Notes

- The micro-intervention you create does not need to be composed, but its parts should all be present and ready to be assembled into a complete intervention. You do not have to actually generate this for all the words, but at least a few exemplary words.
- Think about what might be helpful for a student struggling to read and understand a particular word in a passage. How can you help them improve their reading skills in a fun and engaging way?
- Dynamic Interventions based on context.
    - "Read" (present tense) vs. "Read" (past tense)
    - Present: "reed"
    - Past: "red"
    - Can be a source of confusion amongst young readers who would have read the same word differently earlier.

Idea Set

- Collaborative intervention
    - Focus: Design an intervention in which two students can participate to teach each other or perhaps a game where they can both collaborate ~ (perhaps LLM generated ideas for such games or expert curated games).
    - Strength: Reduces anxiety and shyness of some students as it has been proven to improve performance in comprehension.
    - Drawbacks: Might be difficult to transcribe (due to added noise)

- Student Clustering (implementable)
    - Focus: Analytics
    - Strengths: Identifies a set of sounds among words which a student struggles on and hence, expert interventions can be designed on this set.
    - Drawbacks: (not an intervention)

- Culture Specific Intervention (should only be tried with LLM that goes through safety training)
    - Focus: LLM generates nuanced examples for interventions for students with a particular race/background to help with better contextual understanding
    - Strengths: Increased comprehension
    - Drawbacks: Subject to toxic biases present in LLMs.

- Word to multiple images (implementable)
    - Focus: A word is broken down into multiple parts and each part has an image. Ex:(Snowflake) ~ [Image of an snow + Image of a flake]
    - Strengths: Better comprehension
    - Drawbacks: Not all words could be decomposed

- Music (RAG based system)
  - (Implementation: Difficulty in short time based on the complexity induced by the classifier to check for safety of the song)
    - Focus: Use words in a song.
    - Strengths: Better pronunciation effect as words expressivity is showcased in music snippets.
    - Drawbacks: Range of words that can be covered and different interventions have different music styles leading to different pronunciations of the same word.

- Storytelling (implementable)
    - Focus: A short story might lead to better recall and understanding of the word.
    - Strengths: Better comprehension and recall
    - Drawbacks: Length constraint of a story and stylistic choices in a story might be biassed.

- Rhymes (implementable)
    - Focus: Find rhyming words to the current word and pronounce each one to give a sense of word pronunciation to the students as they would start associating ending words sounds (lime, sublime, mime, chime)
    - Strengths: Students might understand how to pronounce #ime# and the cluster of sounds is better.
    - Drawbacks: Some words might have very few rhyming words (guess)

- Phrase filtering based on the tense of the word? (intervention)
    - Focus: Some words like read (red) and read (reed) are pronounced differently based on the tense of the word. This adds a source of confusion for students/young readers.
    - This implies we should apply rule based phrase selection such that similar words with different contexts do not appear in one reading exercise.
    - Clarification on such intervention is needed

- Silent words (honour)
    - Focus: teaching students how to pronounce silent words (honour, hour, pneumonia)
    - Sounds like "f" for "ph"in phantom

- British English/American English
    - **Aluminium**
    - British: (AL-looh-mee-nee-yu-um
    - American: (A-looh-ma-num

- Emotional expression of words (tone of a word - can be used as additional examples in an intervention)
    - An intervention where a student first speaks a word and then speaks the word in both happy and sad expressions.

Implementation

Assumptions:
- Mono-lingual data (English)
- Interventions are ideally dynamic

Important factors across each intervention:
- Pronunciation (region specific based on student region of education) American English, British English
- Short interventions
- Context dependent pronunciation (read (reed) / read (red))

Interventions:

(Intervention 1)
- Rhyming ~ Play Rhyming words, ask the student to repeat the words.

(Intervention 2)
- Storytelling ~ Play a short story with a video for a given word.

— Optional —
(Intervention 3)
- Different expressions ~ A word can be expressed differently based on tones of the passage.

(Intervention 4)
- Word2Image ~ Break the word down into sounds and find similar images.

(Intervention 5)
- Musical intervention ~ Play a 20 seconds music video with lyrics on the screen such that students can hear which words are being showcased and make sure to include the current word in that sequence

Model

(OpenAI-GPT4o) ~ (reasoning based model is needed for generating stories)

Final Idea

Having personally suffered (it was stuttering when I was young) from a speech problem where I found it difficult to pronounce certain words starting with ("k") or ones that having letters like "dd" example "fiddle", I believe that the analytics portion of amira learning platform can include a speech problem detection module.

functionality of speech problem detection:
- Given a student history of which words does the student mis-pronounced (student object I implemented has the placeholders), we can run a solution with experts.
- I have also included "prefers" tag in the student class that incorporates which type of intervention works the best for which student.
- Speech detection module can analyse a history of past interventions.
    - Cluster on common sounds which the student faces difficult to predict.
    - Collect the same information with students having speech problems.
    - Determine correlation and similarity.
    - Using a classifier to detect such cases early on in lives of children.

Solution:
- Conducting cognitive science studies as to common helping factors for students. (in my case it was singing difficult words along with music)
- Designing music based intervention. (breaking the word down and mapping the subwords to beats and singing along)
- Have a text-to-music generator module at a high level.
- Incorporating this as an independent vertical for amira learning (AI assisted health-tech learning solutions.