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# Understanding the Use of Assistive Technologies for Deaf Students in a Hearing School: A Case Study

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**Abstract**

In this paper, we report the results of a case study that is aimed at understanding the use of Assistive Technology (AT) by deaf students in a hearing school. We conducted email conversations and a 30-minute face-to-face interview with a Disability Accommodation Coordinator in a hearing law school in the Chicago area, where there is one deaf student who received cochlear implant. We found that (1) the school only provided one type of AT to the deaf student, (2) he didn't face great difficulties in general interaction with hearing people, but encountered problems interacting in highly dynamic environments, and (3) the current AT accommodations provided by the school did not exploit the advantage of the new technologies.

**Author Keywords**

Assistive technology; deaf and hard of hearing students; law school; accessibility.

**ACM Classification Keywords**

K.4.2. Computers and society: Social issues-*assistive technologies for persons with disabilities*.

**General Terms**

Human Factors.

## **Introduction**

The Individuals with Disabilities Education Improvement Act (IDEIA) of 2004 defines assistive technology (AT) as:

“Any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of a child with a disability. [4]”

IDEIA supported the role of AT as an integral and necessary component of education for all students with disabilities, mandating that AT be considered whenever the child requires it [4]. As a consequence, it would appear that deaf and hard of hearing (DHH) students are provided solid foundation for them to receive AT in the public schools. In fact, AT is well perceived as an option to help the DHH students participate in the classroom and grow academically and functionally in mainstream learning environments [9, 11]. Literatures also indicated that the use of AT is increasing in the deaf population and there's a tendency that AT use is beginning at an early age [10].

Many other researchers have found that DHH students preferred attending “mainstream” schools with their hearing peers rather than going to schools that specialize in teaching DHH students [1, 8, 12]. For example, Angelides and Aravi (2007) found that the DHH participants perceived mainstream schools as having a higher academic level [1]. Richardson et al. (2010) also found that DHH students in mainstream classes were more satisfied with their acquisition of analytic skills and reading abilities than in special classes [12].

However, DHH students are facing many difficulties in mainstream schools [2, 5, 8-10, 13]. For example, researchers found that DHH students are facing challenges in mainstream classrooms due to problems including inadequate communication, limited classroom participation, and insufficient supportive services [5, 9, 13]. Additionally, information in a classroom setting is usually visually dispersive: there are multiple visual sources of information (e.g. instructors, slides, other classmates, and interpreter or caption) emerging simultaneously at different locations. This could increase the likelihood of missing information of the DHH students [2, 8]. Moreover, due to the lack of exposure to technology, DHH students sometimes don't have sufficient skills and knowledge in terms of how to access and use their personal AT [10]. Many of those problems have still not been well addressed.

In summation, DHH students preferred attending mainstream schools because of the academic advantages; but there are still problems for them to access educational resources in mainstream schools, even though the use of AT is mandated.

In this paper, we will report preliminary results of an explorative case study aimed at understanding the current use of AT by DHH students in a hearing school. Specifically, we were interested in understanding (1) what types of AT the DHH students currently use in learning environments, (2) how helpful those ATs are in facilitating communication and interaction, and (3) the limitations of the current ATs.

### *Related Literature*

While we focused on the benefits and limitations of current use of AT in the classroom settings, we

recognized that our study is also grounded in work which concentrated in designing and evaluating new AT systems that support DHH students in classrooms. There are several studies in this area [2, 3, 6, 7].

For example, Cavender et al. (2009) designed and evaluated ClassInFocus, a learning system prototype that aims at solving the DHH students' visual dispersion problems. ClassInFocus brings multiple classroom components together in one screen and includes a mechanism to automatically notify students of classroom changes. The authors evaluated the system with six DHH students and found that (1) the system could improve the performance of some participants and (2) participants who like the automatic notification were more likely to benefit from them [2]. Many other studies were also intended to address the visual dispersion problem encountered by DHH students.

The work most closely related to our study is research that investigated current AT use of DHH students in a hearing school. However, there are only a few studies in this specific area. Lartz et al. (2008) interviewed nine Deaf students in a hearing university to understand their use of assistive technology. They found that: (1) there was a wide variety of AT use for academic and socialization purposes; (2) barriers arose from difficulties in coordinating the AT, inexperience with the AT, and the challenge of managing dispersive visual information; and (3) the facilitators to AT use included self-advocacy, teamwork, and opportunities to experience AT [9]. While their study focused on the perception of AT from DHH students' perspective (e.g. experience with the AT), we emphasized more on the task they want to accomplish and the benefits and limitations of the technology itself. Further, along with

the prevalence of smart phones and tablet PCs, technologies have dramatically changed from the time that Lartz and colleagues conducted their research. In this study, we also hope to explore how this change affected the use of AT by DHH students.

## **Method**

This case study is based on email conversations and a 30 minutes face-to-face interview with a Disability Accommodation Coordinator (DAC) in a law school in the Chicago area. We recruited the participant with the support of the Assistant Dean of the school and family members of one of the authors.

### *Participant*

The participant, Carl (pseudonym), was a 24-year-old male. He is in his first year working in the law school and this is his first job as a DAC. The responsibilities of his job include advising students with disabilities and coordinating their use of assistive services. Carl regarded himself as tech savvy.

### *Setting*

The setting was a medium-sized law school with a hearing student population of approximately 1,900 enrollees. There are approximately 70 students in this school who have at least one kind of disability, among them included only one student who is hearing impaired. The only DHH student is a male whose name is Daniel (pseudonym). He is profoundly deaf and has received cochlear implant; but we don't know the exact time when he received it. He is in his third year of the General Practice Program. The school has specialists (the DACs) who provide services to students with disabilities, including DHH students.

### *Study Design*

The study included two phases. In the first phase, we sent emails to Carl requesting for information regarding his background, the number of DHH students in the school, and the degree of hearing loss of the student. This information guided our design of the interview questions.

In the second phase, we conducted a 30-minute semi-structured interview with Carl. During this session, we asked him about (1) the current AT accommodations made for the deaf student, (2) his experience interacting with the deaf student, and (3) the efficiency and limitations of the current AT accommodations in his opinion. We audio recorded the interview and took notes during the interview session.

### *Data Analysis*

After completion of the interviews, we transcribed the audio recording verbatim and the data was coded inductively. Each member of the team independently identified major themes in the data.

## **Results**

The topics and themes that emerged from our analysis include (1) the AT accommodation currently provided by the school, (2) the procedure for the deaf student to acquire the AT, (3) the methods that the deaf student interacts with hearing people, and (4) the obstacles that the student faces and the limitation of current AT accommodation.

### *AT Accommodation*

Carl told us that Daniel uses one kind of AT accommodation that is provided by the school, even though he is aided with the cochlear implant. It is an

open captioning technology called Communication Access Real-time Translation (CART). During every class, a trained operator will sit next to him using CART to transcribe spoken speech into written text. This technology will also be used in every mock trial and trial education courses that Daniel will be required to participate. To Carl's knowledge, there is no difficulty for Daniel to read the written texts.

### *Procedure to acquire the AT*

All the students with disabilities, including Daniel must initiate contact with Carl or another DAC to request accommodations. They have to fill and submit three forms along with documentation from the treating professional showing exams performed and the diagnosis. They also have to inform the DAC of their class schedule themselves. In addition, at the beginning of every course, Daniel also needs to inform the instructor about his hearing and the presence of a transcriber to clear up misunderstandings.

### *Interaction with hearing people*

We asked Carl about how Daniel interacts with (1) Carl himself, (2) the professors, and (3) other hearing students. It turns out that Carl didn't think Daniel had major difficulty interacting with hearing people verbally or through writing (e.g. email). Carl stated that he didn't find any problem interacting with Daniel, either:

*"... actually when you talk to him, he doesn't have any kind of speech problems .... First time I met him I didn't actually know he was [deaf]. He has the cochlear implant."*

However, there are some instances, where Carl thinks that Daniel may have an awkward interaction with other hearing people:

*"... sometimes he just says 'sorry could you say it again or write it for me.' But no one ever complained that he caused any problems."*

Moreover, Carl mentioned some situations when Daniel would face serious obstacles interacting with others. We will report those in the next subsection.

#### *Obstacles and the limitations of AT*

During the interview, Carl identified two major obstacles that Daniel would face given the current AT accommodations. The first one is the competency of the transcribers:

*"While if a non-lawyer is going to be the [transcriber] there could be misspell things. It could change the entire meaning of what's being said. The one thing that could be done, would cost a hell of a lot of money, is to have lawyers do it. But what lawyer would want to do it?"*

Another obstacle that Daniel would face is when he has to interact with hearing people in highly dynamic environments, such as mock trial competitions:

*"The biggest problem will likely be from during questions and answers, dealing with witnesses and so forth. ... Because being in court you can't just be sitting at the desk reading everything that is being said. You got to be up and connect with the jury. So that's where he's going have to get out of his comfort zone."*

## **Discussion**

From the interview, we feel that the CART seems to be the only AT accommodation that is provided by the school for the deaf student. While focusing on the access of lecture contents in classes, this service has little benefit in facilitating real-time communication for the deaf student in a highly dynamic interactive environment.

Moreover, the procedure of acquiring this AT is complicated. The students would also have to worry about the logistics themselves when they want to use the AT. This could hinder the accessibility of the AT; and the communicative difficulties of those students would exacerbate this problem.

Carl mentioned once in the interview that Daniel is using a smart phone. However, he didn't know how the smart phone is used in facilitating Daniel's communication and interaction. It appears that the school still accustomed to the old technologies in terms of AT accommodations.

Based on these insights, we suggest that (1) future research on AT for deaf students should emphasize more on facilitating real-time communication in highly dynamic interactions, (2) software systems could be developed to take care of the logistics of using AT, and (3) more researches could be conducted to investigate the exploitation of new technologies for deaf students.

## **Conclusion**

We reported the results of a case study which is aimed at understanding the use of AT by DHH students in a hearing law school in the Chicago area. The study is conducted with a DAC in the school. We found that with

supports of cochlear implant and AT accommodations, the deaf student in the school didn't face great difficulties in general interaction with hearing people. However, he still encountered problems interacting in highly dynamic environments and experienced tedious procedures to use the AT. Moreover, the current AT accommodations provided by the school didn't exploit the advantage of new technologies.

Since this study is conducted at only one school, the results were not representative and generalizable. Moreover, because this study didn't directly gather data from DHH students, we still don't know the benefits and limitations of the AT from the students' perspective. In the future, we would like to explore this study more extensively; this includes gathering and analyzing data directly from DHH students in different hearing schools.

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