User Manual for Ddog (Diction Dog), the Word Analyzer Version 0.1

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Issue Date: August 14, 2026

Introduction to the Software

Ddog is a *word* analyzer. The user enters a word or group of words, and the software analyzes each word in isolation to the others and provides metrics of difficulty. The user can use the values of these metrics to refine prose for ease of reading—to make it easier or more challenging to read. It works at the word level, not the sentence level. It does not estimate the difficulty of a sentence or passage of several sentences (which is the goal of readability formulas), but Ddog does provide average values that can be interpreted as the estimated "diction difficulty" of the provided text. Here are the rules and their violation penalties:

Existing Metrics

Students learning to read English may fail to recognize a word for many and various reasons. I have flagged words that my student does not recognize in print and study these failures for common points of difficulty, such as difficult spelling patterns. I turned several *difficulty metrics* into rules. If a word violates a rule, it is penalized. Therefore, all metrics are numerical, as shown in Figure 1, and are adjustable via sliders. For now, the software penalizes a word for violating the following rules:

- Threshold for How Common the Word Is: The "Over Frequency Threshold" adds a difficulty penalty between 5 and 40 points. The software downloads hundreds of thousands of words from a database. The words are in order of how often (frequency) they appear in print. If the threshold is set at 20 (see Figure 1), then the software will download the top 20% of the words in the database. If the word is among those top-20% words, then it gets a pass, but if it is not, then the word is penalized according to the setting "Over Frequency Threshold," shown in Figure 1. The software also checks for the word's rank among the top X% to indicate relative frequency of the word in print within the clutch of words downloaded from the database.
- Number of Syllables: Each syllable for my student is a mountain that he must climb. Any syllable beyond the first syllable incurs a penalty of 1 to 4 points (for each syllable above one).
- Difficult Spelling Patterns: I gathered these patterns from words unrecognizable to my student and created a rule: If a word "Contains a difficult spelling pattern: ght|igh|eigh|gh|wh," then it incurs a penalty of 1 to 4 points (per word).
- Diphthongs and Triphthongs: These could be categorized as "Difficult Spelling Patterns," but they pose a unique challenge to my student, so I carved them out. Each diph- or triphthong incurs a penalty of 1 to 4 points (per instance, because there may be more than one per word).
- Contractions: My student falters when trying to read contractions. Therefore, each instance of a contraction incurs a penalty of 1 to 10 points (per word).

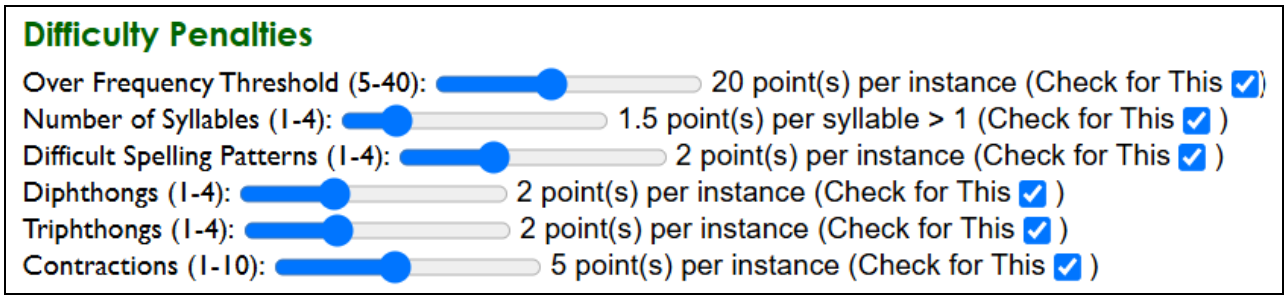

Figure 1: Difficulty Penalties

Thresholds are used for alerting the user to words and averages that exceed a threshold for the metrics shown in Figure 2.

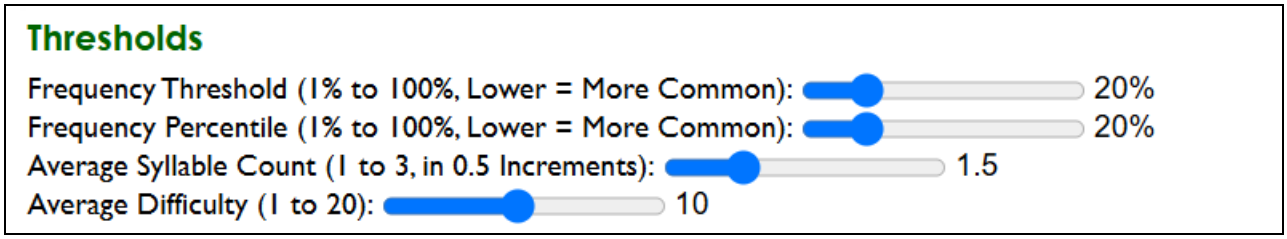

Figure 2: Thresholds for Signaling Problems with a Word or Group of Words (Averages)

Planned Metrics

As I learn more about the features of words that make them difficult for my student to parse, I will add rules to the existing mix (they, too, will be customizable). Proposed new metrics include:

- Word Length: The length of a word—perhaps letters per syllable—seems to correlate with my student's reading problem. This is an easy rule to add, but I may somehow integrate it with syllable count.
- Silent Letters: Silent letters complicate learning an unrecognizable word, especially if the reader is using phonics to recover a word by "sounding it out." This rule will be difficult to implement unless there is an existing list of not just words that have silent letters but which letters in the words are silent.
- Consonant Blends and Digraphs: I am searching for a good list of these troublesome gatherings of letters. I like my chances.
- Foreign Influence: Latin and Greek spellings confuse my student when he does not recognize a word in print. For example, the "ph" in *alpha tester* or "pt" in *receipt* (which overlaps the silent-letter rule—in this case, the "p" in "pt"). The English language is replete with words derived from Latin, words that have poor spelling-to-pronunciation correlation. Many of these can be eliminated during careful composition of the student texts, but there are so many foreign words and spelling patterns in English that objectively flagging them may prove useful.

Get Familiar with the GUI

After the page loads, please review the graphical user interface (GUI), shown in Figure 3. The features of the GUI are:

- Submitting Words for Analysis: At the top of the software is a text box to capture the words to be analyzed.
- Customizing Controls: The customizing controls of the GUI include sliders, which may be adjusted to set a value for a threshold or penalty, and checkboxes, which enable the user to turn penalty checks on and off.
- Buttons: At the bottom of the screen are buttons that enable the user to **Analyze** words, **Make Cards** for vocabulary flashcards, **Reset Form** sliders and checkboxes to their default values, **Load Custom Settings** for thresholds and penalties, and **Save Settings**.

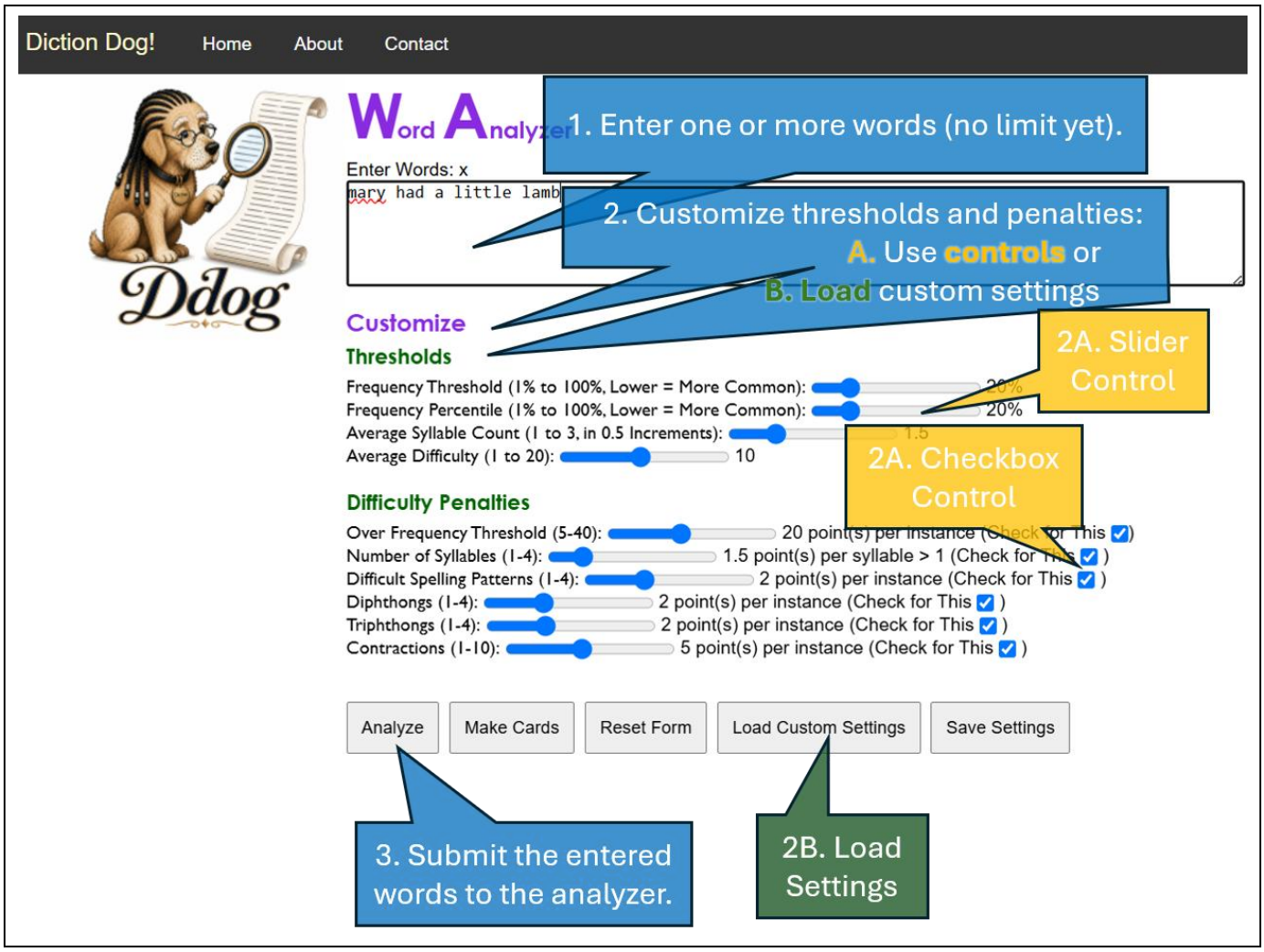

Figure 3. The Graphical User Interface for Diction Dog

The GUI controls are described below:

- Enter Words (text input box): This control accepts a word or multiple words. Because the software focuses on words in isolation to each other, all punctuation gets stripped before the software analyzes the input. When using the software to create flashcards, the user can enter a string of words in this box and click on the "Make Cards" button.
- Customize: Thresholds (Used for Alerting Problems):
  The user can set thresholds for the four difficulty metrics shown below. If a word exceeds a threshold, the user is alerted to the violation.
  - Frequency Threshold: A word's frequency is an indication of how often the word appears in print, based on the analysis of modern texts. The threshold is a percentile, a portion of the entire database that the user requests for word analysis. For example, if you set the threshold to 20%, you are instructing the software to pull the 20% top-easiest words in the database of words, which are ranked by how common the words are in print. The threshold can be adjusted up or down, depending on the student's starting point. The lower the number, the easier it will be for the student to identify the words. For example, if you want

to limit your database pull to the simplest one percent of words in the database, then adjust the slider down to 1%. Any word that does not appear within the threshold will be assigned a failure symbol (✗) in the results. Slide the Frequency Threshold control all the way to 100% to pull all the words in the database (over 300,000 words).

- Frequency Percentile: Within the Frequency Threshold (say, 20%), words are ranked according to how often they appear in print. The Frequency Percentile sets the word difficulty within the Frequency Threshold. Let's say that we want to pull only the top 1% of words from the database (the easiest 1%) for a beginning reader or new English speaker but would like for the complexity of the words in the sample text (input) to vary widely within that 1%. The Frequency Percentile could be set at 100% to allow a full spectrum of words within the Frequency Threshold to be analyzed without penalty (optionally, the check for whether a word is inside or outside the threshold can be turned off, which is discussed later).
- Average Syllable Count: The number of syllables per word (and per word length) is an indication of the word's likelihood of stumping the student. The average cannot be lower than 1.
- Average Difficulty: The difficulty of a word is calculated based on the sum of penalties incurred by a word during analysis. The slider can be adjusted from 1 to 20 (units of difficulty).

❖ Customize: Difficulty Penalties:

Note that all difficulty penalties can be selected or deselected for inclusion in the word analysis by checking/unchecking the checkbox next to "Check for This."

- Over Frequency Threshold: If a word or average exceeds the user-adjusted Frequency Threshold, a failure symbol (✗) will be displayed next to the word (in the case of a single word in the Results table), or, in the case of an AVERAGE, the THRESHOLD will be displayed in red characters (such as **20%**). Words that exceed the threshold (that is, words that do not appear in the top X% of the words in the database) are heavily penalized, from 5 to 40 points (on a 100-point scale for total word difficulty).
- Number of Syllables: Polysyllabic words (such as *polysyllabic*) can pose a kind of reading difficulty that overlaps with word length. For now, the software estimates the number of syllables (and overcounts with some words that have interposed silent letters, like the "e" in *notebook,* a word that the software currently says has three syllables). Polysyllabic words are penalized per syllable beyond the first syllable (the first syllable is free!) between 1 to 4 points per syllable.
- Difficult Spelling Patterns: This category of difficulty is evolving as I study the reading behavior of my student. For now, these problematic patterns are: "ght", "igh", "eigh", "gh", and "wh" (apologies for the British punctuation). A word with one of these spelling patterns is penalized from 1 to 4 points per instance.
- Diphthongs: From AI: "A diphthong is a complex vowel sound or "gliding vowel" where the mouth shifts from one vowel position to another entirely within a single syllable, such as the sounds in *boy, out,* and *day."* For now, I include only "au", "ou", and "oi" (my student doesn't seem to have a problem with "oy" or "ay"). A word with a diphthong is penalized from 1 to 4 points per instance.

- Triphthongs: From AI: "A triphthong is a phonetic term for a smooth, rapid glide through three vowel sounds within a single syllable. It occurs when a closing diphthong transitions into a neutral schwa (ə) sound. For instance, the word 'fire' transforms rapidly from /aɪ/ to /ə/." For now, I include only "eau", "our", "air", "ear". A word with a triphthong is penalized from 1 to 4 points per instance.
- Contractions: This software deletes characters that are non-letters but spares two: the space and the apostrophe. The spaces define the word boundaries, and an apostrophe is a sign that the word may be a contraction, but it also may be, for example, a possessive ("I don't know about Frank's car" would be flagged as having two contractions). This will be corrected in future versions. For now, any word that includes an apostrophe is penalized from 1 to 4 points per instance.

Buttons

- **Analyze**: Submits the user-provided input for the software to analyze.
- **Make Cards**: Print-ready flashcards will be generated for all of the words in the input textbox.
- **Reset Form**: Resets all controls to their default settings.
- **Load Custom Settings**: Users may recall custom settings.
- **Save Settings**: Users may save custom settings.

Software Instructions

Submitting Words for Analysis with Default Settings

1. Browse to the following web address: https://dictiondog.aspx
2. As shown in Figure 3, in the textbox under "Enter Words" near the top of the screen, type in a word or string of words, including punctuation if desired (all punctuation will be stripped during analysis).
3. Scroll down to the five buttons below the slider controls and click on the "Reset Form" button to set all controls to their default settings.
4. Click on the "Analyze" button to analyze the words. Figure 4 shows a sample Results table.

Results [Skip to Averages]

Provided Input: when she was a kitten she crawled between the cushions on the sofa

Word	Frequency Threshold	Frequency Percentile	Syllables	Difficulty (1-100)	Cautions
when	✔ @ 20%	1%	1	7	Contains a difficult spelling pattern: ght|igh|eigh|gh|wh.
she	✔ @ 20%	1%	1	1	
was	✔ @ 20%	1%	1	1	
a	✔ @ 20%	1%	1	1	
kitten	✔ @ 20%	22%	2	5.5	Has **two** syllables.
she	✔ @ 20%	1%	1	1	
crawled	✔ @ 20%	55%	2	5.5	Has **two** syllables.
between	✔ @ 20%	1%	2	5.5	Has **two** syllables.
the	✔ @ 20%	1%	1	1	
cushions	✔ @ 20%	28%	2	5.5	Has **two** syllables.
on	✔ @ 20%	1%	1	1	
the	✔ @ 20%	1%	1	1	
sofa	✔ @ 20%	14%	2	5.5	Has **two** syllables.
AVERAGES (13 Words)	**0.0%**	**9.8%**	**1.4**	**3.0**	
THRESHOLDS	**20%**	**20%**	**1.5**	**10**	

Figure 4: Results of Word Analysis with Frequency Threshold Set at 20%

5. Click on any word in the “Word” column. Figure 5 shows the features of this popup that will be activated in the beta release (but are shown in the figure as design elements). In this popup, users can learn how a word is properly pronounced and syllabified, see the difficulty score and cautions for the word, access articles and exercises, invoke the word’s definition, and view a list of scored synonyms for potential substitution. Figure 6 shows the existing popup, which includes the word, part of speech, and definition pulled from the API for dictionary.com on the fly.
6. Close the popup by clicking on the “Close” button at the bottom of the popup.

dictionary

Difficulty Score: 19

dic ♦ tion ♦ ar ♦ y
dik ♦ shun ♦ air ♦ ee

Cautions: x, y, z

Tutor Resources	Exercises	Synonyms (Score)
Easy Trick To Pronounce -TION and -SION Words	Flash Cards for -tion Words	Glossary (13)
Another	Another	Another
Another	Another	Another

Figure 5: Planned Information Popup for Clicked Word

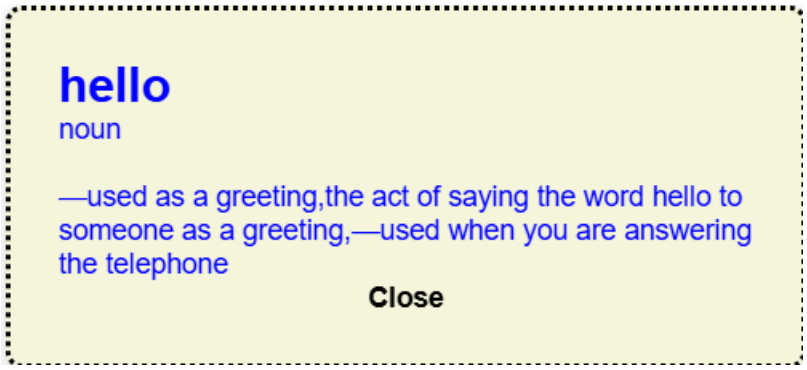

Figure 6: Existing Information Popup for Clicked Word

Altering Thresholds and Difficulty Penalties

1. Change the Thresholds and Difficulty Penalties by dragging the circle of a slider to the left (lower threshold, lower penalty) or right (higher threshold, higher penalty).
2. Click on the "Analyze" button to analyze the words again, using the new settings.
3. Review the Results and note the effects of altering the slider values.

Turning Difficulty Checkers On and Off

1. Select or deselect the "Check for This" checkbox next to any slider in the Difficulty Penalties area. For example, deselect the checkbox for Contractions:

   Contractions (1-10): 5 point(s) per instance (Check for This ☑)

   Contractions (1-10): 5 point(s) per instance (Check for This ☐)
2. Click on the "Analyze" button to submit the text for analysis without checking for various types of recognition difficulty (contractions, syllable count, and so on).
3. Review the Results and note the effects of altering the checkbox values.

Reset the Page Form to Default Values

1. Click on the "Reset Form" button below the slider controls to reset the values of the sliders and checkboxes to their default settings.
2. Verify that the settings for the thresholds and difficulty penalties match those shown in Figure 7.

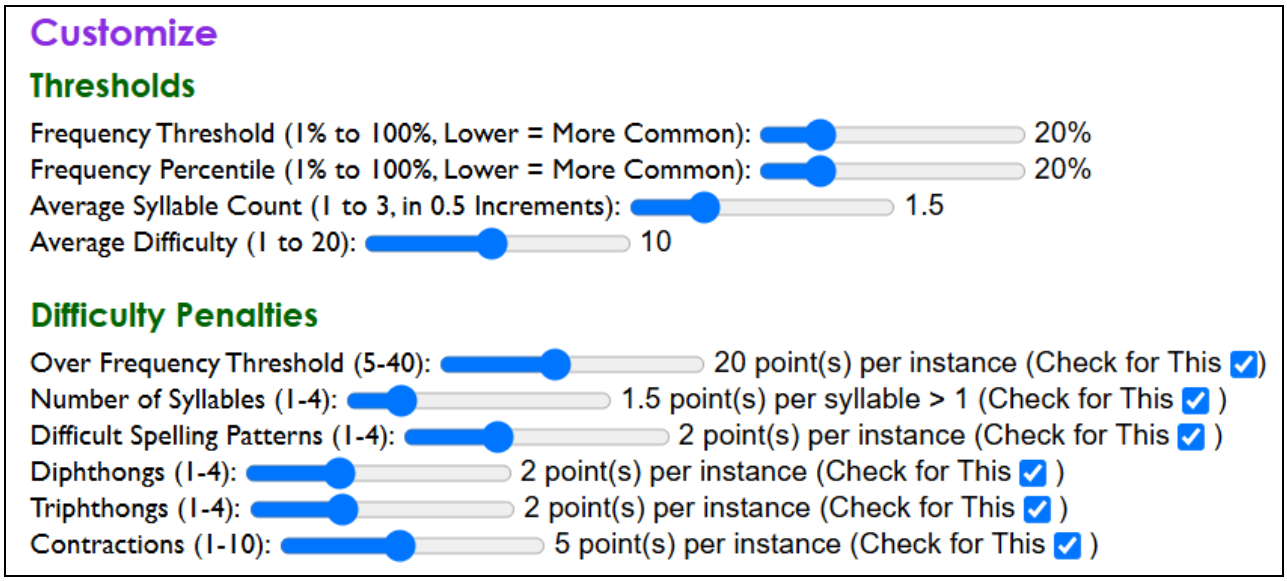

Figure 7: Default Settings

Saving Custom Settings (will require user login in the future)

Note that during alpha and beta testing, all testers share the same account, so anything that you save to the database will be available to other testers. A future version will enable the user to delete accounts, students, and progresses.

1. Adjust the sliders and checkboxes to random or strategic values.
2. Click on the "Save Settings" button below the slider controls to save the current settings.

The popup window shown in Figure 8 will appear. The database is prepopulated with test students and their various progresses. You can select an existing student or create a new one.

3. Enter a new student name in the textbox after "Create New Student," such as "Linda Popper." However, please make up a unique name because other testers will be saving settings to the database as well.
4. Enter a progress name in the textbox after "Progress Name," such as the next number in a series (1, 2, etc.) or an explicit description, such as "Test 2: Christmas Story Reading Material."
5. Click on the "Save Settings" button to save your settings to the database. You should see a SUCCESS message.
6. Close this popup window.

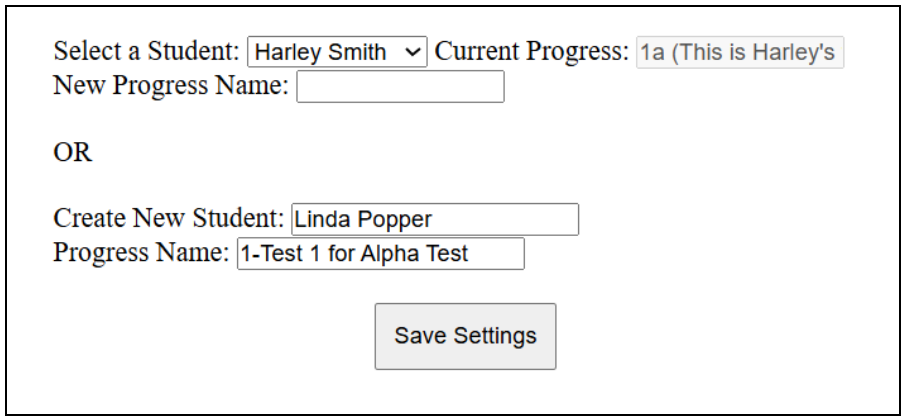

Figure 8: Input Form to Save Settings

Load Custom Settings (will require user login in the future)

1. Click on the "Load Custom Settings" button below the slider controls to load saved settings.

The popup window shown in Figure 9 will appear. Each small button shown after a student name is a link to saved settings.

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2. Mouseover (rollover) the small buttons and observe the expanded text under "Progress Description."
3. Mouseover the button next to the new student that you saved to the database and note the progress description.
4. Click that button to populate the Diction Dog sliders and checkboxes with the saved settings.
5. Verify that the controls on the Diction Dog GUI reflect the settings that you saved.
6. Close this popup window.

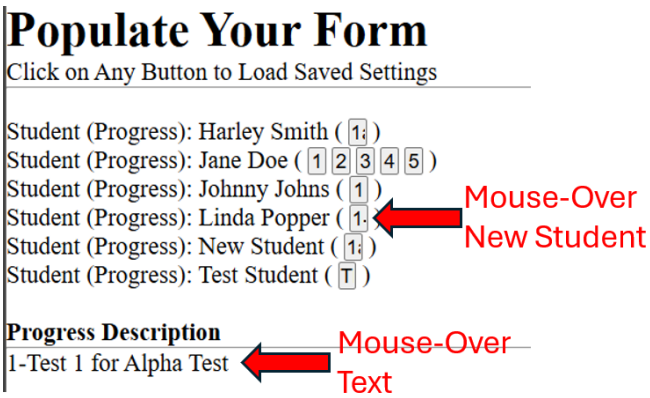

Figure 9: Load-Custom-Settings Form

Making Flashcards for Students

TBD

Use Cases

TBD