CSE 481

Group Assignment 2: Problem Scoping, Needs Assessment and Technical Specifications

* **Identify all the individual tasks the end product might address**
  + Create a board.
  + Edit a board.
  + Teach the user English language constructs / Encourage the user to create grammatically correct sentences. / Language acquisition.
    - Subject verb predicate
  + More quickly access words / reduce selection time between words.
* **Begin by making each task a goal (you will prioritize later)**
  + Significantly reduce the time necessary to create and edit boards (30min to a couple, for example).
  + Allow for an avenue to more naturally access words while also maintaining a portion of the board that is static so users can learn word layout.
  + Allow for the creation of templates that prescribe a certain sequence of selections to teach English grammar and aid language acquisition.
* **What is/are the high-level activity(ies)?**
  + Communication by the user.
  + Set up by care team (parents, therapists, friends, etc) to facilitate communication by the user.
* **What steps are involved in doing that activity? (decompose activity hierarchically into sub-tasks)**
  + Care team sets up device and initial boards.
    - Inexperienced User:
      * Uses a more streamlined wizard interface to create a board from scratch
      * Or edit an existing one
      * (Save output as a csv or an obf that could be used later).
    - Experienced User:
      * Creates spreadsheet with information, or adapts one from an existing spreadsheet?
      * Import spreadsheet into CoughDrop
      * Another layer of editing if need be?
  + Care team adds a new section/board of vocabulary.
  + Care team edits existing boards.
    - They might want to search all existing boards to see if a word is already on the device somewhere.
  + User becomes familiar with the device and communicates with it in day to day life.
    - User accesses specific boards.
    - User forms an English sentence.
    - User needs to speak quickly and with ease so as not to get disillusioned or bored with the device.
* **What needs to be done by the user?**
  + User accesses specific boards.
  + User forms an English sentence.
  + Describe basic needs, perhaps with urgency
  + Communicate socially, in a discussion or a group setting in class, for example.
  + Give consent or refuse requests.
  + State preferences for activities.
* **what needs to be done by the technology?**
  + Device not get in the user’s way when the user tries to speak quickly.
  + Device needs to encourage grammatical correctness through its structure and available actions/selections to the user.
  + Device needs to support memorization or learning of how to access words and boards for long term user proficiency.
  + Device needs to facilitate as best as possible natural language communication, thought and acquisition.
* **What needs to be done by anyone else (support, caretaker, etc)? Who else is involved in the task?**
  + Care team needs to create new boards of vocabulary.
  + Teach user how to use device (and therefore understand it themselves)
* **Any preconditions? dependencies? background knowledge?** 
  + Hardware exists that supports other user needs, such as:
    - Eye tracking
    - Portability and usability when in different environments, traveling, etc.
  + Depends on CoughDrop and access to the web or a tablet or some other AAC device
  + For best results, a knowledge of language structure and/or learning
    - Unless use a default set of rules?
    - Words or phrases that fit a certain category. Ways to say good bye. Could define a sequence of things. Sequence of word categories. Word categories would be machine learned on...
* **What must happen or be done first to make it possible? set up?**
  + User needs boards added to their device
  + User must learn how to use the device itself as well as devices like eyeGaze to access the primary device
* **In what environment is the task performed? (where? what kind? noisy, dirty, dangerous, crowded)**
  + Home - familiar to user
  + School - could be noisy and crowded
  + Workplace - noisy, possibly crowded, may need quicker response time for creating a board
  + Outside locations or in parks, during leisure activities
    - Ie visiting a location, like a National Park, and realize don’t have a way for user to talk about Statue of Liberty. Create a board quickly, send it to the device, allow user to talk.
  + Generally everywhere - very possibly noisy and crowded
* **How often is the task performed?**
  + Ideally whenever the user wants to communicate, so many times a day
* **What are its time or resource constraints?**
  + Time with speech therapists is limited by appointment
  + Parents are often busy with other aspects of care
  + Users might not use devices because it fails to communicate quickly enough for them to be a part of a conversation
* **What can go wrong? – exceptions, errors, emergencies**
  + Accidental input can generate unwanted speech output and decreases other’s confidence that the user means what they say
    - When communicating with people with special needs, the number one rule is “presume competence.”
    - At the same time, for those who do have involuntary movements, AAC technology must work to minimize mistakes so that competence shines through
  + In case of emergency, user pain, or need of immediate communication to ask for something or refuse an action if it is causing pain or against a user’s wishes, device may be too complicated/slow to accommodate needed communication. Words may be too many levels from the top root board.
  + When the user is in pain, it may be more difficult to use eye tracking, etc.
  + User may prefer everything static rather than dynamic so that they can learn the layout of the device
  + User can get bored or frustrated and stop engaging with the device.
* **Define your likely general requirements: user interface, size, weight, material, battery life, color, speed, temperature, air pressure, water, chemical, maintenance, product life, etc.**
  + Low barrier to entry for creating boards. We don’t want to place hurdles between the care team and extending the user’s vocabulary.
  + User interface to create boards that is easy to use for both speech therapists who have a lot of familiarity with AAC tech and language organization, as well as parents who may not have much experience
  + Large enough buttons or grids on device to accommodate user’s eyesight or motor function for manual selection
  + Ease for disabling/enabling different functionalities (like sequencing)
  + Easy to customize.
  + Easy to allow for creation and editing.
  + And possible to handle set up / creation / editing in many different environments.
  + Hardware requirements (not central to our project):
    - Lighter weight to allow portability
    - Easy mounting on wheelchairs
    - Long battery life to allow for long term use including in transit and away from the home.
    - Fast processing and user interface to allow fast communication.
    - Would be great if it were waterproof and not easy to break.
    - Easy to maintain.

**For each large goal and subtask you described, think of a technical specification of the final built system that will be the response to that goal/subtask. There may be several technical specifications for a certain goal. For example, in the nursing documentation project, the goal would be "The user shall be able to log an event in the system and have it time stamped" and the technical specifications related to that goal would be "the system will allow user to select buttons describing the event s/he is logging and save it along with a time stamp in a database" and "the system will allow user to use speech-to-text to describe an event s/he is logging and store the text in the database along with a time stamp"- both will accomplish the goal but in different ways.**

* User accesses specific boards.

**High level goals**

*Subtasks*

1. **Significantly reduce the time necessary to create and edit boards (30min to a couple, for example).**
   * *Care team sets up device and initial boards.*
     + Pre-existing collection of templates allowing rapid customization through our board creation/editing interface
   * *Care team adds a new section/board of vocabulary.*
     + Create a new UI that uses a more streamlined wizard interface to create a board from scratch.
     + Create a separate UI and system outside of CoughDrop for making new boards, and export into csv or obf, and import back into CoughDrop
     + Allowing user to import spreadsheet and automatically generate boards
   * *Care team edits existing boards.*
     + Care team needs to share access to boards (through CoughDrop account?)
       - Allow for selection of existing board form a shared repository and editing in a graphical user interface (GUI)
     + Allow for import of an existing board from obf or csv or some other file type?
2. **Allow for an avenue to more naturally access words while also maintaining a portion of the board that is static so users can learn word layout.**
   * *Care team selects whether to enable autocomplete as a feature.*
     + Includes a toggle in the creation dialog for this option.
   * *Care team selects to use default settings based on age*
     + Corpus of documents/books for specific age group input into machine learning algorithm (if deemed necessary)?
   * *Care team specifies prediction file.*
     + Import settings or create settings in a wizard?
   * *Care team finishes set up and program learns with experience to create better prediction.*
     + Maybe an RNN (recurrent neural network)
     + Or base predictions on nearby words
     + Tradeoff of speed versus accuracy.
     + Machine Learning on past user input in a specialized dynamic space
   * *User speaks quickly with autocomplete (user selects buttons from dynamic board space).*
     + Allotment of a row or a section of the board for autocomplete / dynamic material.
     + Updating of that quickly based on machine learning algorithms and current user input.
3. **Allow for the creation of templates that prescribe a certain sequence of selections to teach English grammar and aid language acquisition.**
   * *Care team selects whether sequencing should be enabled, based on user’s ability (cognitive and/or physical and motor ability).*
     + Includes a toggle in the creation dialog for this option.
   * *Care team builds hierarchy of categories and sequences into the template*
     + Allows for customized by care team
     + Can be customized to focus on grammar rules for English, or something else like the sequence of a knock knock joke.
     + In user interface, must include a way to define groupings and categorize certain words/phrases as part of those groups
     + In user interface, must include a way to organize categories into a sequence
   * *User forms an English sentence.*
     + Device must disable or grey out sections of the board that are not next in the sequence
     + Device must enable the next section in the sequence and allow user to gaze there.
     + Perhaps device should have some sort of notice to user saying why they cannot select something from the disabled section if they are trying to? (Eye gaze and dwelling on a disabled section).