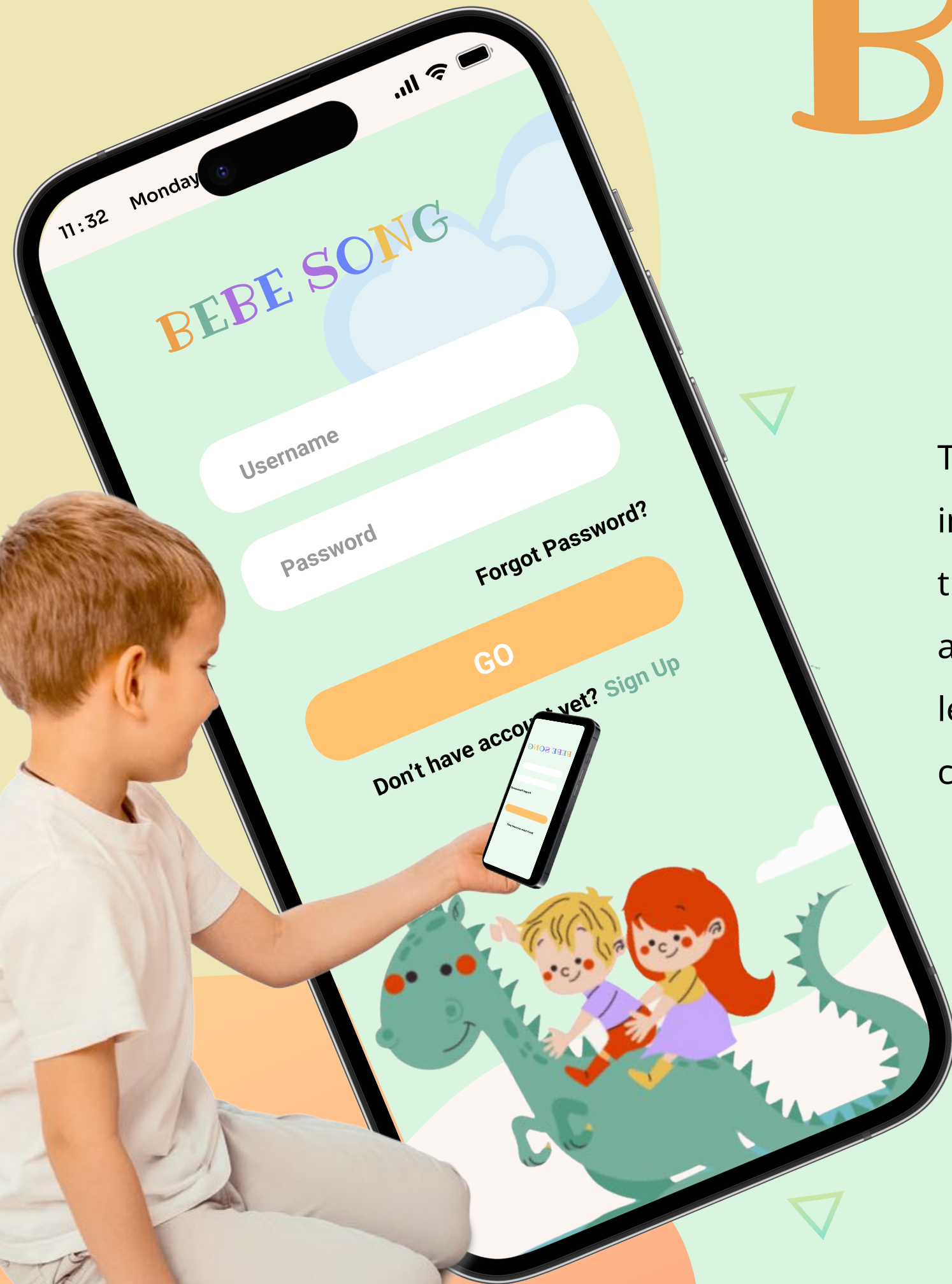


BEBE SONG

- Language learning app and supporting **XR equipment** for **hearing-impaired children**

• **Video List:** <https://youtu.be/R8UM85vFV40>

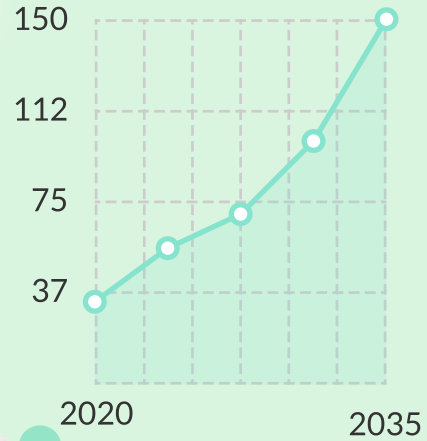
The number of hearing-impaired children worldwide is increasing rapidly. Hearing-impaired children can recover their listening and communication abilities through training. BeBe Song is a series of learning aids that allow children to use mobile app to perform AR learning on stereoscopic book, and to 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.

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**.



PSYCHOLOGICAL PROBLEMS

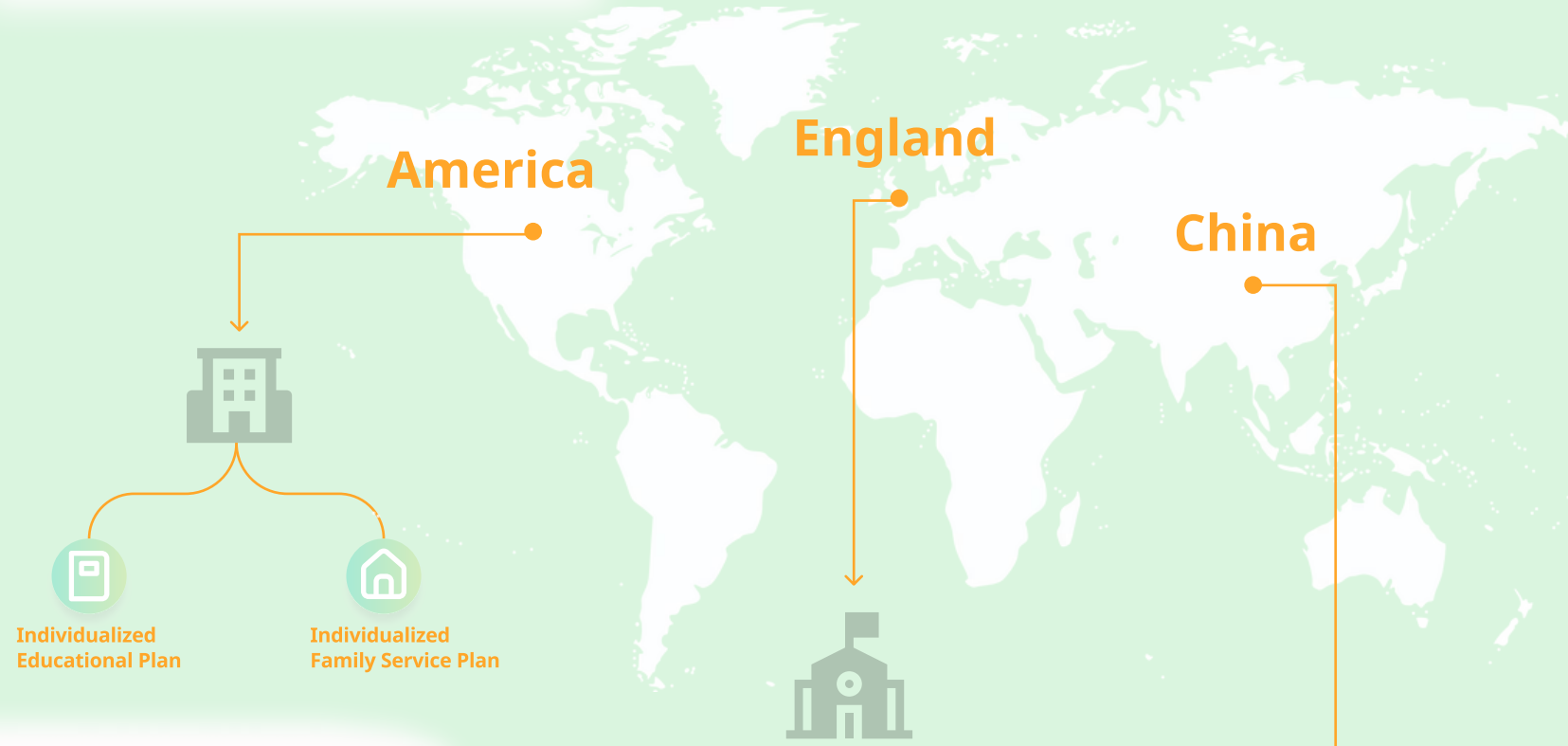
Hearing-impaired children suffer cognitive impairment of people and things. As a result, they become **irritable**, **self abased** and **selfish**. They may even use **violence** or **self mutilation** to vent their emotions.

45.3% psychological problems

26.3% depression



EDUCATION POLICY



Best Period To Recover

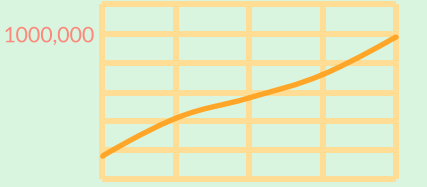
0~6 years old

Teaching Mode

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

2.5% students study in special schools in the UK,

2.5%



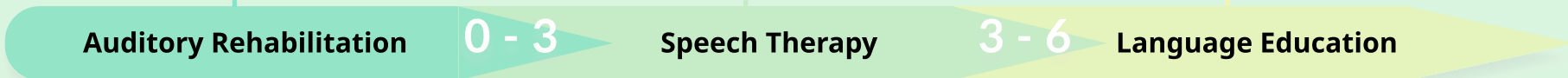
the number of students in special school has increased to **919,800**.

Training In Rehabilitation Center

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

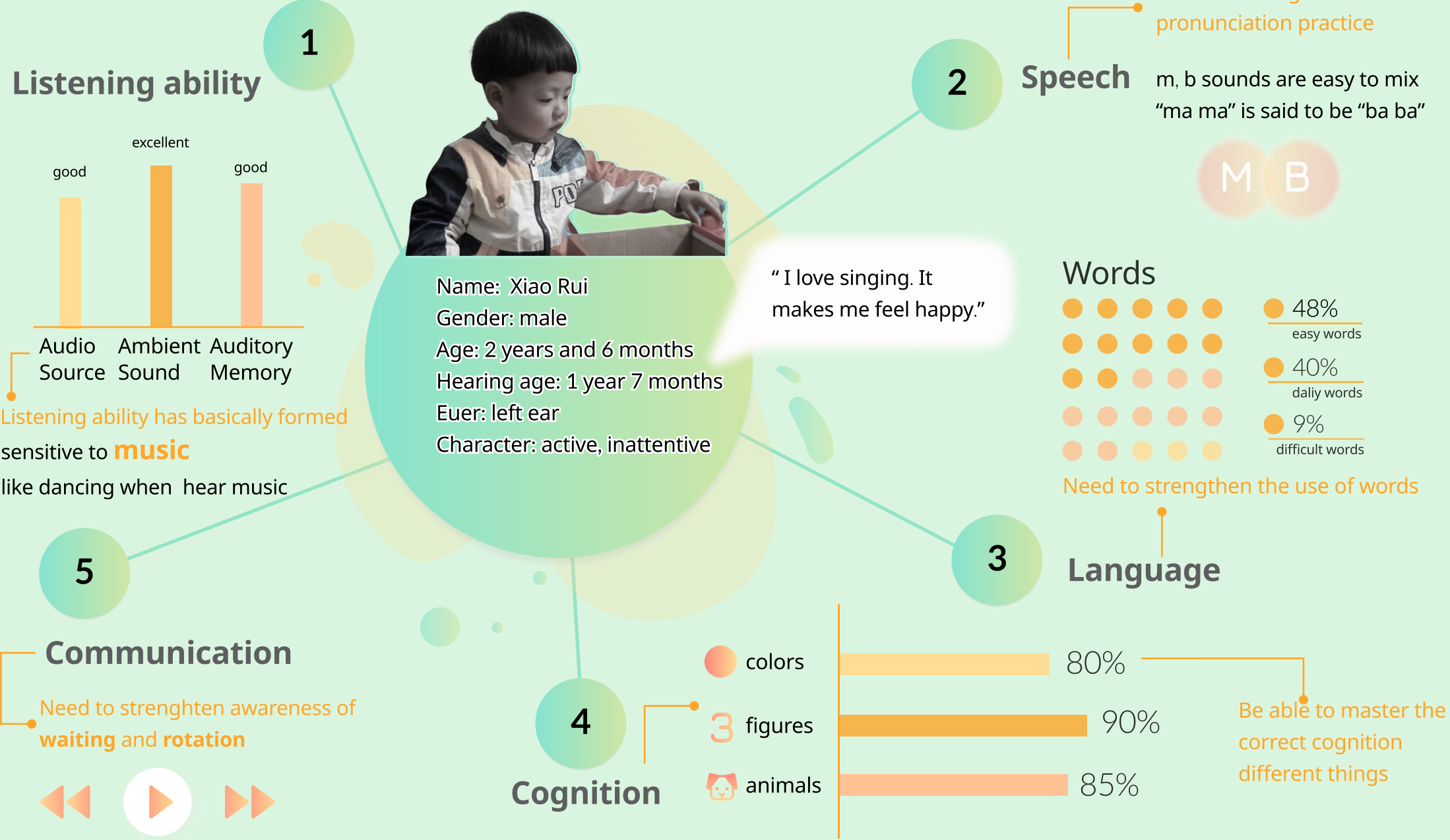
Aim : Breathing training, relaxation training and voice training to help children pronounce comfortably and accurately.

Aim : Although some children have mastered some words and expressions, they cannot apply them to life.

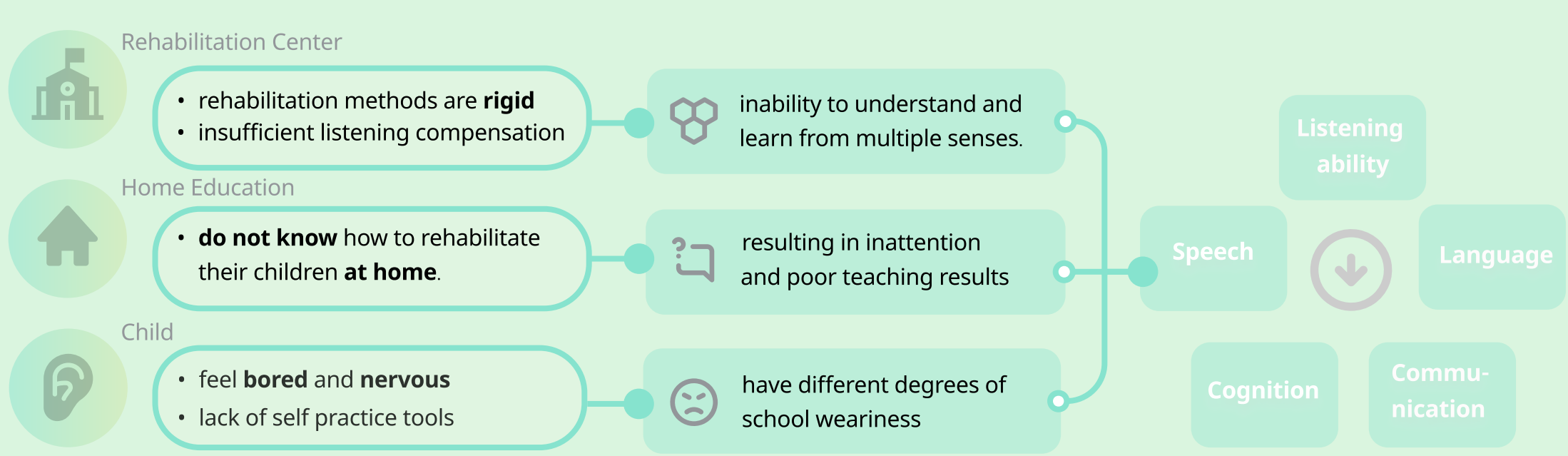


Hearing-impaired children need to recover their ability of **listening, speech, language, cognition** and **communication**. In order to better understand the **core needs** and **frustrations** of those children, I made a hearing assessment of Xiao Rui, who is now studying in the rehabilitation center.

CORE NEED

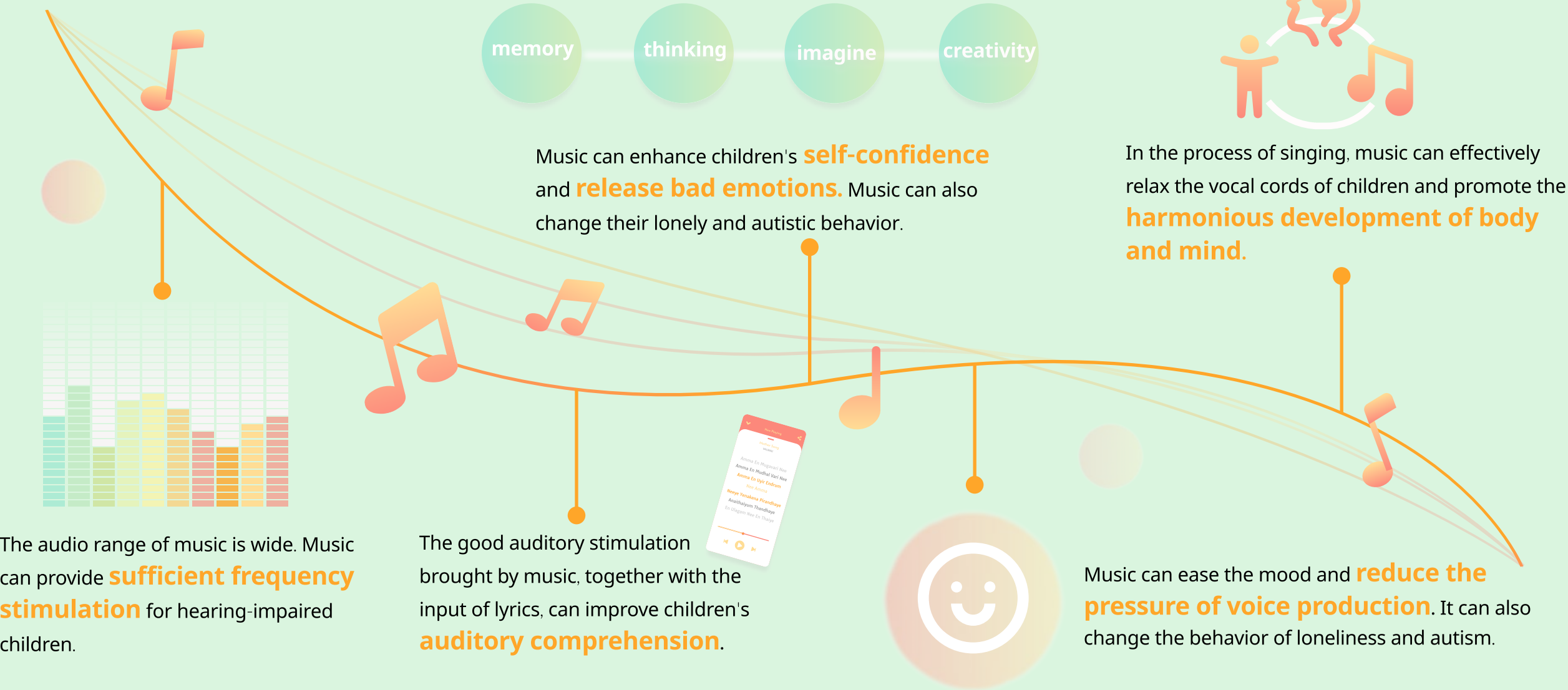


FRUSTRATION

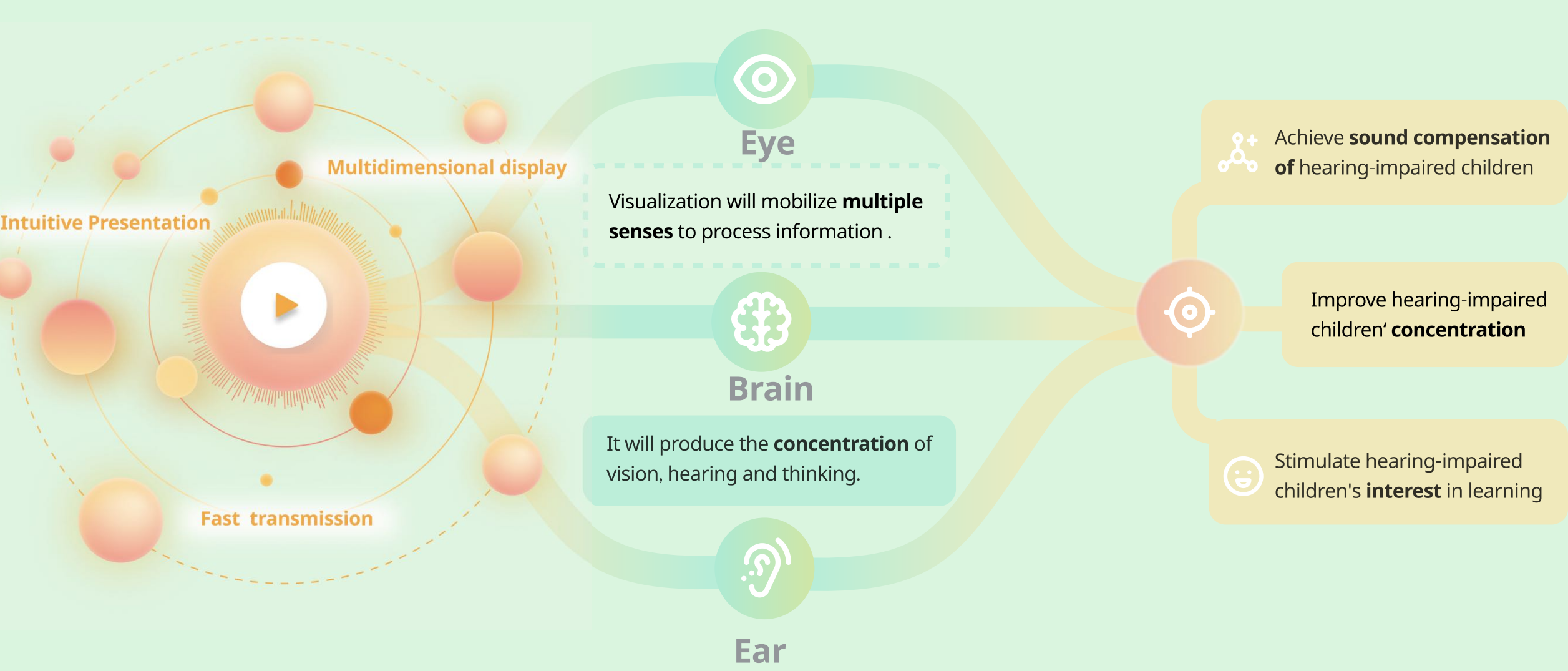


Through research, I have noticed that **music** and **visualisation** education can attract children's attention well and satisfy their core needs.

MUSIC EDUCATION

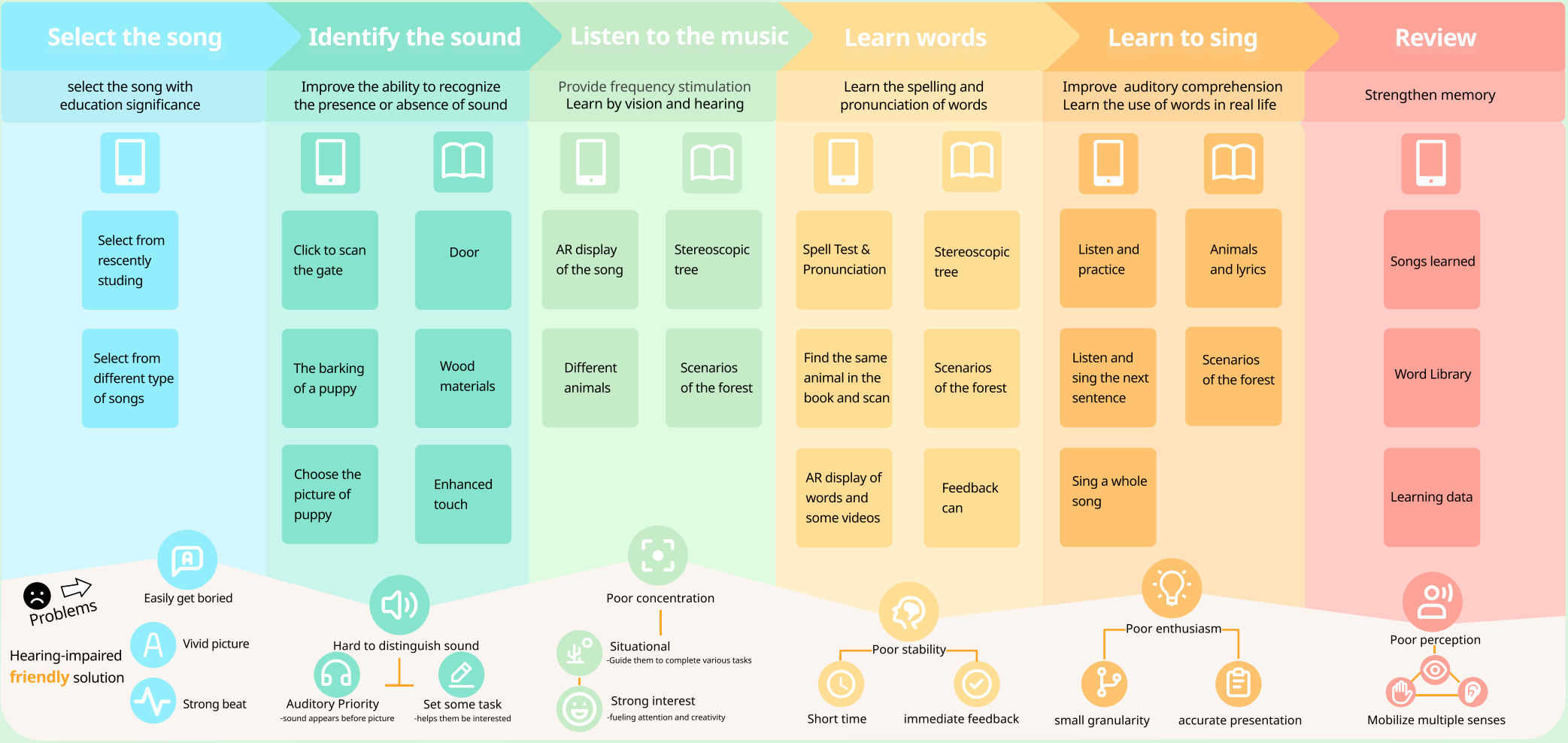


VISUALISATION

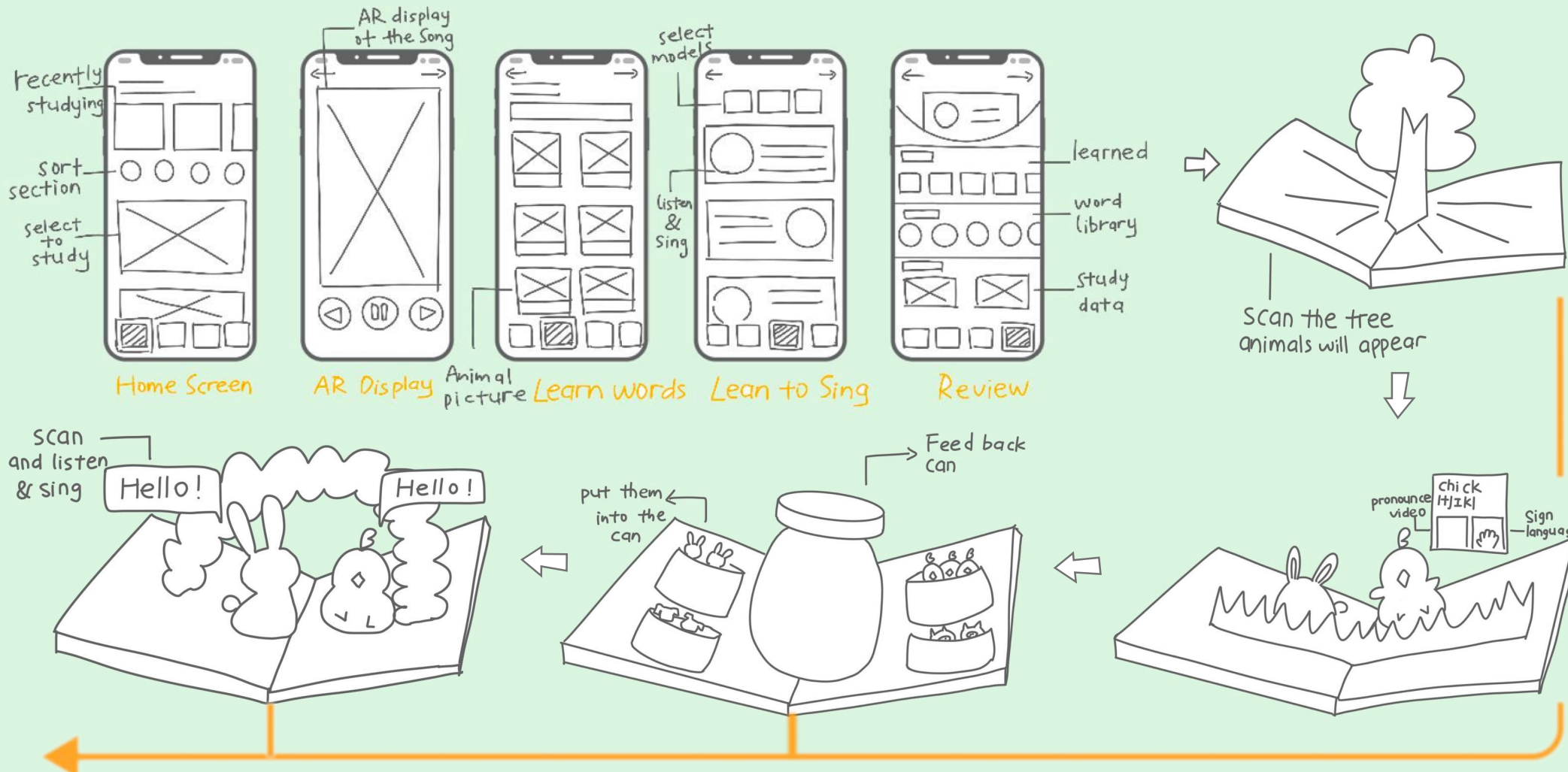


DESIGN STAGE

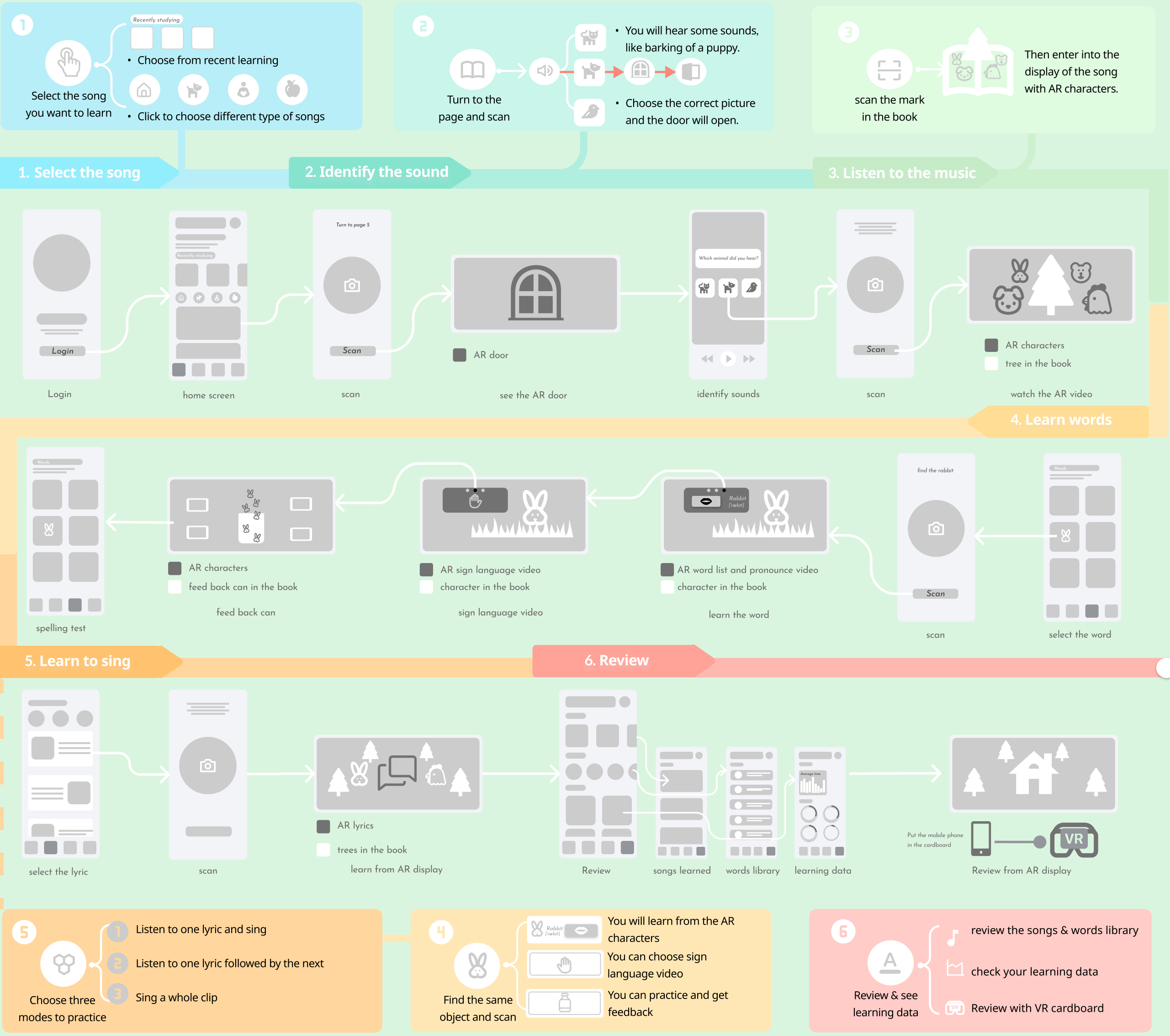
However, there is a lack of music textbooks and auxiliary tools which are friendly to hearing-impaired children. I hope to design a **music app** **AR** and **VR** technology with a **pop-up book** to help hearing-impaired children learn language.



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

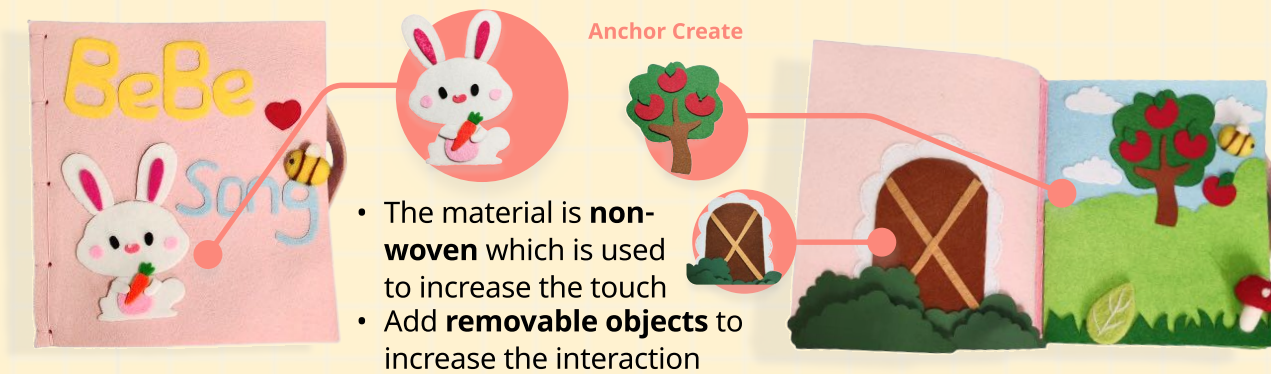


Step5
Complete the production of each page



Step6
Sew each page into a book

DISPLAY OF SOME PAGES

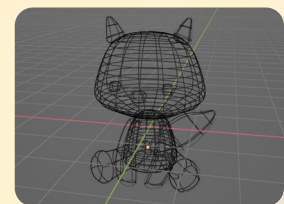


- The material is **non-woven** which is used to increase the touch
- Add **removable objects** to increase the interaction

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, metallicity and so on. Add textures, bump and adjust relevant parameters and determine the output channel to achieve better results.



BASIC SHAPING



SCULPTING



SHADING



ADD TEXTURE

DISPLAY OF SOME MODELS



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

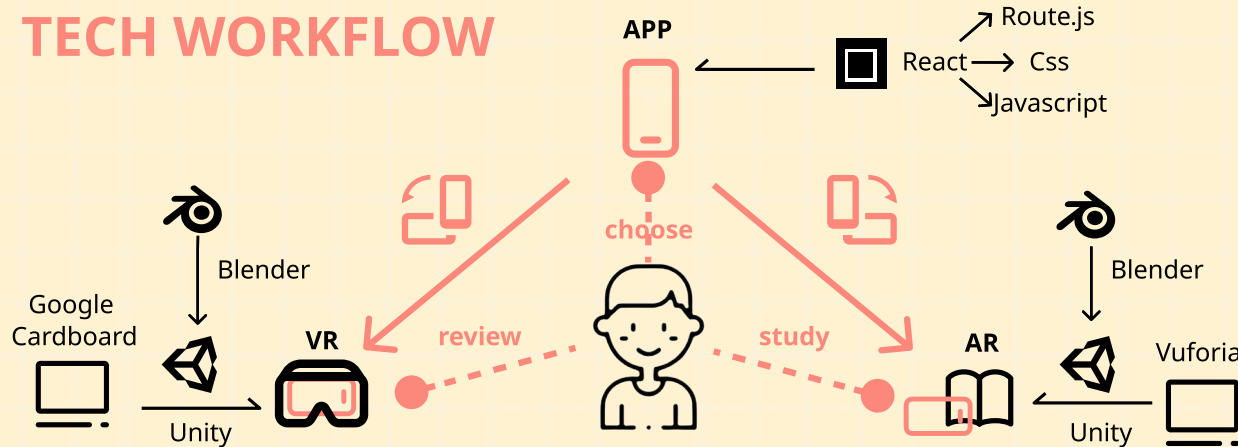


I incorporated the **Vuforia** platform and **Visual Studio** programming software for interactive development.

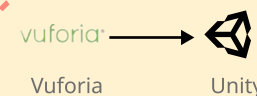


I utilize **React** for writing backend code to implement app functionality.

TECH WORKFLOW



3 AR

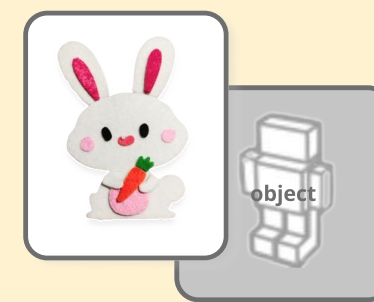


ANCHOR CREATE

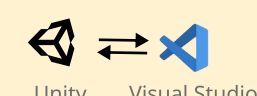
Import Image from **Pop-book** into **Unity3D** as anchor



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

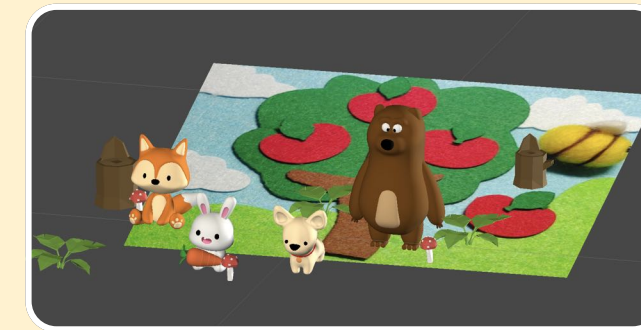


Import the **objects** from pop-book into **Vuforia** as the **anchors** for AR display



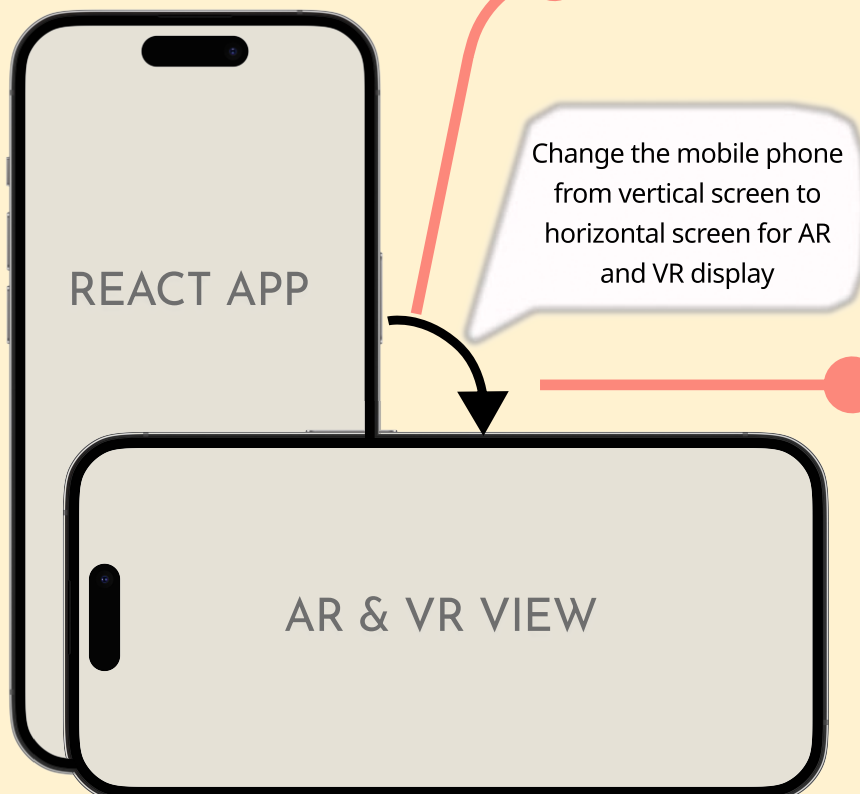
AR INTERACTION

Complete **AR interaction** and **script writing**



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

4 REACT PROGRAMMING

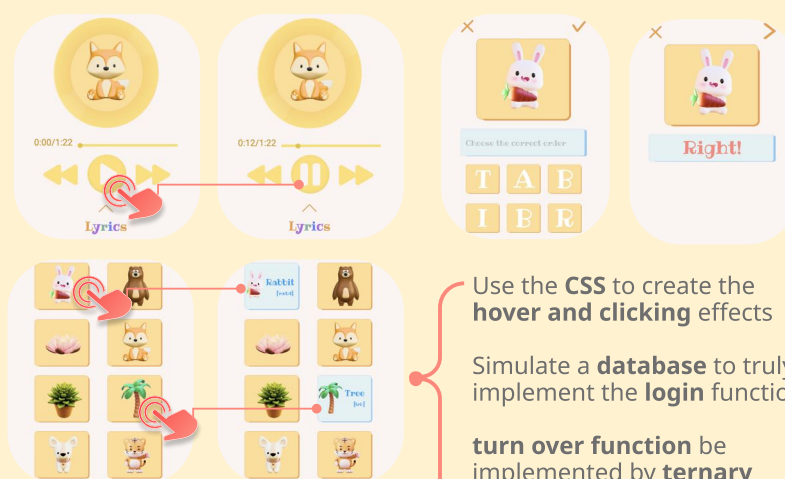


LINK PAGES



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 **useNavigative** Component.

IMPLEMENT FUNCTION



Use the **CSS** to create the **hover** and **clicking** effects

Simulate a **database** to truly implement the **login** function

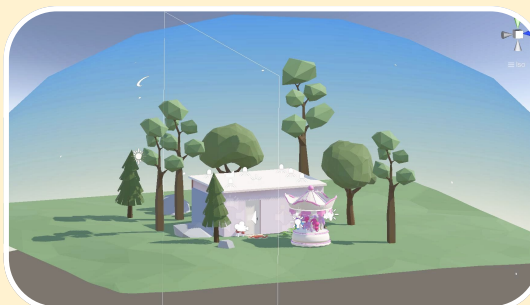
turn over function be implemented by **ternary operator**

5 VR



MODEL INFO

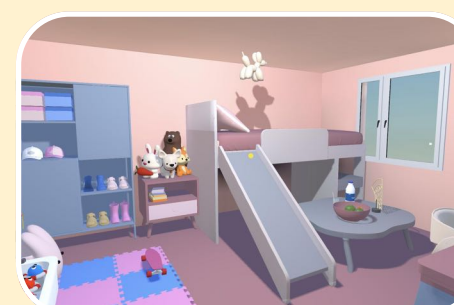
Import The Model from **Blender** into **Unity3D**



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** of some objects to fit the tone of the room

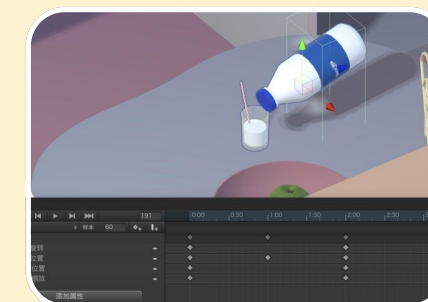


Change the **Color Space** to **Linear**. Set a **point light** as the main light and **7 spotlight**



VR INTERACTION

Complete **VR Gaze interaction** and **script writing**

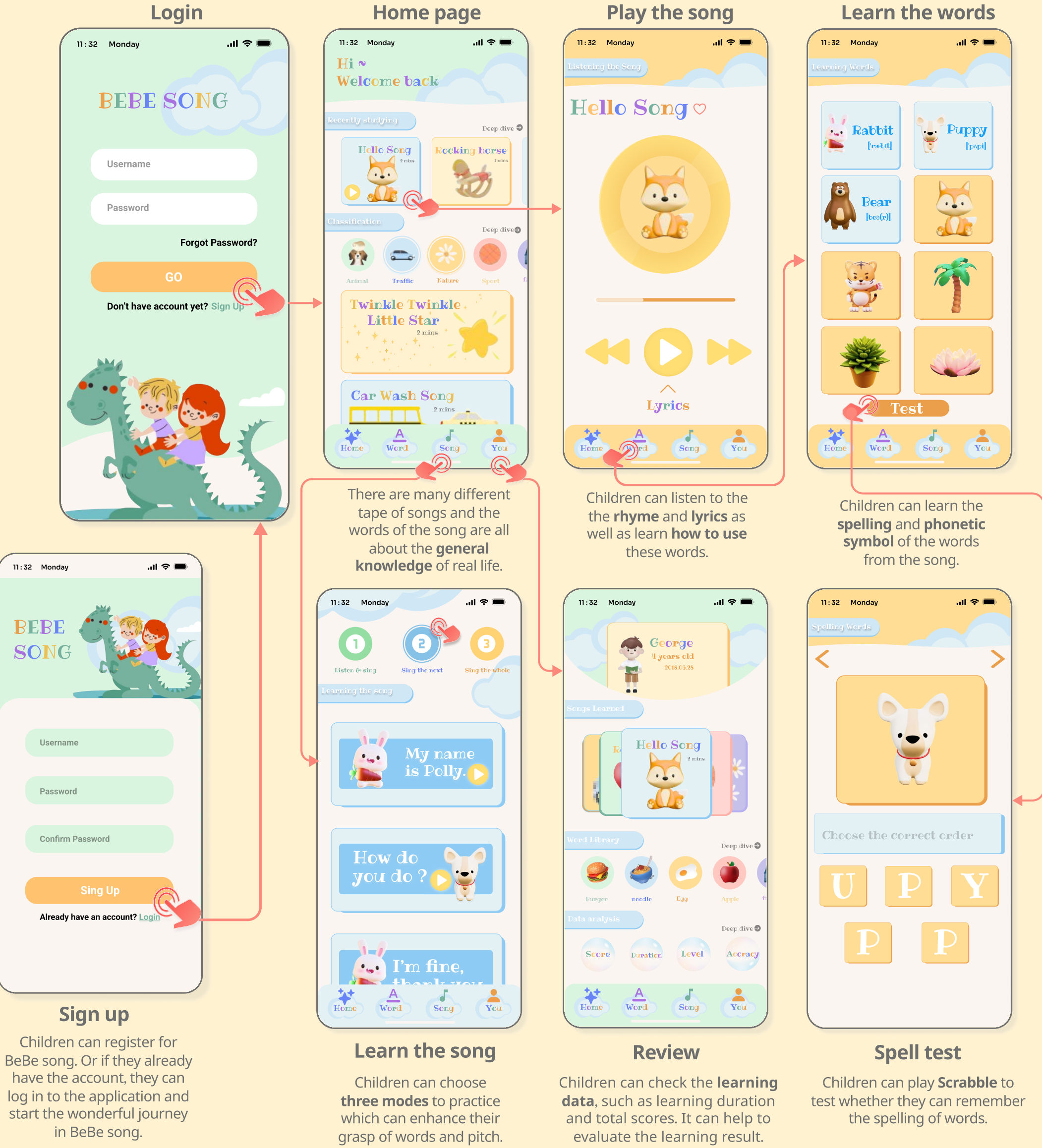


Use **Animation** and **Event Trigger** cooperating with the use of some **scripts**

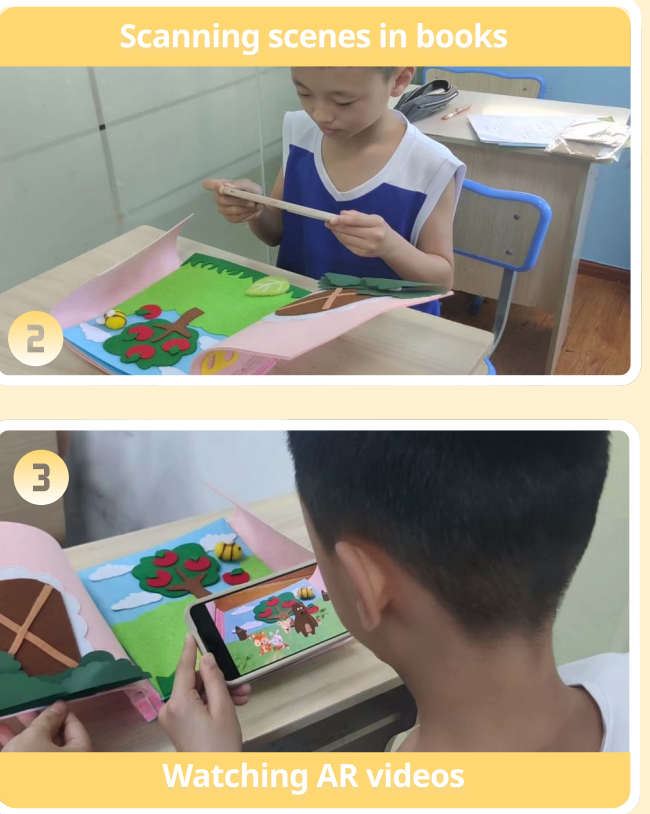
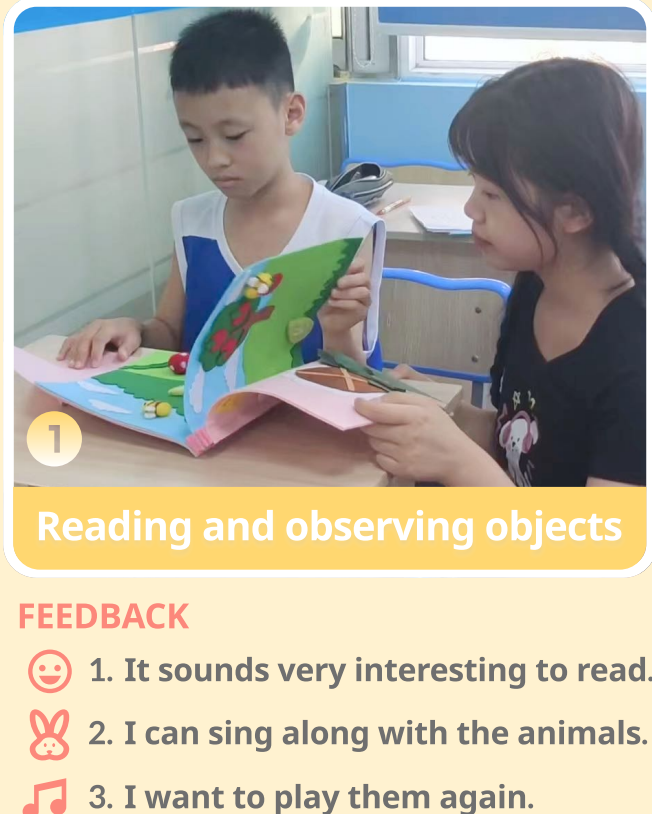


Add the **UI** in the VR room and **add the audio** to enhance children's memory

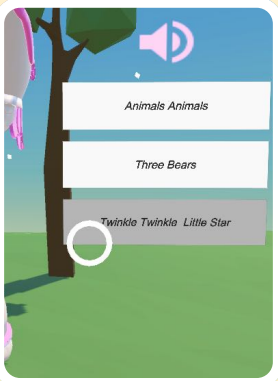
HIGH FIDELITY



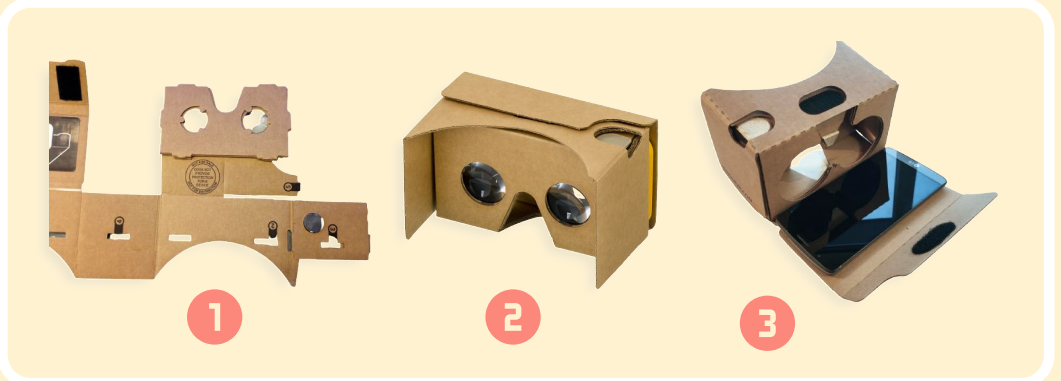
BOOK & AR SCENARIO



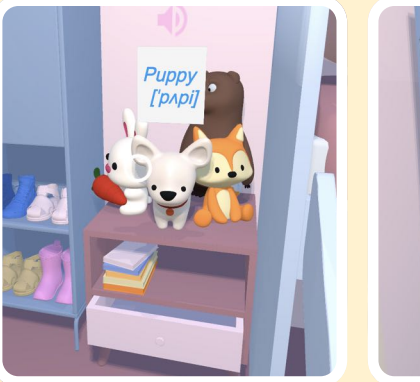
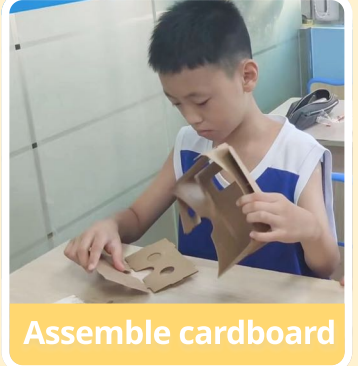
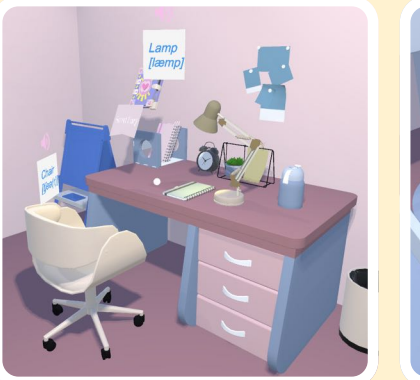
VR SCENARIO



ASSEMBLE Google VR Cardboard



Users can use cheap and simple components to make their own helmets. Place the phone at the back of the helmet and view the content through the lens.



FEEDBACK

1. It's like I've entered this pinky room.

2. Here comes a little rabbit! I can spell it.

3. I can catch the doll.

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.

User scenario

