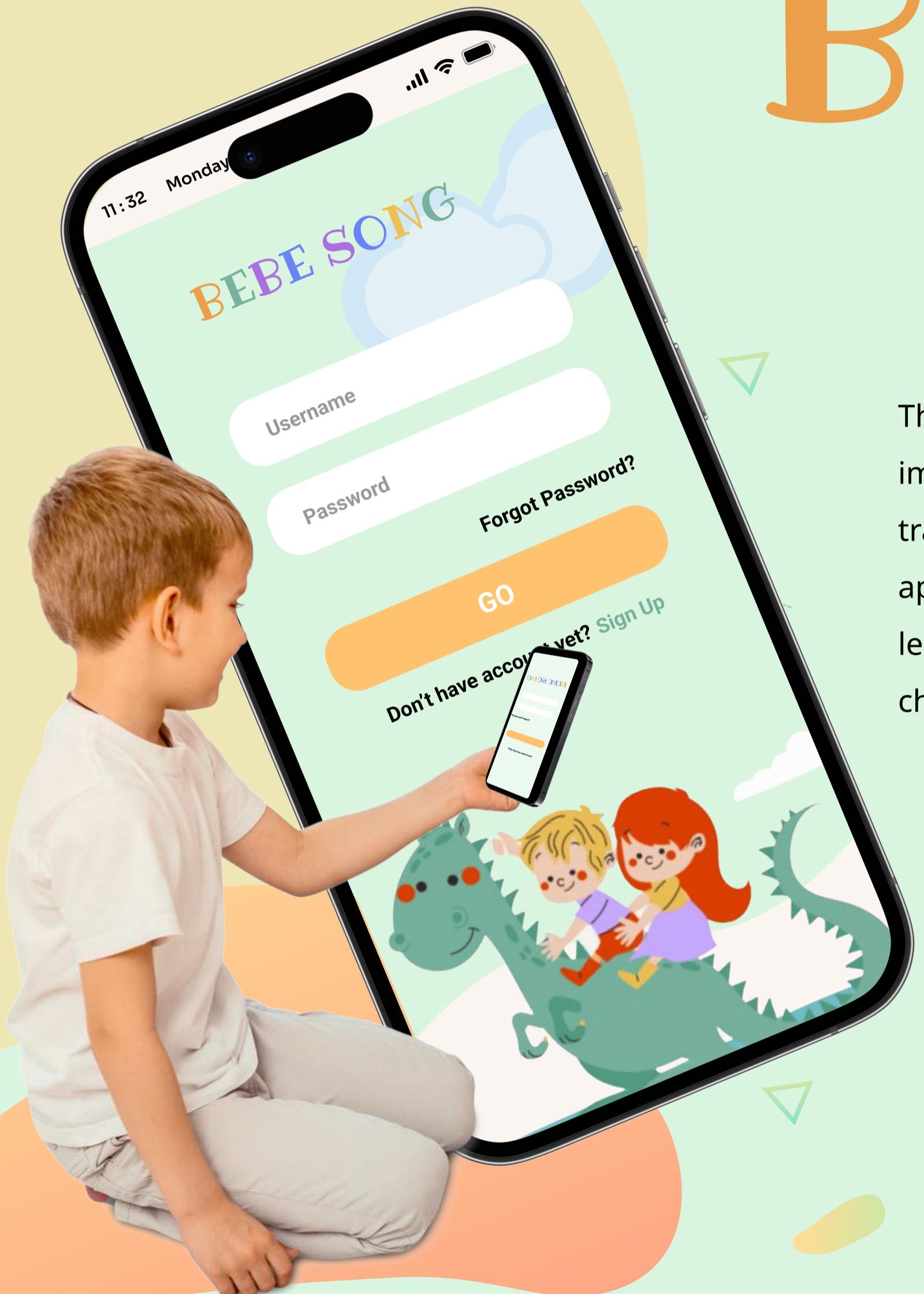


BEBE SONG

- Language learning app and supporting **XR equipment** for **hearing-impaired children**
 - **Video List:** <https://youtu.be/R8UM85vFV40>

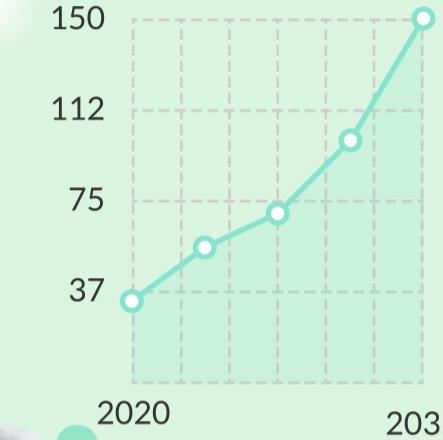
The number of hearing-impaired children worldwide is increasing rapidly. Hearing-impaired children can recover their listening and communication abilities through training. BeBe Song is a series of learning aids that allow children to use mobile app to perform AR learning on stereoscopic book, and to review what they have learned through simple VR devices. BeBe Song can better help hearing-impaired children learn languages at home and at school.



BACKGROUND

Deafness and hearing loss are widespread and found in every region and country. An estimated **466 million** people worldwide - 5% of the population - have disabling hearing loss. Today, **34 million children** have deafness and hearing loss.

SERIOUS SITUATION



The number of hearing-impaired children is **growing rapidly**. It is estimated that by 2035, there will be about **150 million** hearing-impaired children.

PSYCHOLOGICAL PROBLEMS

Hearing-impaired children suffer cognitive impairment of people and things. As a result, they become **irritable**, **self abased** and **selfish**. They may even use **violence** or **self mutilation** to vent their emotions.

45.3%

psychological problems



26.3%

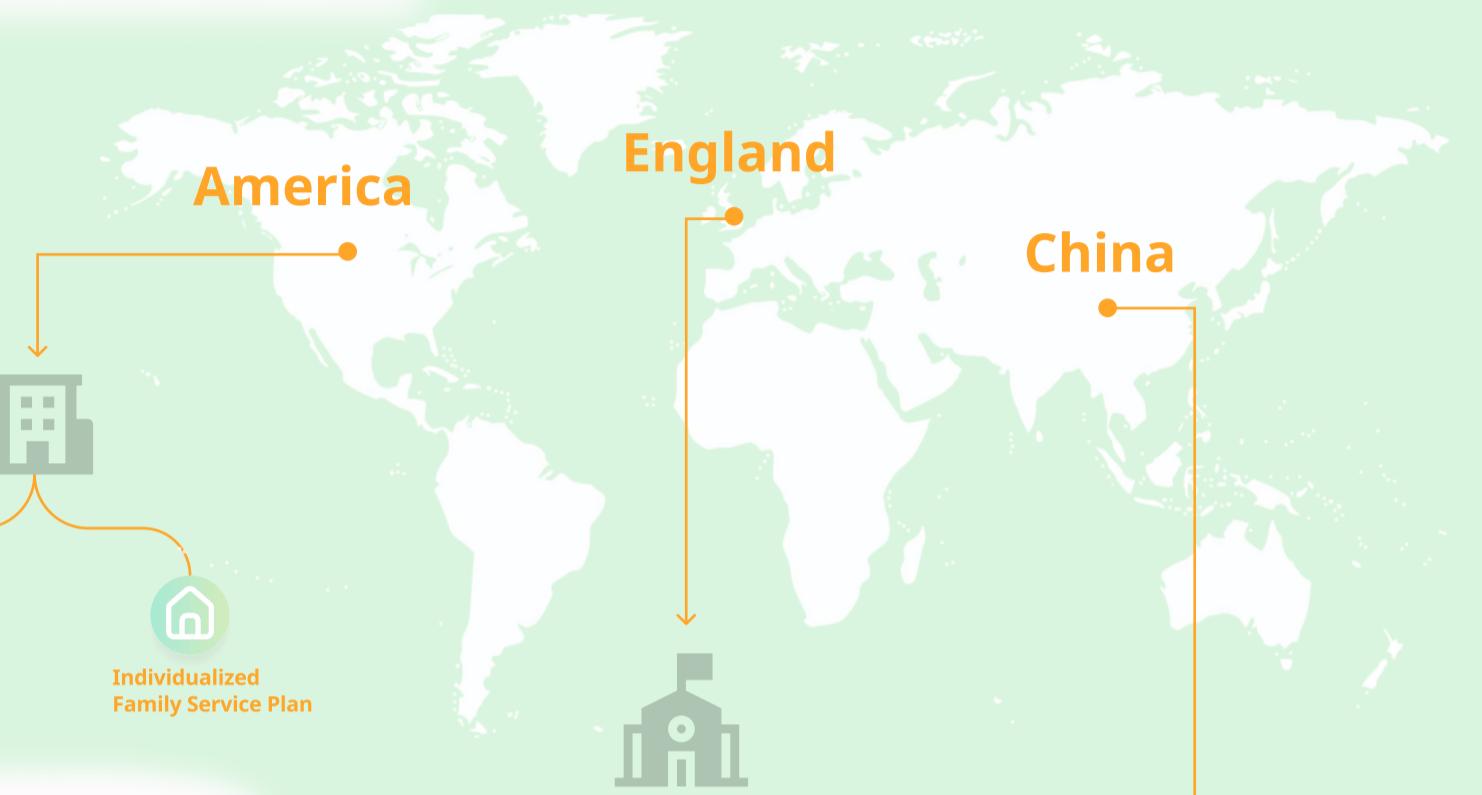
depression

Hearing-Impairment ≠ Deafness

If children's hearing impairment **can be found in time** and effective rehabilitation training can be taken, **95%** of them can recover **as normal children**.



EDUCATION POLICY



Best Period To Recover

0~6 years old

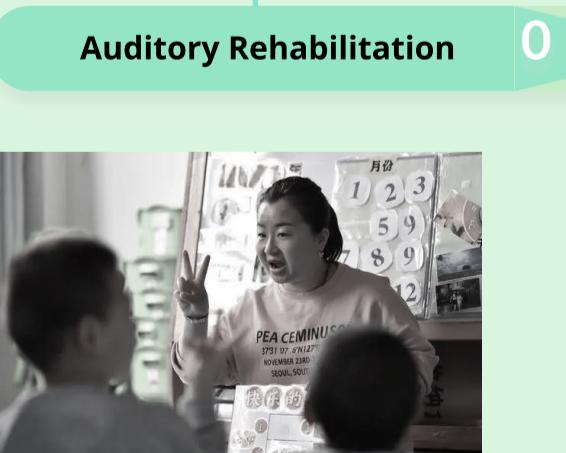
Teaching Mode

0~3 : with parents 3~6 : by themselves

Training In Rehabilitation Center

Aim : help children feel the existence of sounds using their residual hearing and establish correct auditory concepts.

Auditory Rehabilitation



Speech Therapy



Language Education



Hearing-impaired children need to recover their ability of **listening, speech, language, cognition** and **communication**. In order to better understand the **core needs** and **frustrations** of those children, I made a hearing assessment of Xiao Rui, who is now studying in the rehabilitation center.

CORE NEED

Listening ability



1



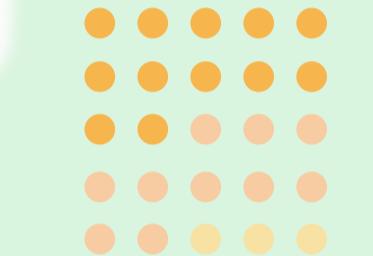
Name: Xiao Rui
Gender: male
Age: 2 years and 6 months
Hearing age: 1 year 7 months
Euer: left ear
Character: active, inattentive

"I love singing. It makes me feel happy."

Need to strengthen basic pronunciation practice
m, b sounds are easy to mix "ma ma" is said to be "ba ba"

M B

Words



Need to strengthen the use of words

Language



Be able to master the correct cognition different things

Communication

Need to strengthen awareness of waiting and rotation



FRUSTRATION



Rehabilitation Center

- rehabilitation methods are **rigid**
- insufficient listening compensation

inability to understand and learn from multiple senses.



Home Education

- do not know** how to rehabilitate their children **at home**.

resulting in inattention and poor teaching results



Child

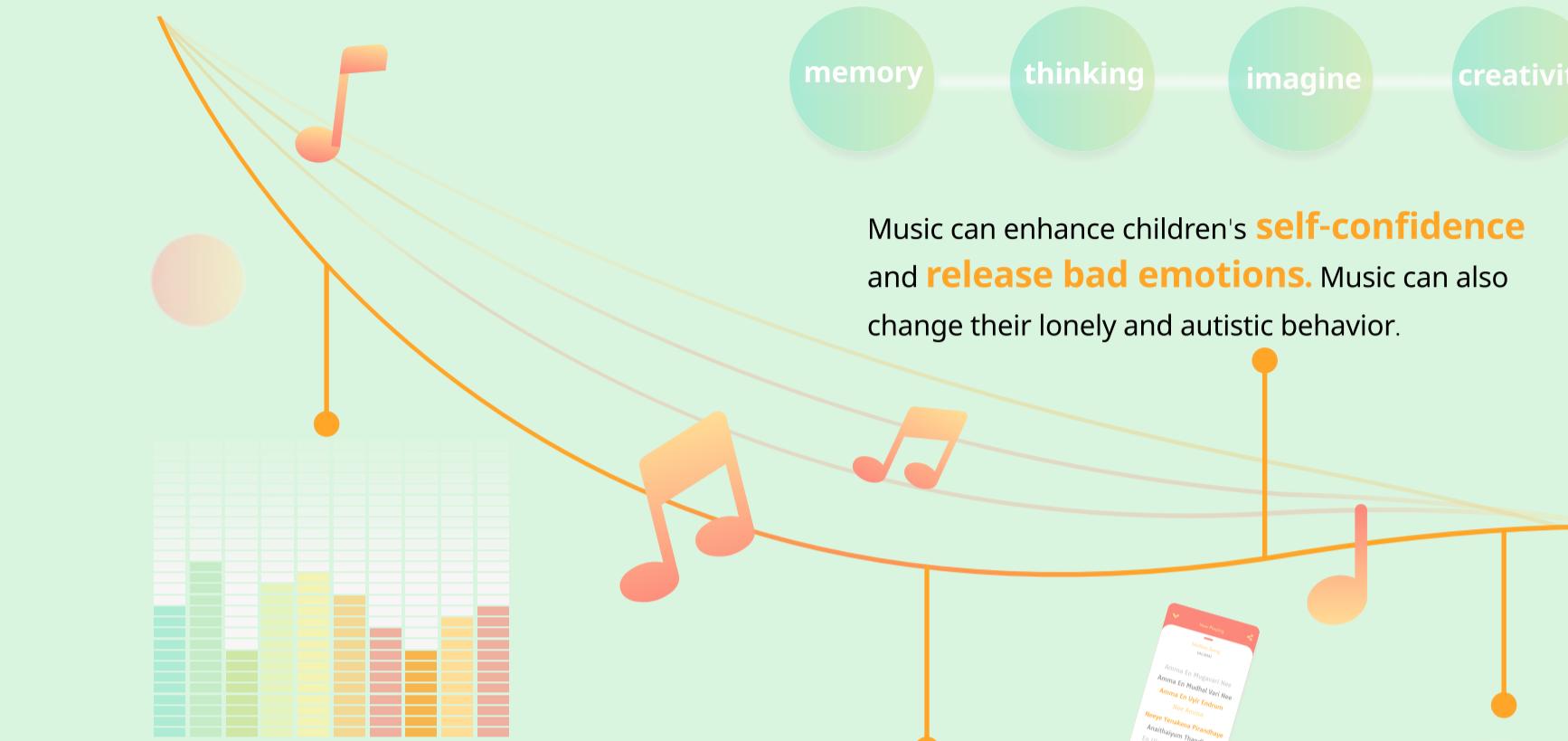
- feel **bored** and **nervous**
- lack of self practice tools

have different degrees of school weariness



Through research, I have noticed that **music** and **visualisation** education can attract children's attention well and satisfy their core needs.

MUSIC EDUCATION



The audio range of music is wide. Music can provide **sufficient frequency stimulation** for hearing-impaired children.

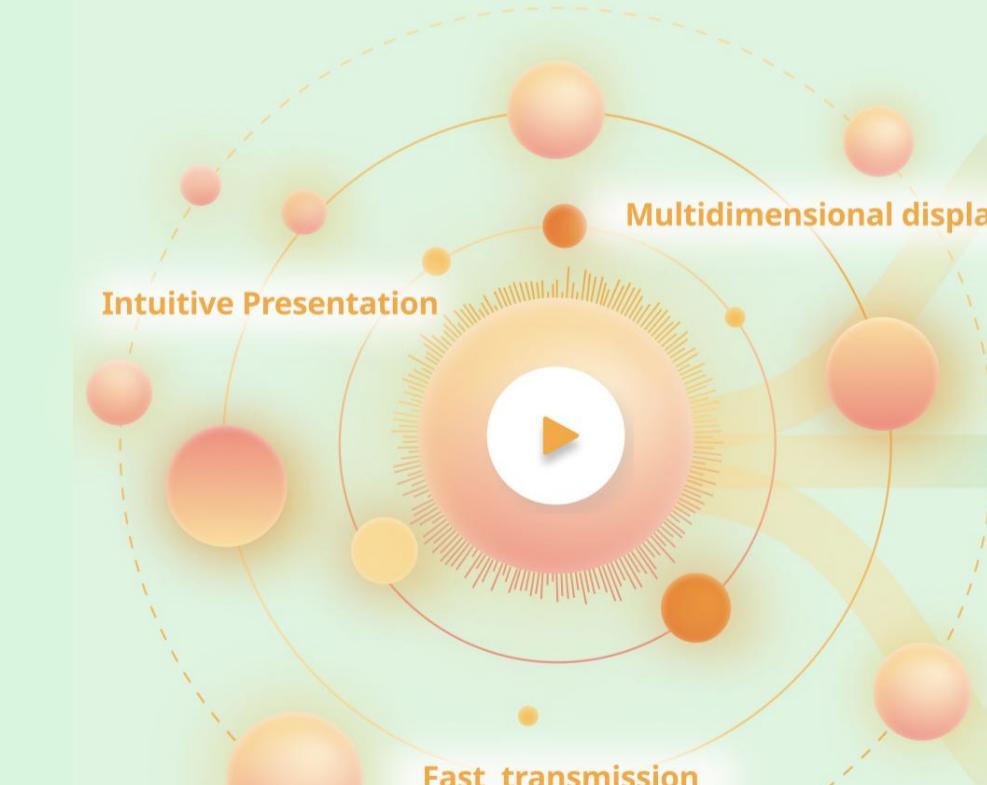
The good auditory stimulation brought by music, together with the input of lyrics, can improve children's **auditory comprehension**.

Music can ease the mood and **reduce the pressure of voice production**. It can also change the behavior of loneliness and autism.



In the process of singing, music can effectively relax the vocal cords of children and promote the **harmonious development of body and mind**.

VISUALISATION



Visualization will mobilize **multiple senses** to process information.

Eye
Brain

It will produce the **concentration** of vision, hearing and thinking.

Ear

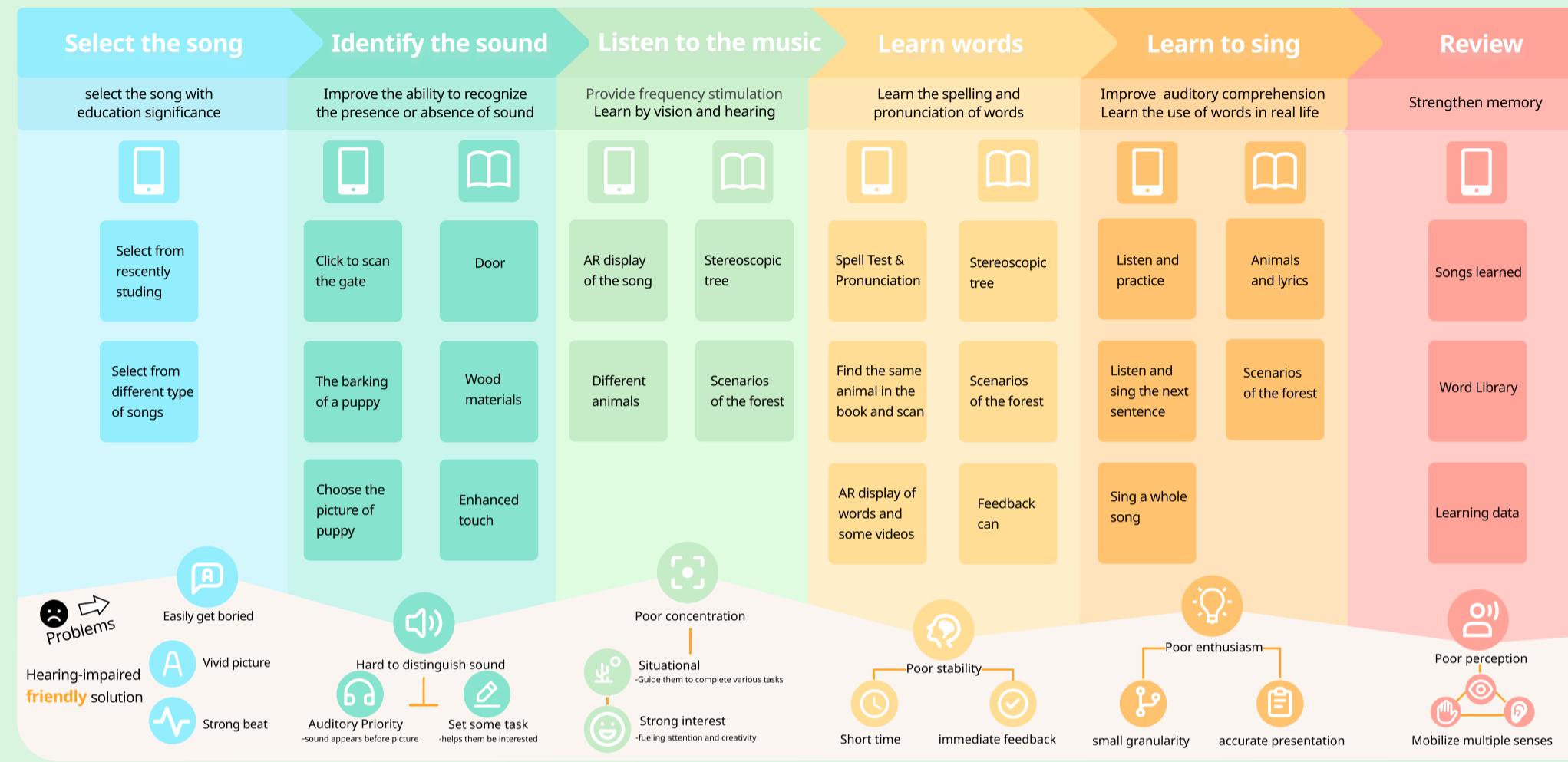
Achieve sound compensation of hearing-impaired children

Improve hearing-impaired children's concentration

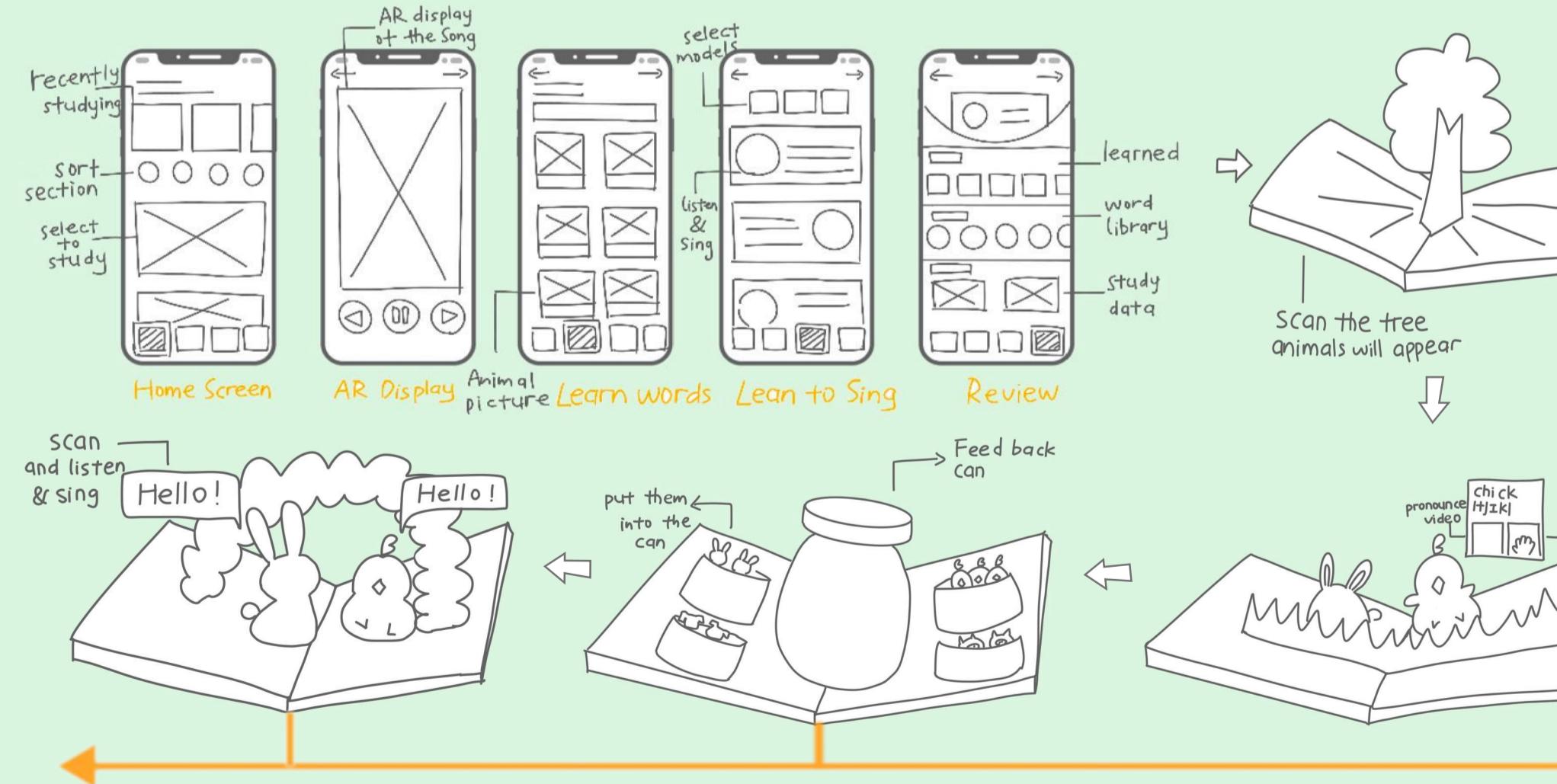
Stimulate hearing-impaired children's interest in learning

DESIGN STAGE

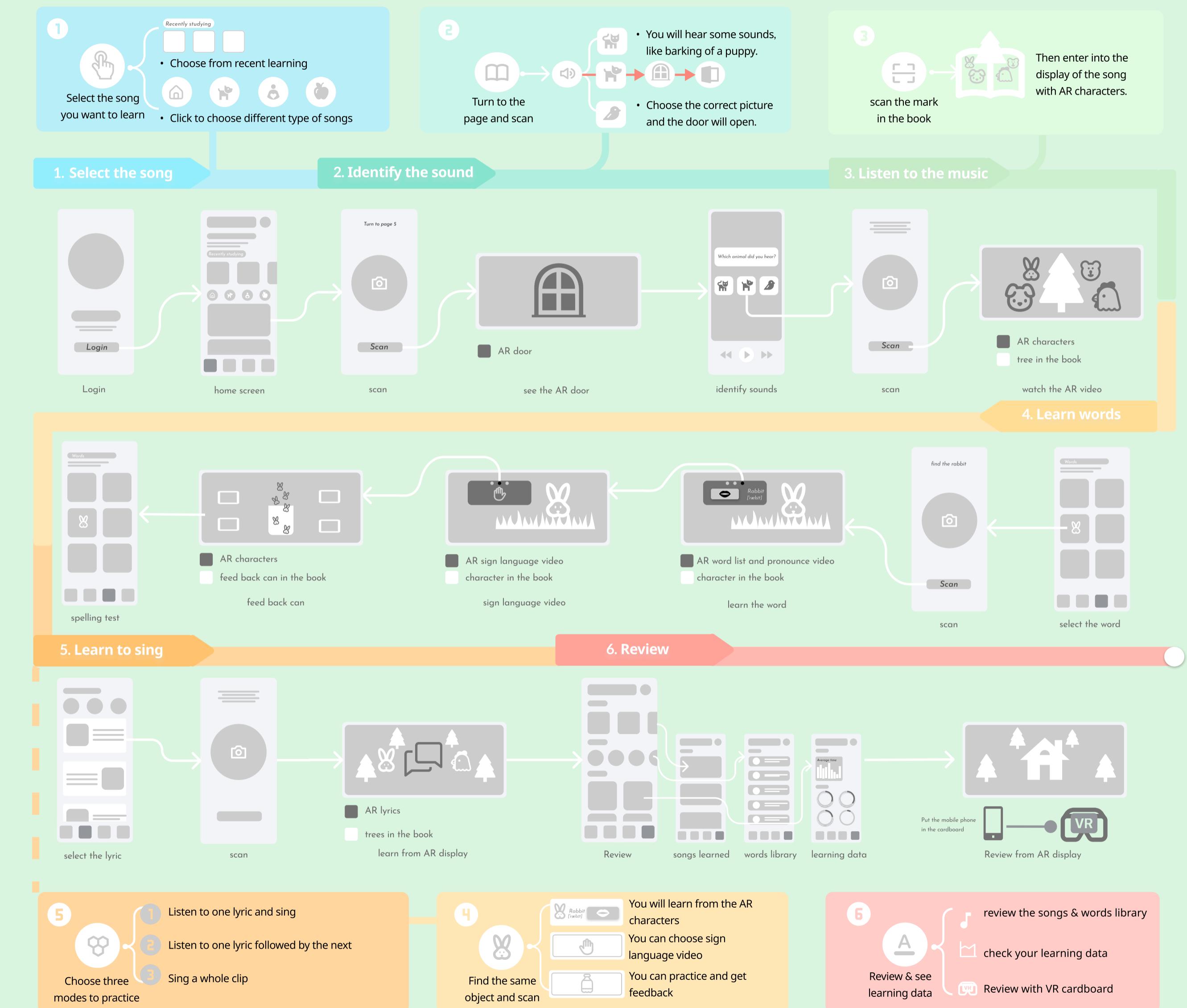
However, there is a lack of music textbooks and auxiliary tools which are friendly to hearing-impaired children. I hope to design a **music app AR and VR technology** with a **pop-up book** to help hearing-impaired children learn language.



SKETCH



LOW FIDELITY



DEVELOPMENT

1 POP BOOK



Step1
Cutting paper with
scissors to form
different patterns

Step2
Collage stereo
graphics on the pages

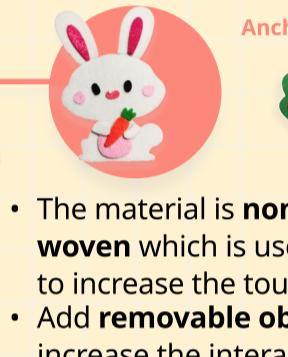
Step3
Compare and
modify with the
modeling diagram

Step4
Add decorations
on the pages

Step5
Complete the production
of each page

Step6
Sew each page into
a book

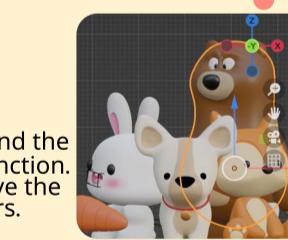
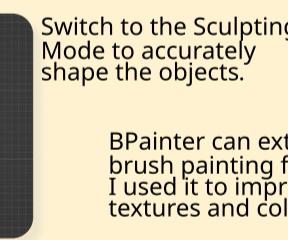
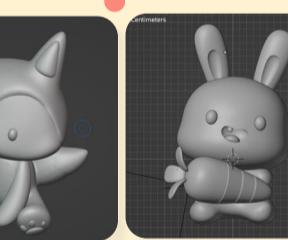
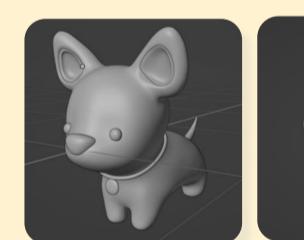
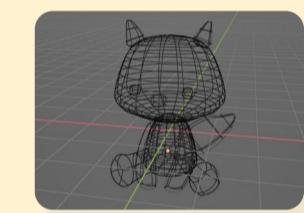
DISPLAY OF SOME PAGES



2 MODELING WITH BLENDER

Selected the original meshes and
adjust the point, line and surface
of the objects in edit mode.

Select the material preview mode and mainly adjust the basic color, roughness,
metallic and so on. Add textures, bump and adjust relevant parameters and
determine the output channel to achieve better results.



TECH WORKFLOW

Blender & Unity

To engage children's multiple senses, I developed
VR and AR devices using Blender and Unity for
creating models and animations.

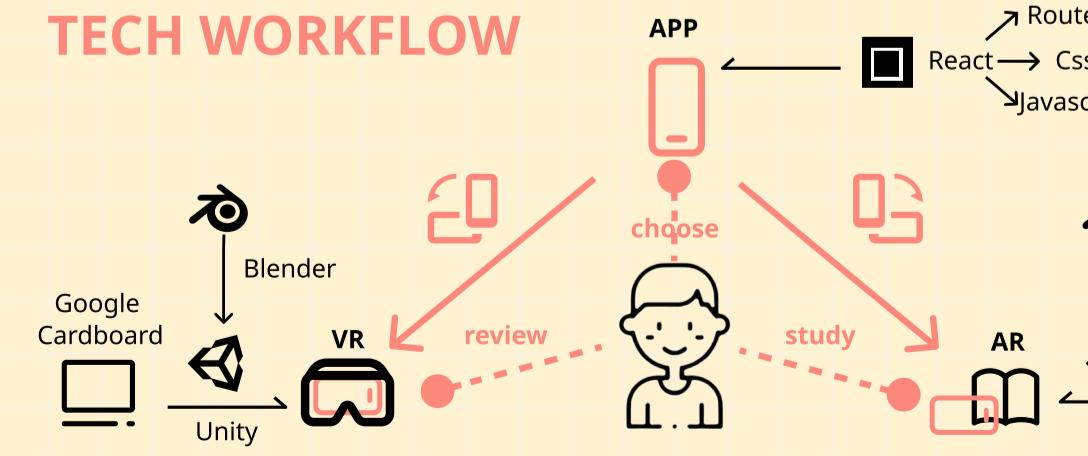
Vuforia & Visual Studio

I incorporated the Vuforia platform and Visual
Studio programming software for interactive
development.

React

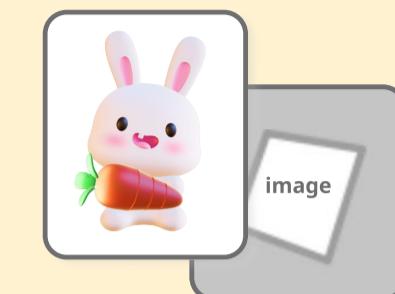
I utilize React for writing backend code to
implement app functionality.

TECH WORKFLOW



3 AR

vuforia → Unity
Import Image from Pop-book into Unity3D as anchor



Import the images from pop-book into Vuforia as the anchors for AR display

ANCHOR CREATE

Import the objects from pop-book into Vuforia as the anchors for AR display



Import the models corresponding to each page in unity, set lighting and scripts, and complete the production of AR animation and music interaction.

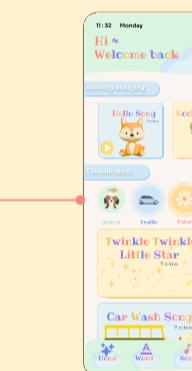
AR INTERACTION

Complete AR interaction and script writing



4 REACT PROGRAMMING

LINK PAGES



The Routes are used to link each page. The functions and the navigation are implemented by them. We create the Route.js to define each route path. And import the useNavigate Component.

IMPLEMENT FUNCTION



Use the CSS to create the hover and clicking effects

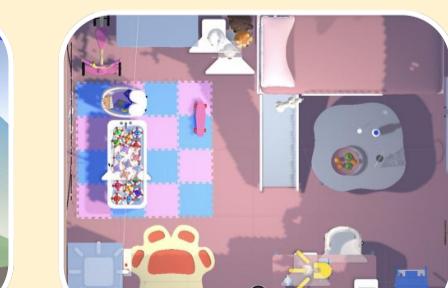
Simulate a database to truly implement the login function

turn over function be implemented by ternary operator

5 VR

Blender → Unity

Import The Model from Blender into Unity3D



The tone of house is pink which can make children feel soft and sweet. The outside environment resource is from the Resource Store in the Unity.

Design the layout and add the objects appeared in the song to the room. Change the color Space to Linear Set a point light as the main light and 7 spotlight

Change the Color Space to Linear Set a point light as the main light and 7 spotlight

MODEL INFO

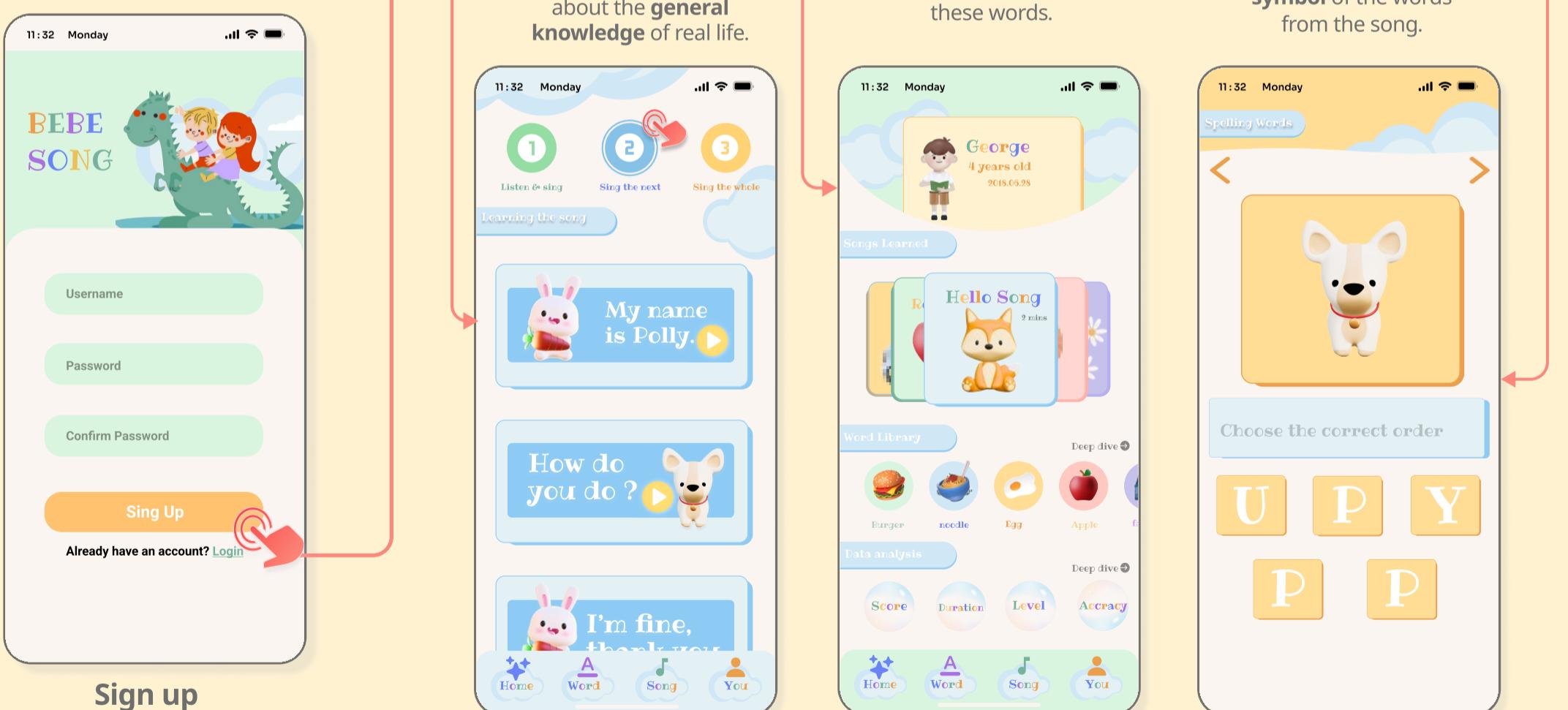
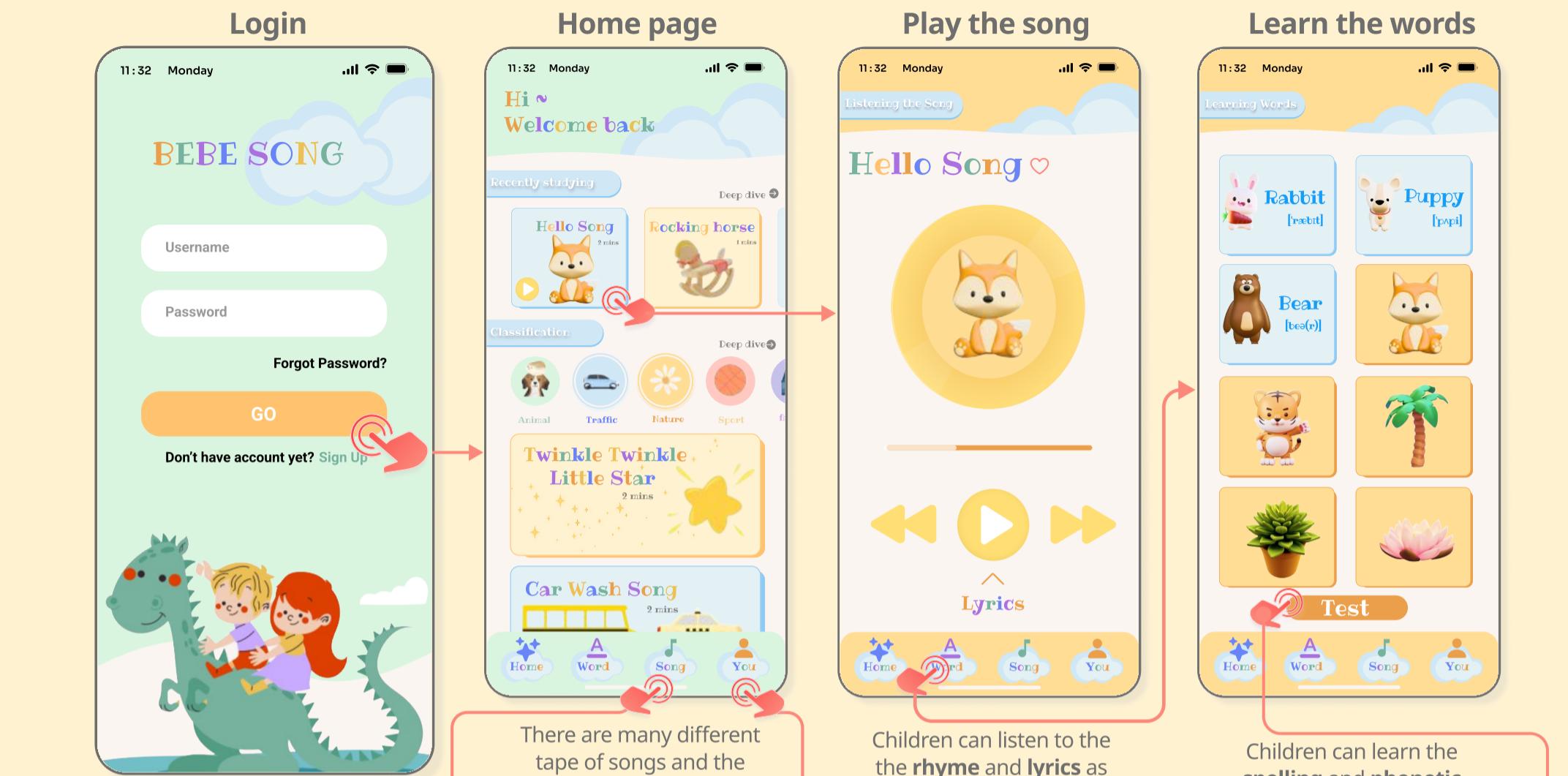
Import The Model from Blender into Unity3D



Use Animation and Event Trigger cooperating with the use of some scripts

Add the UI in the VR room and add the audio to enhance children's memory

HIGH FIDELITY



Sign up

Children can register for BeBe song. Or if they already have the account, they can log in to the application and start the wonderful journey in BeBe song.

Learn the song

Children can choose three modes to practice which can enhance their grasp of words and pitch.

Review

Children can check the learning data, such as learning duration and total scores. It can help to evaluate the learning result.

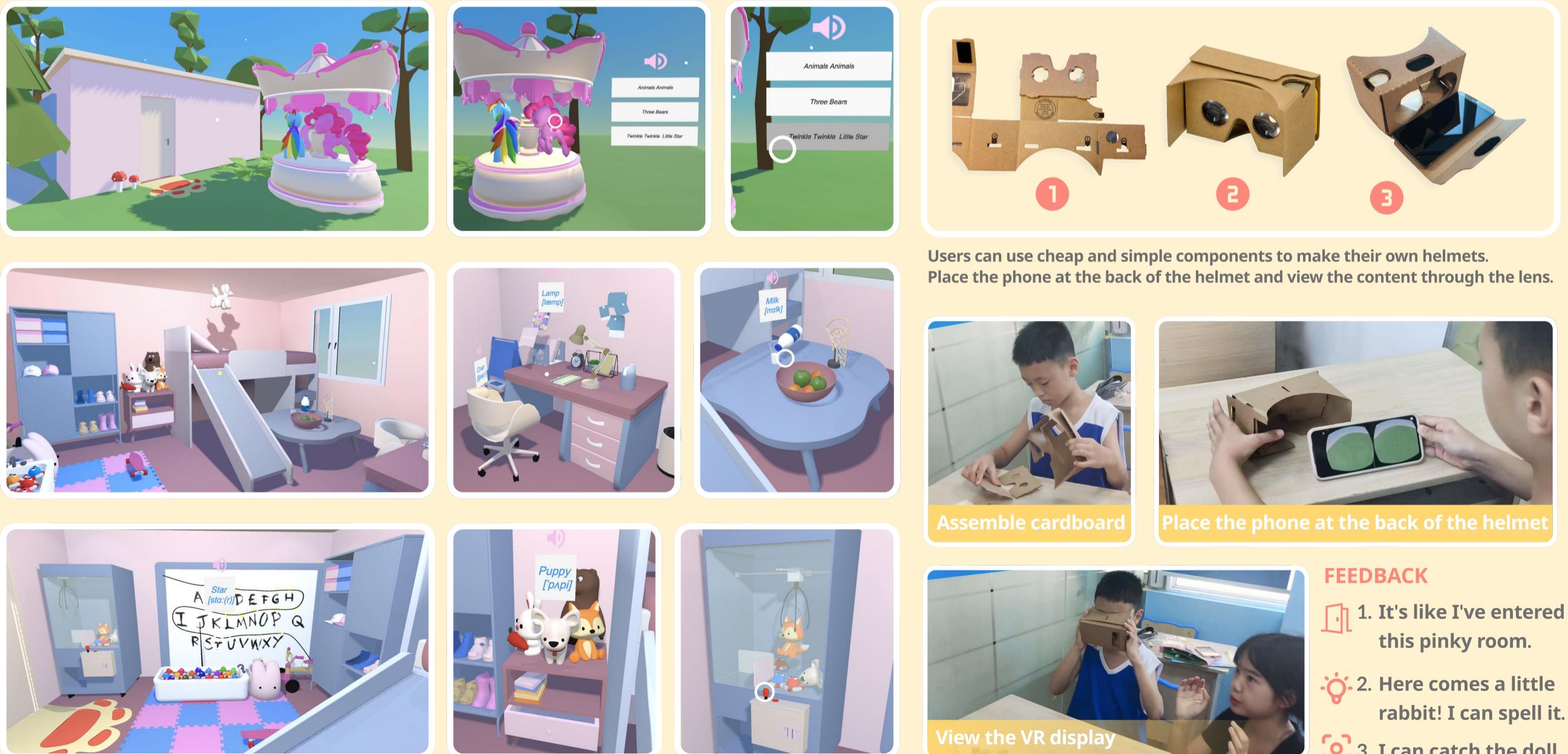
Spell test

Children can play Scrabble to test whether they can remember the spelling of words.

BOOK & AR SCENARIO



VR SCENARIO



TEST RECORDS

I brought BeBe Song's series of products to the hearing-impaired children's center for communication with the teachers, testing with the children, and recording feedback.



INTERVIEW

Teacher in the center

😊 "This tool excels in the classroom, actively assisting students in understanding and applying knowledge."

😢 "However, occasional customization may be needed to meet individual student needs."



THE TEST ONE

**Age: 3 years old
Gender: female**

😊 "This is so much fun! I can sing along with the animals, and I really want to play it again!"

😢 "It's a little bit challenging, and sometimes I don't sing perfectly."

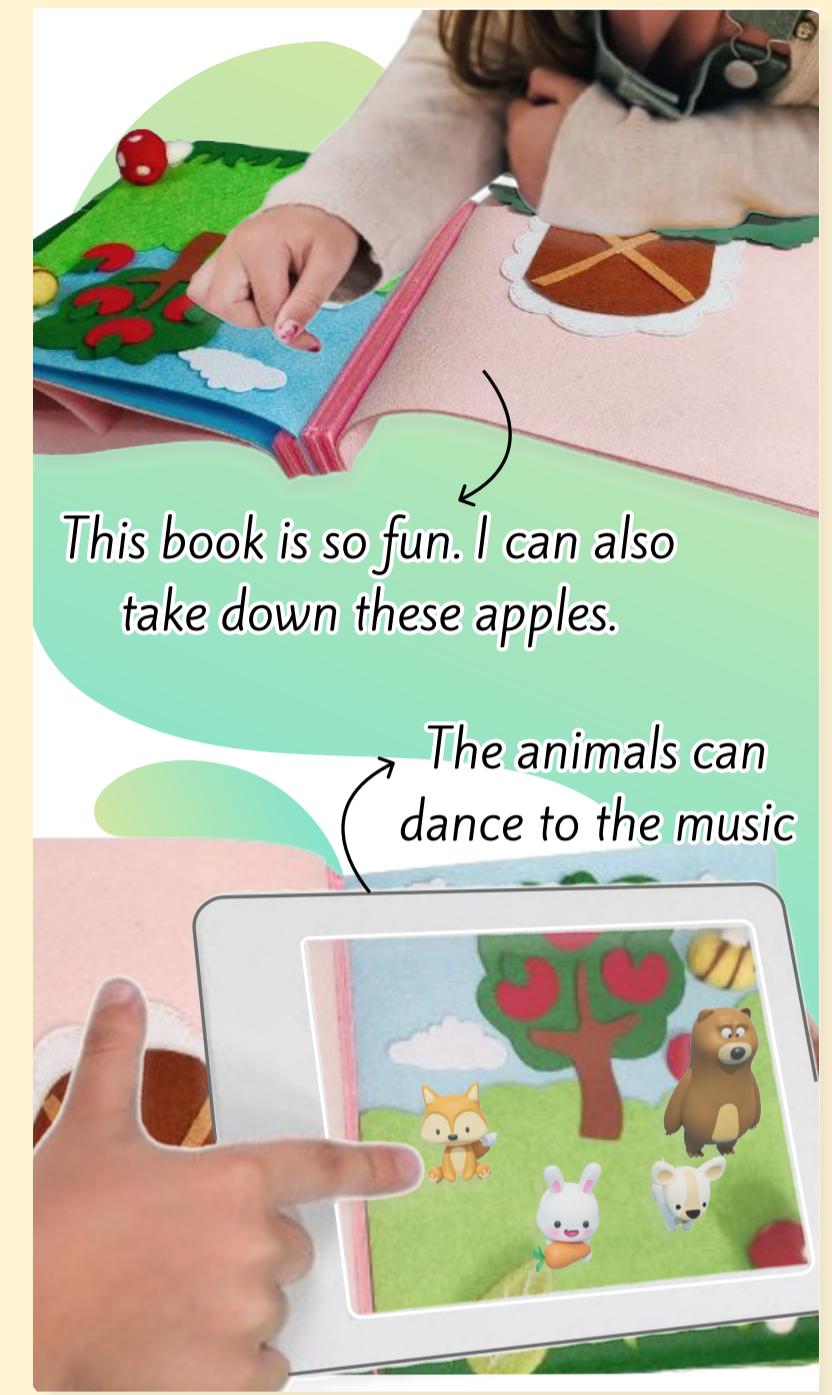
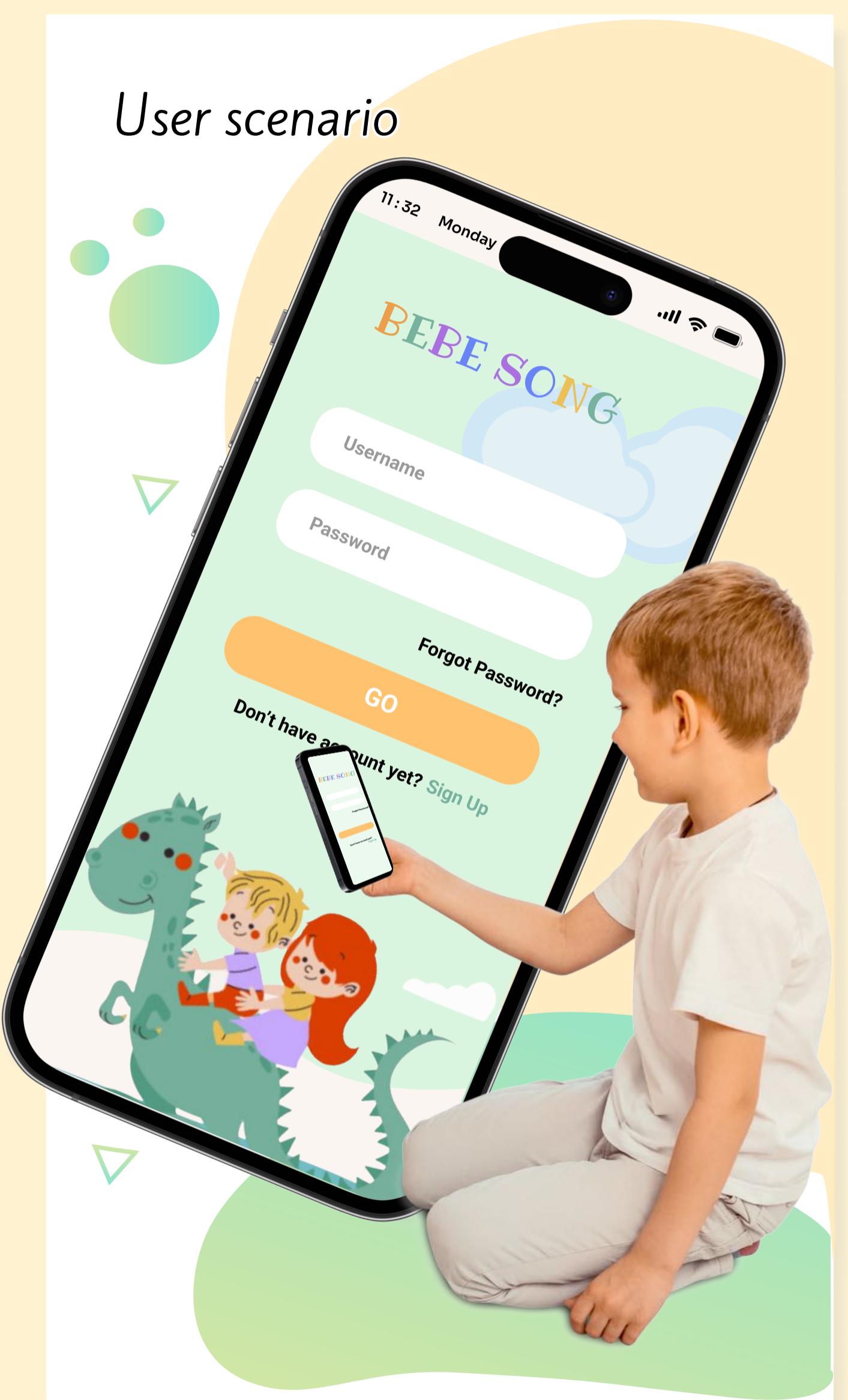


THE TEST TWO

**Age: 6 years old
Gender: male**

😊 "This game is so much fun, and I can learn new words too. I love it!"

😢 "I wish there were more different things to try and play with."



Conclusion

BeBe Song series products excel in effectively supporting student learning and sparking their interest; nonetheless, occasional customization may be needed to meet individual needs.