Design for Inspiration: Children, personal connections and educational technology

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ABSTRACT
The project is working towards building an understanding of the personal interests and experiences of children with the aim of designing appropriate, usable and, most importantly, inspirational educational technology. *kidprobe*, an adaptation of the technology probe concept, has been used as a lightweight method of gaining contextual information about children's interactions with 'fun' technology. *kidprobe* has produced design inspiration which focuses primarily on the social and emotional connections children made. The use of *kidprobe* has generated some important ideas for improving the use of probes with children. It is an important first step in understanding how to effectively adapt probing techniques to inspire the design of technology for children.

Author Keywords
Interaction design, children, technology probes, educational technology

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Evidence shows that children can gain a richer and more meaningful learning experience from supportive learning environments than from instructional learning (Wilson, 1995). Supportive learning environments arise out of a shift in learning trends that demonstrate learning becoming more social and exploratory. With this shift, there is a need to take advantage of new possibilities of learning using computers, in particular focusing on technologies to support creativity and, collaboration in learning environments (Resnick, 2002).

This project explores a new application of technology probes (Hutchinson et al., 2003) as a means by which we may discover new ways to leverage children's natural interest in playful interactions. The goal is to harness the engaging attributes of successful commercial games and toys to build an educational product with which children can make real, lasting and personal connections. The aim is to use these attributes to design appropriate, usable and, most importantly, inspirational educational technology. This creates two challenges: firstly, how do we gain an understanding of what engages and inspires children and secondly, how do we map this understanding to the design of meaningful educational technology? The first of these challenges is explored here.

This paper reports on the use of *kidprobe*, a new approach that aims to explore children's playful interactions and use the insights gained to inspire the design of new educational technology. Probes are instruments that provide researchers with the ability to gain glimpses into contextual interactions and culture. Not all interaction design techniques are appropriate when designing for children. The adaptation of the technology probe concept for use with children is explored as an alternative approach to more time-consuming and intrusive methods for gathering contextually sensitive information. We evaluate the effectiveness of *kidprobe* as a method that contributes to the design of children's technology; in particular the lessons that may be learned though the deployment of a probe within a population of children.

INTERACTION DESIGN AND CHILDREN

The design of appropriate computational technologies to support teaching and learning has, until recently, focused on the impact that established technology has on children and teachers. The recent work of Druin and her colleagues (Druin et al., 1999) has seen a shift in focus and explores the impact that children and teachers can have on the development of new technologies. Cooperative inquiry (Druin, 2002) is an approach that has been developed for including children in the design process. This approach utilizes a number of Interaction Design methods with the aim of determining the particular needs of children. Other work in this field has focused on the notion of informant design (Scaife & Rogers, 1997), in which children and teachers are used as key informants in the design process. Adaptation of core user-centered design techniques, such as participatory design (Druin et al., 1999; Scaife & Rogers, 1997) and usability testing (Hanna et al., 1999), has highlighted the effectiveness of such adaptations in the design, development and evaluation of technology products for children.

Limitations of Interaction Design and Children

Studies conducted using participatory design and cooperative inquiry techniques have highlighted limitations when working with children. There is a need to discriminate in the selection process based on the

OZCHI 2006, November 20-24, 2006, Sydney, Australia.

OZCHI 2006 Proceedings ISBN: 1-59593-545-2

qualities of the children. The use of children in the design process is more effective if participating children demonstrate the confidence necessary for active involvement (Knudtzon, et al., 2003). Children with relevant background knowledge and some design experience are also more readily able to contribute to the process (Jones et al., 2003; Knudtzon, et al., 2003).

Research also highlights the challenges related to the imposing nature of the school environment. Power structures and children's perceptions of appropriate behaviour need to be overcome when children are involved in design processes (Knudtzon, et al., 2003). In addition, children have a tendency to see tasks as competitive rather than constructive (Van Kesteren, et al., 2003).

Involving children in participatory design sessions is time intensive; researchers must build and maintain team structures, as well as organise session activities to produce the desired outcomes (Knudtzon, et al., 2003). The use of an interdisciplinary design team is imperative when including children in the design process. Children alone have difficulties in assessing particular user needs and lack the experience with technology to create new interactive solutions despite their ability to provide creative suggestions (Kafai, 1999).

PROBES AND INTERACTION DESIGN WITH CHILDREN

Probes are a new approach to gaining contextually-sensitive information in order to inform the design of technology. Gaver et al. (1999) coined the term 'Cultural Probe' as a method to gain inspiration by collecting fragments of experiences in domestic settings. The concept has evolved into a form of digital ethnography with the introduction of technology probes by the InterLiving Project (Hutchinson et al., 2003) as novel technologies used to identify new interactions within the home.

Dix (2003) highlights the importance of examining play as a tool for imagination to produce innovative solutions to learning. We aim to gain insight into the nature of children's playful interactions through using a probe-like technique. This technique has been utilized with the view that it may provide a valuable insight into children's culture and interactions without the overheads generally associated with including children in the design process.

KIDPROBE – EXPLORING THE USE OF PROBES WITH CHILDREN

The project has involved the application of the technology probe concept within a child's domain. While the final outcome of this project is an educational application for children, the focus of *kidprobe* was on fun, engagement and socialization, rather than on education. The aim was to be inspired by children's ideas, passions and visions, rather than to gather information about how they learn. The ideas generated through *kidprobe* will underpin the educational content which will be incorporated into the design in the second stage of the development process.

Based on the features identified by Hutchinson et al. (2003), *kidprobe* was designed with the following criteria:

- to be simple as possible, with a single function related to a single concept;
- to be open-ended with respect to use, with children encouraged to reinterpret its functionality and use it in unexpected ways;
- to collect data about children as they use the probe; and
- to help both the children and researchers generate ideas for new educational technology.

kidprobe is a simple agent-based system which allows children to interact with an agent that inhabits the computer desktop. The virtual pet phenomenon has provided a platform on which *kidprobe* has been developed. The popularity of such environments demonstrates that children form attachments to virtual pets and it is this attachment that we were interested in exploring through the development of *kidprobe*. The *kidprobe* in this project extends the Tamagotchi™ concept to provide children with a simulated interactive environment.

kidprobe Functionality

Children were able to download kidprobe via the internet. On start-up children were required to give their kibprobe agent a name, while the system assigned values for a number of the kidprobe agent attributes: hunger, energy, health, happiness and cleanliness. Children could feed, clean and discipline the agent as desired. They could also tell the agent a secret, get it to have a nap, allow it to travel to another computer on the network and give it medicine if it was sick. By choosing to play, the child and the agent together visited an educational website which contained games and puzzles.

It should be noted that the *kidprobe* simulated the networked functionality – for example, the agent was not capable of visiting another computer on a network, but disappeared when the travel choice was selected and reappeared with a story about where it has been, thereby giving the appearance of going to another place. Figure 1 shows Ellie agent as she is 1. having a bath after getting dirty; 2. talking to Carlagotchi who has come to visit; 3. returning from a visit to anther computer; 4. telling a secret; 5. having a nap; and 6. telling me she's hungry.

kibprobe Deployment

Five children aged between 7 and 12 used kidprobe over a one week period. The probe has been designed in such a way as to capture interactions between the agent and the child. Data was gathered in the following ways:

- Feedback via the website which asked children to respond to questions such as "What did you like?" and "What ideas do you have to make it more fun?"
- Data logs of interactions which contained details on the *kidprobe* functions children used.

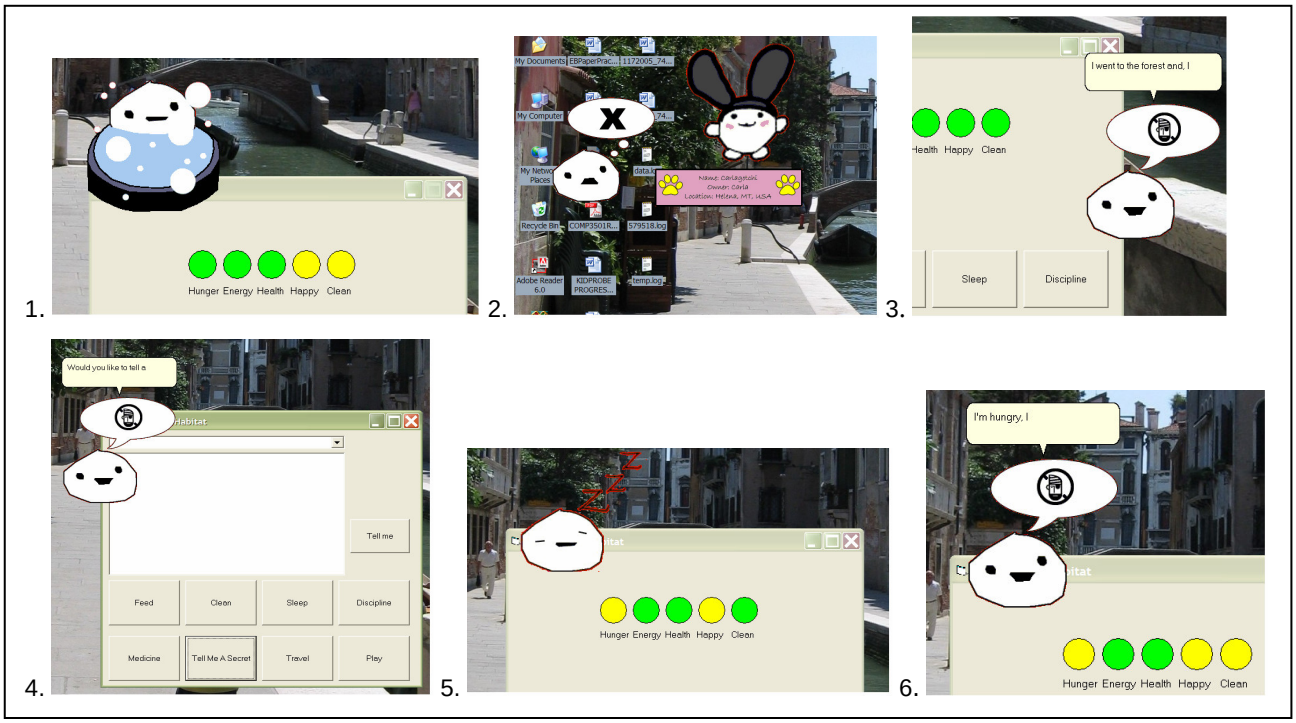

Figure 1: *kidprobe* functionality

In total 21 data logs were collected. These logs showed that the number of direct interactions with the probe varied. Three of the data logs had over 40 interactions with the probe agent, while on average children interacted with the agent on approximately 16 occasions per session. In following a 'probology' method advocated by Gaver et al. (2004), we have not statistically analyzed the data from the probes; rather we have sorted through the data and developed an *empathetic and impressionistic interpretation* which we believe will add value to later design processes.

DESIGN INSPIRATION

Three themes, which may be used to inspire the design of technology with which children may make meaningful connections, have emerged from the *kidprobe* data.

Tailorability – Creating Emotional Connections

There appeared to be a desire for children to transpose their affection for favorite activities and/or toys onto the *kidprobe* environment.

Play with ninja turtles and jump and do double flips and whack the baddies in the head, and that's all! is what one child wanted their agent to do. Agents that played soccer, that could invite friends for a party and that might write messages to each other were further expressions of this desire. Comments like "I think playing teaches her something" and "He watches me and he's happy" demonstrate children's eagerness to relate to the *kidprobe* agent on a personal level.

Importantly, children's insights reflected the age, interests and popular trends of particular groups of children and are therefore are not easily preset. Designing a system which has the flexibility for children to transform their agent into a ninja turtle, a soccer player or a party-goer is a fun idea to explore.

Fun versus Functionality

The behavior of agents within the *kidprobe* can be divided into two categories – biological and entertainment. We found that children were more interested in the fun aspects of interacting with their agent. While the logs demonstrated that children were prepared to care for their agent's needs, they were much more interested in telling secrets, playing and travel. Additional feedback supports the idea of creating a system which builds on the fun, social characteristics of *kidprobe*.

There was a clearly defined gender influence into what children considered fun. The girls who participated were interested extended communication capabilities so they could share stories, tell jokes and read magazines together. The boys wanted to play team sports (basketball and soccer).

Interactivity, Interactivity, Interactivity!

Children loved the notion of increased social interactivity; the idea that they could visit people, visit agents, visit places; that agents could go visiting, could collect information, could provide views from different virtual spaces; that they could interact with their friends through the agent. These ideas have come from children after their interactions with *kidprobe*.

KIDPROBE IMPROVEMENTS

A significant contribution of the research conducted lies in the evaluation of *kidprobe* as a means of gathering contextual data from children. The following insights have been drawn from the project.

In approaching design for inspiration, it is important to move away from an analytic mindset. The data logs generated by *kidprobe* included long strings of text which

provide a detailed account of system status and the interactions which occurred. We found that it was difficult to gain impressions or inspiration from these data logs; the way the data was presented was more conducive to complete and thorough data analysis. Figure 2 provides and example of a way that we feel would give a better "feel" for the data; fun data logs that generate fun design ideas.

Current Version:
autoupdate: | is dirty | --update completed
autoupdate: | is dirty | --update completed
autoupdate: | is dirty | --update completed
autoupdate: | is tired || is dirty | --update completed
sleep tama: tama is not tired
autoupdate: | is homelessly filthy | --update completed
bathed tama: tama is now clean
tama whisper: tell a secret

New Idea:
I'm dirty
I'm really dirty. Please don't ignore me.
I'm really dirty and tired. Please don't ignore me.
Great … a nap … Zzzzz
I'm really, really dirty. Please don't ignore me.
Ahhh … a bath … splash, slash, slash
Shhh … a secret … I love secrets

Figure 2: A new data logging format for *kidprobe*

There is significant design value in the data returned to date. While we are able to see emerging patterns, it is often the quirky responses that inspire design ideas. In addition, including better interactive functionality in *kidprobe*, so that designers are able to communicate more directly, would be of benefit. There was a desire to capture more with *kidprobe*. While the data logs provided some inspiration, additional modes of data capture should be considered. Capturing children's utterances or random screen shots of interactions could provide researchers with further design inspiration. This level of data capture raises a number of privacy issues which would need to be addressed; nonetheless the idea is worth exploring.

CONCLUSION

kidprobe was a lightweight method for capturing contextual data about children. From a design perspective the key issues identified were the importance of social interaction, the notion of tailorability and the significant role fun and engagement play in the development of quality educational technology. Given that we are still seeing educational technology in schools that does not support social interactions, that fails to engage children at an emotional level and that is not easy to tailor to meet the individual needs and abilities of children, these findings are significant. While there are still improvements which need to be explored, the data captured through *kidprobe* has provided the design team with ideas and inspiration for the design of playful educational technology for children.

ACKNOWLEDGEMENTS

We gratefully acknowledge all of the children who participated in this study.

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