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Potter, LE, Korte, J, Nielsen, S

Published

2012

Conference Title

Proceedings of the 24th Australian Computer-Human Interaction Conference, OzCHI 2012

DOI

[10.1145/2414536.2414613](http://dx.doi.org/10.1145/2414536.2414613)

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Sign My World: Lessons Learned from Prototyping Sessions with Young Deaf Children

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ABSTRACT

Sign My World is an application that aims to help pre-literate deaf and hearing-impaired children to learn Australian Sign Language (Auslan). Development is in its early stages and faces challenges in terms of interaction with the children that the application aims to help. This paper presents a set of experiences from early prototyping sessions conducted with a small group of deaf and hearing-impaired children. These experiences indicate the ability and emerging desire of the children to act as active participants within the development process, the visual nature of these children, and the existence of issues in relation to communication between the application developer and the children.

Author Keywords

Prototyping; Child Computer Interaction; Deaf Children

ACM Classification Keywords

H.5.2 User Interfaces (User-centered design)

INTRODUCTION

This paper discusses the experiences of the authors in developing new technologies for young deaf and hearing-impaired children as part of the Seek and Sign Project. This project aims to explore the use of technology to support young deaf children in learning sign language. As part of Seek and Sign, development is underway for the Sign My World application to help pre-literate deaf children learn Australian Sign Language (Auslan).

Sign language is a 'real' language with syntax and grammar (Petitto 1994). Different countries use their own sign languages and within a country different dialects may exist. A range of technologies have been explored to support sign language acquisition, particularly in relation to American Sign Language. This is in contrast to the comparative lack of learning resources for Auslan. Seek and Sign aims to build on the work of Ellis (2007; 2009; 2011) and early Seek and Sign work (Potter et al. 2011) to help bridge this gap.

We are addressing three primary questions in developing the Sign My World application: can technology assist young deaf children to learn Auslan; what innovative capabilities does technology provide; and what is the best approach for working in a successful and positive way with these children? Technology may have a role to play in providing greater opportunities for engagement and learning for young hearing-impaired children (Williams 2004). Electronic learning resources are uniquely suited to displaying signs through the use of videos and animation in a way that books and posters, with only static images, cannot match. However, it is the question

of working in a successful and positive way with young deaf and hard of hearing children that is addressed here.

Creating technology for young deaf and hearing impaired children involves challenges inherent to the skills and attributes of this group. In addition to a potential delay in literacy, communication barriers can exist between the children and a hearing adult according to the child's level of impairment, and acquisition of either written, verbal or sign language. Understanding the experience of developing technology with this group is vital in order to overcome these challenges.

In this paper we present the results of a preliminary requirements gathering phase for the Sign My World application in order to discuss the benefits and drawbacks to using standard prototyping with young deaf and hard of hearing children.

CHARACTERISTICS OF DEAF CHILDREN

It is important to clarify the appropriate terminology for this community. Deaf Australia (2009) defines the term 'deaf' as describing individuals who have some form of hearing loss. The term 'Deaf' describes individuals who identify as belonging to the signing Deaf community and who communicate using Auslan. Deaf individuals may describe themselves as "Culturally Deaf." The term 'hard of hearing' is a broader term describing individuals with a hearing loss who communicate usually with speech. This paper will follow the conventions of Deaf Australia and use the term "'deaf'" when referring to all Deaf and hard of hearing groups at once."

A large percentage of deaf children are born to hearing parents, with statistics reported ranging from 70% to 90% (GRI 2008). While the deaf children of deaf signing parents acquire sign language at a comparable rate and with similar milestones as hearing children acquire verbal language, deaf children of hearing parents acquire language more slowly, leading to ongoing learning difficulties (Masataka 2000). These children go on to experience reduced levels of literacy as compared to their hearing counterparts (Traxler 2000).

While each deaf child has individual characteristics, strengths and challenges, some broader attributes have been identified for deaf children. The importance of cultural characteristics is clear from the definition for Deaf people provided by Deaf Australia. Intellectually, deaf children have similar characteristics for perception, learning and memory to hearing children (Taylor et al. 2009). Despite this, deaf children frequently lag behind hearing children in academic areas, including reading, comprehension, written language, mathematics, and

speech and language (Taylor et al. 2009). This may be due in part to reduced levels of literacy described previously, however deaf children can be active and innovative in approaching communication by incorporating drawing and writing to communicate when they do not have spoken or signed language (Williams 2004). General and spoken language may be limited or delayed for these children, however deaf children who are fluent in sign language are able to learn English as a second language at the same rate as a hearing person acquires English as a second language (Mayberry 2010).

Deaf children may exhibit reduced social and emotional development in terms of communication, understanding of both situations and other people, and flexibility (Calderon and Greenberg 2005).

Deaf children use visual-spatial cognitive perception and processing (Ebrahim 2006). Parasnis (1996) suggests that the acquisition of sign language is a critical factor for the development of visual spatial skills for these children.

THE 'SIGN MY WORLD' SESSIONS

An early prototyping process has taken place in order to determine the feasibility of the Sign My World application and to gather some preliminary requirements.

The Approach and Participants

In order to explore potential requirements for Sign My World, a small group of children interacted with an ever-evolving prototype as a requirements elicitation tool. The aim of interacting with these children was to inform the development of a design framework based on the lessons learned from their thoughts and experiences.

A series of sessions were undertaken for this early phase of the Sign My World application. A single preliminary session took place with one profoundly deaf seven year old boy, who we refer to by the pseudonym of Pat. Pat had had a working cochlear implant for the preceding two years. This was followed by seven sessions within a Special Education Program attached to an Education Queensland school. These sessions involved two hearing-impaired boys aged seven who we refer to by the pseudonyms of Roger and Richard. Roger and Richard both had hearing aids. All of the boys were learning sign language, and the two boys from the Special Education Program were also learning vocalised English.

The first prototyping session took place within Pat's home environment. His mother was present as a silent observer with his grandmother acting as Auslan interpreter for the application developer. The second set of sessions took place within the dedicated Special Education Program building. Roger and Richard would sit on adjacent edges of a small, square table. An Auslan interpreter would sit on one of the opposite sides of the table, in a place where she could see and be seen by the participants. The application developer would sit behind or beside the participants, at such an angle that their interaction with the prototype was visible.

Prior to participation in the prototyping sessions, a questionnaire was completed by the children's parents in order to gather contextual background information.

Direct participant feedback was gathered from the sessions themselves in the form of direct feedback from the boys, written records of their verbal and signed vocalisations, and observations of their interaction with the prototypes. Audio-visual recordings were not included due to constraints within ethical clearances.

The information gathered from the prototyping sessions were analysed to identify user requirements for the potential system, and to discover issues in the requirements elicitation process. It is these issues that are the focus of this paper.

Some Early Experiences

Observation of the behaviour of the boys proved to be of great importance, as they did not always comment directly on things they enjoyed or found difficult. This was highlighted in the preliminary session, as Pat did not make any comments. Likewise, in the second set of sessions Richard was less outgoing than Roger. Instead of making comments himself, Richard tended to direct the more outspoken Roger's attention to areas and items he was interested in. This conveyed information in its own way.

A deliberate decision was made to make the second set of sessions more interactive based on experience from the preliminary session. This proved largely successful, and the comments that were made by Roger and Richard were a unique and valuable tool in the requirements process, as they provided an insight into the boys thought process.

All of the boys were prompted to verbalise or sign their feedback when they seemed thoughtful, happy or frustrated. This prompting often served to remind the boys to describe their experience. The drawback to this strategy is that over-prompting could irritate the boys, or cause them to ignore prompts.

In session three, Richard was distracted when he could see and hear other children playing outside the testing room. To return his attention to the prototype, he was asked if he had any thoughts or suggestions. He started a little, then shook his head, and focused on watching the prototype once more. It is possible that Richard's hearing impairment meant that intervention when he wasn't expecting it startled him, which indicated that care must be taken in this regard. Expectations should be clearly communicated to the child, and standard protocols for communicating with the hearing-impaired should be followed: make eye contact and a small hand gesture to attract attention, or a gentle tap if required.

Roger and Richard both initially appeared a little nervous about their involvement in the sessions and what was expected of them. Having two participants present seemed to help them both in overcoming part of this. As the sessions progressed, Roger particularly seemed encouraged to open up by the presence of another child and he became more outgoing. Peer presence also had the advantage of encouraging spontaneous peer tutoring, evident when Richard tried to demonstrate an interface behaviour to Roger that Roger had struggled with.

Cooperative behaviour was displayed throughout the first session with the boys working well together. In later sessions, some of this cooperation was eroded by familiarity as the boys became comfortable with the sessions and the application. During several sessions their behaviour became more boisterous.

Deaf children tend to be visual and even very minor changes to the application were very obvious to them. Incidental visual changes made between sessions (as distinct from specific changes to the application) appeared to distract Roger and Richard. They would then focus on the minor changes rather than on the larger application. While this could at times hinder progress, it could be used as a creative opportunity as in one session it inspired the boys to discuss possibilities for the prototype.

Some potential requirements which had not been implemented in the prototype were broached verbally. An example was the possibility of a customisable avatar. It was not something which had been discussed with the boys previously, nor did it seem to be an option they had considered; but the idea was appealing when suggested. The challenge with such confirmations was in ensuring common understanding between the application developer and the boys. Visual stimulus may assist in creating this understanding.

Misunderstandings have the potential to be a significant problem. On occasion, Roger and Richard misunderstood attempts to prompt their direct input into the design, which meant an opportunity for closer collaboration was lost. An example of this occurred when the application developer asked what sort of toys and games the boys liked playing with, in order to gather ideas for items in a 'game room' within the application. The Auslan Interpreter suggested through sign that they might have a ball or toy car. Richard simply nodded and repeated these signs. The application developer also experienced difficulties and misunderstood requests for new features, which caused disappointment when these were not addressed as they had hoped. An example of this occurred when Roger requested "characters" and a "movie room" for the application. The application developer misinterpreted what Roger meant by these terms and implemented new game aspects that did not fit with Roger's intent. This misunderstanding may have been due to translation issues and was exacerbated by a lack of confirmation of Roger's meaning by the developer. A series of such misunderstandings could result in incorrect requirements, and potentially undermine the trust established between participants.

A positive experience from the sessions was the enthusiasm shown by the boys as they became more experienced with the process and the application. By the sixth session the boys were comfortable with the approach and were spontaneously suggesting new options for the game. There were some interface errors in the prototype used in this session, however the boys were not disturbed by these and simply requested the application developer to fix them. Many of the earlier misunderstandings were overcome in the final two

sessions, and the boys were comfortable in their interactions with the application developer.

The over-arching theme key to most of our experiences with these boys was communication – eliciting it, understanding it, encouraging it, and achieving a common understanding of intent.

BENEFITS, PROBLEMS, AND LESSONS

Several benefits were identified from the use of prototyping for the Sign My World application. The presence of the prototype served to help focus the boys when they were distracted or energetic. The boys were enthusiastic about participating in the sessions once they were comfortable with the testing sessions and they witnessed the impact their previous comments had made on the developing prototype. This ability and emerging desire of the children to act as active participants was a key experience from the initial prototyping sessions. Essential to the success of this interaction is the provision of support for full communication between the children and the development team.

Conducting the sessions for Sign My World with two children together produced a positive outcome for both the boys and the application developer. This suggests that working with the children in teams is an option worth developing for this group of children. Prompting the children to express their thoughts or attitudes towards the Sign My World application resulted in more feedback for the developer and involvement for the boys.

Some difficulties were also experienced during the prototyping sessions. The boys could not always envision suggested improvements 'in game', and on occasion appeared to be constrained by the prototype itself, rather than being able to apply spontaneous imagination. However the key difficulty emerged in terms of communication.

The overarching theme that emerged from our experiences with the early sessions was the importance of and challenges involved with clear and consistent communication. Apart from the provision of suitable support, such as fluent sign language interpreters, it is vital to select techniques and approaches that enhance communication. The use of some of the more visual techniques such as visual media involving creativity and drawing may assist by facilitating enhanced generation of creative ideas and confirmation of understanding between the members of the team through visual means. Drawing or craft items may provide the children with an opportunity to develop low level prototypes of their ideas themselves or express themselves when they have communication difficulties. This is supported in existing work within the Child Computer Interaction field to develop techniques for working with children involving craft and drawing such as Xu, Read, Sim and McManus' (2009) and Guha, Druin, Chipman, Fails, Simms, and Farber (2005). The visual nature of young deaf children provides new opportunities for working with this group as they possess a high level of attention to visual detail.

Based on these sessions, several lessons were learned. The application designer felt that some creative

opportunities were lost and that she was at a disadvantage at times because she did not know sign language herself. The presence of the experienced Auslan teacher was very successful, however further benefits may be possible if a member of the design team learns Auslan as well.

Clarifying what the boys meant in their feedback is critical. Low level prototyping appeared to assist with this understanding. Observing the boys and their interaction with the Sign My World application provided important information to the application developer, particularly in situations where they were reticent to express themselves with language. Watching their behaviours and interactions provided valuable insight.

CONCLUSION

This paper describes preliminary work developing the Sign My World application as part of the Seek and Sign project. We have presented our experiences from a series of prototyping sessions conducted with three young deaf and hearing-impaired boys. These experiences have provided a series of benefits and limitations for designing with young deaf children, which in turn have informed our own lessons.

Young deaf children not only have much to offer as participants in a design session, they appear keen to participate. Their visual nature appears to help them to be active creative partners. Their contribution is best facilitated by communication support, and may be enhanced by working as a team rather than as individuals. It is the issue of communication that is central to successful participatory design sessions: communication between all participants, clear communication of ideas, and facilities to both facilitate and enhance the contribution of all.

Our experiences have assisted us in refining our approach and have offered opportunities for improvement. The next stage for the Sign My World application will be to conduct sessions using a full participatory design framework that has been developed separately in order to determine if it will produce the desired outcome for the children themselves. This will contribute to our evaluation of the framework for its suitability for participatory design with young deaf and hearing-impaired children.

REFERENCES

Calderon, R., and Greenberg, M. 2005. "Social and Emotional Development of Deaf Children: Family, School, and Program Effects," in *Oxford Handbook of Deaf Studies, Language, and Education*, M. Marschark and P.E. Spencer (eds.). New York: Oxford University Press, pp. 177-189.

Ebrahim, F. 2006. "Comparing Creative Thinking Abilities and Reasoning Ability of Deaf and Hearing Children," *Roeper Review* (28:3), p. 8.

Ellis, K. 2007. "Multimedia to Assist Kindergarten Children to Learn Australian Sign Language," *Journal*

of Australian Research in Early Childhood Education (14:2), p. 12.

Ellis, K. 2009. "Multimedia for Primary School Children Learning Sign Language," in: *Proc OzCHI*: ACM, pp. 97-104.

Ellis, K., Ray, N., and Howard, C. 2011. "Learning a Physical Skill Via a Computer: A Case Study Exploring Australian Sign Language," in: *Proc OzCHI*: ACM, pp. 98-103.

GRI. 2008. "Regional and National Summary Report of Data from 2007-08 Annual Survey of Deaf and Hard of Hearing Children and Youth," Gallaudet Research Institute, Gallaudet University, Washington, DC.

Guha, M.L., Druin, A., Chipman, G., Fails, J., Simms, S., and Farber, A. 2005. "Working with Young Children as Technology Design Partners," *Communications of the ACM* (48:1), p. 4.

Masataka, N. 2000. "The Role of Modality and Input in the Earliest Stage of Language Acquisition: Studies of Japanese Sign Language," in *Language Acquisition by Eye*, C. Chamberlain, J.P. Morford and R.I. Mayberry (eds.). Psychology Press, pp. 3-24.

Mayberry, R.I. 2010. "Early Language Acquisition and Adult Language Ability: What Sign Language Reveals About the Critical Period for Language," in *The Oxford Handbook of Deaf Studies, Language, and Education*, M. Marschark and P.E. Spencer (eds.). New York: Oxford University Press, pp. 281-291.

Myers, M.D. 2009. *Qualitative Research in Business and Management*. London: SAGE Publications.

Parasnis, I., Samar, V.J., Bettger, J.G., and Sathe, K. 1996. "Does Deafness Lead to Enhancement of Visual Spatial Cognition in Children? Negative Evidence from Deaf Nonsigners," *Journal of Deaf Studies and Deaf Education* (1:2), p. 8.

Petitto, L.A. 1994. "Are Signed Languages "Real" Languages? Evidence from American Sign Language and Langue Des Signes Quebecoise," *Signpost* (7:3), p. 11.

Potter, L.E., Korte, J., and Nielsen, S. 2011. "Seek and Sign: An Early Experience of the Joys and Challenges of Software Design with Young Deaf Children," in: *Proc OzCHI*: ACM, pp. 326-329.

Taylor, R., Smiley, L., and Richards, S. 2009. *Exceptional Students: Preparing Teachers for the 21st Century*. US: McGraw-Hill.

Traxler, C.B. 2000. "The Stanford Achievement Test, 9th Edition: National Norming and Performance Standards for Deaf and Hard-of-Hearing Students," *Journal of Deaf Studies and Deaf Education* (5:4), p. 12.

Williams, C. 2004. "Emergent Literacy of Deaf Children," *Journal of Deaf Studies and Deaf Education* (9:4), p. 14.

Xu, D., Read, J.C., Sim, G., and McManus, B. 2009. "Experience It, Draw It, Rate It - Capture Children's Experiences with Their Drawings," in: *Proc IDC*: ACM, pp. 266-270.