Mobile Sign Language Learning Outside the Classroom

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Abstract

The majority of deaf children in the United States are born to hearing parents with limited prior exposure to American Sign Language (ASL). Our research involves creating and validating a mobile language tool called SMARTSign. The goal is to help hearing parents learn ASL in a way that fits seamlessly into their daily routine.

Author Keywords

sign language, informal learning, mobile language learning

ACM Classification Keywords

K.3.1 [Computers and Education]: Computer Uses in Education]: Computer-assisted instruction.

Introduction

Ninety-five percent of deaf children are born to hearing parents who have little prior experience with American Sign Language (ASL), the most accessible language to the deaf in North America [4]. When faced with the difficulties of communicating with their deaf child, most parents make the decision to learn ASL. They achieve varying degrees of aptitude. One factor impacting parents' ability to learn, is that ASL can be as difficult for an English speaker to learn as Japanese or Chinese due to the use of simultaneous morphological inflections and non-manual grammar in ASL [3]. A second factor is the
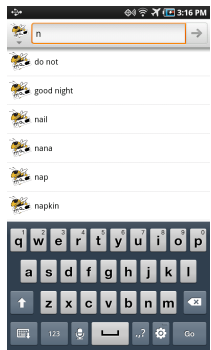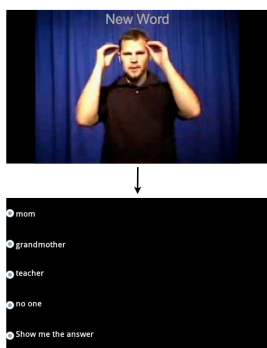
Figure 1: The search interface

Figure 2: The quiz interface

Figure 3: The practice interface

limited availability of classes. Classes are taught in many areas of the country but may not be accessible to individuals living in more rural areas. There are also not many classes that advance beyond introductory material.

Parents' difficulties mastering ASL have a large impact on their child. Deaf children of hearing parents develop language at a much slower rate than hearing children of hearing parents or deaf children of deaf parents. This slower development has been attributed both to incomplete language models and less parent-child interaction [1, 5].

Application design

SMARTSign is an application designed to help parents learn and practice ASL on their mobile phones. By providing parents with better tools for learning the language, we hope to eliminate the language deficit experienced by deaf children of hearing parents. The current focus of SMARTSign is on vocabulary acquisition. Future work will involve incorporating ASL grammar and fluency practice into the application.

SMARTSign is an Android application designed for smartphones with front-facing cameras. It currently has three components for learning: search, quiz, and practice. Each component fulfills a different function. The search component is intended to be used when parents have immediate communication needs with their child. They can search for an ASL video either by typing the English equivalent on the keyboard or by speaking using speech recognition. If the parent chooses to use the keyboard for input, the search interface suggests terms from the dictionary as soon as characters are entered to aid in faster retrieval. The search interface is shown in Figure 1. The search component aids learning because parents are

retrieving signs so they can immediately use them in context.

The quiz interface is shown in Figure 2. This component is useful when parents have a free moment during the day to study new vocabulary. First, a video with a sign is shown. Once the video has finished playing, parents are presented with five choices: four vocabulary words and one option when the parent just wishes to see the answer. If the parent chooses the incorrect response, the target video will be replayed and the incorrect option will be grayed out when the choices are repeated. If the parent chooses "Show me the answer," the video will be replayed and the answer will be displayed. Parents can continue watching videos and responding for as long as they have time.

In interviews, parents reported feeling uncomfortable signing. We created the practice component so they could record themselves performing a sign and compare it to the example video. This interface is shown in Figure 3. Parents can continue record themselves until they feel comfortable with their performance. Previous research with just a quiz interface showed that it could help individuals learn how to recognize ASL videos, but they were not able to recall how to produce the signs [2]. Including the practice component changes the application's learning focus from sign recognition to sign production.

In addition to the three components, parents have the ability to set notifications to remind them to study. They can specify both the time of the reminder and the days of the week they would like to be notified. This way parents can set reminders for times when they are least likely to have other responsibilities. Parents can also specify how many new signs they would like to learn daily in the quiz component. Once the parent has studied the new words

for the day, any further use will be review.

Parents are also able to track their progress using the application. Progress is determined by the number of signs they have gotten correct when using the quiz component and signed when using the practice component. They can view general progress learning all of the available vocabulary as well as progress learning different word categories. If a parent selects a category in their progress report, they can also see specific details on the individual words, how many times they have viewed a sign versus how many times they have responded correctly in the quiz, their latest response, and when a word as been signed using practice. Initial deployments of SMARTSign to hearing parents with deaf children have been promising. Parents have reported enjoying the application and sharing it with others in their family.

Making time for learning
SMARTSign is designed for parents who do not have access to ASL classes. We plan to conduct a study with the goal of understanding how parents decide when it is time to learn and how these decisions impact their ability to learn to recognize and produce ASL vocabulary. All of the parents will be given access to a smartphone running the SMARTSign application for a month. To investigate how to motivate use of the system, half of the parents will be told the application is designed for learning common words that should be used and recognized by their children. The other half will be told the system is for learning vocabulary for common children's stories such as *Go Dog, Go!*.

We will collect a variety of data over the course of the study. A pre- and post-test of vocabulary knowledge will be administered to all parents. This data will give information about how well parents are able to learn sign language using the SMARTSign application. We will also record detailed logs of application use. This data will include: when people access the application, how long people access the different components, and what vocabulary is accessed. Parents will also be asked to provide information about where they are, who they are using the system with, and reasons for accessing the system throughout the course of the study. This information will help create a better understanding of the level of parental self motivation. It could be that parents are most interested in a tool for immediate communication provided by a dictionary search of SMARTSign express and will ignore study notifications. Another possible situation is that parents will take advantage of the mobile affordances of the device and find small moments throughout the day to study more often.

Deploying technology
We have performed two formative studies with our target population: an interview study and a four-day deployment for usability issues. In interviews with hearing parents of deaf children, parents provided feedback about what was important to them in a phone. Two mothers were most interested in the devices with front-facing cameras. One mother said that since her son is getting older (he's eight now), he will start going out alone to play with friends. If she wants to be able to communicate with him, sign language would be the most convenient. The existence of tools like FaceTime make the iPhone desirable. Phones also serve an added bonus as entertainment for their children while waiting. A parent described how doctors' offices do not usually activate captioning on their TV. She liked being able to give her phone to her child to play games as entertainment. Parents are also excited about potential educational opportunities for their child that can

be provided by smartphones. One mother said her home provider has been encouraging her to purchase an iPhone for this reason.

The difficulty with designing a learning tool for parents is how broad should we reach and how quickly. Current phone ownership is far from standardized. Four out of eleven parents reported owning a smartphone. Two parents owned iPhones, one parent owned an Android device, and one parent owned an older Palm device but was intending to buy a new Android phone in the near future. Some mothers reported that their husbands owned smartphones, but they had to make decisions based on finances as to who in the family had smartphones and who had "dumb" phones. Data plans were also not common. Only half of the families already possessed data plans.

Developers have to make a decision on the trade-offs between developing for multiple platforms for widest access to potential users or developing for a single platform for better experimental control. We are attempting to find a middle path with SMARTSign. Our initial development and deployment is taking place on the Android platform. We will provide the same type of phone as well as a data plan to all participants so that everyone will have access to a full implementation of the application. This will allow us to validate the tools we have created. Once the tool has been validated, we can then focus on a broader deployment of the system for greater impact.

Conclusion

In this paper we have explored what it means to create a mobile informal learning tool for hearing parents of deaf children attempting to learn sign language. We described the application and outlined a study which will investigate how using this application will impact parents' ability to learn vocabulary.

The final contribution of this paper is a reflection on the how device platform decisions may impact the developmental cycle and the evaluation of mobile applications. In the case of SMARTSign we strive first for experimental validity and will then expand development to provide wider access to the target population.

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