Designing Tools to Facilitate Students Learning American Sign Language

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Big Picture: Overall Project
Students learning American Sign Language (ASL) lack interactive tools to give them feedback on their signing accuracy, when a human ASL instructor is not available.

In this multi-university NSF-funded project, we are creating software, utilizing a Kinect camera, to aid students who are learning ASL. In the final system, computer vision software will identify aspects of signing that contain non-fluent movements and give feedback to students practicing ASL independently.

This tool won’t replace feedback from ASL instructors; it would only catch certain errors.

Focus of This Study
The focus of this current study is: How should our system indicate feedback to the student about the errors that were found in their ASL performance?

Since the system isn’t built yet, we used a “Wizard of Oz” approach to create prototypes of different ways of providing feedback, and we compared each of the alternatives.

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Methods
We designed video-based prototypes for displaying feedback to ASL students.

Students performed ASL homework assignments recorded as video submissions. The videos were linguistically annotated to identify errors, and feedback videos were produced to indicate errors to students.

The students viewed the feedback videos, and they re-attempted the homework again. An ASL instructor graded both attempts.

Results
Students preferred tools that gave feedback; such videos led to the greatest reduction in student production errors. In addition, students preferred videos in which feedback was time-aligned with their signing.

Discussion
The results guide how our tool should be designed for this project, and it also suggests ways for ASL instructors to best provide feedback to students. Our collection of videos of ASL students and fluent signers, with annotation of linguistic phenomena and errors, will also support research on ASL.

Feedback Conditions

VIDEO: Repay the student’s first video without any feedback provided

FEEDBACK: Provide feedback to the student

a. NOTES: Text at end of the student’s video with feedback

b. POPUP: Feedback messages appear during the student’s video when errors occur

Errors Identified in Videos
In this study, 17 unique error codes and 7 unique correct-usage codes were used to annotate the participants’ ASL recordings. This table includes examples of error codes and correct-usage codes used for analyzing students’ recordings.

Response Data Collected
Students answered a scalar question to subjectively rate the quality of the feedback videos they saw. An ASL instructor graded both homework attempts (without knowing which was the first or second attempt).