

“Lucy’s always with us”: overcoming absence from school through ambient orb technology

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Abstract: *When children are in hospital for a period of time and are absent from the classroom, there is a risk that ‘out of sight, out of mind’ may contribute to the disconnection with school. There is, therefore, a need for a more effective approach to the provision of education support that utilises available technologies. This proof-of-concept research is trialing the creation of a presence for hospitalised children in their school classroom through the use of broadband-enabled ambient technologies. The ‘ambient orb’ has been effective in alerting teachers and schoolmates to a hospitalised child’s desire to connect with their classroom and peers, without requiring the need to establish communication.*

Key words: Ambient orb, broadband-enabled ambient technologies, social presence, awareness, illness, child

Introduction

Health conditions can affect and disrupt many children’s school attendance and learning opportunities, their foundational literacy, numeracy and connection with their school communities (Wolfe, 1985). For some children,

protracted periods of hospitalisation and repeated admissions span multiple stages of learning and development and critical transition points. As the major provider of paediatric health care in the Australian state of Victoria, the Royal Children's Hospital (RCH) sees approximately 10,700 school-aged children (6–18 years) who are admitted annually. Significant barriers exist for these many of these children in terms of their continuing education. This places these children at risk of compromised social wellbeing, academic failure or disengagement from school (Martinez & Ercikan, 2009).

Currently, hospital-based educational support for children includes limited use of technology to connect children to their schools (*e.g.*, via email and teleconferencing) (Wilkie & Jones, 2008). This interaction tends to be informal, *ad hoc* and varies greatly from child to child. Broadband-enabled technologies are starting to provide new opportunities to connect children with their schools and contribute to a culture of learning across hospital and school settings.

The proof-of-concept study reported in this paper was to investigate the impact of creating a 'presence' in the classroom for children who are absent due to health conditions through the use of ambient orb technology (McCullough, 2005). An ambient orb is a globe-shaped device which can change colour in response to an array of input data. The orb is peripheral to attention, aesthetically pleasing, a subtle and non-intrusive way to suggest a presence without disturbing or burdening the user (Mankoff et al., 2003; Matthews, Dey, Mankoff, Carter, & Rattenbury, 2004). We tested the use of these orbs to help children absent due to hospitalisation create a 'presence' for themselves in their school classroom, thereby alerting their teacher and schoolmates to their desire to connect with their classroom, peers and learning environments, without requiring the need to establish communication. This research is funded by The University of Melbourne's Institute for a Broadband Enabled Society.

Project aims

The research set out to:

- a. Develop a broadband-based prototype for improving children's sense of belonging to peers and school community during periods of school absence
- b. Test ambient broadband technology as a feasible means to mediate presence for children absent from their classroom due to hospitalisation
- c. Assess the response to ambient broadband technologies across the hospital-school settings for children, parents and educators.

Theoretical framework

This project is based on the social presence theory which was founded by Short, Williams and Christie in 1976. The essence of this theory is a communicator's sense of awareness of presence of the other person through a medium (Short, Williams, & Christie, 1976). Presence can be defined as a sense of 'being there' within a mediated environment (Biocca, Harms, & Burgoon, 2003; IJsselsteijn, de Ridder, Freeman, & Avons, 2000). The concept of social presence has been variously defined. In this study, the succinct definition of social presence as the "sense of being with another" by Biocca et al. (2003) was used for its resonance with our research aims, *i.e.* using a broadband-connected ambient orb as a medium to create the classroom presence for a child with health conditions in hospital without exchange of or two-way interaction between the child in the hospital and his/her classmates at school.

Other concepts which are closely related to social presence and that have been taken up in this study are 'awareness' and 'connectedness' (Rettie, 2003). Awareness refers to "an understanding of the activities of others, which provides a context for your own activity" (Dourish & Bly, 1992) or "the state of knowing about the environment in which you exist; about your surroundings, and the presence and activities of others" (Wisneski et al., 1998, p. 3). Connectedness is defined as "a positive emotional appraisal which is characterized by a feeling of staying in touch within ongoing social relationships" (IJsselsteijn, van Baren, & van Lanen, 2003). Social presence is coupled with judgement of the perception of other participants or of the communication medium whereas connectedness is associated with emotional experience, a sense of belonging, of staying in touch and intimacy (IJsselsteijn et al., 2003, p. 927; Rettie, 2003).

Method

The study predominantly used qualitative methodologies to explore the impact of the ambient technology. Brief baseline demographic data of hospital-based child participants were also recorded. The project was approved by relevant Human Research Ethics Committees. All participants were advised of their full voluntary status and the protection to their privacy before participating. This was explained both verbally and in writing.

Data was collected from hospitalised children, their parents, their teacher, classmates and hospital teachers. The four children were recruited from the hospital's wards and ambulatory (day stay) areas. Eligibility criteria include admission for significant or frequent periods of hospitalisation during term time in 2010, enrolment in Grade 3–6 at a Melbourne metropolitan or rural primary school, spending over 80% of school time in one classroom, capable of participating in learning activities with the hospital teachers, and having sufficient English. Child participants were recruited between June and August, 2010 and followed for duration of their stay in the RCH, with follow-up via parents.

The project involved three stages of qualitative data collection:

- a) *Before* installation of the ambient orb technology to establish baseline demographics and experiences of connections with school
- b) *During* activation and testing of the orb via log data and observation to capture responses to the ambient orb technology
- c) *After* the child participant has returned to school, or after 1 month if the child has not returned to school, to assess any changes in experiences of connections with school.

The ambient technology consisted of an Internet-based web application and a light orb in the classroom controlled by a wireless sensor node connected to a laptop. The child in the hospital was able to turn the light orb in his/her classroom on and off, and change its colour, by accessing a secure, password-protected web application via the netbook.

Data was triangulated by comparing different perspectives at different time points, e.g. before, during and after implementation of the ambient technology. The opinions and perspective of the children's parents, school teachers and classmates and hospital teachers were also recorded via interviews (individual or group) and classroom observations, as follows:

- a. *Interviews* were semi-structured and explored the child's attitude toward school, connection to school and learning, and feelings about returning to school after periods of absence
- b. *Observations* were recorded via field notes and time-activity log data. Hospital and classroom observations were conducted simultaneously.
- c. *Group discussions* were facilitated by a research team member at the end of each class to assess classmates' reactions to changes in the orb appearance and feelings about their absent classmate.

All interviews and focus group transcripts, observation time-activity logs and field notes were stored and managed using NVivo software (QSR International 2008). Case narratives and cross-case analyses were developed. All data, including the time-activity log data, underwent thematic analysis to respond to the research aims while also allowing themes to emerge from the data. Analysis occurred alongside data collection to allow for iterative changes to the study design (Denzin & Lincoln, 2000). To guard against idiosyncrasies of individual researchers and to ensure rigour in the data analysis process, three researchers independently coded and categorised data, and discussed themes and differences with the broader research team to reach agreement. Log data was used to generate 60-minute snapshots to see the ways in which children changed the orb colour.

Sample

Four children were recruited for this small, proof-of concept study including 3 girls and 1 boy. Below is a chart showing the age, location, school type and kind of admissions for each child (Note: pseudonyms used).

| Case | Age | Type of admission | Home location | Grade, school |
|-----------|-----|-----------------------|-------------------|-----------------|
| Jerry (F) | 9 | 2 weeks, 3-4x year | Melbourne | Grade 3, govt |
| Lucy | 11 | Long term (11 months) | Remote Victoria | Grade 5-6, govt |
| Sarah | 10 | Long term (3 months) | Melbourne | Grade 5, govt |
| Felix | 10 | 1 day every week | Regional Victoria | Grade 5-6, govt |

Interim findings

A summary of the findings are presented below according to the key themes that emerged from the total data sets: presence, awareness and connectedness,

Presence: the 'sense of being together'

The school teachers and especially classmates expressed that when they saw the orb turn on or off, or change colour, it reminded them of the hospitalised child and felt as if the child was in the classroom. Hospitalised children thought that the orb helped their classmates know that they were working with a computer in the hospital. This is illustrated in the following excerpts:

"I reckon it was good... some of my friends said when it changed colours it reminded them of me and I liked it 'cause everyone would think of me."
(Lucy, post-interview)

Student 1: It's cool how it lights up and stuff and you know that Jerry's there.

Student 2: It reminds us of Jerry, if, like, we forget about her..... since we haven't seen her for a long time maybe when we see that it reminds us of her, like she's here.

Student 3: It feels like Jerry's in the classroom.

Student 4: Well, she's just sitting there! [points at orb]

Student 5: If you didn't have this [orb] you wouldn't be thinking of Jerry that much.
(Jerry's classmates, post-class discussion)

Awareness

The orb was instrumental in raising the awareness of the hospitalised child for the class teacher and classmates. When changing the orb colour in the hospital, the hospitalised child was aware that the classmates and/or teacher were watching at the other end, for example:

"I think [the orb]'s a smart idea because..... they can know I'm thinking of them, and they can think of me. And that's good."
(Felix, pre-interview)

"She liked the idea that that would be her..... She'd sort of giggle and laugh, and go, 'I'm switching it on. They'll know I'm busy doing work!'"
(Lucy's hospital teacher, post-interview)

For the classmates, the colour change of the orb was often associated with the absent child, with children speculating on the hospitalised child's physical or emotional wellbeing and/or progress. The classmates associated the colour change of the orb with feelings or activities of the child in hospital, things like "sad, happy, angry", "going for a break or something", "wasn't doing work on the computer", "probably asleep", "probably needed to go and have some medication" or "might have finished her studies".

Teacher: Oh, it's red! What colour do you think she is feeling for red?

Student 1: Sad?

Student 2: Angry, 'cause she might be angry she has to do maths.

Teacher: *Very good. She could be angry she has to do maths.*
(Lucy's class discussion)

and

"The [classmates] are more aware, because the orb was there..... they are thinking, 'Oh, that's Jerry. What's she doing?' It's good from both sides... if Jerry changed the colour, she'd be thinking, 'What are they doing in class? I'll change it to pink'...."
(Jerry's mother, post-interview)

Connectedness

The presence of orb in the classroom and the ability to control it from within the hospital created a desire for both the hospitalised children and their classmates to initiate or escalate communication with one another. The hospitalised child expressed desire to send emails to class teachers to stay in touch as a direct result of contact with orb whilst classmates expressed enthusiasm and requests to their teacher to set up Skype or to email their hospitalised classmate to inquire what the colours meant, and to visit the child in the hospital. Class teachers also felt that having the orb in the classroom could be a way of prompting communication between classmates and the hospitalised child.

Whether communication was escalated between the two parties is not known, and is not the subject of our investigation. The desire to escalate the connection between the parties does, however, suggest that the ambient technology serves as a prompt to think about making a connection and to foster a sense of empathy:

Student 1: She's still part of the class and stuff but sometimes we forget to Skype her and stuff and then when we see it change colour we think, 'Oh Lucy's here, maybe we'll go Skype her.'
Student 2: 'Cause Lucy's always with us then.
Student 3: I'd be pretty lonely [in hospital] so I'd want to do this to connect with school.
Student 4: It's like she's in the class and it's all colourful.
(Lucy's classmates, post-class discussion)

Unlike direct communication such as Skype, the children based at school noted the advantage and flexibility that the orb offered the child in hospital:

"We have to have arranged timetables to Skype Lucy, but when she's got the orb, we don't have to [connect at the same time]."
(Lucy's classmate, post-class discussion)

Discussion

The findings clearly indicate that the ambient orb technology had an overall positive impact on the hospitalised child and their classmates. Hospitalised children changed the orb colour simply to create a change in the orb's appearance in the classroom and provoke a response from their classmates; however their classmates imbued meaning into the different colours (sad, happy, angry, etc). Overall the hospitalised children deeply wanted their classmates to be aware of their virtual existence and wanted to stay in touch with their peers and teachers.

Hospitalised children benefitted from imagining that their peers and school community were thinking of them and enjoyed the experience of connecting with their class through the orb. Overall, the hospitalised children were enthusiastic about using the orb, integrating it into their day of treatment and learning. Somewhat unexpectedly, the classmates were extremely positively affected by the ambient orb, with the orb being highly effective in prompting a 'sense of being together' and awareness without necessarily prompting a call to action.

To some extent, ambient technology transcends the physical details of reality. The fact that there was no feedback between the two parties (i.e. no direct communication) may have benefits for the hospitalised child, who could believe that their classmates were thinking of them regardless of what was happening in the classroom. This ambiguity was a feature of all of the case studies and deserves further attention in the future to ascertain whether it is beneficial and whether it is maintained over a longer period of time.

Conclusion

The response to ambient broadband technology across the hospital-school setting for children, parents, teachers, and classmates has been overwhelmingly positive. The ambient broadband technology has emerged as a feasible means to mediate presence for children absent from their classrooms due to hospitalisation.

This technology has helped raise awareness of the benefits of using the national broadband network to connect hospital-based children with schools. Furthermore, hospitalised children can now have a presence in their classrooms through the colour changes of the orb.

The evidence of this research shows that the broadband-based orb prototype to some extent could improve children's sense of belonging to peers and school community during periods of school absence. Ambient broadband technology could be a feasible means to mediate presence for children absent from their classroom due to health conditions. Future work could also focus on what other forms of technologies could be used for establishing a stronger sense of connectedness between the patient and their classmates as well as looking at how the technology can be applied to different settings.

These developments are another important step in cross-sectoral research between stakeholders from the health, education and information systems sectors and, importantly, in keeping children absent from school due to health conditions connected with their peers, learning and school community.

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