Children's Experiential Memory Aid

Creating a personal AI assistant to enhance children's experiential memory

Process Book

IACT 730
Winter 2020
Prof. Sung Park

Team:
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Miaolin Sheng
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Xiaoxiao Chen

Executive Summary

The world is a complex place for kids. Just completing everyday tasks can be daunting when curiosity and adventure are a top priority. Kids need a companion to help them stay on task and remember all the important and fun things going on in their lives.

Here is where Tuki comes in. Tuki allows parents to assign routines to their kid in a fun interactive way to help kids remember what comes next. Tuki also allows you to see the progress your child makes in a handy application on your phone.

OUR TEAM

Alexys Scott
Project Lead
MA Design Management

Brieana Nestler
Research Lead
MFA Service Design
BA Sociology

Wenting Zhu
Creative Lead
MFA Service Design
MEng Structural Engineering

Ashley Montalvo Falto
Prototyping Lead
MFA Service Design

Miaolin Sheng
User Experience Lead
MFA Design Management
MA Industrial Design

Xiaoxiao Chen
Programming Lead
MA Design Management

ROLES & RESPONSIBILITIES

Project Lead

- Oversee project goals
- Facilitate group meetings
- Manage group assignments
- Look into the overall plan

Prototyping Lead

- Provide direction for prototyping methods
- Manage the prototyping process
- Analyze the results of the prototyping

Research Lead

- Oversee research plan
- Work with team to align research and design

User Experience Lead

- Oversee user experience methodologies, usage, and language

Creative Lead

- Manage consistent design language across the board
- Provide creative insight for presentations and other deliverables

Programming Lead

- Lead and proof the programming for the project
- Delegate coding responsibilities
- Finalize programming

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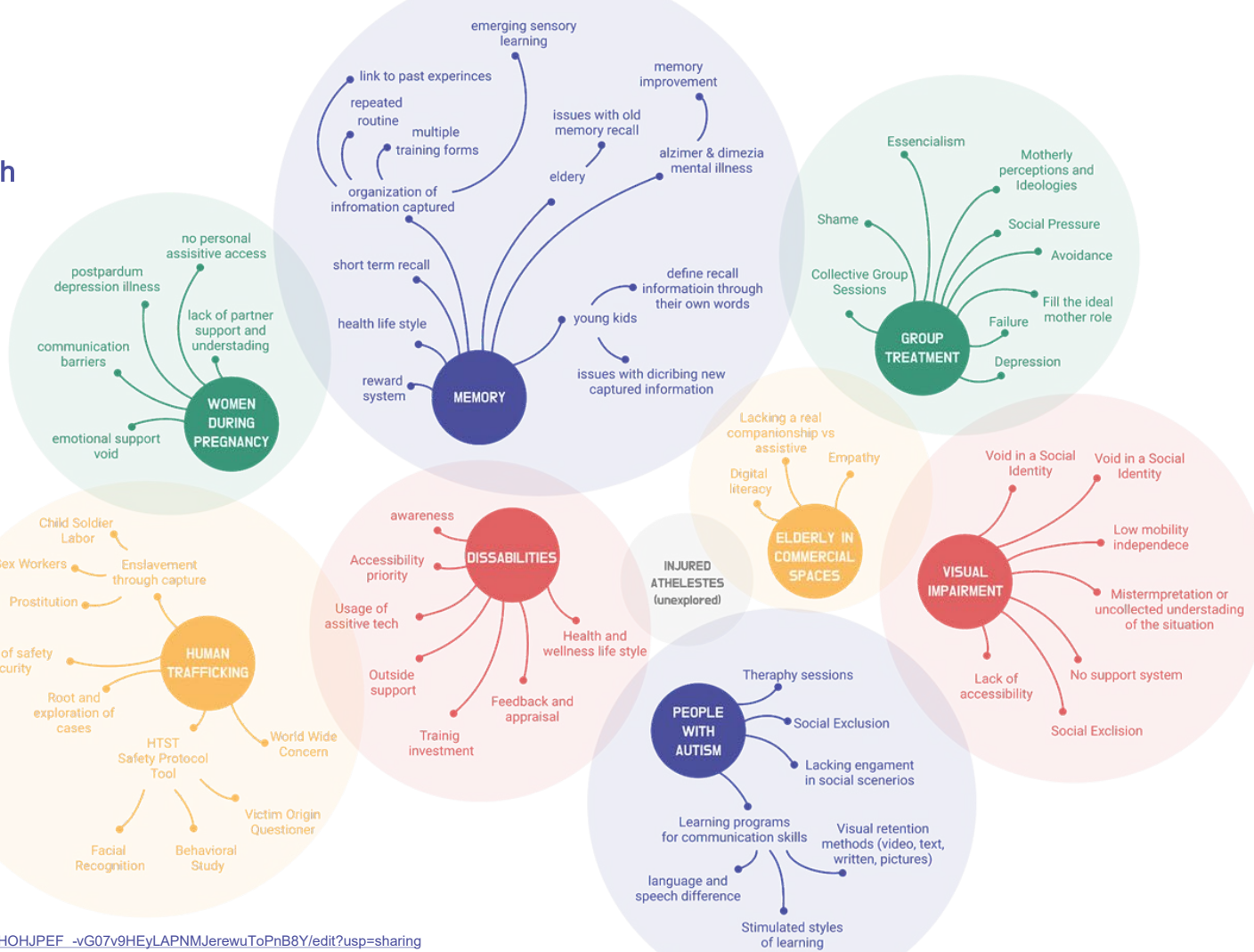
Mind Map

Based on Secondary Research

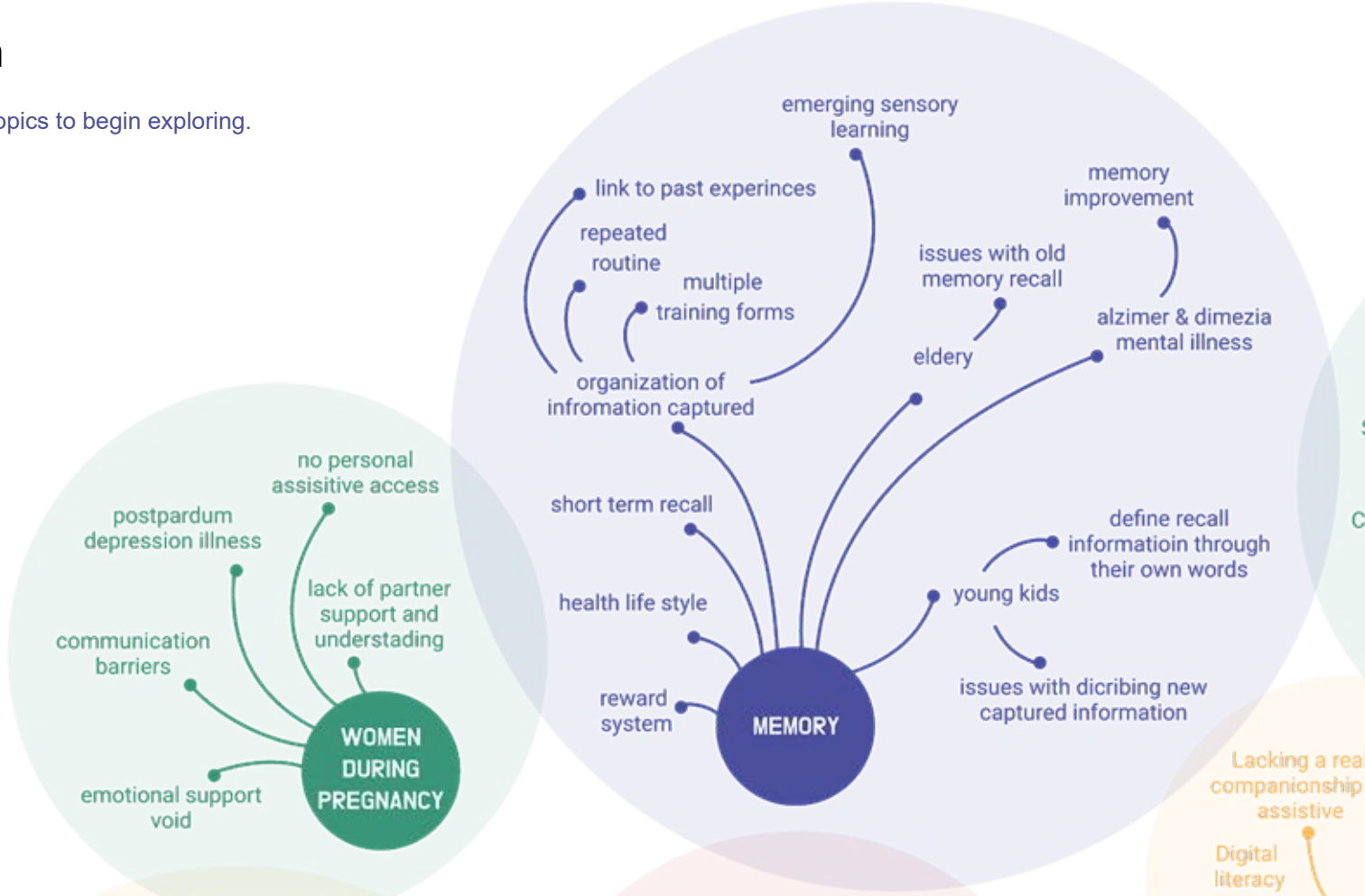
We started with eight broad topic spaces to design within: Pregnancy, Memory, Human Trafficking, Disabilities, Autism, Visual Impairment, Group Therapy, and Elderly people in commercial spaces



Source: https://docs.google.com/spreadsheets/d/1mzAn_VrjHOHJPEF_-vG07v9HEyLAPNMJerewuToPnB8Y/edit?usp=sharing

Topic Selection

We then voted on two top topics to begin exploring.



Topic Selection

Measurement of Feasibility, Desirability, Accessibility

Feasibility: By examining the possibilities of technical limitations in Arduino, using AI to make something, and the realism of creating a full support system *memory* was agreed upon as a more feasible topic.

Desirability: Would these be products people will want and keep was our priority questions. In this category, while pregnant women would definitely buy into the product because of the market space available, the possibilities of extending the system outside of pregnancy was limited. Again *memory* was unanimously a more desirable product.

Accessibility : Given how many children versus pregnant women we have access to research and test with, memory became the winner again.

On Scale 1-5	Feasibility			Desirable		Accessibility		TOTAL
	Tech (Product)	AI (Goal)	System	Attract	Extend	Research Access	Testing Access	
Pregnant	3	3	4	5	3	5	3	26
Memory	5	4	3	4	5	5	4	30

Through a matrix of the design principles Feasibility, Desirability, and Accessibility we explored the two topics further.

“The multiple systems model posits that memory is *not a single, unitary system* that relies on one neuroanatomical circuit; rather…

made up of multiple memory systems that can work *independently* of one another.”

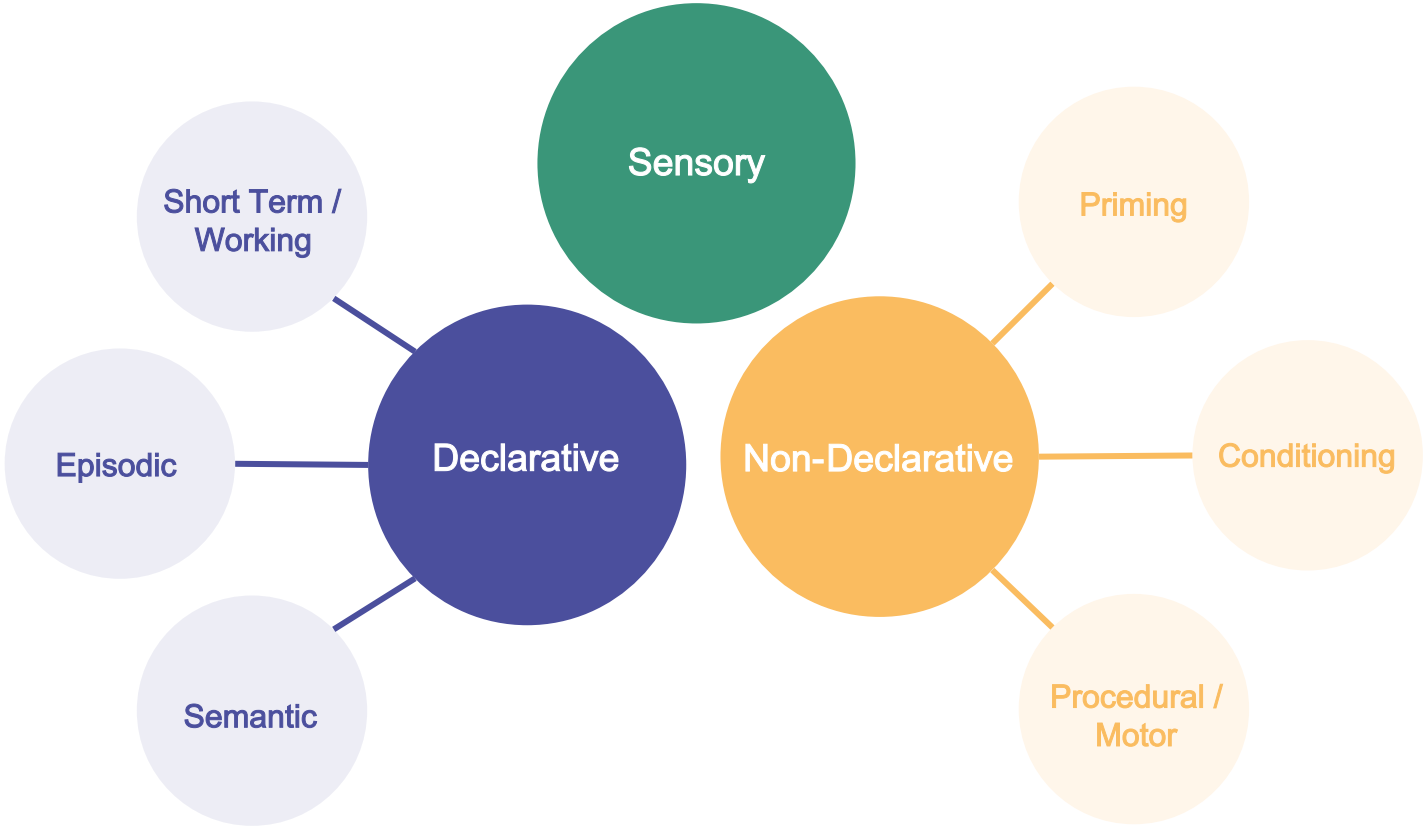
Early in our research, we stumbled through how we were to tackle such a broad and very well established field. Are we concerned with linear mechanical cognitive processes or contextual situations we use memory?

May, C. P., & Einstein, G. O. (2013). *Memory: A Five-Day Unit Lesson Plan for High School Psychology Teachers*. American Psychological Association.

Topic of Interest

Memory

We also questioned what type of memory are we exploring?

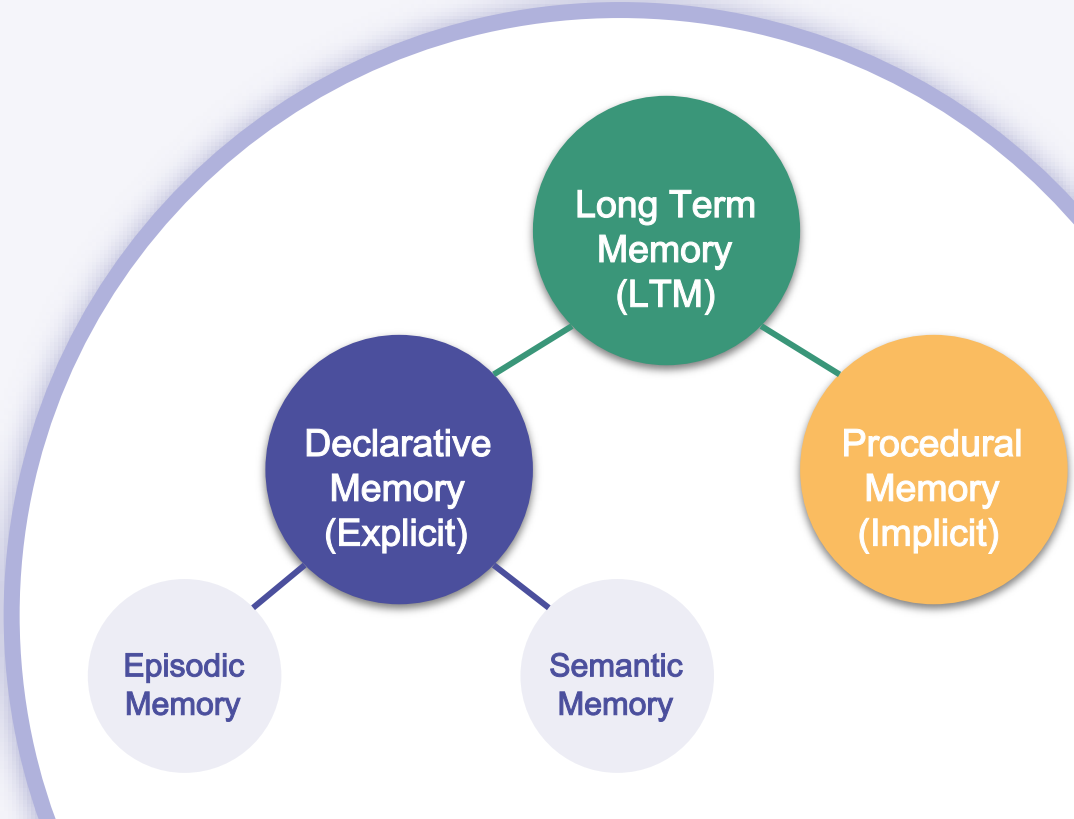


May, C. P., & Einstein, G. O. (2013). *Memory: A Five-Day Unit Lesson Plan for High School Psychology Teachers*. American Psychological Association.

Long Term Memory

Secondary Research

Long Term Memory is categorized as sensory, working, and long term; memories are encoded and then recalled in various contexts. Long Term Memory (LTM) in particular is largely divided into two categories, the implicit and explicit. Procedural memories are implicit, they are unconsciously recalled, such as the steps in brushing your teeth. The memory is unconsciously recalled and completed with little conscious thought. Explicit memory on the other hand is that which is consciously recalled upon, such us remembering a family holiday or the state capital of Georgia during an exam



Topic of Interest

Memory Development in Children

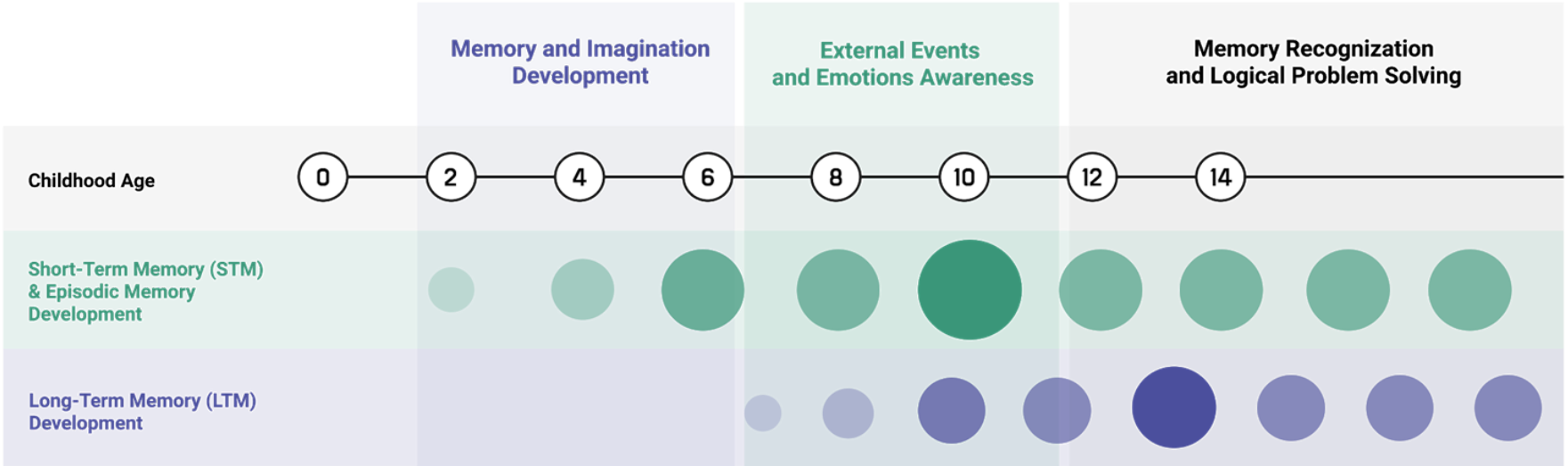
Early on we knew we wanted to create something for children and their memory development, but still questioned what part of the memory process are we investigating?

May, C. P., & Einstein, G. O. (2013). *Memory: A Five-Day Unit Lesson Plan for High School Psychology Teachers*. American Psychological Association.

Topic of Interest

Memory Training in Children

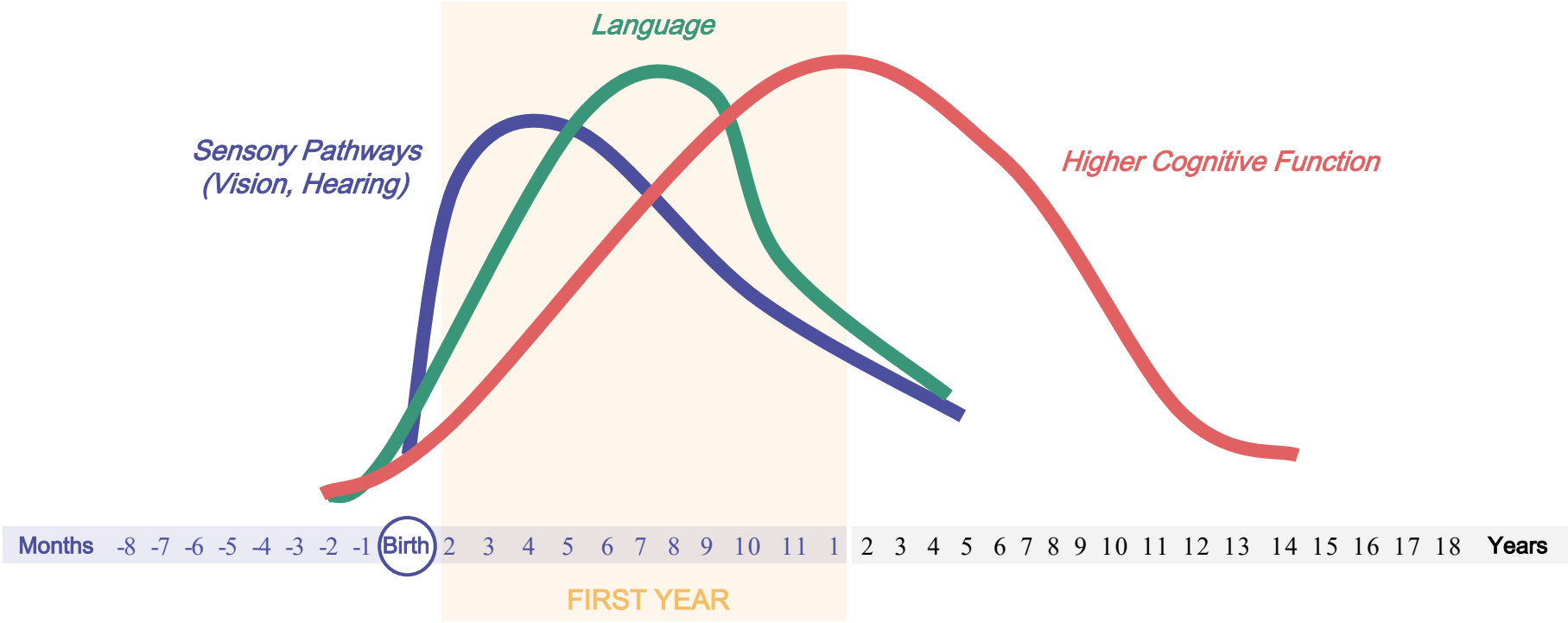
Through our research we found a prime age range of 5-14 years old, since this is when Long Term Memory really begins flourishing.



4 COGNITIVE STAGES FOR CHILD DEVELOPMENT https://www.learningrx.com/4-cognitive-stages-for-child-development

Neural Connection Development

Secondary Research

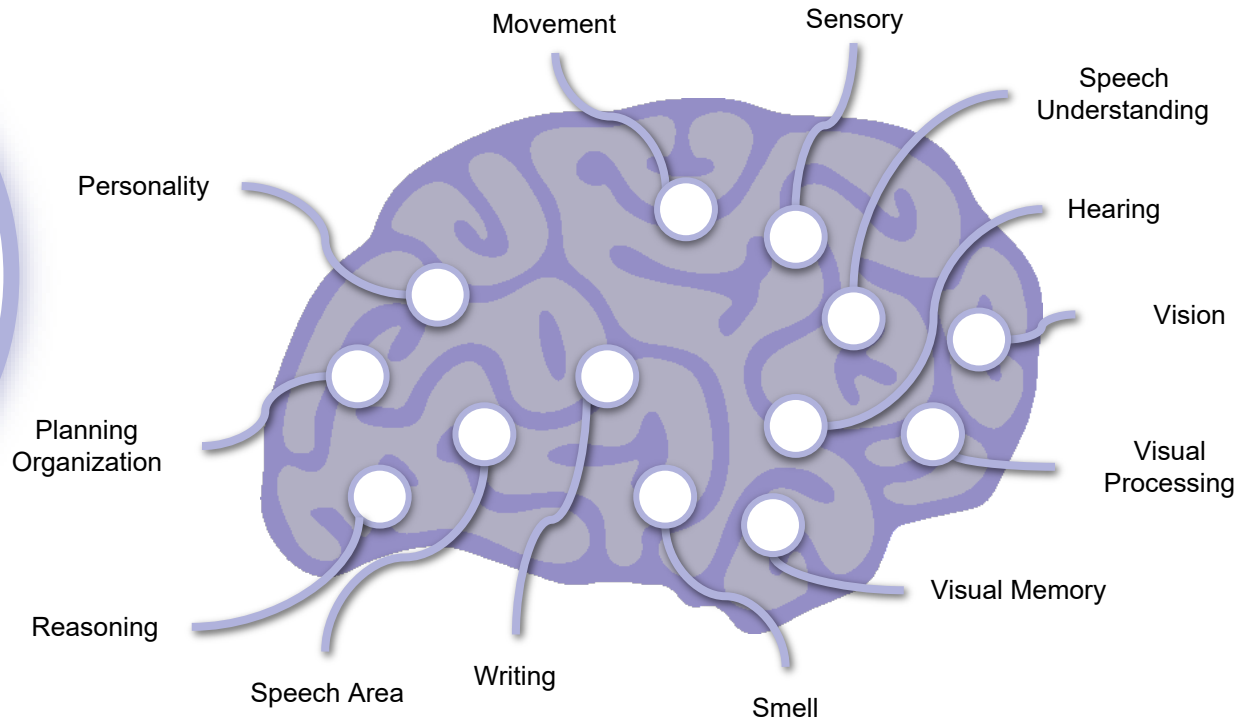


Nelson, C. A. (2000). Neural plasticity and human development: the role of early experience in sculpting memory systems. *Developmental Science*, *3*(2), 115–136.

Child Psychology

Brain Sections

Memory development is traditionally described through means of neurobiological and cognitive processes internally within the brain. However, when designing new technologies this purely neurobiological perspective neglects the complex contextual moments in which memory is both encoded and recalled.



https://www.apa.org/images/brain -functional-areas_tcm7-96746_w1024_n.gif

I think we need a more general conception that may be called ***experiential memory***, that is, memory that is derived from personal experience in **everyday living**, some of which is procedural and perceptual (PP), and other declarative (DM), expressible through mimetic means.

We followed a sociocultural approach to memory, specifically the development of children's memory. A sociocultural framework of memory "recognizes that in development the individual child is situated within a social context that draws on a large complex of cultural understandings and knowledge structures which provide aliment for memory."

Nelson, K. (2013). *Sociocultural Theories of Memory Development* The Wiley Handbook on the Development of Childrens Memory, 87–108. doi: 10.1002/9781118597705.ch5

Child-Computer Interaction

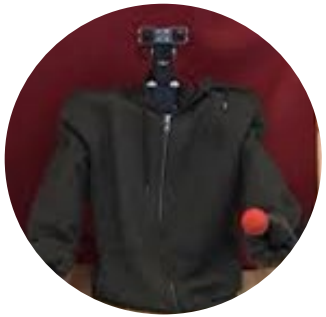
Secondary Research

Based on the subfield of Human Computer Interaction: Child Computer Interaction, we learned that whatever we designed would need to utilize repeated interactions, symbol recognition, and a gamified system to keep children engaged with our product.

Hourcade, J. P. (2015). *Child-Computer Interaction* (1st ed.).

Artificial Intelligence

Secondary Research



Piper

As **human-robot dialogue** faces the challenges of long-term interaction, understanding how to use prior conversation to foster a **sense of relationship** is key because whether robots remember what we've said, as well as how and when they expose that memory, will contribute to **how we feel about them**.

Leite, I., Pereira, A., & Lehman, J. F. (2017). *Persistent Memory in Repeated Child-Robot Conversations.* Proceedings of the 2017 Conference on Interaction Design and Children - IDC 17. doi: 10.1145/3078072.3079728

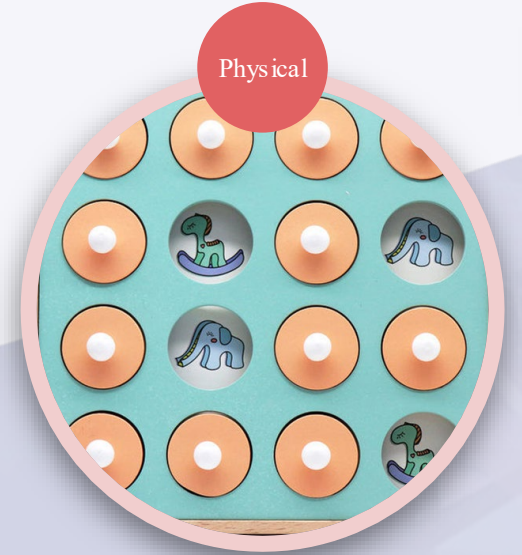
Market Analysis

Childhood Memory Training

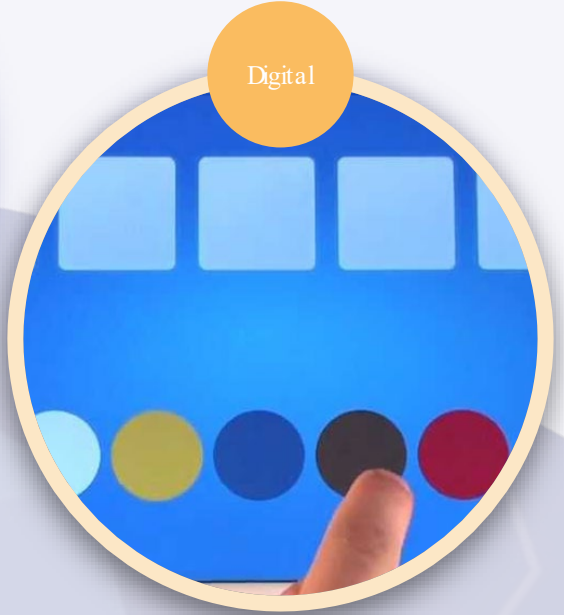
Memory development toys for children fall under two main categories: Card Association and Figure/Symbol Matching. The physical analog products are either card or wooden based.

Then digitally there exists these same exact toys, just through a touch screen interface.

Physical



Digital

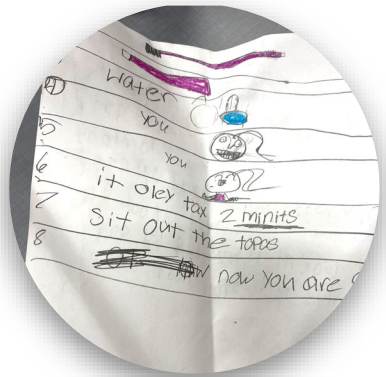


Primary Research

Methodology

Cultural Probe

Interview



Drawing Study

Observation

Cultural Probe

Introduction

Understanding how children encode and **retrieve** long term memories based on **sensory cues.**

Participants (15 in Total)

- *5 Children*
- *10 Parents*

Cultural Probe

Results

- Children love **animated characters**
- Children **repeat** what they know
- Children want **colorful balloons**
- Children need **encouragement**
- **Don't restrain** the thinking of kids
- Parents are very **protective** of their kids

While we had interesting takeaways, this research method was found to not be the best methodology to tackle the complexity of the issue we wanted to explore.

Interview

Introduction

According to Parents and Teachers, children need **assistance with retrieving all types of Long Term Memory** .

Children often lose items, forget procedures, and episodic memories.

Participants (16 in Total)

- *5 Children (Age 5-10)*
- *6 Parents*
- *5 Teachers (Teaching children in age 5-10)*

Time & Day

33 Parent Mentions

I don't know

10 Child Mentions

Parent Have Negative Assumptions Of Children Forgetting

I think kids are lazy, Because he **knows how to** put the shoes in the closet. And then he'll take his shoes off and leave them in the living room and I ask him, 'why the shoes are there?' and he'll say 'I forgot'. **No, he's just being lazy.**

- *Parent 05*

Children Really Do Forget Steps Of Processes

Remembering the **process** is what is hindering them mastering the skill because they know all the steps. And like I said, this comes back to like it is not doing things around the house like having **chores**.

- *Teacher 03*

Children Have a Hard Time Verbalizing Memory

Description

If i just ask him, ‘Do you**remember** what you did at school?’ He would say, **‘No’**.

- *Parent 04*

Emotional Attachment to A Memory Allows Effective Encoding

He started to remember things at 3 years old when we just moved to Savannah and **we lived our first house** there. He remembers it was a wood house. **He is emotional about that house** . Every time we talk about that house he wants to cry, he misses it so much.

- *Parent 02*

Children Get Easily Frustrated When Technology Doesn't Work

> Alexa, can be **rude** 'What can I do for you today.' We didn't even ask anything or say Alexa, we were saying [something else]. So we will be like **stop it** Alexa.
>
> - *Child 03, Age 8*

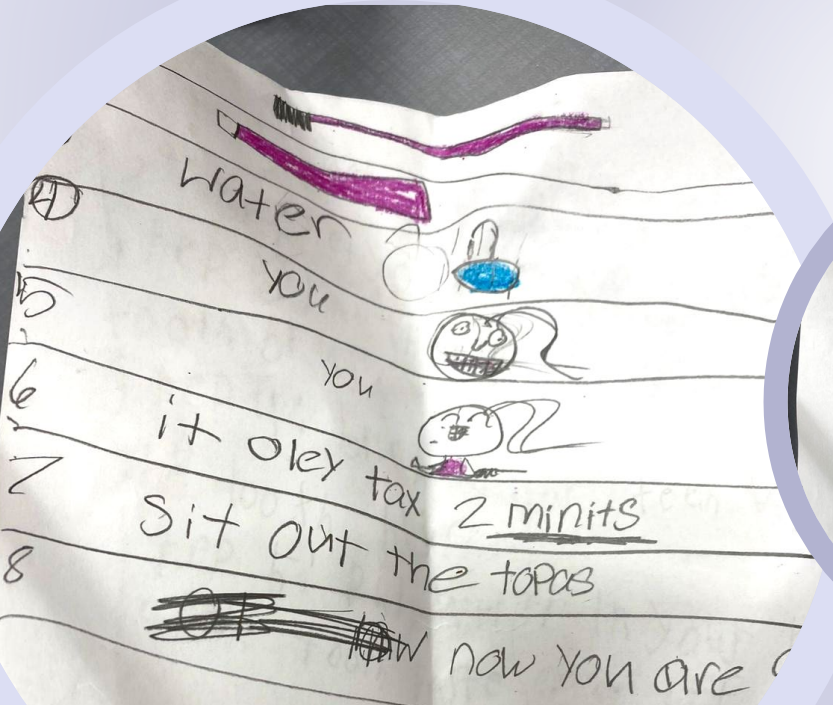
VUI Is Not Designed For Children

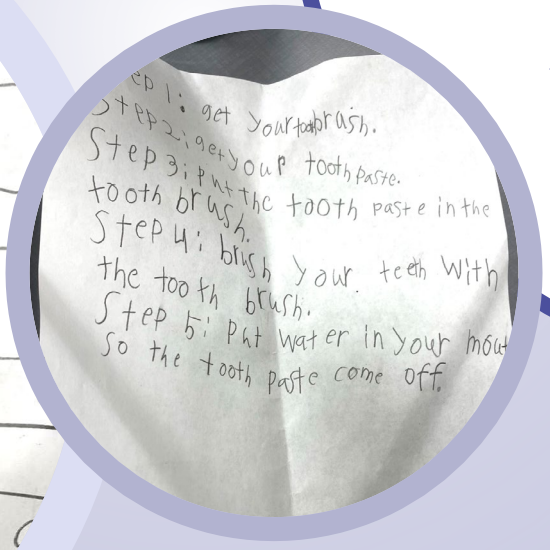
She's sometimes **annoying**, but she helps me spell things. Like, I asked her stuff, and she either **hears the wrong thing**, or she gives me like wrong answers that I already know.

- *Child 01, Age 7*

Drawing Study

Introduction





Topic:

How to brush your teeth

Goals:

- Tapping into procedural memory
- The system that children use to link steps of a process
- Things children remember of a day to day process

Participants: *5 Children (Age 5 10)*

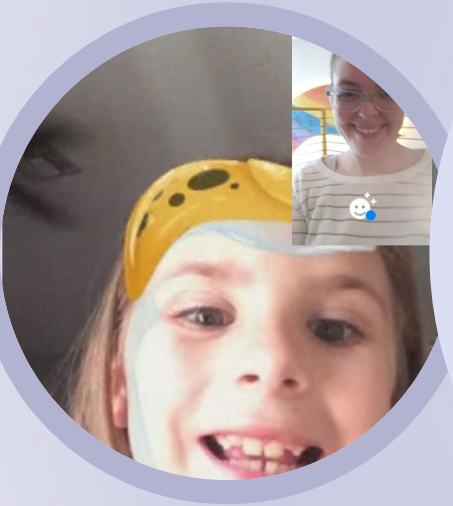
Drawing Study

Results

- Children understand that there are multiple steps to complete the task.
- **Words and drawings** help children depict the steps
- One child even used **color** to help highlight the steps
- Children **struggle to recall and communicate** steps within a process.

Observation

Introduction



Hyper aware of our **interactions** with children and studying their memory informally

Observation

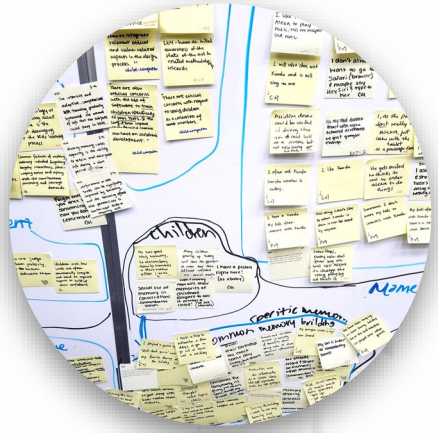
Results

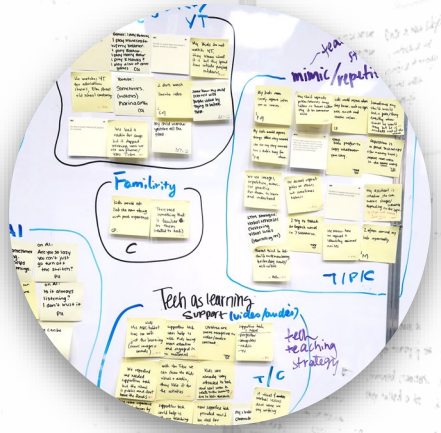
- Children really do **forget** steps of a process
- Easily **frustrated** when technology does not work
- **VUI NOT** designed for children
- Very particular and know what they want
- Frequently say **“I don’t know”**


Affinity Mapping
Over 450 Data points across secondary and primary research

Affinity Mapping

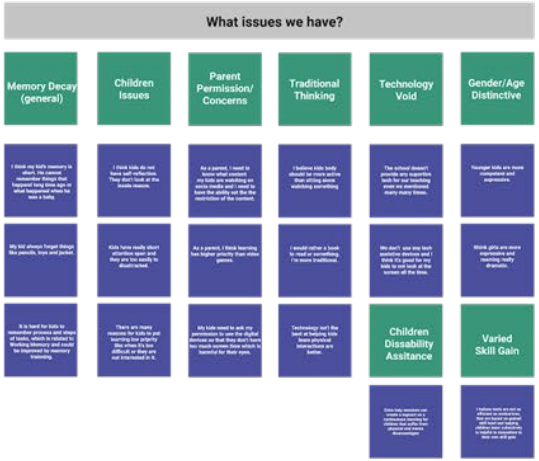
Process

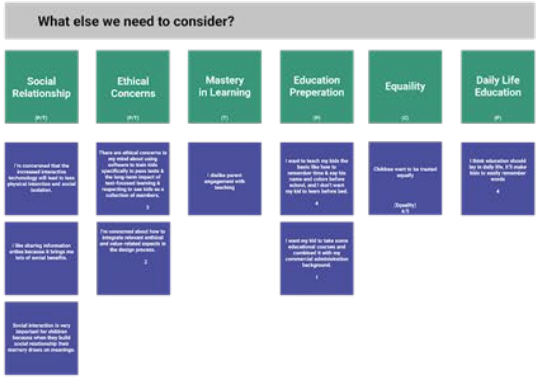




Affinity Mapping

Results





Raw Data:https://www.figma.com/file/tH5oAr2ELItvULeGZqeYei/MEMORY-AI?node-id=133%3A81

KEY POINTS

Teaching Strategy (P/T)	Memory Collection (C/P/T)	Children Interest (C)	Equality (C)	Daily Life Education (P)	AI (C/P/T)
When we get closer and trust each other, It's easier to teach. (Trust Building) 8/11	We stayed at home played some indoor games together due to the bad weather. (Common Memory) 14/16	Blue is my favorite color.	Children want to be treated equally (Equality) 4/5	I think education should lay in daily life, it'll make kids to easily remember words . 4/6	I use AI as an assistive device to interact with content in different ways but I'm concerned with limitations of time that need to be placed and unaccurate material being accessible to anyone 9/16

Insight #1

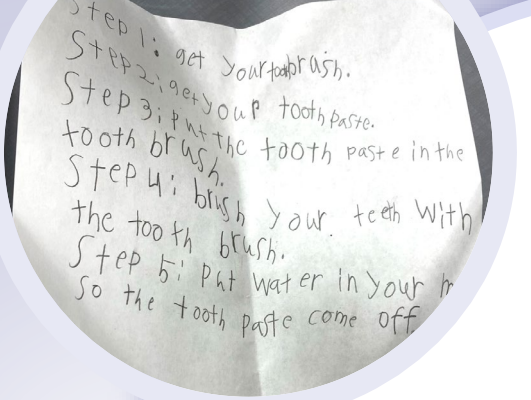
VUI & Children Voices

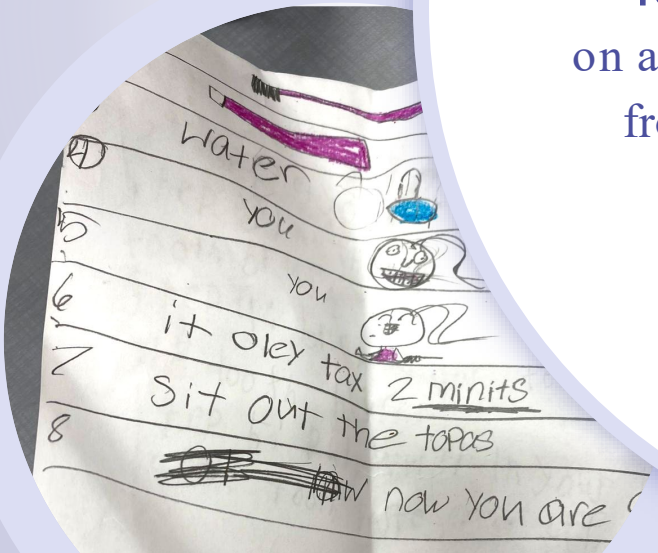
She's sometimes **annoying**, but she helps me spell things. Like, I asked her stuff, and she either **hears the wrong thing** , or she gives me like wrong answers that I already know.

- *Child 01, Age 7*

Insight #2

User Frustrations





Children struggle with
recalling experiential memory
on a **daily basis** and need assistance
from their parents and teachers.

Insight #3

Creating Trust with Voice

As **human-robot dialogue** faces the challenges of long-term interaction, understanding how to use prior conversation to foster a **sense of relationship** is key because whether robots remember what we've said, as well as how and when they expose that memory, will contribute to **how we feel about them**.

Leite, I., Pereira, A., & Lehman, J. F. (2017). *Persistent Memory in Repeated Child-Robot Conversations.* Proceedings of the 2017 Conference on Interaction Design and Children - IDC 17. doi: 10.1145/3078072.3079728

Target Users

Based on Research

Children

(Age: 5-14 years old)

Parents

02 Ideation

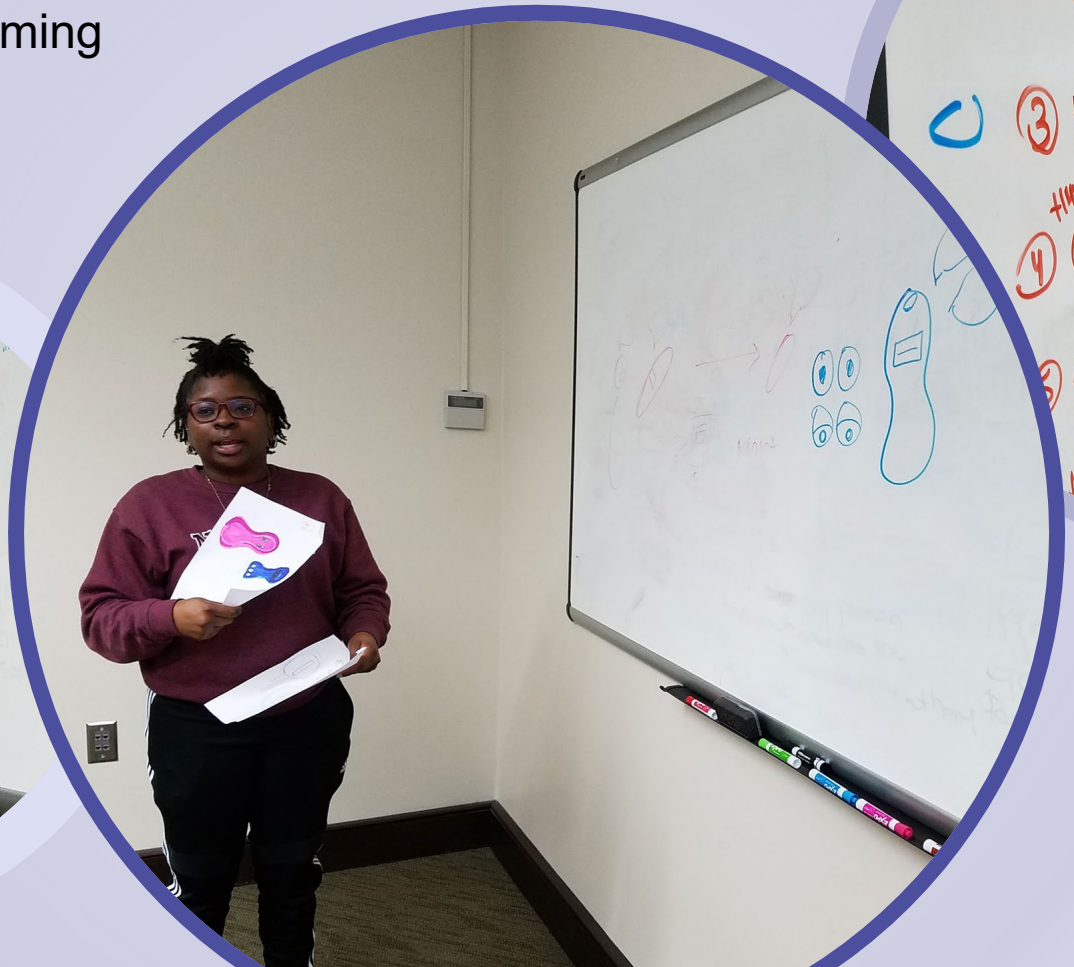
- How Might We
- Concept Brainstorming
- Initial Concept A: Tuki
  - Sketch
  - Storyboard
  - Moodboard
- Initial Concept B: Capi
  - Sketch
  - Storyboard
  - Moodboard
- Concept Testing
- Tuki 2.0
  - Product Sketch
  - APP Wireframe
  - Scenario Building

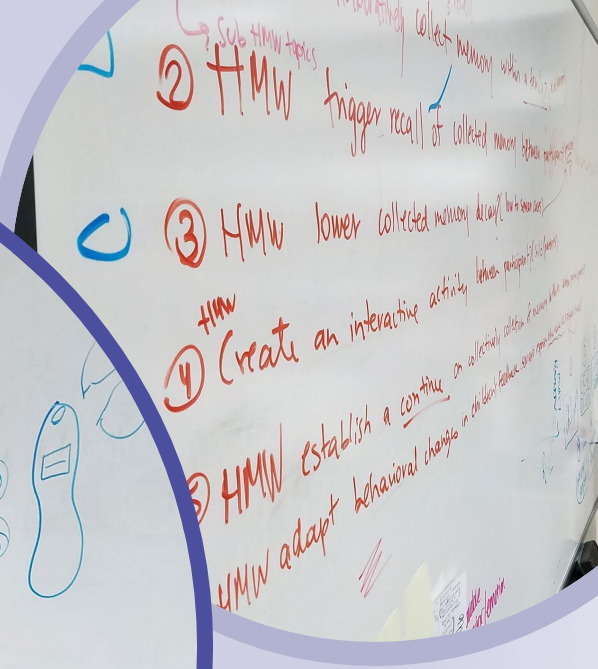
How Might We

1. Enhance children’s Experiential Memory (EM) retrieval?
2. Support parents efforts in this process?
3. Use AI to assist with this memory retrieval?
4. Create a children’s AI personal assistant?

Concept Brainstorming

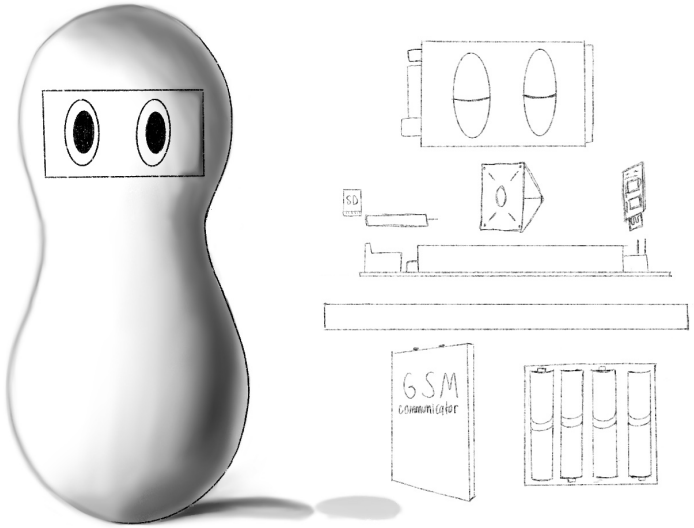
Individual Sharing





Initial Concept A

Tuki



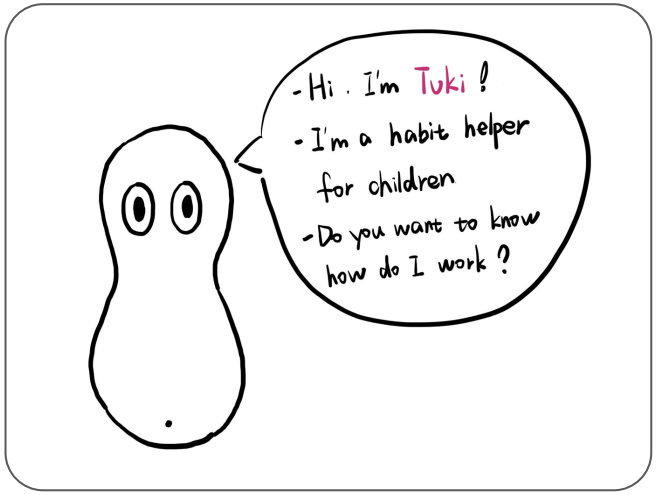
Tuki is a happy helper

that assists children with their **daily routines**, to keep them **focused and excited** to complete tasks assigned to them by their parent.

The support App allows parents to **assign tasks** to routines and then be communicated in a **fun gamified** way for the child.

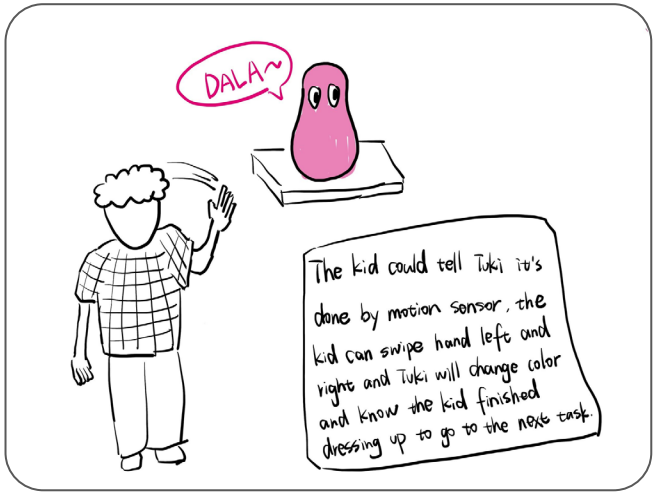
Tuki

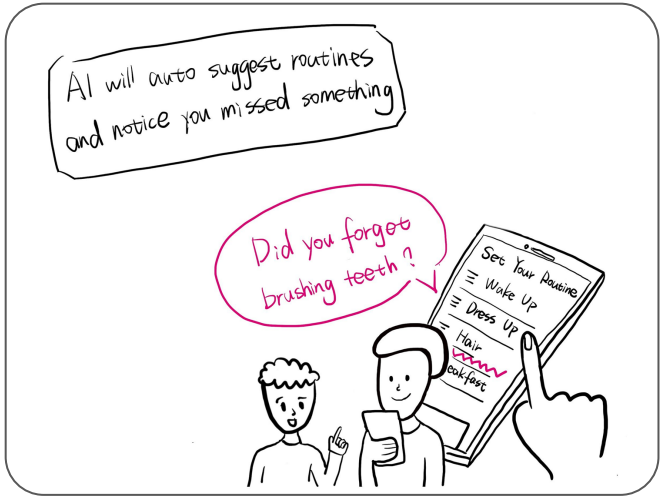
Storyboard



Tuki

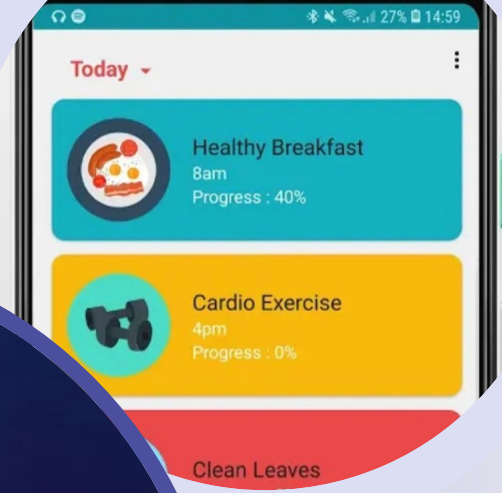
Storyboard

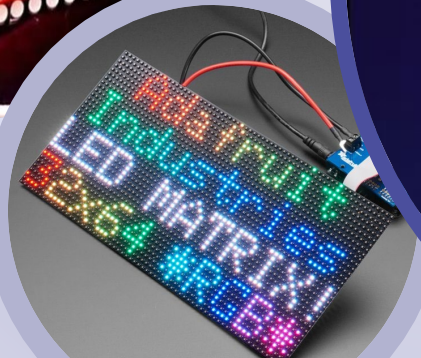




Tuki

Moodboard





Initial Concept B

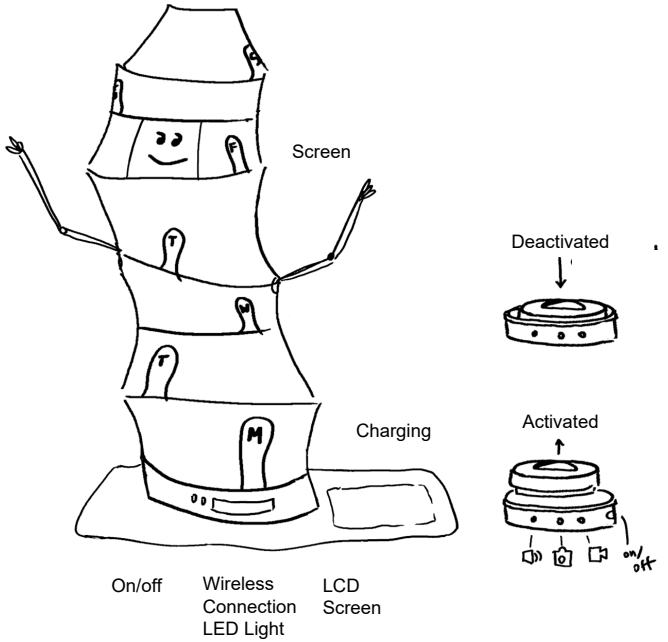
Capi

Capi is an interactive lamp

that is able to **capture memories** of both the parent and child in order to continue building **collective family memories** .

At the end of each day families can come together to **have real conversations** based on the data collected by the mobile capi device and **turn on a colorful light for the day.**

Capi keeps **7-day memories & lights of a week** .

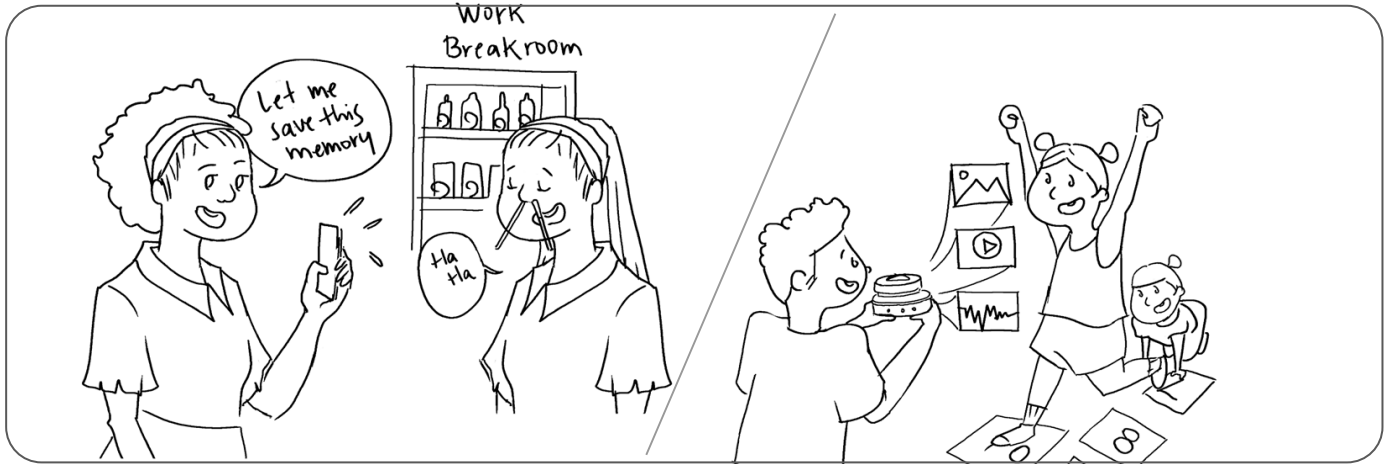


Capi

Storyboard

1. Mom asks son what he did in school, but he ***can't never remember***.

2. Mom brings home ***NEW lamp "Capi"*** for her son.



3. Mom and son record events of the day they like, so they ca***save their memories*** of what they did during the day to later visit them.

B

Capi

Storyboard

4. Mom and son arrive home and ***saved memories*** *of the day* ***get uploaded*** *to Capi.*

5. Mom and son interact with Capi, ***review saved memories*** *with picked up* ***words of the day*** *and* ***share****.*

6. Mom and son stop sharing their saved memories of the day. ***A color light turns on representing the emotions of the day.***

B

Capi

Moodboard

Quick Concept Testing

Tuki

Pros:

- help reduce parents' stress
- Time management/time saving
- Buddy
- Parent involvement to build routines
- Use at home or other places

Cons:

- Will children pay attention?
- Firewall security
- Managing routines in App

Suggestions:

- Unbreakable
- Youtube intro for trust building
- Extend for helping with HW, Assignments, reading, time, alarm, etc.
- Cost $30-50

Capi

Pros:

- Easy to use
- Learning related
- Bring family together
- Can be at home/ kids room (light)
- Possible Extended usage
- Visual representation of the week
- Stronger relationships for easier communication starter

Cons:

- Capi's small addon device can't go to school
- May not complete the days
- Hard to understand

Suggestions:

- Refine product exterior look
- Combine with Tuki's system functions

Concept

Tuki

2.0

Tuki 2.0

Function +

Appearance

Function (for parents):

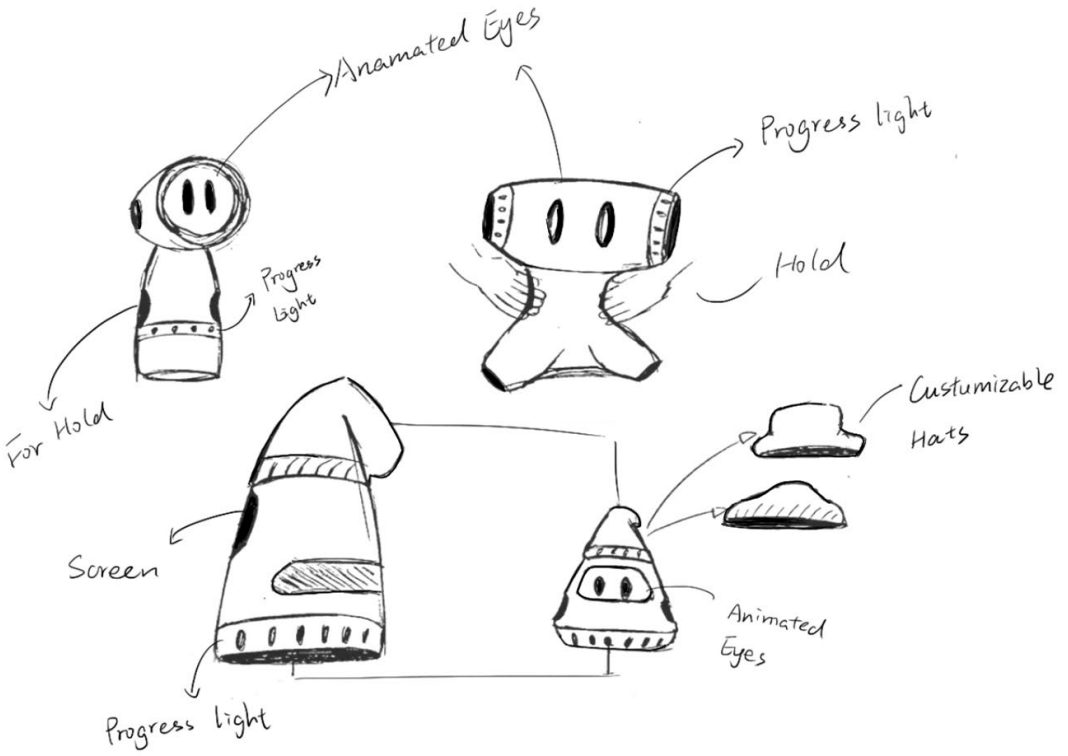
- Routine setting
- Suggestions for plan
- Progress tracking
- Completion visualization

Function (for kids):

- Task Guide
- Voice encouragement
- Progress tracked by Light

Appearance:

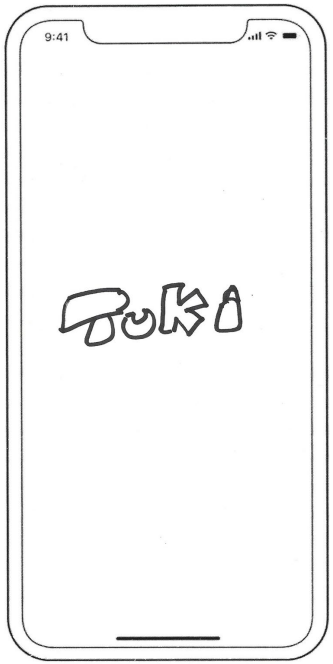
- Eyes
- Lights to show the progress of week
- Round shape



Tuki 2.0

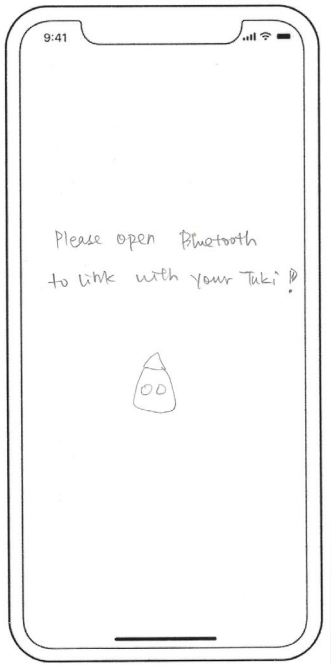
App Wireframe (Digital)

Landing Page



Sign Up

Connect with Tuki



Heuristic Evaluation

Based on Nielson's 10 Usability Heuristics

Modified an existing Heuristic Evaluation Checklist (Pierotti)

Key Features

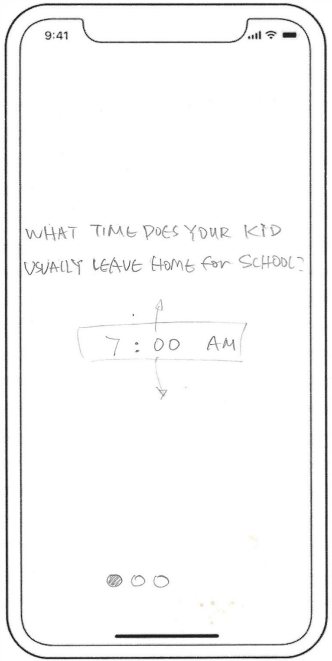
1. Visibility of System Status
2. Match Between System & Real World
3. User control & Freedom
4. Consistency & Standards
5. Error Prevention
6. Recognition Rather than Recall
7. Flexibility & efficiency of use
8. Aesthetic and Minimalist Design
9. Help Users recognize, diagnose, and recover from errors
10. Help & Documentation

Check List: https://docs.google.com/document/d/15WYuwb9Jcw9P5K2xfK0r7rDHKoEw7ilm7u-CE2iOf4M/edit

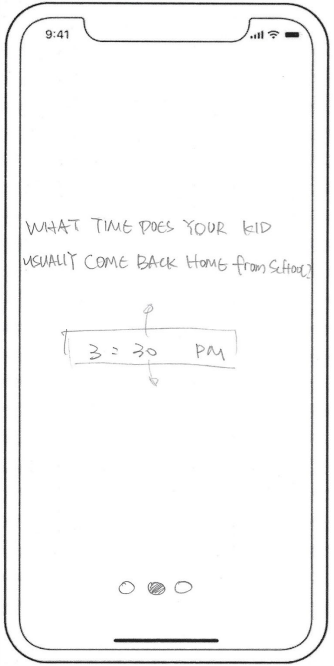
Tuki 2.0

App Wireframe - Basic Info

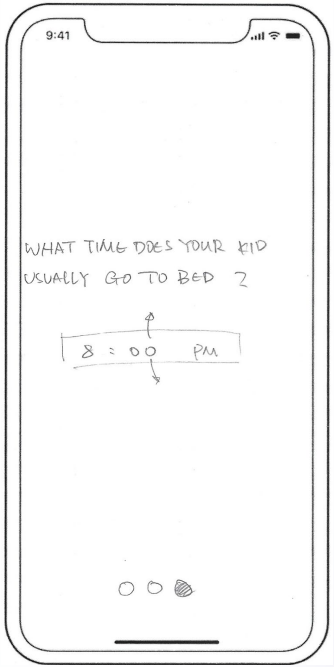
Time: Leave Home



Time: Back Home



Time: Go to Bed

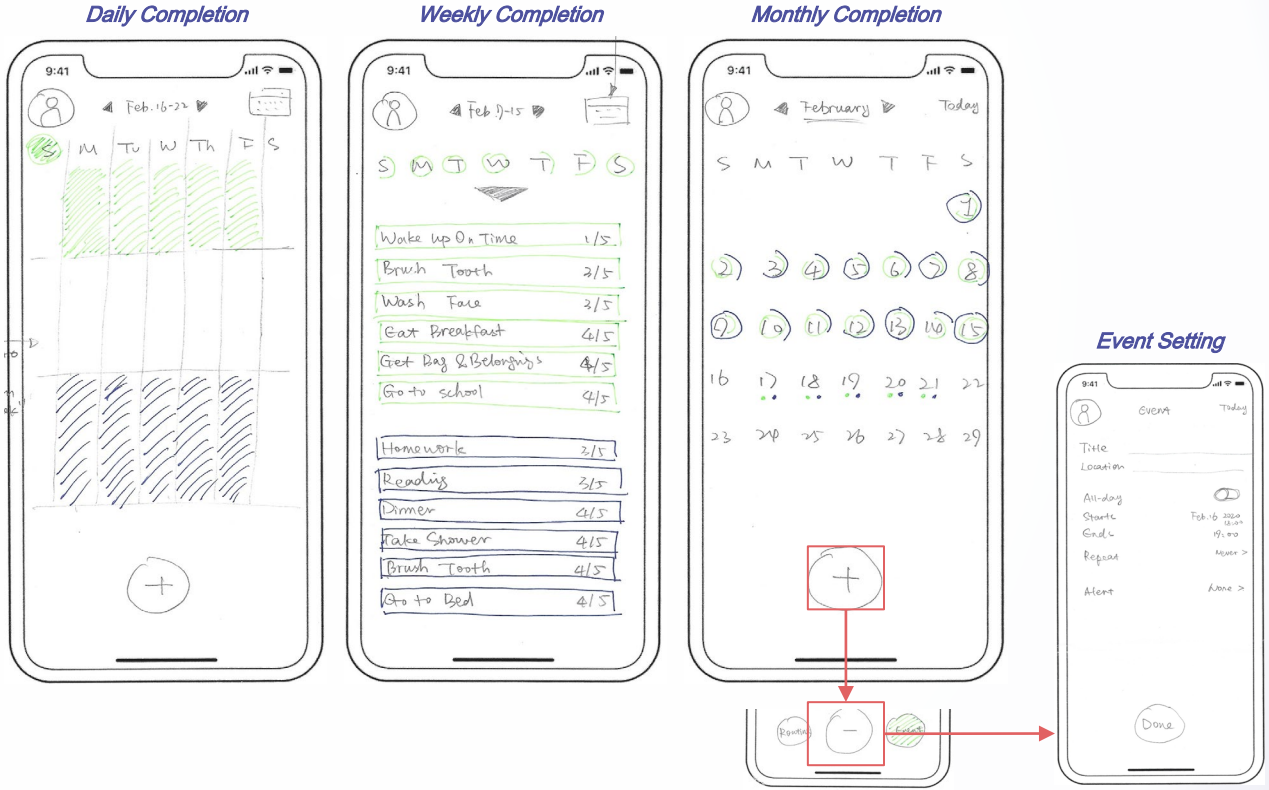


Basic Info can help Tuki better understand users so that Tuki can support parents to **organize time and make plans** by give auto suggestions.

Tuki 2.0

App Wireframe - Completion Tracking

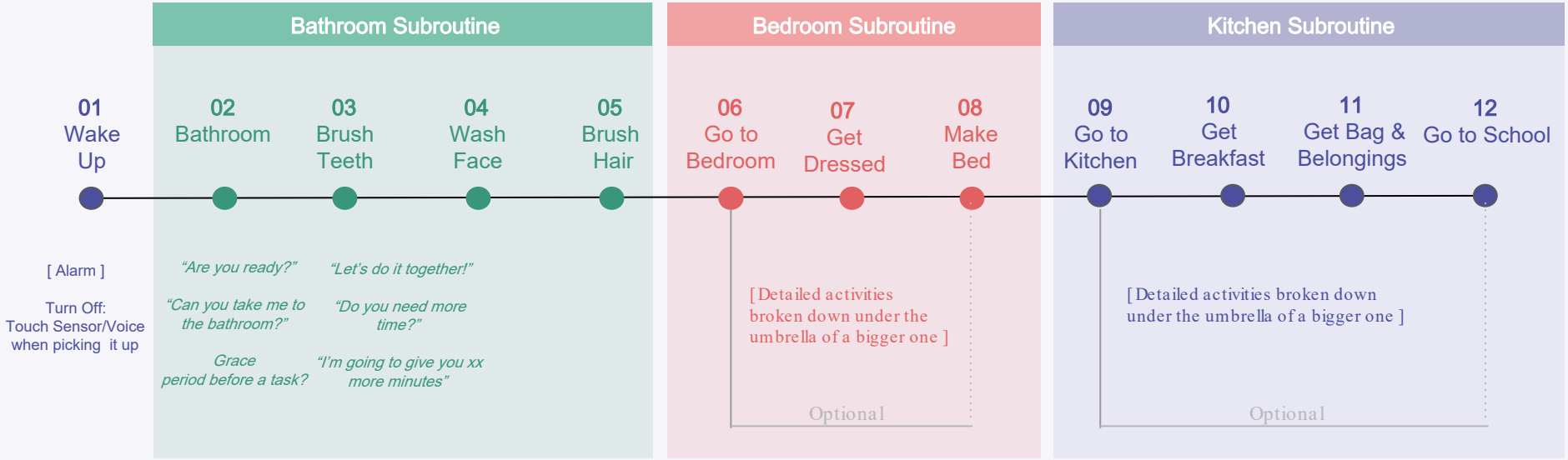
Completion tracking can help parents' better understand their kids and make plans.



Tuki 2.0

Scenario Building (Physical) Morning Routine

The Scenario follows a **morning routine** of a child during a school day, following a step by step activities that need to be considered for further **Parent App** activity set up and **child interactions.**

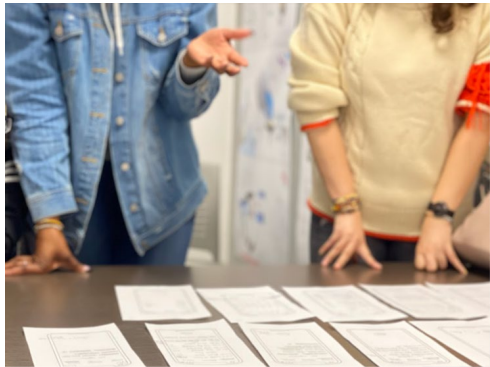


03 Prototyping

- Prototype #1:
  - Low-Fi Prototype (App)
- Prototype #2:
  - Wizard of OZ (System)
- Prototype #3:
  - Appearance Testing (Physical Product)
- Prototype #4:
  - Brand Testing

Prototyping #1

Low-Fi Prototyping (APP)



To understand the parent usage of

- Onboarding process
- Flow of UI interactions
- Easy Access to:
  - Calendar
  - Setup of activities
  - Timeframe of activities
  - Observed progress
  - Suggestive add-ons

Participant: 5 parents (4 moms & 1 dad)
Location: Gulfstream & Shed
Duration: 2 days

Prototyping #1

Takeaways

- Parents like the **clean interfaces.**
- **Suggestions** from Tuki let parents easily make plans.
- **Two steps** to set up one routine saves time for parents.
- Parents like the **tracking of completion.**

- Parents want **suggestions based on the age** of kids.
- Parents think **kids with an older age** (more than 10 age) might **not follow the steps** from Tuki.
- Parents want **more graphic ways** to see the progress and completion.

Prototyping #2

Wizard of OZ (System)

To understand the systematic functionalities of

- Voice Interaction
- Script Conversational
- Triggers (activities)
- Eye Movement
- Time management
  - Light of progress 50-100%
  - Music timelapse

Participant: 3 Kids in Total

- Boy A, 8 years old
- Boy B, 7 years old
- Girl A, 5 years old

Location: Gulfstream & Sheds

Duration: 2 days

Prototyping #2

Wizard of OZ (Scenarios)

01
Wake Up
"Bedroom"

02
Brush Teeth
"Bathroom"

03
Eat Breakfast
"Kitchen"

Prototyping #2

Takeaways

Similarities

- Less talking from Tuki
- Want music more than words
- Color and lights would be attractive
- Prefer to tap the top of Tuki

Differences

Girl A, 5 year old:

- More trust
- Willing to follow the steps

Boy B, 7 year old:

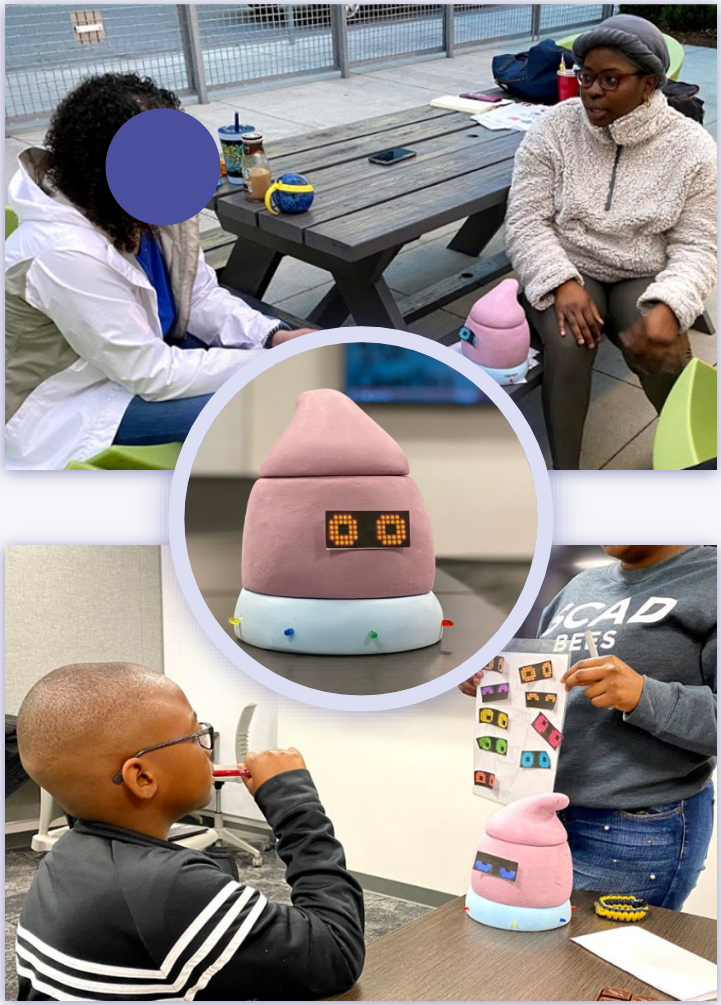
- Quick Learning
- Actively interacted with Tuki

Boy A, 8 year old:

- “I don’t want it”
- More mastery to set up routine & event
- Reminder rather than routine helper

Kids want more mastery with age

Prototyping
3
Appearance Testing



Aims to understand

- Model Look/shape/material
- Capability in traveling to different rooms
- Touch sensors

Participant: 5 Parents and 3 Kids in Total
Location: Gulfstream & Shed
Duration: 2 days

Prototyping
3
Takeaways

- Easy to move
- Multiple eyes on Tuki
- Interact with expressive eyes
- Voice encouragement when completed
- Light color change when completed

- More customized (color)
- More round (shape)
- Metallic surface
- Transparent material for light part
- Like the hair-like top
- Robotic voices

Prototyping
4
Brand Testing

Understand the direction of branding.

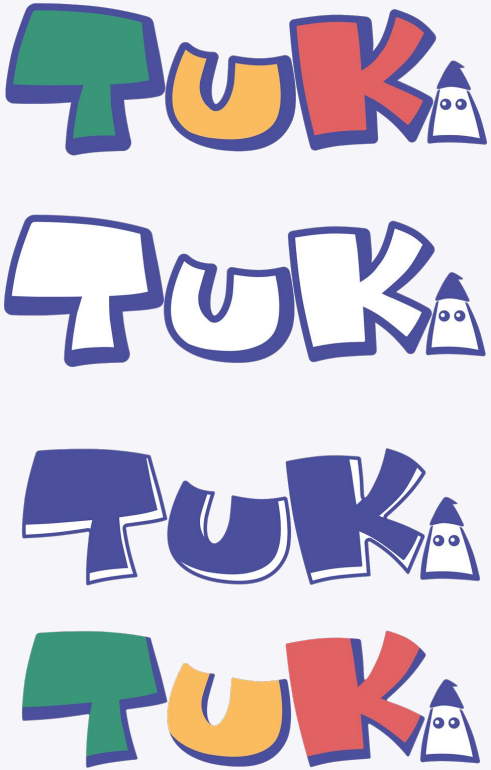
Participant: 5 Parents and 3 Kids in Total
Location: Gulfstream & Shed
Duration: 2 days

Prototyping #4

Takeaways

Kids preferred a **fun** approach to the logos with **wider** letter shapes and **color variations** .

In contrast, ***Parents***, preferred a more **dynamic** look related to the **meaning** behind each letter, still having a **kids-like** style and being easy to read.



Majority selected by 3 kids

Majority selected by 5 parents

Final Concept

- Tuki Persona
- Instruction Video
- Customer Persona
- User Persona
- Current Experience Map
- NEW Experience Map

Tuki 3.0

Function

Routine Helper

Active Happy Helper
Grow up with Kid (5-10 age)

Kids between 5 and 10*are more susceptible to the goal of Tuki's functions and features*

Tuki

“Will you be my friend?”

The younger sibling of Alexa, Siri, Echo, and Google, **Tuki** is made **just for kids,** with their needs in mind. Tuki likes to **make boring things, fun!** Tuki will tell kids what a good job they’re doing, remind them of what to do next, play fun music while completing tasks, and light up cool colors!

Voice

- Monotone
- Robotic
- Playful
- Encouraging
- Minimal Emotions

Instruction Video

https://www.youtube.com/watch?v=77jqNJvCCYY

Personas # 2

Customer & User -Parent

Trish, 28

“Morning is a rush. It’s hard to keep up with getting ready.”

Age: 28 years old
Job: Full time Professional Stylist
Status: Divorced

- **Value family and time**

Frustrations

- Limited time for schedule
- maintain a stable routine with her son across households

Goals

Trish would like to have an affordable device that contains features that she already has in her home but is dedicated to her son.

UX Needs

- Easy flow
- Weekly Suggested Plans
- Recommendations
- Visual Feedback

Personas # 3

User - Child (young)

Ky, 5

“I don’t know.”

Age: 5 years old
Grade Level: Kindergarten

- More Trust
- Willing to learn
- Curious about new

Goals

The ability to follow steps through a unique and interactive learning experience.

Frustrations

- Struggle with learning the basics of everyday routines
- Voice recognition in Alexa doesn’t pick up Ky’s voice commands

UX Needs

- Visually pleasing
- Interactive
- Encouraging

Kid e-Pad | Mom’s iPhone | Alexa *(Mom’s house)*

Personas # 3

Future User - Child (older)

Ky, 8

“I don’t want to be told what I need to do.
I just want to remember better.”

Age: 8 years old
Grade Level: Third Grade

- Quick Learner
- Actively Interacted with Tuki
- More mastery

Goals

Master the steps for a routine he needs to complete without being told

Frustrations

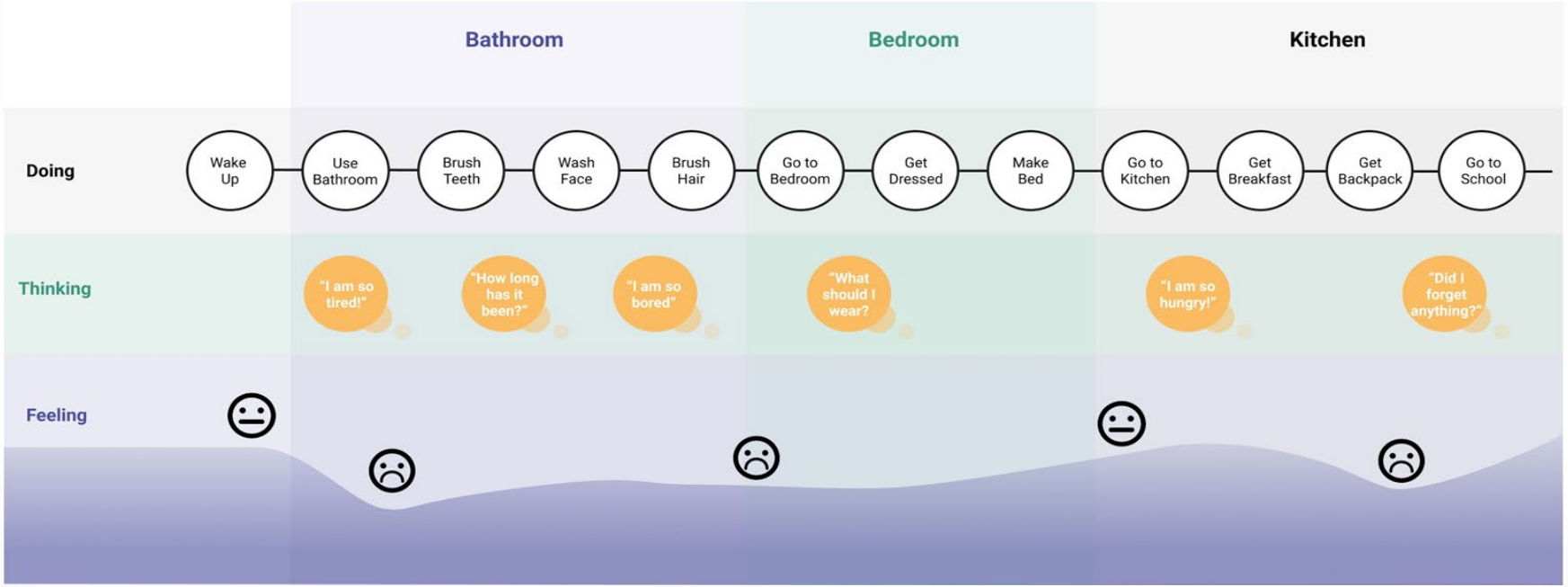
- Wants a device that he can trust doesn’t tell on him if he doesn’t follow his routine in the right way
- Struggles with following up on homework

UX Needs

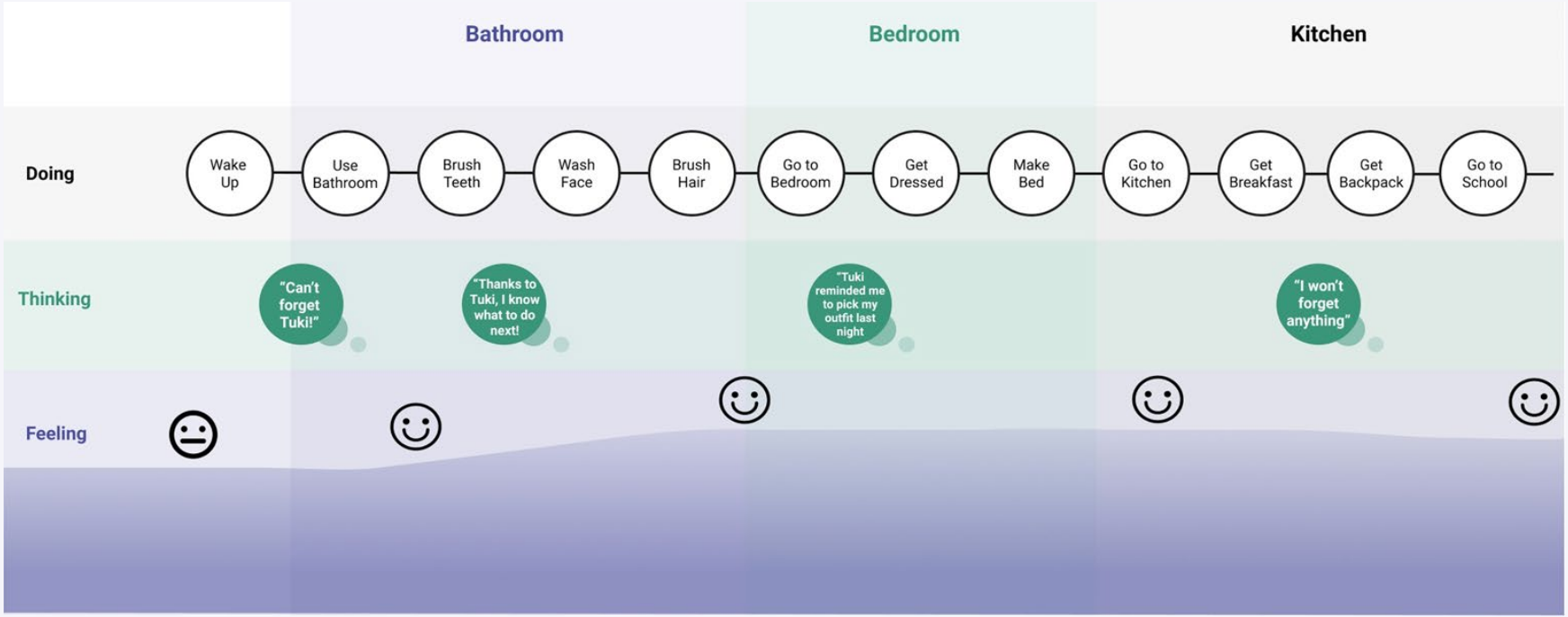
- Informative
- Reminder
- Encouraging

Mom’s iPad | Mom’s iPhone | Alexa *(Mom)* | Google Home *(Dad)*

Current User Journey



NEW User Journey



05 Implement

- Digital Product
- Physical Product
- AI Component
- Programming

Digital Product

Hi-Fidelity

Onboarding:

Colorful interface represents kid -friendly feature that matches with the branding.

Fun shape with Tuki icon on the top guides parent or family member to connect with the physical device of Tuki.

Basic Info can help Tuki better understand users so that Tuki can support parents to **organize time and make plans** by giving automatic suggestions.

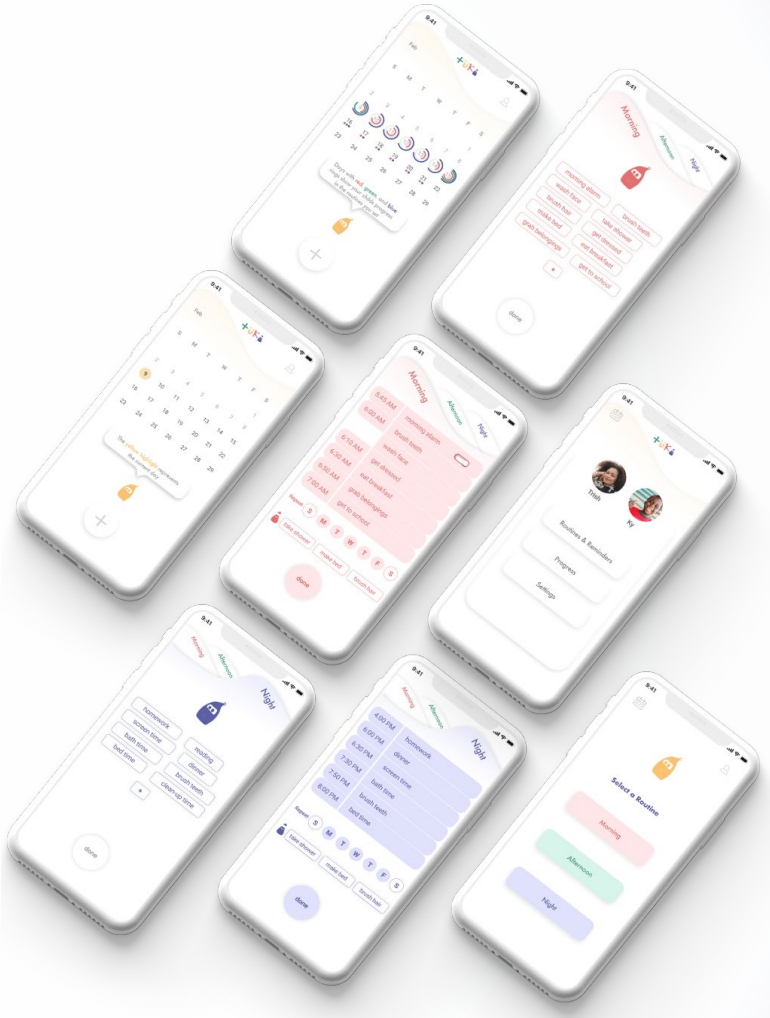
Digital Product

Hi-Fidelity APP

Quick setting process streamlines the complicated step which can reduce parent's daily stress.

Realtime routine schedule management adapts to the relevant feedbacks that can match with the kid's interests and personality.

Completion tracking can help parents' better understand their kids and make upcoming routine plans.



Physical Product

Form and Appearance

Form

- Kid-friendly rounded shape
- Robotic
- Inviting shape to hold top
- Flat bottom for stability
- Hat top makes it character like (easy to customize)

Material (prototype)

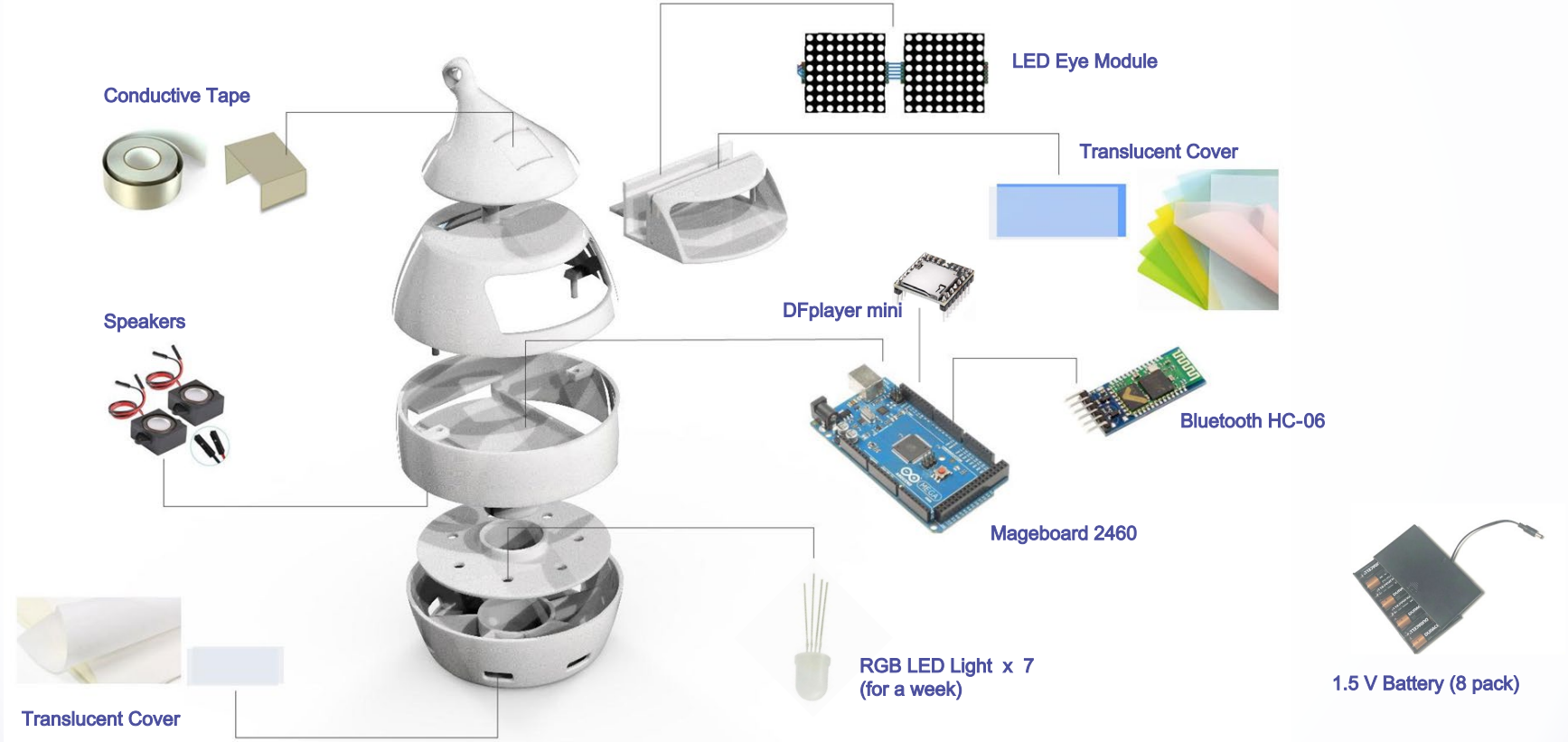
- Plastic (3D printing)

Material (in the future)

- Metal like plastic
- Matte surfaces make it easy to hold

Physical Product

Exploded View

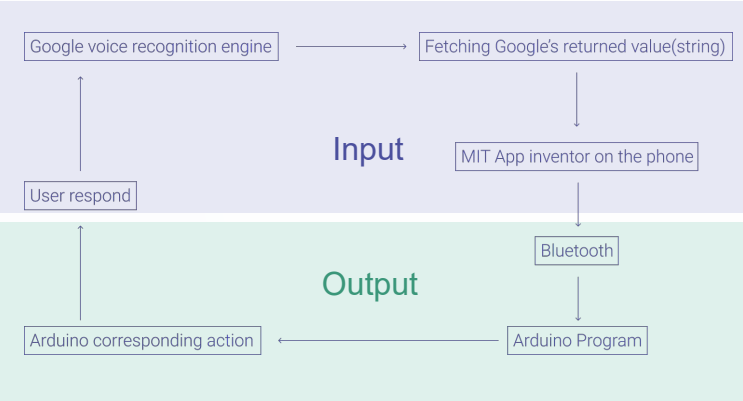


Physical Product

Assembling

Artificial Intelligence

Machine Learning



How Tuki learns from users

(unique AI, predictive analysis)

A major concern from most adults was "**what if the child is lying** " about their task completion.

Through machine learning and testing the product,**Tuki can collect large sets of data** on the timing, tempo, and firmness of the tapping a child does to know if the child is lying (i.e. Multiple quick taps in a certain span indicate that the child is rushing through the tasks and not properly completing them).

Over time and with more interactions,**Tuki can learn to be a better helper** , adjusting to routines such as which tasks children need more time to complete.

Programming

Dialog Flow

Routine
Based on time

Tuki says: Good Morning
Eyes: Happy

Tuki: Play alarm
Eyes: Neutral <--> Happy
Light: Rainbow

"Stop"

No Response

Tuki says: Good job!
Eyes: Happy
Light: Rainbow for 2 rounds

Tuki says: Let's brush your teeth together!
Eyes: Happy

"Yes"

Tuki: Play music for brushing teeth
Eyes: Neutral
(Tap to stop the music)

No Response
After 2mins

Tuki says: Do you need more time?
Eyes: Happy

"Complete / Done"

Tuki: Good job
Eyes: Happy
Light: Rainbow for 2 rounds

Based on time and how much tasks

Tuki says: It's time for school
Eyes: Happy

"Bye"

Tuki says: Goodbye
Eyes: Turnoff

Reminder
Based on need

"Hi Tuki! I'm Back"

Tuki says: I'm glad you're back
Eyes: Happy
Light: Rainbow

"Remind Me"

Tuki says: What do you want me to remind you of?
Eyes: Happy

"Do homework 1 hour later"

Tuki says: Yes, I'll remind you an hour later
Eyes: Happy

Based on time

Tuki says: Time to check up your homework
Eyes: Happy

"Okay"

Tuki says: Ok. I'll remind you to take a break after 20 minutes
Eyes: Happy

Based on time

Eyes: Sleepy
Tuki says: It's already been 20 minutes

Tuki says: Let's grab a snack
Eyes: Happy

Bedtime
Based on time

Tuki says: You completed all your tasks! Now you can pick a color!
Eyes: Happy

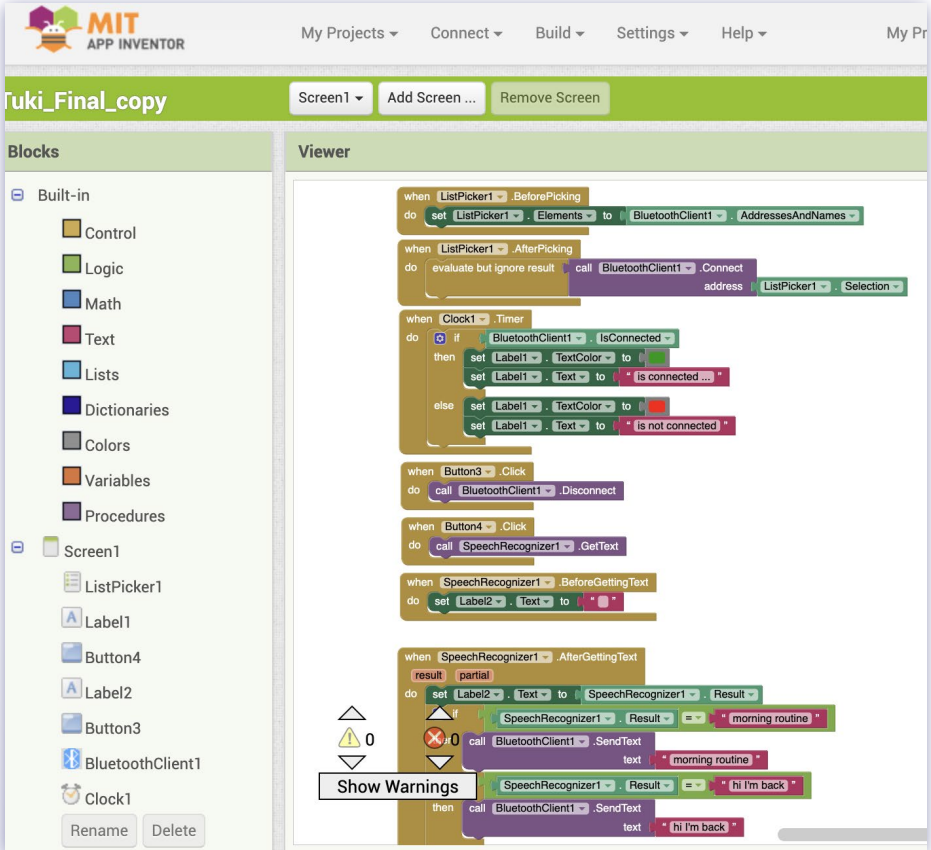
"Red / Orange / Yellow/ Green/ Blue/ Purple/ Pink"

Tuki says: Great Choice!
Eyes: Happy
Light: Rainbow for 3 rounds and light up the certain color for certain day

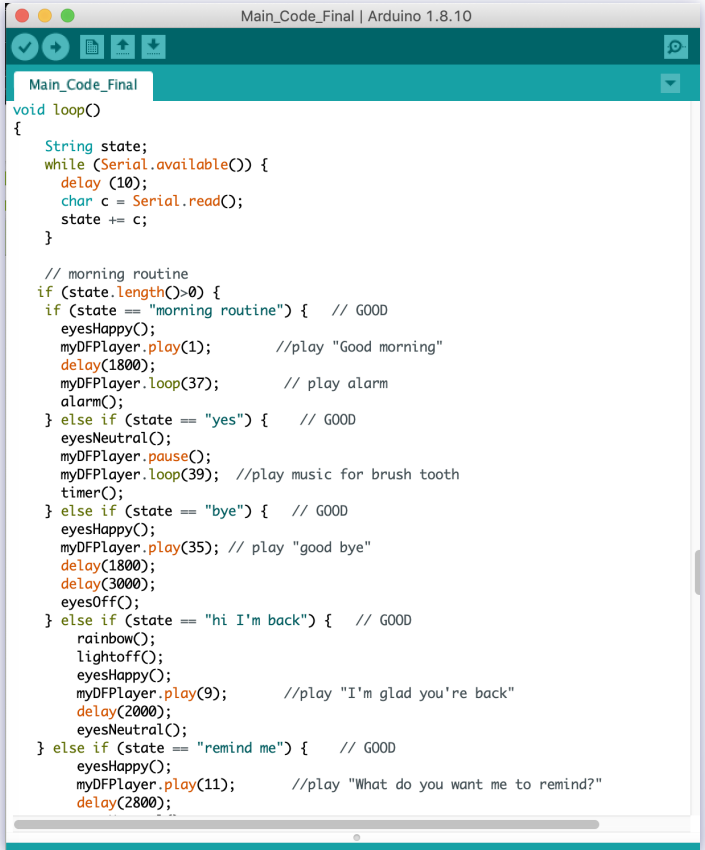
Tuki says: Good night
Eyes: Happy
Light: All the remaining lights are white
Eyes: Sleepy
(Tap to turn off)

Programming
Coding

MIT App Inventor (Voice Recognition)



Arduino (Voice Interaction)



06

Marketing

- Competitor Analysis
- 5 E’s
- Branding Development
- Vision Video
- Instruction Video

Competitor Analysis

	Cos	Kid-Friendly	Modality	Form
Tuki	$$	Yes	Touch, Voice	Transportable
Alexa	$$	Parental Controls	Touch, Voice	Stationary
Siri	$$	Parental Controls	Touch, Voice	Transportable
Google Mini	$$	Parental Controls	Touch, Voice	Stationary

Five E's

01 Entice

- Attract with YouTube Character video
- Tuki Pamphlet with Features and interactions

02 Enter

- Subscription through Tuki App
- Sync Phone App to Tuki device (using Bluetooth)
- Setting Up the user's criteria

03 Engage

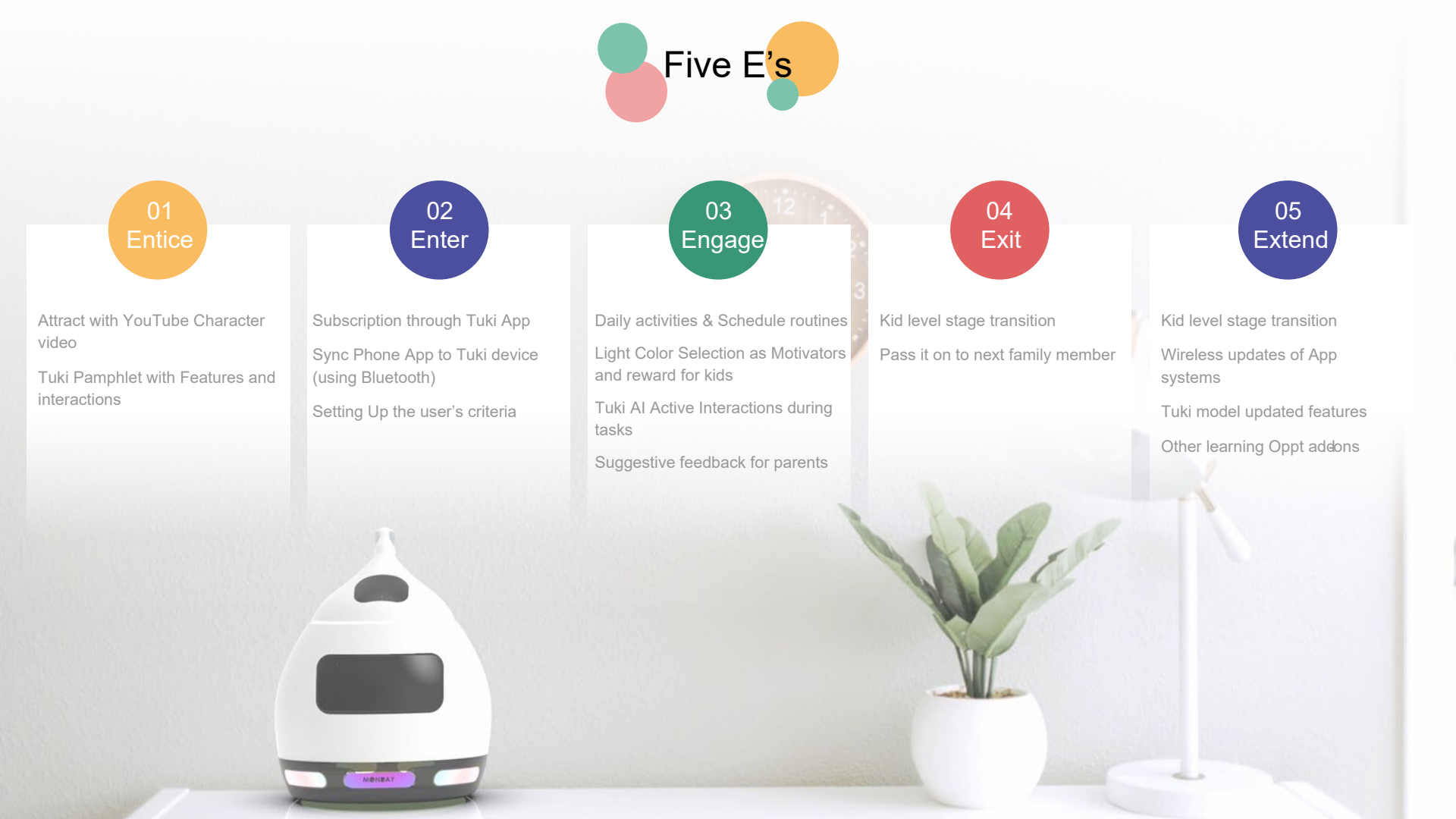
- Daily activities & Schedule routines
- Light Color Selection as Motivators and reward for kids
- Tuki AI Active Interactions during tasks
- Suggestive feedback for parents

04 Exit

- Kid level stage transition
- Pass it on to next family member

05 Extend

- Kid level stage transition
- Wireless updates of App systems
- Tuki model updated features
- Other learning Oppt addons



Brand Development

tuki

HAPPY HELPER. HAPPY HOME

The logo's curves mirrors the product's exterior curved form. The meaning behind **Tuki's name, translated from Finnish, meaning supporter, aid, and assistance** . Therefore, the phras **'happy helper"** was believed to be fitting for this to be the true identity of what a kid-friendly social robot should represent.

Through exploration of colors. Each letter was colored and created to fit describe the meaning behind them.

The lowercase letter 't', represents as a plus to the add-on knowledge that the color green reflects its sustainable and trusting features.

ü

The ‘ü’ is represented as the happy helper, yellow color, buddy that adapts with kids as they age.

The **k**’is shaped as as the kid being the user and kid-friendly encourager.

And lastly, I'as tuki itself that represents the mediator between parent and kid's communication with color as purple that reflect the indepence kids can practice in a magical experience.

Vision Video

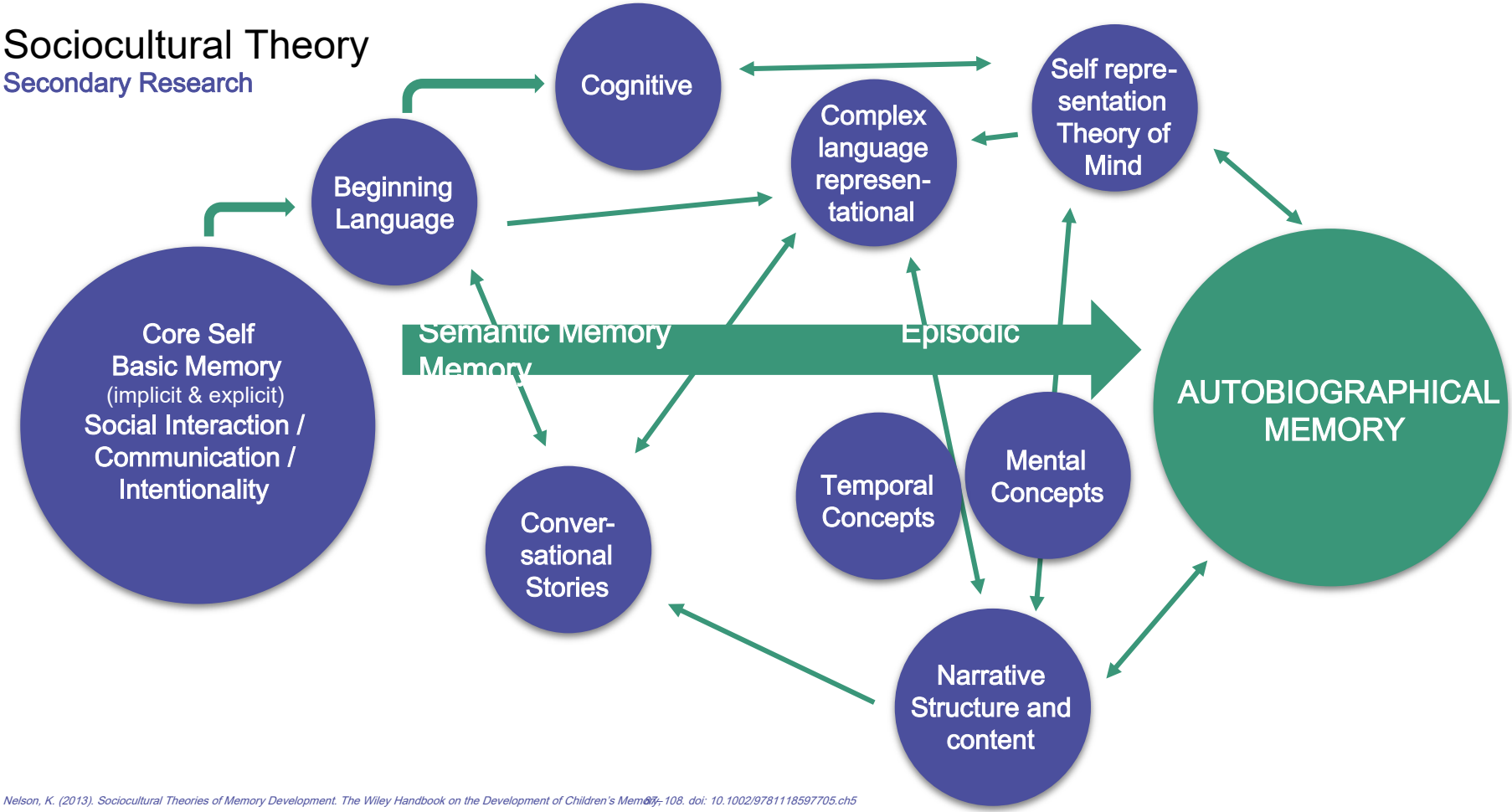
https://www.youtube.com/watch?v=Gno-f8DkVmE

07 Appendix

- Research
- Concept Cloud
- Low-Fi Wireframes
- Hi-Fi Wireframes
- Raw Codes
- Process Photos

Sociocultural Theory

Secondary Research



Nelson, K. (2013). Sociocultural Theories of Memory Development. The Wiley Handbook on the Development of Children's Memory, 87–108. doi: 10.1002/9781118597705.ch5

Interview

Scripts Directed Storytelling

Do you try to remind your child to let them remember something? How do you do that? What methods you think are helpful?

Script Teachers:

Thank you so much for taking the time to talk with me today. As I told you, we're doing design research to understand children's memory and learning. Everything you say today is going to remain anonymous and used only for research purposes. I really appreciate you giving me your insights on how we can design something really amazing. If it's ok with you I'll go ahead and start the recording.

Walk me through your career and background

Why did you become a teacher?

How long have you been teaching?

What do you teach? (Age, subjects)

What do you love about teaching?

What do you least enjoy about teaching?

What's your teaching style or philosophy?

What is the relationship between memory and learning?

In your experience what do you think children have the most trouble remembering?

What technologies do you use in the classroom?

Which technologies do you think are the most helpful in teaching? Least helpful?

Do you have a story you can share about technology and teaching?

***Interview Protocol:* Adults**

Many questions are from the *Use of the Everyday Memory Questionnaire With Children*.

Script Parents:

Thank you so much for taking the time to talk with me today. As I told you, we're doing design research to understand children's memory and learning. Everything you say today is going to remain anonymous and used only for research purposes. I really appreciate you giving me your insights on how we can design something really amazing. If it's ok with you I'll go ahead and start the recording.

Please tell me about yourself

How many children do you have?

How old are they?

What grades are they in?

Tell me about your favorite memory of being a parent?

What did you do over the holiday break?

Does your child watch youtube? What do they watch on youtube?

Do you have Alexa, Siri, Google, etc?
Does your child interact with it? Do they like it? Do you like it?
What do you wish it could do?

Does your child lose things? Can you tell me about a time your child lost something?

Does your child forget things like what happened yesterday, a month ago, or longer? Can you tell describe a time this happened?

Does your child repeat jokes or stories?

What's your child's favorite toy? Why do you think it's their favorite?

If you could make the perfect toy for your child what would it be? What would it look like? What would it do? What would it sound like?

***Interview Protocol:* Children**

https://uxdesign.cc/user-research-tips-for-interviewing-kids-ae686e5324ac

With children one on one interviews need to be engaging to keep their attention, also fun and not boring like a test. Need to remain flexible with the structure and order, be comfortable jumping around. Don't be afraid of leading questions, unlike other age groups, children need more guidance. Let their imagination run wild! *Must be less than 1 hour!*

Questions Ideas:

- How old are you?
- What grade are you in?
- Do you like school?
  - (Why)
- What's your favorite subject at school?
  - (Why?)
- What did you do during the holiday break?
- What's your favorite color?
  - What's your parents favorite color?
- What video games do you play?
  - Why do you like them?
- What is your favorite toy?
  - Why?
- What is your favorite food?
- What is your favorite movie?
- What is your favorite TV Show?
- Who are your friends?
- What do you want to be when you grow up?
  - Do you know what you friends what to be when they grow up?
- Do you watch Youtube?
  - What do you watch on Youtube?
  - Why?

- Do you have Alexa, Siri, Google, etc?
  - What do you like about (Alexa, Siri, Google, etc.)
  - What don't you like about (Alexa, Siri, Google, etc.)
- What does the word forget to mean?
- Do you forget things? Can you tell me about a time you forgot something?
- Can you remember being a baby?
- If you could make the perfect toy or thing to play with what would it be? What would it look like? What would it do? What would it sound like?

Prototyping #2

Pre-recorded Audio

Used scripted **pre-recorded audio** for Wizard of Oz scenario walkthrough but **changed** its usage through different participants **preference**

Tuki Voice Script - Morning Routine, During the Week, Before School

WAKE UP Scenario

"Music sounds as a alarm" (wake up alarm)

N/A Audio- "Good Morning! I am so excited for today! Are you ready?"

Audio 1-"Good morning! It's time for us to start the day!"

Audio 2-"Time is 8:00am, tempature's outside are 80 degrees"

Audio 3-"Good morning! It's time for us to wake up!"

Audio 4-"We need to get ready for school today!"

Audio 5-"Are you ready?!"

Audio 6-"Do you want to get ready with me?"

Audio 7-"Did you get a good rest?"

Audio 8-"Rise & Shine! It's morning. Do you know what that means? It's time to get ready together"

Audio 9-"Rise & Shine! It's time for us to get ready together"

BATHROOM Scenario

Audio 10-"Do you want to go to the bathroom together?"

Audio 11-"Would you like to get ready now?"

Audio 12-"Are you ready to: brush your teeth, wash your face, brush your hair?"

Audio 13-"Are you ready?!" {repeated in Audio 5}

Audio 14-"First we need to: brush your teeth, wash your face, brush your hair"

Audio 15-"Do you want to get ready together?"

Audio 16-"Let's go to the bathroom together! There, we can get ready."

Audio 17-"Let's go to the bathroom! We can get ready together!

Audio 18-"Can you take me to the bathroom! We can get ready together!

Audio 19-"If you need more time say, 'Tuki I need more time!' If you are already done say, 'Tuki, I'm done'

Audio 20-"Do you need more time?"

Audio 21-"I'm finished! Did you complete: brushing your teeth?!"

Audio 22-"I'm finished! Did you complete: washing your face?!"

Audio 23-"I'm finished! Did you complete: brushing your hair?!"

BEDROOM Scenario

Audio 24-"Now that that's done, can you take me to the bedroom now?

Audio 25-"Let's make the bed ready together!"

Audio 26-"Let's get our stuff for school!"

Audio 27-"Do you have your backpack?"

Audio 28-"Don't forget to get your stuff before school!"

Audio 29-"Let's make the room before you leave for school!"

Audio 30-"Let's make the room together before you leave for school!"

KITCHEN Scenario

Audio 31-"I'm feeling a little hungry! Do you want to get breakfast together?"

Audio 32-"Do you want to get breakfast together?"

Audio 33-"Now that that's done, do you want to get breakfast together?"

Audio 34-"Can you take me to the kitchen now?"

Audio 35-"Would you like to get breakfast before going to school?"

Audio 36-"Maybe we can grab food before school!"

Audio 37-"Would you like to eat together?"

Audio 38-"You know, getting breakfast is an important part of the day!"

TRIGGER Scenario

Audio 39-"That's me! How can I help my best friend?"

N/A Audio-"I only know a few words, but my big sister Alexa knows everything"

LEAVING FOR SCHOOL Scenario

Audio 40-"Goodbye now! I'll see you later today"

Audio 41-"Goodbye!"

Audio 42-"See you later!"

Audio 43-"Goodbye! Looking forward to seeing you later today!"

Audio 44-"Goodbye! Have a great day at school!"

See you later alligator!

Concept Selection

Concept Cloud

Prototyping #2

Pre-recorded Audio

Used scripted **pre-recorded audio** for Wizard of Oz scenario walkthrough but **changed** its usage through different participants **preference**

Tuki Voice Script - Morning Routine, During the Week, Before School

WAKE UP Scenario

"Music sounds as a alarm" (wake up alarm)

N/A Audio- "Good Morning! I am so excited for today! Are you ready?"

Audio 1-"Good morning! It's time for us to start the day!"

Audio 2-"Time is 8:00am, tempature's outside are 80 degrees"

Audio 3-"Good morning! It's time for us to wake up!"

Audio 4-"We need to get ready for school today!"

Audio 5-"Are you ready?!"

Audio 6-"Do you want to get ready with me?"

Audio 7-"Did you get a good rest?"

Audio 8-"Rise & Shine! It's morning. Do you know what that means? It's time to get ready together"

Audio 9-"Rise & Shine! It's time for us to get ready together"

BATHROOM Scenario

Audio 10-"Do you want to go to the bathroom together?"

Audio 11-"Would you like to get ready now?"

Audio 12-"Are you ready to: brush your teeth, wash your face, brush your hair?"

Audio 13-"Are you ready?!" {repeated in Audio 5}

Audio 14-"First we need to: brush your teeth, wash your face, brush your hair"

Audio 15-"Do you want to get ready together?"

Audio 16-"Let's go to the bathroom together! There, we can get ready."

Audio 17-"Let's go to the bathroom! We can get ready together!

Audio 18-"Can you take me to the bathroom! We can get ready together!

Audio 19-"If you need more time say, 'Tuki I need more time!' If you are already done say, 'Tuki, I'm done'

Audio 20-"Do you need more time?"

Audio 21-"I'm finished! Did you complete: brushing your teeth?!"

Audio 22-"I'm finished! Did you complete: washing your face?!"

Audio 23-"I'm finished! Did you complete: brushing your hair?!"

BEDROOM Scenario

Audio 24-"Now that that's done, can you take me to the bedroom now?

Audio 25-"Let's make the bed ready together!"

Audio 26-"Let's get our stuff for school!"

Audio 27-"Do you have your backpack?"

Audio 28-"Don't forget to get your stuff before school!"

Audio 29-"Let's make the room before you leave for school!"

Audio 30-"Let's make the room together before you leave for school!"

KITCHEN Scenario

Audio 31-"I'm feeling a little hungry! Do you want to get breakfast together?"

Audio 32-"Do you want to get breakfast together?"

Audio 33-"Now that that's done, do you want to get breakfast together?"

Audio 34-"Can you take me to the kitchen now?"

Audio 35-"Would you like to get breakfast before going to school?"

Audio 36-"Maybe we can grab food before school!"

Audio 37-"Would you like to eat together?"

Audio 38-"You know, getting breakfast is an important part of the day!"

TRIGGER Scenario

Audio 39-"That's me! How can I help my best friend?"

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Audio 40-"Goodbye now! I'll see you later today"

Audio 41-"Goodbye!"

Audio 42-"See you later!"

Audio 43-"Goodbye! Looking forward to seeing you later today!"

Audio 44-"Goodbye! Have a great day at school!"

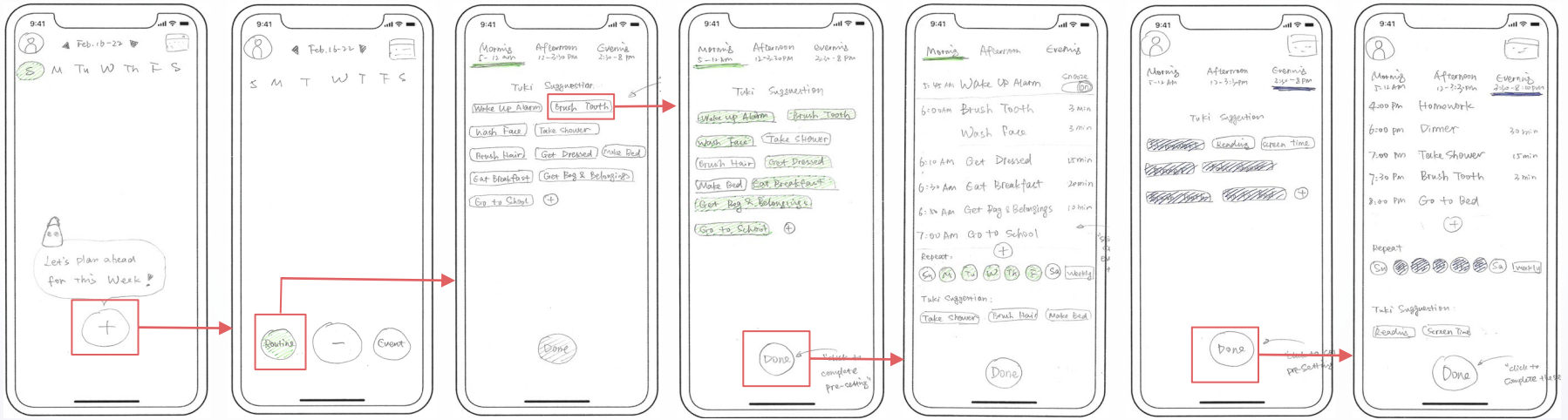
See you later alligator!

Digital Product

Low-Fi Wireframe

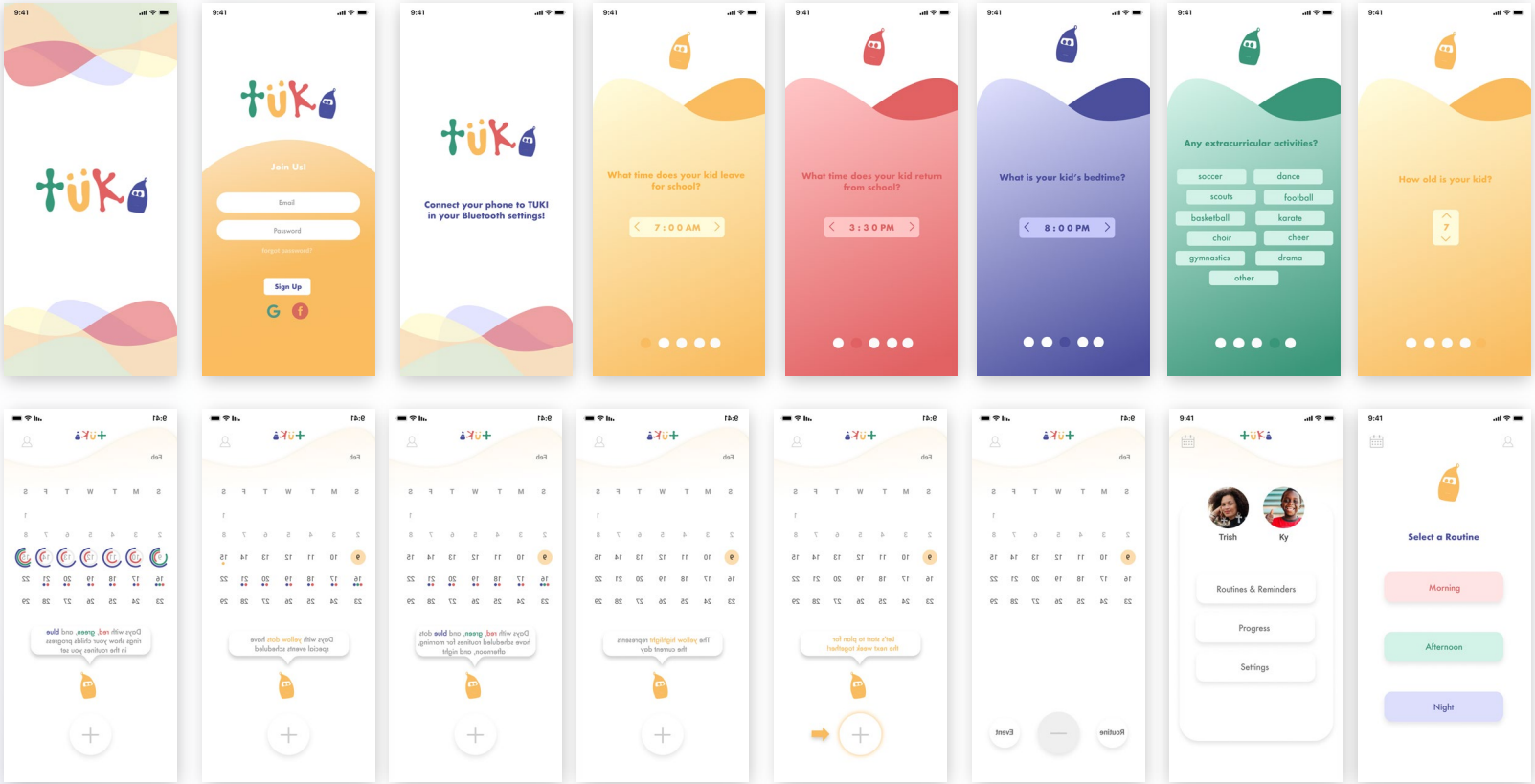
Morning Routine Setting
(with Tuki Suggestion)

Evening Routine Setting
(with Tuki Suggestion)



Digital Product

Hi-Fi Wireframe



Digital Product

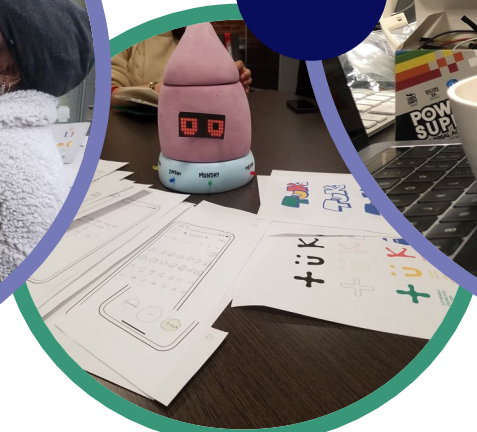
Hi-Fi Wireframe

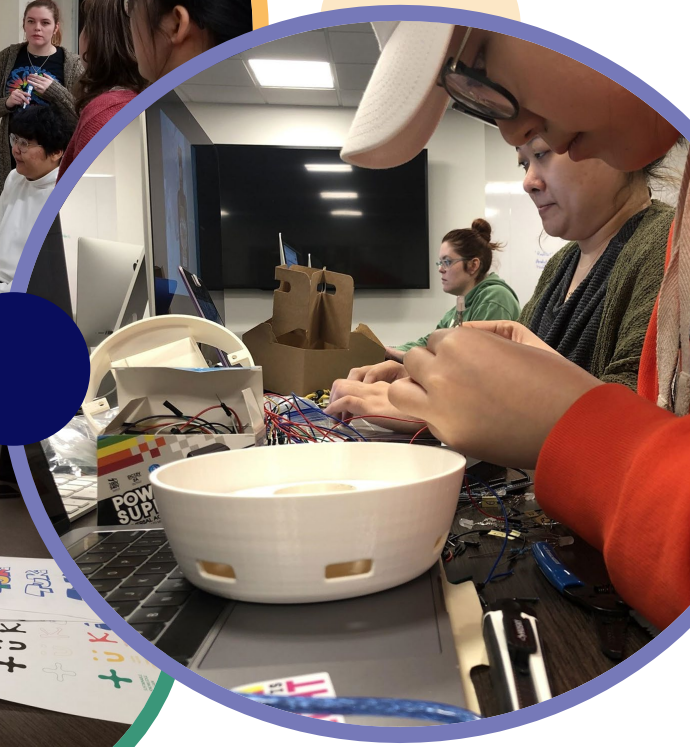
Programming

Arduino Coding

```
#include <Arduino.h>
#include <SoftwareSerial.h>
#include <DFRobotDFPlayerMini.h>
#include <LedControl.h>
#define BUTTON 23

// for RGB light (pin:31-51)
int redPin;
int greenPin;
int bluePin;
int redValue;
int greenValue;
int blueValue;
// for eyes (pin:9-11)
int DIN = 11;
int CS = 10;
int CLK = 9;


int buttonFlag = 0;


LedControl eyes =
LedControl(DIN,CLK,CS,1);
const byte neutral[8]={
  B00000000,
  B00111100,
  B01111110,
  B01100110,
  B01100110,
  B01111110,
  B00111100,
  B00000000
};
const byte happy[8]={
  B00000000,
  B00011000,
  B00111100,
  B01111110,
  B01100110,
  B01000010,
  B00000000,
  B00000000
};
const byte sleep[8]={
  B00000000,
  B00000000,
  B00000000,
  B01111110,
  B01111110,
  B00000000,
  B00000000,
  B00000000
};

int colorRed(){
    redValue = 255;
    greenValue = 0;
    blueValue = 0;
}

int colorPink(){
    redValue = 255;
    greenValue =20;
    blueValue = 187;
}

int colorOrange(){
    redValue = 180;
    greenValue = 120;
    blueValue = 0;
}

int colorYellow(){
    redValue = 255;
    greenValue = 215;
    blueValue = 0;
}

int colorGreen(){
    redValue = 0;
    greenValue = 255;
    blueValue = 0;
}

int colorBlue(){
    redValue = 65;
    greenValue = 105;
    blueValue = 255;
}
int colorPurple(){
    redValue = 145;
    greenValue = 88;
    blueValue = 255;
}
// for light
int rainbow(){
    redPin = 31;
    greenPin = 32;
    bluePin = 33;
    colorRed();
    analogWrite (redPin,
redValue);
    analogWrite (greenPin,
greenValue);
    analogWrite (bluePin,
blueValue);
    delay(100);


    redPin = 34;
    greenPin = 35;
    bluePin = 36;
    colorOrange();
    analogWrite (redPin,
redValue);
    analogWrite (greenPin,
greenValue);
    analogWrite (bluePin,
blueValue);
    delay(100);


    redPin = 37;
    greenPin = 38;
    bluePin = 39;
    colorYellow();
    analogWrite (redPin,
redValue);
    analogWrite (greenPin,
greenValue);
    analogWrite (bluePin,
blueValue);
    delay(100);


    redPin = 40;
    greenPin = 41;
    bluePin = 42;
    colorGreen();
    analogWrite (redPin,
redValue);
    analogWrite (greenPin,
greenValue);
    analogWrite (bluePin,
blueValue);
    delay(100);


    redPin = 43;
    greenPin = 44;
    bluePin = 45;
    colorBlue();
    analogWrite (redPin,
redValue);
    analogWrite (greenPin,
greenValue);
    analogWrite (bluePin,
blueValue);
    delay(100);


    redPin = 46;
    greenPin = 47;
    bluePin = 48;
    colorPurple();
    analogWrite (redPin,
redValue);
    analogWrite (greenPin,
greenValue);
    analogWrite (bluePin,
blueValue);
    delay(100);


    redPin = 49;
    greenPin = 50;
    bluePin = 51;
    colorPink();
    analogWrite (redPin,
redValue);
    analogWrite (greenPin,
greenValue);
    analogWrite (bluePin,
blueValue);
    delay(100);
}


int lightoff (){
  for(int i = 0; i < 7; i += 1) {
    redPin = 31 + i*3;
    greenPin = 32 + i*3;
    bluePin = 33 + i*3;
    analogWrite (redPin, 0);
    analogWrite (greenPin, 0);
    analogWrite (bluePin, 0);
    delay(10);
  }
}

SoftwareSerial
mySoftwareSerial(13, 12); //
RX, TX
DFRobotDFPlayerMini
myDFPlayer;
void printDetail(uint8_t type,
int value);


// eyes neutral
void eyesNeutral() {
  for(int i=0;i<8;i++) {
    eyes.setRow(0,i,neutral[i]);
  }
}
// eyes happy
void eyesHappy() {
  for(int i=0;i<8;i++) {
    eyes.setRow(0,i,happy[i]);
  }
}
// eyes sleep
void eyesSleep() {
  for(int i=0;i<8;i++) {
    eyes.setRow(0,i,sleep[i]);
  }
}
// eyes turnoff
void eyesOff() {
  for(int i=0;i<8;i++) {
    eyes.setRow(0,i,off[i]);
  }
}


void nightlight() {
  for(int i = 0; i < 4; i += 1) {
    redPin = 31 + i*3;
    greenPin = 32 + i*3;
    bluePin = 33 + i*3;
    analogWrite (redPin,
255);
    analogWrite (greenPin,
255);
    analogWrite (bluePin,
255);
    delay(100);
  }
  for(int i = 0; i < 2; i += 1) {
    redPin = 45 + i*3;
    greenPin = 47 + i*3;
    bluePin = 48 + i*3;
    analogWrite (redPin,
255);
    analogWrite (greenPin,
255);
    analogWrite (bluePin,
255);
    delay(100);
  }
  delay(3000);
  eyesOff();
}


void alarm() {
  int alarmState = true;
  while (alarmState = true) {
    rainbow();
    lightoff();
    eyesNeutral();
    delay(444);
    eyesHappy();
    delay(444);
    String state;
    while (Serial.available()) {
      delay (10);
      char c = Serial.read();
      state += c;
    }
    if (state.length()>0){
      if (state = "stop"){
        alarmState = false;
        break;
      }
    }
  }
  lightoff();
  eyesHappy();
  myDFPlayer.play(3);  //play
"good job! let's brush your
tooth together"
  delay(4000);
  eyesNeutral();
}


void timer() {
  int timerState = true;
  while (timerState = true) {
    String state;
    while (Serial.available()) {
      delay (10);
      char c = Serial.read();
      state += c;
    }
    if (state.length()>0){
      if (state = "done"){
        timerState = false;
        break;
      }
    }
  }
  myDFPlayer.pause();
  eyesHappy();
  myDFPlayer.play(5);
/play "Good job! brush your
tooth"
  delay(3000);
  rainbow();
  lightoff();
  rainbow();
  lightoff();
  eyesNeutral();
  delay(5000);
  eyesHappy();
  myDFPlayer.play(33);  //pl
ay "it's time for school"
  delay(2000);
  eyesNeutral();
}


void setup()
{
  // setup SD-card
  mySoftwareSerial.begin(96
00);
  Serial.begin(115200);

  Serial.begin(9600);
  // Serial.println();
  // Serial.println(F("DFRobot
DFPlayer Mini Demo"));
  // Serial.println(F("Initializing
DFPlayer ... (May take 3~5
seconds)"));
  if
(!myDFPlayer.begin(mySoft
wareSerial)) { //Use
softwareSerial to
communicate with mp3.
    Serial.println(F("Unable to
begin:"));
    Serial.println(F("1.Please
recheck the connection!"));
    Serial.println(F("2.Please
insert the SD card!"));
    while(true);
  }
  Serial.println(F("DFPlayer
Mini online."));
  myDFPlayer.volume(30);  //
Set volume value. From 0 to
30
  myDFPlayer.setTimeOut(50
0); //Set serial
communication time out
500ms
  myDFPlayer.EQ(DFPLAYE
R_EQ_NORMAL);
  myDFPlayer.outputDevice(
DFPLAYER_DEVICE_SD);


  Serial.println(myDFPlayer.r
eadState()); //read mp3 state
  Serial.println(myDFPlayer.r
eadVolume()); //read current
volume
  Serial.println(myDFPlayer.r
eadEQ()); //read EQ setting
  Serial.println(myDFPlayer.r
eadFileCounts()); //read all
file counts in SD card
  Serial.println(myDFPlayer.r
eadCurrentFileNumber());
//read current play file
number
  Serial.println(myDFPlayer.r
eadFileCountsInFolder(3));
//read file counts in folder
SD:/03


  // for eyes
  eyes.clearDisplay(0);
  eyes.shutdown(0, false);
  eyes.setIntensity(0, 15);


  // for touchsensor
  for(int i=31;i<50;i++) {
    pinMode(i,OUTPUT);
  }
  for(int i=0;i<13;i++){
    pinMode(i,OUTPUT);
  }
  pinMode(BUTTON,INPUT_
PULLUP);
}


int buttonState = 0;
int led=0;
// for touchsensor
int touchsensor()
{
  buttonState =
digitalRead(BUTTON);
  Serial.println(buttonState);
  if ((buttonState == 0) &&
(buttonFlag == 0)) {
    lightoff();
    myDFPlayer.pause();
    buttonFlag = 1;
    delay(80);
  } else {
    if ((buttonState == 0) &&
(buttonFlag == 1)) {

      nightlight();
      redPin = 43;
      greenPin = 44;
      bluePin = 45;
      analogWrite (redPin,
redValue);
      analogWrite (greenPin,
greenValue);
      analogWrite (bluePin,
blueValue);
      myDFPlayer.loop(41);
      buttonFlag = 0;
      delay(80);
    }
  }
}


void loop()
{
  String state;
  while (Serial.available()) {
    delay (10);
    char c = Serial.read();
    state += c;
  }

  // morning routine
  if (state.length()>0) {
  if (state == "morning
routine") {  // GOOD
    eyesHappy();
    myDFPlayer.play(1);
  //play "Good morning"
    delay(1800);
    myDFPlayer.loop(37);
  // play alarm
    alarm();
  } else if (state == "yes")
{  // GOOD
    eyesNeutral();
    myDFPlayer.pause();
    myDFPlayer.loop(39);  //
play music for brush tooth
    timer();
  } else if (state == "bye")
{  // GOOD
    eyesHappy();
    myDFPlayer.play(35); //
play "good bye"
    delay(1800);
    delay(3000);
    eyesOff();
  } else if (state == "hi I'm
back") {  // GOOD
    rainbow();
    lightoff();
    eyesHappy();
    myDFPlayer.play(9);
  //play "I'm glad you're back"
    delay(2000);
    eyesNeutral();
  } else if (state == "remind
me") {  // GOOD
    eyesHappy();
    myDFPlayer.play(11);
  //play "What do you want
me to remind?"
    delay(2800);
    eyesNeutral();
  } else if (state == "do
homework 1 hour later") {  //
GOOD
    eyesHappy();
    myDFPlayer.play(13);
  //play "Yes, I'll remind you
an hour later"
    delay(3200);
    eyesNeutral();
    delay(5000); // kid is
playing
    eyesHappy();
    myDFPlayer.play(15);
  //play "Time to check up
your homework"
    delay(2500);
    eyesNeutral();
  } else if (state == "okay")
{  // GOOD
    eyesHappy();
    myDFPlayer.play(17);
  //play "Ok. I'll remind you to
take a break after 20
minutes"
    delay(4300);
    eyesNeutral();
    delay(2000);
    eyesSleep();
    delay(2000);
    myDFPlayer.play(19);
  //play "it's already been 20
minitus"
    delay(2500);
    eyesHappy();
    myDFPlayer.play(21);
  //play "Let's grab a snack"
    delay(2000);
    eyesNeutral();

    //bedtime
    delay(5000); //wait until
bedtime
    eyesHappy();
    myDFPlayer.play(23);
  //play "You completed all
your tasks! Now you can pick
a color!"
    delay(4500);
    eyesNeutral();
  } else if (state == "red")
{    // GOOD
    eyesHappy();
    myDFPlayer.play(25);
  //play "Great choice!"
    delay(1500);
    rainbow();
    lightoff();
    rainbow();
    lightoff();
    redPin = 43;
    greenPin = 44;
    bluePin = 45;
    colorRed();
    analogWrite (redPin,
redValue);
    analogWrite (greenPin,
greenValue);
    analogWrite (bluePin,
blueValue);
    delay(2000);
    myDFPlayer.play(27);
  // play "Good night!"
    delay(1500);
    eyesSleep();
    nightlight();
  } else if (state == "Orange")
{    // GOOD
    eyesHappy();
    myDFPlayer.play(25);
  //play "Great choice!"
    delay(1500);
    rainbow();
    lightoff();
    rainbow();
    lightoff();
    redPin = 43;
    greenPin = 44;
    bluePin = 45;
    colorOrange();
    analogWrite (redPin,
redValue);
    analogWrite (greenPin,
greenValue);
    analogWrite (bluePin,
blueValue);
    delay(2000);
    myDFPlayer.play(27);
  // play "Good night!"
    delay(1500);
    eyesSleep();
    nightlight();
  } else if (state == "yellow")
{    // GOOD
    eyesHappy();
    myDFPlayer.play(25);
  //play "Great choice!"
    delay(1500);
    rainbow();
    lightoff();
    rainbow();
    lightoff();
    redPin = 43;
    greenPin = 44;
    bluePin = 45;
    colorYellow();
    analogWrite (redPin,
redValue);
    analogWrite (greenPin,
greenValue);
    analogWrite (bluePin,
blueValue);
    delay(2000);
    myDFPlayer.play(27);
  // play "Good night!"
    delay(1500);
    eyesSleep();
    nightlight();
  } else if (state == "green")
{    // GOOD
    eyesHappy();
    myDFPlayer.play(25);
  //play "Great choice!"
    delay(1500);
    rainbow();
    lightoff();
    rainbow();
    lightoff();
    redPin = 43;
    greenPin = 44;
    bluePin = 45;
    colorGreen();
    analogWrite (redPin,
redValue);
    analogWrite (greenPin,
greenValue);
    analogWrite (bluePin,
blueValue);
    delay(2000);
    myDFPlayer.play(27);
  // play "Good night!"
    delay(1500);
    eyesSleep();
    nightlight();
  } else if (state == "purple")
{    // GOOD
    eyesHappy();
    myDFPlayer.play(25);
  //play "Great choice!"
    delay(1500);
    rainbow();
    lightoff();
    rainbow();
    lightoff();
    redPin = 43;
    greenPin = 44;
    bluePin = 45;
    colorPurple();
    analogWrite (redPin,
redValue);
    analogWrite (greenPin,
greenValue);
    analogWrite (bluePin,
blueValue);
    delay(2000);
    myDFPlayer.play(27);
  // play "Good night!"
    delay(1500);
    eyesSleep();
    nightlight();
  } else if (state == "pink")
{    // GOOD
    eyesHappy();
    myDFPlayer.play(25);
  //play "Great choice!"
    delay(1500);
    rainbow();
    lightoff();
    rainbow();
    lightoff();
    redPin = 43;
    greenPin = 44;
    bluePin = 45;
    colorPink();
    analogWrite (redPin,
redValue);
    analogWrite (greenPin,
greenValue);
    analogWrite (bluePin,
blueValue);
    delay(2000);
    myDFPlayer.play(27);
  // play "Good night!"
    delay(1500);
    eyesSleep();
    nightlight();
  }
  }
  state = "";
  touchsensor();
// if (firstTime == 0)
// { eyesHappy(); firstTime =
1; }
}
```

Process Photos






MONDAY