Summit to Create a Cyber-Community to Advance Deaf and Hard-of-Hearing Individuals in STEM (DHH Cyber-Community)

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STEM Student Perspective on Benefits/Challenges Associated with On-line Remote Interpreting and Captioning

Prepared by Joshua R. Beal

Awareness of the challenges that face disabled students pursuing STEM education at the post-secondary level has resulted in commitments of funding and research efforts from the National Science Foundation (NSF), IBM and a number of higher education institutions such as RIT/NTID and three other alliances supported by NSF: the MIDWEST, EAST and RASEM2.

While each of these alliances vary in focus on K-16 STEM education access, much of those efforts are targeted at improving educational technology accessibility for student populations with visual, mobility, health and learning barriers. There is a plethora of literature available on mitigating these barriers, however obstacles continue to exist for deaf and hard of hearing students in STEM programs across the country.

For the purpose of this whitepaper, the discussion is focused on exploring educational access technology options for deaf and hard of hearing STEM students attending mainstream post-secondary education settings as opposed to those attending traditional post-secondary education settings for the deaf and hard of hearing such as NTID/RIT, Gallaudet University or CSUN. The distinction is vital since traditional post-secondary education settings for the deaf and hard of hearing have accumulated a body of knowledge and resources that are very difficult, if not impossible, to replicate and transfer to other institutions.

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An important distinction should be made between deaf and hard of hearing students due to the communication methods that are primarily used by each group. Deaf students, whose first language is American Sign Language (ASL), rely on ASL as their primary means of communication. While some students may have lip-reading and speech capabilities, the capability for oral communication widely varies from individual to individual. Another factor to consider is that deaf students throughout K-12 trained to practice self-identification methods in respect to requesting their communication access needs. Consequently, at the post-secondary level, these students are well aware of their right to communication access services such as ASL interpretation, CART, or note-taking services.

In contrast, hard of hearing students, may not be used to exercising self-identification methods in order to obtain communication access services. This is a challenge for post-secondary institutions that are eager to provide communication access services to their students, but are unable to identify the students who would benefit from those services. As a result, a knowledge gap exists within the mainstream institution, which is not adequately differentiating between the needs and preferences of individual deaf or hard-of-hearing student in respect to communication access in the classroom.

There are several new tools available today for addressing varying deaf and hard of hearing student communication needs. They include Video Relay Service (VRS), Video Relay Interpreting (VRI), Real-time Remote Online Captioning (RROC), and Automatic Speech

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Recognition (ASR). These tools have wide implications in respect to providing communication access to deaf and hard of hearing individuals as their uses in the educational setting continues to be refined and developed.

VRS allows for personal direct communication, from outside the classroom, between the deaf and hard of hearing student and the classroom peers, tutors, professors and support staff. VRI enables the capture of information inside the classroom through an ASL interpreter who is connected through a direct internet connection and conveys the classroom lectures to the student using ASL communication. RROC operates using the same premise as VRI, except the information conveyed is in English. ASR is a software application that requires personalized training by the speaker to capture their spoken language and effectively convert it to proper text. All these communication access tools, with the exception of ASR, require a third party to convey the information between the student and the transmitter of information – student, support staff or teacher.

Of these three tools, only VRS is subsidized by the Federal government, therefore there are no cost constraints or limitations to continued use. VRI and RROC have relatively high costs, typically $35-$120 per classroom session, subjective availability due to marketplace supply/demand and varying credential requirements for interpreters/operators by providers make it difficult to ensure consistent quality provision of services. These factors make it difficult for

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mainstream settings to consistently obtain the high level of service needed to convey STEM educational content to the student.

VRI and RROC have been adapted from in-person service provision to internet-based services, thus increasing availability of services over dispersed geographic areas and ensuring that the student's communication needs are met. While the increasing use of VRI and RROC in the class-room setting provides more communication access options to students at post-secondary institution, barriers remain. These barriers appear throughout the classroom environment:

- Field Trips – Controlled environment requirement due to Internet/Audio capability
- Lab/Study Groups – Inability to capture audio from numerous speakers, lack of visual indicators
- Multiple Information Sources – Transcription is not aligned with other content (Notes, PowerPoint slides, classroom handouts)

Integration of VRI, RROC into the classroom, for the purpose of resolving the communication access barrier for deaf and hard of hearing students continues to be an effective, but costly solution.

Today, the greatest opportunity for developing full communication access in the classroom comes through the concept of a digital classroom environment. A good example of this is an online course which provides in advance, accessible content to students including readable text for blind, captioning for any video content provided and ease of communication through email

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between students and faculty. While online courses are an emerging option for creating an accessible digital classroom environment, post-secondary institutions are attempting capture the benefits of online learning while providing personal instruction through blended courses, which are a combination of online and classroom instruction.

Blended courses, with proper preparation, can enable full communication access by using third party services such as VRI and RROC or it can incorporate ASR technology as a means of transmitting the speaker's verbal content. The use of ASR technology, while requiring user-intensive training to correctly align the speaker's voice with text, can allow for self-contained classroom communication access. While time-consuming and relatively untested, use of ASR technology is promising due to the removal of the third-party service provider, thus saving time and money.

All these advances in development of communication access tools and digital classroom environments lead to the examination of a Internet-based Cyber-Infrastructure system that not only provides accessible options to deaf and hard of hearing students, but also post-secondary institutions who seek to use these tools.

These tools would include:

- Online Databases
    - Technical Vocabulary Guides
    - Classroom Content/Material

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- Teaching Tools for Educators
    - Accessible Content for Instruction
    - Guides to effective VRI, RROC, ASR use
- Accessibility Guidelines for Content Development
    - Guidelines for Deaf and Hard of Hearing content development
- Best practices for STEM relating to RROC and VRI Personnel
    - Technical Vocabulary for third party service providers

For these purposes, the primary benefit of such as system would allow for use of accessible content that is focused at deaf and hard of hearing STEM students, the respective faculty and support staff at those institutions. Furthermore, providing an open database to STEM students/faculty would promote standards and more easily compel a greater number post-secondary institutions to implement effective and affordable communication access solutions that meets the needs of those deaf and hard of hearing students.

In conclusion, an increasing number of non-traditional post-secondary institutions are educating deaf and hard of hearing students in the STEM disciplines with limited resources and knowledge of communication access issues and tools. With the advent of technological tools such as VRS, VRI, RROC and ASR, there continues to be progress in addressing the communication access needs of deaf and hard of hearing students, but it has yet to be done in a complete fashion that ensures full 100% communication access. A Cyberinfrastructure System would provide an opportunity to implement full communication access for deaf and

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hard of hearing students in the STEM disciplines, at geographically dispersed locations, through the shared dissemination of best practices, tools and guidelines for students and educators alike.

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