Chapter 3: Children as Our Technology Design Partners+

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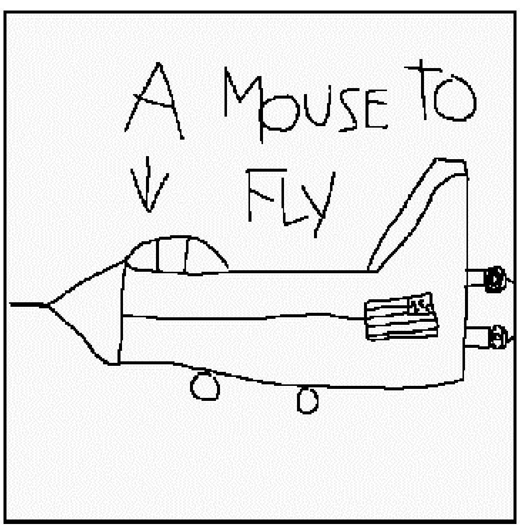
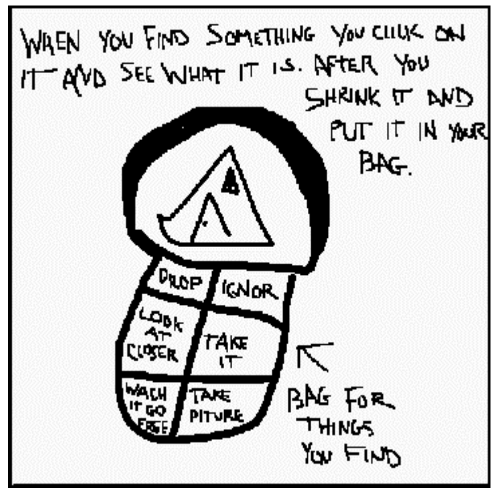
ABSTRACT
"That's silly!" "I'm bored!" "I like that!" "Why do I have to do this?" "What is this for?" These are all important responses and questions that come from children. As our design partners in developing new technologies, children can offer bluntly honest views of their world. They have their own likes, dislikes, and needs that are not the same as adults' (Druin, Stewart, Proft, Bederson, & Hollan, 1997). As the development of new technologies for children becomes commonplace in industry and university research labs, children's input into the design and development process is critical. We need to establish new development methodologies that enable us to stop and listen, and learn to collaborate with children of all ages. In the chapter that follows, a discussion of new research methodologies will be presented.

KEYWORDS
Children, technology, design partners, contextual inquiry, participatory design, technology immersion, software development, KidPad, Pad++, intergenerational design teams



[Figure 1: Megan's Drawing (Age 8): What she would like to see in future technologies]



[Figure 2: Cheryl's Drawing (Age 7): What she would like to see in future technologies]

1.0 INTRODUCTION
Today, an array of methodologies has been developed to observe and understand adults as users of technology. In general, these are used in a workplace environment where tasks are clearly defined for a required end-user product (Bjerknes, Ehn, & Kyng, 1987; Beyer & Holtzblatt, 1997; Holtzblatt & Jones, 1992; Holtzblatt & Jones, 1995; Holtzblatt & Beyer, 1997; Muller, 1991; Muller, Wildman, & White, 1994). The observation and participation methodologies of these experiences do not take into account the difficulty in studying the constantly changing interaction between children and technology. When children are given the chance to use technology in ways they would like, many times they do not have a defined task and their activities are open-ended and exploratory (Druin, 1996a) .

Interestingly enough, the one environment for children that has typically been well-researched is the school environment (e.g., Collis & Carleer, 1992; Kay, 1996; Norton, 1992; Ringstaff, Sterns, Hanson, & Schneider, 1993; Tinker, 1993). We believe that this has been the case because school activities lend themselves to the existing observation and participation methodologies. Schools are generally places where children are asked to carry out

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directed, adult-specified tasks. Children are typically not in control of when they can have art or what they can write about, even when they can go home. Ultimately, we believe that researchers can only tell so much about what children want or need in technologies from environments such as these. Therefore, our research has primarily been focused on what happens with children and technology outside of the school environment.

In the chapter that follows, the research methods which were developed and adapted for work with children are described. In addition, an example of how these methodologies have been used to develop a prototype drawing tool for children will also be discussed. This work is based upon a year and a half of frequent and intensive direct contact with children (Druin, Boltman, Miura, Platt, Uscher, & Knotts-Callahan, 1997). Hundreds of children were observed in a wide range of activities in diverse southwestern sites: from urban middle class homes, to isolated non-English speaking rural farmhouses, to an intensive 5-day technology camp experience at an international conference. These children varied in age (3-13 years old) as well as ethnic background (e.g., Native American, Hispanic, African American, Caucasian, and children of recent immigrants from Vietnam, China, and Korea).

2.0 ADAPTING THREE DESIGN METHODOLOGIES

Based upon a review of the literature and some initial exploratory studies (Druin, 1996b), we found it necessary to collect data with children in three different ways. The first methodology was adapted from *Contextual Inquiry* techniques (Beyer & Holtzblatt, 1997; Holtzblatt & Jones, 1992; Holtzblatt & Jones, 1995; Holtzblatt & Beyer, 1997). We found that three to five-year old children can be at times non-verbal or less self-reflective in discussing the world around them. Therefore, in order to understand what these children's needs may be, our observation techniques had to capture children's exploratory activity patterns (Druin, et al., 1997). We found that a modified form of contextual inquiry could serve this purpose.

The second methodology that we developed came to be called *Technology Immersion* (Boltman, et al., 1998; Druin, et al., 1996). This methodology grew out of our need to see how children use large amounts of technology. We found that if we only observed what children did with what they currently had, we missed what children might do given better circumstances (Druin, et al., 1997). Many times, children had minimal contact with technology in their homes or public places. Therefore, by using the observation techniques of contextual inquiry in a technology-rich environment, we found that many patterns emerged in children's use of technology.

Finally, the third methodology was adapted from *Participatory Design* techniques (Bjerknes, Ehn, & Kyng, 1987; Muller, 1991; Muller, Wildman, & White, 1994). We found that in addition to collecting data through observation, we needed to hear from children directly. We wanted the opportunity to develop a partnership with children much in the same way that we do with our adult users of technology (Druin & Solomon, 1996). It is not uncommon to work with artists when developing a drawing program or to work with biologists when developing a tool for biology. Therefore, we wanted to work with children so that they too could tell us in their own words what they would like to see in the future. This is not to say that children can tell us everything about what is needed for a new technology. On the other hand, design team members that are for example, computer scientists or educators are also limited in their range of experience and expertise. However, when all the team members have a say in the design process, including children, a complete range of experiences can be taken into account during the research process. In the sections that follow, a full description of the techniques for each research methodology will be described.

2.1 Contextual Inquiry with Children

The methodology of Contextual Inquiry (CI) calls for researchers to collect data in the users' own environment. Generally, users are observed performing typical activities and researchers ask questions of users when clarification is needed (Beyer & Holtzblatt, 1997; Holtzblatt & Jones, 1992; Holtzblatt & Jones, 1995; Holtzblatt & Beyer, 1997). In the case of users that are children, we observed them in their homes and favorite public places (e.g., children's museums, activity centers, game arcades).

With our modified form of CI, the techniques we used were essentially the same whether in a home environment or public place. There was always at least one *interactor* and two *note-takers*. The interactor was always the researcher who initiated discussion and asked questions concerning the activity. The interactor asked questions that were directed to what the user was doing at the moment (e.g., How come you're doing that? Why do you like that? What's this?). The interactor would avoid asking questions that might steer the activities of the child (e.g., Could you show me this? How about doing that?). For research purposes, we found it important that the interaction be lead by the child user, not the adult researcher (Druin, et al., 1997).

With this form of CI, notes were never taken by the interactor. Children clearly felt uncomfortable and distracted if the interactor was taking notes while talking to them. Note-taking seemed to make children feel that they were in school, being tested by a teacher for wrong or right answers. Instead, we found that the interactor should become a participant observer, talking naturally to children and becoming a part of their active experience (Druin, et al., 1997).

On the other hand, different researchers acted as the note-takers who recorded what the children did and said. One note-taker recorded the activities (what the user does) and the other note-taker recorded quotes (what the user says). Both note-takers recorded the time so that the quotes and activities could be synchronized in later data analysis. It should be understood that at the time of this research, video cameras were not found to be successful in capturing data (Druin, et al., 1997). We found that children tended to "perform" when they saw a video camera in the room. In addition, even with small unobtrusive devises, video was still difficult to use in small bedrooms and large public spaces. The sound quality was inaudible in public spaces. And the video image was incomplete in private spaces since it was difficult to know where to place cameras when it was unknown where the child would sit, stand, or move in their own environment.

For both interactor and note-takers, we found that informal clothing should be worn (e.g., sweatshirt, jeans, etc.). In this way, researchers seemed to represent less of an "authority figure," and more of a friend or confidant who they could feel comfortable with sharing their thoughts. In general, children are used to seeing teachers and their parents work in more formal clothes. By wearing informal clothes, researchers had a easier time of developing a more relaxed relationship with their users (Druin, et al., 1997). In the chart that follows a summary of the specific techniques we found to be successful with children are described [See Table 1].

Following a CI session with children, we found it extremely useful to discuss our quick impressions of the research experience (Druin, et al., 1997). Many times we would discuss the activity patterns we saw emerging, or the process of the research itself. With this technique of quick self-reflection, our research methodology was refined. These discussions were captured in quick notes and used during diagramming sessions. After a digestion period of one day to a maximum of one week, our research team regrouped to chart or diagram the experience. Other CI researchers generally develop "task" or "bubble" diagrams to interpret the data (Beyer & Holtzblatt, 1997; Holtzblatt & Jones, 1992; Holtzblatt & Jones, 1995; Holtzblatt & Beyer, 1997). In our case of examining children, we found these visualizations limiting and often too complex to make sense of what occurred. We found children may start a task without finishing it, start another and yet another. Then without pause they might go back to the task they started at the beginning and then start something else anew (Druin, et al., 1997).

Thanks to these exploratory activities, we found it more understandable to diagram these experiences based on *Patterns of Activity* and *Roles the Child Played*, rather than by task. In this way, a more complete picture emerged of the child. We developed a spreadsheet or cell-based diagram [see Table 2] in which the information is broken up into six columns: *Time, Quotes, Activities, Activity Pattern, Roles,* and *Design Ideas* (Druin, et al., 1997).

The *Time* column is used to synchronize quotes with activities. The *Quotes* column contains phrases and sentences said by the child or children during a session. The *Activities* column contains the observed actions of the child or children during a session. The *Activity Pattern* column is developed by the researchers during data analysis and is based on repetitive patterns that emerge in the *Quotes* and *Activities* columns. The *Roles* column is also developed by the researchers, from the data in the *Quotes* and *Activities* columns. The *Roles* column describes "the who" children are when they are interacting with technology (e.g., storyteller, researcher, creator, writer, player). Finally, the last column contains the *Design Ideas*. It is a culmination of all of the information gathered or generated. This column is also the start of the brainstorming process. It offers new ideas for the development of new technology that can be related directly to the observed data.

Each of these columns represented from left to right, is a finer interpretation of the data gathered. In general, we would start by diagramming all of our raw data, (e.g., time, quotes and activities) and then extrapolate to developing the columns that contained the reflective observations (e.g., activity patterns, roles, design ideas). A sample activity pattern that we witnessed was *user tells a story about what is on the screen*; a sample role was *child as storyteller*; a sample design idea was *more user-initiated storytelling activities need to be developed in our technology* (Druin, et al., 1997).

2.2 Technology Immersion with Children

The second research methodology that we refined to be used with children is Technology Immersion. With this methodology, children were provided with a technology-rich environment where they were decision-makers. The children were asked to make their own choices concerning what they did with technology. The methodology of Technology Immersion also offered a time-intensive experience, where children had a great deal of time (10 hours a day, for five consecutive days) to explore different kinds of technology and to make decisions about what they liked and did not like. In addition, this methodology supported children with large amount of technology (e.g., PCs, Macs, scanners, printers, digital cameras, and Internet access). No child ever had to share a computer if he or she did not choose. No child ever had to wait to accomplish what he or she wanted to--the technology was waiting to be used. Generally, children do not have this kind of unlimited access to technology in schools. Many children are lucky if they can use a computer for a 45-minute session a day (Fulton, 1997). It is becoming more common for children to have technology at home, but again their time with technology is limited. Generally, children will have access to a home computer after school and it may be shared with other family members. On the other hand, with Technology Immersion a combination of technology, time, and freedom of choice offers researchers more opportunity to understand what children do and want with technology (Boltman, et al., 1998; Druin et al., 1996).

One such Technology Immersion experience that we developed has come to be called CHIkids (Boltman, et al., 1998; Druin et al., 1996; Druin, 1996b; Druin et al., 1997). This is an on-going Technology Immersion experience offered at ACM's yearly CHI Conference on computer-human interaction [see Figure 3]. It is an annual experience that supports up to 100 children (ages 3-13) in four main areas of technology exploration: Multimedia Storytelling, Technology Workouts, CD-ROM Fieldtrips, and the CHIkids Newsroom (Boltman, et al., 1998; Druin et al., 1996; Druin, 1996b; Druin et al., 1997). Children explore technology by being multimedia storytellers, software testers, and newsroom reporters. This Technology Immersion experience has been replicated at the CHI96, CHI97, and CHI98 conferences.

[Figure 3: The CHIkids program at CHI97]

The actual Technology Immersion methodology calls for two CHIkids adult leaders, as well as a number of college student volunteers to support each of the four main CHIkids technology areas. All adult leaders and college volunteers take a "facilitator" approach to working with the children in their area. In our past experience, using this approach encourages children to make their own choices-- giving them control over their technology exploration. Some educators would call this a *problem-centered* approach to using technology (Norton, 1992). The focus of the children's exploration was not the technology or an adult telling them to follow 10 specific steps to "learn" something new. Instead, the focus was a "problem" of interest to the children, such as to be a newsroom reporter for the CHI conference, or to form a company and create new multimedia software, or even to test experimental software of the CHI conference attendees. In tackling these so-called problems, children used whatever technology tools they needed, in ways they felt comfortable, and used their adult mentors as resources. The adults were there to offer suggestions and provide feedback when the children asked for it.

By offering up to 100 children a flexible, time-intensive, technology-rich environment, each year we have been able to observe children of varying ages, in ways not usually available to researchers in schools or at homes. These children shared many important insights with us about their technology experiences. These were not *one-shot* observations or single occurrences, but rather patterns of activity that each year we consistently witnessed over the 50 hours we spent with these children. Interestingly enough, many of the same activity patterns that emerged in our CI research became more obvious in the Technology Immersion experience. In fact, patterns of activity that we had overlooked in the CI data were more obvious after the Technology Immersion research. In a later section we will further describe what we learned from these experiences.

2.3 Participatory Design with Children

The third research methodology we refined for children is Participatory Design (Muller, 1991; Muller, Wildman, & White, 1994). As opposed to being observed, with this methodology children are directly asked to work with researchers to collaboratively create "low-tech prototypes" out of paper, glue, crayons, etc. [See Figure 4]. In this way, we as adult researchers can identify new technology possibilities that might not have been considered otherwise. At the same time, children who are not well-skilled in the development process can be inspired and empowered by their collaboration with adults to generate new ideas. The low-tech tools give equal footing to adults and children as design partners. Both adults and children know how to use these prototyping tools, and these tools act as a bridge or an "ice-breaker" for a more comfortable brainstorming session (Druin& Solomon, 1996; Druin et al.,1997).

[Figure 4: A sample participatory Design session during a tutorial at ACM's CHI '94 Conference]

This methodology has been used and refined by authors of this chapter for over eight years in pilot studies in the United

States and Europe. We have found that children ages seven to 10 years old make the most effective design partners (Druin & Solomon, 1996; Druin et al., 1997). These children are self-reflective and verbal enough to discuss what they are thinking. They can understand the abstract idea of designing something on paper or in clay that will be turned into technology in the future. These children however, seem not to be too heavily burdened with pre-conceived notions of the way things "are supposed to be", something we see commonly in children older than 10 years of age. Interestingly enough, we have found that children ages 7-10 years old can be productive technology designers even when developing software for older or younger children (Druin et al., 1997). What we have also found is that two to four children paired with two to three adults create an productive brainstorming experience (Druin & Solomon, 1996; Druin et al., 1997). We believe that one lone adult should never be placed with two or more children in one design team. In this case, we have seen that the team dynamics take on the feel of a classroom with one teacher and many children. We have also found that a group with a single child is not productive in a collaborative design experience either. The child feels outnumbered or overwhelmed by the adults in the group. For a summary of the Participatory Design techniques that we have found to work with children, see Table 3.

To gain a better understanding of this research methodology, below is an example Participatory Design session. It occurred in April 1997, at the University of New Mexico (Druin, et al., 1997). During this session four design teams were asked to prototype a computer of the future which could help children understand some aspect of the human body. Each group contained two adults and two or three children, ages seven or eight. The notes below were recorded by one of the authors of this chapter, D. Knotts-Callahan:

All team members are sitting at a round table. Materials are spread out all over the table in no particular order. All the team members start fiddling with materials and a lively discussion occurs about the body and computers. This team functions like a kids club, with a secret. Initially, when another adult approaches or this note-taker, a team member makes a comment, "Shhh, don't show or tell them. It's a secret." This game/bonding experience adds to the kid-chemistry of the team dynamics. Despite the secrets, this note-taker catches them off-guard and captures some of their interactions.

Kids (one girl and two boys) are working together building a clay form. Adults are at opposite sides of the table making other parts. They are all working together, with the kids taking more of the lead.

Adult#1 says, "Maybe we could draw all the things we've done and name them." Boy and girl are busily attaching strings of yarn to a clay object: their "brain." The other boy is making a mouse out of clay. Boy steps back, inspects the project, pointing to a piece of yarn asks, "Shouldn't we make this go under the head?"

Adult#1 adds, "Hey, what if we can take this all apart and put it back together?" Adult#2 says, "Like Mister Potato Head?" All of the kids respond, "That's cool!" Adult#1 points to part of their prototype and asks, "What can you do with this?" Adult#2 asks, "What if you have different eye colors? Should we consider genetics?" Adult#1 says, "I guess, but I don't know much about that kind of stuff."

During this whole interaction between the two adults, all three kids continue to focus on what they're working on (e.g., attaching parts, making labels, etc.). One kid says to the other, "What about the mouse?" Another kid produces a clay mouse that has been sitting at the sidelines. The final touches are at hand. Adult#1 adds the last dab of clay....

All four teams bring their computers to the central table.... Team 3 presents their idea. The three kids gather round their prototype. The girl starts, "The title of our project is Touch and Pull." One of the boys moves into place next to the project, and points to a clay form, he says, "This is Roger, our mouse Roger looks like an animal, not your typical computer mouse." An adult from the crowd asks, "What does it do?" The boy responds, "You talk to Roger. You ask him what the body does and he tells you." Girl kid joins in, "And you touch body parts, like the eyes and Roger tells you what the eyes do."
(Druin, et al., 1997, pp. 17-23)

For photographs showing examples of these Participatory Design sessions and the final prototypes see: http://mtsnmc.unm.edu/intel97.

4.0 RESULTS OF OUR FIELD RESEARCH

All too often, we hear, "That's a nice story about a kid, but how does that tell me what technology to design?" With the research methodologies of Contextual Inquiry, Technology Immersion, and Participatory Design, we are able to piece together something more than a story. These are not guesses based on isolated personal incidences, and these are not conclusions based on quantitative tests. These are methodologies that illuminate and highlight in various qualitative ways what children do and want. When we compared the data from each of these methods we came to three overall conclusions about what children want in technology experiences. In addition, we were able to better understand what children themselves, notice about technology. What follows is a brief discussion of both results.

4.1 What kids want in technology:

4.1.1 Control

The nature of being a child is such that they are dependent on others. Children are empowered when they feel in control of their environment and when they feel they "own" the environment. Our research has shown that children need to make their own decisions about how they spend their technology time doing what they choose when they choose it. We saw in both our CI and Technology Immersion research that when new technology offered children limited paths of interaction, children easily became bored and uninterested. When technology offered options for varied interaction, children spent a considerable amount of time exploring and actively engaged.

4.1.2 Social Experiences

Children naturally want to be with other children. We saw in both our CI and Technology Immersion research that no matter how much technology children are offered (one computer per person), they will consistently form groups around one piece of technology (a computer, video game, etc.). We saw technology as a bridge and catalyst for children interacting with each other. If children are strangers to each other, technology is the ice-breaker. If children already know each other, technology is the means to know one another better. Children generally do not create in isolation--they want to share, show, and use technologies with others. We saw on numerous occasions during Technology Immersion experiences, older children (11+ years old) working with younger children (four years old and younger), using technology. We also saw in Technology Immersion experiences that close relationships can quickly form between children from France and Saudi Arabia, from the United States and India. Thanks to the shared use of technology, cultural differences were replaced with shared interests. In addition, the Participatory Design results showed numerous examples of technology that multiple users can share. We saw that it was important for children that their tools of the future offer social opportunities.

4.1.3 Expressive Tools

Children like to tell stories, make up games, and build things. We saw this in all three of our research methodologies. Children enjoy many different forms of expression: sound, visuals, movement, physical appearance. They want all of that and more in the technologies they use. In much of our field research we saw that children are natural born artists and writers, architects and philosophers. They are sculptors and poets, dancers and musicians. Children are not waiting to become these in the future; they are all of those things right now. As such, when participating in the design process, children suggest that new technologies should enable them to tell stories, design games, and build futuristic machines. Children are part of teams that propose developing "the story-monster machine", "the eye-ball building computer", or "the brain-game" (Druin, et al., 1997; Druin & Solomon, 1996).

4.2 What children notice about technology:

4.2.1 "What's cool"

Our research has shown that there's a great deal of peer pressure among children, even at early ages. They want to wear headphones as opposed to listening to built-in speakers because headphones are "cooler." They want to use the newest video games not last year's, because last year's are passed the "cool prime." They want what their friends have because that is "what's always cool."

4.2.2 "How easy it is to learn"

Children want to be in control of their world as quickly as possible--and that means learning something quickly. If it is a struggle, they will have little patience for something. If it is easy to learn they will quickly become immersed in the experience. Contrary to what most adults might imagine, children have long attention spans, but only when there is something to do that is meaningful and makes sense to use. If a tool offers them little control, they will lose interest quickly.

4.2.3 "What things look like"

Children are sensitive to what they see, much more so than adults would imagine. They care what something looks like just as much as how it works or what it does. They don't want the visual look of things to "talk down to them" or question their intelligence. They want what adults want—things that look good and respect who they are as users.

4.2.4 "How much multimedia"

Children have become accustomed to "having it all." It used to be that technology could get away without having sound--but thanks to video games, TV, movies, multimedia, etc. kids want a multi-sensory experience. Not only do they find it more entertaining, but more engaging an environment to explore.

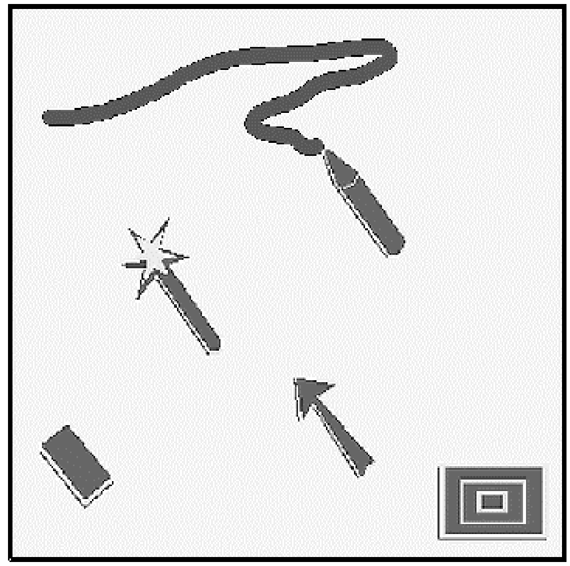
5.0 USE OF THE RESEARCH METHODOLOGIES

KidPad is an example of what these research methodologies can lead to (Druin, Stewart, Proft, Bederson, & Hollan, 1997; Stewart, 1997). This technology was created with the Pad++ software developed by researchers at the University of New Mexico and New York University. Pad++ offers software tools that replace windows with a zooming information environment (Bederson, Hollan, Perlin, Meyer, Bacon, & Furnas, 1996; Bederson, Hollan, Druin, Stewart, Rogers, & Proft, 1996). While Pad++ was never meant to be a tool for children, we saw the possibilities for future changes and development appropriate for children.

Taking into account what our research told us from CI, Technology Immersion, and Participatory Design, we began development of a tool that enabled children to express themselves, in a social way, with a form of control that would be enjoyable. Therefore, KidPad enabled children to tell stories by drawing and zooming through their information [See Figure 5]. We found that the activity of zooming strongly supported the creation of non-linear stories. It seemed to be a natural way for children to tell their stories. They enjoyed the freedom of piecing together their thoughts and connecting them in ways they chose by zooming (Druin, Stewart, Proft, Bederson, & Hollan, 1997; Stewart, 1997). Children had a feeling of control by zooming in their storytelling. This zooming approach also strongly supported collaboration between children. Many times one child would begin the story by typing or drawing, and another child would add the next part of the story in another part of the KidPad surface. In this way, children would work together endlessly writing, drawing, zooming, and telling their stories.

[Figure 5: An example of the KidPad technology used by an 8-year old child]

It should be noted that the drawing/storytelling tools developed for KidPad also offered a new form of control for children. These tools came to be called "local tools" (Bederson, Hollan, Druin, Stewart, Rogers, & Proft, 1996). Instead of traditional floating palettes of tools, KidPad had large, simple tools that sat directly on the surface [See Figure 6]. They enabled children to be "messy" and "use tools that didn't live in straight lines." With local tools, children could select a tool (by single-clicking on it), and the cursor would turn into that tool in both size and shape. If the child wanted to drop that tool, and use another, the child would double-click in the place they wanted to drop it and the tool would remain in that place. They could leave tools where they chose to, not where the technology made them. These tools included what the children called a "crayon" to draw with, an "eraser" to delete objects, and an "arrow" to select objects. The arrow was used in combination with the picture scrapbook. This scrapbook consisted of a slider to move through pictures that ranged from green dinosaurs to red hats. Once the child saw what they wanted, they chose a picture with the arrow, and dragged the picture onto the surface (Druin, Stewart, Proft, Bederson, & Hollan, 1997; Stewart, 1997).



[Figure 6: KidPad Local Tools]

Another local tool was the "magic wand." When a child selected the wand, and clicked on the surface, a link was started. The next place that was selected would be the place that was "linked to." These two places could be easily seen because a bright yellow line connected the two selections. When children de-selected the magic wand, they could zoom between links by touching a "hot zooming spot" with another tool. In this way children told their zooming stories. In addition to these local tools, there was a "tool box". This box was placed in the bottom right corner of the screen. When children clicked on it, all the local tools would zoom back to where they started, lined up along the bottom of the screen. This turned out to be extremely useful when children would zoom around the surface and forget where they left their tools (Druin, Stewart, Proft, Bederson, & Hollan, 1997; Stewart, 1997).

Currently, a new version of KidPad is being developed that focuses on the children's social needs by enabling more than one child to use the software (Stewart, 1997; Stewart et al., 1998). In much of our work we saw children sharing one computer. Many times they were frustrated when they could not agree on who would get to use the mouse to zoom or to draw. We observed that more assertive children would tend to monopolize the use of the computer, frustrating more passive children. Therefore, Stewart is currently implementing software and hardware support for two mice on one computer. In this way, a computer might better support the work of two children sharing the same software.

6.0 SUMMARY

Our work continues in developing and refining new research methodologies that are inclusive of children. Our work also continues in using the results of our field research in developing new technologies for children. We are trying to understand how we can bring our knowledge from the "real world" of children into the "design world" of technology development. The techniques we use in recording what we see with children, need to show a direct relationship to what we develop [See Table 4 as an example for KidPad].

It is our hope that one day the question, "Why did you design this?" won't need to be said. It will be obvious based on the research results. Until that day, we need to continue to refine the research process with children for children, because ultimately our goal is simple: to create exciting, meaningful new technologies for children.

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