Data Model Diagram

Firebase Collections

Legend for Data Types

- **string**: Textual data.
- **number**: Integer or floating-point numbers.
- **boolean**: True/False values.
- **timestamp**: Firestore Timestamp (Date and Time).
- **map**: A nested JSON object.
- **array<string>**: A list of strings.
- **reference**: A string containing the document ID of another document, acting as a Foreign Key.

1. Collection: users

Purpose: Stores profile information for all actors in the system (teachers & students). The Document ID usually matches the Firebase Authentication UID.

Field Name	Data Type	Description & Relationships
id	string (ID)	The unique identifier for the user document (typically the Auth UID).
email	string	User's email address.

fullName	string	User's full display name.
username	string	A unique username handle.
role	string	Defines roles (e.g., "Teacher", "Student").
institution	string	The name or ID of the school/organization they belong to.
local	string	Locale setting (e.g., "en-US").
isEmailVerified	boolean	Has the user verified their email address via Firebase Auth.
verificationStatus	string	Email verification status (e.g., "Approved", "Pending").
createdBy	reference	Points to the users doc ID of the creator
createdAt	timestamp	When the user profile was created.
updatedAt	timestamp	When the user profile was last modified.

2. Collection: classes

Purpose: Represents a classroom, managed by a teacher containing multiple students.

Field Name	Data Type	Description & Relationships

id	string (ID)	Auto-generated unique identifier for the class.
classCode	string	Code used for student login
institutionId	string	Identifier for the school organization.
sectionId	string	Identifier for the specific section (e.g., "001").
teacherId	reference	Points to the users doc ID of the primary teacher.
studentIds	array<reference>	An array of users doc IDs representing students rostered in this class.
totalWordsToComplete	number	The curriculum goal for the number of words students need to master.
averageClassWordAttemptScore	number	Aggregated metric of overall class performance.
wordStruggledIds	array<reference>	An array of words doc IDs that the class collectively struggles with.
audioRetention	boolean	Configuration setting to determine if audio files are kept

createdBy	reference	Points to the users doc ID who created the class.
createdAt	timestamp	When the class was created.
updatedAt	timestamp	When the class details were last modified.

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3. Collection: words

Purpose: The central curriculum database containing the words students need to learn to pronounce.

Field Name	Data Type	Description & Relationships
id	string (ID)	Unique identifier for the word document.
text	string	The actual word string (e.g., "much").
level	string	The curriculum level name (e.g., "Third Grade", "Pre-Primer").
levelOrder	number	Used for sorting words sequentially within a specific level.
sentences	array<string>	Example sentences using the word.
createdBy	reference	Points to the users doc ID who added this word to the database.

createdAt	timestamp	When the word was added.
updatedAt	timestamp	When the word details were last modified.

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4. Collection: attempts

Purpose: An immutable record of a single instance of a student attempting to pronounce a specific word.

Field Name	Data Type	Description & Relationships
id	string (ID)	Auto-generated unique identifier for this specific attempt.
userId	reference	Points to the users doc ID of the student making the attempt.
classId	reference	Points to the classes doc ID context in which the attempt was made.
wordId	reference	Points to the words doc ID being attempted.
score	number	The graded result of the attempt
confidence	number	The AI model's confidence score in its transcription/grading.
speechToTextTranscript	string	What the system heard the user say.

audioPath	string	The file path/URL to the actual audio recording (Firebase Storage).
audioCodec	string	Metadata about the audio file format.
durationMS	number	Length of the audio recording in milliseconds.
deviceOS	string	Metadata about the student's device operating system.
devicePlatform	string	Metadata about the student's platform (iOS, Android)
createdBy	reference	Points to the users doc ID who performed the action
createdAt	timestamp	When the attempt took place.
updatedAt	timestamp	Usually the same as createdAt for immutable records, unless reprocessing occurs.

5. Collection: student.progress

Purpose: Aggregates a specific student's cumulative progress within a specific class.

Field Name	Data Type	Description & Relationships
uid	reference	Points to the users doc ID of the student.

class	reference	Points to the classes doc ID this progress record pertains to.
currentWordLevel	string	The current curriculum level the student is working on.
countWordsAttempted	number	Total count of distinct words the student has tried.
countWordsCompleted	number	Total count of distinct words marked as mastered.
averageWordAttemptScore	number	Running average of the student's scores.
wordLevelsCompleted	map (string: bool)	A map tracking status of levels. E.g., {"Pre-Primer": true, "Primer": false}.
wordCompletedIds	array<reference>	An array of words doc IDs the student has successfully mastered.
wordStruggledIds	array<reference>	An array of words doc IDs the student is currently struggling with.
wordAttemptIds	array<reference>	An array of attempts doc IDs associated with this student.
createdAt	timestamp	When this progress tracking began.

| updatedAt | timestamp | When progress data was last calculated/aggregated. |