ASL-STEM Forum: A Bottom-Up Approach to Enabling American Sign Language to Grow in STEM Fields

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Abstract

Deaf and hard of hearing students studying advanced topics in Science, Technology, Engineering, and Mathematics (STEM) lack standard terminology to enable them to learn, discuss and contribute to their chosen fields. The ASL-STEM Forum enables the diverse, thinly-spread groups that are independently creating and using terminology to come together using a community-based, video-enabled web resource. A common vocabulary would provide interpreters with consistent terminology and enable deaf scientists to more easily converse from a common basis. This paper discusses the implementation of the ASL-STEM Forum, describes our approach to building a community using the site, and overviews the unique opportunities it offers for observing a language developing from the bottom-up.
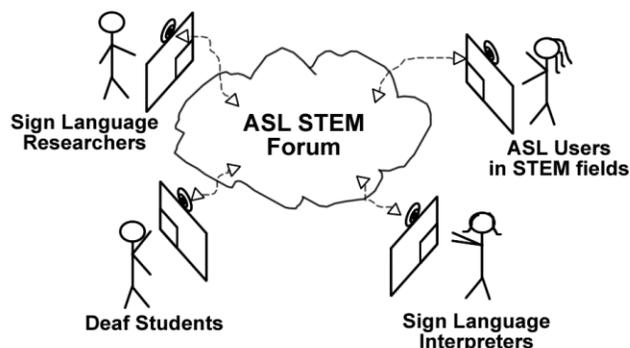
Figure 1: The ASL-STEM Forum can bring together students, teachers, interpreters, language specialists, and others. Video discussion will help build consensus on the most effective and conceptually correct methods for signing STEM concepts.

Introduction

As deaf and hard of hearing students prepare for careers in Science, Technology, Engineering and Mathematics (STEM) at advanced levels, they need standardization of scientific terms in American Sign Language (ASL). Because most deaf and hard of hearing students study at mainstream universities, students seeking advanced degrees will likely attend universities that do not have easy access to interpreters who know the scientific vocabulary needed for advanced study in STEM courses. In fact, standard vocabulary for many advanced topics does not exist yet. Providing English captions is not sufficient because English is not the first language of many deaf individuals and many deaf individuals prefer to communicate in sign language. Captions also convey less information than either spoken or signed languages because they lack intonation (tone of voice or facial expression) and can cause confusion when caption delays result in missed often express speaker gestures or references to visual displays.

Studies have shown that deaf students entering STEM fields have high attrition for a variety of reasons, including the lack of conceptually correct signs for concepts in their

field (Lang 2002). Students and their interpreters (English to and from ASL) lack the vocabulary to talk about many scientific topics at a high level. The problem we are addressing is how to build up ASL to include a richer vocabulary that covers advanced topics in STEM fields, thereby opening the door to more deaf students entering and succeeding in these fields.

Deaf students pursuing advanced degrees in STEM are spread thinly around the country with only a few at a given university. Students often collaborate with local interpreters before or after class to invent signs for course concepts. Invented signs may be used for the class, but rarely survive to become part of the language. Different signs are often created independently for the same concept, hindering collaboration, because no convenient mechanism is available for sharing signs with others.

There is a strong need for consensus among members of the deaf and hard of hearing community about how to sign for STEM topics (Lang 2006) and several groups have begun to catalog technical and scientific signs into online video references (COMETS 2008; Shodor Educational Foundation 2008). These resources represent an important first step to enabling advancement in STEM fields but lack the fluid natural language evolution that informally occurs as other written, spoken, and signed languages develop.

They have also focused primarily on creating a video dictionary of equivalent signs for English terms. Sign definition alone is not sufficient: discussion of grammar, appropriate usage (a perfectly accurate sign may actually convey too much information in exam situations), and spatial language are also needed (i.e. both signs and sign concepts). Tools should support community-centered discussion about language progression with geographically-dispersed community members. Because ASL is a visual language, video discussion and collaboration will best enable this natural process.

Enabling Community

We have designed and implemented a video forum, the ASL-STEM Forum, which enables members of the community to upload videos of signs and sign concepts, discuss alternatives, and rate other contributions. This video forum builds on the deaf community's rapid acceptance of video phones, Vlogs (Video blogs), and video-enabled social networking on sites such as facebook.com and camfrog.com. These video technologies have already affected ASL by bringing together dispersed deaf communities and accelerating the natural process of discussion about differing vocabulary and idioms, resulting in agreement on common vocabulary or acceptance of alternatives for the same concept.

ASL-STEM will bring together students, interpreters, sign language experts and deaf STEM professionals, such as teachers from Gallaudet University and the National Technical Institute for the Deaf. As the ASL-STEM Forum becomes populated with signs and discussions about them, deaf students and their interpreters will be able to find signs to use directly, participate in the discussion and evolution of existing signs, and help the language converge to an accepted vocabulary by rating signs. Using supplied ratings, the most appropriate signs for each concept are chosen using a collaborative filtering approach (Konstan *et al.* 1997). If the forum becomes an authority on what signs to use, more users will want to use it, giving the site a viral quality that will motive users to participate as others do so.

Implementation

The initial version of ASL-STEM forum is implemented as a Ruby on Rails web application (Figure 2). It enables users to contribute videos, discuss them in both text and video, and rate candidate signs. The capture, upload and hosting of videos is managed by youtube.com. Signs are organized in a hierarchy that is user-modifiable. Designing with participation from the deaf community will encourage users to contribute content and enable the site to succeed.

Future Work & Conclusion

The next steps are to seed the ASL-STEM Forum with signs and promote it among potential participants. We will

Figure 2: The ASL-STEM Forum page for the term "Object." a) Terms are organized by the community into a meaningful hierarchy, b) highly ranked signs are displayed at the top, enabling the site to act as a reference, c) signs are rated by the community, and d) users can discuss in both English text and ASL video.

initially seed the ASL-STEM forum with signs targeted at introductory computer programming and data structures. To promote the ASL-STEM forum, we have organized an NSF-sponsored Summit to Create a Cyber-Community to Advance Deaf and Hard-of-Hearing Individuals in STEM (DHH Cyber-Community) to be held this summer at Rochester Institute of Technology. Participants at the summit will be able to participate fully on the site. We hope this will spawn discussion and feedback for the project and catalyze the forum's growth.

References

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