Remote Human Assistant Technology: Classroom Learning Accessibility for Children with Visual Impairments

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Abstract
It is very important for child with visual impairment (CVI) to learn how to interact and engage with sighted peer for their equal social participation and inclusion throughout their life. This brings up benefit and a need of the classroom learning provided by a regular school because it provides great setting for CVI to easily and naturally learn the communication and social skills. For CVI to maximally take the benefit, their full and independent participation in the class activities are needed. However, not much attention has been paid to research that supports interaction and engagement in classroom setting but to an individual level focused learning technology. We propose leveraging a hybrid form of human plus technology assistance that may support CVI in a classroom setting and investigating a feasibility of the hybrid technology with an exploratory study.

Author Keywords
Visual impairment; Classroom learning; Remote human assistant; Social inclusion

ACM Classification Keywords
K.3.1 [Computer Uses in Education]: Collaborative learning;

K.4.2 [Computers and Society]: Social issues - Assistive technologies for persons with disabilities

Introduction

Learning by its nature requires a high level of visual information processing. Thus, it is obviously highly challenging for learners with visual impairments (LVI) and becomes even more challenging and difficult task for a child learner with visual impairment (CVI). The need of representing visual information in non-visual ways has led to significant effort in developing assistive technology and aids for enabling a person with visual impairment to learn (e.g., braille book).

There have been great amount of assistive technologies and devices (e.g., screen reader, Optical Character Recognition technology, braille labeler, and closed circuit television (CCTV)), developed and researches [2, 3, 4, 5, 6] conducted for CVI to access information about learning material and concepts even if the whole learning process is daunting and complicated. The benefit of classroom learning for CVI is significant – especially for CVI's early development of social and communication skills. It would be even more beneficial for CVI to attend regular school since a classroom setting in regular school is a microcosm of the real world; enabling experiences and interactions with sighted peers. The number of LVI attending regular school has been increasing. With this increase, there is an opportunity to study how to accommodate and help LVI participate in and benefit from classroom learning. CVI still face challenges and have problems with full and independent participation. This hinders learning how to interact, communicate, collaborate, and work with sighted peers, which are important skills that support equal social inclusion.

The Problems and Challenges in Classroom

Passive participation

One of the problems that keeps CVI from fully participating in a regular classroom setting is the lack of accessibly information about their immediate surroundings. It is hard for them to initiate participation without the proper stimuli, and often they wait for long periods of time until someone else in the room (a teacher or student) engages with them. Without visual information about their environment, any type of interaction becomes challenging: raising a hand for asking a question on the right time, understanding work progress or group members' status (e.g., facial emotional cues, engagement level, and roles) in a collaborative setting, understanding and knowing about scenes happening in a classroom that needed for CVI to make a decision on what the appropriate actions they need to take is, and knowing about who is approaching to them for establishing any kinds of interaction with them. LVI need more information in order to fully participate in a learning environment.

Dependency on teacher or aide

Learning and developing is very important for CVI's higher education and, ultimately, for finding a career. The fact that CVI have much to learn just because their being young means they need a lot of assistance. They may need help finding their books and note-taking tools and packing their bag. More broadly, they may need help understanding a concept in class. In cases such as this, a class assistant is allowed to sit next to CVI. However, assistants and teachers may opt to do things for CVI rather than take the necessary time to teach them how to do something or understand a concept on

their own. CVI's dependence on an assistant or teacher can easily grow bigger and bigger.

Many different kinds of devices needed
Participating in and performing learning activities in a classroom setting requires LVI to carry many different assistive technologies and tools such as screen readers, braille reader or writer, talking calculators, and so on. Could it be possible to combine these devices into one or two multi-purpose devices to relieve some of the burden on LVI?

Concept of Using Remote Learning Assistant

We propose leveraging a hybrid form of human plus technology assistance called AIRA [1] that may support LVI in a classroom setting. AIRA is currently commercially available for people with visual impairments, and it has rapidly developed a strong reputation among its users and a high demand among potential users. AIRA connects a remote, sighted human assistant to PVI 18 hours a day seven days a week. These sighted assistants help with many tasks, including note-taking during undergraduate lecture classes.

Interview Study with AIRA User

We conducted an interview study with (n=4) AIRA users, whom we recruited using snowball sampling. We found one case showing the potential for using a remote, sighted assistant to make an LVI's classroom experience more beneficial and enjoyable, which could result in improving the overall learning experience.

The interviewee, Nikos (pseudonym), is a college student and has been totally blind for seven years. During an hour long, open-ended phone interview, they shared their experience of using AIRA for all different types of activities, including: simple reading, navigating, finding objects, and, interestingly, performing classroom activities. These activities included giving a class presentation and watching other presentations. In the former, the AIRA agent gave Nikos feedback about audience reactions to his presentation. In the latter, an AIRA agent read text on the presentation slides. He found the service very useful and helpful in that he could get more information in real time. According to Nikos, doing a presentation and making real-time changes based on inaudible audience feedback (e.g. facial expressions, eye contact, smiles) was not possible without the help of an AIRA assistant.

Nikos said, *"I was doing a presentation, I was able to get the point to the screen the agent knew, I want them to read that……I told the agent ahead of time that I needed, I wanted them to describe when people come up, whether people were looking at my project, if they give me eye contact, if they were smiling, stuff like that…so I get to know what's around me."*

In our view, this case shows the potential of real time engagement and interactive communication possible with augmented reality that the remote assistant created with the technology.

Remote Assistant for Child CVI Classroom Learning

We see the potential of the sighted, remote assistant as in making classroom learning more accessible. One way they might do this is by providing more information to LVI about inaudible information (e.g. body language, text, and so on) that were previously inaccessible. So,

it would seem that there is potential for AIRA (and AIRA-like devices) to reduce the challenges and problems that LVI experience in classroom settings. Also, AIRA may have the potential to help strengthen an LVI's independence in the classroom. Whereas live assistants and teachers sometimes carry out tasks for LVI, a remote, sighted assistant may not be able to do this given their remoteness. Lastly, AIRA may reduce LVI's need of many different types of assistive tools and devices since the assistant has the capacity to do many different things. In our view, it may be worth investigating the following research questions:

RQ1: Would the description about the surroundings the remote agent provides will make full and active class participation nearly possible for the children LVI?

RQ2: How the agent not being in the presence but remotely located helps children LVI to learn and live independently compared to having an aide right next to them?

RQ3: Would this case open an opportunity to gather design implication for development of virtual personal assistant for children LVI's classroom learning?

Future Study Suggestions

AIRA recently launched the AIRA Campus Network as a way to extend their service offering in learning environments. The program aims to create smarter campus, and it has already been adopted by the Perkins School for the Blind. AIRA has clear demonstrated interest in providing their service as an education technology for LVI in a school setting. We would like to conduct an exploratory study in undergraduate classrooms – and perhaps with AIRA's partner institutions – to examine the effectiveness of using a remote, sighted assistant in a learning environment. Ideally, we will be able to partner with schools and with AIRA. This research may also open a door for further investigation on designing an AI-powered personal learning assistant for classroom learning.

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