

ITSY

Proposal Report Half Ice No Sugar

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ITSY

Half Ice No Sugar

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Physical computing & Interaction Design Studio Proposal

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Introduction

Our team's goal is to create a learning experience for children to help improve their everyday motor skills. We want to create and develop a method of learning that goes against the traditional learning style, thus improving development of children.

The Team Domain

Problem Space

Due to the prevalence of using electronic devices, children are incorporating less motor skills to learn and play in their daily lives. There is solid evidence that infants and toddlers have difficulty transferring new learning from a 2D representation to a 3D object. [1]

Traditional learning techniques generally engage just two senses – hearing and vision – when providing access to information. Tangible Interaction promotes the concept of engaging multiple senses including vision, hearing, touch and even smell and taste as a medium for interacting with learning content. [2]

Concept

Based on the problem space stated above, the team came up with the idea of the tangible learning toy Itzy to provide children a better learning tool. Itsy allows the user to learn at a more comfortable pace with more than one interactive input. This allows for a synchronized development of the brain. Targeting both the creative and analytic part of the brain.

Context of Use

- Teachers can utilise ITSY to assist and better perform their work, such as teaching math by physically counting the Lego blocks and ITSY will give children feedback about their answers.
- Parents can also let children learn colours and vocabularies by ITZY telling the questions and the kids can point out and speak up the items with the colour ITZY mentioned.

Response to Feedback

Initial Concept



Image 1: prototype of Itzy with different interactions

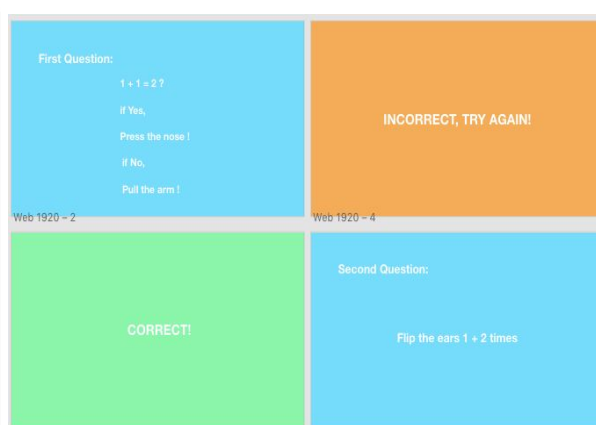


Image 2: website with questions

The Initial concept utilised both physical interactive and an online platform to educate kids on learning math. Kids will have to answer the math questions through an online platform by interacting with Itsy.

Feedback

The feedback from the pitch generally focuses on the interactions: inputs and outputs, the target user group and the learning topics.

- Topic - The team was recommended that we should aim for the final product, so that the technology will not limit our design.
- Approach of presenting questions - The use of the website (*Image 2*) as a message delivery tool is one of the major problems people have mentioned, since it is too plain and does not involve much interaction with the kids.
- Input - Many people have raised the concern that the interaction with the teddy bear is not suitable for children (*Initial concept & Image 1*), and it is suggested to let the kids make emotional connections with the toy in order to learn in a comfortable environment. Recommended inputs include clapping, colour identification and voice recognition.
- Output - Besides from the glowing ears and voice encouragements, friendly tone and phrases can be used to motivate the kids, such as 'You are close to the final answer, give it

another try', and music, vibration and heats can also be added to give children more feedback on various senses.

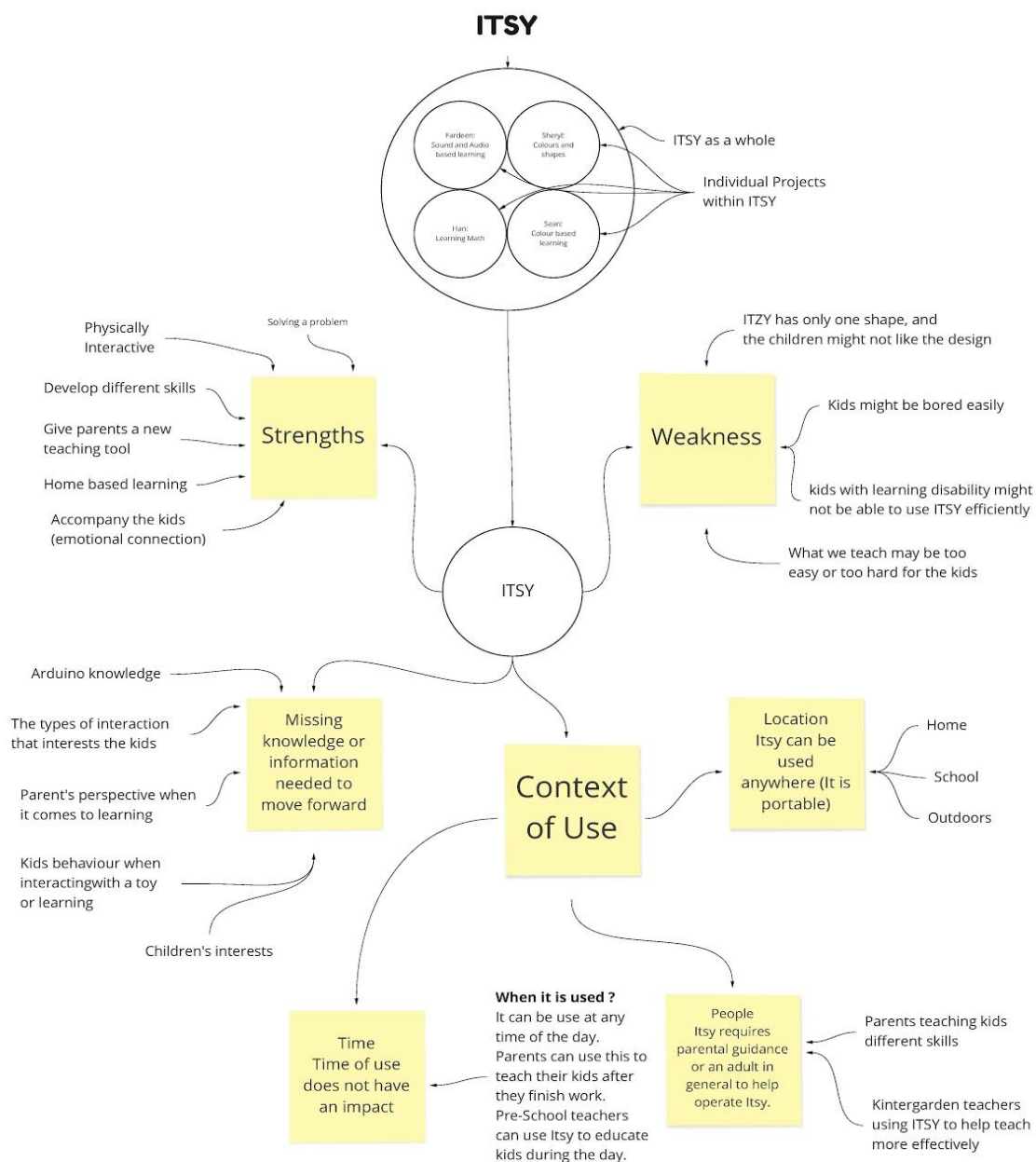
- Audience - Another crucial feedback is that the target group is ambiguous regards to the demographic and use case.
- Learning topic - The scope of the learning activities is too broad, so that it might be hard for the team to focus on one solution. The potential topic includes Math, English and Colour identifying.
- Physical solution - Different types of toys can be developed based on children's like and different learning goals, such as microphone for English vocabulary pronunciation and fluffy rabbit for kids who like peter rabbit.

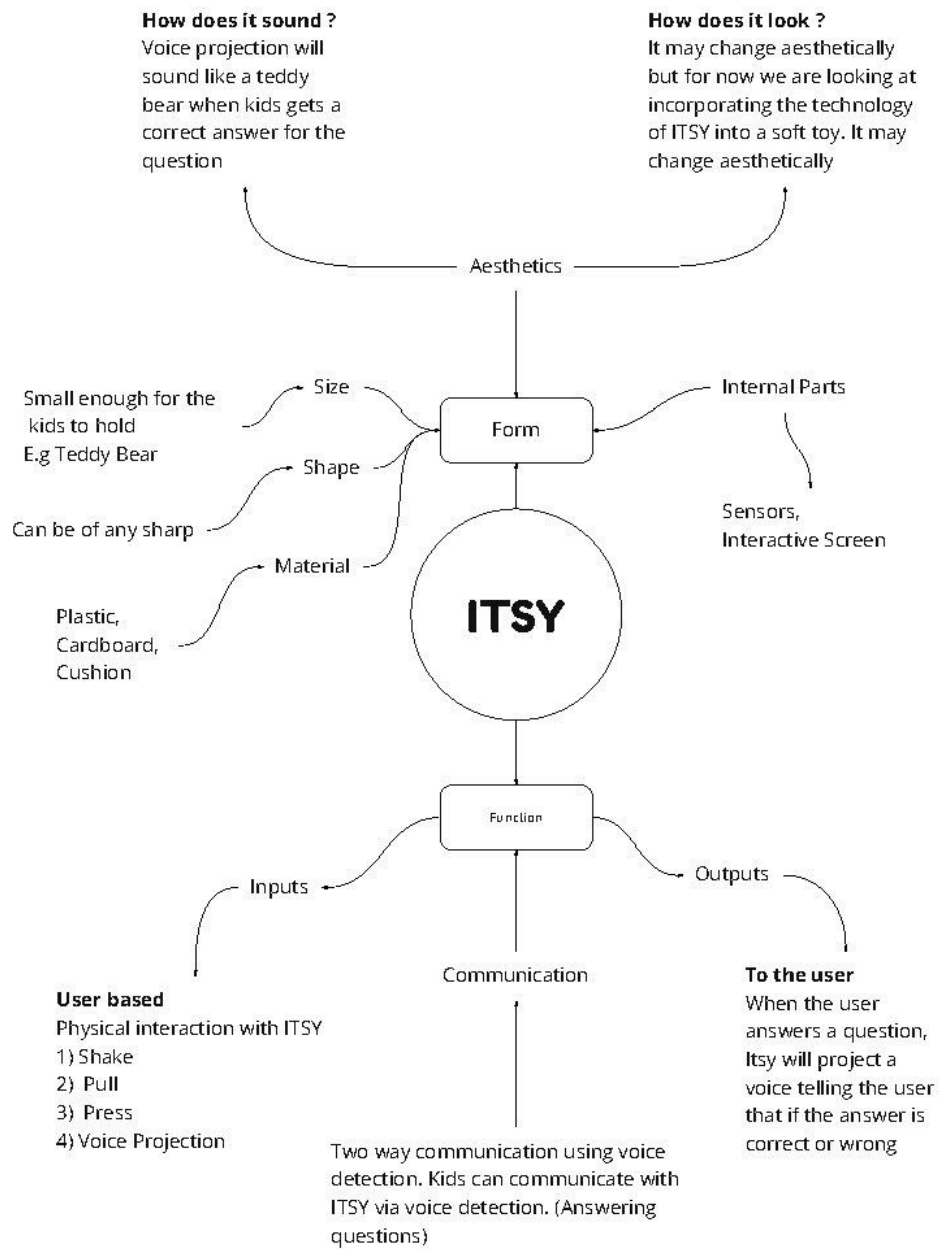
Project Redefined

From the feedback received, we have decided to make the following changes to our concept.

- Instead of the website directly showing questions, the team agreed on presenting the questions in a more interactive way, such as voice output, which allows kids to practice listening as well as utilising different senses.
- Based on the feedback, the team agreed on interacting with the toy in a more friendly and encouraging approach such as hugging the bear when the kids answer the questions correctly rather than pull the limbs which may have negative impacts on children.

We will be narrowing down our target audience, designing suitable tasks for each learning goal and also design proper input and output methods, taking into consideration the target audience and their learning goals. This is where we split the concept into multiple versions that each team member will research and develop.





Related Work

Our entire concept is heavily based on Human Computer Interaction (HCI) principals, specially those outlined in the Eight golden rules of HCI by Ben Shneiderman [5]. Some of the major ones we need to focus on is being able to provide clear and informative feedback; allow retrying if answers are not correct; and help reduce short-term memory load, as we are focused on long term learning.

According to the paper, UI is Communication. As a result, it is crucial to have an emotional connection with the UI and the product [6]. It is not enough for the product to fulfil its purpose. There needs to be a bond and a connection. For example, to me a MacOS has a very soft, warm and fluid feel to it, however, Windows 10 feels sharp, cold and uncertain. The two operating systems essentially can do the same task but they have completely different emotional impacts. Another great point mentioned is that we are not designing for robots, the interaction needs to match social emotions [6]. For instance, if people answer the questions incorrectly with ITZY, it will not be blunt and rude but be forgiving and supportive like a mother or a teacher would be.

There is a term called Learning Experience Design (LXD), where the goal is to help someone learn something in the best way possible. One of the most important parts of LXD is the UI that supports and enhances the cognitive processes of learning [7]. The article also stated that it is useful to set learning in a real-world context, which is the learning experience Itzy provides. Having a real-world toy/object to interact with will help transfer the skill and knowledge to a real-world application.

Potential Approach


The paper provided a set of methodologies, architectural models, examples of interaction with children with disabilities, case studies, and usability considerations in the context of disability that focuses on providing the reader with the elements required to build human-computer interaction systems thinking in children. This paper provides us lots of methodologies on doing user research and there are many useful case studies which are related to our domain [8].

Audience & Intended Experience

Audience

The team has made 4 personas to better identify the target audience and their motivation of using Itzy. The characters in personas include working parents and a children care teacher, which is the direct user of the product. Different types of Itzy will be built in order to satisfy children's preferences as well as learning goals. Itzy can be considered as a learning tool that assists parents in teaching their kids.

 <p>Melissa Age : 34 Occupation : Nurse <i>"Doing whatever I can for my kids to be happy"</i></p> <p>BIO Melissa is a nurse. As she is a single parent, she has to work multiple shifts in order to provide for her kids. She has two kids of age 3-5. Her mom is currently taking care of her kids when she is off working multiple shifts.</p>	<p>Goals</p> <ul style="list-style-type: none"> • Making sure that she has enough money to support her children for education. • Making sure that she tries to help her kids with learning so that they can grow and be well-equipped with knowledge as they grow. <p>Motivations</p> <ul style="list-style-type: none"> • Working hard so that her kids can have the best resources for learning. • Encouraging her kids to always be curious and to always learn • Looking for possible solutions to educate her kids without her help <p>Frustrations</p> <ul style="list-style-type: none"> • Not spending enough time with her kids as she has to work multiple shifts. • Technology nowadays are so advanced that her mom find it hard to teach her kids when she's off for work. She wishes to have something that is user friendly so that her mom can help her educate her kids when she is not around.
 <p>Linda Age: 35 Occupation: Accountant <i>"Giving my kids the best resources"</i></p> <p>BIO Linda is a business woman working in a private accounting firm. Linda is also a mother of a twin boy aged 5 and a girl aged 3, and she enjoyed the role of being mom.</p>	<p>Goals</p> <ul style="list-style-type: none"> • Success in work and being promoted to manager by this year • Taking care of her children well • Support her children's daily and education needs in both financial and emotional aspects <p>Motivations</p> <ul style="list-style-type: none"> • Give the best resources to her children • Encourage the kids to have the interest in learning • Improve the kid's learning experience • Look for suitable teaching methods for the kids <p>Frustrations</p> <ul style="list-style-type: none"> • Cannot finish the work on time due to time balancing between family and work • Taking care of 3 energetic children at the same time • Afraid of her children will be left behind when they entered kindergarten • Hard to find the appropriate toys or learning materials which have high education purpose as well as playful approach
 <p>Monica Age: 23 Occupation: Kindergarten teacher <i>"Play is an indispensable part of education"</i></p> <p>BIO Monica just graduated from college and become a kindergarten teacher who she teach 12 preschoolers in her class.</p>	<p>Goals</p> <ul style="list-style-type: none"> • Find more fun activities to do with her students. • Have more experience in teaching preschoolers. • She wants to teach based on children's interests. <p>Motivations</p> <ul style="list-style-type: none"> • Increase children interest in learning. • Children are more willing to participate in doing fun activities. • Let children learn language in easier way. <p>Frustrations</p> <ul style="list-style-type: none"> • Hard to let all kids participated in learning language. • Children felt bored when they were learning • With little experience in teaching preschoolers.

 <p>John</p> <p>37</p> <p>Occupation: Runs a Business from Home</p> <p><i>"I want to spend as much time with my kids as possible"</i></p> <p>BIO</p> <p>John runs a successful business from home and takes care of his 3 kids, one 3yo and 5yo twins. He likes to spend his free time, playing and teaching his kids.</p>	<p>Goals</p> <ul style="list-style-type: none"> • Work from home without his kids disturbing him • Spend his free time helping them learn cool new things • Understand how his children prefer to learn. <p>Motivations</p> <ul style="list-style-type: none"> • Support his kids the best way he can. • Find some alone time to work on his business • He wants to be a more involved parent as his wife is a nurse and has to work all the time. <p>Frustrations</p> <ul style="list-style-type: none"> • His wife has to go to work all day, as she is a nurse • Hes has to handle all 3 kids when school isn't on • Sometimes he can't focus on his task as the kids are distracting.
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As children of this age might not have enough vocabulary to express themselves, it will be difficult for them to read off the screen. Thus, we will use voice projection to assist with fine motor development for the kids.

Our target audience is children from 2 to 5 years old, since the children at the age are old enough to develop their basic communication skills as well as cognitive skills in order to protect themselves from accidents. Research has shown that children at that age are suitable for learning colours, numbers and shapes. [3]

The paper noted the importance of meaningful playing to children, which is beneficial for both of their muscle/motor skills and mental developments. The report also mentioned that learning through playing gives the children the opportunity to explore and practice what they have learnt. [4]

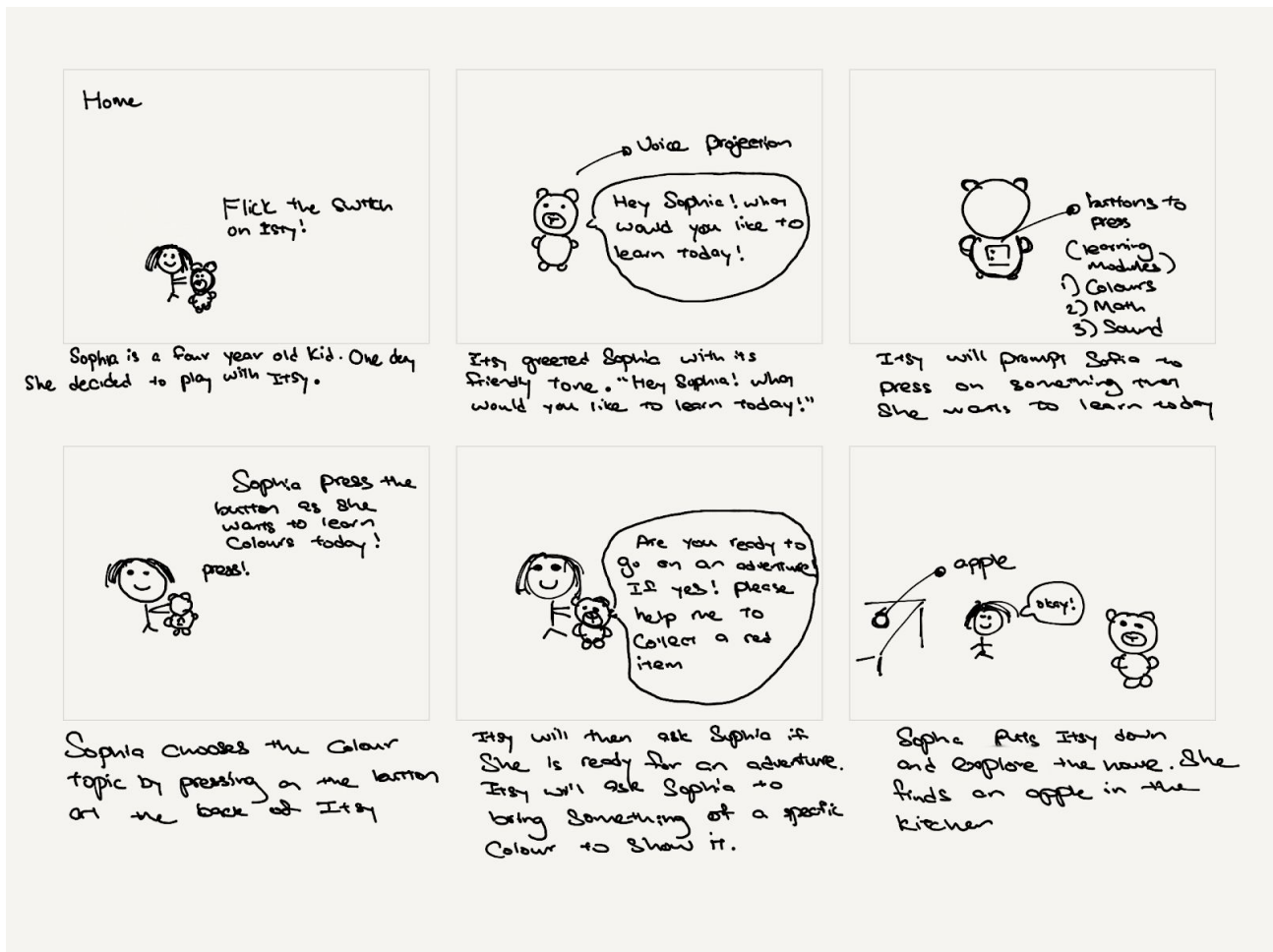
Intended Experience

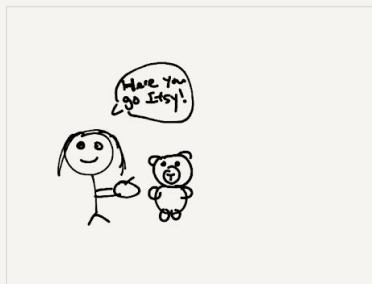
We hope the audience experiences a playful and interactive learning style when using Itzy and allows the kids to expose to different learning options. Learning through playing is the main goal Itzy has, it allows the kids to learn with different methods as well as establish their learning habits, interests and motivations. The storyboards below detailed-present how the kids will utilise Itzy for learning and accompanying and the positive interaction between the kids and the toy.

1. Sophia is a 4-year old kid. She turns the switch on Itzy and Itzy greets her with a friendly tone saying 'Hey Sophia ! What would you like to learn today !'
2. Itzy will prompt and ask Sophia what topic she would like to learn today. Sophia chooses the colour topic by pressing the button at the back of Itzy.
3. Itzy asks 'Are you ready to go on the adventure!, if yes, please help me to collect a red item!'
4. Sophia puts Itzy down and starts to explore around the house. She then finds an apple in the kitchen
5. She is excited and runs back to Itzy to show what she found.
6. Itzy will detect the colour of the object and if it is correct, Itzy's ear will vibrate and there will be a background music projecting from Itzy. Itzy will then say 'Good Job Sophia, this is the right colour !'

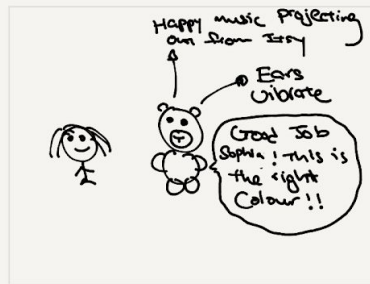
7. Itzy will ask Sophia to hug it and it will thank Sophia for being its friend. This will build a deeper connection between the user and the toy.

The first two storyboards depict a scene where Sophia tries to interact with Itzy and she was happy and more encouraged to learn after getting her first answer correct.





Sophia showed the apple to Itzy and Itzy detects the colour of the apple.



when Itzy detects the right colour, Itzy ears will vibrate and it will tell Sophia that she did a great job.



Itzy will then prompt Sophia to hug it.

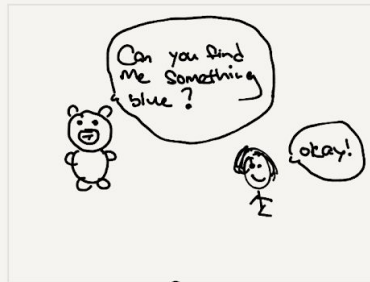


After hugging Itzy, Itzy will say "Thank you for being my friend". This will build connection with Sophia.

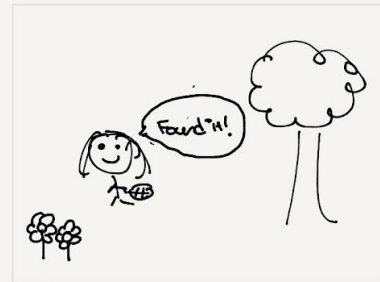
This storyboard depicts a scene where Sophia didn't manage to get her answer correct this time. However, she was not discouraged and kept trying until she got her answer correct. Itzy provides a sense of comfort to kids whenever they do not manage to get the correct answer. This will also help to strengthen the connection between Itzy and the user.



Itzy asks Sophia if she is ready for the next challenge and Sophia replied "yes!" with excitement



Itzy asked Sophia if she can find something blue



Sophia explores around the house and found a leaf at her backyard.



Itzy detects the colour of the leaf and it is incorrect.



Itzy gives Sophia words of encouragement



Sophia found a pen and bring it back to Itzy. Itzy detects the colour and it was correct.

8. Itzy says 'Are you ready for the next challenge ? ', Sophia replies 'Yes' with excitement.
9. Itzy then asks 'Can you find something blue for me ?' Sophia replied "Okay!"
10. Sophia explores the house and finds a leaf at her backyard
11. She runs back to Itzy to present the leaf she found
12. Itzy says 'Umm, that is not quite correct, let's give it another try !' with encouragement
13. Sophia looks around the house and get a blue pen to Itzy
14. 'Great job! Come and have a hug ' Itzy says

Relevance to Theme (Creative Learning)

We are designing a playful toy that can be used by many younger children everyday; to learn, practice and improve their motor skills. Itzy is safe and easy to navigate for children, thus, the parents do not need to worry about the safety issue of using Itzy, which is suitable for daily use. Itzy can be used in everyday life, in order for the children to maintain the habits of learning through playing and practicing their motor skills. Itzy provides different learning activities and goals that encourage children to have open-ended interaction with Itzy.

Team & individual aspect of the project

The individual project will be divided based on different learning goals, however the target audience and the problem we want to address will be the same. The concept is that each of us works on one functionality of Itzy and eventually, merges into one product.

Individual Section

Fardeen:

Introduction to me:

DECO3850 feels like the boss level in this IT degree. Throughout my IT degree I had to do all the HCI and design computing related courses, and each one taught me different skills to use at the next level. Finally, in my last year of study I am doing this course. I can offer a plethora of technical and interpersonal skills to my team, including but not limited to:

- HCI research (I have worked at the Department of Transport QLD as a research officer)
- Product development
- Team and client management (I am the co-founder of a media company @dot.media)
- Web design and Database management (Currently tutoring)
- I am a moderately extroverted person and I enjoy talking, listening and connecting with people
- Hard working and determined.

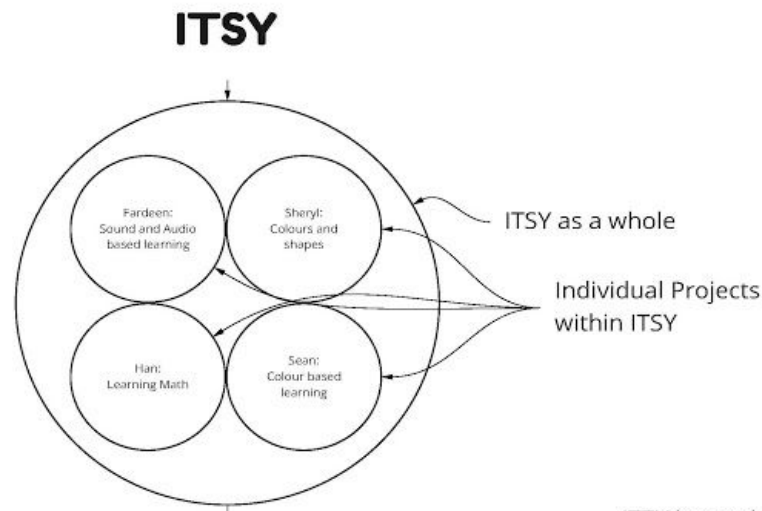
Some weaknesses I have are:

- Sometimes I get distracted and drift off into a different thought process.
- Occasional lack of motivation

However, I have identified this and some other personal issues that have affected me in the past and I am actively improving myself and fixing them. I will apply a similar mindset to this project, learn from the mistakes and improve with more research and feedback. I have experience in a similar project from DECO2300, which will most definitely come in handy creating the actual prototype.

My Focus:

As you have read from the team section that we are focusing on creating a plush toy that will help children with learning. We have divided the learning experience into multiple different mediums, as you can see below:

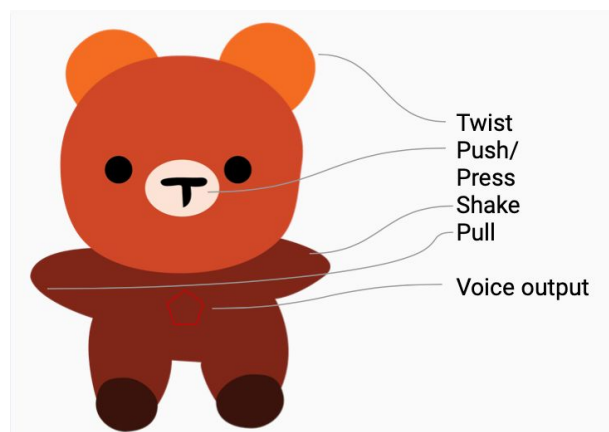


I will be working on the sound and auditory learning techniques. Where the user will hear sounds and reply to it or do certain tasks from the given audio cues. For example, We can ask the user to show something coloured blue, and they would hold it in front of the toy.

Each of the features can work individually or cohesively. It is good to have this option while we're developing the features as it will help us integrate them together,

I want to use the Arduino microphone input and speaker output to try achieving this. There will be some challenges such as finding a library that helps with sound recognition and it works seamlessly.

Response to Feedback:



This was the initial design that we pitched to the class and we received some very important feedback. One of the themes was that some of the actions were too aggressive and not suitable for younger children.

In response to that feedback, I ditched the twist, push and pull inputs, however, I want to leave the shake function. It is a good method of interaction. According to my research about learning experience design, having a UI that relates to the real world helps engage the user more.

Discovery:

Some things that concern me is that will this be enough inputs and outputs for a small human to understand what is going on, and how comfortable the parents will be having such a device interact with their kids. What will happen to the tech once the kid grows out of it? Can it be repurposed into something else? Will having this device at home create any new additional problems? We don't want to solve one problem by creating more.

I would like to get the answers to all those questions through interviews with parents / kindergarten teachers and some more contextual research.

Interviews with parents and kindergarten teachers

Given the circumstances with COVID-19 we will not be able to do a face to face in person interview, however we can still conduct this online, through a video/voice call. This is my preferred method over surveys and forms as it allows for actual discussion to happen and helps me understand their point of view a lot better. Here are some of the main question I will ask them:

- Ask about how the children behave
- If there are any tools they wish they had to help
 - Describe that tool
- What methods they use currently
- Ask them what they think about our concept
 - Is it too technical?
 - How do they think the children will react?
 - Would they use such a device?
 - If yes, why
 - If no, why, and what do they not like

Research

I want to do further research to answer and back up some of the questions I stated earlier.

- Pros and cons of technology-based learning at a younger age.
- How to adapt a product to multiple age groups to reduce future waste

As part of this research I want to observe some videos of parents and teachers interacting with kids to understand their behaviour more closely, as I can repeat the video as many times as I need. This method will also highlight the problems that already exist.

Project Constraints:

As we all know the biggest concern right now are all the restrictions that are placed because of COVID-19. We are not allowed to interact with our team members in person or use the UQ workshop facilities etc. One impact this is having for our project is the lack of proper testing that we can do, such as running live demo sessions that could have helped with getting many valuable insights.

I am planning to do some online interviews and find more peer reviewed research which should provide enough feedback and evidence to back up our claims. I Have many family members with kids whom I can call and potentially visit depending on how the laws change in the future.

One other limiting factor of our prototype is how the technology can be fitted in a plush toy and presented to children. I will need to find a way of getting my hand on a toy and look up videos and instructions on how to modify it.

A plan for completion of the project:

Milestones and Time Allocations

Week	Things to Accomplish	Key-Points in the Evolution Of My Project	Team Discussion + Class	Individual Work
6	<ul style="list-style-type: none"> Start research listed in discovery Plan for interviews 	<ul style="list-style-type: none"> Evaluating the research domain Develop a run sheet for interviews 	10 Hours	10 Hours
7	<ul style="list-style-type: none"> Setup arduino Find appropriate arduino libraries 	<ul style="list-style-type: none"> Buy appropriate sensors if not in the kit Refresh memory on Node.js Build arduino with sensor 		
8	<ul style="list-style-type: none"> Work on individual design and prototype Get feedback 	<ul style="list-style-type: none"> Work and refine the prototype. Ask tutors and teammates for some feedback Implement changes based on feedback 		
9	<ul style="list-style-type: none"> Setup the prototype for demo 	<ul style="list-style-type: none"> Compare and integrate individual projects for team delivery 		
10	Team + Individual Final Delivery	Continue team discussions and iterations on final team delivery. We need to work closer to avoid any last minute issues		
11	Team + Individual Final Delivery			
12	Team + Individual Final Delivery			
13	Team + Individual Final Delivery			

Resources Allocation

I have my garage with many of the tools I will need (soldering, cutting, drilling etc.). I have allocated \$100 for the arduino sensors and other project related expenses.

Sean:

Introduction to you:

Throughout this course I am able to help out my teammates in many ways like user-testing, research. My knowledge on HCI and relevant research skills can help my teammates in documentation. I love to communicate with my teammates and will always try to help my teammates whenever they are in need. My weakness on software skills tends to make me more dependable on my teammates however, I will try to learn as much as possible. The only concern is that I get distracted easily which might affect my work.

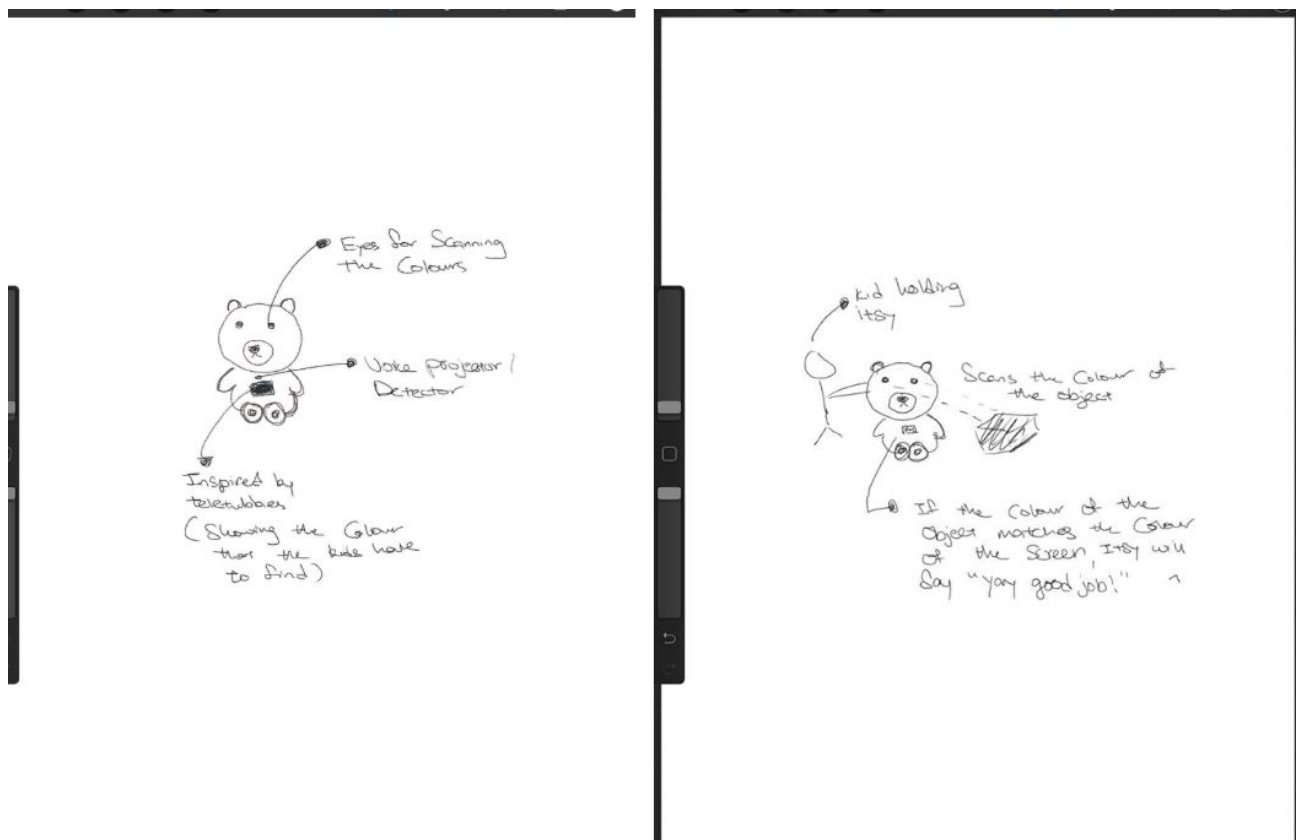
As I am interested in learning and teaching, I would love to see how much I can learn about creative learning throughout this semester so that I might have a chance to apply what I have learned in future if I am seriously considering teaching.

This team has been really good, everyone is working well together, although the pandemic has stopped us from meeting up. We will always try to make it a point to help one another, I will always be available if they need my help on research or anything in general as we are working on a similar concept.

Your Focus:

My main focus will still be teaching kids on how to learn more efficiently through creative learning. Our team will be finding different types of learning modules (Shapes, math and sound). I will be focusing on colour. Through my exploration I hope to find out how practising motor skills can help teach kids colours. As our team focuses on how fine motor learning skills can aid kids in learning, I hope to figure out different ways of developing fine motor skills that can help kids in their learning.

Response to Feedback:



This was an initial concept that I have after looking at some of the feedback received from the pitch. This revised concept doesn't require a laptop connected to the bear, the screen on Itsy's belly will be used to show the colours that the kids are required to find. The kids will then bring the bear along to find the colours. Upon finding the right colours, the kid will scan the colour of the object by using Itsy's eye. If the colour of the object matches the colour of the screen, Itsy will project a soothing voice that encourages the kids to want to learn more.

However, this concept doesn't incorporate fine motor learning skills. It's just a way of teaching kids colour. What I want to do for my individual concept is to find out how to incorporate fine motor learning skills to teach kids about colours.

Discovery:

For now most of the things that I want to find out can be through the use of contextual inquiry and research. The main concern for my project is working on using hardware for this prototype. Assembling everything together can be quite tedious for me. My approach to this concern is to find out more about what I need for my prototype and understanding how it works. I will have to try out all the available online resources and rely on my friends and tutors if I have any issues.

Contextual Inquiry

For contextual inquiry I would want to use YouTube videos to have a general observation of a kid's learning behaviour in class. I would want to see what interests them the most in class and maybe incorporating that as part of my design. Using Online platform might be another way to assist me in finding out a kid's behaviour. I would want to find the specific motor skills they incorporate when they are doing creative things or fun things in class so that I can have an in-depth understanding about motor skills developing for kids.

Interviewing parents and kindergarten teachers (If Possible)

I would like to find out how parents or pre-school teachers educate kids nowadays and what are some interesting facts they know about educating the kids.

- Kids behaviour when interacting with toys, in school, at home
- Specific action or motor skills kids incorporate when doing stuff, how if this helps to develop their learning faster.

Research :

- What are kids learning nowadays
- Essential concepts in toy design : Empathy and play value (How to make kids want to play with this toy again and again)
- Vocabulary capacity of kids
- Interesting concept that teachers and parents are using to educate their kids and how I can incorporate fine motor skills in that aspect.

This will allow me to gain a basic understanding of what I need to know before moving on to the hardware stuff.

Project Constraints:

Assuming that my product requires time to test it out in order to have a more effective result because it requires time to observe how fine motor skills can assist in learning. My concerns regarding this project might be finding out how I can test my prototype and get feedback. There are limited resources on how to incorporate fine motor skills in learning for kids, thus I might ask my tutors to see they have any suggestions on what I can do relating to that factor. There might also be limitations of fine motor skills if I were to use a fluffy bear as my prototype so I might also look into toys that I can incorporate fine motor skills.

A plan for completion of the project:

Time	Things to Accomplish	Key-Points in the Evolution Of My Project	Team Discussion + Class	Individual Work
Week 6	Research and coming up with questions for contextual inquiry	<ul style="list-style-type: none"> • Coming up with questions for interviews with parents and pre-school teachers • Finding Videos regarding kids in classroom to know more about kids behaviour and how they incorporate motor skills in learning activities 	10 Hours	10 Hours
Week 7	Start working on individual prototype	<ul style="list-style-type: none"> • Knowing what kind of sensors i need and knowing how it works • Assembling individual parts together • Constantly asking helps from tutors and groupmates when i have doubts 		
Week 8	Working on individual prototype and getting feedback.	<ul style="list-style-type: none"> • Continue working on my prototype • Assembling everything together for feedback • Work on improving the concept based on feedback(if possible) • Start to work on video presentation 		
Week 9	Showcasing of individual Prototype and prototype appraisal	<ul style="list-style-type: none"> • Starting to discuss with teammates regarding team final delivery 		
Week 10	Team Final Delivery + Individual Final Delivery			

Week 11	Team Final Delivery + Individual Final Delivery	More of discussion with team mates for team final delivery and work on individual final delivery		
Week 12	Team Final Delivery + Individual Final Delivery			
Week 13	Team Final Delivery + Individual Final Delivery			

Resources needed :

Money for buying extra Arduino sensors : \$100

Sheryl

Introduction to you

My strengths are to provide the team different aspects of the concept and communicate among the team members to gain further insights. My weaknesses include lack of motivation and procrastination, which may have a negative impact on my study especially when working from home, but after a few weeks of adapting, I believe I will get back to routine and stay motivated.

I was excited to participate in the course because of the physical aspect of the project, thus, my initial goal for the course is to build solutions with physical objects and utilise the novel technology such as 3D printer and laser cutting machine to achieve it. Due to the current circumstances, my goal has changed to develop my solution with an Arduino kit and learn the most out of the experience.

My approach to project delivery is to do research on the concept and target users which are stated under the team section and 'Your Focus'. Since the teams are doing the prototype in a collaborative way, I will ensure to spend time on communicating with the team and share resources and ideas if needed. I will be using an Arduino kit to implement the prototype, however, I have concerns regarding the technology.

The purpose for me being in a team is to share resources and experiences as well as support each other when needed. The situation includes encountering difficulties of building the solution, gaining quick feedback and testing on the prototype, or having someone to discuss the concept and provide different aspects. The process works in both directions, thus, when my teammates need any suggestions or feedback on their work, I will also do my best to support them.

Your Focus

I will be focusing on shape and colour aspects within the team concept, which will also give the kids an opportunity to explore the objects in their home. The idea is that the toy can determine whether the colour and shape of the items the children have found at home match with the requirement. If the children cannot find the match, they can either draw one on paper or use clay to make one.

From my discovery, plush toys are the most appropriate form of Itzy, since the touching feeling gives children a sense of security and comfort.

Children usually attend kindergarten at the age from 3 to 5, which is similar to our target age group. The Kindergarten Curriculum Guideline [a] has shown that it is beneficial for toddlers to not only explore and experiment with two-dimensional shapes and colours in art works to practice their innovation but also understand and speak simple sentences, which allows children to practice aural and oral communication. By utilising Itzy, the kids can learn how to make shapes and identify colours as well as get used to the structure of the sentence by interacting with the toy.

Building positive traits such as enthusiasm and persistence is another crucial element for kids in kindergarten development, which can be achieved by expressing curiosity, showing interests in their environment and being persistent on the difficult tasks. Furthermore, in order for younger children to build skills and positive attitudes to physical movement, they are encouraged to use small muscles to achieve certain tasks such as using a pen [a]. The toy prompts the kids to physically explore within their home and use their imagination to create artworks which satisfy the requirements as well as encourage the kids to learn from mistakes with a friendly tone.

The idea allows children to learn creatively, in terms of the playful, interactive and explorative traits of the toy, which matches the end goal of the team domain. Furthermore, the concept provides an alternative learning goal for kids of learning colours and shapes at the same time so that they have another interactive learning activity to interact with when using Itzy.

My goal is to provide children the best learning experience with the following approach: first, catch the children eyes by the appearance and the functions of the toy, and then motivate them to learn by creating emotional attached with the toy, and finally make the learning as a habit so that they will not feel like a burden to interact with the toy.

Discovery

The implementation of the prototype is one of my concerns for the project, since I have little experience on working on hardware and exposing it to the related technology. My approach to overcome the difficulty is to explore online resources on the possible solution for the functions such as colour and shape identification and voice output, and then try the available online tutorial on my own and look up the problems if I encountered any.

There are several concerns regarding the concept and I would address it by conducting online interviews and browsing the related forums.

Since my knowledge about our target audience is mainly from online resources, I would like to understand deeper about the age group from the first hand information and personal experiences. Considering the kids may have limited communication skills, the adults including parents and teachers from child care will be the main information-gathering participants.

In the interview, fist of all, the concept will be introduced

- Ask for general feedback regarding the concept
- Any suggested improvements to better assist the teaching / learning experience
- Similar toy / concept that already possess

Basic understandings on the target group

- The topics the children interested the most: colours, shapes or maths
- The difficulty levels of the topics: colours, shapes or maths
- Other learning area that is lacking physical toy / interaction to learn
- Whether the kids' speaking and listening level is high enough to interact with the toy
- Whether the kids' have enough vocabulary to understand the sentences
- In order to narrow the target group, define the most suitable age group for the toy / topic

The interaction that is most suitable for kids

- The types of interaction the children like / suitable for them
- Whether the interactions are enough to interest the kids

By understanding the key audience and acknowledging the needs from the parents and teachers, I will be able to adjust the concept and develop the most suitable solution for the kids in terms of interactions and difficulty levels.

Project Constraints

Due to the current situation, it is relatively hard to reach out to people especially kids for interview or user testing. Thus, with the solution mentioned above, I will conduct user testing through zoom with kids and user testing with people I can easily and safely access.

There are only limited available peer-reviewed articles about toddlers learning, thus, my solutions are to either ask the others from different universities to grant access and research in their libraries or just use the website resources that are available.

In order to put an Arduino breadboard into the fluffy toy, it requires additional sewing techniques. As a result, I decide to practice my sewing skills as soon as possible so that I will be ready when it needs to be put together.

The expenses on producing the prototype may be high. My solution will be to do adequate preparation as I mentioned in discovery, and try to minimise the cost by looking at others' comments and methods to ensure that the material I am going to buy is actually useful for the project. Thus, the materials will not be wasted and the cost can hopefully be minimised.

A plan for completion of the project

	Key Steps Required	Resources Needed
Milestone 1 9 April - 14 April	Since I have little experience with Arduino, I may need a longer time to research and discover the kit. Thus, I will be spending a few days to familiarise the toolkit as well as explore potential technology that can achieve colour and shape identification.	Time: Since it is the semester break, I will Material: just Arduino toolkit will be used at this stage
Milestone 2 15 April - 19 April	The colour and shape identification is the major function of the concept, thus, it will be the first function to implement. Once the identification technologies are found, I will try out the materials from the existing toolkit. If it is not applicable, I will purchase the piece of element that works for the functions.	Time: It may take longer if the materials need to be purchased Material: <ul style="list-style-type: none"> - May need to buy the elements to implement the function - Teddy bear as the fluffy toy If I encountered difficulties, I will discuss with my teammate since

		Sean is implementing similar technology as well
Milestone 3 20 April - 4 May	Within two weeks, I aim to finish building the identification system and start exploring the voice projection. The voice function may be challenging since one of our teammates has researched the function before and found that there is only a limited ability of achieving this using Arduino. Additional Improvements based on the feedback from user testings and interviews.	Time: around two weeks to submit the prototype demonstration. Material: the element for voice project <u>Submission of the video demonstration</u>
Milestone 4 5 May - 17 May	I will keep working on the voice projection if it is not yet finished. The different colours of lights showing on the teddy bears ears will be the next implementing function. Green means correct and red means try again.	Time: 2 weeks Material: the technology that allows colour glowing
Milestone 5 18 May - 31 May	The vibration of the toy will be another feedback for kids and it will be implemented in this milestone along with other interactions that may be suggested in the future interviews.	Time: 2 weeks Material: the technology that allows vibration
Milestone 6 1 June - 8 June	Wrap up the prototype and check if all the functions work well. Improvement based on the feedback from user testings and interviews. If things are behind schedule, this week is for catching up.	Time: 1 week <u>Submission of the proof-of concept prototype</u>

For the final outcome, all of the functions will be implemented, however, the schedule of work may be changed based on the feedback I received from the interview. Research will also be done to look into other interactions with the fluffy toy.

Time allocation

For time allocation, around 10 hours will be individual development, which includes contact and workshop sessions and self-reflection on journals. The time balance between project and team-based tasks will be equally divided but it will be adjusted based on different assignments. The team will allocate meetups weekly for catching up what we have done during the week, sharing resources of Arduino technology and collaborating on solving the difficulties the team members have encountered.

[a] 2014. KINDERGARTEN CURRICULUM GUIDELINES. [online] Available at: <https://k10outline.scsa.wa.edu.au/media/documents/outline_downloads/Western-Australian-Kindergarten-Curriculum-Guidelines-pdf.pdf> [Accessed 8 April 2020].

Han:

Introduction to you:

My name is Han and I am a third-year IT student, majoring in Software Information System and User Experience Design. I have experience in User Interface Design and Front-End Web Development, but I don't have much experience in building circuits and doing In-System programming. It may take me some time to get familiar with it in the beginning. I aim to improve my In-System programming skills and get more knowledge about HCI for children during this semester.

To deliver this project, I will take videos of my project for each iteration, clearly describe the functionality of my project and how I build it, the videos will be uploaded to YouTube, it also helps my teammates easily know my process.

My teammates have already done lots of research on our domain and analyse the strengths and weakness of our concept and I think I can use their research and analysis to further explore our concept, what's more is that some of them already have some experience in using Arduino so that I may ask them for help if I find difficulty in using Arduino. I will support my team by doing more research on children learning math and explore more on users' needs, adding features to our prototype that let children learn math.

Your Focus:

Since our group has separated our tasks to different learning goals. I decide to focus on helping children learn math. Children may feel bored when parents or teachers use traditional learning styles to teach math. I aim to create an interactive learning environment for children to learn math and also improve their motor skills. Instead of giving questions and letting children answer it, ITSY will give instructions to kids by using voice output, let them count the number of items with different shapes and colours that they have collected before and ask them easy math questions based on that. For example, users need to count the number of items with round shape and items with red colour, there will be a math question which is related to these two numbers such as 'shake the bear's hand if $3+4$ equals 7'. The question will be voice output as well. Children can easily answer the question because they can see how many items they have just counted. So that the toy provides visual support for children who start learning math. Users need to do correct responses like shaking the toy bear's hand, then the bear will give light feedback if users do correct responses.

Response to Feedback:

Some audience mentions we need to further specify our target users and learning topics so that I decide to focus on the target users to preschoolers who start learning some easy math, and that helps them learn math in an easier way.

I will change the inputs since some audiences thought that our previous inputs (pull, twist, push) may be too violent for children. The new input like scanning different items with different colours and shapes will be more interactive.

Last but not least, instead of using a website to display math questions, I choose to use voice output so that kids can easily understand the instructions and questions.

Discovery:

My key concern about our concept is that we haven't done much user research, the research on the learning method is broad and I am still not familiar with our users' needs. I will do more research about it, such as looking for some online parenting forum to find some problems that parents meet when teaching their children and there will be some advice which is given by other parents. I can also find some online parent communities so that I am able to conduct online interviews with parents or hand out surveys.

I will be focusing on helping children learn math, but we have done little research on children learning math. I need to further explore it by finding some good cases of teaching math and how to improve kid's interest in math.

We are going to work on separate features and finally merge everything together, so that another concern is how can we make sure our individual works to be combined together in the end, for example, if each of us using totally different code package or making different size of material, it will become hard to put everyone's work together. We can have a video meeting every week and present our work to teammates, it will be a good way to make sure everyone is always on the same page.

Project Constraints:

The key constraint for this project will be the accessibility of materials. It may become harder for me to come to the workshop and use the material and machine there because of the coronavirus. For example, I don't know where to get a display screen to show users our instructions. I may also have less communication with my teammates. It may be difficult for me to know other's processes. Another constraint is that it will be hard for me to access my target audiences because there will be less chance to do face to face interviews or observation. I am also not confident with using Arduino, it will take me some time to watch some online tutorials before I start working on it.

A plan for completion of the project:

To start working on this project, I need to do more user research on my target audiences, interviews and surveys will be conducted to gather some feedback about my idea. Then I will do some research on children learning math, find some case study of existing solutions or children's perceptions about learning math.

After that, I will watch some Arduino tutorials to get familiar with it since I am going to use the Arduino kit to build up my project. I have some experience in using NodeJs so that I will use some existing packages to connect Arduino. All of these preparations will take me approximately one week.

To build up this project, I need to cooperate with other teammates since I am going to build my features based on theirs. I will work on the shape and colour detection with other teammates first (2 weeks) and then work on voice output (2 weeks). I also need to buy a motion sensor to build the shake hand input. (2 week)

Reference

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