International Journal of Child-Computer Interaction 3–4 (2015) 23–40

Contents lists available at ScienceDirect

International Journal of Child-Computer Interaction

journal homepage: www.elsevier.com/locate/ijcci

Widening participation in technology design: A review of the involvement of children with special educational needs and disabilities

Laura Benton [a,*], Hilary Johnson [b]

[a] London Knowledge Lab, UCL Institute of Education, 23-29 Emerald Street, London, WC1N 3QS, United Kingdom
[b] Department of Computer Science, University of Bath, Claverton Down, Bath, BA2 7AY, United Kingdom

ARTICLE INFO

Article history:
Received 11 October 2014
Received in revised form
20 May 2015
Accepted 9 July 2015
Available online 13 July 2015

Keywords:
Technology design process
Participatory design
Children
Special educational needs
Disabilities

ABSTRACT

This article presents a review of the design methods and techniques that have been used to involve children with special educational needs and/or disabilities (SEND) in the technology design process. Situating the work within the established child–computer interaction research sub-field of participatory design, we examine the progress that has been made in relation to the participation of this specific child population. An extensive review of the literature in this area has been undertaken and we describe the different roles, responsibilities and activities that have been undertaken by both the child and adult participants within previous technology design projects. We also highlight the different types of outcome from this previous work involving children with SEND, exploring the impact the children's participation has had on both the resulting technology as well as the impact on the child participants themselves. Finally we conclude this review with a set of reporting recommendations for technology designers and researchers aiming to involve this population in future technology design projects.

Contents

1. Introduction ... 24
2. Defining special educational needs and disabilities (SEND) ... 24
3. Participatory approaches to technology design ... 27
4. The involvement of children in the technology design process ... 27
   4.1. Previously defined roles of children in the technology design process ... 28
5. The involvement of children with SEND in the technology design process ... 28
   5.1. Literature search ... 28
   5.2. Previously defined roles of children with SEND in the technology design process ... 29
   5.3. Outcomes of involving children with SEND in the technology design process ... 30
      5.3.1. Impact of participation on resulting technology ... 30
      5.3.2. Impact of participation on the child participants ... 32
6. The role of the adult ... 33
   6.1. Roles, responsibilities and activities undertaken by adults when involving children with SEND in the technology design process ... 35
      6.1.1. Facilitation ... 35
      6.1.2. Motivation ... 35
      6.1.3. Caregiving ... 36
      6.1.4. Contributing as proxies ... 36
      6.1.5. Adults contributing as co-designers ... 37

* Corresponding author.
E-mail addresses: l.benton@ioe.ac.uk (L. Benton), h.johnson@bath.ac.uk (H. Johnson).

http://dx.doi.org/10.1016/j.ijcci.2015.07.001
2212-8689/

6.2. Discussion of adult roles, responsibilities and activities 37
7. Recommendations for reporting future PD projects involving children with SEND 37
7.1. Epistemology 38
7.2. Stakeholders and participants 38
7.3. Values 38
7.4. Outcomes 39
8. Conclusion 39
Acknowledgements 39
References 39

1. Introduction

The UK government has recently introduced a new Special Educational Needs and Disability (SEND) Code of Practice, which provides guidance for organizations who work with and support this population (DfE and DfH [1]). It highlights the requirement for providing children with "the information, advice and support" to enable them *to participate* in "discussions and decisions about their support", with the use of technology becoming an increasingly important part of this educational support.

A universally accepted definition of what it means 'to participate' is unlikely to exist. However, definitions generally acknowledge that participation encompasses different sets of interests and involves sharing some element of the decision-making affecting one's life or the life of the community in which one lives [2]. The key point here is the action of decision-making, i.e. being given the opportunity and support to influence rather than simply providing an opinion. Since the establishment of the UN Convention on the Rights of the Child (UNCRC) in 1989 [3] a greater importance has been placed on giving children the right to participate fully in family, cultural and social life. However, there is evidence that in establishing this culture of child participation there has been slower progress in the provision of opportunities for children with disabilities [4]. The guidance and regulations laid out in Article 13 of the UNCRC [3] state that disabled children should not be assumed to be unable to participate and instead be provided with the appropriate communication aids where necessary.

There are a variety of approaches to participation and one commonly used approach within the field of technology design is participatory design (PD), which enables end users to be actively involved in the decision making process throughout the technology design process. Given the significant impact well-designed technology can have on the lives of children with SEND providing them with an opportunity to participate within the design of this technology is important. The involvement of children in the technology design process is now well established, with many methods and techniques having been developed to facilitate this participation. However, specifically involving children with SEND can be more complex due to the range of additional support needs they may have during the design process and therefore, as with any form of participation in decision-making in society, children with SEND have had more limited opportunities to influence technology design. This is beginning to change, with increased research funding in this area, there are now many more researchers actively seeking to involve children with SEND in the design of new educational and assistive technologies and through this work are developing specific methods and techniques that can be used to support the participation of this population. Although this is a step in the right direction, unfortunately much of this work is constrained to one-off projects and is also spread across a wide range of different research areas. This paper therefore seeks to review the work that has been undertaken in this field, attempting to summarize what has been achieved so far to enable other researchers to build on this, and proposes future directions for the field. Section 5 provides further detail about the scope and the criteria for the inclusion of papers within this review.

Within this paper we examine the different SEND populations that have been previously involved in the technology design process and the roles and activities that the child participants have undertaken as part of their involvement. We consider the various outcomes that have resulted from the participation of children with SEND both in terms of the impact upon the final technology as well as the impact on the participants themselves. We also look at the various roles, responsibilities and activities that adult participants within the technology design process have undertaken and the impact they have had upon the outcome of the process. Lastly we consider the future of this research area and propose a set of recommendations for the reporting of technology design projects involving children with SEND. The primary contributions of this review are therefore:

- An outline of the current state of the art within PD for children with SEND through an extensive review of the literature, (and summarized in Table 1)
- An identification of the major issues in undertaking PD studies involving children with SEND and important factors to take into account when doing so
- A discussion of work still to be done and unresolved issues
- Recommendations for reporting studies in this area (aimed at both authors and reviewers).

2. Defining special educational needs and disabilities (SEND)

The UK Departments for Education and Health [1] define a child or young person as having SEND if "they have a learning difficulty or disability which calls for special educational provision to be made for him or her". This can mean that they have a significantly greater difficulty in learning than their peers or are hindered from making use of facilities provided in mainstream schools or post-16 institutions. Within this the Departments for Education and Health define four broad areas of need which include:

- Communication and interaction e.g. speech, language and communication needs, or autism spectrum conditions.
- Cognition and learning e.g. learning difficulties from moderate to profound and multiple, or specific learning difficulties such as dyslexia, dyscalculia and dyspraxia.
- Social, emotional and mental health difficulties e.g. anxiety, depression, eating disorders, attention deficit disorder, attention deficit hyperactivity disorder or attachment disorder.
- Sensory and/or physical needs e.g. vision impairments, hearing impairments, multi-sensory impairments or physical disabilities such as cerebral palsy.

Longer-term health conditions such as cancer may also significantly impact a child's learning and result in them being identified as having SEND.

In designing technology for a SEND population it is important to consider how the concept of 'disability' is positioned within the design process. Two of the most prominent models of disability are the medical model and the social model. The medical model (which can also be referred to as the deficit or individual model)