



POLITECNICO
MILANO 1863

ARTY QUEST

Elevating Speech Therapy Through Personalized Exercises with LLM Integration

ADVANCED USER INTERFACES 2023/2024



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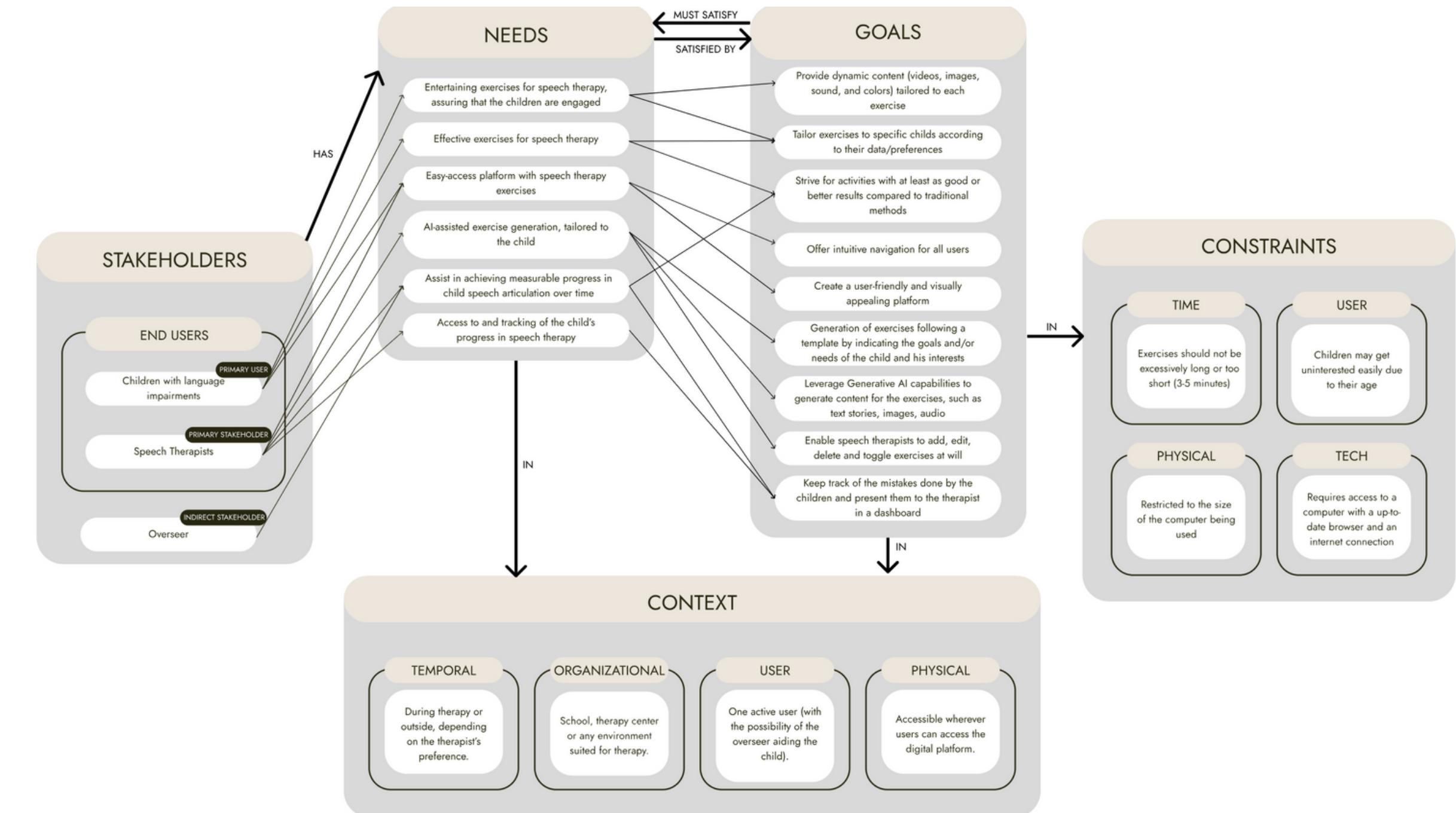


management engineering



PROBLEMS

The main problem addressed by "Experiencer" is childhood apraxia of speech, a condition affecting children aged 10-16 that hinders their ability to coordinate oral movements for sound articulation.





Arty Quest

STATE OF ART



SPEECH THERAPY



Evolving Speech Therapy: Tailored approaches, early intervention, and technology integration.

Post-surgery Rehabilitation Focus: Location, psychological support, and personalized exercises for voice and swallowing issues.

Importance of Speech-Language Pathologists: Associations stress their significance, especially in treating motor speech disorders like apraxia of speech (CAS).

Current Trends: Hybrid therapies, client-focused decision-making, and technology-enhanced, personalized interventions.

ADULT VS CHILDREN



	Child	Adult
Developmental focus	Early intervention	Recovery and retraining
Treatment Approaches	play-based activities	structured exercises
Diverse Objective	age-appropriate speech and language	varied goals ex. post-stroke recovery

LLM GENERATED EXERCISE



Clinical Progress: LLMs exhibit promise in clinical neuro-rehabilitation text generation (Felske et al., 2022)

Educational Impact: LLMs improve tailored exercise generation, enhancing student Math Word Problem solving (Liang et al., 2023).

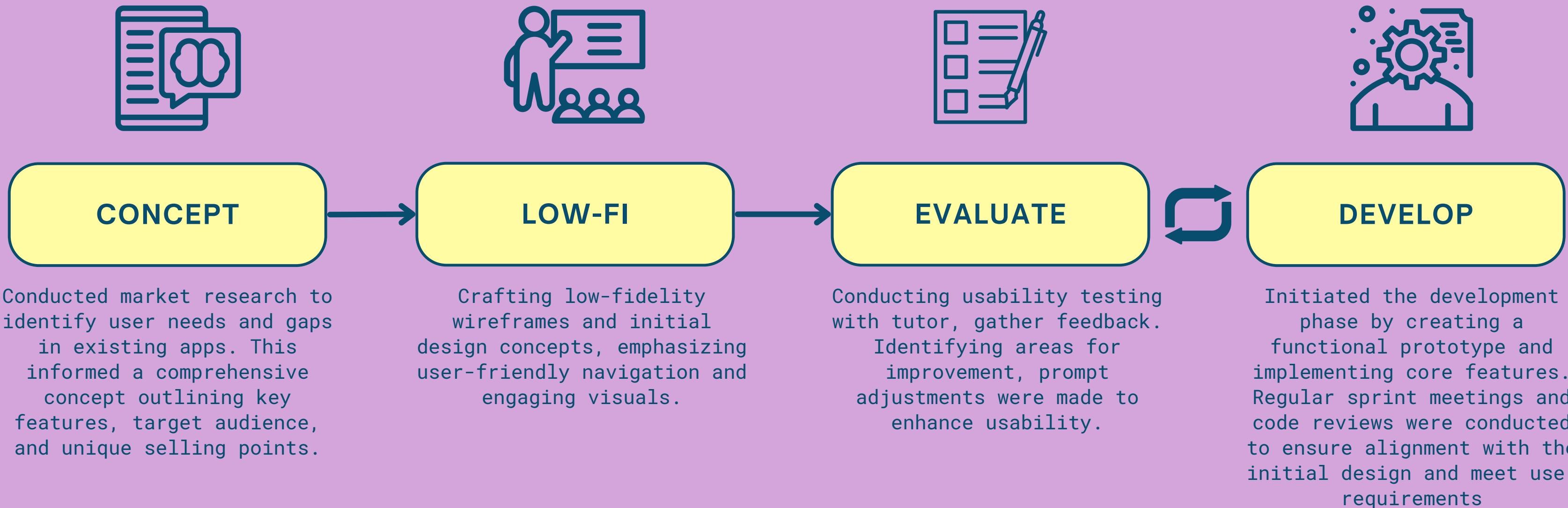
Refinement Through Feedback: User feedback is crucial for ongoing LLM refinement (Xiao et al., 2023), with future work focusing on domain-specific model fine-tuning.

OST System Exploration: Review examines online speech therapy (OST) systems for childhood communication disorders (Attwell et al., 2022).

Evolving Research Landscape: Cohesive overview of evolving research highlights LLMs' transformative role in personalized speech therapy.



WORK PROGRESS





DESIGN SOLUTION

Interaction paradigm of conversational agents emphasizes communication between the user and the system through both written and spoken conversational language

The application is structured in two distinct sections.



Speech Therapists

create personalized exercises for each child by textually inputting their symptoms and personal interests.



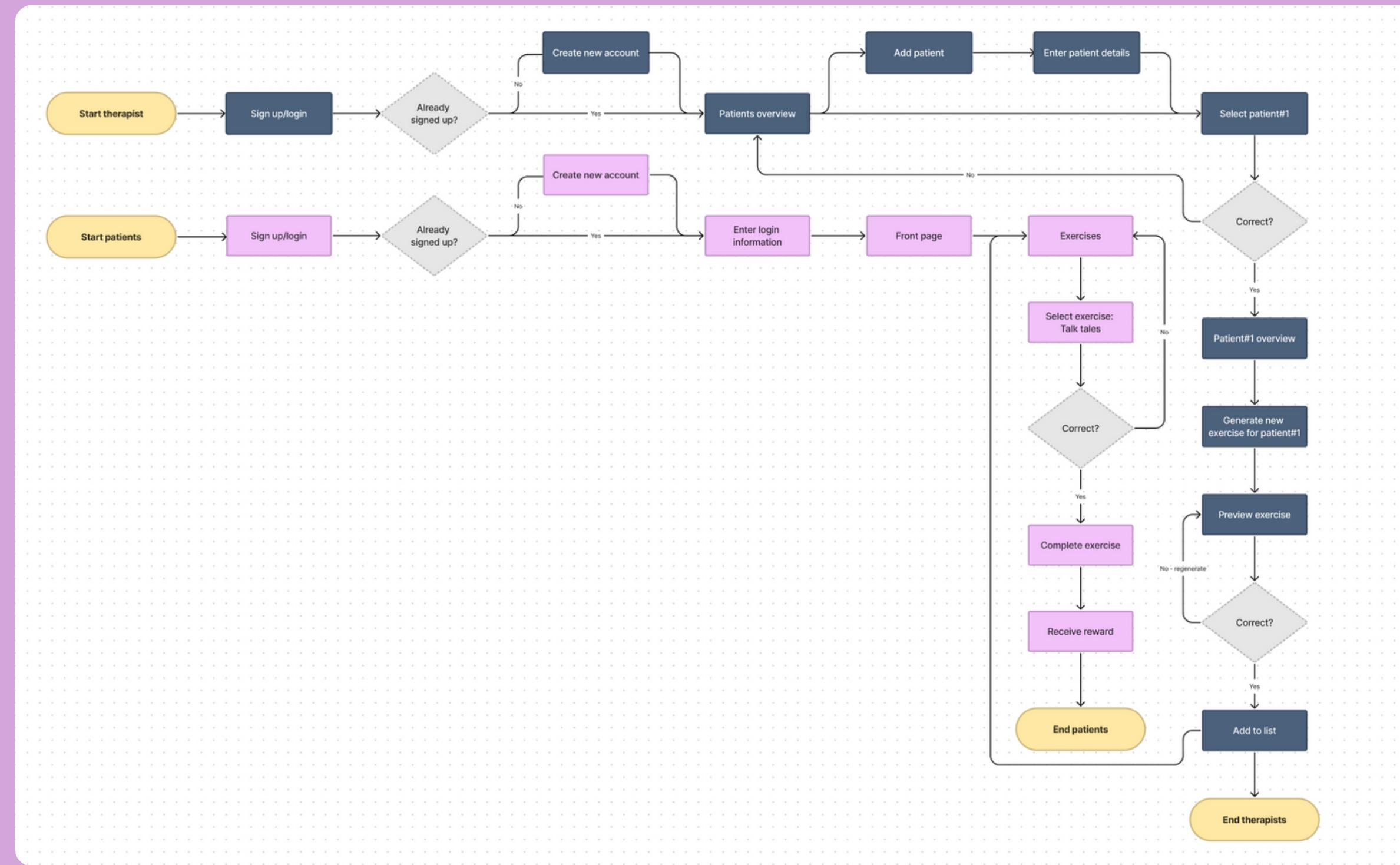
Children

the primary users of the application. Based on the therapist's inputs, each child engages in exercises crafted around their personal interests and speech condition.



TECHNOLOGICAL SOLUTION

USER WORKFLOW DIAGRAM





UX DESIGN FOR THERAPISTS



Patients

Exercises



Search by name



Reset

Add Patient



Jane Smith
15 years old

Diagnosed with
CAS

Can't pronounce words with the 's' sound
Voicing errors



Patients

Exercises



John Doe
13 years old

Patients

Exercises



John Doe
13 years old

Patients

Exercises



John Doe
13 years old

Patients

Exercises

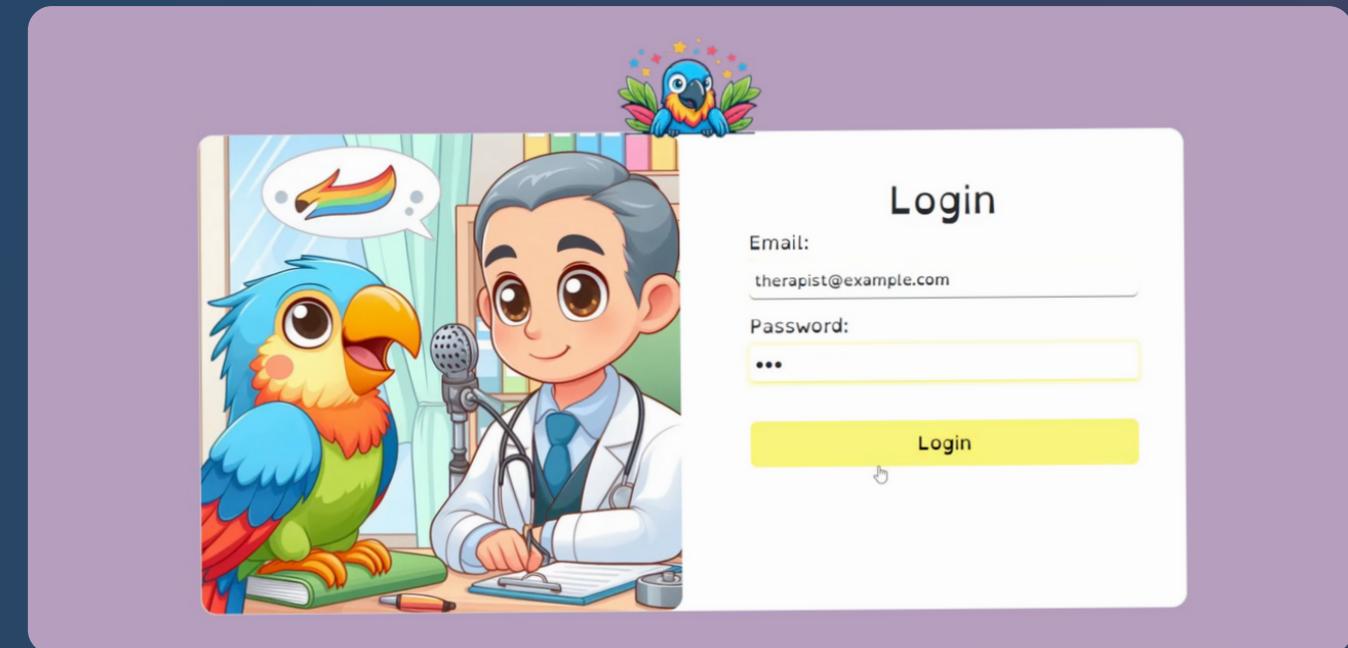
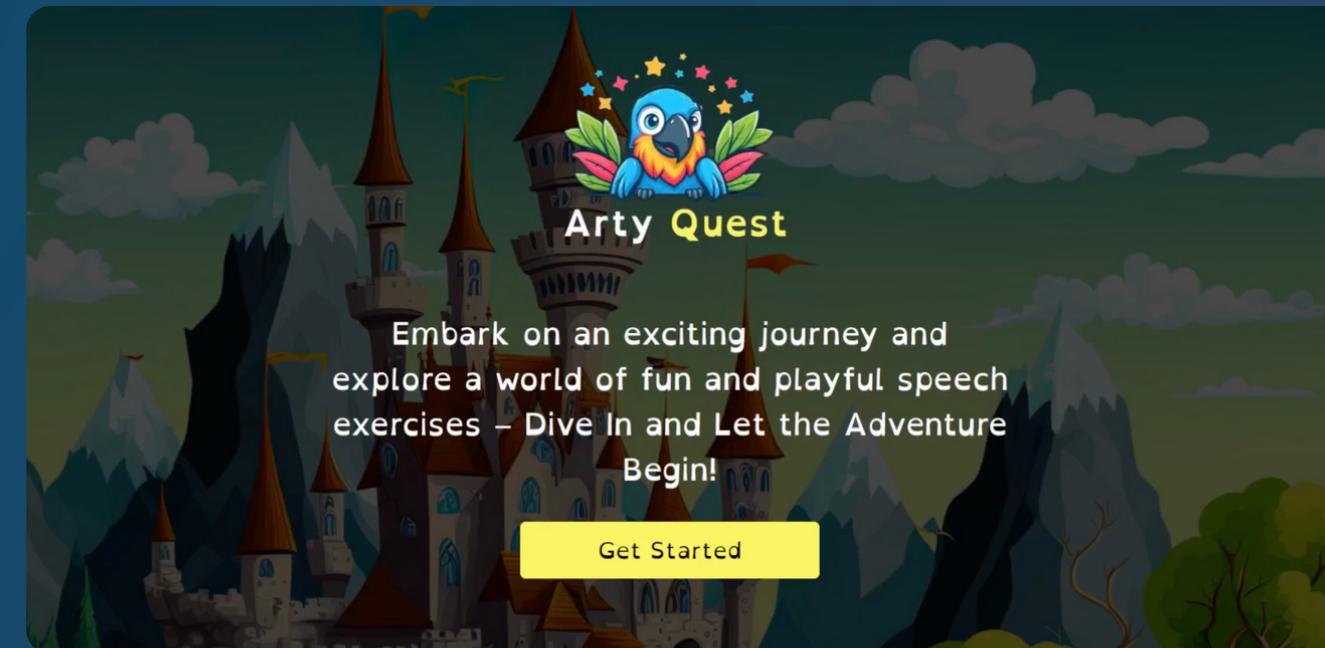


1 . Homepage

2 . Login

3 . Patient List

4 . Progress
& Exercises



UX DESIGN FOR THERAPISTS

5. Generating Exercise

Describe what the exercise should tackle, such as sounds or specific words:
's' sounds

Describe the exercise theme (having in mind the child's interests, for example):
Christmas in the South Pole

Generate

Story

In a whimsical twist of fate, Santa Claus decided to celebrate Christmas in the South Pole this year. The Southern Hemisphere's summer sun required Santa to swap his traditional suit for something cooler—thus, the sunglasses and Hawaiian shirt. Christmas trees are scarce in this frosty environment, but Santa, with a little magic, brought one to life right on the ice. The local penguins, ever so excited for the celebration, took it upon themselves to be Santa's little helpers. They danced around, sharing candy canes with each other. Meanwhile, Santa's reindeer took a much-deserved break, letting a few strong polar bears pull the sleigh filled with beautifully wrapped gifts. The igloos nearby shone

Click on the text to edit!

Save Go back

UX DESIGN FOR THERAPISTS



6. Phrases

7. Tongue Twisters

Phrases

Santa Claus wore his sunglasses at the snowy South Pole.
Penguins waddled around the decorated Christmas tree.
Santa's sleigh was pulled by a team of strong polar bears.
Igloos twinkled with colorful Christmas lights.
Seals on toboggans slid swiftly down the snowbank.
The snowman wore a tinsel scarf and had a bemused expression.

Tongue Twisters

Sunglass-Santa
Christmas-cheerful
Sleigh-bears
Snowman-scarf

Click on the text to edit!

Save Go back

Arty Quest

Exercises

Search by description

(1) Talk Tales It should tackle his lisp A whimsical scene set in a magical forest clearing begins to unfold. An eye-catching...

(2) Talk Tales Stuttering Visualize a whimsical, imaginative classroom nestled within a large, leafy tree. The...

(3) Talk Tales 'S' sounds Envision a lively scenery unfolding at the South Pole. There's a jolly character...

Reset Add Exercise

8 .Exercise List

Arty Quest

Personal Information

First Name
Enter first name

Last Name
Enter last name

Date of Birth
dd / mm / aaaa

Email
Enter email

Speech Assessment

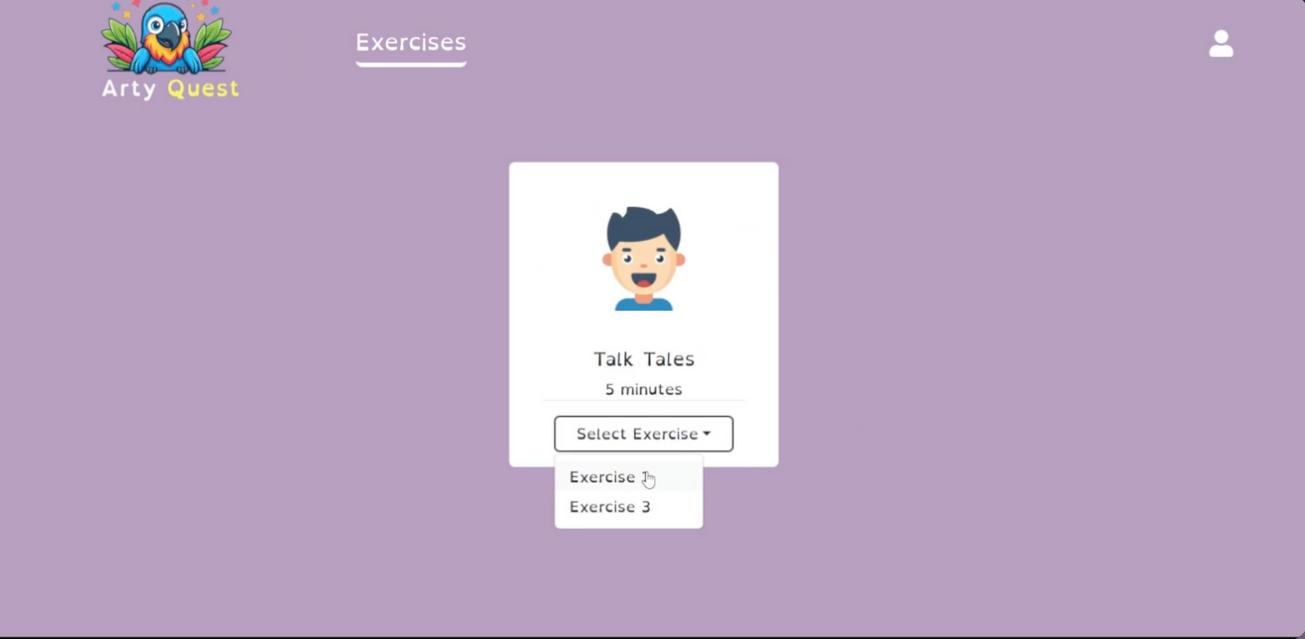
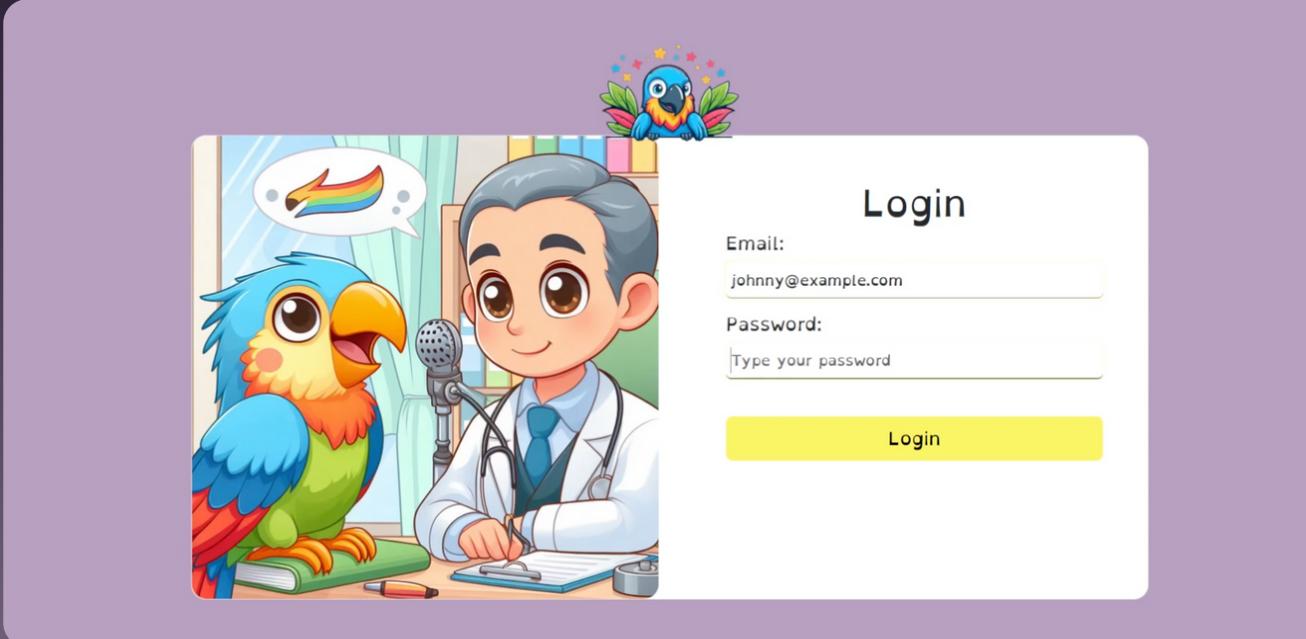
Speech Condition

Symptoms

Add

9 .Add Patient

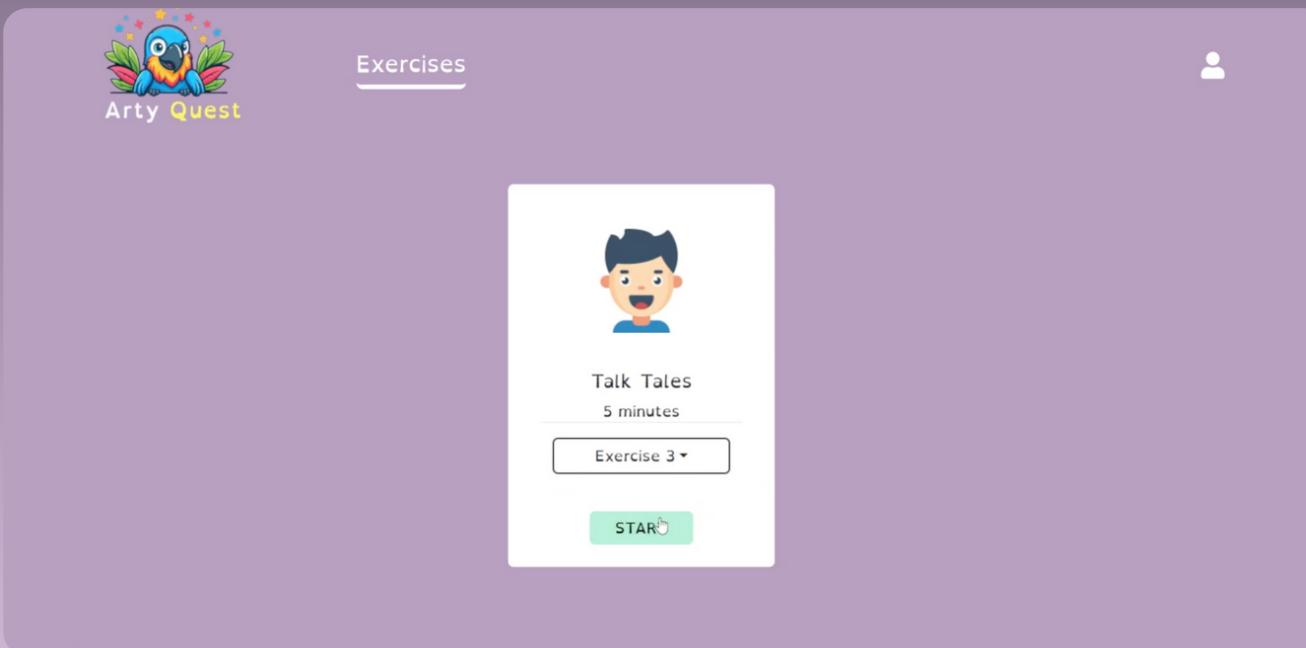
UX DESIGN FOR CHILDREN



The image shows two screenshots of the Arty Quest application. The left screenshot, titled '1. Login', displays a cartoon doctor character and a parrot. It has input fields for 'Email' (johnny@example.com) and 'Password' (Type your password), and a yellow 'Login' button. The right screenshot, titled '2. Exercise List', shows a list of exercises: 'Talk Tales' (5 minutes). A dropdown menu shows 'Select Exercise ▾' with options 'Exercise 1' and 'Exercise 3'.

1. Login

2. Exercise List



The image shows two screenshots of the Arty Quest application. The left screenshot, titled '3. Exercise Chosen', shows the 'Talk Tales' exercise selected. The right screenshot, titled '4. Story telling', shows a whimsical winter scene with Santa Claus in a Hawaiian shirt and sunglasses, surrounded by penguins and reindeer. A numbered callout '1' points to the first sentence of the story: 'In a whimsical twist of fate, Santa Claus decided to celebrate Christmas in the South Pole this year.'

3. Exercise Chosen

4. Story telling



UX DESIGN FOR CHILDREN



Penguins waddled around the decorated Christmas tree.

Said Differently

Penguins **waddled** around the decorated **christmas** tree.

5. Repeat after

6. Error
Correcting

Penguins waddled around the decorated Christmas tree.

Aarty Quest

Congratulations! You have completed the Exercise! Click here to go back to the main screen!

Go back to main screen

7. Passing
exercise

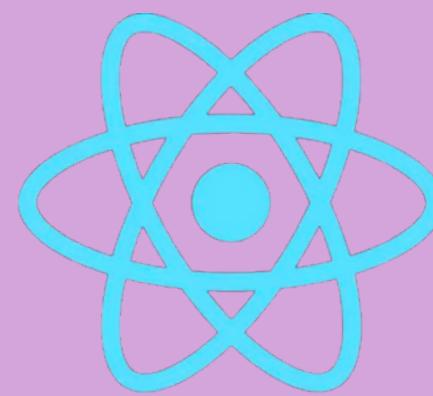
8. Finishing
Exercise



TECHNOLOGICAL SOLUTION

IMPLEMENTATION

Front-end



React JS

Back-end



Flask

- Storage Compartment
- Requests API
- External API Integration

Azure's Speech Cognitive Services



Error correcting





TECHNOLOGICAL SOLUTION

IMPLEMENTATION

OpenAI's API Integration

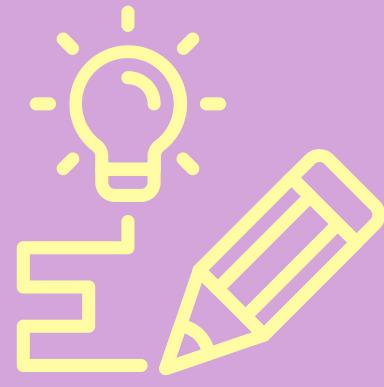
	Text generation	gpt-4-1106-preview
	Image creation	dall-e-3
	Audio production	tts-1

Exercise generation process

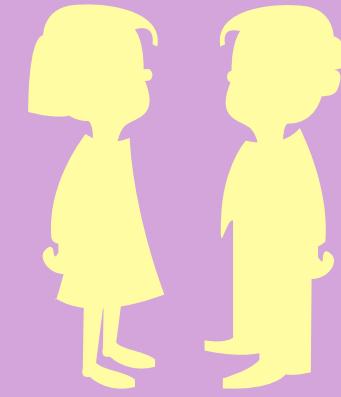
- 1 Prompts --> Creating Story
- 2 Image Generation
- 3 Audio Generation



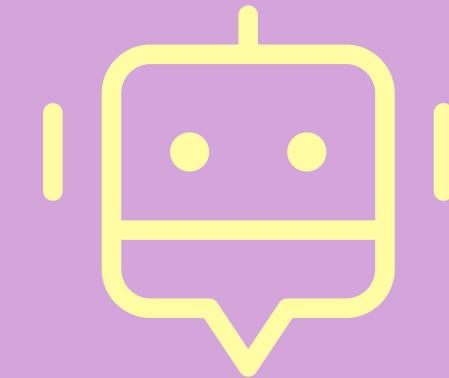
VALUE PROPOSITION



PERSONALIZED AND
ENGAGING EXERCISE



CHILD-FRIENDLY
UX-UI



AI-POWERED
EXERCISE GENERATION

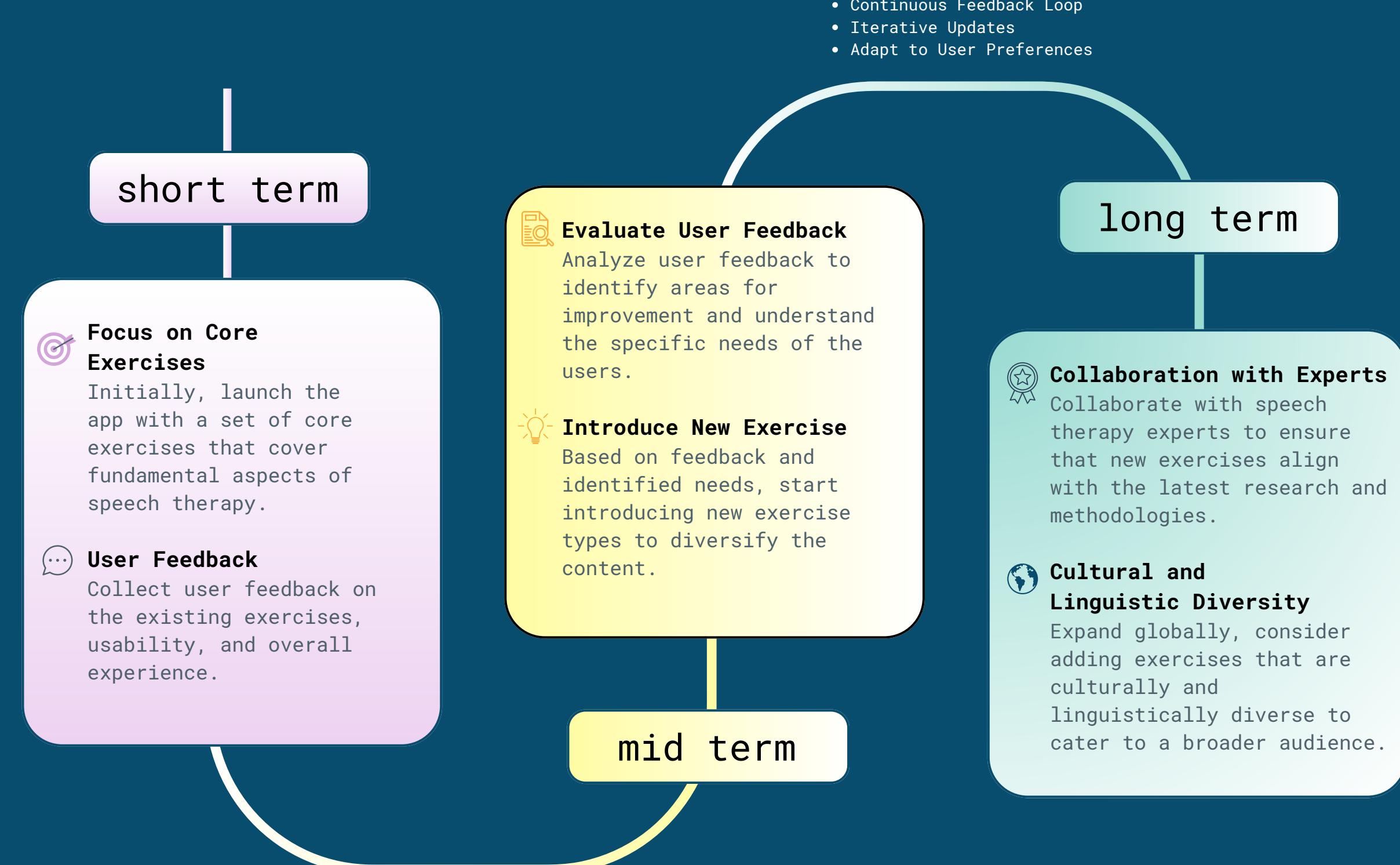


ACCESIBLE
ANYTIME



EMPOWERING
THERAPISTS

FUTURE WORK





Thank you