HELLO

A Tablet App for Children with Autism

- Yani & Qiqi -

Abstract

"Practice in the virtual world, succeed in the real life"

The name of the app is **Hello** and it's a tablet app for higher grades elementary-aged children (9~12yr) who have mild Autism Spectrum Disorder (ASD).

The main goal of our app is to help children with autism to develop social interactions skills. It could also be used to help children with autism practice basic life skills (how to take a public transportation, etc.), and help them develop personal interests / hobbies (drawing, etc.).

By providing different scenarios that children may encounter in daily life, children could learn how to behave appropriately in social life. It also reduces children's fear of socializing since they can practice at home by using the app.

Target Audience

The target audience of our app is higher grades elementary-aged children who have mild ASD and need to practice social interaction skills. It's also targeted for special education teachers who would like to use our app as a teaching tool in classrooms.

Children with mild autism don't classically hit all the criteria but they have some of the symptoms. They may only have a little language developmental delay, but still facing difficulties in communicating with others. Therefore, our app is helping these children do better in the areas they still struggle with, especially helping them to practice social interaction skills in this context.

Some of the children with mild ASD may still have a little trouble reading text and expressing themselves. Therefore, many audios, child-friendly visuals, and voice recognition features are being used in the design.

Research Background

Researches show that children with ASD have difficulty with social interaction behaviors, including establishing and maintaining relationships, reciprocating social interaction, and communicating with others.

Many children on the autism spectrum need help in learning how to act in different types of social situations. They often have the desire to interact with others, but may not know how to engage friends or may be overwhelmed by the idea of new experiences.

Some effective methods to help them is to practice new social skills with them in different places, and with different people. Links the skills to real life examples is helpful. **This is basically what we do in our app.**

Technology Mediums

Instead of saying it's an app, we think it's more like a tablet educational game, which is available with major mobile operating systems like ios and android. Digital camera, voice detection and recognition, voice command, Wifi for indoor environments or data for outdoor is needed.

Storyboard

In this storyboard, the main character is a little boy who has mild autism. He wants to go outside to play with other children, but he doesn't know how to interact and communicate with them. His parents are very worried about him and one day his mom brings him a really interesting app. By using this app, he is able to go outside virtually and practice his social interaction skills.

The little boy also would like to find his interests/hobbies. In this case, he figures out that he really like arts after virtually visiting an art museum. The interests in art is further developed and he is able to create amazing artworks now!

Information Organization

In this section, we will go through different stages in our app, introduces what kind of interactions users could have in each stage, as well as explains the reason why we choose to design like this. There are four main stages in total in our app: Log In, Survey, User 's Profile (Home), Hello World and Hello Me games.

Information Architecture
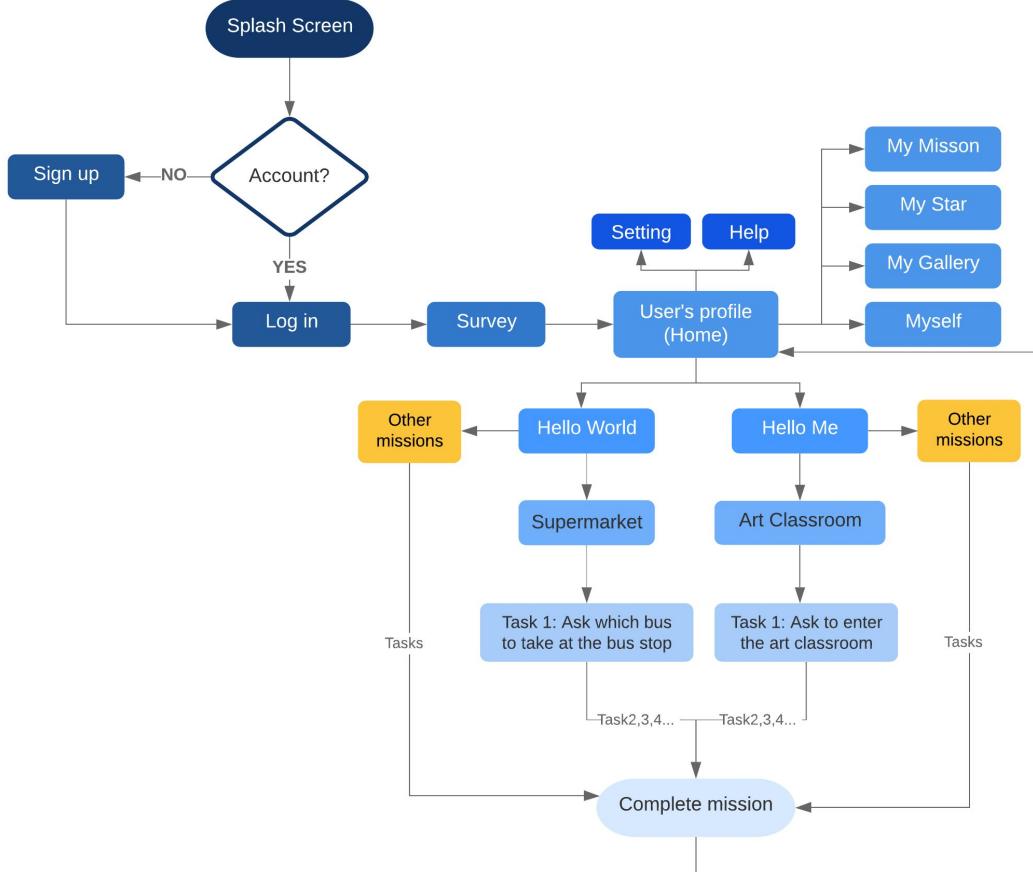
Stage 1 - Log In
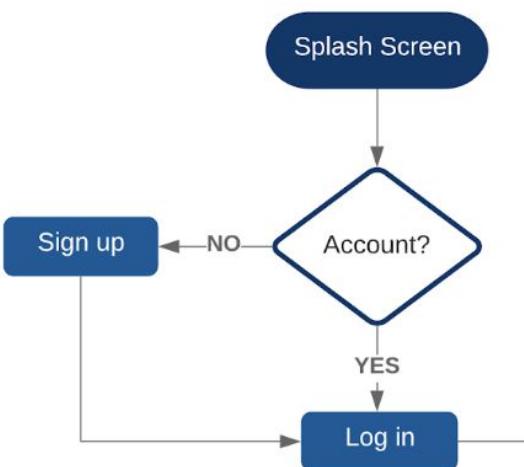
The first stage is the login stage. For users who don't have an account, they can also sign up there. We want to have a login feature in our app is because we want this app to be personalized for each user. The content in the game later will be created based on their personal interests or situation. Letting the users log in first could help the app store their personal data and provide a better playing experience.
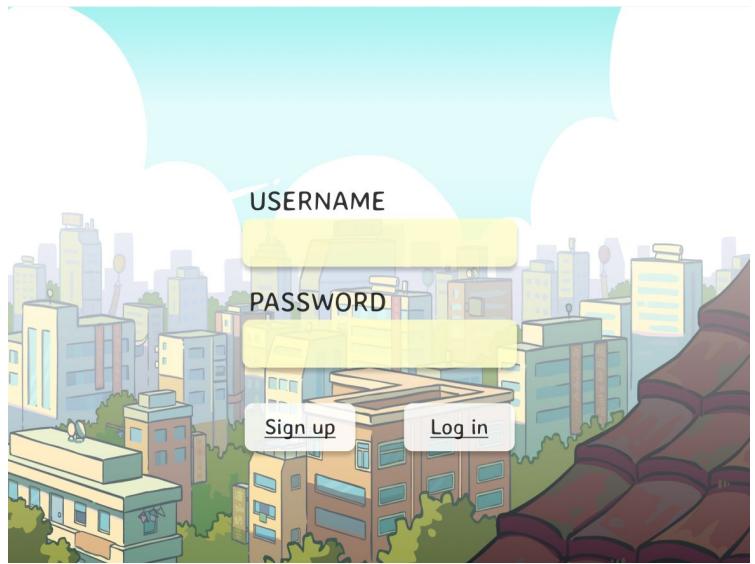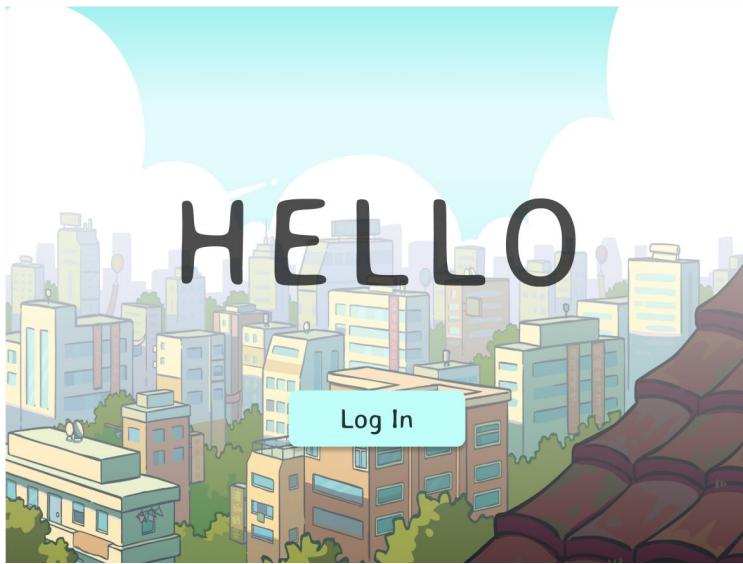
Stage 2 - Survey

Survey serves as a platform to customize the game for users and enhance users' experience when playing it. Users will follow the questions and click on answers they choose and move on to complete all.
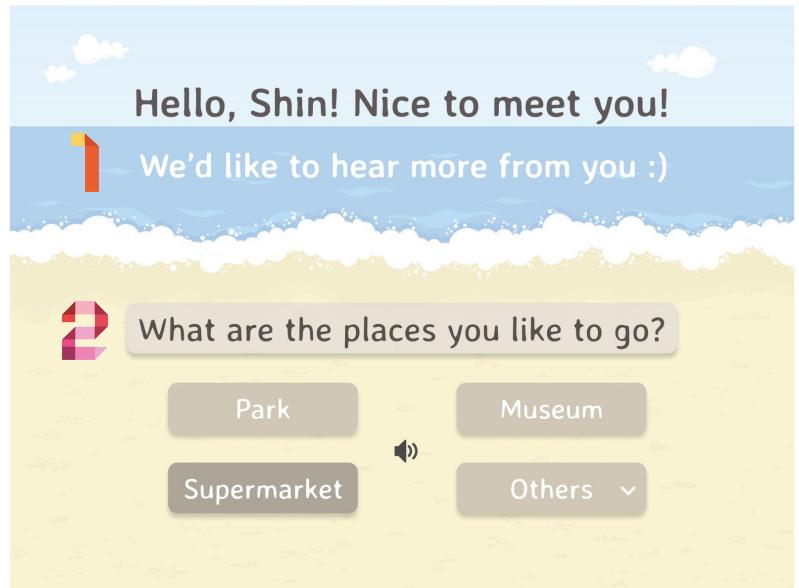
1 The phrase "hear more from you" represents a survey, but also gives users a feeling of necessity on completing this stage for a better experience in game.

2 Short phrasing questions and one-word answers make them easier to understand for children, and not feel overwhelmed by the information.

Stage 3 - User's Profile (Home)
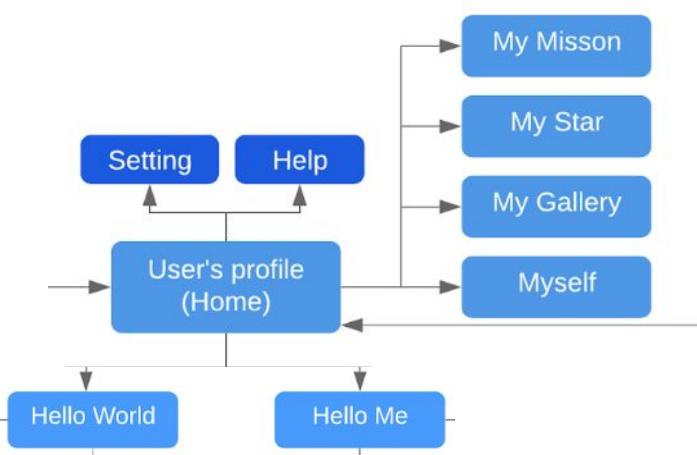
The next stage is the User's Profile, which is also the Home page. After finishing the survey, users will be on this page. They can start the Hello World game and the Hello Me game from there. And they can also check the My Mission, My Star, My Gallery, Myself, Setting and Help pages there. The design of this page is very clear and child-friendly. The user's name will also be there at the top of the page.

In **My Mission**, users could check what skills they have already learned and practiced in the games, what skills they still need to practice more later in the games, as well as knowing how well they performed for each skill. Since users could practice multiple different skills in the games, we want there could a place to organize and analyze what they learned, so they can check at any time.

**2** In **My Star**, users could check how many stars they have already earned. After completing each mission in the game, users will earn a different amount of stars based on their performance. The total number of stars they earned will be shown there.

3 In **My Gallery**, users could save and see their artifacts (drawings, etc.) that were completed in the Hello Me game. Since one of the main goals of the Hello Me game is to help users find and develop their interests, there will be different interests related small activities during the game. Most times, users will be asked to create their own artifacts, and then they can save it to the My Gallery.

4 In **My Self**, it's a place to save user's survey results, to save their personal data. Since the game content will be created based on the survey results, there could be a situation that users want to change the answers of the survey. If they want to change it, they can just go to this section and redo the survey. And then the game content, the skills they need to practice will be changed accordingly too.
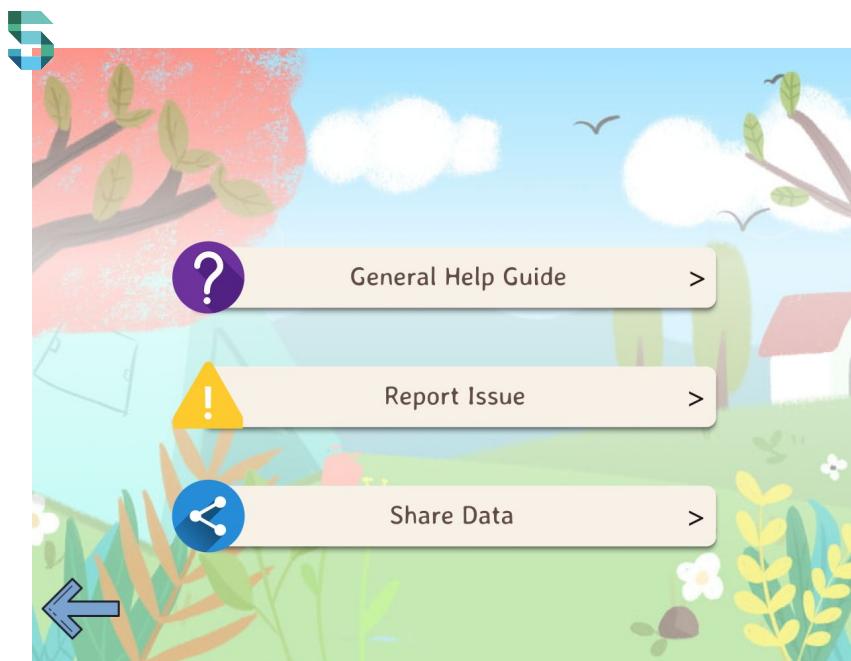
5 In the **Help** section, a tutorial about how to use this app will be provided in the General Help Guide feature. And answers for some general asked questions will also be provided there. If users want to report an issue in the game, they can also use the Report Issue feature. Share Data is a feature to allow parents or teachers to monitor children's performance in the game. By using this feature, adults will be able to see children's behaviors in the game on their own devices.
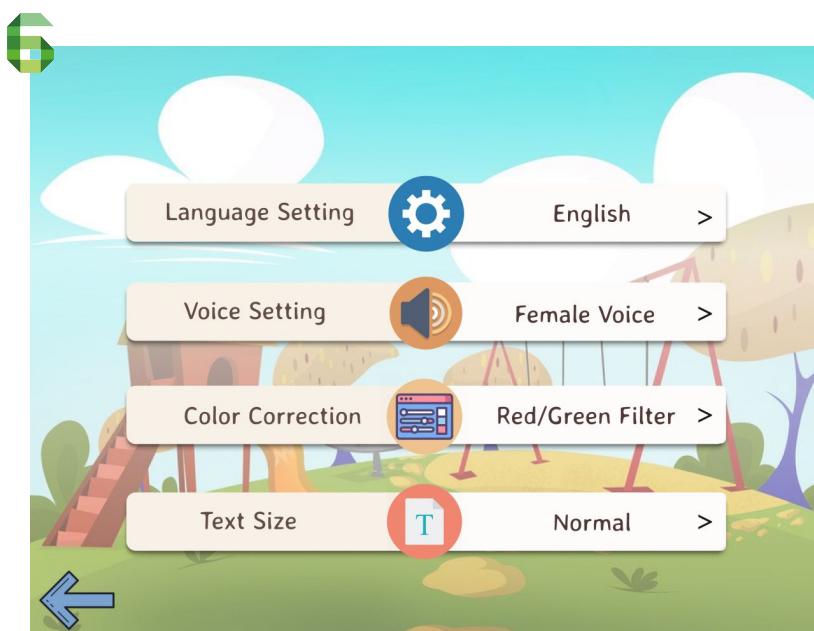
6 Children with autism have very different personal situations and have very different preferences, so personalization is very important for our app. In the **Setting** section, users could change the language of the app, which is helpful for users who cannot understand English very well. Since our app uses lots of audios to help children who may have trouble reading text to understand the game content, they can also change the voice they want to hear in the game. Furthermore, they can also change the text size. And color correction option is also provided for users who may need it. All these features increase the accessibility and usability of the app.

Stage 4.1 - Hello World
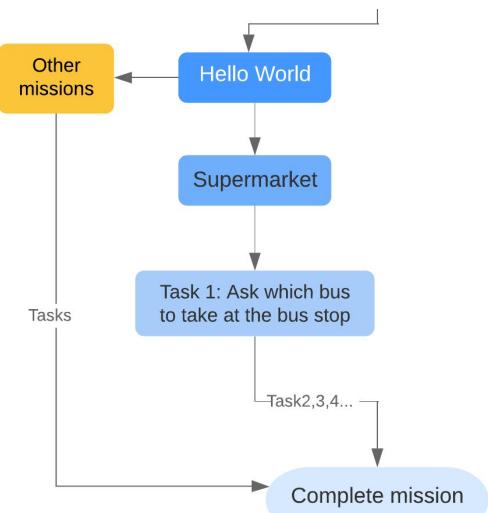
In Hello World, users can learn and practice basic life skills, as well as developing social interaction skills. On the "Hello World Map", missions' locations are selected based on essential places childrens might go frequently in their real life (supermarket, bus stop, etc.). Missions come with multiple tasks and users need to finish all tasks in each mission and get the "stars" in the end as prizes.

Purpose of this game : for children to learn to communicate with others appropriately, and develop multiple life skills like how to take public transportation and use money.

1. Users can switch between 'Hello Word' and 'Hello Me' game map freely, choose which game to play by tapping on the switch button. Because these two games are in different themes with different purposes, two maps with different colors would be easier for users to recognize and move between games.

2. This is the portal to go back to user's profile, users can change or check anything from the profile easily before and after playing games.

3 The circular icon represents each location that users can complete related mission in, the little profile picture indicates which mission the user is at. The icons with simple relative graphics will let users easily match locations with things can do in there in real life situations. Users can clearly see their progress in game by the little profile picture.

4 Setting and Help buttons are available in map and throughout whole game process, so that users can easily change anything to make them feel comfortable, such as if they would like to see text in larger size sometimes, or seek for help in anytime.

Mission 1 - Supermarket

After choosing each mission, there will be a background story given to the users, and then users will know what is his/her mission today from the story. We choose to add this part first instead of directly giving the mission to the users is because we want this game to be closely related to their real life. It may be a little awkward if someone suddenly tells you something you need to do in the real life, so we want the users' experience to be more coherent and authentic in the game by adding the background story part. Also, the audio feature is provided so users could listen to the content instead of reading it.
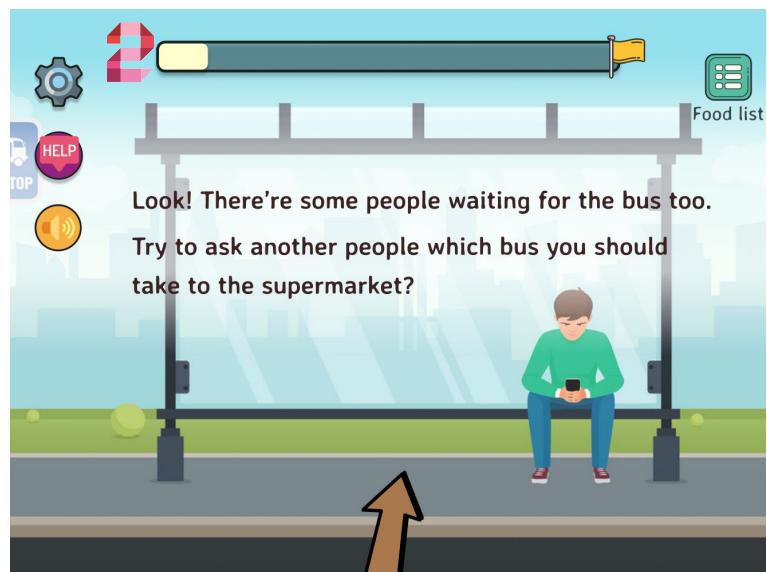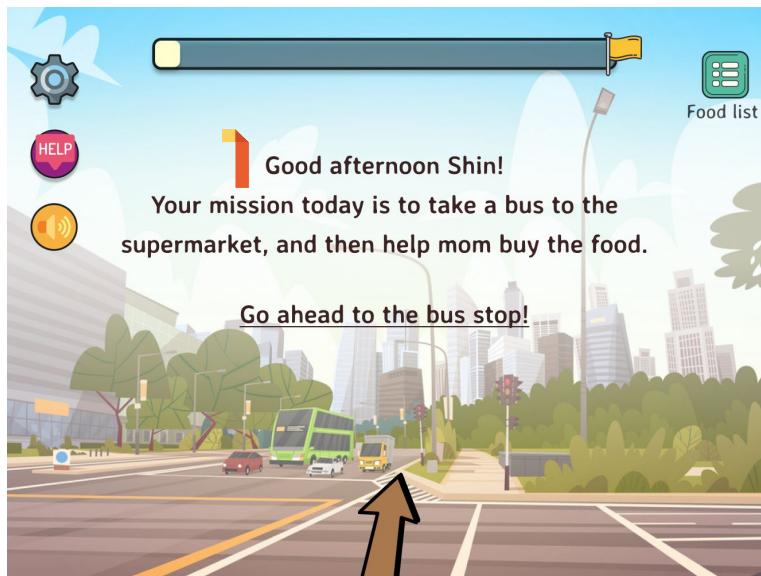
1 Users will officially get into the game after the story. Instructions will be provided on the screen that tell users what they should do next. Very child-friendly and positive words are used in order to motivate users to continue playing. Users will feel like someone is talking to them in the game.

2 A progress bar is also provided there. Since in each mission, users will have multiple tasks to finish, it will be very easy for them to lose patience if they don't how much they still need to go through. By having a progress bar, they will know how much they have finished and how much they still need to do. It could increase the motivation to play the game, as well as giving a sense of accomplishment.
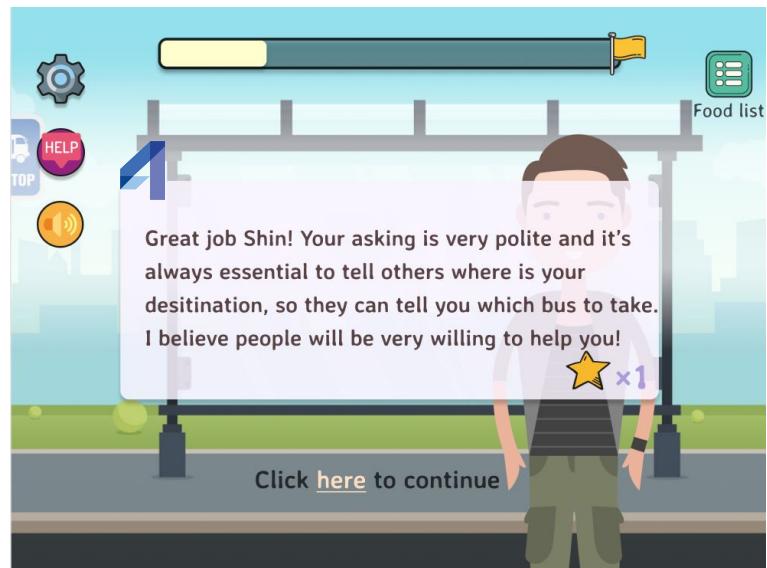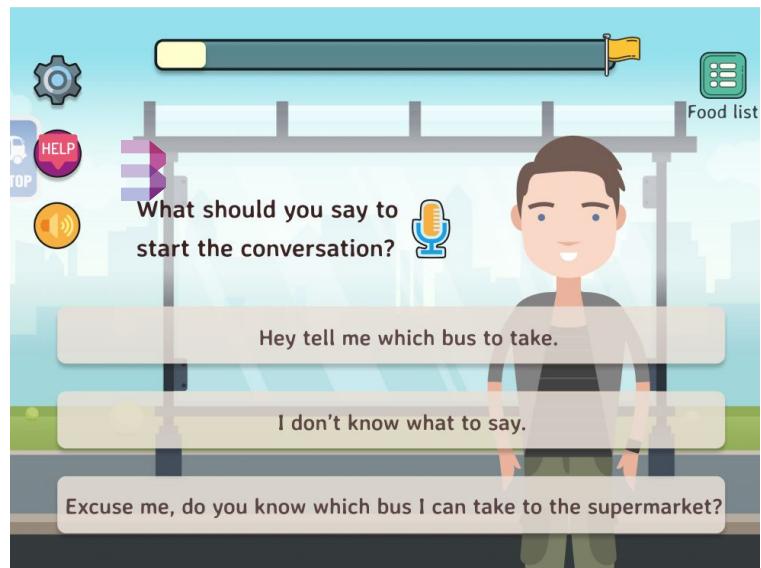
3 This is the first task in this mission. The game will ask questions related to that situation, and users need to choose an appropriate way to communicate or interact with others to finish the task. We choose to use this format is because it clearly shows the correct and wrong behaviors to the users. They can easily distinguish which one is correct and which one is wrong by considering these different choices. The wrong answers could be something they might say before in their real life, but after playing the game, they could have the awareness that those are not correct behaviors and they should not behave like that anymore. It meets the goal of teaching and learning. Furthermore, in addition to the audio feature we have throughout the whole game, we also include a voice recognition feature there to help users answer the questions. Users can choose either clicking on the right answer or speaking it aloud. By doing this, it not only improve the playing experience for users who have trouble in reading text, but also helps users practice communication skills by saying the phrases out loud as they are in the real world situations.

4 After the users choosing the answer they think are correct, we will provide feedback according to their choice. If they choose the right answer, we will explain to them why it is right just in case they choose it at random. If they choose the wrong answer, we will also explain to them why it is wrong. We add the feedback section is because we want users are really learning something from the game, but not just playing the game. Also, we will give "stars" to them as prizes at this stage. After reading the feedback, they'll be able to continue the mission and move to the next task.
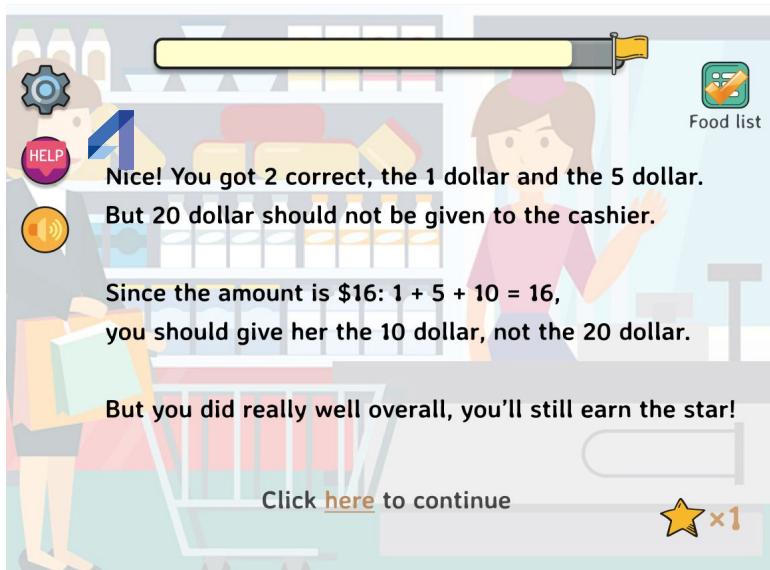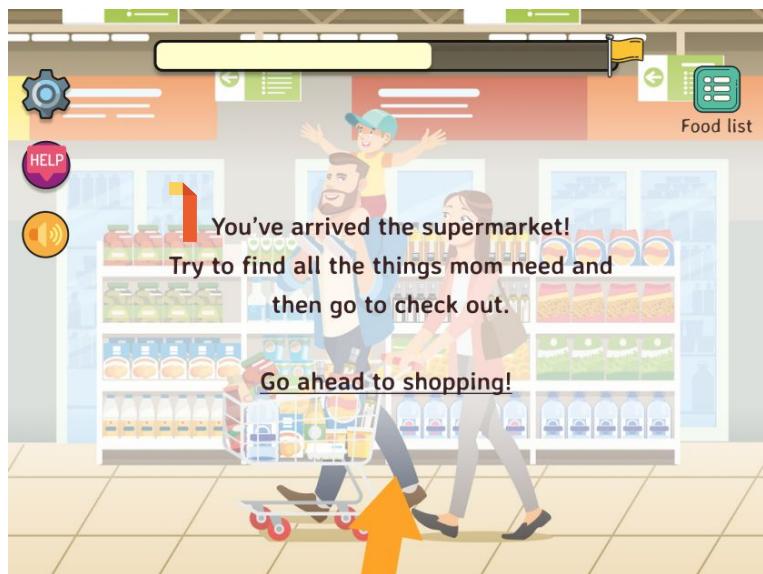
This is the second task we made on our prototype in the first mission.

1 2 4 are explained in the previous task.

3 As we mentioned before, in addition to help children with autism practice social interaction skills, in the Hello World section, we also want users to learn some basic life skills like how to take a public transportation or how to use money. This task is designed to teach users how to use money. They need to choose the right amount of money and then feedback will be given based on their choice.
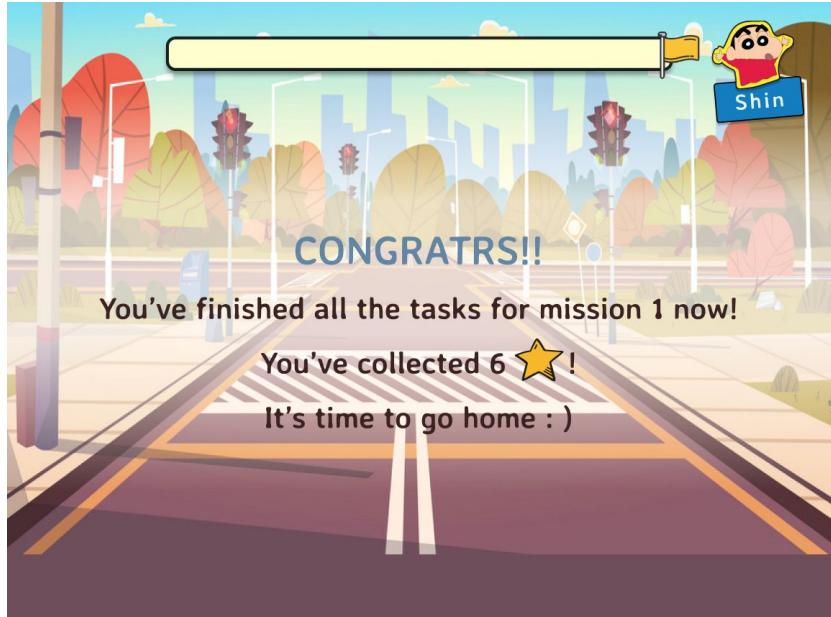
After finishing each mission, there will be a Congrats page. And users will also know how many stars they have collected in total from this mission. It gives users a sense of accomplishment and helps them to build up confidence. This will increase their courage to have more social interactions with other people. By clicking the upper right corner button, they can go back to the home page and continue playing.

In our prototype for mission 1, we only show two tasks: how to ask other people which bus to take and how to correctly use the money to check out. However, our ideal version of this app should include 5-6 different tasks in each mission. For example, in mission 1, there could be more tasks like how to behave on a bus, how to ask where is a specific item in the supermarket be provided. All the tasks should be different but in a similar difficulty level. And they also should be engaged and interesting for the users.

Stage 4.2 - Hello Me
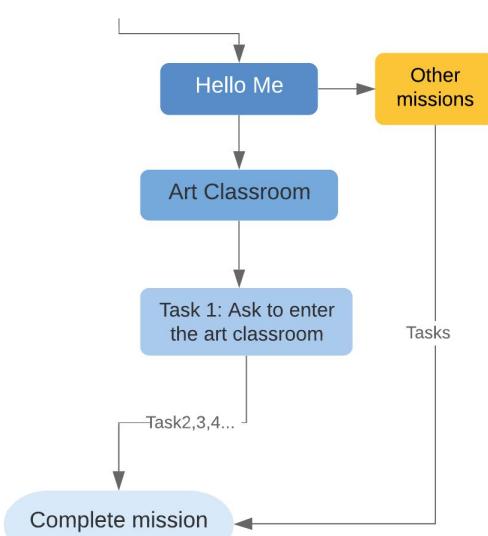
In Hello Me, users can find and develop their interests/hobbies, as well as practicing social interaction skills. Survey results generated will help users customize locations and missions in this map based on their current interests or hobbies. For example, if the user choose drawing as his/her hobby in the survey, we will provide places like art class and art museum on the map. Similar to Hello World, different places have different missions, users need to finish all the tasks in each mission, and then get "stars" in the end as prizes.

Purpose of this game : for children to develop their interests, practice social interaction skills and save what they draw or any other works they did to the "My Gallery" feature.

1 2 3 4 are explained in Hello World map section.

3 has different circular icons due to different locations require to complete missions based on the purpose of this game.

Mission 1 - Art Classroom
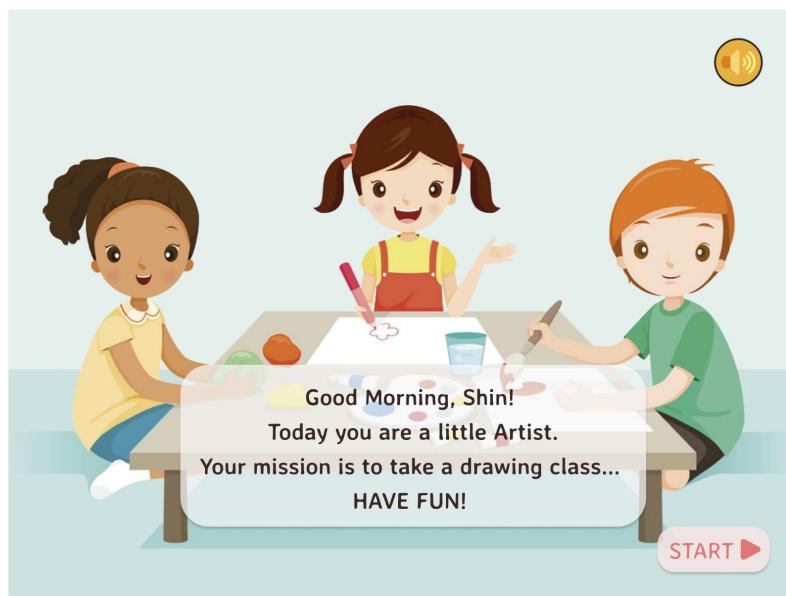
This is a character setting for users before they start to complete missions. In here, since Shin chose he likes to draw in the survey, this mission is to take a drawing class in art classroom, character setting is 'little Artist'. Character setting gives users a sense of purpose and encourages users to tried their best in doing tasks. The encouraging phrase like 'HAVE FUN!' here also would be motivations to users in completing the mission.
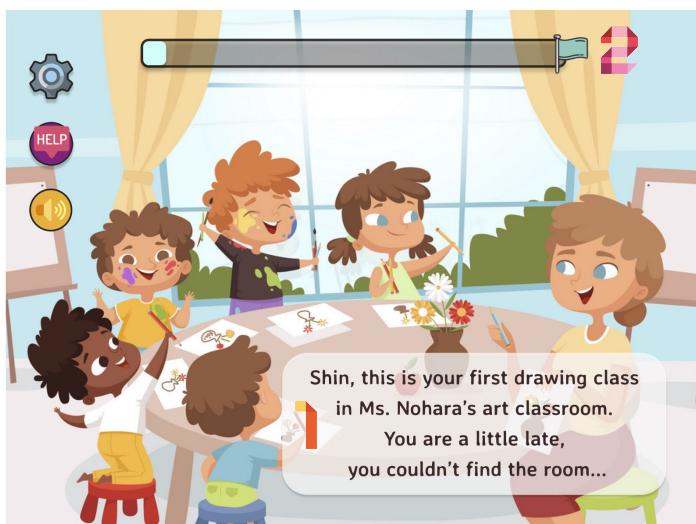
1 They are the explanations on situations user is in, which are for smooth connection to tasks before and provide background for the following task. Users can read the short sentences or listen to it by tapping the audio icon. In this way, users are aware of what kind of situations they are in and do tasks based on these situations. The situations provided are likely to occur in real life, after users do the task, feedback will be given from the game which will help them do better in similar real life cases.

2 'progress bar' is explained in Hello World Mission 1 second set of prototype pictures.
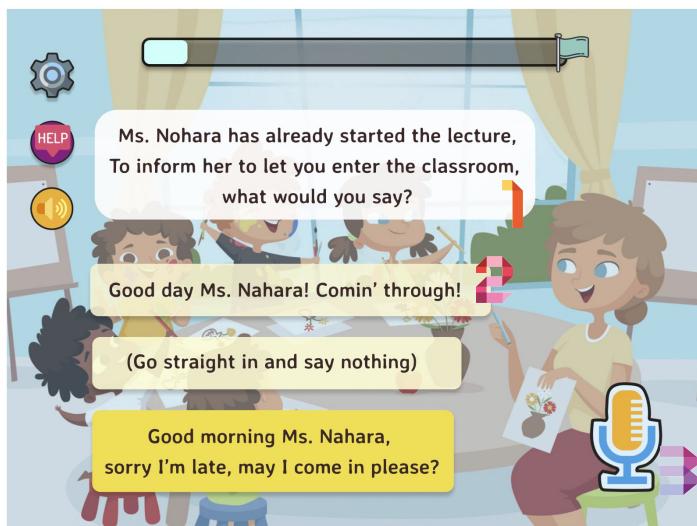
1 In Hello Me Mission 1, users mostly communicate with people they will be meeting frequently and do works together, so the questions are designed to give users practice on communicating with respect towards adults and same age children. Be familiar with conversations in these situations is important for users to make friends and exceed in developing their interests.

2 The choice of giving 3 options of answers is not too many or too little for children to choose from, and they can also learn some possible mistakes during conversations from wrong answers. The answers are short and easy to understand, answer chosen will be highlighted. The second question contains 2 correct answers, which can offer

different choices for users to learn to communicate politely, and deal with possible situations they did not practice through the game.

≡ The yellow mic detects users' voice and choose answers by saying their chosen answers out loud, purpose is explained in Hello World under third sets of prototype pictures.

These pages will identify the answer chosen is correct or wrong and give feedback to users. Congratulating phrases on accomplishment are also shown here and the stars collected by completing the task. Further explanation on purpose on these pages are explained in Hello World Mission 1 under third set of prototype pictures.

This is a digital drawing board for users to use. Different kinds of pen, pencil, brushes with different colors will be offered, also it contains other basic drawing boards functions like fill colors, shapes… This platform provides opportunities for users to develop interests in art and their creativity, sensitivity, observation skills etc. This fulfils the purpose of this game for developing hobbies/interests other from social interaction.

1 Users can save their artwork to 'My Gallery' by clicking SAVE, and they will see the progress made through time on developing interests and skills. Also, sense of accomplishment can be developed by seeing all the amazing works.

2 The trash can button is for discard the works users not satisfy with and start new blank page to create another work on.

This is the final congrats page same purpose to last prototype picture for Hello World.

There are only 2 kinds of task shown in prototype of Hello Me Mission 1: ask questions politely and drawing on digital drawing board. More similar difficulty level tasks was planned for complete experience in doing this mission including ask questions during lecture, showcase and critique works etc.

Connection to the class content

10 Usability Heuristics for User Interface Design

What we have in our app?

Visibility of system status - Our app is always keeping users informed about what is going on. Users can see their performances in the game from multiple features in the app: My Mission, My stars, and Maps to see how many missions they have completed. Also, in the game, there are instructions continually telling users what they should do next. And the progress bar is also telling users which stage they are at.

Match between system and the real world - Since the main goal of the app is to help children with autism practice social interaction skills they need to use in real life, our app is closely related to children's real life environments. All the missions and tasks are designed based on real life situations and follow real-world conventions. All the information appear in a very natural and logical order.

Recognition rather than recall - All the objects, actions, and options in our app are visible, so it minimizes the user's memory load. Users do not need to remember information from one part to another part to finish the game, instructions for each step will be given very detailedly during the game. Also, setting and help features are visible throughout the whole game process, users could easily make any changes they want.

Help users recognize, diagnose, and recover from errors - During the game play, if users choose the wrong answer for the task, the app will provide detailed feedback for the users and help them understand why it is wrong. Users are making progress through the game.

Limitations

1. Even though we add lots of audio and voice recognition features in our app, if users cannot understand the text, their playing experience will still be influenced a lot. Therefore, our app may not be a good choice for children with autism who also have lots of trouble reading and speaking. Our target audience could only be children with autism who don't have much trouble in reading and speaking, as well as need to practice social interaction skills. This limits the range of our target audience. However, there still a limitation that the voice recognition may not recognize what kids say, maybe adding a facial expression identification feature could be helpful.

2. There are not many interaction activities in our app, especially in the Hello World game section. Users are just clicking-through and choosing the correct answers. Since our target audience is younger children, they will be easily distracted when playing the game. There could be a lack of motivation and engagement.

3. Users could be a little confusing about figuring out the difference between the two games: Hello World and Hello Me.

4. The rewarding system works for most typical development children but may not work for children with autism. How to allow users to exchange their stars to in-app rewards or out-app rewards need to be considered.
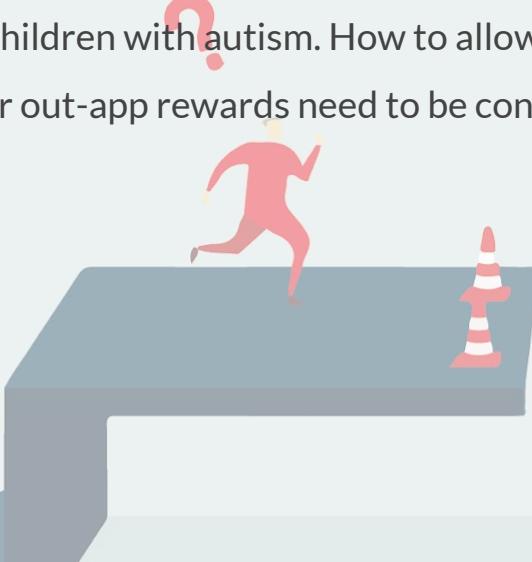
Future Improvements and Expansions

- **New User Tutorial -** Even though we have a tutorial feature in the Help section, we think tutorial should be given automatically at the beginning of the app, since our target audience is children who may not be familiar with the technology. Tutorial at the start can be like each function/button having a callout attach to it with further explanation inside.

- **Levels in Game -** Tasks in different difficulty levels could be given based on how users perform previously. The app could also be designed for elder users by offering more mature content.

- **Alternative Reward System -** Since the rewarding system in the app may not work for children with autism and different child has different preferences, one way to continue doing the rewarding system is to let users keep the stars they collected from the game, and then communicate with their parents to use these stars to exchange something they would like to own in real life.

- **Use for Special Education -** The app could be designed to use in special education classrooms as a teaching tool for teachers. Different places on the map could be changed to different skills teachers want their students to learn in each semester. And teachers will be able to track each student's progress and activity on using this app.

- **Augmented Reality (AR) -** The app could be more related to real life situations by using AR. Backgrounds in each task could be changed to the real environments in the user's community. And places on the map could be changed to the real existed places in the user's community. By doing this, the app becomes one step closer to children's real life. The learning effect may be better. But the user's' current location and 3D visuals from real environments will be needed.

Effectiveness of design process

We would like to say that our design process is somewhat effective, but we have changed our point of view a lot from the start, spent more time than needed on certain phases of the design process.

What phases we found important…

- Define point of view
- Define target audience
- Information organization
- Test Usability & Accessibility
- Presentation of product

What we suggest…

- Discuss more on main point of view of the design, come up with one that you are almost 100% satisfied with
- Define specific target audience (users of your product), think from their perspectives, never forget that everything should be created to satisfied their needs
- Organize information in multiple ways (wireframe, flowchart etc.) and keep trying to make the organization detailed and clear
- If applicable, find your target audience to do usability tests, give them tasks that can use your product to complete and see their reactions, ask for their feedback
- Give clear, short presentation, go straight to the point, cover main parts or your idea, design process and product, less words more visuals on slides
- Divide time spent on each phase of design wisely, try to not spend too much time on one part and ignore others

Paper Prototype

HELLO

LOG IN

USERNAME
helloshin

PASSWORD
x xxxxx

Sign Up   Log In

Hello, _____ !
We want to know more about you :)

What places do you like to go ?

Park   Supermarket
Museum   Others v

You're all set !
Nice to meet you. Jack !
You can start the game now !

setting   Shin   log out
Help

My Mission My Stars My gallery Myself

Hello World   Hello Me
map   Map

Setting

Language   ABC English   >
Text   A medium   >
Volume   -   20   +
Color   red / green filter

BACK

Help

General   Report   Share
Help guid   issue   data

BACK

Hello World   Map   Jack

setting   bank
Help   bus stop
Jack   hospital
supermarket
                      park   police station

clicking on the first mission: Supermarket.

Help   At home
setting
        Mom   Hey Shin, can u
               help mom to buy
               sth. from the Supermarket?

Help
setting   Mom   These are what
                 I need:

          object1 object 2 object 3

Good morning, Shin !   Shopping List
Your mission today is to take a bus to the supermarket.
and then help mom buy the things she needs.
Go ahead to the bus stop !

Street View   ↑ → Click to move

H   Look ! There're some people waiting for the bus too.
S   Try to ask another people which bus to take !
              STOP

bus stop view   ↑ → Click to move to meet a person.

Panel 1 (top-left):

H
S
→ people in the bus stop
List
Tell me which bus to take
Hi, how are you? Could u tell me which bus I can take to the supermarket?
I don't know what to say.
Click a answer / voice detect

Panel 2 (top-middle):

H
S
List
Feedback
(correct / wrong.)
Continue

Panel 3 (top-right):

① ② ③
Next Task: Supermarket
H
S
List
Arrived Supermarket.
Find the food, and then go to check out
Supermarket background
→ click to find food

Panel 4 (middle-left):

H
S
Lists
Go to check out!
Choose the correct amount of money!
1 $ 10 $
5 $ 100 $
Check out background
confirm

Panel 5 (middle-middle):

H
S
Lists
Feedback.
You're wrong. reason
Continue

Panel 6 (middle-right):

H
S
Back to map
Congrats!!!
You've finished all the tasks!

Panel 7 (row 3, left):

Hellow Me   Map   ⊗ Jack
setting
Help
photography exhibition
Jack
art classroom
art museum
Fab lab

Panel 8 (row 3, middle):

Mom
Jack, today you are going to take a drawing lesson. Take your water bottle and get ready!

Panel 9 (row 3, right):

setting
help
audio
Shin, you are a little late to the art classroom
...

Panel 10 (bottom-left):

setting
help
audio
To inform the teacher for letting you in to the class what would you say?
A. Good day, let me in!
B. (Go straight in, say nothing)   voice command
C. (Good morning sorry I'm late may I come in please?

Panel 11 (bottom-middle):

setting
help
audio
Nice Job. Shin!
You got the correct answer. 1 × ☆

Panel 12 (bottom-right):

setting
help
audio
drawing board
○ ○ ○ ○ ○ ○ ○ ○
colors
finish