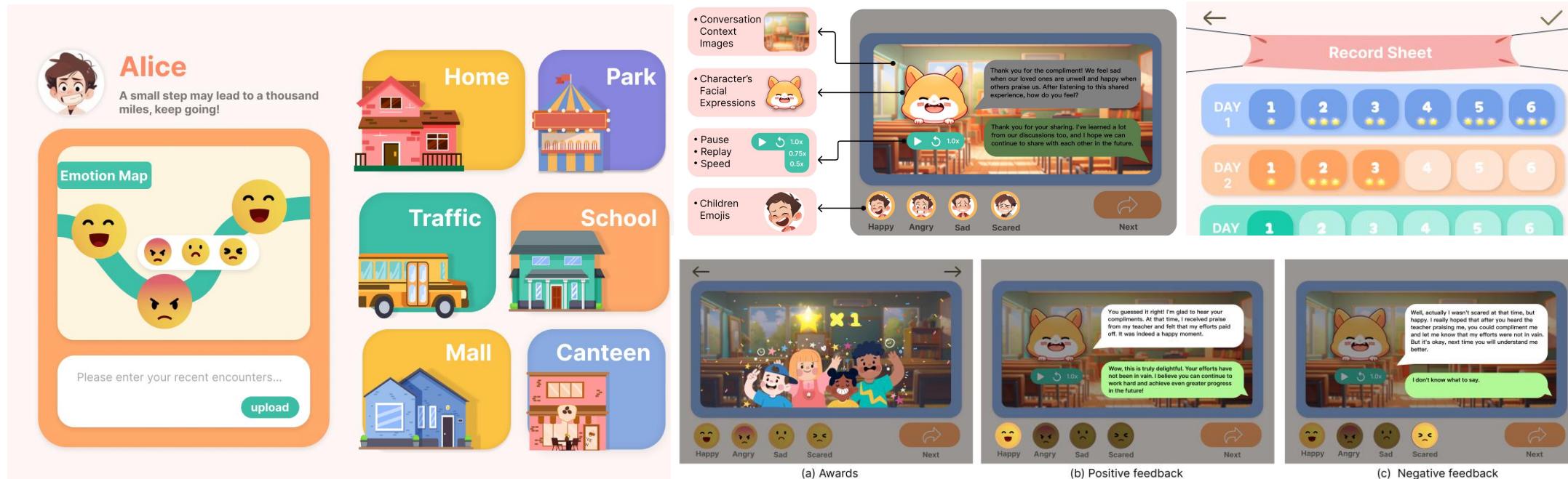


EmoEden: Applying Generative AI to Emotional Learning for Children with High-Function Autism

Yilin Tang, Liuqing Chen*, Ziyu Chen, Wenkai Chen, Yu Cai, Yao Du, Fan Yang, Lingyun Sun



HIGH-FUNCTION AUTISM (HFA) CHILDREN

- Autism spectrum disorder (ASD): a neurodevelopmental disability, difficulties in social communication
- HFA: a subtype of ASD:
 - normal intelligence with emotional challenges
- Attend mainstream schools, perceived as indifferent to others, difficulty establishing social relationships



EXISTING SOLUTIONS

- Conventional social-emotional Interventions
 - require high resources and accessibility
- Current conversational agents
 - Difficulty comprehending HFA Children' language
 - Emotional expression is rigid
 - Struggle to generate personalized content tailored to the specific needs of each children



WHAT ABOUT USING GENERATIVE AI TO SUPPORT HFA CHILDREN'S EMOTIONAL LEARNING?

FORMATIVE STUDY

Semi-structured Interviews

- 5 professional HFA therapists
- 7 parents of children with HFA

Observation

- 15 HFA children
 - 14 boys and 1 girl
 - 6 to 13 years old



FINDINGS

Emotional challenges

- identify and express their own emotions, recognize and respond to the emotions of others

Existing training methods

- “emotion cards”, “emotion-based role play”, “emotional wall”...

Special interests

- 3D figures, high-contrast color combinations, exaggerated intonations, and soft voices..

Opportunities of applying GAI

- Large language models (Play a role, emotionally rich expression, personalized content)
- Text-to-image models (create customized visual intervention materials)

EMOEDEN

1. Contextualized Learning

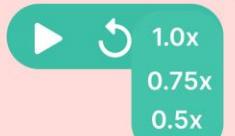
- Conversation Context Images



- Character's Facial Expressions



- Pause
- Replay
- Speed



- Children Emojis



2. Visually and Auditorily Expressing Conversations

Thank you for the compliment! We feel sad when our loved ones are unwell and happy when others praise us. After listening to this shared experience, how do you feel?

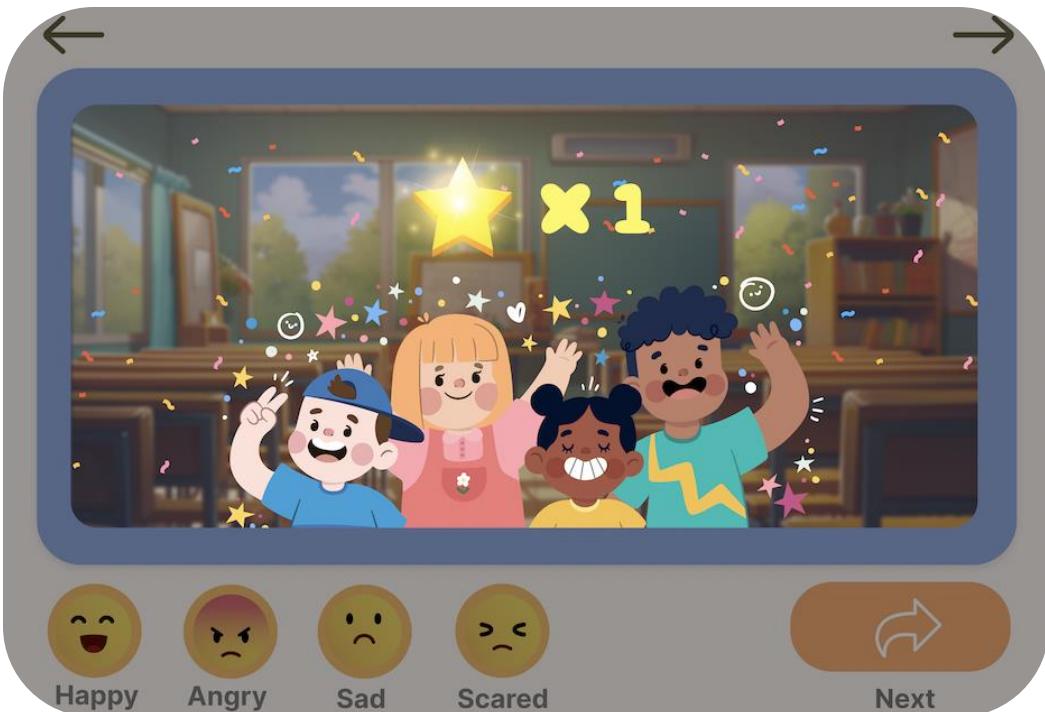
Thank you for your sharing. I've learned a lot from our discussions too, and I hope we can continue to share with each other in the future.

Happy Angry Sad Scared

Next

EMOEDEN

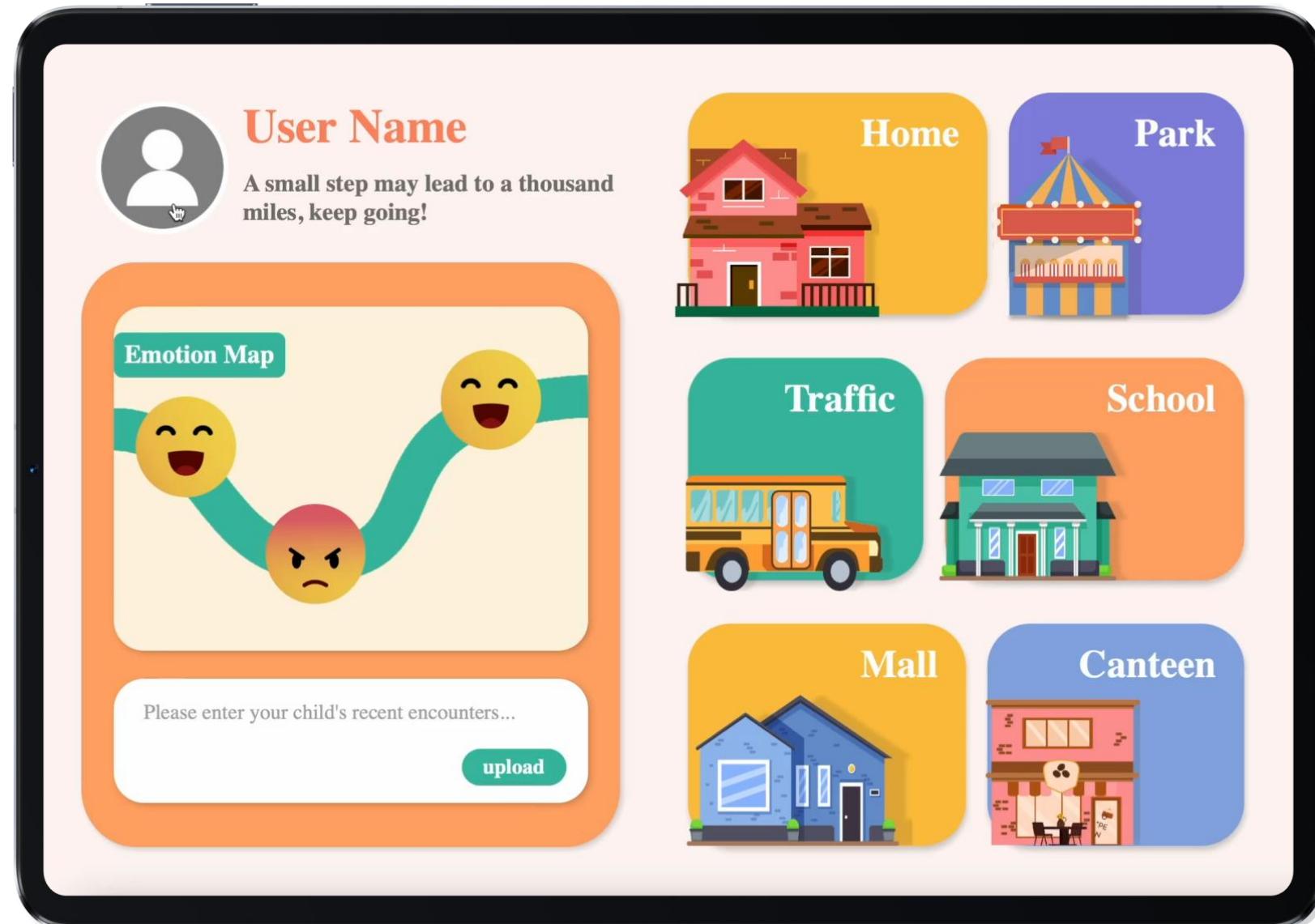
3. Feedback and rewards



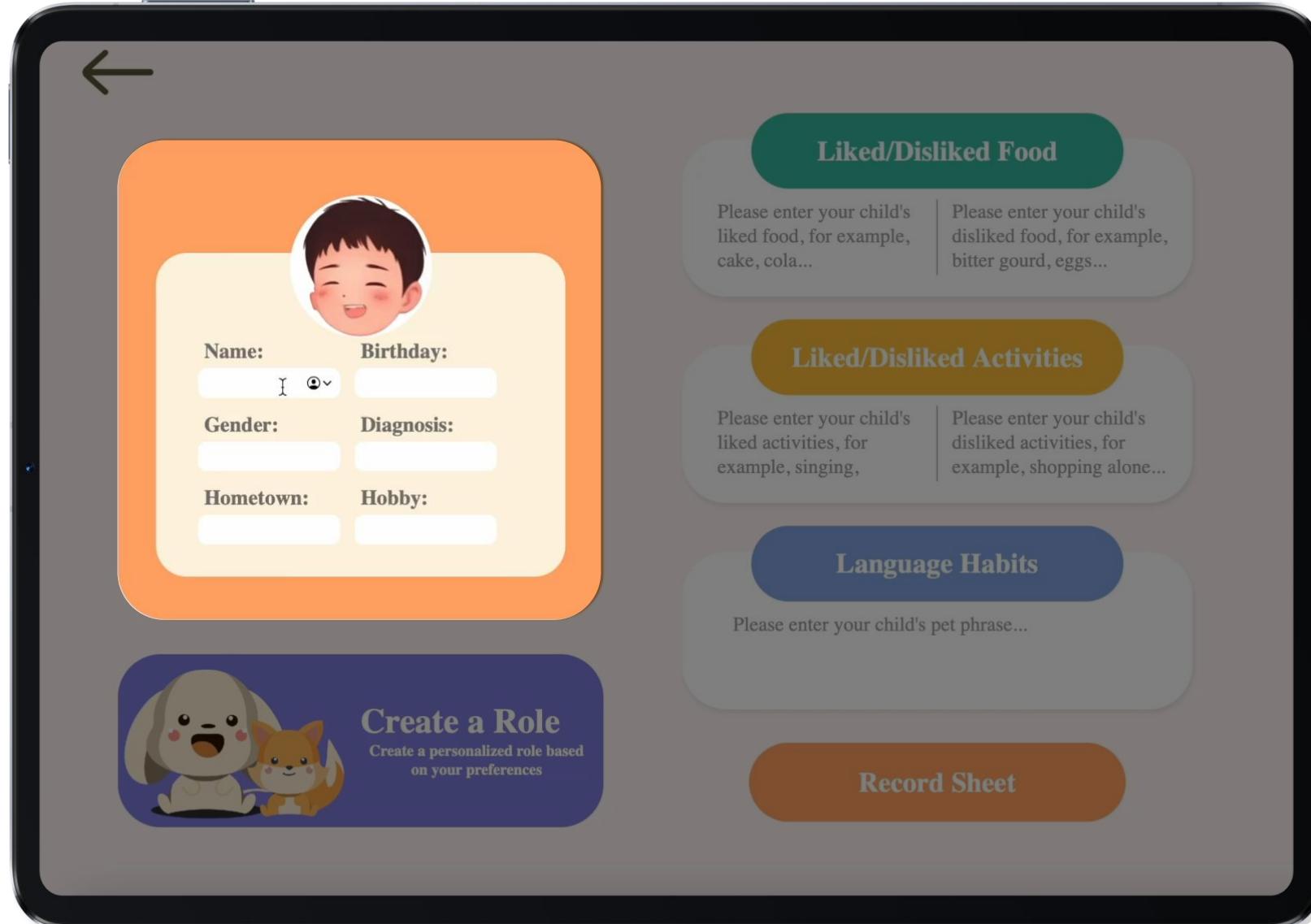
4. Personalization

A screenshot of a personalization settings screen. It includes a user profile picture of a boy, followed by input fields for Name, Birthday, Gender, Diagnosis, Hometown, and Hobby. To the right, there are sections for 'Liked / Disliked Food' and 'Liked / Disliked Activities', each with two input fields for entering preferences. Below these is a 'Language Habits' section with a placeholder for a pet phrase. At the bottom left is a 'Create a Role' button with a dog and cat icon, and at the bottom right is an orange 'Record Sheet' button.

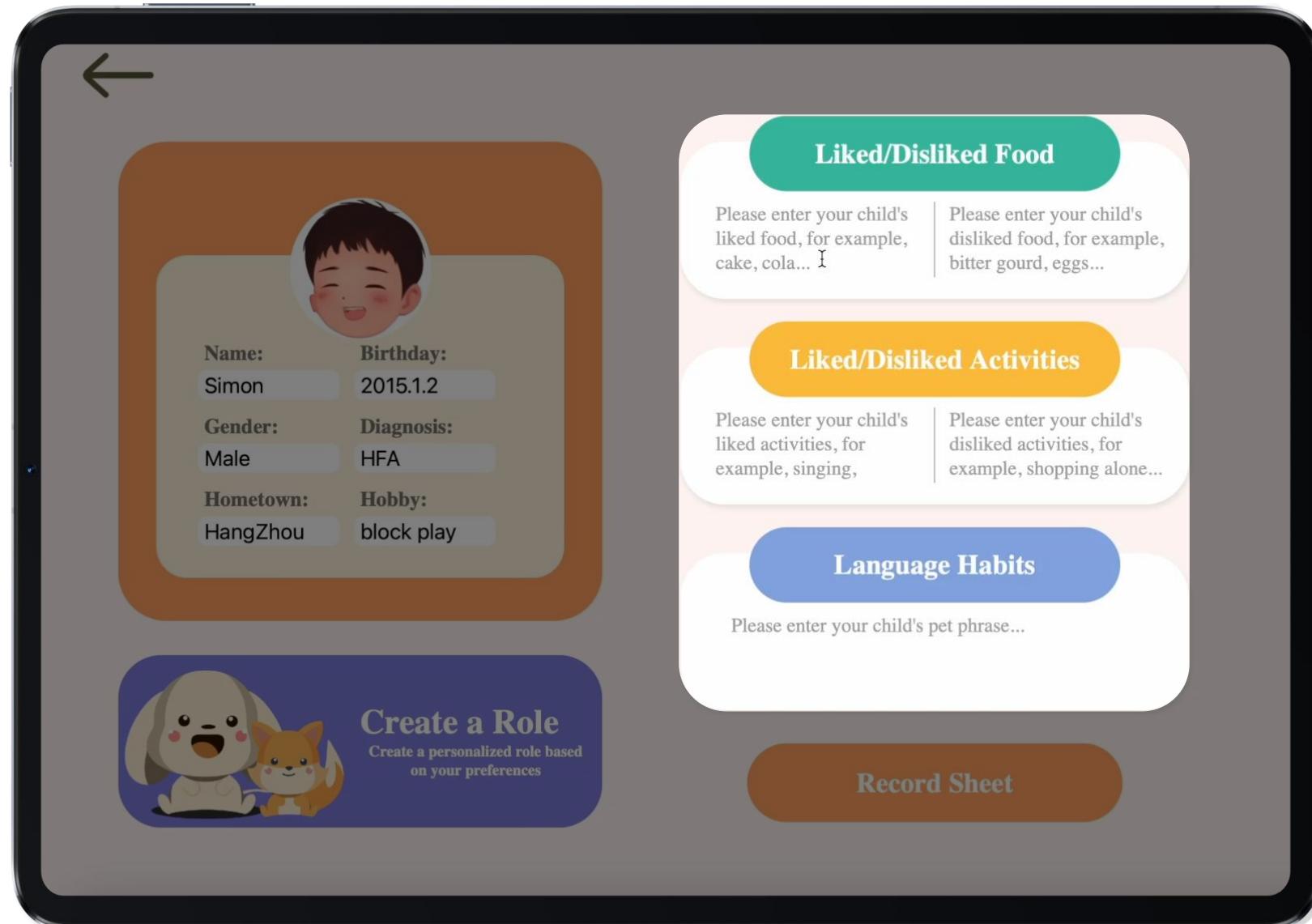
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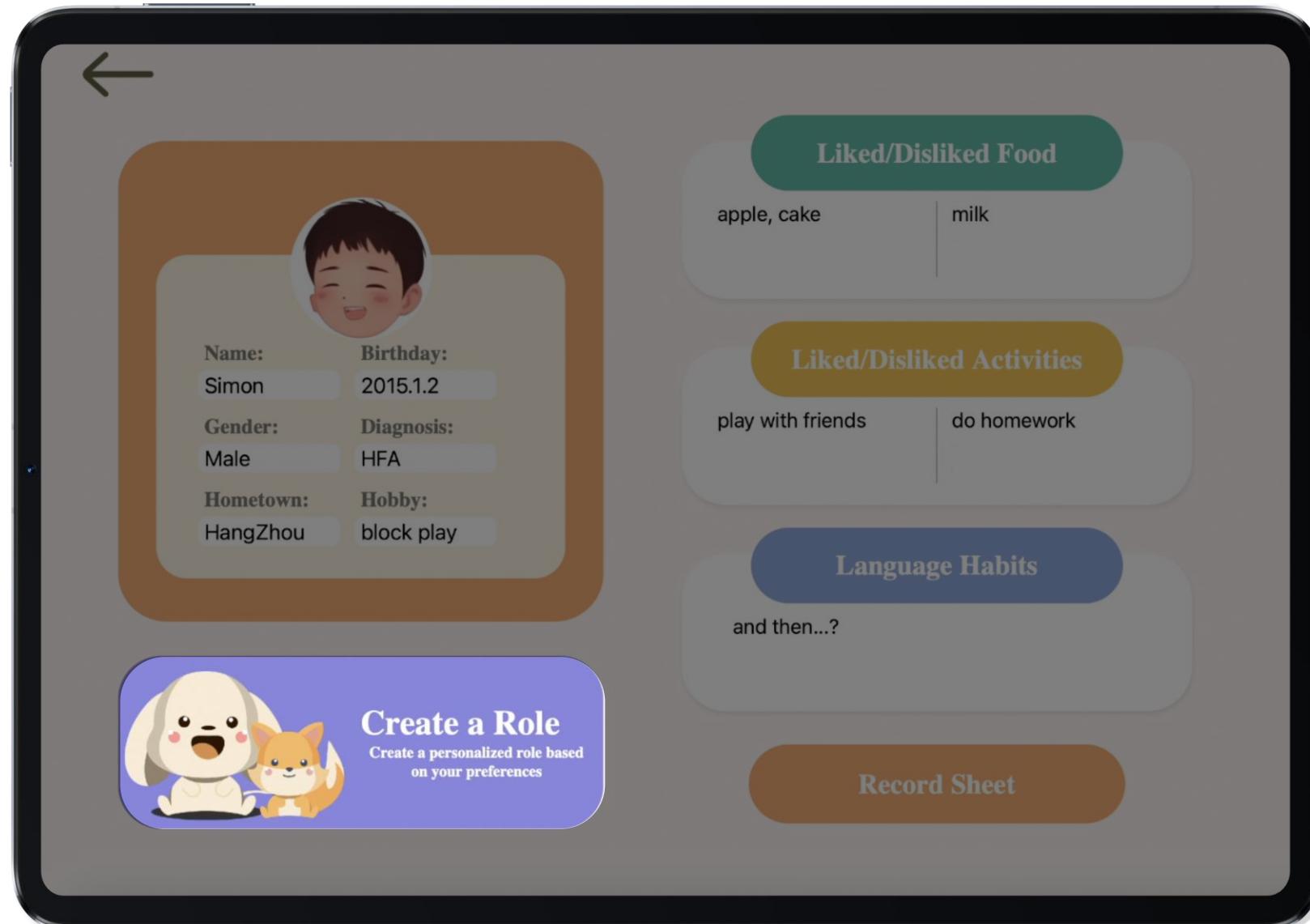
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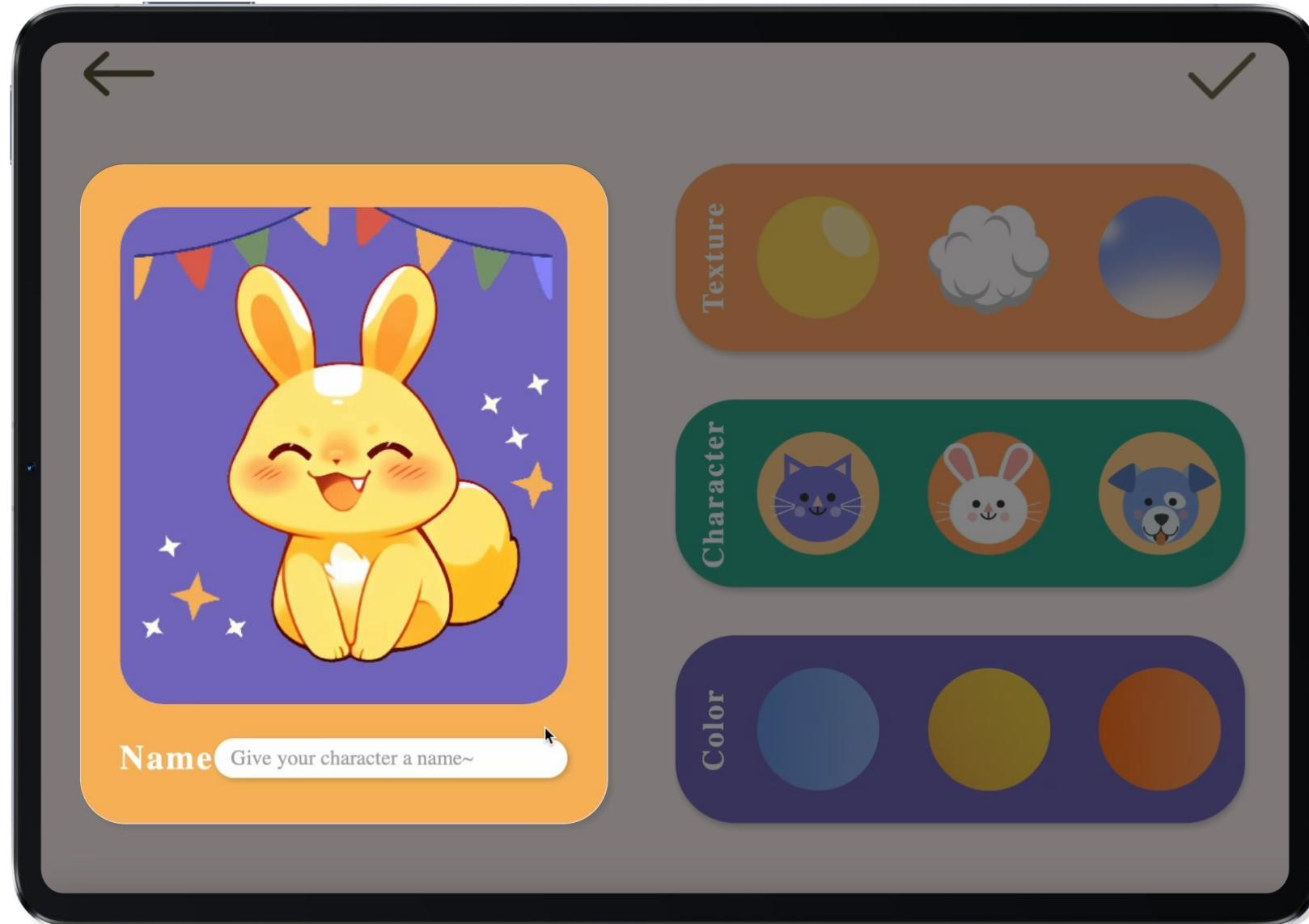
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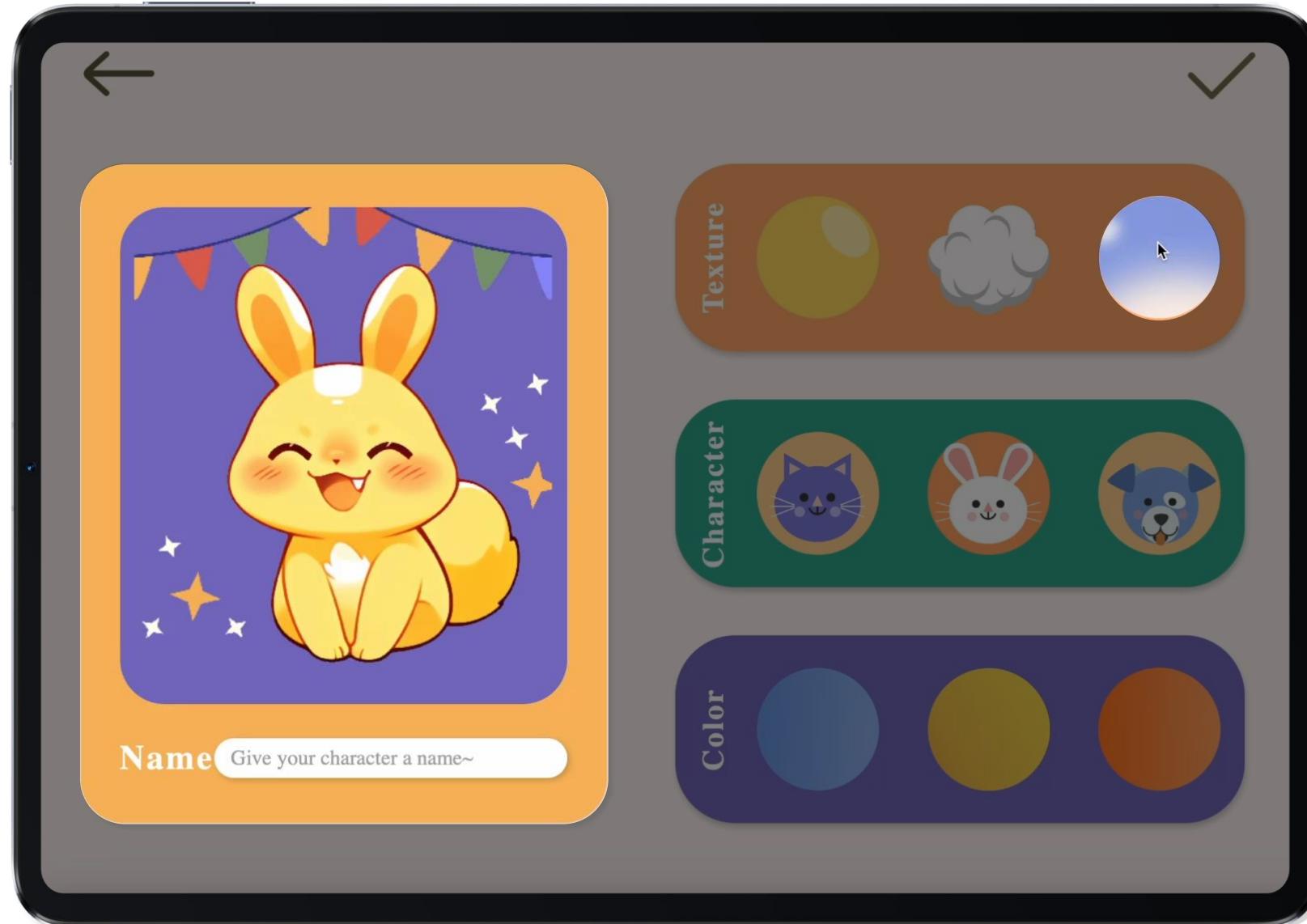
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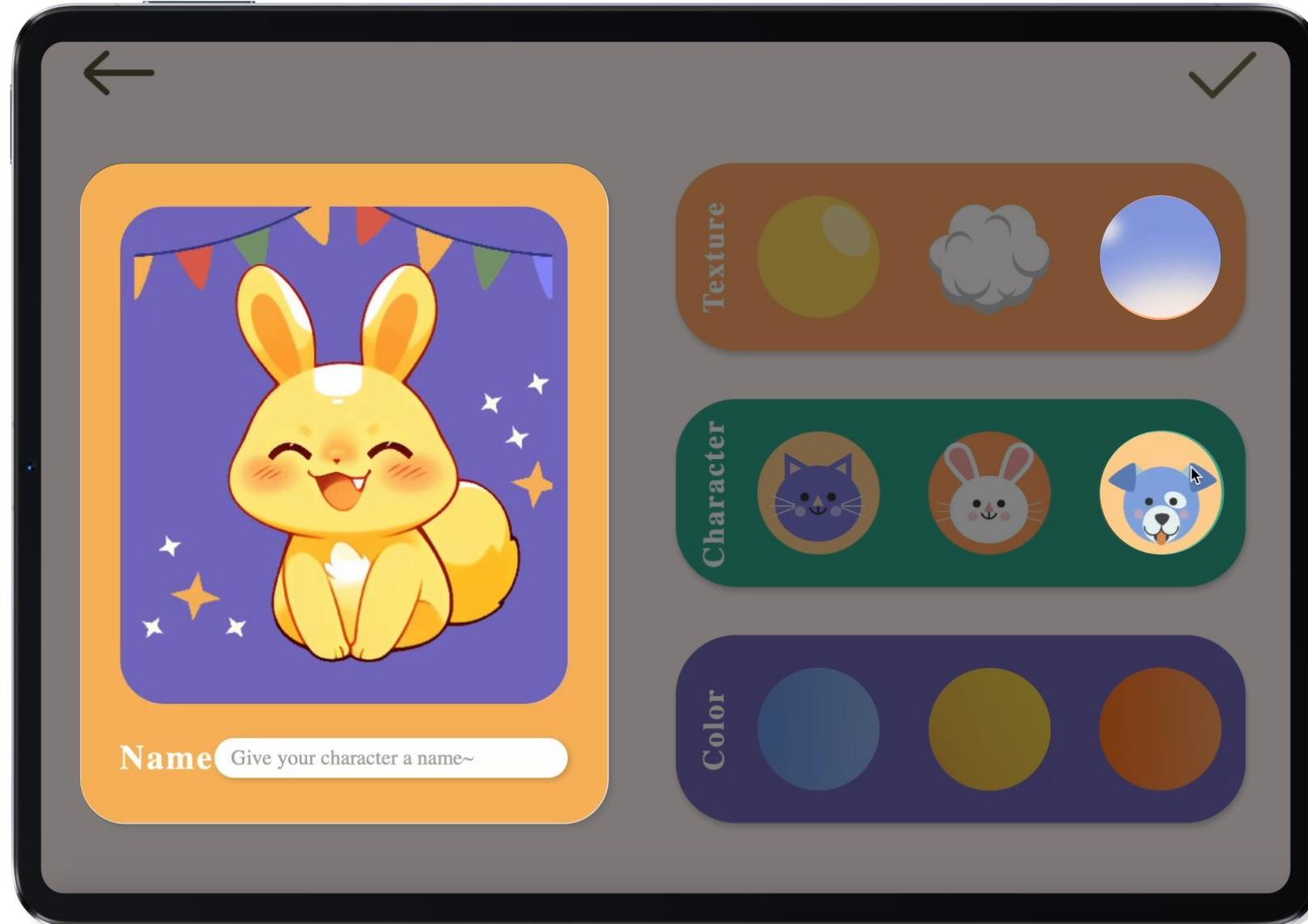
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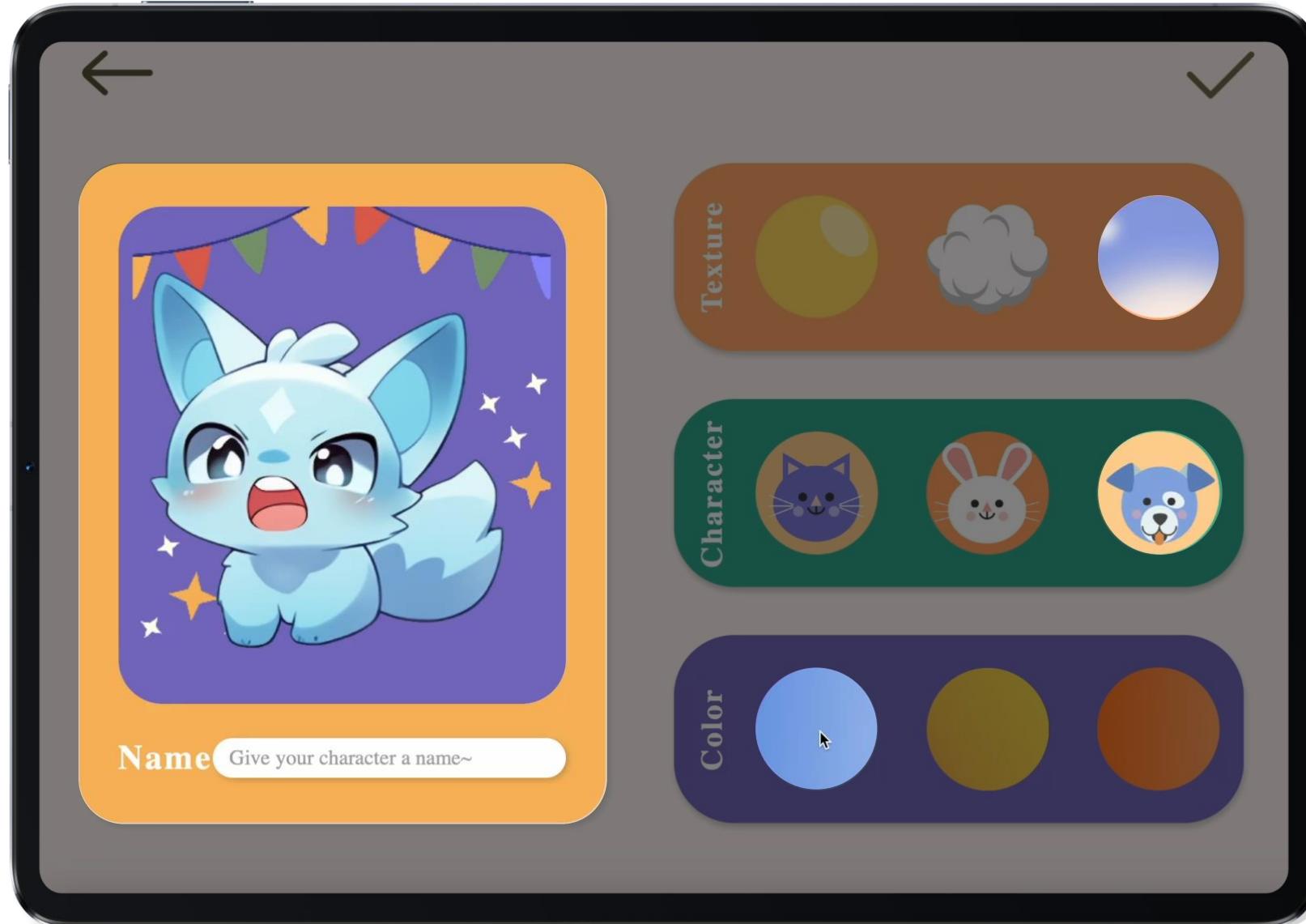
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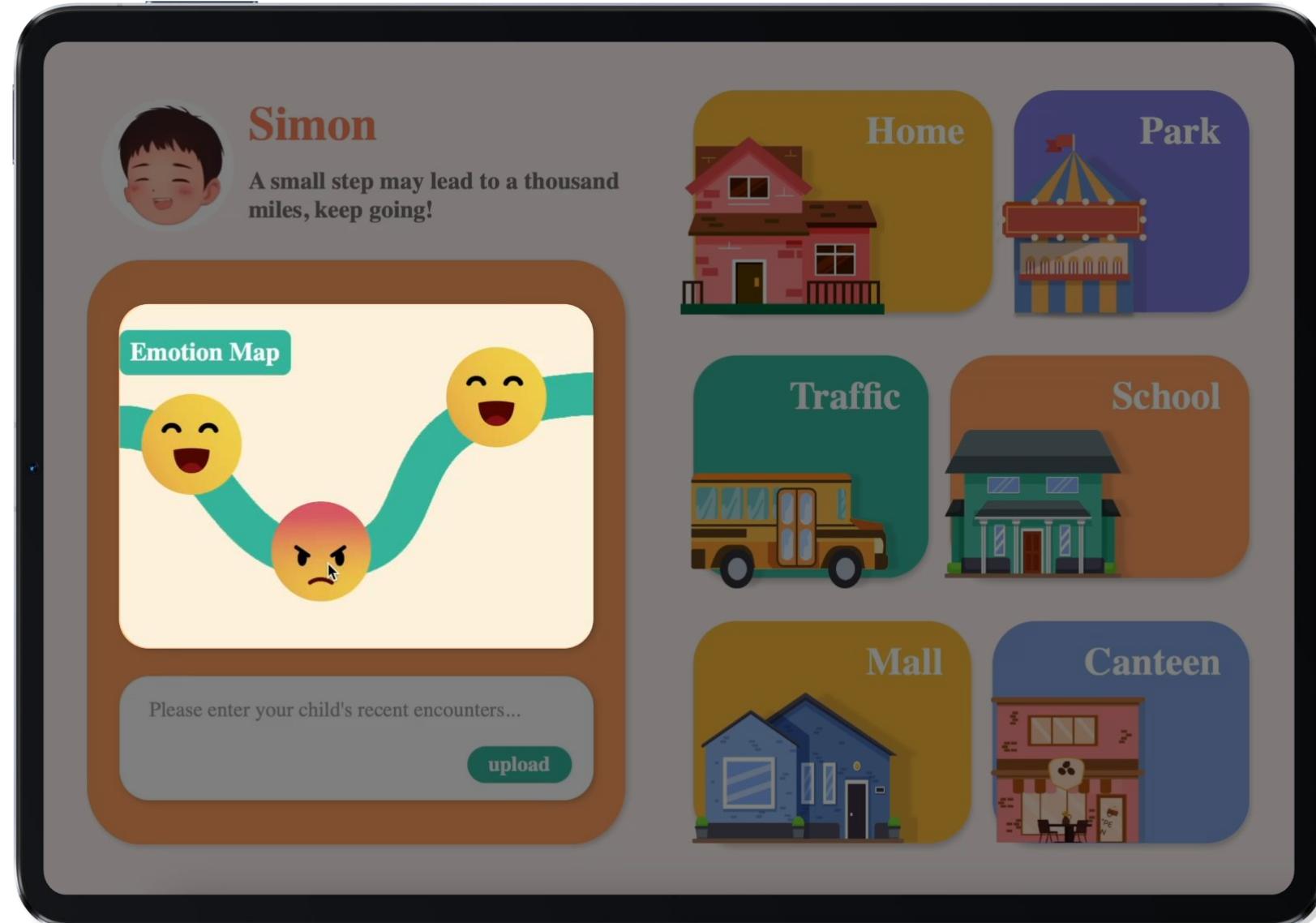
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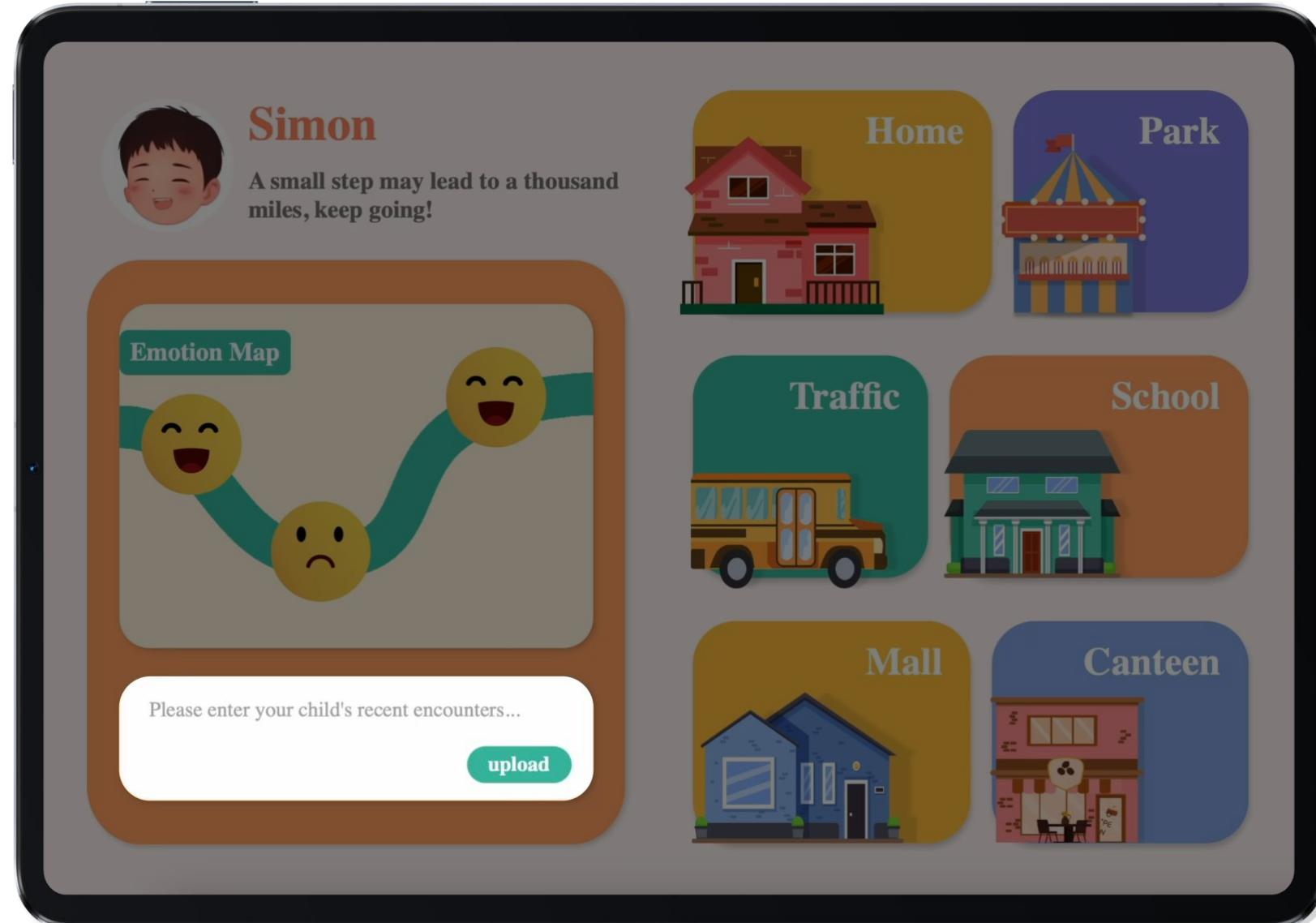
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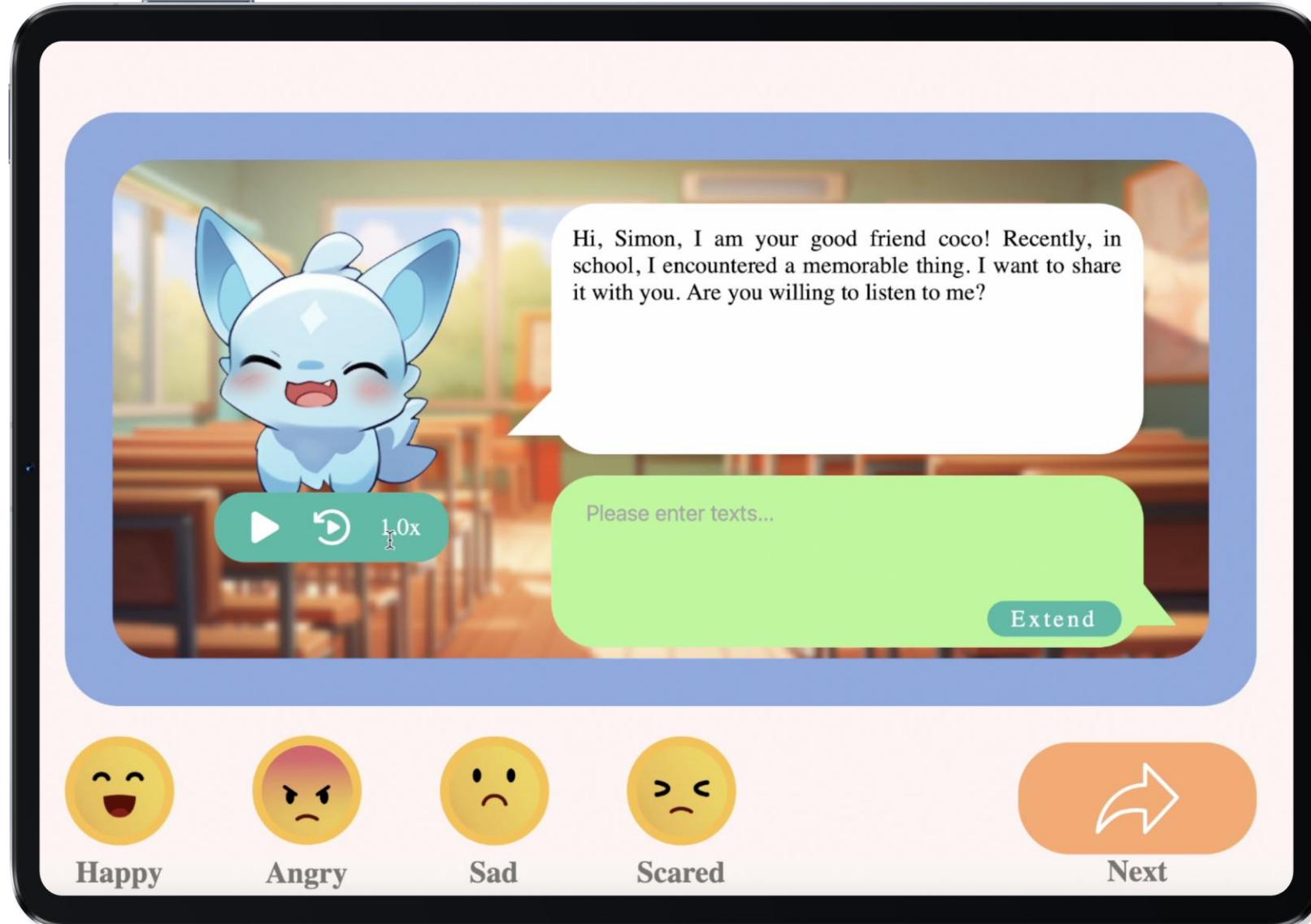
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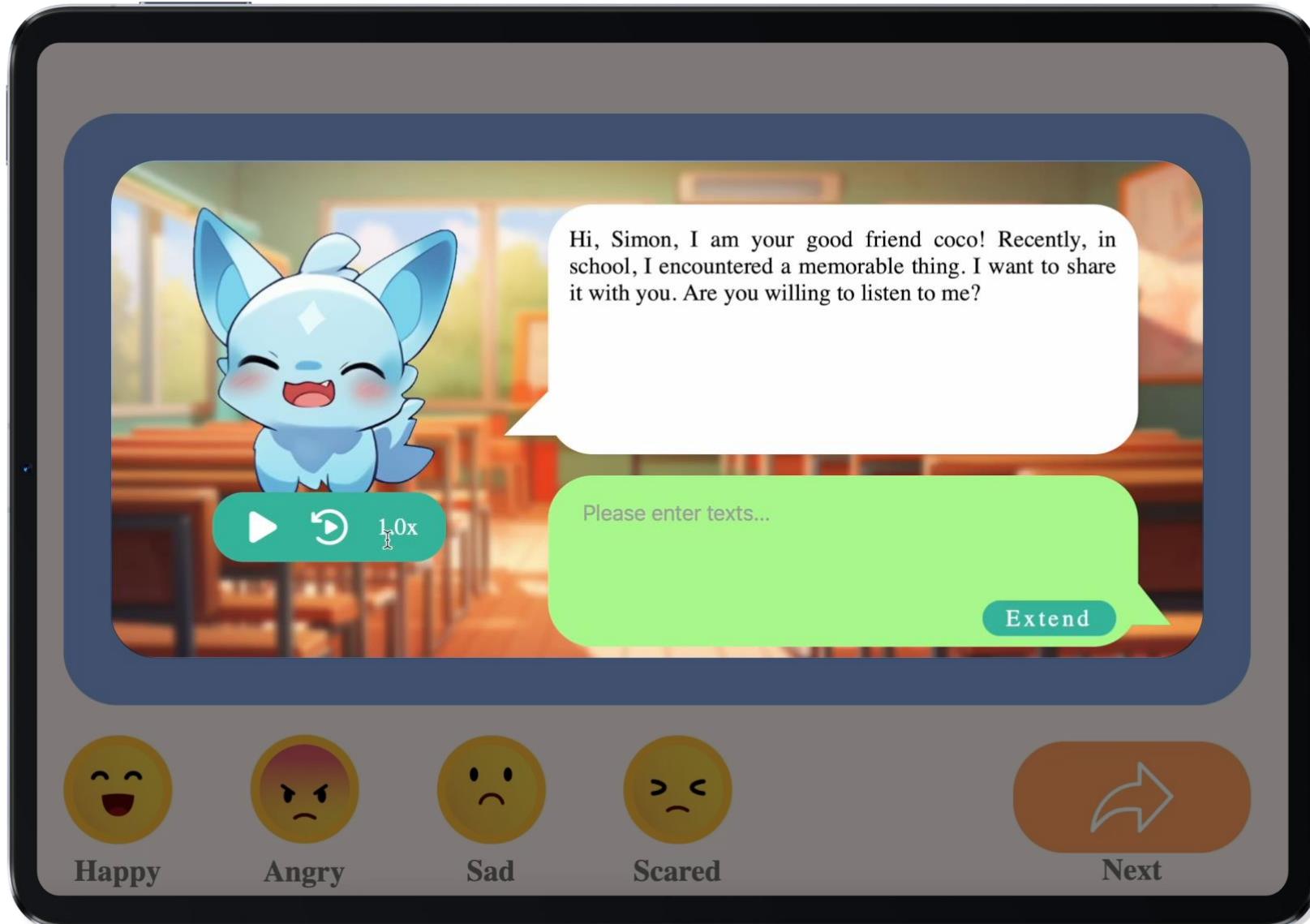
STEP 1: SET



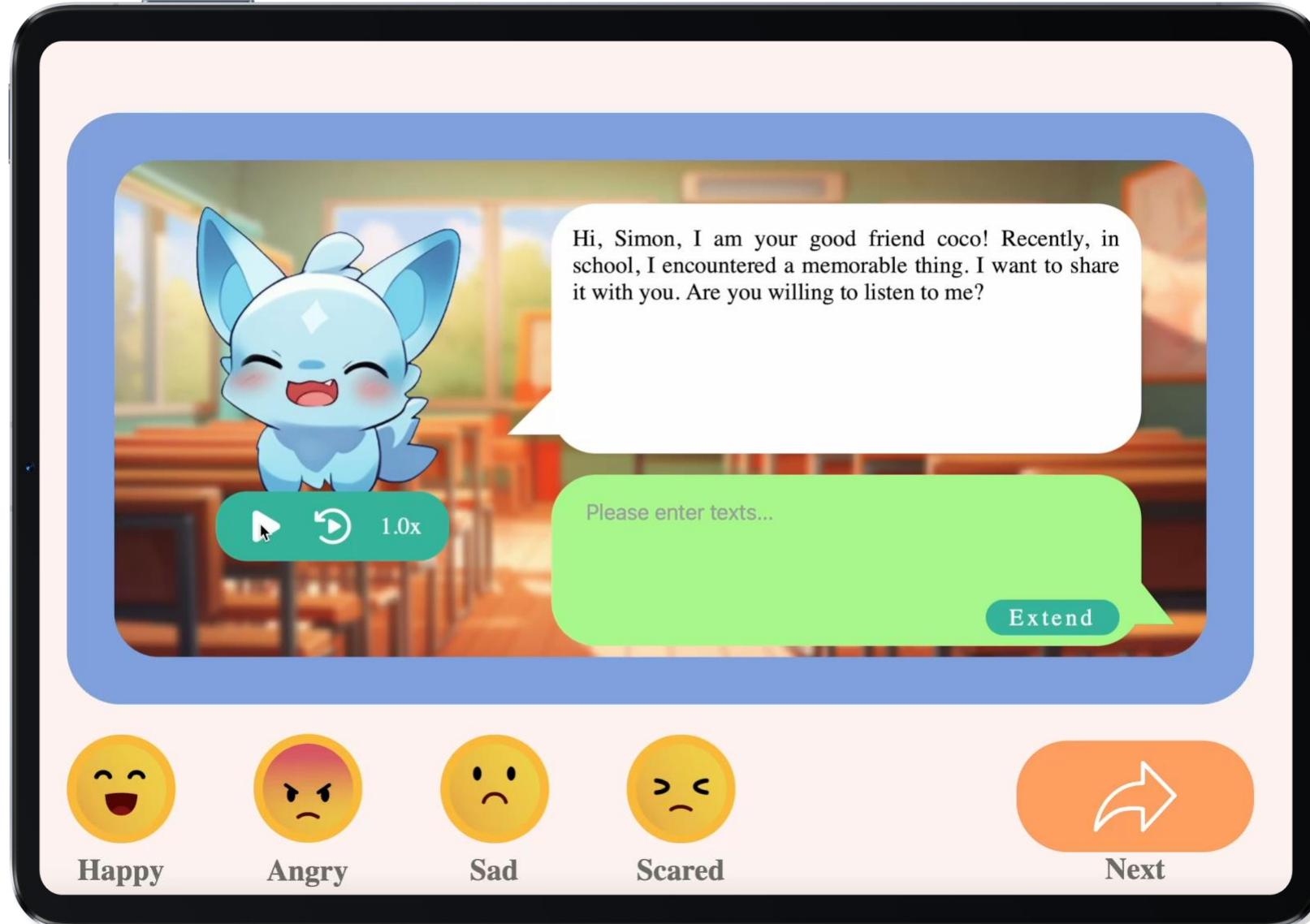
STEP 2: CONVERSATION



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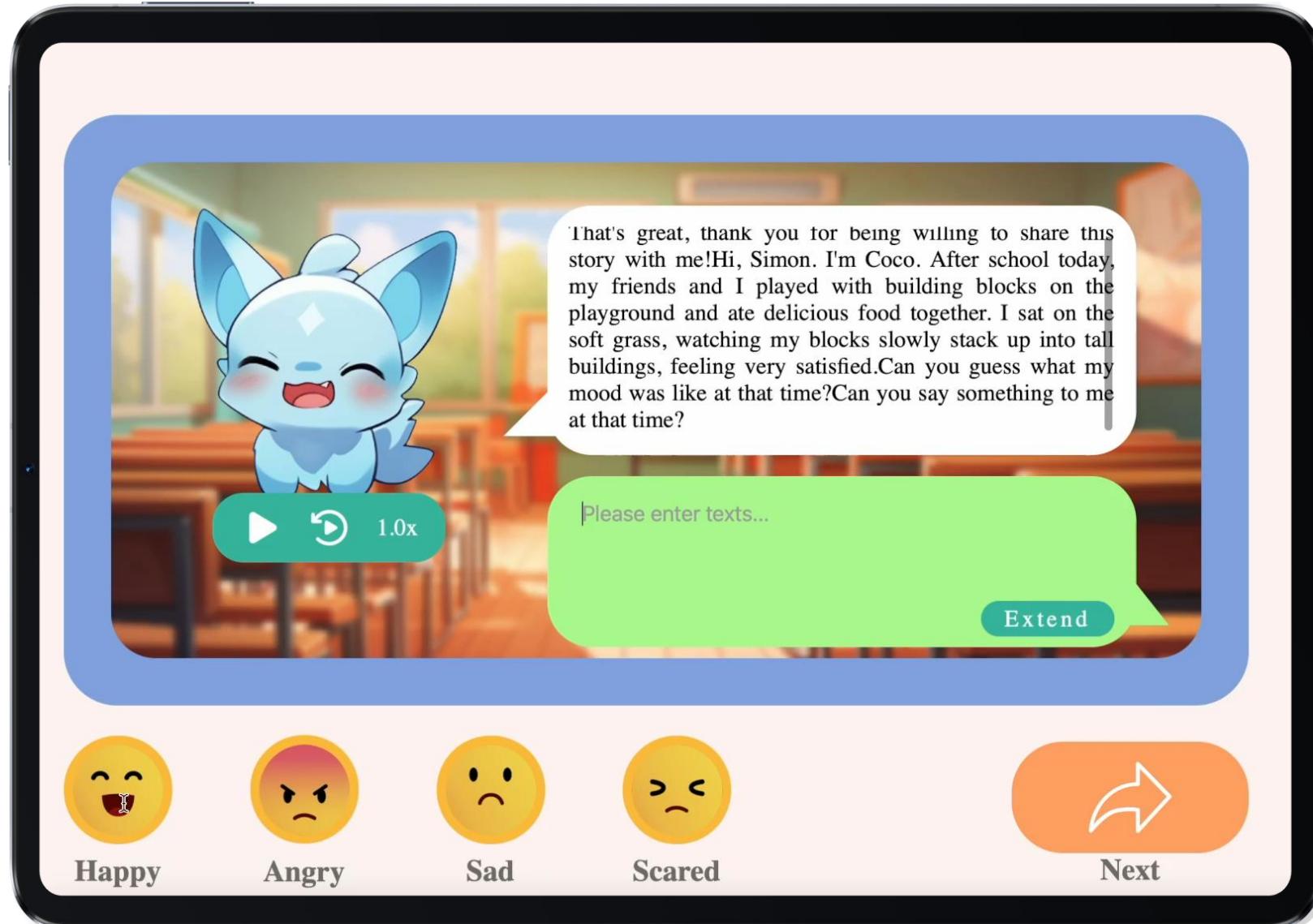
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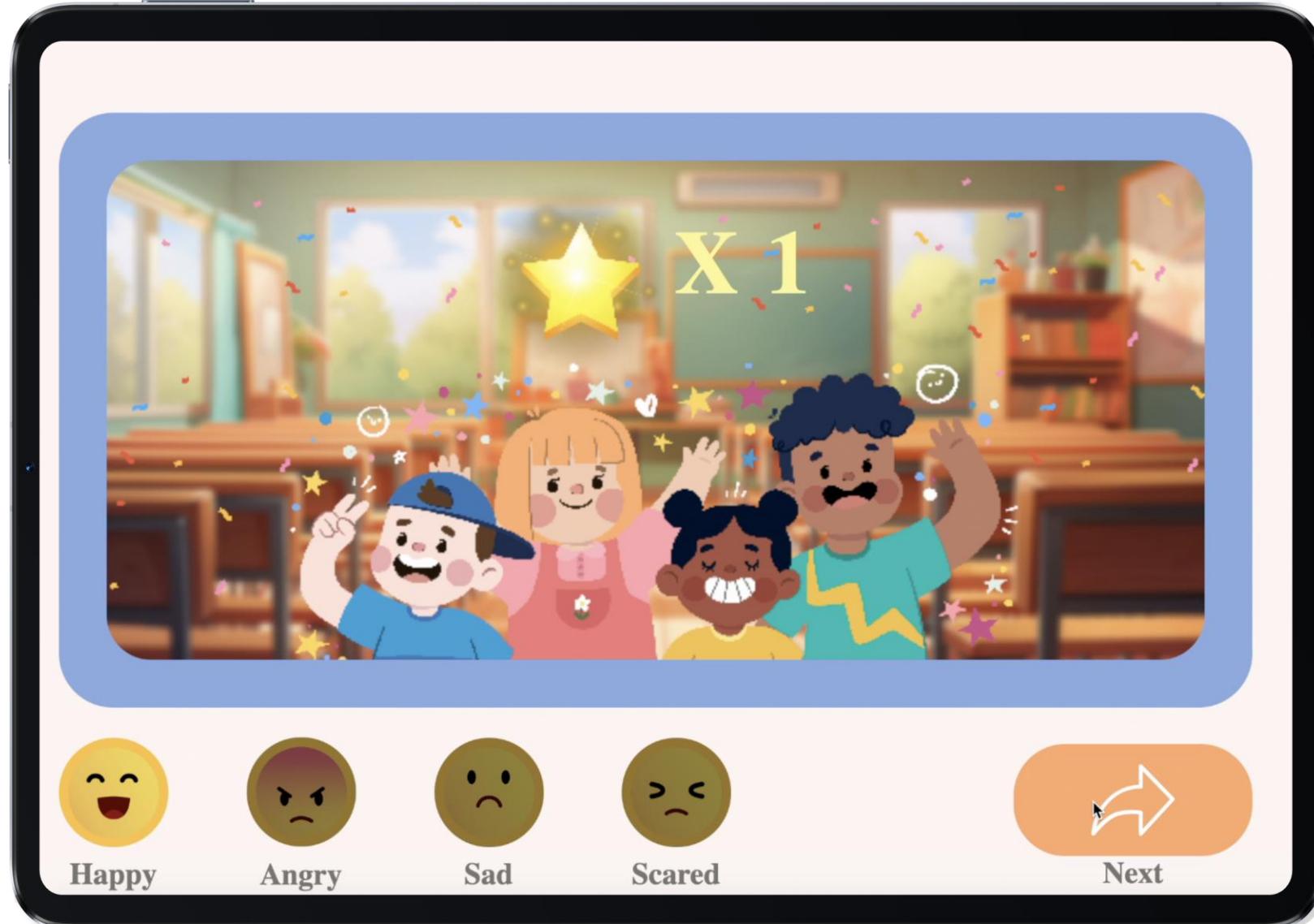
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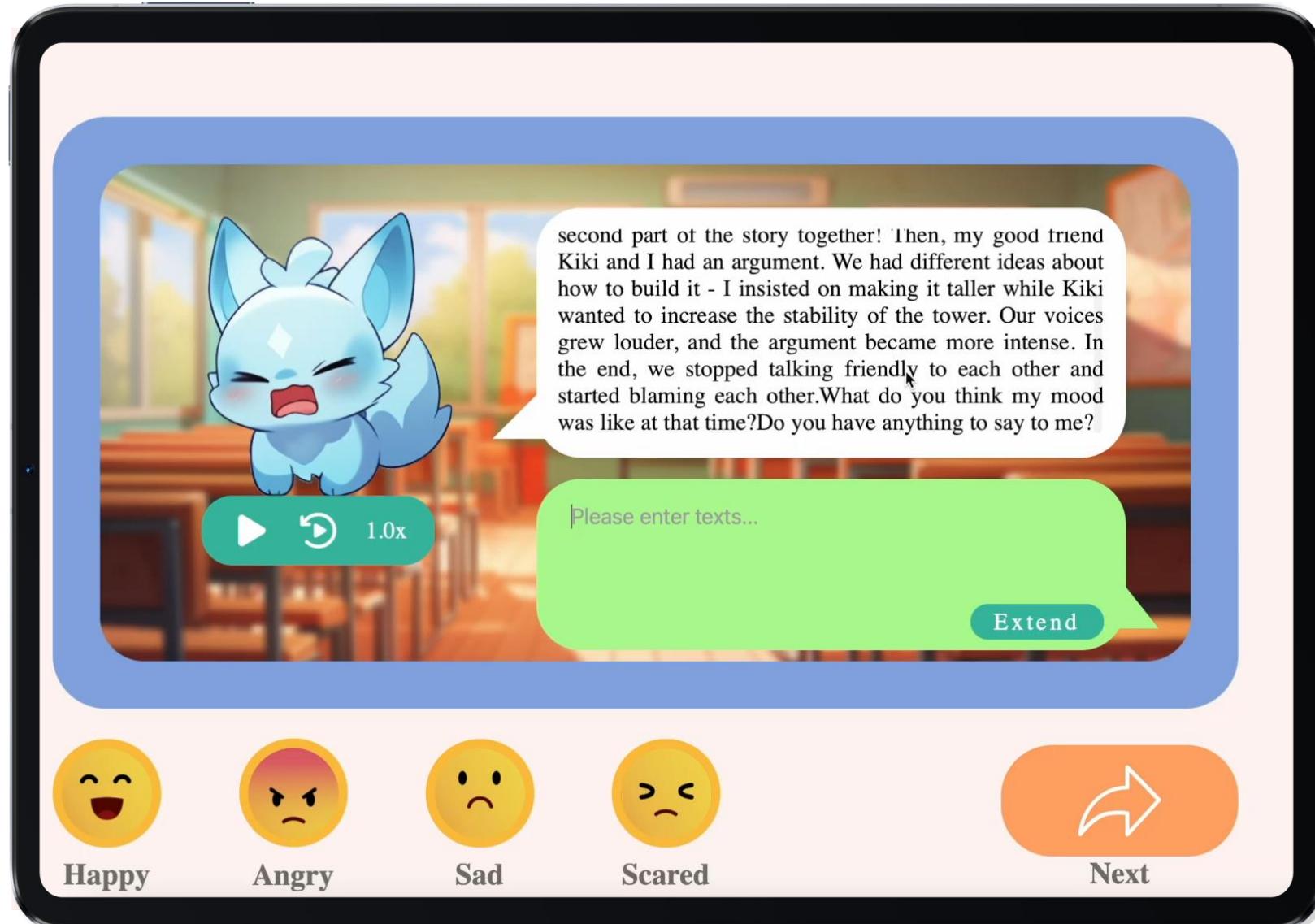
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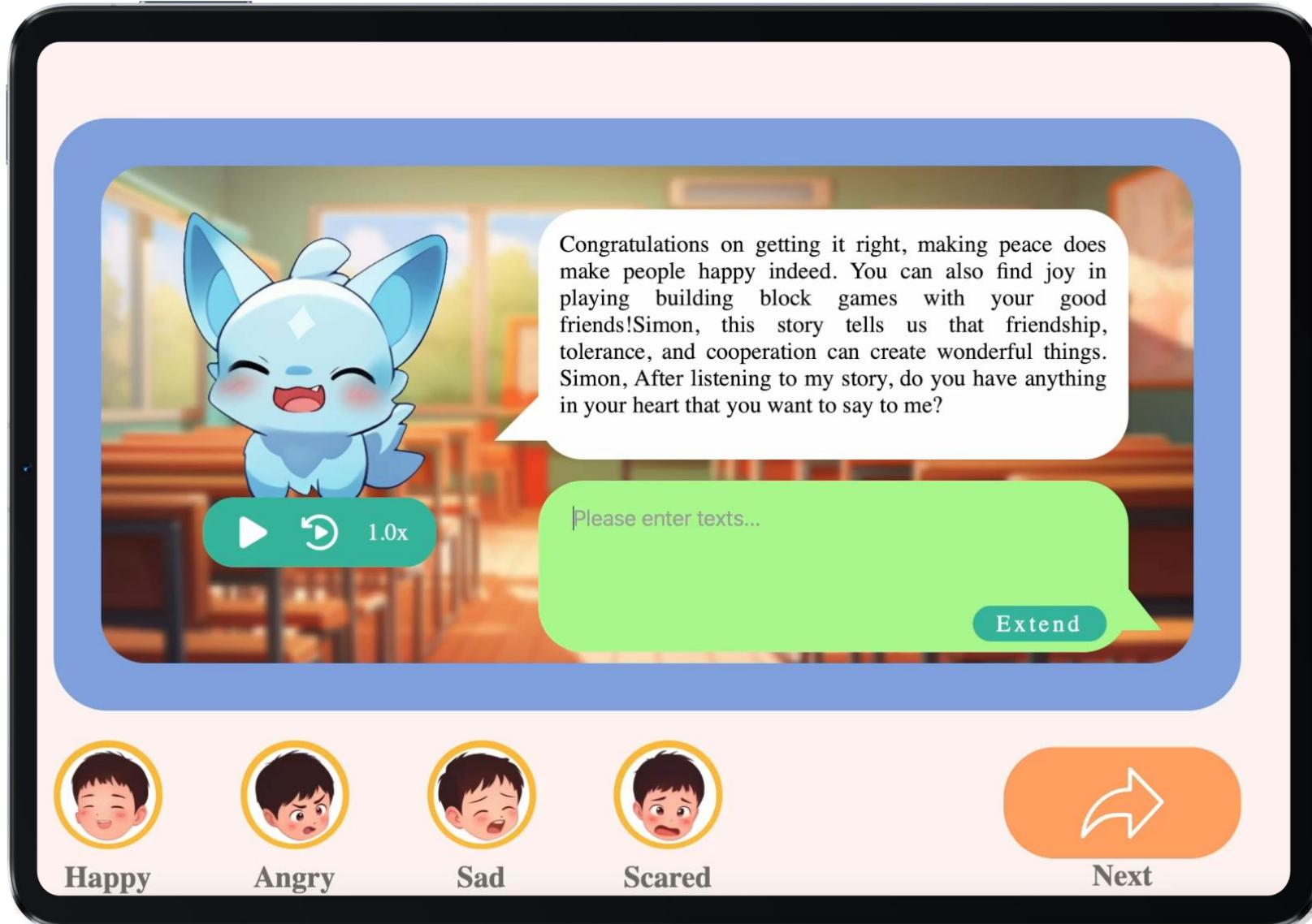
STEP 2: CONVERSATION



STEP 3: SUMMARIZATION



STEP 3: SUMMARIZATION



STEP 4: ASSESSMENT

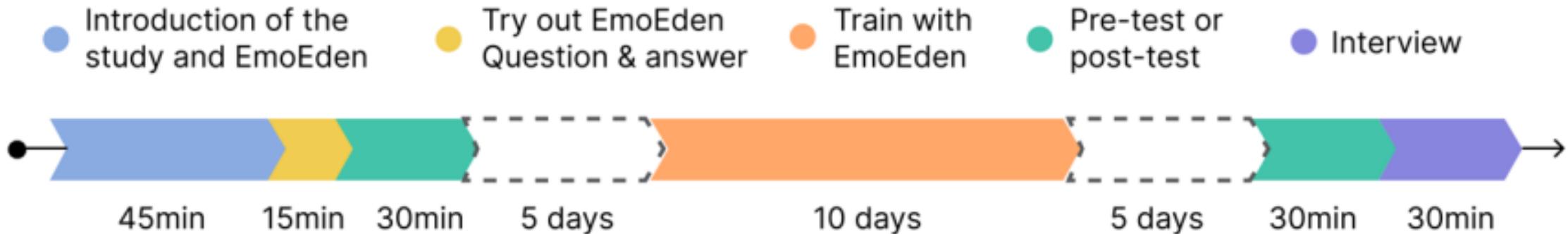


USER STUDY

RQ1: To what extent can EmoEden engage for HFA children?

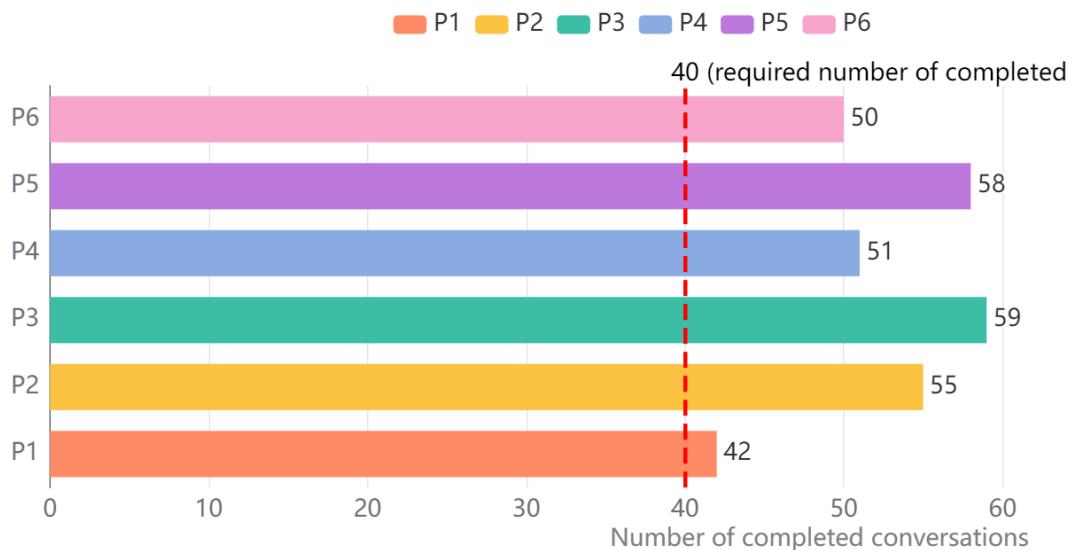
RQ2: How would HFA children's ability of emotional recognition and expression be affected by their use of EmoEden?

RQ3: How does generative AI perform in supporting emotional learning for HFA children?



FINDINGS

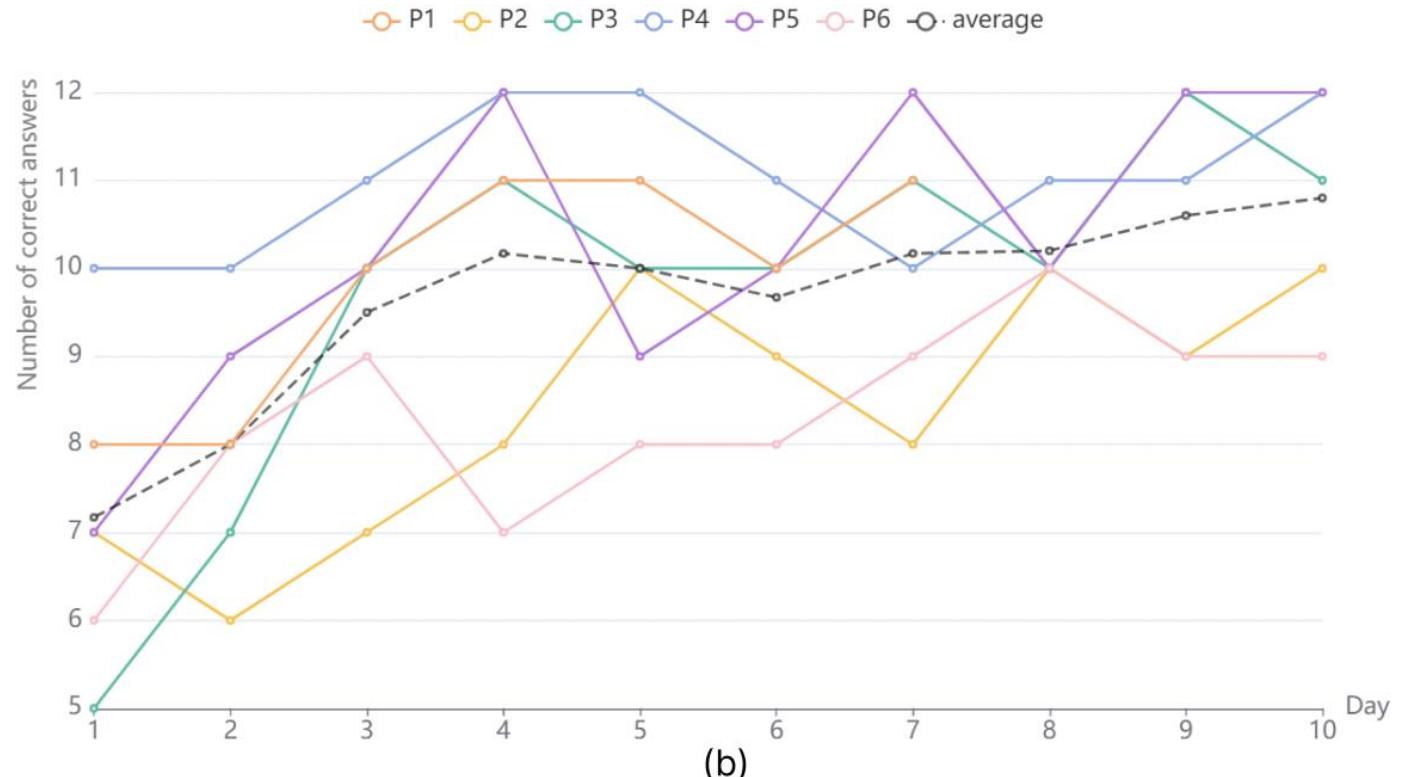
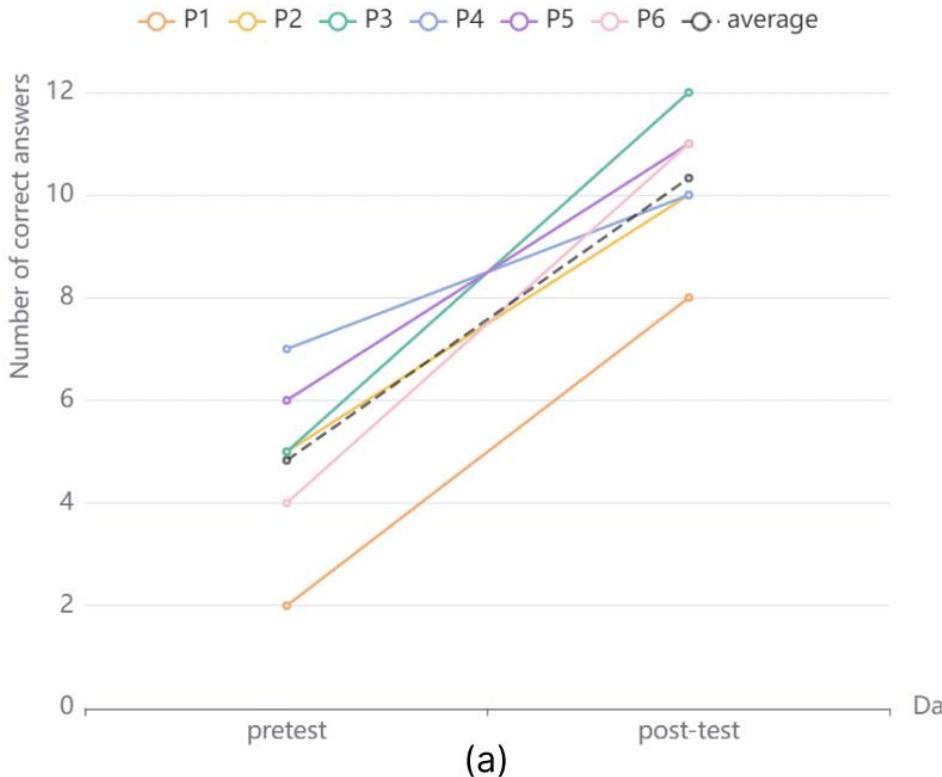
1. Completion and engagement



Theme ↗	Subtheme ↗	Participant ↗	Example ↗
Imitation ↗	Facial expressions imitation ↗	P1, P2, P3, P5, P6 ↗	On Day 2, after seeing the expression of the character change from a smile to a frown, P2's expression also changed from a smile to a frown. ↗
	Language imitation ↗	P1, P3, P4, P5, P6 ↗	On Day 3, P5 imitated the character's tone and repeated the sentences involved in conversations spontaneously, such as "understanding and embracing all friendships with heart." ↗
	Action associations ↗	P4, P5 ↗	On Day 4, when P4 heard the character picking up dropped potato chips in the supermarket, he made a grasping motion with his hand. ↗
Attraction ↗	Special reactions to certain content ↗	P1, P2, P3, P4, P6 ↗	On Day 9, when P3 heard word "coconut" appearing in the conversation, he smiled, clapped hands, and said "delicious". ↗
	Exploration ↗	P1, P3, P5 ↗	On Day 5, P1 attempted to click and drag on the circus depicted in the context image to further view. ↗
	Proactive training initiation ↗	P3, P4, P6 ↗	On Day 5, P6 ran over for the training actively after hearing the voice of the character. ↗
Empathy ↗	- ↗	P1, P4, P5, P6 ↗	On Day 7, when P4 heard the character being cut in line, he angrily tapped the table and kicked his legs. ↗
	Sharing ↗	P4, P6 ↗	On Day 9, P6 initiatively shared with mom that the character ate braised pork. ↗
Distraction ↗	Impatience to latency ↗	P1, P4 ↗	On Day 1, P4 ran away while waiting for the long response latency caused by the poor network connection. ↗
	Boredom to similar content ↗	P3, P4 ↗	On Day 2, when P3 heard the character narrating an experience similar to a previous one, he complained, "you do something like that again." ↗

FINDINGS

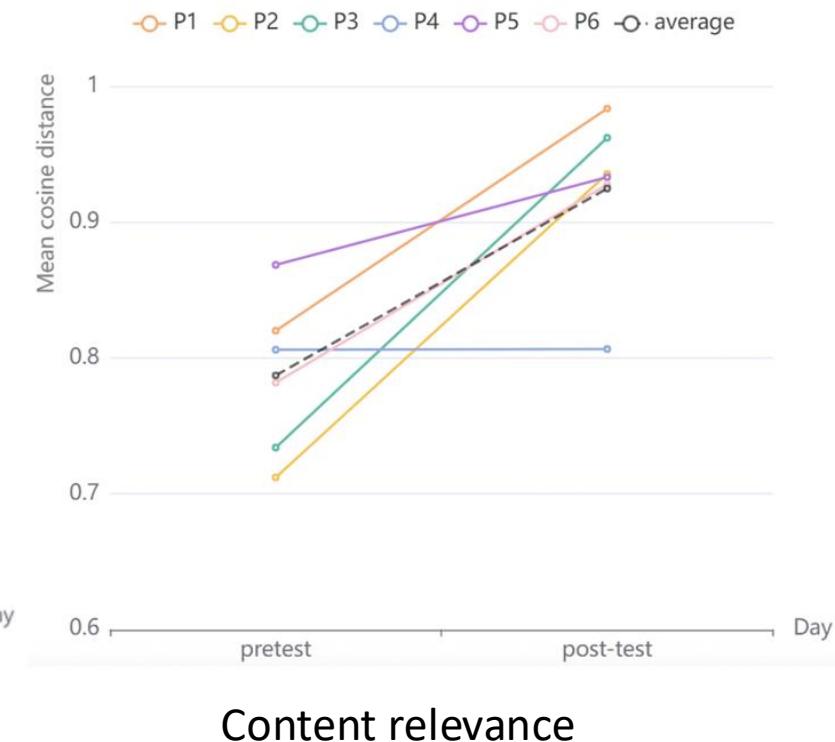
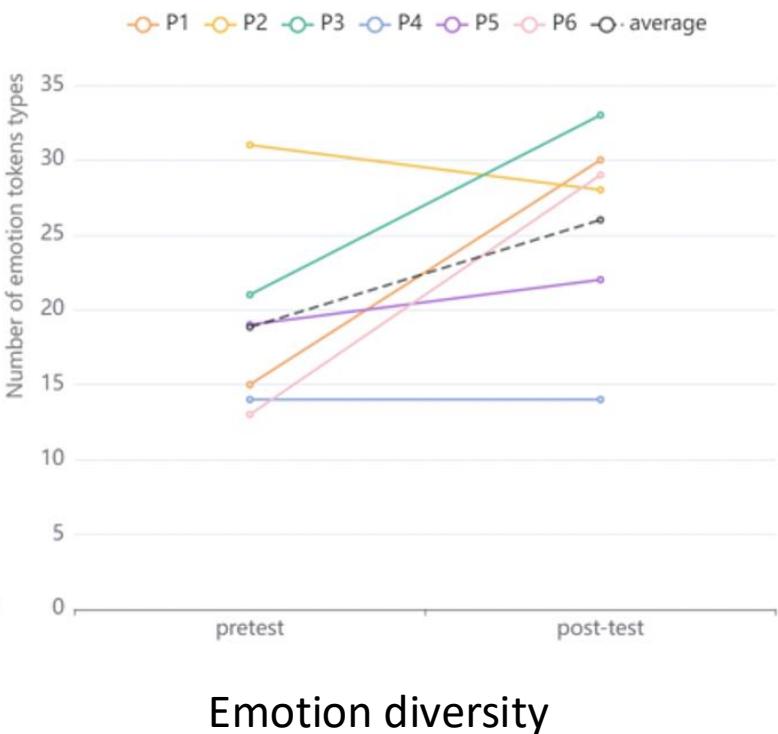
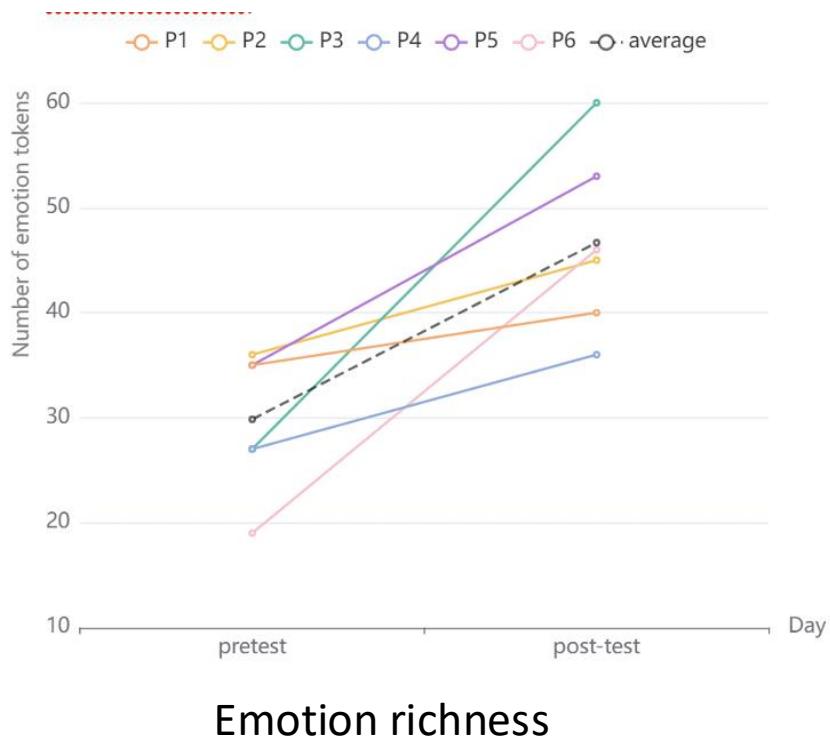
2. HFA's emotional recognition abilities



EmoEden is likely to improve the emotional recognition abilities of HFA children, and the increased training duration may contribute to a greater improvement in their abilities.

FINDINGS

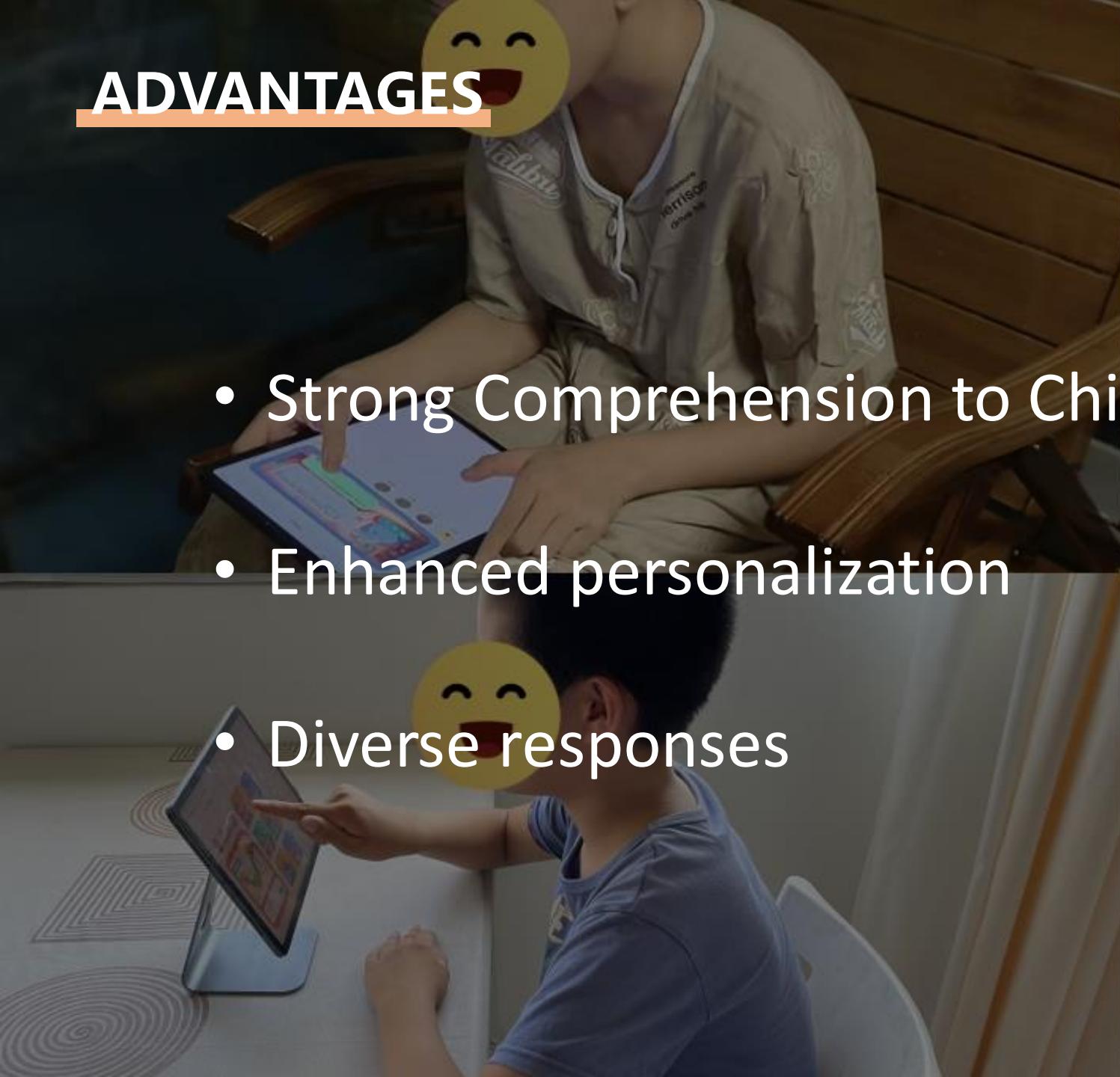
3. HFA's emotional expression abilities



EmoEden led to the incorporation of more emotion tokens in HFA children's expressions, along with increased attention to the emotions of others. Due to individual differences, some children showed an improvement in the diversity of emotion tokens, while others did not.

ADVANTAGES

- Strong Comprehension to Children's Expressions
- Enhanced personalization
- Diverse responses



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Looking for Ph.D. program in Fall 2025!

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