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Contribution Statement:
Zachary Chun: 25% contributed to write-up and project ideas
Emily Leland: 25% contributed to write-up and project ideas
Kha Nguyen: 25% contributed to write-up and project ideas
Saralyn Santos: 25% contributed to write-up and project ideas

NOTE: this is an initial submission - after talking to Ashish and Nigini in quiz section today, we found we needed to do more revision of our solution to the problem.   However, due to time constraints and coordination we have not been able yet to meet to confidently decide on a solution going forward. This submission is representative of the submission we would have turned in otherwise with some minor tweaks to try and hint at our future ideas.

1. Found in Translation

2. Team Members and Roles

Zachary Chun research participant recruiter, idea reviewer
Emily Leland note taker for interviews, assignment writer, ideas contributor
Kha Nguyen ideas contributor, assignment writer
Saralyn Santos: sketch and storyboard creator, assignment writer, idea contributor

3. Problem and Solution Overview

One problem common within immigrant families is the problem of a language barrier. Parents who come to the United States without a strong understanding of English, or any understanding of English at all, are often forced to rely on their children to translate between English and their native language. The children, who generally grow up in the United States, have a higher proficiency in English than their parents. However, as a result of growing up in the United States, they may lose some proficiency in their parents' native language, or may never learn it at all. This results in a language barrier not only between parents and English speakers outside the family, but also between parents and their own children. Our proposed solution to this problem is a combination of a smart home speaker and a tablet application. We chose this design because it requires minimal technological aptitude. As a result, it can be used by multiple generations, which is necessary since we want to serve both parents and children. Additionally, it centers the interactions around the home, where the users can both discuss personal matters and

practice language skills privately without fear of judgement. Since we aimed to help resolve conflicts between parents and children of immigrant families, the information going through our system is more private, so we thought this venue the most appropriate. Since communication is most effectively achieved when all parties involved are a part of or witness to the resolution of any miscommunications, it seemed better to have a design that encouraged group interaction.

4. Design Research Goals, Stakeholders, and Participants

The main design research method we used was interviews. Although we were considering putting out a survey as well, we ultimately chose to interview our participants because we wanted to be able to follow up immediately on responses that we found interesting or different.

Going into our research, we aimed to solve the problem of a language barrier between immigrant parents and school administration. However, as we continued to interview our participants, we found that the language barrier between parents and administration could easily be solved with the help of an interpreter. The bigger problem our participants faced was

The participants in our research were mainly UW students who had experienced the problem of a language barrier between themselves and their parents, or between their parents and English speakers outside of their families. They were mainly second-generation immigrants, meaning that they were born in the United States, but their parents were not. We realize that the results of this research may be biased because we only interviewed university students. Although we attempted to find other interviewees through reaching out to local schools and contacts, we were ultimately unsuccessful.

The ideal design methods we would consider are surveys, interviews, and contextual inquiry. By interviewing immigrant families, we can confirm our design problems and focuses. Talking to different households can enhance the varieties of experiences and perspectives we encounter.

The interviews will allow us to have more of a conversation with each of our stakeholders, and to develop good questions for the survey. Additionally, we can get more depth on emotional issues, which are hard to learn about in a survey.

Participant 1:
Participant 1 is a Computer Science student at UW. Her parents are both originally from Beijing, China. They moved to Canada in the early 1990's, and then to America years later. Her father got a job at Boeing, for which he learned a lot of English and became fluent. However, her mother continued to speak only limited English, and neither parent was very comfortable in a school setting communicating with her teachers during conferences. She has an older brother,

who helped her with English homework that her parents couldn't help her with. Her parents were always involved in her education and helped her with other homework, like math. She remembers being embarrassed by their limited English skills and said she generally tried to keep her parents out of social situations that would require them to speak English to her teachers. She never had to translate much, because of her father's skill. For documents she used Google Translate. In spoken conversations, she often simply translated small phrases that were idiomatic and beyond her father's comprehension.

Participant 2:

Participant 2 is a Computer Science student at UW. His parents were both originally from Vietnam. After the Vietnamese Reunification Day in 1975, his dad immigrated to the United States while his mom went to Germany. In their 20s, his dad sponsored his mom here. The participant is a second generation American. His parents currently have limited English skills and depend on him to resolve problems that involve American English. In order to understand documents and paperwork, his parents use dictionaries or Google Translate to convert words from English to Vietnamese. Recently, his dad had heart surgery, and the doctor could not communicate with the participant's parents, so he desperately looked at the participant for help. With limited translation skill, the participant could not help much. His parents later decided to hire an interpreter. The participant has always felt awkward for being an intermediary since he was a child. He had to be involved in adult-related things that he did not want to engage in, such as spending hours to resolve a problem for his dad on the phone. It was difficult to speak both languages back and forth during a school conference. Language barriers stopped his parents from helping the participant with any further decisions and problems. He answered every phone call from school to his parents himself. For that reason, he felt forgotten in the family. However, he understands and treasures his relationship with his parents.

Participant 3:

Participant 3 is a student at UW. His parents were originally from China. Neither of them has developed fluent or comfortable English to this day. He has given up trying to converse with them in English, and simply uses Mandarin. This causes some problems, as he feels his Mandarin isn't good enough, and that occasionally things get lost in translation. This makes arguments difficult, as an original disagreement can be exacerbated by a miscommunication. He never had difficulty at school, because his school provided adult interpreters for parent teacher conferences, so his parents' English ability was never an issue for him. He also recalls occasionally using Google Translate for translating written documents, like tax forms and insurance papers.

5. Design Research Results and Themes

In our design research we found that our interviewees had very few problems translating written documents, and their needs were mostly met by google translate. Instead, when we asked about translation they focused on verbal translation. We were originally focusing on school related translation, but found in that it wasn't a huge problem. In one case a parent was fluent enough to interface with the school, and in another the school provided interpreters for parent teacher conferences and the like. We concluded that the solution for this problem was really just having an interpreter present, whether technological or human.

But there were some problems mentioned that seemed more interesting to try to solve. The interviewees had all needed to translate for their parents at some point, and expressed feeling embarrassment in the moment that this was necessary. Another common experience was parent reluctance to use and practice English because of embarrassment about a lack of fluency. Reciprocally, families tended to use the parents' native language at home, but it was also common for the first generation children to lack native speaker level fluency in that language. On one end of this extreme one interviewee's sister spoke solely in English to her parents, despite the parents only speaking Mandarin back. Generally interviewees expressed some frustration with this situation, as it made communicating with their parents in tense situations hard, since neither party had much patience for resolving miscommunications. Additionally, the language barrier made our interviewees feel somewhat distant from their family in some cases. For that reason, we want to pursue our project topic as solving miscommunication between parents and children to find a solution to family-related issues due to language barriers.

Themes:
Bringing parents and children into an arguable conversation
The current issue of immigrant families is children gradually feel separated from their parents due to language barriers. The first step of this project is to create spaces and times for them to metacognitive think about all reasons by going through specific topics. Being able to address all family-related issues gives them chances to open up their minds to express difficulties and disagreements in life. Arguments from an immigrant family where both parties were born and raised in two completely different societies with different culture are able to resolve. Thus, this can be a bridge for both parents and children to understand each other.
Enhancing a short-term expression proficiency during a conversation
Our interviewees mentioned that there is always an awkward moment where their partner cannot reach up with the conversation due to lacking word choices and vocabularies. The method being used right now is to pause the conversation and look up words from Google Translate or dictionaries. Unfortunately, this increases an expressing latency during a conversation and causes a distraction. For that reason, the use of an advanced technology to remain listening during the

whole conversation and immediately suggest any necessary word if stumbling is detected would be so helpful to improve the conversation quality.Thus, this addresses a short-term expression proficiency.

Enhancing a long-term comprehension and expression proficiency

Human memory is limited. Therefore, suggested words are easily forgotten by users. Moreover, our interviewees mentioned that their parents have difficulties in learning new vocabularies. Having only a few misunderstandings between parents and children is an ideal conversation. We can approach that problem by letting them review and leave their opinions on all mistakes. Being able to look at those more than twice, new vocabularies in each context will remain in their mind longer. This can increase their reaction to those words and performance to produce a word significantly in future conversations.

6. Task Analysis Questions:
1. Who is going to use the design?
   - Families with immigrant parents who have internal miscommunication because of a language barrier - in particular, parents with low to basic English proficiency whose children have low to basic proficiency in the native parent language.
2. What tasks do they now perform?
   - Conversations involving both parent in child, though shorter and not always clearly concluded
   - Destress / talk to friends that they can use native language with instead of each other
   - Translate words / sentences for each other (in public and in private)
   - Look up definitions / words on google translate to continue through conversation / communication

   All of these tasks are slightly indirect or not ideal to accomplish the goal of each task, and so these are tasks we hope to support and provide alternatives for through our design.

3. What tasks are desired?
   - Easy language practicing with everyday language relevance
   - More fluid (and well communicated) arguments with parents in a multi-language conversation
4. How are the tasks learned?
   - Experience since toddler ages will expose them to speaking the parents native language at home as well as English in other public contexts like school
   - Google Translate, dictionaries, family friends, neighbors are all current sources to help family members communicate more effectively or talk about family problems
5. Where are the tasks performed?
   - The tasks are to be performed at home. Anywhere where the family can sit down and have a conversation with each other is where these tasks can take place.
6. What is the relationship between the person and data?
   - The data in this case is the content of the conversation between parent and child - personal information about feelings and topics at home.
   - There is also metadata such as information about the conversation - noise levels of the conversation, length of conversation, comparisons of how long each person speaks, etc. These all can be useful information for reflection and to know for future discussions.
7. What other tools does the person have?
   - Modern technologies like Google Translate and dictionaries on the internet are commonly used for quick translations.
   - Sometimes younger children or parents will rely on the oldest child.
   - Other modern technologies exist to help individuals learn a language both for speaking and listening comprehension.
8. How do people communicate with each other?
   - Conversations between parents and children take place in person both in public and private. Depending on the fluency of the two parties, these types of conversations might

include the use of Google Translate or some other online translation or just gaps in communication.

9. How often are the tasks performed?
    - It's expected the tasks of conversation will take place everyday. The translating / destressing to another source will vary based on the language and communication skills of the family as a whole.

10. What are the time constraints on the tasks?
    - For a direct in-person conversation the task requires immediate attention and there is a total limited time, so it is time constrained in more way than one. As the translation takes longer amounts of time, the conversation becomes less effective and more awkward.

11. What happens when things go wrong?
    - Most often, important things get lost in translation. This can result in parents or children acting on incomplete or incorrect information. And miscommunications may result in further family emotional tension and reluctance to communicate going forward or attempts to mediate an argument.

## 7. Proposed Design Sketches - "3x4"

Smart Home Speaker

This first design targets people with lower technological skill, and acts more as an interpreter. It is focused on verbal communication and human connection. It is mobile, so that it can be taken anywhere a person might want a translator by their side to help mediate a conversation. The speaker will be focused on guiding a specific discussion on a topic chosen by the user. This can address conversations such as house chores, educational problems, etc. It also can help with language acquisition and comfort by suggesting words when a user is struggling and rephrasing sentences so that users can get a sense of what native speakers would say. It will do this at explicit prompting from a user, but learn to interject over time with machine learning. It also helps with specific vocabulary. The fact that it is a verbal interface lends to increasing communication about said vocabulary. It makes the creation of vocabulary lists something to do together with both invested parties (the teacher and the student) and makes practicing more personal as encouragement can be in the mentor's voice.
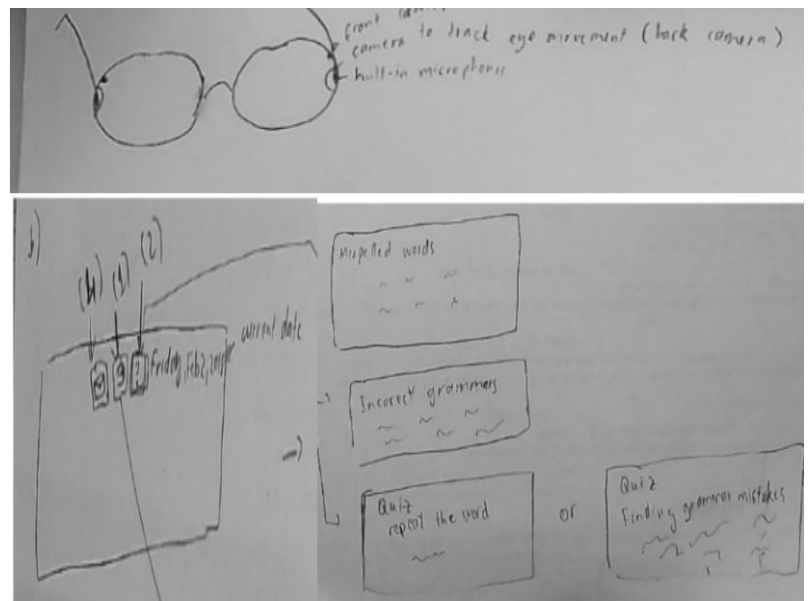

Design 1. Smart home speaker
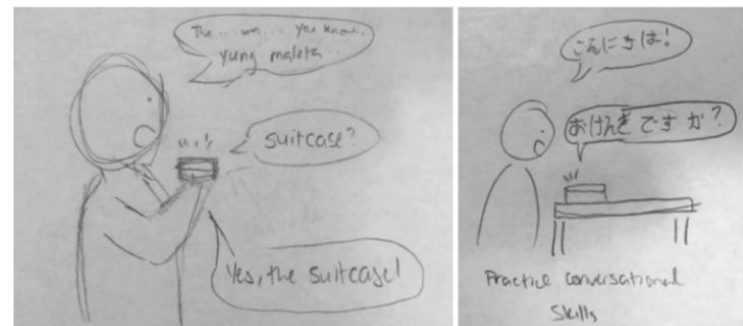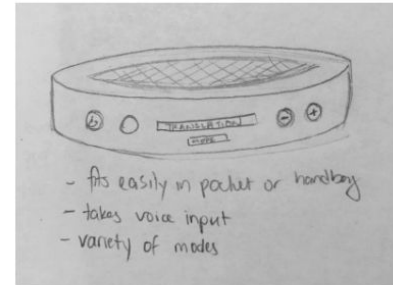
Mobile App

"The second design also focuses on language acquisition in the form of a mobile app. Since most people generally have their phones with them at all times, this app is convenient in that it can help develop language skills in a variety of environments (time and place), not just the home. You can always opt in and feel connected with a long term goal of becoming more fluent at a language when the technology is almost always with you. Like design 3, this design allows for some subtle support in the form of text translation rather than verbal, meaning that it can be used unobtrusively in social settings." - this is our previous vision for the mobile app. Another more task focused idea for the mobile app is more
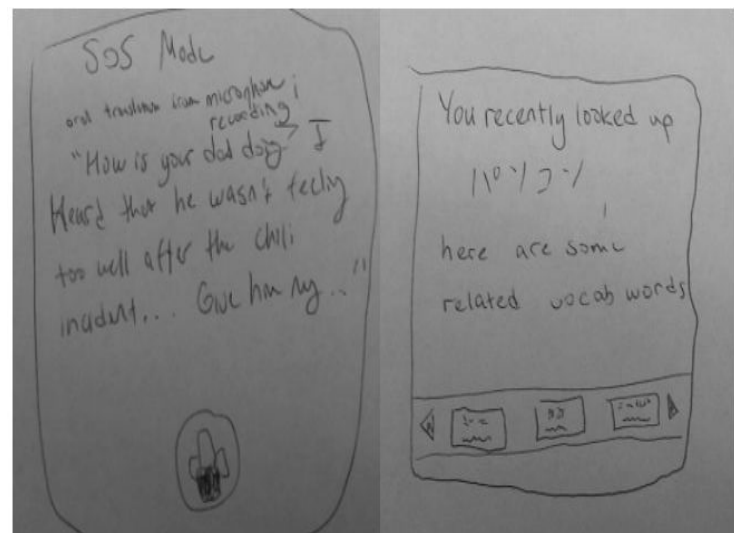
game focused. We can gamify tracking progress of language development with rewards and leaderboards, and provide visual alternative to solely audio data / interaction like with the speaker.

Smart glasses

This design is more focused on a person who wants to improve their communication abilities on individual terms. The text based interface, unlike the vocal one of design 1, allows for a person out and about to conceal their need for translation, and perhaps act more naturally in unfamiliar situations. This allows for children and parents alike, when needing to use their second language, to avoid embarrassment and the need for the other party to intervene and translate for them. To do this the glasses can display suggested vocabulary words if it detects confusion or hesitation in the wearer's expression, and can display contextual news or cultural summations when triggered by keywords in the conversation it is listening to and a query by the user. It can also track vocabulary during everyday conversations that caused confusion and it thinks are likely to be unknown. Then family members can have a conversation with each other and use challenging vocabulary to collaboratively build up their vocabularies, all while knowing the other person has the tools to understand and practice with the words. It can help in the case of arguments exacerbated by miscommunications due to language barriers by allowing for each person in the argument to say their piece in the language that they are most comfortable in and then sending a text transcription. This allows both parties distance from the miscommunication and argument to read over the other person's well articulated thoughts.

Selected Design
Smart Home Speaker & Mobile App
We chose to design a combination of an application for a tablet and a smart home speaker. The selected design requires minimal technological aptitude so can be used by multiple generations, which is necessary since we want to serve both parents and children. Additionally, it centers the interactions around the home, where the users can both discuss personal matters, and practice

language skills privately without fear of judgement. Since we aimed to helps resolve conflicts between parents and children of immigrant families, the information going through our system is more private, so we thought this venue the most appropriate. For our selected design, we want to pursue the following tasks: The smart home speaker mediates a miscommunication between parents and children due to language barrier in specific guided questions while adding in small tidbits after detecting pauses, noise levels, or explicit prompting. The tablet allows users to self-practice conversational language.

8. Written Scenarios - "1x2"

Mediate an argument between children and parents when there are small miscommunications due to a language barrier

"The storyboard below described a scenario where a smart home speaker resolves the communication issue between parents and children by engaging them in a topic, suggesting missing words, and increasing children and parents' fluency during a conversation. At the beginning of the scenario, users start a conversation that might later cause a conflict suggested by a home bot. During the conversation, a bot detects stumble, analyzes the context, and suggests suitable words. From there, the user can decide which word is the best match to use and continue the conversation. When the user struggles with understanding a whole sentence, the user requests the bot to translate the whole conversation in their native language. " - original scenario

What this has morphed into after some discussion with the TAs is a more specific structure. This speaker won't do as much analyzing context and providing full translations as much as mediating discussion with basic (programmed) common sense and when explicitly prompted. The scenario is fairly similar otherwise, but imagine that a speaker stops to think, unsure of a word. If at a loss for the word or how to rephrase, the person speaker can explicitly prompt the speaker device to suggest words in both languages that are synonyms. And after the users can decide whether that translation seemed appropriate or if they are both on the same page .

Practice conversational language as an individual

After the conversation, users reflect on the whole conversation by reviewing a conversation transcript on the tablet, pointing out any unknown word or sentence, then practicing their comprehension and speaking skills. In the process of effective learning, self-evaluation is the most important thing. For that reason, user reflects the conversation by reading a conversation transcript given by the bot after the talk. When they find any vocabulary difficult to understand, they ask the bot to explain to them and take note right onto the tablet. Sometimes, there are complicated sentences that bring confusion to users. The bot is responsible to translate the whole sentence to the user per request. Furthermore, the review process is not just about improving comprehension skill but also increasing speaking skill that might help the user to gain confidence

during any further conversation. The bot fixes any pronunciation problem as well as sentence production from the user.

9. Storyboards of the Selected Design

Task 1. Mediating conversation between child fluent in English and parent fluent in native language

Task 2. Practicing conversational language skills on one's own