

# Designing Cognitive Technologies for People with Disabilities – Perspectives for Theory and Practice

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## ABSTRACT

This panel will identify and discuss practical and theoretical issues in the design, implementation, and evaluation of technologies to assist persons with developmental and acquired cognitive deficits.

## Categories and Subject Descriptors

K.4.2 [Computers and Society]: Social Issues - *Assistive technologies for persons with disabilities*; H.5.2 [Information Interfaces and Presentation]: User Interfaces - *Evaluation/methodology, graphical user interfaces, prototyping, user-centered design*

**General Terms:** Design, human factors

**Keywords:** Cognitive disabilities, assistive technology, universal usability, universal access

## 1. PANEL MEMBERS

Panel members include interdisciplinary researchers and practitioners from the University of Colorado Cognitive Levers Project ([www.cs.colorado.edu/~l3d/clever](http://www.cs.colorado.edu/~l3d/clever)) and Princeton University/University of British Columbia Aphasia Project (<http://www.cs.ubc.ca/projects/Aphasia>):

- Mark Dubin** Department of Neural, Cellular and Molecular Biology, University of Colorado
- Gerhard Fischer** Department of Computer Science, and Director of the Center for Lifelong Learning, University of Colorado
- Peter Graf** Department of Psychology, University of British Columbia
- Skip Marcella** Participant in the Aphasia Project
- Margaret Morris** Senior Researcher, Proactive Health, Intel Research

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**Barbara Purves** Speech and Language Pathologist, School of Audiology and Speech Science, University of British Columbia

**Jeff Riley** Assistive Technology Specialist, G.F. Strong Rehabilitation Centre

## 2. STATEMENT OF THE PROBLEM AND ISSUES FOR DISCUSSION

The HCI community recognized long ago that it should play a role in the design, implementation and evaluation of technology for users with cognitive disabilities (e.g., CHI '86 panel: Human Interface Design and the Handicapped User). Yet, to date there has been relatively little HCI research done with this population of users. For example, a search for “cognitive impairments” (or cognitive disabilities, disorders, or dysfunction) in [hcibib.org](http://hcibib.org) yields remarkably few publications.

While there are significant challenges to working with users who have cognitive disabilities, there has never been a more opportune time to embrace those challenges. Advances in computer technology, including the prevalence of low-cost hand-held devices, combined with the increasing likelihood that individuals with acquired cognitive disabilities were computer-literate prior to acquiring the disability, suggest new opportunities for assistive technology to support these individuals in their daily activities.

Panel discussions will consider the challenges of designing technologies that promote universal accessibility for persons with cognitive disabilities as they address the following issues:

**Problem scope and definitions.** How many people are affected by a cognitive disability? What constitutes a disability? When is a cognitive deficit disabling? What are assistive technologies? When are assistive technologies a help and a hindrance?

**Communities.** What communities must be involved to design cognitive technologies that are useful and usable? What can we learn about ethnographic study and participatory design to overcome the following multi-tiered “proxy” problems:

1. end users may not be able to articulate what they want or need.
2. communities who may be able to articulate what *should be designed* (i.e. caregivers, family members) are not necessarily the same communities who create the technologies.
3. communities who know how to develop, select, or customize information systems (i.e. technology developers) are often not in a position to offer this service.

**High vs. low tech.** When are technologies most suitable for helping cognitive disabilities? When are low or “no-tech” solutions best? How can these approaches inform the design of new, innovative solutions?

**Learning and living.** Do technologies which make cognitive tasks easier stifle learning? Can technologies be designed to support both living and learning? Are there other uses for cognitive technologies beyond binary choices as tools for learning vs. living?

**Universal usability: a design goal or dilemma?** While universal usability argues that technology should be designed “for all,” the entire context in which a person with disabilities lives, as well as her or his abilities and disabilities, make each person’s situation unique. What does universal usability mean if a “one-size-fits-all” design approach is ineffective and personalization and customization is necessary? Can technologies be universally designed to suit user communities with stable, degenerative disabilities, regenerative losses or transient disabilities? For communities with a mix of the above?

**Technology selection, customization, and abandonment.** What technologies and tools are needed to:

1. locate suitable technologies that already exist
2. choose from existing technologies
3. modify, adapt, or configure technologies to suit a person’s needs
4. decide when another technology is available better suited to a person’s needs or abilities

**Evaluation.** How can research on innovative assistive technology be evaluated? How does one assess and compare technologies that require extensive customization? How should technology be assessed if it serves as temporary scaffolding and is no longer needed?

**HCI research opportunities.** How can research on distributed cognition, ubiquitous computing, user modeling, and adaptive and adaptable user interfaces support the design of innovative assistive technologies? How can HCI benefit from the development of mobile technologies to help the cognitively disabled?

### 3. PANEL FORMAT

The panel will begin with the two co-leaders introducing the topic of designing cognitive technologies. This will be followed by four short presentations given by a subset of the panelists. These presentations will briefly highlight the challenges listed above and describe possible solutions and approaches to addressing those challenges. The mini presentations will be used to seed the discussion amongst the panelists, and the audience will be encouraged to participate by asking questions and contributing their own experiences. Throughout the discussion, panelists will underscore lessons learned in their research with disabled communities, and offer challenges to HCI designers and universal usability researchers to reduce the digital divide between disabled and non-disabled communities.