ABSTRACT

Digital media have great potential as tools for self-expression and artistic exploration. We seek to enrich the discussion of challenges and benefits associated with using digital design methods and materials with children in developing countries through a case study. Our contributions to this discussion are based on our involvement in facilitating a two-day co-design workshop with 25 marginalized children in Oaxaca, Mexico. Together, we explored, designed and implemented digitally augmented paper artifacts based on traditional folk art from the children’s native region. We analyzed the artworks and observed the children during the workshop to inform our research. Lessons learned include the importance of establishing trust through local contacts, incorporating relevant cultural and social elements, planning concrete outcomes and using technology appropriately. We hope that this detailed case study may serve as an exemplar, by providing insights and inspiration for other designers, researchers, and developers when planning, carrying out, and studying workshops.

Author Keywords
Co-design with Children; Intercultural Collaboration.

ACM Classification Keywords
H.5.2. User Interfaces

INTRODUCTION

The emergence of accessible, both technically and economically, digital hardware and software tools, as well as, a global increase of interest in Making and Tinkering methods are bringing about a paradigm shift in design and production that some technology pundits call “the new industrial revolution” [1]. There is much potential to be explored in this area. Many initiatives have identified and explored possibilities of facilitating the use of technology for education and information sharing on a global scale [2]. A seemingly inevitable outcome of the combination of globalization and digital design “democratization” should be the proliferation of new global digital design ideas and perspectives: something that has been slow in coming!

We present the results of a case study in the form of a two-day digital media design workshop with children in Oaxaca, Mexico. The workshop aimed to provide the participants with a basic understanding of what technology is and its relationship to art and to facilitate the design of digitally augmented artifacts. The workshop was an example of intercultural collaboration, not only between the facilitators and the participants, but also among the facilitators themselves who came from different backgrounds. This characteristic is bound to become more common in research and educational efforts in an increasingly multicultural and heterogeneous global society [8]. Thus, we find it important to share our experiences working at a grassroots level.

The children who participated in the workshop are among the most marginalized and underserved children in Mexico with many families affected by social problems such as drug trafficking and sex work. These characteristics had important implications for the design of the workshop and it was essential to incorporate information about the cultural and social context in which the children are situated into the workshop design. One of the authors is from Mexico and has already worked with these children for several years. Her experience and relationship with the children was an essential part of the project and made it possible to come up with a plan that was relevant and informed, prior to conducting the workshop. The ultimate goal of this research effort is to come up with methodologies that not only facilitate creative expression and learning for children in similar contexts but bring about empowerment through creativity.

BACKGROUND

Learning and Agency
The traditional school system has been under great criticism in recent years. There has been a wide recognition of the diversity of intelligences and their effect on learning [7, 20]. Studies have identified the existence of multiple learning styles among children and have shown that achievement
increases as teaching method matches the learning styles of children [6, 20].

Constructivism, an influential school of developmental psychology whose pioneers, Jean Piaget, John Dewey, and Maria Montessori regard children as constructing knowledge rather than being empty vessels and taking it in, emphasizes creating space for children to direct their own learning through experimentation and creative expression [12]. In this view, deep concentration through purposeful action is essential for learning for children. Seymour Papert applied these ideas to the design of tools to facilitate digital design for children at an early age and argued that the learning experience is positively transformed once children become engaged in projects that they design and execute themselves [17].

In recent years, innovative projects have demonstrated the potential of technology to educate and empower marginalized children. In the Hole-in-the-Wall project, [15] a computer connected to the Internet was embedded in a concrete wall in a slum in India. Access to the keyboard and mouse was restricted to children by placing guards that only small hands could pass through. No supervision was provided to the children and it was hypothesized that they will learn in an independent, self-motivated and collaborative manner. A computer literacy test, conducted after 248 days, reported a hike from 7% to 43%. This showed that the children could learn basic computing skills in the absence of teachers and curriculum, and with a fraction of the cost of setting up a class [15]. The study has since been emulated in 22 other locations throughout India with similar results [16]. While our methodology is different from Mitra et al., we are inspired by the results of questioning assumptions and using minimal technology to achieve great results. Another study of XO laptops distributed as part of the One Laptop per Child program to school children in Uruguay, identified positive effects such as increased interest in reading, writing, collaborating and learning from each other, as well as, accessing previously unavailable information resources, in the children [9].

Co-design and Children

Several methodologies have been developed to facilitate digital design for children. Cooperative Inquiry, with roots in Participatory Design, is specifically developed to allow children to be design partners and collaborate with adults to come up with novel design ideas [5]. The method views children as potential designers and aims to facilitate their abilities to be design partners through accessible and intuitive methods. Cooperative Inquiry uses a series of techniques such as Bag of Stuff and Stickies to prototype and critique ideas. Bag of Stuff uses low-tech tools such as paper, pens and craft material to allow children to come up and express novel design ideas. Stickies uses small pieces of paper with adhesive glue on the back to express reasons for liking or disliking a design or to suggest new ideas about it. The ideas expressed initially on paper are to be followed up into actual implementation. Cooperative Inquiry is generally to be performed with child design partners frequently and over a long period of time.

Our method can be viewed as a different variation of Cooperative Inquiry in that it is highly inspired by it and shares the philosophy of viewing children as design partners. However, there are important differences. First, the main objective of our workshop was not to design a new interface for children, but to facilitate the design and creation of digitally augmented art works. Thus, in our approach the emphasis was on creative expression and aesthetics rather than problem solving or technological innovation. The focus and goal of our method is not to develop or evaluate user interfaces, although this could happen as a side effect, but to facilitate empowerment and learning through self-expression and creativity.

Second, the context in which we apply our method is different. The main implication of this is that resources, including time for facilitators and children to work together, are very limited. While in Cooperative Inquiry, the goal is to come up with design ideas that will be implemented in the future, for us the outcomes of the workshop were self-contained. In other words, while we initially used drawings as design proposals or interpretation of materials in the presentation, at the end, they turned into interactive artifacts and became one of the main outcomes of the workshop. This is essential because due to logistical reasons we cannot have frequent meetings with the children and, thus, for the workshop to be effective and meaningful for the children, we had to come up with concrete and self-contained results within such a short time.

Third, we had to take into account specific cultural and social barriers. The children did not have prior familiarity with computers (something that is increasingly rare in developed countries) and we had to provide scaffolding in the form of interactive presentations throughout the workshop. Finally, as with any project in a developing context, the question of sustainability was crucial to our designing the workshop. We will come back to questions of impact and sustainability in the discussion section. In a recent reexamination of Cooperative Inquiry, the developers of the method suggested its potential for modification for and application in developing world contexts [8].

Two other similar methods, Bonded Design and Informant Design, allow for children to be involved in the design process in different capacities. Informant Design incorporates children’s input into design but does not view them as co-designers [18]. Bonded Design views children as design partners but also questions whether the hierarchies between adults and children can be overcome during the design process [11]. While our method has many similarities with Bonded Design, especially the emphasis on learning, in viewing children as full design partners we feel our approach is closer to Cooperative Inquiry and, perhaps, even goes further in viewing the children not only as design partners but
actually as the main designers and the adults as facilitators or technical informants on how the children’s ideas can be executed.

AN INTERACTIVE DIGITAL ART WORKSHOP

Workshop Background
The workshop was conceived through the coming together of two cultures and disciplines. The authors have different backgrounds: Computer Science and Interaction Design, on the one hand, and, Fine Arts, Public Art and Education, on the other. The idea for the workshop was formed through discussions around how technology and art can be combined and used for education and empowerment. The workshop was to focus on hands-on activities with concrete outcomes but be rooted in theory and foster reflection.

The aim of the workshop was two-folds: 1) to provide an introduction to what is technology and its relationship with art and creative expression; and 2) to facilitate the practice of knowledge learned through the hands-on design of digitally augmented artifacts. During the workshop, we observed the children closely and also analyzed their drawings, sketches and artworks post-workshop to inform our research.

Setting and Participants
The participants consisted of 25 children between the ages of 5 to 13 (8 girls, 17 boys). One of the participants, a 7-year old boy had an unidentified speech impediment. Another boy of 12 had autism and did not communicate clearly, although he participated in many of the drawing activities. The children are amongst the most marginalized and vulnerable children in Mexico. The children live at the Casa Hogar Hijos de la Luna (Home of the Children of the Moon), which is a non-governmental organization (NGO) caring for children of impoverished families whose mothers are often involved in night-time employment and are not able to provide proper adequate care for their children. Many of the kids have experienced and witnessed violence and some have undergone abuse in the past.

The second author has worked with the children for several years and has a close relationship with many of them. In the past two years, she and her university students have spent several weeks each summer organizing an arts and craft festival called Yo Soy Arte (I am Art). The activities have included the creation of masks and traditional fantastical creatures called alebrijes, from papier-mâché and the writing, directing and acting in a theatrical play. This existing relationship was key to making the current technology-based workshop possible and effective.

The center is located in the suburbs of Oaxaca City, which is the center of Oaxaca state, a state in Mexico known for its rich folk art tradition and indigenous culture. From the beginning, we aimed to incorporate artistic and cultural elements familiar and relevant to the children in the workshop. In discussing possibilities for activities and projects during the workshop, we considered many artistic practices from carpet weaving to papier-mâché to mural painting. These were communicated to the children throughout the workshop and they chose which theme to focus on.

Figure 1. The setting of the workshop.

The workshop was held in a large room with a lot of sunshine and fresh air. The children sat on a large common table and were each given paper and simple crayons. Other than the first author’s personal computer and a projector, no other computers or displays were available. Figure 1 shows the setting of the workshop.

Material and Technique
A key consideration in designing any activity in a developing world context is sustainability: the question of what happens when the research or intervention teams leave? Our priority, especially for the hands-on activities, was to focus on design thinking and a method that could be applied to other contexts. Thus, it was essential not to focus on the tools but rather the method. Additionally, we wanted to incorporate existing and available material from the children’s lives rather than introducing unnecessary technological gadgets and tools. The challenge, then, was how to engage the children and facilitate the creation of novel interactive designs using minimal computational material.

Drawing is one of the most accessible methods of communication for young children [21]. It makes sessions more interactive and is a good method to include participants, especially in a large workshop. Additionally, it provides a personal record for the children and a concrete and tangible outcome. The drawing phase of the workshop is essential because it helps internalize the concepts and gives the kids a chance to customize the ideas and take ownership of them. We used drawings in three capacities: as interpretations of concepts (e.g., technology, art festival, …), as proposals for digitally augmented artifacts and as functional digitally augmented paper artifacts. During the workshop, we had several drawing sessions. The third capacity is novel to our approach in the sense that the drawings were not ideas or only suggestions for future implementation, as we will
describe in more detail in the outcomes section, the drawings were part of the implementation.

Many of the children who participated in the workshop do not have prior experience working with computers. While many of them knew what computers were and how you could access information, send and receive email and play games using them, only a couple of the children had actually used a computer before. Similarly, they had never used a smartphone or tablet. The implication of this was that we had to provide adequate scaffolding and context for the children to build on their design thinking. Thus, we came up with a simple theoretical model that was exemplified by concrete instantiations. We hypothesized that if we were successful in communicating the model effectively, the children could extend it and come up with new examples of its application.

The children had explored the theme of “art” in the previous years’ festivals. They already had first-hand experience creating and showcasing artistic works. However, they had not explored the theme of technology before and so we did not spend time explaining and exploring the concept of art and focused on technology during this workshop.

Following, we will describe the workshop components in detail.

Process: day 1
The workshop ran over two days and each day we worked with the children for approximately 4 hours. There were two short breaks, one for play and one for snacks, during each day. During the first day the following activities in the order mentioned were conducted.

Meet and greet: A key ingredient for successful intercultural collaboration is trust. The first author had not met the kids previously and did not speak their native language, Spanish. Therefore, it was essential for him to be introduced formally by the second author who had worked with the children before and had a close relationship with them. This transfer of authority is something that can be achieved by a simple introduction (preferably accompanied by a physical and symbolic act of greeting such as shake of hands, giving hugs, … depending on culture) and is very important to laying the foundation of a good relationship. The relationship was further established when the second author described where he was from, showing it on the map and so on.

Overview of previous year’s festival: As mentioned previously, the children had participated in an art festival the year before and the next activity was for them to describe what was the favorite part of the festival. The purpose for this activity was two-fold: first, to identify possible ideas from the festival that could be extended by introducing digital material, and, second, to give a chance to the children to lead a dialogue and describe their activities and achievements to the adult facilitators. In our philosophy, children and adults should meet on equal planes and while letting children tell us about their world is not enough to break the hierarchies imposed between adults and children, especially if adults are perceived as “experts”, it is a good start. The use of such relationship building activities is recommended in previous research [2].

As the children were talking about their favorite parts of the festival, the second author wrote and categorized the ideas on a big sheet of paper that was hung on the wall. We came back to the sheet several times during the workshop as reference on possible projects to work on in the future. The section was followed by a drawing session where we asked the children to draw their favorites part(s) of the festival.

An interactive presentation on technology and its relationship to us: After talking about the art festival and the drawings the children made of their favorite parts, we conducted an interactive media-rich presentation on technology and its relationship to us. We used a style of presentation that uses a lot of metaphors, humor and personal stories. We have found that this technique, which we refer to as poetic presentation, allows for the engagement of diverse populations and age groups. During the presentation, we first explored the question of what is technology.

We used Marshal McLuhan's idea of "Technology as extension of man" [14] to expand this notion of technology to include tools that are not necessarily digital, for example wheels and candles and knives. This approach easily led to the question of what is the purpose of technology. Through questions and answers with the participants, we identified the purpose of making tools as objects designed to help people, make life more comfortable and allow people to express themselves (e.g., through musical instruments), etc. We also touched upon the idea that bad design can lead to accidents and problems (illustrated by a Charlie Chaplin clip from the Modern Times where a worker gets sucked into a factory machine).

This introduction was necessary to shift the children's understanding of technology as something to be consumed to something to be designed. This approach followed from our main goal to use digital design to engage the children in co-design and, thus, it was necessary to prepare them for hands-on activities that were to follow. In addition to being influenced by McLuhan's idea, the theory and design philosophy we use is highly influenced by Reflective Design that emphasize the importance of questioning underlying values in design and aiming to incorporate positive values in design [19].

In the presentation we also talked briefly about a simplified Input-Process-Output (IPO) model (originally formalized by IBM Corporation). We used the IPO model to help children break down components of an interactive design. We used metaphor and analogies to illustrate the model. For example, when a human encounters fire, their senses of sight and smell (i.e., input) alert their brain (i.e., processing unit) about the fire. Based on this input, the brain makes a decision (i.e., process) to move legs and vocalize a warning (i.e., output). This process is similar if we create a robot to detect fire. In
the case of an encounter, the robot’s sensors detect the fire (i.e., input), the microcontroller or computer inside makes a decision to act (i.e., process) and its actuators are activated so that it can move or alert others (i.e., output). As we were describing the example, two of the children suggested that in this case the wires would be like the nervous system because they carry the messages around. This confirmed that they had internalized the model and understood the metaphor and were able to extend it themselves. We showed a concrete technological example in the form of a wearable interface, HugBug that consists of a hat augmented with LED lights and a touch sensor. When the wearer of the hat hugs another person (activating the sensor) a light show in the hat is triggered.

After this session we had another drawing activity, where each child made drawings of their interpretation of technology and the examples they were shown.

**Design proposals for digitally augmented art works.** At this stage, we examined the drawings of favorite parts of the previous years art festival and identified several possible themes that could be further explored in the rest of the workshop. Our criteria for the themes were that they had to have a basis in the cultural context from which the children come from, they should be doable within a limited amount of time and the children must be interested in doing them. The possible themes identified were fantastical papier-mâché creatures called alebrijes, costumes and gadgets for superheroes, a mural that tells a story and an interactive life tree with plants and flowers. After considering each possibility and taking into account the overwhelming preference of the kids, we decided to focus on the first option, alebrijes, in this workshop and consider the other themes for future ones.

**Alebrijes** are fantastical Mexican folk art papier-mâché sculptures that since their inception in the 1930’s by the Mexican folk art legend Pedro Linares have become quintessential symbols of Oaxacan folk art [3]. The creatures are often times juxtaposition of different animal parts (e.g., elephant with wings) that are loved by children and despite their fearsome appearance are believed to be protectors from evil nightmares.

An appeal to choosing this topic for the workshop was that the children were already familiar with the creatures and did not need instruction on how to draw them. We asked them to draw their own alebrijes and indicate if they had lights, sensors, sound and other components where would they place them. We asked the children to use glitter to indicate glow and light if they wanted to.

After drawings were made, we concluded the first day’s workshop. Note that until this point, the children had not used any new digital components in their drawings or activities. The outcome of the first day workshop was close to 50 drawings, most of which were interpretations of technology and some initial sketches of alebrijes. Six or seven of the younger children wanted to draw things unrelated to the theme of the workshop, something that we did not encourage but allowed if they insisted.

**An interactive presentation on electricity and interaction:**

At this point, we gave another interactive presentation on what is electricity and how to use it to make objects interactive.

To illustrate our point through a fun example, we introduced a new technology: the Makey Makey board [4]. While the underlying design of the board is complex for the children, the concept it exemplifies (that any conductive material including fruit, humans and water can be turned into a key on a keyboard) was very intuitive for the children and allowed them to experience interactivity and how electricity can affect it, first hand.

Using simple diagrams, we showed that a circuit is formed when two poles of an electric source are connected together. They experienced this when they held the ground (negative)
wire connected to the Makey Makey and touched a banana that was connected to the positive wire, creating a closed circuit that triggered a sound effect on the computer. The children interacted with a simple sound effect software using the interface. They took turns playing and helped each other by making sure all the connections were made when each person was using the interface.

**Digitally augmenting the alebrijes.** Building on the play session with the Makey Makey, we described how an LED works and how it should be connected to a battery. We gave out a single blinking LED and a battery to each child. We instructed the children to first attach a second sheet of paper to the back of their drawings. Next, they had to make two small holes around the spot they wanted the LED light in. The two legs of the light were to be connected to the battery that was to be stuck to the back of the drawing. Finally, the second sheet of paper was glued so that you could only see the blinking drawing and not the underlying battery.

This process turned out to be harder than expected. A question was how do we make the battery and light stick together properly without soldering them. Many of the children wanted the light to have a switch so that it can become interactive and respond to touch. The solution to both problems came with the realization that if we leave the connection between the battery and LED loose, it can be activated when touched and effectively becomes a switch. We gave the children the choice between a permanent blinking light and one that is turned on by pressing a dot painted next to it. By the end of the session, there were 18 unique augmented drawings. Most of the children (10 out of 18) decided to make the LED lights sensitive to touch and loosened the connection to the battery. The drawings were different from each other not only in the shape, color and formation of the animal parts that formed the alebrijes but in the position of the light and whether they were permanently blinking or sensitive to touch.

Many more drawings had been made in addition to the augmented ones but some of the children did not finish putting in the LED lights. This was because they became restless and tired at the end and slowly lost interest. The workshop sessions were long and although we had breaks, some of the children, especially the younger ones became tired towards the end of the day. While 5 of the 7 children who did not finish their drawings were among the younger participants (5 to 8 years of age), at least 4 younger participants in the same age range did finish the work and stayed active until the end of the workshop.

**Figure 3. A participant with his augmented alebrije.**

**Show-and-Tell:** We concluded the workshop by putting all drawings on a table. It was a beautiful sight for the children to see the fruits of their effort. The children had many questions about the lights (e.g., how long the battery is going to last? Would it blink at night?). The children were given a choice to keep their drawings or leave them in the common room where other people could see them. Many of the children were excited to show their work to parents (who occasionally visit them at the center) and the other caretakers and adults at the center. The drawings encouraged social interaction between the children; they would examine their peers’ work and comment on things they liked and didn’t like. Also, all the children who finished putting lights into their prototypes were proud of their work and some wanted us to take their picture with their artwork (e.g., see Figure 3).

**Outcome**

The 18 unique augmented alebrijes drawings are self-contained digital media art designs. They can also be viewed as proposals for future physical papier-mâché versions. While these (along with the other drawings made during the workshop) were the most concrete and tangible results of the workshop, they are an expression of an internal learning and creativity exercise that we believe the workshop facilitated.

In our mind, using simple and affordable digital technology, one LED light and a battery in this case, is a strength of the approach and shows how much can be achieved with little material. We believe the children’s achievement in making designs that are personally meaningful for them with such limited instruction and material is remarkable.

The children were happy after the workshop and wanted us to come back to do more activities together, a positive sign that they enjoyed the sessions. We did not ask them directly whether they enjoyed the sessions to avoid putting pressure on them to respond positively to please us. Rather, we observed the joy and pride they took in their creations and their eagerness to show them to the other caregivers at the center; to each other and to us.
DISCUSSION

Being acutely aware of the challenges and potential of conducting an intercultural co-design workshop is a humbling experience that is rewarded by the ingenuity and joy the children embody. Here, we share the lessons learned that were informed by observing the children during the workshop and analyzing their artworks and drawings after the workshop.

Building relationships: When conducting intercultural collaboration projects, the key ingredient is trust. We believe the success of our project was because of the trusting relationship that the children had developed with the second author who has worked with them on art projects for several years. We cannot overemphasize the importance of collaborating with someone who is situated within a culture in these projects. During the workshop, whenever there was need for clarity or direction, the children would defer to the second author who they knew and trusted. At the end of the workshop, they clearly enjoyed showing their final designs to her. In cases where collaboration at this level is not possible, at least having a local Human Access Point (HAP) is essential. In the field of Information and Communication Technologies for Development (ICT4D), HAP refers to a trusted member of the community for which the project is to be designed for [13]. Not only can a HAP provide invaluable feedback and suggestions on the design, but perhaps more importantly he or she can mitigate the trusting relationship with the community that is essential for any effective collaboration.

Cultural and personal relevance: Previously, “personal meaningfulness” of design activities in similar workshops, is identified as a prerequisite for deep engagement that is important for both learning and empowerment [9, 10]. We involved the children in the brainstorming that led to the activities of the workshop and observed consistent signs of pride and attachment in them not only towards the final outcome but to the collaborative process of the workshop as well.

We highly recommend that workshop facilitators make an effort to familiarize themselves with the culture of the region within which they plan to work and try to design culturally relevant activities. In our case, we found great sources of inspiration in the folk art and craft traditions of the folk artists and craft masters of Oaxaca and are honored that the outcome of the workshop turned out to be a fusion of an existing tradition and recent digital design methods and tools. From the outset, we wished to find a way to help the children appreciate their own culture and find value in the art and craft that they have inherited from their community. Of course, as with any activities planned with children, we had several backup plans, including working on cardboard robot models or futuristic gadgets, in case we could not identify other ideas successfully. However, we did not have to resort to these plans.

Sustainability and impact: One of the challenges of conducting projects in a developing world context is how to achieve sustainability and impact in such a short amount of time and with such little resources (especially, having limited time and ongoing contact). While these are big questions and this case study is just a start in developing methods or solutions, we will share some ideas and observations.

Three elements were present during the workshop: the relationships, the process and the outcome. With respect to the relationship between the facilitators and the children, we tried to embody our philosophy that the children are artists and designers too and our coming together is an encounter in which we respect each other for who we are and do not put pressure on the children by unrealistic expectations or plans for the future. At the end of the workshop, the children felt very comfortable talking with us and kept insisting that we come back for more workshops. With respect to the process, by limiting the technological tools used, we emphasized that the design process and design thinking are more important and useful resources than specific tools or technologies. The children quickly learned how to connect an LED light to a battery and furthermore learned how to “hack” the combination to create a push switch. Once the children learn how to question things, make decisions and weigh different choices and realize the value of their creativity and originality, they can use it in any context. Finally, with respect to outcome we made sure there were concrete expressions, in the form of the augmented drawings, of our collective experience during the two days. The children had vivid memories of the art festival of the previous year because they made tangible crafts and participated directly in the activities. We believe having a concrete outcome, such as the artifacts created in the workshop, provides the children with the experiential knowledge that their work matters and can last beyond the short workshop sessions.

The use of technology, although minimal, allowed us to achieve two results: 1) capture and sustain the children's attention throughout the workshop 2) give the children the ability to see technology as a tool whose design is not exclusive to factories or adults but can also be designed by them. Our claims about the impact of our approach should not be taken as a challenge to the idea (especially practiced by Cooperative Inquiry) that ongoing and frequent contact with children is not important to co-design. In fact, that would be an ideal setting where children and facilitators can establish a close relationship and deepen their understand of each other’s method of thinking, feeling and experiencing. However, these conditions are not available to the children that we are working with who are, in fact, representative of a large number of children worldwide. If we plan to include these children in the worldwide design dialogue, something that is at the center of our research effort, we have to develop new techniques and modify existing ones to take into account these specific conditions.
CONCLUSION
We have described and presented a case study involving a two-day workshop with marginalized children with Oaxaca, Mexico. The workshop was designed to facilitate creative expression through digital media and bring about learning of concepts pertaining to technology and interaction. We worked with 25 children ranging in age from 5 to 13. The children created 18 detailed drawings of *alebrijes*, fantastical creatures from the folk art of the region from which they were from, and augmented them with blinking LED lights.

The lessons learned during the workshop included realizing the importance of establishing trusting relationships through Human-Access Points, incorporating relevant cultural and social elements into the activities, planning concrete outcomes (e.g., tangible artifacts or toys) that provide a sense of completion and achievement to the children and using technology, but sparingly and sustainably. We plan to conduct more workshops with the children and also examine the effects of the project in the long-term. We hope that our lessons learned in this detailed case study would provide insights and inspiration for other designers, researchers, and developers when planning, carrying out, and studying similar workshops.

REFERENCES