilized spaces in the yards and exterior spaces that were used primarily for storage.
- Uninspiring views of nature seen from inside the homes such as trash cans and overhead wires in the foreground.
- Family aspirations to enjoy their backyards were often unrealized. For example, at the end of summer there were covered bar-b-ques and brand new sets of bar-b-que utensils sitting dusty and unused.
- A generic vocabulary for nature and surrounding areas was observed in the neighborhood maps that were drawn by teenage participants.

– Outdoor areas that were being used appeared to be structured much like an interior space and lacked a sensitivity to the potential of an outdoor environment.

With these findings, we wondered how the neighborhood shapes what Angelenos define as their community, the boundaries they establish as their yards, the nature that a yard may or may not contain, as well as how Angelenos define their home and the boundaries that determine what's inside and outside. Our concern became how these perspectives may also shape how they view nature, and ultimately the environment and world at large.

Guiding influences on our design explorations included a teahouse at a local Japanese garden and Ronchamp Cathedral by Le Corbusier. The teahouse had configurable spaces based on the modular tatami mat system and two sets of interior and exterior shoji screens that provide varying degrees of openness to the environment. The window wall of the Ronchamp was seen as an interface for light. Early design iterations include such unique directions as a cloud aquarium, moldable grass, and solar tracking experiments. These brought us to the idea of a breathing home, modular grass, visualizations of wind, and sunlight tubes, creating a fiber optic array which would bring sunlight into the home and also serve as a way to track the sun throughout the day. Eventually, these ideas were synthesized into a modular wall of concept prototypes that demonstrated the potential for new and delightful interactions with nature.

We built cardboard models and constructed modules for a garden table, magnification of minute happenings, and apertures for viewing the yard. Concept prototypes including a flip garden, mediated nature views and details, a minigarden, and the pore wall were composed into a wall at full scale (Fig. 5) for further testing. The synthesis of all this was to explore the conditions of interior and exterior space in regards to nature. We created new interactions that were designed to foster the first steps of a relationship with nature for Angeleno families. Our prototypes serve as proof of concept that the domestic environment is a rich area for innovation in and around designing a relationship with nature. We hope that our project will spark a dialogue about new possibilities and investigations among urban planners, communities, environmentalists, designers, and families.

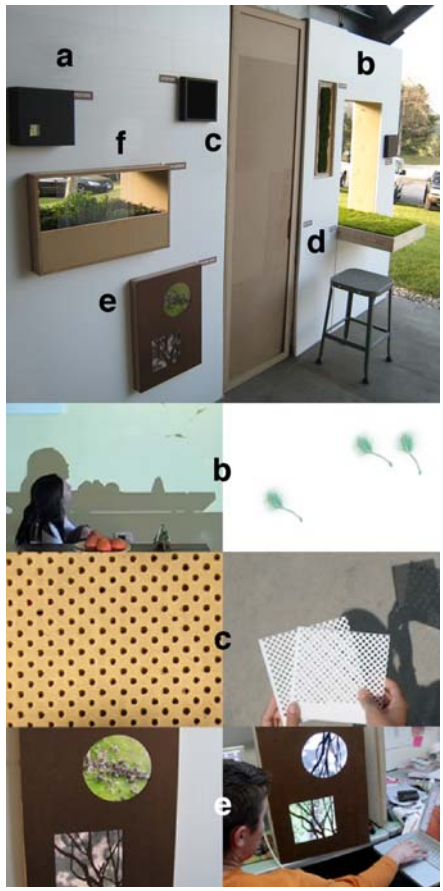

Fig. 5 The Unwall and its many concept prototypes, spring of 2007. *A*, "Apertures" frame particular views of the garden such as a budding plant; *B*, "Wind Delight" is a speculative interactive wall that visualizes the intensity of the wind outside with floating seed patterns while also responding to the in-door activity of someone blowing on the virtual seeds whereby scattering them further across the wall; *C*, "Pore wall" allows the homeowner to open and close a wall to allow fresh air in while at the same time creating moiré patterns that filter garden views; *D*, "Moss Table" when flipped open (shown) is a tabletop of green moss that is suitable for a dining surface, when closed it blends with the house exterior; *E*, "Nature view" shows mediated and real-time views of the garden including microscopic close ups of insects as well as shadow patterns, *F*, "Herb garden" built into the wall that speculates on future possibilities of customizable-herb hybrids such as watermelon flavored basil with high levels of nutrients

Concept 2: Roam

Roam is a game activity designed for teens in urban areas to build a personal relationship with nature and develop a greater visual and aural vocabulary around creatures living in the wild. Public spaces where teens like to congregate in the Los Angeles area provide little

Fig. 6 *Three uppermost pictures*: Capturing animals for Roam in the city and its nature habitats. *Middle*: The digital device. Animal avatars are collected through these cellphones. Animal sounds are heard through the speakers and visual interactive data are downloaded to the phone's memory. *Down*: The Urban Space. Teens interact with their avatar animal in places like malls, theatres, recreation centers, and schools. As they return to local nature spots, they can collect new animals or upgrade the interactions of their current one

nature that they can relate to, prompting us to think about ways to bring nature into that experience. The neighborhood map probe shows the teen Angelenos' generic drawings of their surroundings. From interviews of 10 families, we found unfamiliarity with their local nature. As a result, Roam is designed as social outlet for teens to explore their neighborhood in both their urban and local nature areas.

Players go out into local nature to collect animal avatars with their digital device. Electronic checkpoints in these select nature locations contain digital data of the desired animal. These animal avatars are brought back into the urban area, where they reveal themselves in mobile phones and through sound, and visually on large interactive displays strategically located in public spaces (Fig. 6).

Before families could engage with larger issues like climate change, they first needed to establish a personal relationship with nature. Our approach was to design experiences in local nature areas as a means of taking the first step towards building that personal relationship. Focusing on the teenagers in Los Angeles, we researched existing nature activities. Most of them foster a relationship that treats nature as an adversary. Activities like Outward Bound, or even Boy Scouts, pit teenagers against the elements, and prioritize building character instead of an affinity with the environment. Extreme sports are similar, looking at nature as something to be conquered. One of our research participants owned a dune buggy, which we thought was the perfect symbol of nature as adversary. As we began to focus on addressing teenagers directly, we recognized that nature can become a viable space for them, as they are trying to be independent from their parents. Teenagers do not have any claim to a space of their own outside of their room. That leaves them with nowhere to go except public spaces, although nature is the biggest public space of them all.

By roaming to interface with nature, teenagers explore their local nature with a different mindset than they've had before. This introduces a rich area for further research and discussion. The realm of mobile gaming, personal identity, social behavior, and environmental awareness all become relevant when nature is thought of as a public space instead of an adversary or escape.

Discussion

Over the last 10 years, cultural probes have proven to be an efficient and exciting way to identify design opportunities through studying people. However, there have been few attempts to describe how the step from probe returns, often evocative and exciting, to actual design outcomes takes place. While some researchers have seen this step, just like any other, attempt to specify requirements for engineering (Cheverst et al. 2003), others have defended the importance of ambiguity in keeping the opportunity space open as long as possible (Gaver et al. 2003). Still, others have

stressed the co-designer aspects and dialogue in making sense of probe returns (Mattelmäki 2006).

In Super Studio, the approach has been closer to the ambiguity and co-design arguments, but it has been based on an intentional movement towards using design-specific methods of translation. This movement using the affordances unique to the discipline of design has not been modest. It has embraced everything from formal characteristics of the ephemeral, the metaphorical, and even the simple ability of design to inspire or incite delight. This paper has described how Super Studio 2006–2007 has explored the meaning of biosphere in the lives and minds of Los Angelenos. Probe returns were first analyzed in detail, just like in other approaches. However, after this mode of analysis, they were communicated not in terms of itemized responses, concepts and categories, but in terms of interpretations that, subsequently, were placed into an exhibition (Nugent et al. 2007). The way in which the exhibition has been built varies from one Super Studio to the next. In 2005–2006, it was based on the idea of *Wunderkammer*, while in 2006–2007, it was based on the metaphor of fifteenth century notebook. Although large design offices often dedicate rooms for projects and build knowledge environments, two things distinguish Super Studio's approach from what companies like IDEO are doing in their daily work: Super Studio's metaphoric conceptual basis, and the fact that the space was built to be an exhibition rather than a directive of data, interpretations, and design ideas.

Building an exhibition into the studio space was an extra step, which took several weeks. The reason for this extra effort was that it gave the Super Studio members and the outsiders alike an overview of the process and the probes, made it easy to browse the probes, and to create juxtapositions between various probe findings. Even more importantly, the exhibition format is interfaced with differently than a book or journal, which tend to be along with power point and the bulleted list, the formats of choice for structuring research outcomes in other disciplines. This format requires the reader to contribute by stepping into an information space, to recognize that it is larger than them. It can oppress viewers or it can encourage them to share their judgments. Regardless, this format, in lieu of the book or journal codex, encourages a creative exploration of not just one, but several probes and to eliminate a quick jump from the probes data into design decisions. Once the room was created, there was no way to make obvious interpretations.

As always in design, the value of research is measured by new insight it leads into. In Super Studio 2006–2007, the process led to two concept areas, *The Unwall* and the *Roam* Game Concept. *The Unwall* is designed to bring nature into ordinary living environments through a variety of displays and media elements installed into homes. It has precedents in architecture – for example, the Ronchamp Cathedral and the roof of *Sagrada Familia* in Barcelona – but this time, the concept used mediated interactions and experiences to bring nature into the home. *Roam*, on the other hand, sought to create engagement with nature by creating a game that attracted teens out from their homes and created topics for discussion for them, Both concepts were based on the main observation of the knowledge environment created in Super Studio: that the Angelenos have only a limited vocabulary for describing nature and their interactions with it.

However, in their details, the concepts built on different aspects of this observation. While *Roam* tried to create an active relationship to nature, and introduced nature into those activities that take place outside the home, *The Unwall* tried to create engagement in the immediate home, seeking design opportunities from the proximate environment. No doubt, other concepts would have been possible too, but given the limited size and time of Super Studio, only two groups were created.

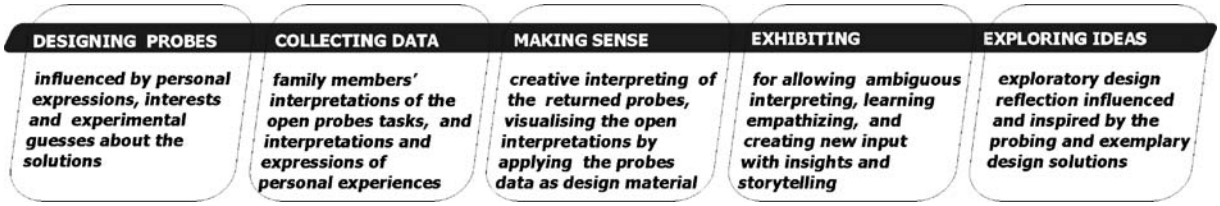

Fig. 7 The probing process. The five steps of the approach are explained in the diagram. The exhibition phase opened an ambiguous but transparent knowledge environment and enhanced exploratory design reflections

In this paper, we have seen how Super Studio has used design specific methods of analysis whose results are intended to inform design (Fig. 7). In the history of probing over the last 10 years, there has been a tug of war between a more scientific and an antiscientific stance what comes to understanding how the step from the probes to design is supposed to take place (see Boehner et al. 2007). The key term has been ambiguity: some have defended the ambiguous and creative nature of probes, while some have seen probes in more traditional scientific terms, as flight from ambiguity as Levine (1985) once characterized the history of Western science. Super Studio participates in this dialogue by showing in concrete terms how one can use design-based methods – creating an exhibition instead of creating a scientific article or some other linear presentation – to organize this crucial step. We believe that in its spirit, our approach is not only well in line with the situationist roots of the probes (Gaver et al. 1999), but also with an important trend in current design research: embracing design practices in a way that enables designers to do and produce research reflective of their unique offerings, taking a step in bridging the gap between these two worlds.

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