








# Table of Contents

|                             |    |
|-----------------------------|----|
| Executive Summary.....      | 2  |
| Motivation .....            | 3  |
| Design Considerations.....  | 4  |
| Initial Implementation..... | 5  |
| Usability Tests .....       | 6  |
| Final Implementation .....  | 8  |
| Appendix .....              | 13 |



# Executive Summary

Children of various ages all over the United States participate in spelling bees competitively. For nearly 90 years, students have competed in the Scripps National Spelling Bee, an annual spelling bee that attracts students who seek to improve their spelling and increase their vocabularies. To be successful in this pursuit, students must study spelling and words for extended periods of time. Bee A Speller provides an interactive game for **word-hungry students** to enhance their spelling without the need for another person to quiz them.

**Bee A Speller** is a single player game that utilizes an interactive voice response. To play this game, the player will call Bee A Speller

number and directs the game via voice commands. The layout is modeled after the setup of typical spelling bees in which competitors can ask for the word's definition, language of origin, use in the a sentence and part of speech. The **natural flow** of the game replicates the experience a real spelling bee in a low stress and fun environment.

Initial testing revealed that the system is logical and easy to use. Although there are innate problems within the speech system that Bee A Speller is hosted on, the system can be a useful tool for aspiring spellers.



# Motivation

A study at the University of Pennsylvania showed that the key to success in competitive bees is daily **independent solo study** of vocabulary for extended periods of time. However, students rated solo study as the least enjoyable and the most effortful in the same study. Students prefer to study with someone else, usually a parent. As more and more parents enter the workforce and work longer hours, it becomes nearly impossible for parents to help their children

study for spelling bees as long as their children will need. **Bee A Speller** provides a **virtual study buddy**, a fun and easy solution for students to practice on their own.

The majority of our team has competed in spelling bees in the past. Based on our past experiences including our successes and failures while competing, we want to improve the experience of the future generations of spellers by utilizing current speech system and interactive voice control technology.

All spelling bee competitions are defined by the **voice interaction** of the competitor and the moderator. An interactive voice response system is suitable for this game because it replicates the experience of spelling bee competitors.



# Design Considerations



In designing a spelling game, we considered how to best convey the game to our target audience. Since our target audience is elementary and middle school students preparing for the spelling bee, we found it natural to emulate the **spelling bee experience** with modifications to be more **practice friendly**. In addition, our target audience is young and therefore influenced our brand to be more family friendly.

In a spelling bee, when a word is given to the speller, the speller can ask for more information about the word. Therefore, we included a way for users to get the definition, language of origin, use in a sentence, and part of speech of words they are asked to spell. Users are also limited to one spelling guess in a


spelling bee, but we decided to include **multiple guesses** so users can get more practice per word. Also, spellers in a spelling bee have different spelling abilities, and we accommodate for that in our game by including **levels of difficulty** so that users can practice where their abilities lie. In general, we wanted the system to simulate real spelling bees, but be practice-friendly as well (*See Appendix Figure 1: Brainstorming K-Script and Figure 2: Brainstorming Flow Chart*).

To make our brand more **family friendly**, we first debated on the name of our game. We decided on "**Bee a Speller**" to demonstrate what our game hopes to accomplish. We also decided on a bee for our mascot, which can be seen on any of our documents. The font we chose came after deliberation on what looks the most family friendly, deviating from the more professional fonts to establish our brand (*See Appendix Table 4: Creating our Family-Friendly Brand*).



# *Initial Implementations*





Our game relies on an **interactive voice response system** to interface with the user. The user first calls the system, and is welcomed to the game. The system then gives the user a brief overview of all the available voice commands, and prompts them to choose between three difficulty levels: easy, medium and hard. There is a different word list for each difficulty level (*See Appendix Table 2: Lists of all spelling words in the system*).

Afterwards, a word is randomly chosen from the associated word list, and the system prompts the user to spell the word. Here, the user can **ask questions to clarify** what word the system is asking the user to spell; the user can ask for the word's definition, language of origin, use in a sentence, or part of speech. In addition to questions about the word, the

user can also **choose to skip** the word if they do not wish to spell it. If the user does not spell the word correctly, then the system prompts them to try again. After the user incorrectly spells the word three times, the system tells the user the correct spelling. If the user correctly spells the word at any time, the system congratulates the user and gives the user another word to spell.

The game continues until the user wants to end the game, which they can do at any time with a voice command.



# Usability Tests

## Round 1

For our first round of usability testing, we tested four users: one elementary school student and three MIT students. Although our system was designed primarily for students in grade school, we had limited access to this user group for usability testing. Test results provided valuable feedback and revealed aspects of the system that needed improvement.

While 100% of users found the system logical and organized, 0% of users felt the system helped them learn how to spell and 50% of users felt more confident with their spelling after using the system. We dug into each user's interaction with the system to reveal the root causes of users' dissatisfaction with their experience. After uncovering several sources contributing to a suboptimal experience, we took immediate steps to implement changes to the system.

## Round 1 Major Improvements:

- ◆ **New commands:** We incorporated new commands that users wished the system understood, such as an option to restart spelling a word, repeat a word, and more commands to end the game such as "end" and "bye".
- ◆ **Increased timeout:** Many users were interrupted in the middle of spelling a word. We fixed this problem by programming Angel to wait longer for the user's response.
- ◆ **Clearer pronunciation:** Many users had trouble understanding the system's pronunciation of words and letters. We adjusted Angel's voice settings and selected a voice with clearer pronunciations. We also slowed down the correct spellings of words.
- ◆ **Clearer instructions:** Users also said they had trouble remembering the lengthy instructions given quickly at the beginning of the game. We reworded the options to make them more clear and concise.

## Round 2

In the second round of usability testing, we tested three MIT students and one adult. Due to the improvements we made to the system after Round 1, users on average agreed much more strongly that the system helped them learn how to spell. They also agreed more strongly that the flow of the system is logical and organized. Users found the system easier to use and more pleasant to interact with. Based on user feedback, we identified a few final areas for improvement in the final system design.

As a result, users on average agreed much more strongly that the system helped them learn how to spell. They also agreed more strongly that the flow of the system is logical and organized. Users found the system easier to use and more pleasant to interact with. Based on user feedback, we identified a few final areas for improvement in the final system design.

## Round 2 Major Improvements:

- ◆ **Variations of commands:** Angel did not understand variations of commands, such as “Can I have the definition?” instead of solely “Definition”. We improved this by hard coding common variations of commands that the user might say.
- ◆ **Angel Confidence Levels:** The system sometimes told users they had spelled a word incorrectly even when they were correct. We fixed this by editing the confidence level of Angel for each word.
- ◆ **Reminders of Options:** Some users had trouble remembering all of the options during the game. We programmed the system to remind the user of their options every four words.

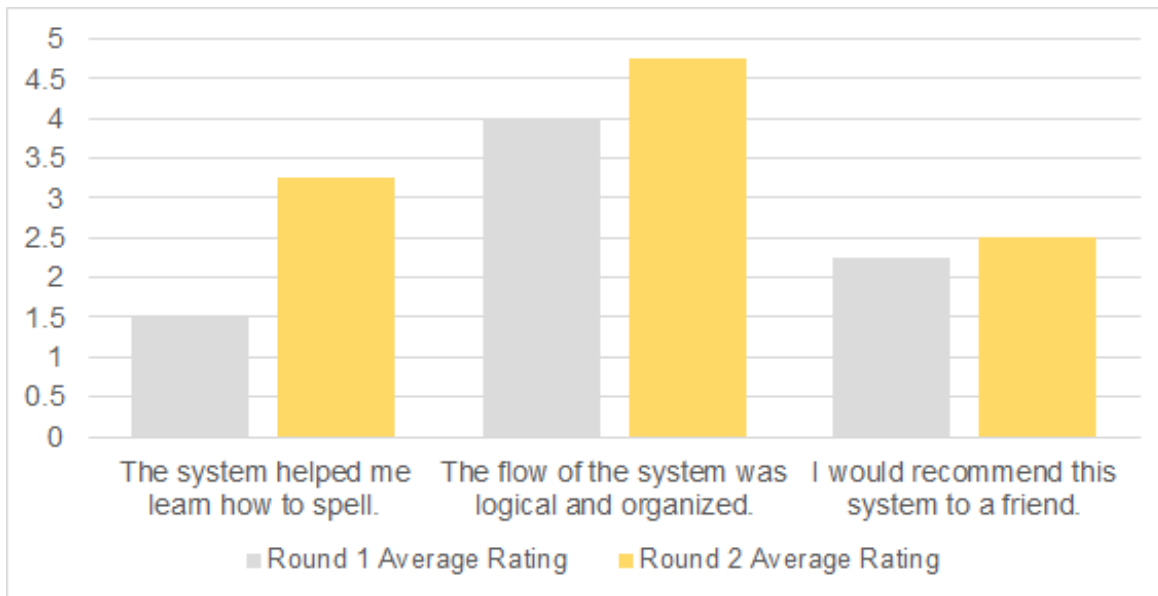
# Usability Tests

## Usability Test Comparison

Following each usability test, users were asked to rate the system in several metrics on a scale of 1 to 5, or “strongly disagree” to “strongly agree”. The complete post-test questionnaire can be found in the appendix (*See Appendix Figure 4: Usability Testing Script, Pre-Test and Post-Test Questionnaires*).

We made several improvements to the system between Rounds 1 and 2 of usability testing, and as a result users ranked the system higher in many areas. Three of the most important metrics were

whether the system helped the user learn how to spell, whether the system flow is logical and organized, and whether the user would recommend the system to a friend. As shown in the following graphic, users on average agreed more strongly with each of these metrics in Round 2 than in Round 1. These results confirmed that the changes we implemented to the system improved the user experience. See *Appendix Table 1: System Evolution for more details on the the full system implementation*.



# Final Implementation

**Figure 1: Final K script**

| Sample Interaction |   |  |
|--------------------|---|--|
| Speaker            | Action  | Notes  |
| User               | < User calls system >   |  |
| Angel              | <p>Hello. Welcome to Bee a Speller! Let's practice spelling together!</p> <p>For each word I ask you to spell, you may ask for the word's definition, language of origin, part of speech, or use in a sentence. You can also say skip, repeat, restart spelling, main menu, or end game. To hear these options again at anytime, say options. Remember to speak loudly and clearly into your microphone. Let's begin!</p> <p>What level of words would you like to practice? Easy, medium, or hard.</p> | <p>Allow user to choose from three levels to accommodate spellers of all levels.</p> <p>Give users a briefing of all the commands they can do in the game, and remind them to speak clearly so the voice recognition system can understand the user's commands.</p> <p>Allow user to skip the instructions by saying "easy", "medium", or "hard", if they already know all the rules/commands available.</p> |
| User               | Medium  |  |
| Angel              | <p>You have selected <u>Medium</u>.</p> <p>Your next word is: government. Please spell <b>government</b>.</p>   |  |
| User               | What's the <u>definition</u> ?  | Competitors are allowed to ask for a word's definition in actual spelling bees.  |
| Angel              | The definition of government is: a political administration. Please spell government.   |  |
| User               | Give me the <u>language of origin</u> .   | Competitors are allowed to ask for a word's language of origin in actual spelling bees.  |
| Angel              | The language of origin of government is: Old French. Please spell government.   |  |

**Figure 1: Final K script continued**

| Sample Interaction |   |  |
|--------------------|---|--|
| Speaker            | Action  | Notes  |
| User               | < User calls system >   |  |
| User               | What's the <u>part of speech</u> ?  | Competitors are allowed to ask for a word's part of speech in actual spelling bees.  |
| Angel              | The part of speech of government is a: Noun. Please spell government.   |  |
| User               | <u>Use the word in a sentence.</u>  | Competitors are allowed to ask for a word to be used in a sentence in actual spelling bees.  |
| Angel              | An example of using the word government in a sentence is: He must keep order, keep the law, that's what the government is there for. Please spell government. |  |
| User               | <u>Repeat the word.</u>   | Competitors are allowed to ask for a word to be said again in actual spelling bees.  |
| Angel              | Your word is: government. Please spell government.  |  |
| User               | <u>Restart spelling please.</u>   | Allow user to restart spelling a word in case they misspelled (not allowed in real spelling bees, but allowed here because this is a practice environment) |
| Angel              | You may restart spelling the word.  | Confirms that Angel has heard the command, and prompts user to restart spelling.   |
| User               | G-O-V-E-R-N-M-E-N-T   | User spells the word correctly.  |
| Angel              | That's correct. Great job!<br>Your next word is: satisfactory. Please spell <b>satisfactory</b> .   | Praise the user for spelling the word correctly, and immediately gives the user another word to spell so as not to waste time.                             |
| User               | Uhhh.. I want to <u>skip</u> this word.   | User doesn't want to spell this word and wants to skip the word (not allowed in real spelling bees, but allowed here for practice purposes)                |



**Figure 1: Final K script continued**

| <b>Sample Interaction</b> |   |  |
|---------------------------|---|--|
| Speaker                   | Action  | Notes  |
| User                      | < User calls system >   |  |
| Angel                     | Your next word is: zucchini. Please spell <b>zucchini</b> .   |  |
| User                      | ...   | User thinks about the spelling of the word and says nothing.   |
| Angel                     | I'm sorry, I didn't hear you. Please spell <b>zucchini</b> .  | Angel re-prompts user to spell the word after getting no input from the user.  |
| User                      | Z-U-K-E-E-N-E-E   | 1st incorrect spelling.  |
| Angel                     | I'm sorry. That is incorrect. Try again. Please spell <b>zucchini</b> .   | Prompt user to retry spelling the word again.  |
| User                      | Z-U-K-I-N-I   | 2nd incorrect spelling.  |
| Angel                     | I'm sorry. That is incorrect. Try again. Please spell <b>zucchini</b> .   | Prompt user to retry spelling the word again.  |
| User                      | Z-U-K-I-D-N-E-Y   | 3rd incorrect spelling.  |
| Angel                     | I'm sorry. That is incorrect. The correct spelling of zucchini is: Z-U-C-C-H-I-N-I.<br><br>Your next word is: recommend. Please spell recommend.  | After user spells the word incorrectly 3 times, Angel gives the correct spelling of the word so that the user knows how to spell it correctly next time. |
| User                      | <u>Options</u>  | User forgot some of the game commands, and wants to hear all the options again.  |
| Angel                     | For each word I ask you to spell, you may ask for the word's definition, language of origin, part of speech, or use in a sentence. You can also say skip, repeat, restart spelling, main menu, or end game. To hear these options again at anytime, say options. Remember to speak loudly and clearly into your microphone. |  |
| User                      | <u>Main Menu</u>  | User wants to try another difficulty level.  |



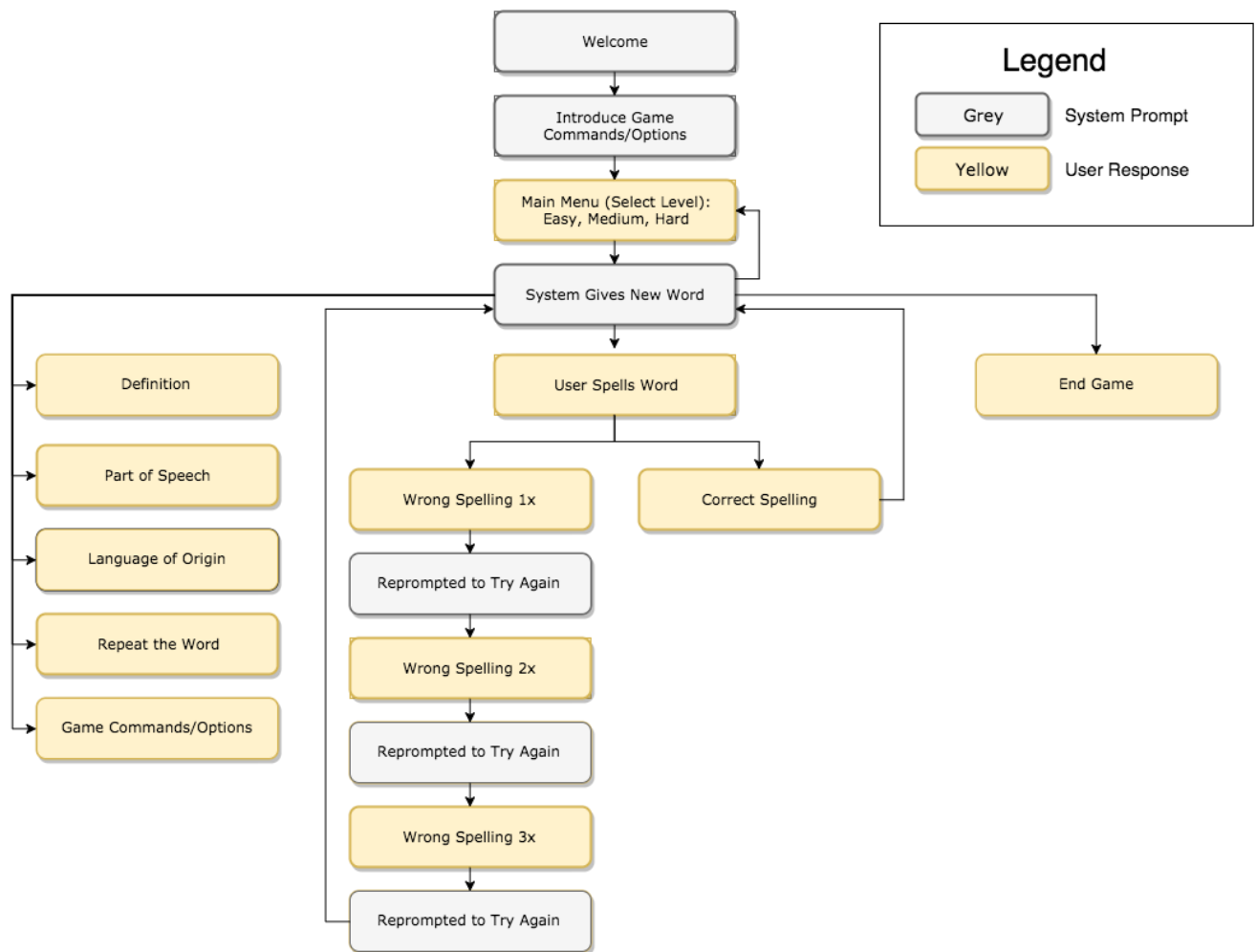
**Figure 1: Final K script continued**

| Sample Interaction |  |  |
|--------------------|--|--|
| Speaker            | Action   | Notes  |
| User               | < User calls system >  |  |
| Angel              | <p>Hello. Welcome to Bee a Speller! Let's practice spelling together.</p> <p>For each word I ask you to spell, you may ask for the word's definition, language of origin, part of speech, or use in a sentence. You can also say skip, repeat, restart spelling, main menu, or end game. To hear these options again at anytime, say options. Remember to speak loudly and clearly into your microphone. Let's begin!</p> <p>What level of words would you like to practice? Easy, medi-</p> | Takes the user back to main menu, and re-prompts user to select another difficulty level.        |
| User               | Easy   |  |
| Angel              | <p>You have selected Easy..</p> <p>Your next word is: uncle. Please spell <b>uncle</b>.</p>  |  |
| User               | U-N-C-L-E  |  |
| Angel              | <p>That's correct. Great job!</p> <p>Your next word is: human. Please spell <b>human</b>.</p>  |  |
| User               | I want to end the game.  |  |
| Angel              | <p>Thank you for using Bee a Speller. Here is your final score. Out of <b>3 words</b> spelled in total, you spelled <b>2 words</b> correctly, and <b>1 word</b> incorrectly, for a final score of <b>66 percent</b> of words spelled correctly. Great job. Let's play again some time. Good bye.</p>   | Give the user their final score so the user can keep track of their progress and spelling level. |



# Final Implementation

## Final User Call Flow



See Appendix Figure 3: Logic Flow Diagram for the complete system logic.



# Appendix

**Figure 1: Brainstorming K-Script**

| <b>Brainstorming K-Script</b> |  |  |
|-------------------------------|--|--|
| <b>Who</b>                    | <b>Observable Action</b>   | <b>Unobservable Actions/Notes</b>  |
| User                          | Alexa, open Spelling Bee Prep.   |  |
| Alexa                         | Welcome to Spelling Bee Prep. Please select a level: "Easy", "Medium", or "Hard".              | Alexa allows the user to select from 3 difficulty level. Alexa selects words from a different list for each difficulty |
| User                          | Hard   |  |
| Alexa                         | You've selected "Hard". To select a word to spell, please choose a number from "1" to "20".    | The user selects a number to randomize the order of words that the user is given.                                      |
| User                          | 1  |  |
| Alexa                         | Your word is "conflagration". To spell the word, say "Spell." For more options, say "Options." | Give user the option to either spell the word, or remind them that they have options/commands they can ask.            |
| User                          | Options  | User wants to know the different commands available.   |

**Figure 1: Brainstorming K-Script Continued**

| <b>Brainstorming K-Script</b> |   |   |
|-------------------------------|---|---|
| Who                           | Observable Action   | Unobservable Actions/Notes  |
| Alexa                         | <p>You may ask for the word's: "Definition," "Language of Origin" or "Part of Speech". You can also choose to "Repeat the word", or "Use the word in a sentence".</p> <p>When you are ready to spell the word, say "Spell." To hear these options again, say "Options". To return to main menu, say "Main Menu"</p> | <p>Remind users of the commands available:</p> <ul style="list-style-type: none"> <li>● Repeat word</li> <li>● Definition</li> <li>● Language of Origin</li> <li>● Parts of Speech</li> </ul> <p>Use in a sentence</p> <p>-----</p> <ul style="list-style-type: none"> <li>● Spell the word</li> <li>● Repeat Options</li> <li>● Return to Level Selection</li> </ul> |
| User                          | Definition  | Competitors are allowed to ask for a word's definition in actual spelling bees.   |
| Alexa                         | The definition of "conflagration" is "an extensive fire that destroys a great deal of land or property." You may ask another question or say "Spell".   |   |
| User                          | Language of origin  | Competitors are allowed to ask for a word's language of origin in actual spelling bees.   |
| Alexa                         | The origin of "conflagration" is Latin. You may ask another question or say "Spell".  |   |

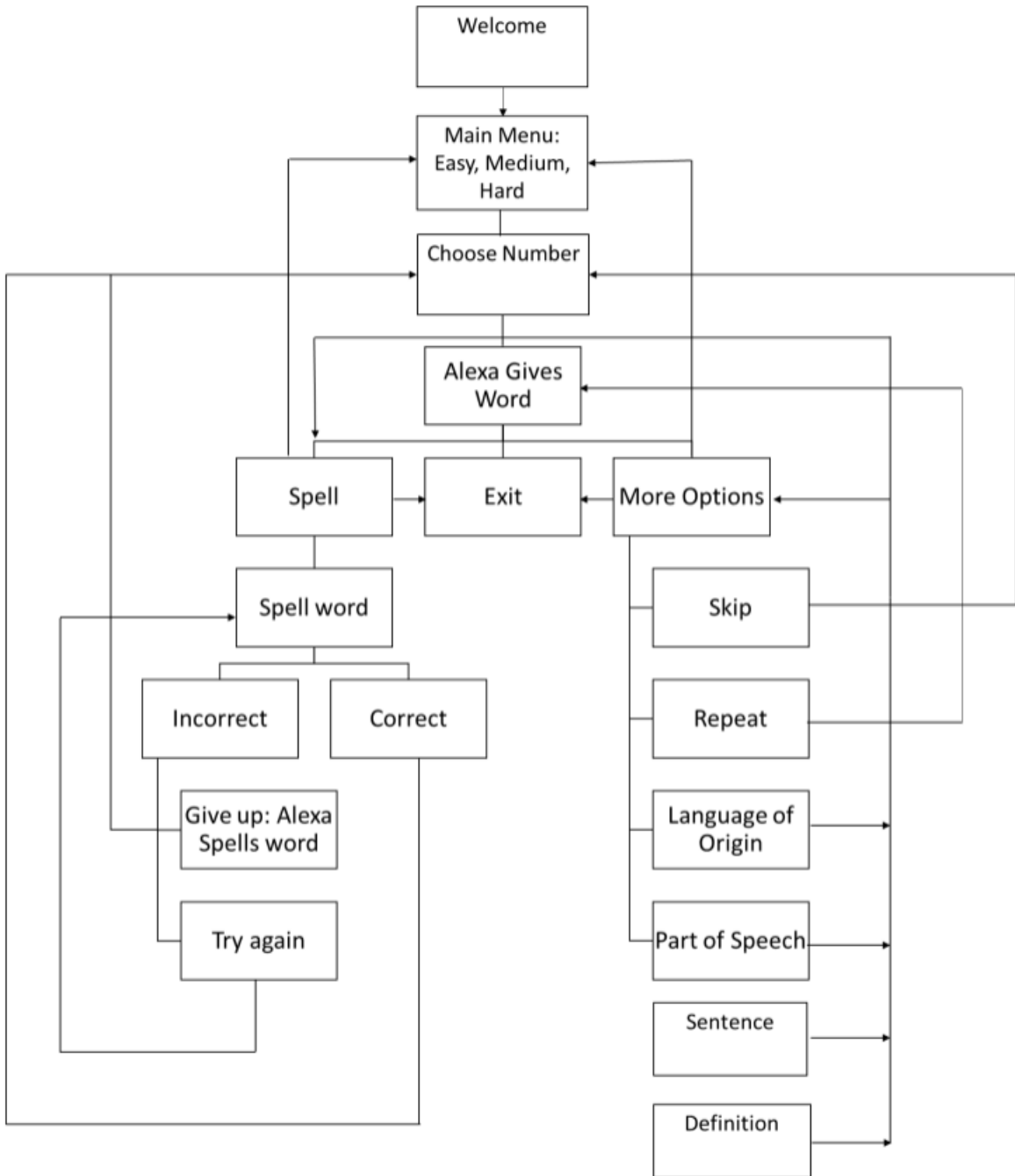
**Figure 1: Brainstorming K-Script Continued**

| <b>Brainstorming K-Script</b> |   |   |
|-------------------------------|---|---|
| <b>Who</b>                    | <b>Observable Action</b>  | <b>Unobservable Actions/Notes</b>   |
| User                          | Parts of Speech   |   |
| Alexa                         | "Conflagration" is a Noun. You may ask another question or say "Spell".                                       | Competitors are allowed to ask for a word's part of speech in actual spelling bees.                 |
| User                          | Can you repeat the word?  | Competitors are allowed to ask for the word to be repeated in actual spelling bees.                 |
| Alexa                         | Your word is "Conflagration". You may ask another question or say "Spell".                                    |   |
| User                          | Uhhh.. Use the word in a sentence.  | Competitors are allowed to ask for the word to be used in a sentence in actual spelling bees.       |
| Alexa                         | "The conflagration spread rapidly through the wooden buildings." You may ask another question or say "Spell". |   |
| User                          | ...   | The user thinks about the spelling of the word, and says nothing.                                   |
| Alexa                         | Your word is "conflagration." You may ask another question or say "Spell".                                    | Alexa gets no input, and re-prompts user to spell the word.   |
| User                          | Spell   | This separates spelling from asking questions. Alexa is now ready to hear the spelling of the word. |
| Alexa                         | Please spell "conflagration."   |   |
| User                          | C-O-N-F-L-A-G-R-A-T-I-O-N   |   |

**Figure 1: Brainstorming K-Script Continued**

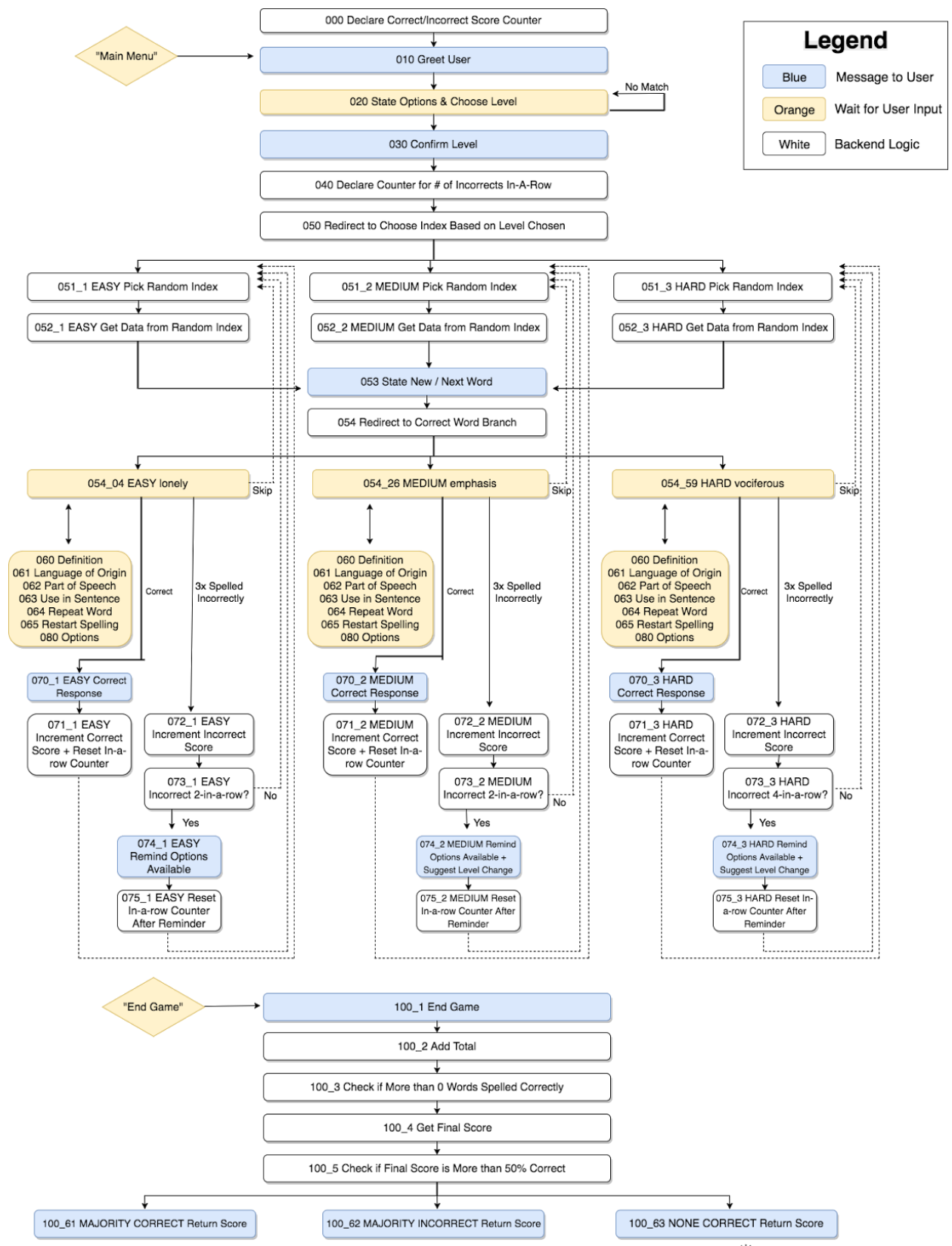
| <b>Brainstorming K-Script</b> |  |  |
|-------------------------------|--|--|
| <b>Who</b>                    | <b>Observable Action</b>                       | <b>Unobservable Actions/Notes</b>  |
| Alexa                         | Very good. To select another word to           | After spelling the word correctly, the                                   |
| User                          | 2  |  |
| Alexa                         | Your word is: "pertinacity." You may           |  |
| User                          | Spell  |  |
| Alexa                         | Please spell "pertinacity."                    |  |
| User                          | P-E-R-T-E-N-A-C-I-T-Y.                         |  |
| Alexa                         | Sorry, that's incorrect. You can either        | If the user spells the word wrong,                                       |
| User                          | I give up.                                     |  |
| Alexa                         | The correct spelling is P-E-R-T-I-N-A-C-I-T-Y. | When user gives up, Alexa spells the word correctly and then prompts the |
| User                          | Main Menu                                      |  |
| Alexa                         | Please select a level: "Easy", "Medium",       | User may return to main menu to se-                                      |
| User                          | Exit   | The user may say "exit" at any time and                                  |
| Alexa                         | Ending Spelling Bee Prep                       |  |

**Figure 2: Brainstorming Flow Chart**





# Figure 3: Logic Flow Diagram



## Figure 4: Usability Testing Script, Pre-Test and Post-Test Questionnaires

### Usability Test Script

Hi, <usability tester name>, I'm <usability testing name>, and today you'll be helping us test the usability of our automated speech system, which is a Spelling Bee Helper. You will be calling a phone number and responding to prompts. Don't worry about anything that happens during this test; the system is still being developed, and so problems that arise are all the system's problems and not yours. Before we begin, I'd like you to fill out this pre-test questionnaire.

*[Give computer to user and have them fill out the pre-test questionnaire]*

*[After user finishes answering questions]*

Thank you very much. We're ready to begin. Your task is to practice spelling three words with the system, in whatever difficulty level you choose. To begin the game, just call the number we've given you in advance and follow the voice prompts. Please keep your phone on speaker when interacting with the system. You may start whenever you're ready. Good luck!

*[Conduct Test]*

Great. Now I'd like you to answer a few post-test questions. Please be honest in your feedback.

*[Give computer to user and have them fill out the post-test questionnaire]*

*[After user finishes answering questions]*

Awesome! We are done with the user testing. Do you have any last questions or suggestions?

< WAIT FOR A LONG TIME >

Thank you so much for your time and feedback!

### Task List

Practice spelling three words with the system, in the difficulty level of the user's choice.

### Pre-test Questionnaire

1. How old are you?
2. Are you currently a student? If so, what grade/year?
3. What major are you? (If applicable)
4. How do you enjoy spending your free time?
5. Have you competed in spelling bees before? If so, how many have you competed in, and when were they?
6. Have you ever interacted with an automated speech system before? For example, Siri, Alexa, or Amazon Echo?
7. Do you own any smart devices? For example, an iPhone, Apple/Android Watches, or iPad?
8. Do you own a phone? What brand/type?
9. Have you used a phone before? Or any other similar systems (ie Skype, Line, WhatsApp, etc.)?
10. On a scale of 1 to 5, how much do you enjoy spelling?
  1. I really dislike spelling.
  2. I dislike spelling.

- 3. neither like nor dislike spelling.
  - 4. I like spelling.
  - 5. I really like spelling.
11. How confident would you rate your spelling ability?
- 1: I am really confident with my spelling skills.
  - 2: I am confident with my spelling skills.
  - 3: I am neither confident nor unconfident with my spelling skills.
  - 4: I am unconfident with my spelling skills.
  - 5: I am really unconfident with my spelling skills.

**Post-test Questionnaire**

- 1. Which level did you select: easy, medium, or hard? Why?
- 2. Are there any features you wish this system had?
- 3. Was there anything you didn't like about the system?
- 4. Was there anything specific that you found hard to use/understand in the system?
- 5. Do you have any suggestions on how to improve this system?

|   | 1: Strongly Disagree | 2: Disagree | 3: Neither Agree nor Disagree | 4: Agree | 5: Strongly Agree |
|---|----------------------|-------------|-------------------------------|----------|-------------------|
| This system helped me learn how to spell.   |                      |             |                               |          |                   |
| This system was simple to use.  |                      |             |                               |          |                   |
| I enjoyed using this system .   |                      |             |                               |          |                   |
| The system worked as expected.  |                      |             |                               |          |                   |
| The flow of the system was logical and organized.                                   |                      |             |                               |          |                   |
| The system was pleasant to interact with.   |                      |             |                               |          |                   |
| The difficulty level of the words matched my expectations for the level I selected. |                      |             |                               |          |                   |
| I would recommend this system to a friend.  |                      |             |                               |          |                   |
| I would use this system again.  |                      |             |                               |          |                   |
| I feel more confident with my spelling skills after using this system.              |                      |             |                               |          |                   |



**Table 1: System Evolution**

| <b>Features Added (UI)</b>   |  |  |
|--|--|--|
| <b>Before Usability Tests</b>  | <b>After Usability Test 1</b>  | <b>After Usability Test 2</b>  |
| Level Selection (Easy/Medium/Hard)   | Level Selection (Easy/Medium/Hard)   | Level Selection (Easy/Medium/Hard)   |
| Randomly Select and Spell Words  | Randomly Select and Spell Words  | Randomly Select and Spell Words  |
| Commands: <ul style="list-style-type: none"> <li>• Repeat Instructions/Options</li> <li>• Definition</li> <li>• Language of Origin</li> <li>• Part of Speech</li> <li>• Use in a Sentence</li> <li>• Skip</li> </ul> | Commands: <ul style="list-style-type: none"> <li>• Repeat Instructions/Options</li> <li>• Definition</li> <li>• Language of Origin</li> <li>• Part of Speech</li> <li>• Use in a Sentence</li> <li>• Skip</li> <li>• Repeat Word</li> <li>• Restart Spelling</li> <li>• Change Difficulty Level / Return to Main Menu</li> </ul> | Commands: <ul style="list-style-type: none"> <li>• Repeat Instructions/Options</li> <li>• Definition</li> <li>• Language of Origin</li> <li>• Part of Speech</li> <li>• Use in a Sentence</li> <li>• Skip</li> <li>• Repeat Word</li> <li>• Restart Spelling</li> <li>• Change Difficulty Level / Return to Main Menu</li> </ul> |
| End Game   | Remind user of available commands, if 4 words in a row are spelled incorrectly   | Remind user of available commands, if 2 words in a row are spelled incorrectly   |
|  | End Game + Get Final Score   | End Game + Get Final Score   |

**Table 1: System Evolution Continued**

| <b>Usability Updates (Backend)</b> |  |  |
|------------------------------------|--|--|
| <b>Before Usability Tests</b>      | <b>After Usability Test 1</b>  | <b>After Usability Test 2</b>  |
| n/a                                | <p><b>Voice Recognition:</b></p> <ul style="list-style-type: none"> <li>Increased system timeout (wait longer for input)</li> <li>Added different variations of commands to end the game</li> </ul> <p>(ie. end, end game, stop)</p> | <p><b>Voice Recognition:</b></p> <ul style="list-style-type: none"> <li>Adjusted confidence level</li> <li>Added different variations of commands to EACH option</li> </ul> <p>(ie. definition, language of origin, part of speech, use in a sentence)</p> |
| n/a                                | <p><b>Instructions/Options:</b></p> <ul style="list-style-type: none"> <li>Shortened length of blurb</li> <li>Explicitly reminded users to speak loudly and clearly into microphone</li> </ul>                                       | n/a  |
| n/a                                | <p><b>Correct Spelling</b></p> <ul style="list-style-type: none"> <li>Slowed down the speed in which Angel repeats the correct spelling of a word back to the user</li> </ul>  | n/a  |

## Table 2: List of All Words in the System

| Easy Words |         |   |                |                    |   |                                 |
|------------|---------|---|----------------|--------------------|---|---------------------------------|
| Index      | Word    | Definition  | Part of Speech | Language of Origin | Example Sentence                            | Phonetic Spelling               |
| 1          | uncle   | the brother of one's father or mother or the husband of one's aunt. | noun           | Latin              | My uncle is visiting tomorrow.              | you, en, see, ell, yee          |
| 2          | little  | small in size or extent   | adjective      | Old English        | I have little hearts on my bracelet.        | ell, i, tea, tea, ell, yee      |
| 3          | human   | a person  | noun           | Latin              | I am a human.                               | aitch, you, em, ei, en          |
| 4          | lonely  | being without company   | adjective      | Middle English     | The cat became lonely without her owner.    | ell, oh, en, yee, ell, why      |
| 5          | pillow  | a support for the head of a reclining person                        | noun           | Latin              | My pillow is soft and fluffy.               | pee, i, ell, ell, oh, doubleyou |
| 6          | lazy    | not energetic or vigorous   | adjective      | German             | I am too lazy to water the garden.          | ell, ei, zee, why               |
| 7          | hungry  | feeling an uneasy sensation from lack of food                       | adjective      | Old English        | I did not eat dinner and am very hungry.    | aitch, you, en, jee, are, why   |
| 8          | selfish | concerned excessively with oneself                                  | adjective      | Old English        | The selfish boy only cared about himself    | es, yee, ell, ef, i, es, aitch  |
| 9          | medal   | a small usually metal object bearing a religious emblem or picture  | noun           | Latin              | The gold medal is for first place.          | em, yee, dee, ei, ell           |
| 10         | cheap   | at minimum expense  | adjective      | Latin              | That radio is really cheap.                 | see, aitch, yee, ei, pee        |
| 11         | lesson  | something learned by study or experience                            | noun           | Latin              | We have one more lesson until summer break. | ell, yee, es, es, oh, en        |
| 12         | bright  | radiating or reflecting light                                       | adjective      | Old English        | The light was too bright for the bedroom    | bee, are, i, jee, aitch, tea    |
| 13         | movie   | motion picture  | noun           | English            | My favorite movie is Finding Nemo.          | em, oh, vee, i, yee             |
| 14         | science | a department of systematized knowledge as an object of study        | noun           | Latin              | My science teacher is so smart              | es, see, i, yee, en, see, yee   |

**Table 2: List of All Words in the System Continued**

| Easy Words |         |   |                |                    |  |                                |
|------------|---------|---|----------------|--------------------|--|--------------------------------|
| Index      | Word    | Definition  | Part of Speech | Language of Origin | Example Sentence                       | Phonetic Spelling              |
| 15         | artist  | a person who creates art  | noun           | French             | I want to be an artist when I grow up. | ei, are, tea, i, es, tea       |
| 16         | afraid  | filled with fear  | adjective      | Middle English     | I am afraid of the dark.               | ei, ef, are, ei, i, dee        |
| 17         | fruit   | a product of plant growth   | noun           | Latin              | Bananas are my favorite fruit.         | ef, are, you, i, tea           |
| 18         | library | a place where books, magazines, and other materials (such as videos and musical recordings) are available for people to use or borrow | noun           | Latin              | I love getting books from the library. | ell, i, bee, are, ei, are, why |
| 19         | animal  | a living thing that is not a human being or plant   | noun           | Latin              | My favorite animal is a horse.         | ei, en, i, em, ei, ell         |
| 20         | towel   | an absorbent cloth or paper for wiping or drying  | noun           | Middle English     | Bring a towel to the pool.             | tea, oh, doubleyou, yee, ell   |



**Table 2: List of All Words in the System Continued**

| <b>Medium Words</b> |              |   |                       |                           |   |   |
|---------------------|--------------|---|-----------------------|---------------------------|---|---|
| <b>Index</b>        | <b>Word</b>  | <b>Definition</b>   | <b>Part of Speech</b> | <b>Language of Origin</b> | <b>Example Sentence</b>   | <b>Phonetic Spelling</b>                                |
| 1                   | government   | a political administration  | noun                  | Old French                | He must keep order, keep the law, that's what the government is there for.                        | jee, oh, vee, yee, are, en, em, yee, en, tea            |
| 2                   | wheelchair   | a chair mounted on wheels for use by persons who cannot walk.                         | noun                  | English                   | They were dispatching a wheelchair for you when I came in.  | doubleyou, aitch, yee, yee, ell, see, aitch, ei, i, are |
| 3                   | recommend    | to present as worthy of confidence, acceptance, use, etc.                             | verb                  | Latin                     | He, however, was the first to recommend the use of impersonal accounts in the national household. | are, yee, see, oh, em, em, yee, en, dee                 |
| 4                   | neighbor     | a person who lives near another.  | noun                  | Old English               | He was merely a friendly neighbor practicing southern hospitality.                                | en, yee, i, jee, aitch, bee, oh, are                    |
| 5                   | acceptable   | capable or worthy of being accepted   | adjective             | Latin                     | The quality of work is unacceptable for this assignment.  | ei, see, see, yee, pee, tea, ei, bee, ell, yee          |
| 6                   | emphasis     | force or intensity of expression that gives impressiveness or importance to something | noun                  | Greek                     | The school has a long-established emphasis on sports.   | yee, em, pee, aitch, ei, es, i, es                      |
| 7                   | confiscate   | to seize by or as if by authority   | verb                  | Latin                     | The teacher confiscated the student's cell phone.   | see, oh, en, ef, i, es, see, ei, tea, yee               |
| 8                   | satisfactory | adequate  | adjective             | Latin                     | The work was satisfactory this time.  | es, ei, tea, i, es, ef, ei, see, tea, oh, are, why      |
| 9                   | merchandise  | goods to be bought and sold   | noun                  | Old French                | The shopkeeper put the merchandise on display.  | em, yee, are, see, aitch, ei, en, dee, i, es, yee       |
| 10                  | lieutenant   | a deputy or substitute acting for a superior  | noun                  | English                   | She has her best lieutenants working on a proposal.   | ell, i, yee, you, tea, yee, en, ei, en, tea             |



**Table 2: List of All Words in the System Continued**

| Medium Words |             |   |                |                    |  |   |
|--------------|-------------|---|----------------|--------------------|--|---|
| Index        | Word        | Definition  | Part of Speech | Language of Origin | Example Sentence   | Phonetic Spelling                                   |
| 11           | cowardice   | lack of bravery   | noun           | English            | He displayed his cowardice in the haunted house.                   | see, oh, doubleyou, ei, are, dee, i, see, yee       |
| 12           | unscathed   | without suffering any injury, damage, or harm   | adjective      | Middle English     | While his pants were ripped in the fight, his shirt was unscathed. | you, en, es, see, ei, tea, aitch, yee, dee          |
| 13           | cinnamon    | a spice obtained from the inner bark of several tree species                                  | noun           | Middle English     | Mom makes the best cinnamon rolls.                                 | see, i, en, en, ei, em, oh, en                      |
| 14           | catastrophe | an event causing great and often sudden damage or suffering                                   | noun           | Latin              | The sinking of the Titanic was a catastrophe.                      | see, ei, tea, ei, es, tea, are, oh, pee, aitch, yee |
| 15           | infuriating | making one extremely angry and impatient  | adjective      | Latin              | The chirping of the one cricket was infuriating.                   | i, en, ef, you, are, i, ei, tea, i, en, jee         |
| 16           | luxurious   | extremely comfortable, elegant, or enjoyable, especially in a way that involves great expense | adjective      | Old French         | She lived a luxurious lifestyle.                                   | ell, you, ex, you, are, i, oh, you, es              |
| 17           | aqueduct    | an artificial channel for conveying water   | noun           | Latin              | The Romans were famous for their impressive aqueducts.             | ei, queue, you, yee, dee, you, see, tea             |
| 18           | zucchini    | a green variety of smooth-skinned summer squash   | noun           | Italian            | Dad made some great zucchini pancakes the other day.               | zee, you, see, see, aitch, i, en, i                 |
| 19           | hospitable  | friendly and welcoming to strangers or guests   | adjective      | English            | Joan was known for being the most hospitable person on her floor.  | aitch, oh, es, pee, i, tea, ei, bee, ell, yee       |
| 20           | chameleon   | a small slow-moving Old World lizard  | noun           | Latin              | The chameleon changed colors while hanging on the branch.          | see, aitch, ei, em, yee, ell, yee, oh, en           |

**Table 2: List of All Words in the System Continued**

| Hard Words |               |   |                |                    |  |  |
|------------|---------------|---|----------------|--------------------|--|--|
| Index      | Word          | Definition  | Part of Speech | Language of Origin | Example Sentence   | Phonetic Spelling  |
| 1          | environment   | the aggregate of surrounding things, conditions, or influences                            | noun           | Old English        | Mary needs an environment without stress.  | yee, en, vee, i, are, oh, en, em, yee, en, tea           |
| 2          | outrageous    | passing reasonable bounds   | adjective      | Middle French      | Was he mocking her, or did he think she was naive enough to believe his outrageous flattery? | oh, you, tea, are, ei, jee, yee, oh, you, es             |
| 3          | ubiquitous    | existing or being everywhere, especially at the same time                                 | adjective      | Old English        | He aims to make his product ubiquitous by selling it internationally.                        | you, bee, i, queue, you, i, tea, oh, you, es             |
| 4          | extraordinary | beyond what is usual, ordinary, regular, or established                                   | adjective      | Latin              | Unquestionably, an extraordinary amount of talent was present during the Renaissance         | yee, ex, tea, are, ei, oh, are, dee, i, en, ei, are, why |
| 5          | onomatopoeia  | the formation of a word from a sound associated with what is named                        | noun           | Late Latin         | An example of onomatopoeia is the word bark.   | oh, en, oh, em, ei, tea, oh, pee, oh, yee, i, ei         |
| 6          | galvanize     | shock or excite, typically into taking action   | verb           | English            | The drill sergeant galvanized his troops in the morning.                                     | jee, ei, ell, vee, ei, en, i, zee, yee                   |
| 7          | impeccable    | in accordance with the highest standards of propriety; faultless.                         | adjective      | latin              | He is a man of impeccable character  | i, em, pee, yee, see, see, ei, bee, ell, yee             |
| 8          | contagious    | likely to spread to and affect others.  | adjective      | late latin         | Her enthusiasm is contagious.  | see, oh, en, tea, ei, jee, i, oh, you, es                |
| 9          | stevedores    | a person employed, or a contractor engaged, at a dock to load and unload cargo from ships | noun           | Latin              | on the wharves, stevedores were unloading cargo from the far corners of the world            | es, tea, yee, vee, yee, dee, oh, are, yee, es            |
| 10         | commendable   | deserving praise.   | adjective      | Spanish            | he tackled the tests with commendable zeal   | see, oh, em, em, yee, en, dee, ei, bee, ell, yee         |

**Table 2: List of All Words in the System Continued**

| Hard Words |               |   |                |                    |   |   |
|------------|---------------|---|----------------|--------------------|---|---|
| Index      | Word          | Definition  | Part of Speech | Language of Origin | Example Sentence  | Phonetic Spelling                                     |
| 11         | incessant     | continuing without pause or interruption  | adjective      | Old French         | Throughout the day, the dog's barking was incessant                             | i, en, see, yee, es, es, ei, en, tea                  |
| 12         | ricochet      | rebound one or more times off a surface.  | verb           | French             | they fired off a couple of rounds, ricocheting the bullets against a wall       | are, i, see, oh, see, aitch, yee, tea                 |
| 13         | tribulations  | a cause of great trouble or suffering.  | noun           | Middle English     | Her son's illness has been a source of great tribulation.                       | tea, are, i, bee, you, ell, ei, tea, i, oh, en, es    |
| 14         | azalea        | a usually small bush that has flowers of many colors which are shaped like funnels                      | noun           | Greek              | He was excited for the spring time when his favorite azaleas would bloom        | ei, zee, ei, ell, yee, ei                             |
| 15         | fluorescent   | very bright in color  | adjective      | English            | He wore a fluorescent T-shirt to school that afternoon                          | ef, ell, you, oh, are, yee, es, see, yee, en, tea     |
| 16         | reservoir     | a place where something is kept in store  | noun           | French             | She found the reservoirs of energy she needed to finish the job.                | are, yee, es, yee, are, vee, oh, i, are               |
| 17         | truculent     | aggressively self-assertive   | adjective      | Latin              | die-hard fans became truculent and violent after their team's loss              | tea, are, you, see, you, ell, yee, en, tea            |
| 18         | generalissimo | the chief commander of an army  | noun           | Italian            | Many statues of the generalissimo were removed                                  | jee, yee, en, yee, are, ei, ell, i, es, es, i, em, oh |
| 19         | vociferous    | marked by or given to vehement insistent outcry   | adjective      | Latin              | He was vociferous in his support of the proposal.                               | vee, oh, see, i, ef, yee, are, oh, you, es            |
| 20         | merengue      | a ballroom dance of Haitian and Dominican origin in 2/4 time in which one foot is dragged on every step | noun           | American Spanish   | The energetic musical is flavored with hip-hop, salsa, merengue and soul music. | em, yee, are, yee, en, jee, you, yee                  |

### Table 3: Letter Phonetics

Final list of the pronunciation of all the letters so Angel's voice recognition system can listen to individual letters

| Letter | Phonetic Spelling |
|--------|-------------------|
| A      | ei                |
| B      | bee               |
| C      | see               |
| D      | dee               |
| E      | yee               |
| F      | ef                |
| G      | jee               |
| H      | aitch             |
| I      | i                 |
| J      | jay               |
| K      | kay               |
| L      | ell               |
| M      | em                |
| N      | en                |
| O      | oh                |
| P      | pee               |
| Q      | queue             |
| R      | are               |
| S      | es                |
| T      | tea               |
| U      | you               |
| V      | vee               |
| W      | doublingyou       |
| X      | ex                |
| Y      | why               |
| Z      | zee               |

**Table 4: Creating Our Family Friendly Brand**

| <b>Family-Friendly Fonts</b>    |                      |
|---------------------------------|----------------------|
| <b>Name</b>                     | <b>Font</b>          |
| Atma                            | Bee a Speller        |
| Bree Serif                      | <b>Bee a Speller</b> |
| Bubblegum                       | <b>Bee a Speller</b> |
| Chewy                           | <b>Bee a Speller</b> |
| Emily's Candy                   | Bee a Speller        |
| Luckiest Guy                    | <b>BEE A SPELLER</b> |
| Oxygen                          | Bee a Speller        |
| Schoolbell                      | Bee a Speller        |
| Short Stack                     | Bee a Speller        |
| Smythe <input type="checkbox"/> | Bee a Speller        |

