



**r e i m a g i n i n g**  
**m y**  
**t r e e h o u s e**

**Revitalisation of the Children's Section in the Central Library @ Bugis**

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**T14: SPRING**

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Submitted to:  
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Industry Partners:  
City Development Limited and National Library Board

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## **FOREWORD**

The National Library Board (NLB), together with City Developments Limited (CDL), is keen on revitalizing the current green library for children, “My Treehouse”, which is located in the Central Public Library at Bugis. The purpose of the current green library is to “push green information and services out to nurture children to become green advocates from young.” (Kingsmen Exhibits Pte Ltd, 2012)

However, the space is riddled with long standing problems that prevents patrons and staff alike from enjoying and working in the space. As such, the aim of our intervention was to revitalise the current space, approach and engagement.

Through this project, we looked into various factors contributing to the current experience in the library. This allows us to have a more in-depth grasp of the situation to allow us to tackle the engagement with children (regarding the eco-theme), safety of the space and most importantly give the library space a new life.

With the introduction of a storyline-based trail, the library will focus on integrating spatial designs, books and features using a eco-themed approach that focuses on how one’s actions impacts the environment.

We hope that our intervention will help children and parents alike have a fun and fulfilling experience in the library.

# C O N T E X T

## Industry Partners:



### CITY DEVELOPMENTS LIMITED

City Developments Limited (CDL) is a Singapore-listed international real estate operating company with a global presence spanning 94 locations in 26 countries. In advocating Corporate Social Responsibility (CSR) and its commitment to environmental sustainability, CDL focuses on engaging its stakeholders and the wider community through various platforms – including cultivating social and environmental consciousness amongst the next generation.



National Library Board (NLB) is a statutory board of the Ministry of Communications and Information, Singapore (MCIS). Tasked to manage the public libraries and to lead them into the Information Age where non-print resources are making their mark, the NLB aims towards the creation of "borderless libraries," an initiative aimed at bringing libraries closer to Singaporeans, and to connect Singaporeans with the outside world.

### Site:

"My Treehouse" is the green library housed at the Central Public Library (CTPL) located within the National Library Building in Singapore. The green library doubles as a children's library. The library is considered to be appropriately housed at the Central Public Library because it has been bestowed many honourable awards for green buildings in Singapore by the BCA.

However, in the children's section, there are observed shortcomings in terms of



interactivity, engagement and design.

The following are our observations and analysis of the library and its spatial qualities:

### 1. Inactive Interactive Features



The data projection weather stump is not active as seen in this picture due to a technical failure that occurred during our site visit to the library



The shadow play wall was also facing technical difficulties and as such the chairs were placed in front of the wall due to inactivity

## 2. Deactivated or unusable spaces

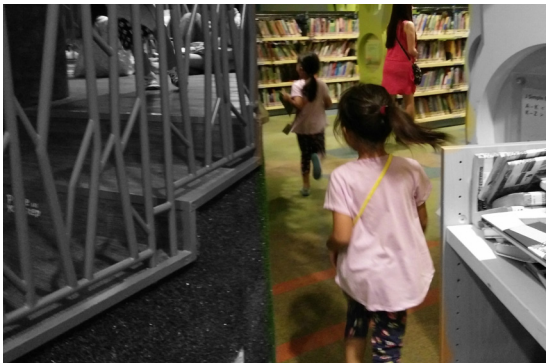


There are a lot of empty spaces in the library that are not utilised on a daily basis.

## 3. Lack of safety and child-proofing



The edges have to be taped up to ensure that children do not injure themselves

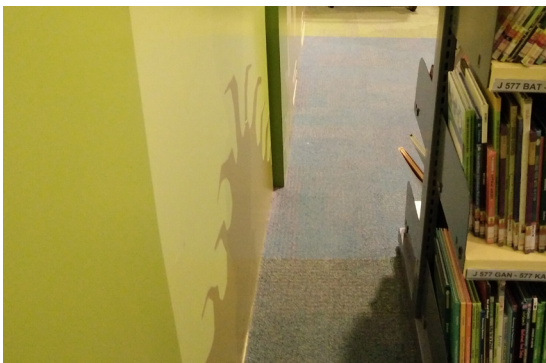


Some of the spaces are poorly designed resulting in tight spaces that are difficult to use and can also pose as a danger to children



The exposed edges make it dangerous for children in the space

## 4. Signs of wear and tear



Some of the spaces are underutilised as a result of poor planning and layout



The wear and tear of the decoration in the library can give a bad image to the library



The damage to the walls can be dangerous and is also unsightly

## People

In order to better understand the users of the library, we decided that interviewing them was an efficient way to find out about their awareness of the space and their interactions within the space.

The interviews were targeted at two groups of people: parents and librarians. The response from these people will help shed light on issues that were experienced by the patrons and also bring to light intricacies that could potentially affect the project.

Generally, the negative pointers that we gleaned from the interviews are:

- Too much noise
- Lack of decorum in a library space
- Lack of awareness of interactive features and overall theme of the library.

The following are the quantitative results obtained from our interviews.

From our interview with the **parents**, we learnt that:

- 4 out of 10 parents are aware that the library is eco-themed.
- 3 out of 10 parents are aware of the interactive features.

- 10 out of 10 are fine with the current noise levels in the library.

From our interview with **librarians** and service assistants, they felt that:

- The library is too noisy and patrons (children and parents) are expected to maintain decorum and etiquette of being in a library.
- The children should be well-behaved and not play around in the library.
- Supervision of the children by the parents would help with the current noise situation.

In conclusion, these interviews gave us insight into the library's needs for:

1. Increased awareness of eco-theme of the library and its interactive features
2. Achieving middle ground between the decorum of being in a library as well as playing and learning
3. Encourage increased parent-child interaction in the library which doubles as supervision

Having the following information essentially gave us a better gauge as to the perception and success of the interventions that follows as we continue to develop this project.

**B R I E F**



## Problem Statement

Recreating the children's library into an immersive and interactive eco-space, where reading and playing generates positive outcomes.

where:

### Positive Outcomes:

Creation of an environment that provides a space for children to grow in their own little ways, through an independent process of having fun and learning.

### Immersive:

A storyline and development of a cause-and-effect relationship (i.e. actions and impacts) set children in an environment where they can tap into their knack for imagination. Visual cues and stimulation also help to speed up cognitive processes during playtime.

### Interactive:

Through a holistic engagement of the senses, the environment becomes a collection of inputs and outputs through which we are able to create an environment that cultivates a strong relationship between the children and their environment.

## The Brief

The brief forms an integral part of the project. It outlines some of the needs of the clients and most importantly their vision for the project.

In general, for this project, the clients are interested:

1. To **exhibit and implement** a strong eco-theme and storyline to keep children captivated
1. To **holistically engage** with children to get them to learn about the environment
2. To **explore** the concept of "My Tree House" to identify an appropriate approach and spatial programming for the space.

Our initial ideas involved a major overhaul of the library, which included redesigning the existing treehouse.

This decision was influenced by:

- The **brief** that was initially provided to us
- The **various observations** of the problems that have manifested in the space
- The **interactions** that we have had with our industry partners

However, midway through the project, after we had developed two separate sets of very focused frameworks, we realised we were on a very different path than anticipated by the clients.

It was pointed out that our ideas were going off tangent from what our clients had in mind. This change came as a result of the lack of follow up in terms of both the brief and for the new personnel-in-charge. Nonetheless, the sudden change in the project direction also

put what we had suggested into perspective.

They also discussed other pertinent points they were concerned about:

1. Budgeting:

The initial budget for the upgrade that we were informed of was actually much smaller than intended.

2. Sustainability:

The library design is nearly 3 years old, with outdated content but not so old as to require an overhaul of the entire space. As part of our clients' values of sustainability, they would like to preserve as much as they can of the existing space.

3. The Treehouse:

They also mentioned the treehouse being a prominent and recognisable feature of the library and as such they wanted to retain this feature as much as possible.

4. Focus on upgrading:

They felt that the library only needed upgrades in some areas that have proven to be unusable and dangerous. A lot of what we had suggested was leaning towards a rather major overhaul of the library space and definitely required more effort than imagined. They were actually looking at a small scale upgrade rather than a big renovation of the space.

5. Minimal intrusion:

The library should still be functional even as the renovations happen and should maintain the safety and usability of the space; this means that :

- The renovations that require more space and are bigger in scale will be carried out after opening hours

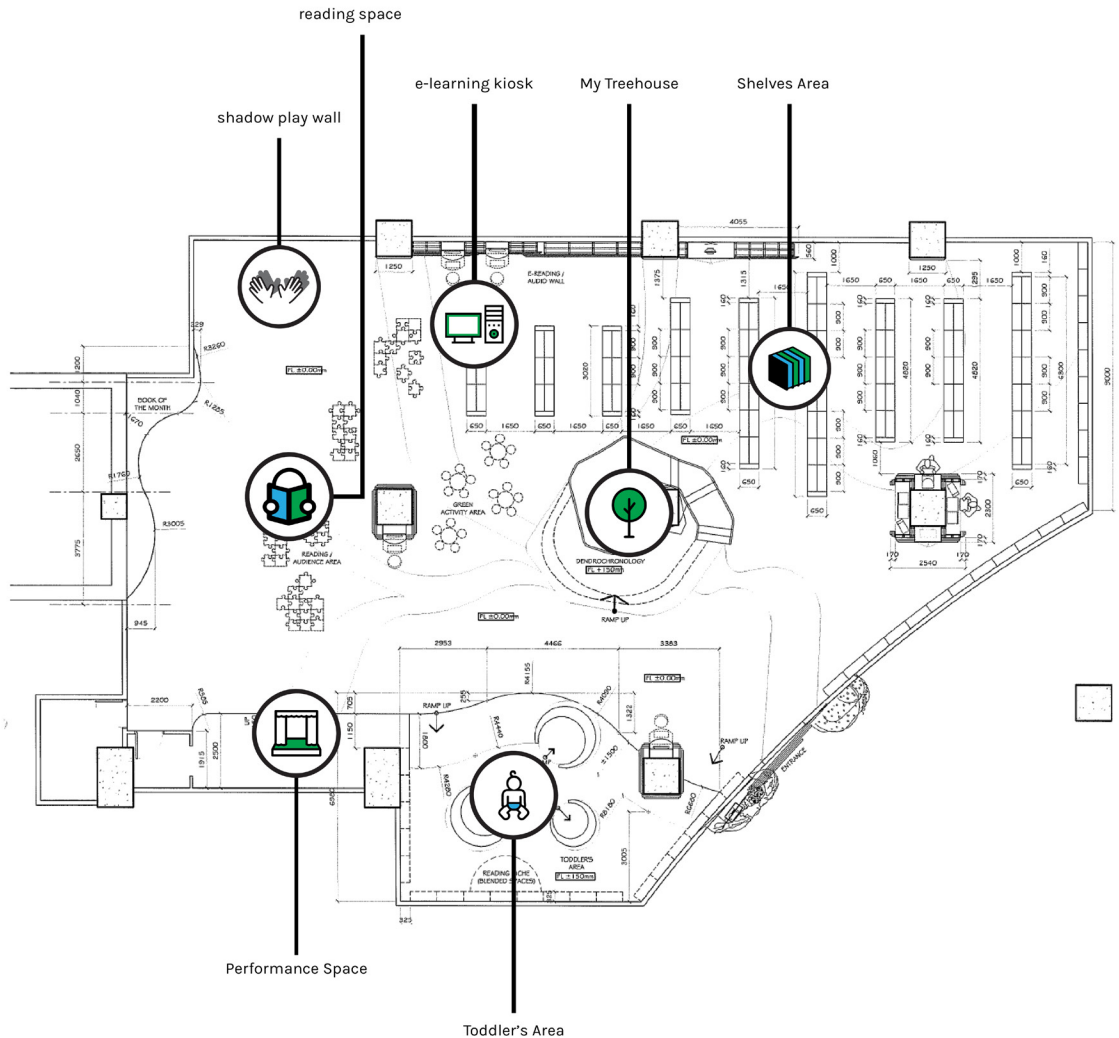
and should be done within a smaller timeframe to reduce impact of disruptions on the daily functionality of the library.

- The renovations that needed to be carried out during opening hours should be fast, quiet and should not have to affect the functionality of the library and its staff in any way.
- The renovation plan should have a phase by phase plan which allows progressive access to the functionality of the library and the new features installed along the way. It also gives our clients the flexibility to alter or even pause the implementation at any point in time if necessary.

To conclude, it was not because they disagreed with what we had suggested, up till the turning point in the brief, but rather, there were many factors that contributed to the need to keep the scope of the project practical.

Also, as a team, we felt that the turning point also helped us focus on the changes that mattered. It helped tone down our ideas to something that can be realised. This turning point also forced us to relook into what mattered in the end and also provided an opportunity to improvise and work with what we already had to create something concise and realistic. It also educated us on project management and the intricacies of real world projects.

So with a renewed look at this project, the following entails the changes.

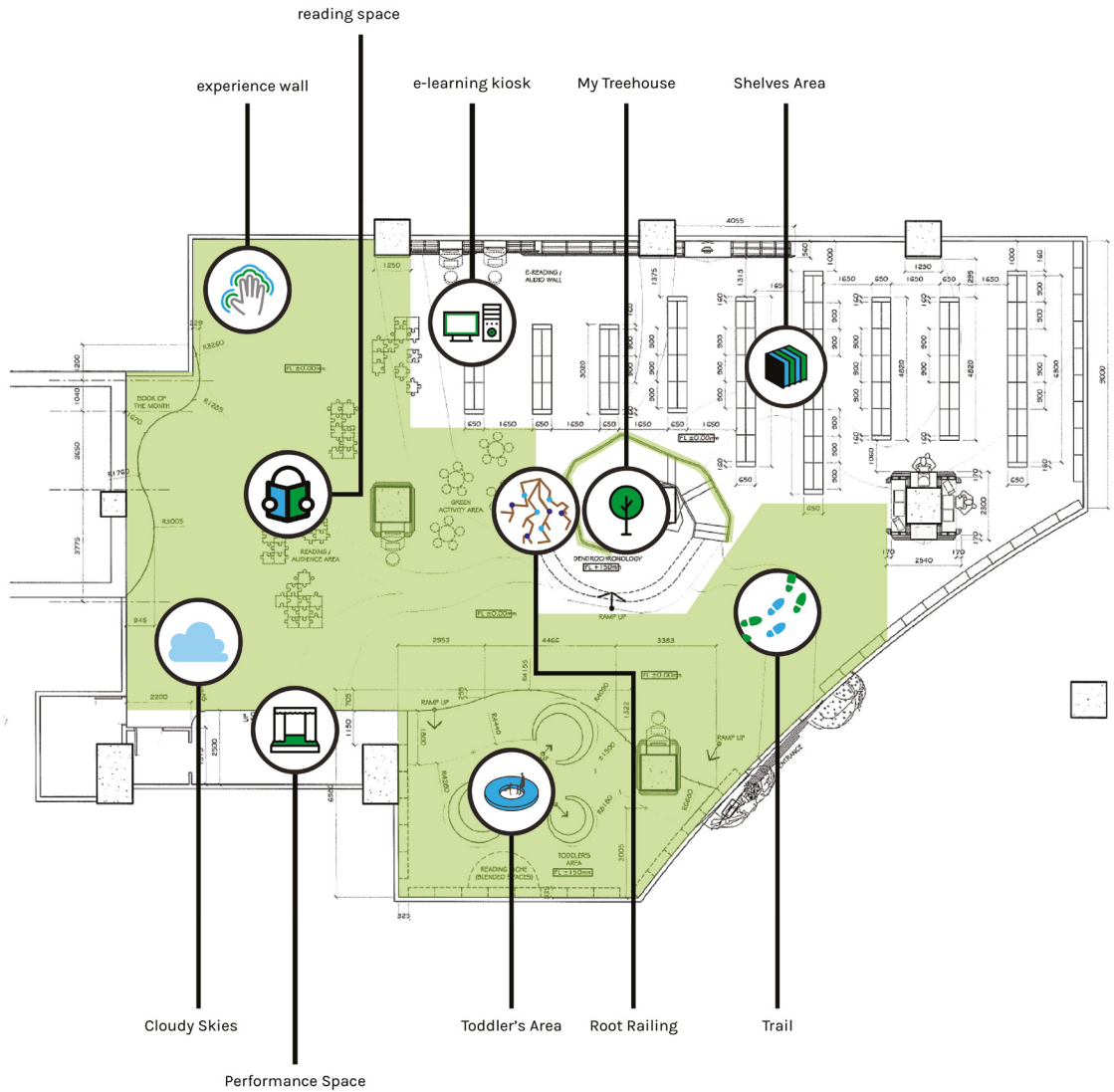


**WHAT TO KEEP/RETAIN OF THE EXISTING LIBRARY SPACE:**

The idea of retention is to ensure that the library remains recognisable to the patrons and also appeals to the existing public perception of the library. This is also to help keep the library functional at all times. Also, it appeals to the core intention of the company and the budget they have allocated to this project.

As such the following will be retained:

1. The shelves (arrangement and design)
2. The treehouse
3. The library's catalogue stations
4. The e-learning kiosks
5. The performance stage
6. The location of the other features



**WHAT TO UPGRADE IN THE EXISTING LIBRARY SPACE:**

A more focused agenda and the introduction of the interactive and spatial design features and their location with a physical trail and storyline that ties them altogether:

1. Root Railing: giving the railings on the treehouse a new life and purpose
2. Experience Wall: redesigned replacement for the shadow wall

3. Cloud Data: improved data visualisation from the weather stump
4. A physical carpet trail:
  - a. Benches along the carpet trail (that also addresses the relocation of book highlight display)
  - b. Signages along the carpet trail
5. Rebuilding of the seats in the Toddler's Area

The following section will detail how we developed design principles to guide certain design decisions that we make in the project.

**D E S I G N**

# Design Principles

The design principles came as a result of a process where we synthesised our clients' expectations, users' perspective as well as certain design goals we wanted to achieve.

With the problem statement in mind, the design principles were to be aligned with:

- **Approach:** Specifically tuned towards environmental issues

## Principle 1 - Duality

*where the symbiotic relationship of fun and learning contributes to a meaningful experience of being in the library*

- Growth  
The key intention is to provide a time and space for children to grow in their little ways
- Positive outcomes  
A system where generation of motivation is key in encouraging the children to learn
- Green literacy  
There is a focus on engaging the children with learning and reading about the environment and related concepts
- Interactive  
focused and complete engagement of the senses through either visual or physical triggers

## Principle 2 - Simple and Intuitive

*where content and interaction is catered for children regardless of age and learning capabilities*

- Focus on user interface  
To reduce complexity and jargon where physical and virtual interactions are obvious and straightforward

- Visual Impact  
Through the usage of colours and shapes, we hope to cause a significant impact regardless of duration of visit
- Physical + Digital Interventions  
reduces complexity and taps into intuition and logic
- Ergonomics  
the study of people's efficiency in their working environment
- Safety  
surfaces and fixtures should be free of mechanical, radiation, biological and fall hazards that could cause injuries to children

## Principle 3 - Unity

*where various elements and features are fully integrated with one another and are connected physically and visually*

- Visually Seamless  
where the various parts of the library are connected visually with a seamless facade
- Integrated/Connection  
To create an environment where everyone can be part of the collective experience
- Immersive  
To tap into children's capacity for imagination through stimulation of senses to speed up cognitive processes

## Design Directions

The 4 design directions are derived from our ideals, the client's needs (and constraints) and reality. These directions help to guide:

- **Engagement:** Focuses on how actions impact environment
- **Design Focus:** Integration of hardware and software through spatial design and interactive feature that are safe

It helps us understand what is at stake and also how to approach the various features. The design directions help remind us of the problems and generate ideas or suggestions that hit the problems/constraints/needs head on.

### Maximise Utilisation of Space

From our site visit, we realised that there are many spaces in the library that are poorly used. There are dark and unused corners with no purpose and lack of enclosed area for activities and camp. Due to poor usage of space, there is not a clear demarcation and purpose of the general space. As such, children run around the library, treating the unused space as a playground.

Our team aims to solve this issue by maximizing the space of the library through:

1. Creation of varied spatial qualities  
This means that the programmatic zones of the library will have different spatial qualities attached to them which allows the user to adapt and behave appropriately. This helps demarcate the zones. This way, we can better engage the user.
2. Integration of new and old  
The library has both new and old programmatic zones. By integrating them together to create an environment helps with

the user's experience and also gets the user to move through the zones, engaging with books and features.

This will prevent children from running around the library aimlessly and will try to read or learn more about the environment.

### Awareness of Eco-Theme

We conducted interviews and we found out that most parents are unaware that "My Tree House" is a green library. As such, the parents and children will treat the library as a regular one and not learn about the environment, attempt the green features or read the eco-books. Thus the purpose of educating children about the environment would not be met.

Thus, in order to better educate the children about the environment, the library has to generate more awareness of its eco-theme. This is done through:

1. Emphasis through the books  
The books displays should be more prominent and should be thematic. Also, there should be more book displays around the library since the shelves are tucked away behind the treehouse.
2. Visual Cues  
There is a lack of key visuals that signify the eco-theme of the library. Also, the colour used should be closer to nature and above all easily recognisable and relatable to children.
3. Eco-themed games and interactive features  
Other than the books, games and interactive features should highlight the eco-theme and display eco-content so that interactions with the games and features allow the children to be exposed to the content as such.

## **Encourage Independent Learning (in line with growth)**

The library currently utilizes an active approach to educate the children about the environment, which needs adult facilitators and often take place on weekday afternoons when caters to families with working parents. This limits their learning (or exploration) time to only weekends.

Hence we feel the need to have a system that encourages independent learning and exploration. The children will be able to learn without the aid/supervision of parents. The children will be able to learn about the environment at their own pace.

This does not mean that we remove the role that parents play in educating children. We are simply reducing the over-reliance on supervision. We are creating an environment where independent learning and parent engagement can coexist and complement each other.

## **Updating of Content**

The current interactive features contain content which are unable to be customized due to proprietary software. The interactive features show the same content over a long period of time. As a result the children will not play it again, hence this reduces the attractiveness of the interactive feature.

Our intervention will definitely consider the ability for the library staff to change content. This allows the content to be continually updated, in line with the progressive nature of the storyline we are intending to have. This will entice the children to visit the library frequently and learn about the environment.

In order to allow changes to be made to the content, the following should be looked into:

### 1. Simple interface

By establishing consistency, we can create input and output system that appeals to a consistent set of user expectations and intuition.

### 2. Simple replacements

With a simple interface, the input system should create an environment that appeals to the user making the changes by reducing complexity.



# Nature of Project

The following details the uniqueness of the project:

1. Unconventional library with a focus on interactivity:

As libraries continue to maintain its traditionality of learning through reading, this children's library has proven to be different by focusing on the environment. By building on this core idea of educating the children on the environment, our intervention continues to push the library to greater heights:

- Physical interactivity through spatial design
- Digital interactivity through features

2. Always safe:

In a children's library, safety is number one priority. We ensure that our intervention in the space always maintains the highest safety standards to ensure that learning, reading and having fun is not inhibited by the possibility of injuries.

3. Focus on the integration:

Our intervention is trying to integrate all the parts of the library together into a cohesive experience and space. The various parts of the library come together through the weaving in a storyline and trail but not limiting the user to a single permutation. Also, our integration also looks into the crossover between digital and physical content. Our integration efforts can be compared to an open world game with storyline and side quests.

4. Sustainability:

This comes in line with the positions of our clients and their project scope. As much

as this project is about the rejuvenation of the library space, our intervention should use the least invasive techniques of sprucing up the place. We should also keep as much of the existing condition as possible.

To add on, our intervention should consider the introduction of features that can be:

- recycled
- improved upon
- further developed

5. A good learning platform:

The creation of this library's experience is to ensure that while learning is fundamental to a library space, it should not be carried out at the cost of fun. Having fun and learning should always be hand in hand. In the space, we are using fun to draw them in and as a tool to engage them with learning points.

6. Appealing Interactive features:

Our intervention through the interactive features should be targeted at the user.

It should be:

- easy to learn
- easy to interact
- for all ages

However in the case of the clients, the features should appeal in the sense of:

- Low upfront and maintenance cost
- Easy maintenance
- Easy to update or upgrade

# FRAMEWORK

## About

Before we delve in to the chosen framework, we used the idea of a framework (rather than concept or idea) because this is used to characterize our approach based on our concept. The intention to use a framework is a unique intervention on our end. The framework consist of the essential structure where interactive unique features and spatial designs are applied into the space and studying their relationship which helps create the desired environment and allow patrons to have a fulfilling experience.

This project entails tackling the aforementioned problems with a framework which is our way of packaging the features and their implementation in the space.

What that means is that there is an Introduction of Storyline + Trail, with **a focus on spatial integration.**

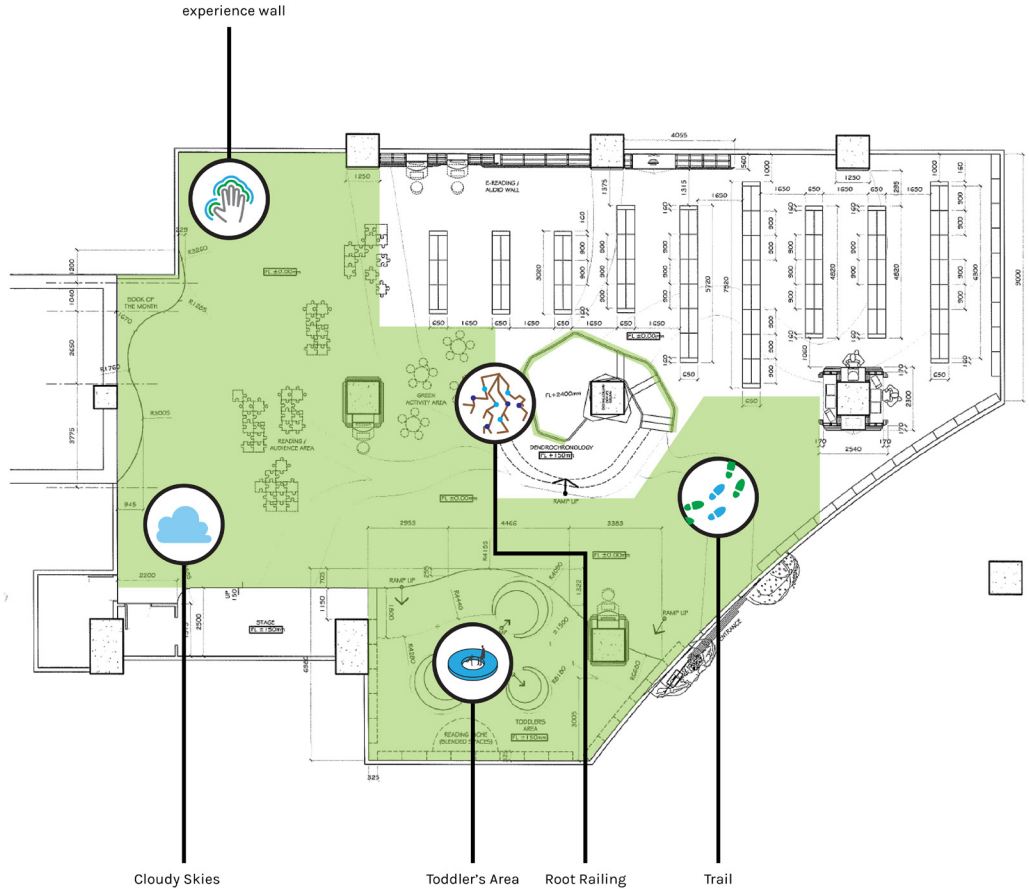
This entails:

- **Approach:** Specifically tuned towards environmental issues
- **Engagement:** Focuses on how actions impact environment
- **Design Focus:** Integration of hardware and software through spatial design and interactive feature that are safe

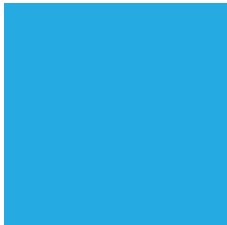
This intervention is targetted at creating this well-integrated eco-space that gives unique learning experience for the kids.

# FEATURES

# New Features

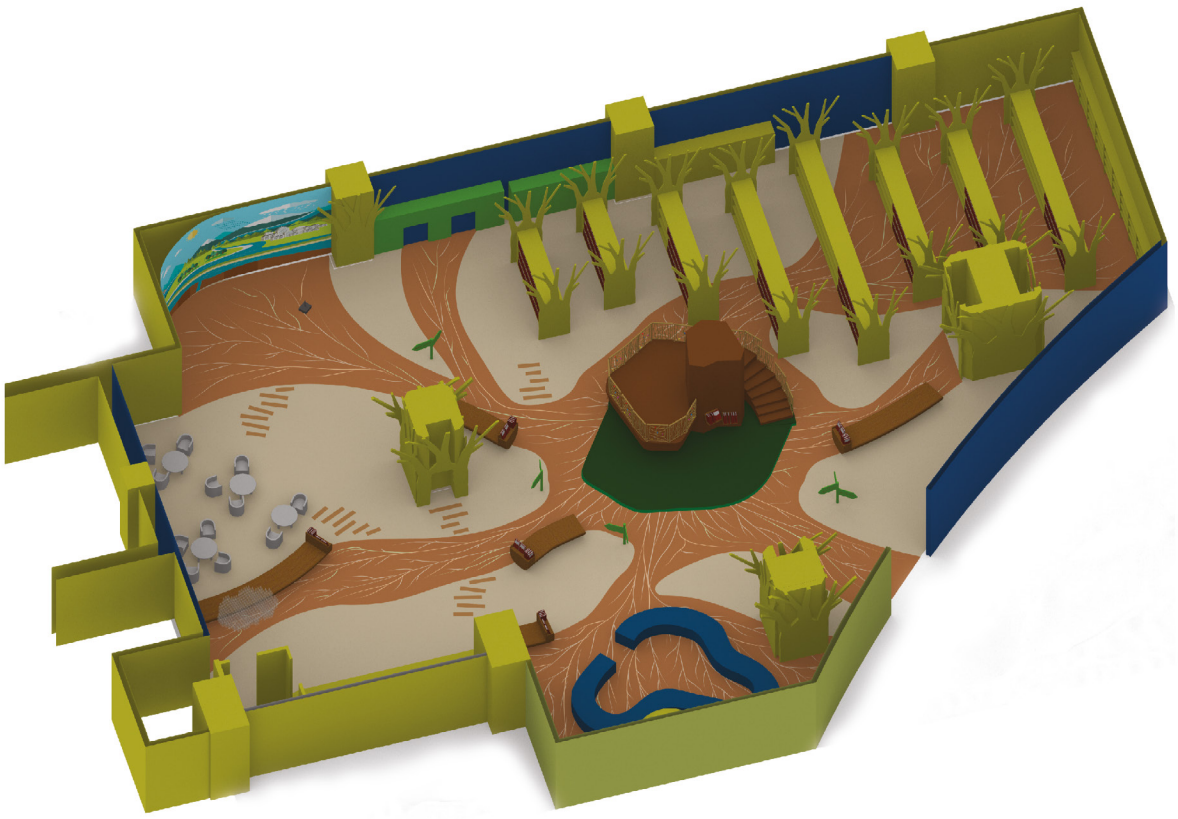


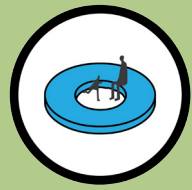
# Colour Palette



The colour palette was selected based on colours that one would associate with nature. They also help children recognise the eco-theme in the library. These colours will be used in the interactive features and spatial designs. The shade of the colours aims brighten up the space.

# Overall Visualisation





# space :

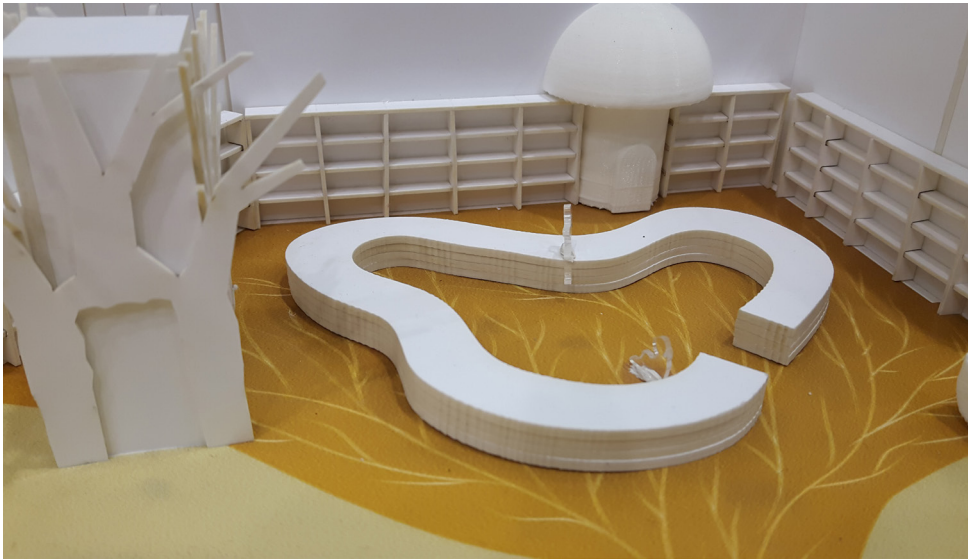
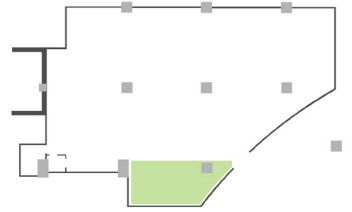
## toddler's area

The toddler's area is a reading space / storytelling space catered for toddlers (2-9 yo) and supervising adults. This is aimed at increasing opportunities for parent-child interactions.

There needs to be an intervention in this old seating area because the current design is non-inclusive, serves a singular purpose (i.e. unable to do anything else in the space and also doesn't serve the patrons very well due to the design) and also very unsafe for children due to the exposed edges. The old seats become under utilised when users generally prefer not to share the small nooks. As such the new toddler's area is designed inclusivity and safety in mind. It creates opportunities for people to share the spaces along the big nooks and also acts like a "net" to keep the children in sight and safe.

### WHAT PROBLEM(S) DID THIS TACKLE?

1. Safety of children's area
2. Activation of reading space to also be a storytelling space
3. Refreshing of the space visually and physically
4. Creation of seating that is more inclusive and promotes sharing of space with people



*Redesigned seating in Toddler's Area*



The toddlers' area is a place that is commonly frequented by both parents and toddlers alike. In this space, parents supervise children as they read books and play with their peers. We wanted to create a space that:

**Safety:**

To tackle the issue of safety we considered two main aspects, the shape and the materiality.

In terms of **shape**, we were going for a more organic and rounded shape, The edges were also rounded to ensure that in the event that children fall or bump into the seats they are still safe.

In terms of **materiality**, we specifically wanted to tailor to keeping the children safe at all times. As such we were inspired to use the materials that is very commonly used in play areas - **gym foam mat material** which is:

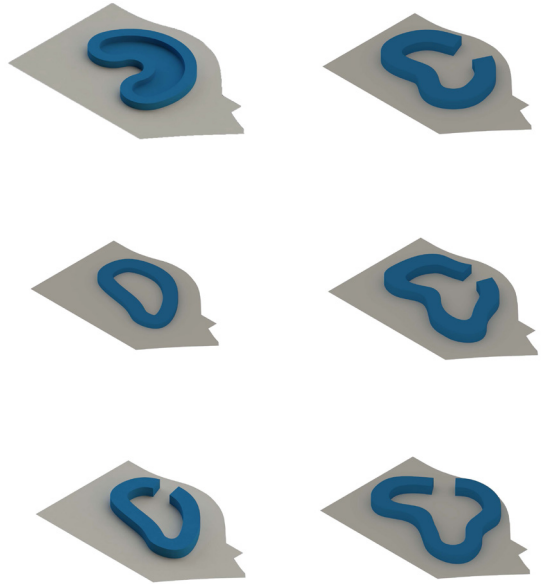
1. waterproof
2. washable
3. safe
4. caters to any design/colour

**Inclusivity:**

These seats was designed to have nooks that caters to individuals and families and also creates opportunities for them to interact.

It taps into the intention to maximise the utilization of the space. This means that instead of just creating a space for family to read and interact, we also imagine the space to function as a storytelling space. We also hope that families will interact with each other through the spirit of learning and reading, hence encouraging their children to interact with others. This creates a space that focuses on more than just reading and learning.

The following renders of the different iterations of the seating area, shows the various considerations to create a unique space:



*Iterations of the seating area with different shapes and openings*

1. Visual Impact

To create something that is visually appealing and also informs people of the appropriate decorum approaching the space and using the space.

2. Inclusivity

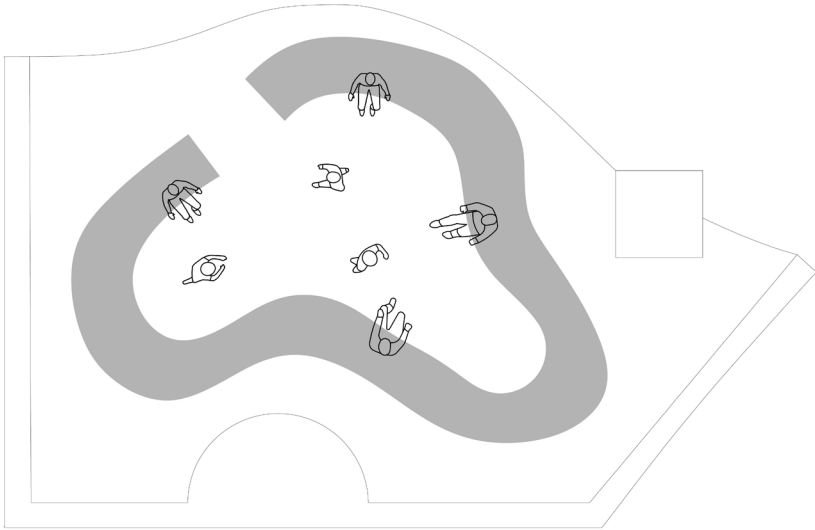
To design a space that allows for interactions between parents and children alike.

3. Safety

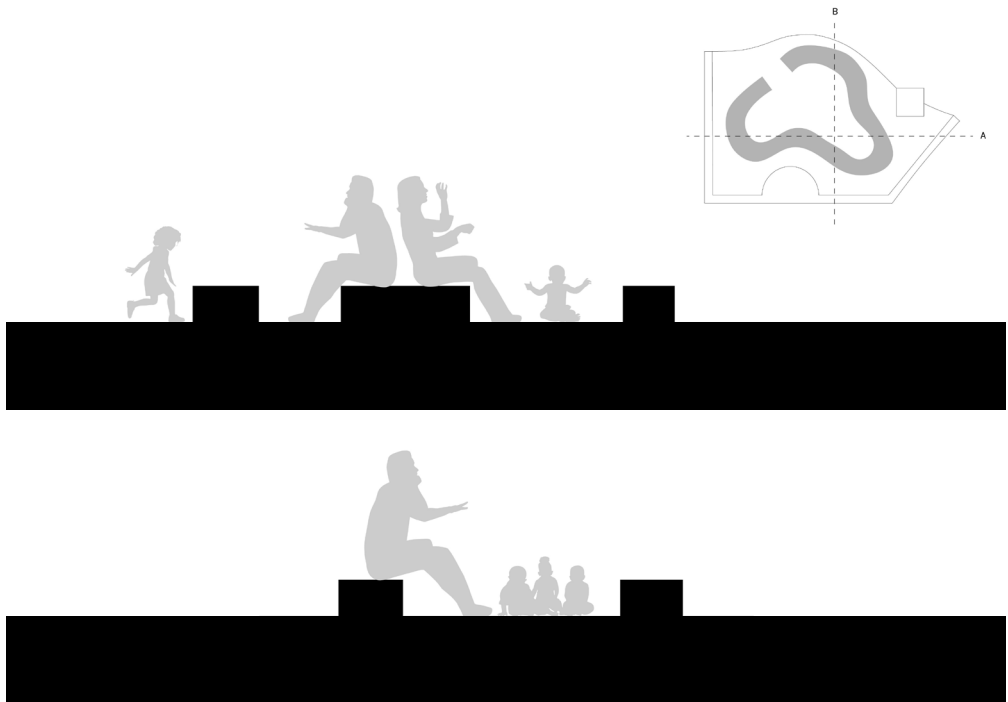
To ensure that children who use this space are safe from unnecessary injuries.

4. Seating ergonomics

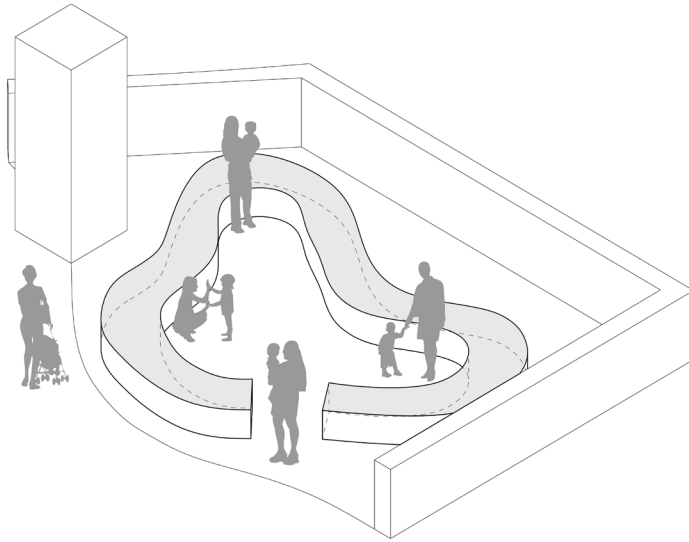
To design seats that allow people to enjoy the space and feel comfortable.



*Plan of the new seating in the toddler's areas*



*Sections to show how children and adults use the space*



*Axonometric to illustrate usage of space*



*Render to illustrate possible scenarios in the toddler's area*



# space :

## trails

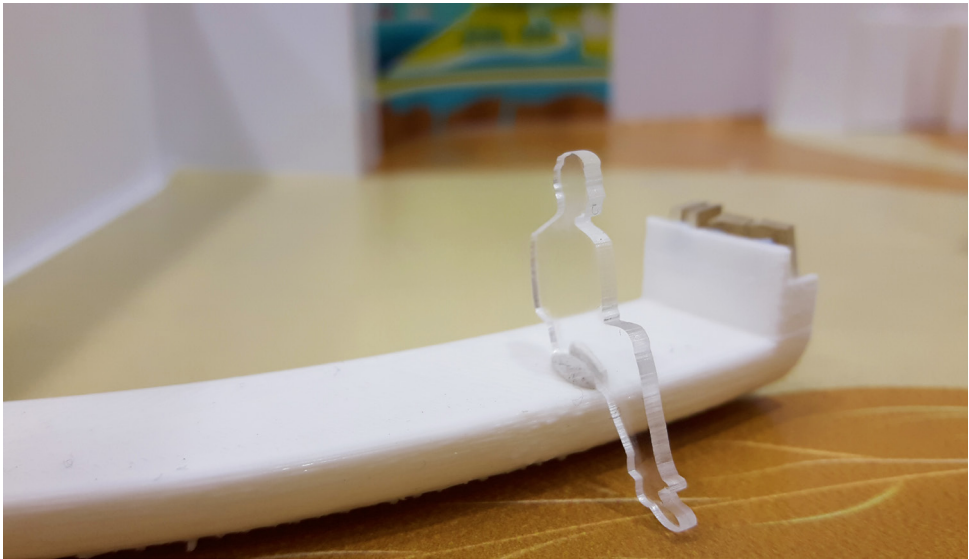
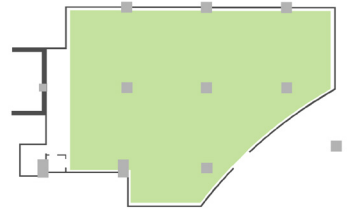
The trails is a very important and integral part of the library. This is part of the overall spatial design and integration of the library space. A variety of routes/paths to take leading to different parts of the library with a range of activities and spaces that appeal to different groups of people. Also it is aimed at guiding children to a designated set of activities (through the trail) that they can try out depending on duration of stay and age group and literary requirement.

The integration of new and old sections of the library by creating pathways mainly directed at connection. Also, this increases the users' exposure to all the features by leading them from one to the other with some connection. This is done through:

1. Carpet design
2. Signages
3. Multi-purpose seats
4. Book highlight displays

### WHAT PROBLEM(S) DID THIS TACKLE?

1. Behavioural Change
2. Maximise utilization of space
3. Integrating disjointed zones
4. Integrating play, space & content
5. Strategic relocation of book highlight display



*Redesigned Trials with benches, book displays and signages*

## STORYLINE

Tolo the Tree Guardian is the centerpiece and the soul of My Tree House. As a guardian, his purpose is to protect all trees and wildlife across the world, and he can only do so with enough help from the Tree House Rangers.

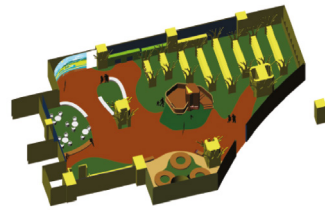


Artist Impression of the Storyline

## CARPET DESIGN

Mimicking Tolo's tree roots which spread outwards from the Tree House centerpiece, these paths are a form of wayfinding which guide the Rangers to the various features of the library. Secondary paths, whose form mimics wooden planks, also branch out from the main path leading to other features.

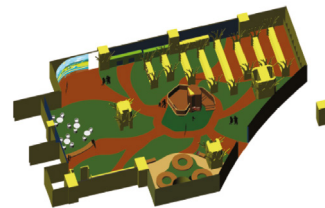
As such, these paths are designed to provide a variety of routes where they can be permuted differently depending on the user's different duration of stay, age group and literary requirement.



Iteration 1



Iteration 2



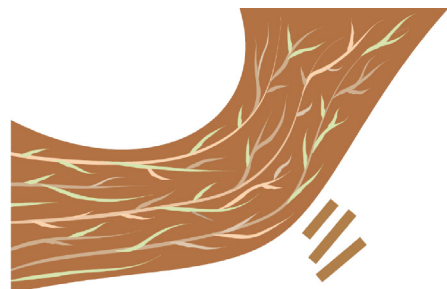
Iteration 3



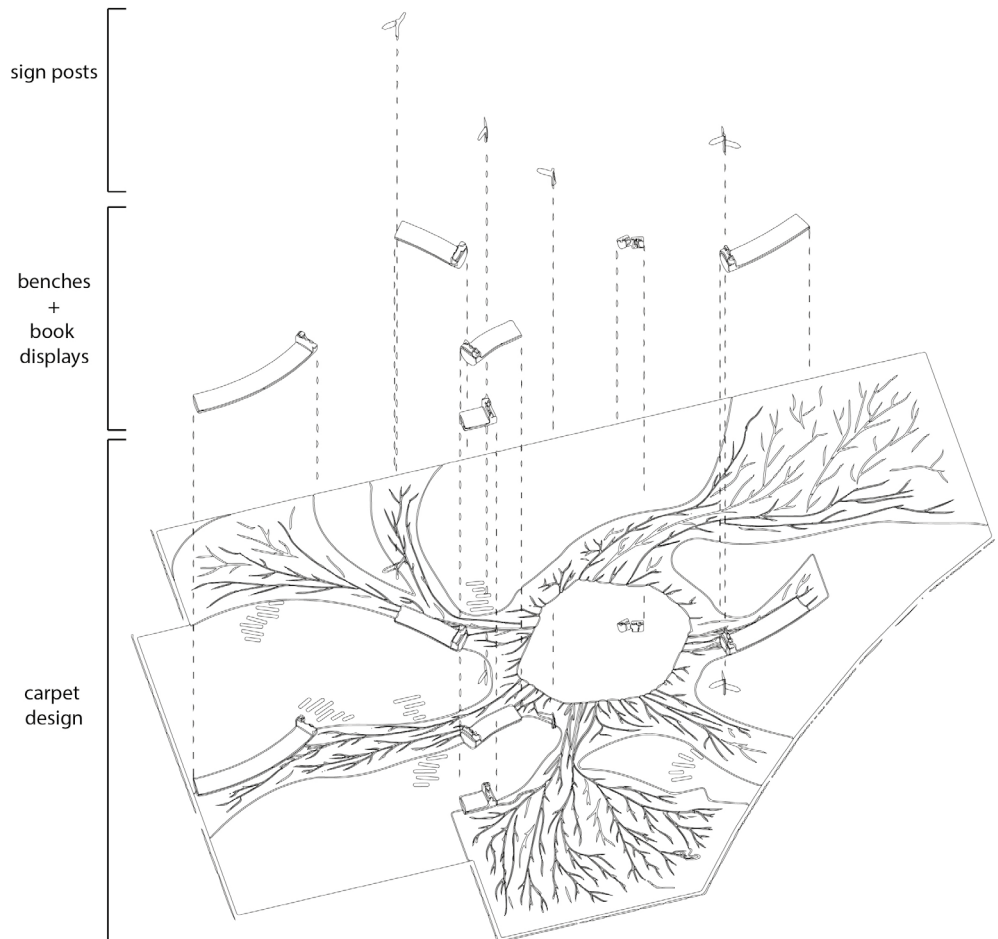
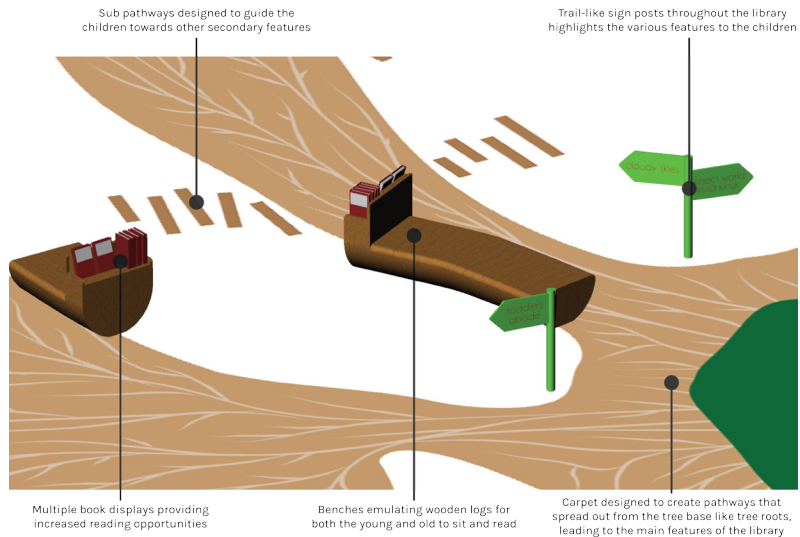
1:1 Installation



Overall carpet design



Close up of design



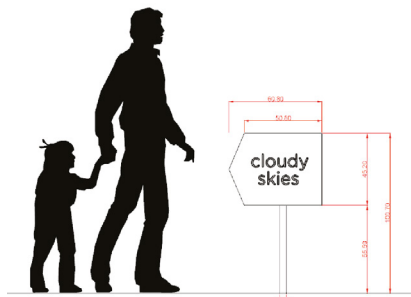
## SIGNPOSTS

To further enhance the trail experience, signposts are positioned at the junctions of the trails to provide directions to the various features. These signposts are of children's height as they are targeted to the Rangers.

Although they look like wooden signages to simulate those in a forest trail, these mini signages are made of waterproof vinyl fabric which wraps cushion-like foam. This improves the safety aspect of the signpost in the children-friendly environment.



1:1 Prototype of the Signpost



Scale & Dimension of Signpost

## BENCHES AND BOOK DISPLAYS

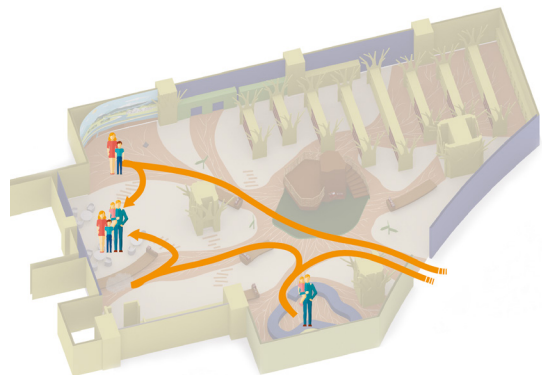
Framing the pathways, the benches emulate log benches in a forest trail. Besides providing seats for both the children and adults, each bench also has an attached rack for book displays.

This brings reading closer to the users throughout the library, creating reading opportunities at every sitting opportunity. Although the benches look like wooden logs, these too are designed to be cushion-like so as to be safer for children.



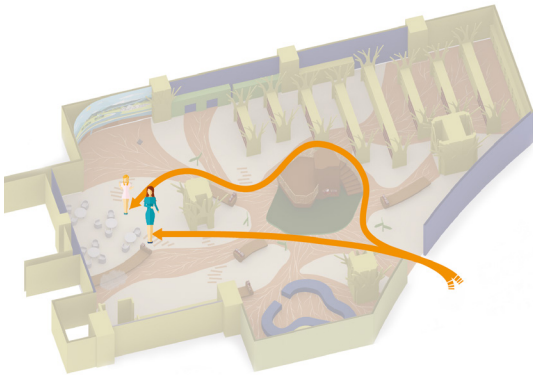
Visualisation Bench

## TRAIL SCENARIOS



Here is a scenario where a family of 4 comes to library to spend for perhaps 2 hours. Perhaps the father and daughter might proceed to the toddler area while the mother and son might proceed to the kinesthetic world directly. After which they might respective grab some books and sit together as a family at the tables of the seating spaces.





*In another scenario, a mother and daughter might just be dropping by for a short span of 30mins. The mother could entrust her daughter to explore the shelves on her own and subsequently meet her again at the seating spaces where she might be reading her own book.*

### **BEHAVIOUR CHANGE**

The trail aims to stimulate a change of behaviour in the children towards My Tree House. By giving them a role to play - Tree House Rangers - the new scheme hopes to instill a sense of responsibility in them. This encompasses both the responsibility towards the environment as well as the library itself. Through this strategy, the children will no longer treat the space like a physical playground but a fun platform where they can learn through play.

### **MAXIMISE UTILIZATION OF SPACE**

Dark corners of the library will no longer be underutilised with the implementation of the trails on the carpet that leads to the various features.

### **INTEGRATING DISJOINTED ZONES**

The existing two zones - Active zone and Passive zone - will no longer be too disjointed as the distinction between the two will be blurred as we integrate certain elements of each other into the other. Having the trail intruding into the reading zones aims to bring the zone more alive while the spewing book racks onto the each of the benches throughout the rest of the library also immerse the users into the reading experience even in the interactive zones.

### **INTEGRATING PLAY, SPACE & CONTENT**

The new scheme brings more a more structured and holistic experience for the users. When children step into the library, it is not just a physical spatial environment that they enter, but also another dimension, as they take on their roles as Rangers. This makes it a more exciting journey for them to learn through play.

### **STRATEGIC RELOCATION OF BOOK HIGHLIGHT DISPLAY**

The previous book highlight display was inaccessible as it was located furthest from the entrance, causing the highlights to be not especially effective. In the new scheme, the main book highlight display is at the Tree House trunk while more secondary displays are being scattered throughout on each of the log benches, bringing reading closer to the users.



# interactive:

## root railings

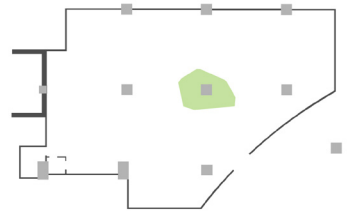
The root railings is a physical interactive feature with sliding / movable beads along a rail structure which lights up when moved from one end to another. This caters for children ages 2-9.

The intervention is to give the railings a secondary purpose on top of being a safety measure. The railings allows the children to learn more about plants, roots and the nutrients they absorb. This can encourage them to be increasingly curious and expand their knowledge by reading related books.

This interactive features, which is catered mainly to toddlers, aim to improve hand-eye coordination through the senses (touch and sight) which is especially important for growing toddlers.

### WHAT PROBLEM(S) DID THIS TACKLE?

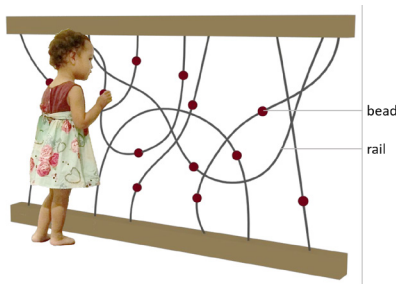
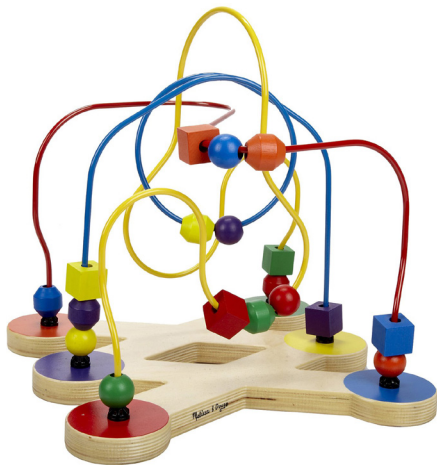
1. Underutilization of treehouse area
2. Physical railings fixture now with added interactive function
3. Learning through play



*Redesigned root railings that will replace the ones on the Treehouse*

## INITIAL CONCEPT

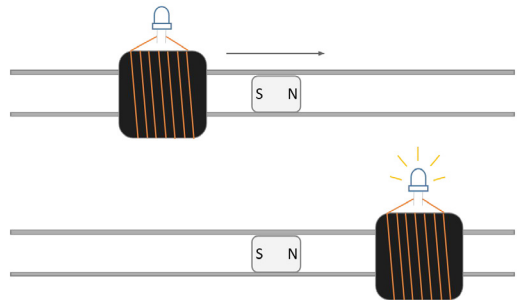
The Root Railings are inspired by wooden bead maze puzzles like ones as shown in Figure X. The initial design incorporated the use of the beads and thin, bent rods as the rails (see Figure X and X). To achieve the desired visual response of either having the railing or bead lighting up when the beads are moved, we proposed two designs: User Powered and Externally Powered design.



## USER POWERED

The User Powered design uses the concept of electromagnetic induction to light up the beads as they are moved by the user. From Figure X below, the bead has an LED and

copper wire coiled around it and while the rail has magnets inside. The movement of the bead across the magnet induces voltage that lights up LED. This design would be sustainable as it does not need external power. Prototypes were made and tested to determine the design's feasibility. (Refer to Annex X for User Powered Testing Details and Results)



## EXTERNALLY POWERED

The Externally Powered design would use switches to detect the movement of the bead, lighting up the rail when the switches are triggered. Initially, micro-switches were used to activate the LEDs, however, they were found unsuitable as they could be easily broken especially if our main users are children, and they cannot detect the bi-directional movement of the sliding beads. Considering this, reed switches were used instead, as they do not require direct contact to activate; and are activated by magnets in close proximity. Prototyping and testing were conducted as well for this design. (Refer to Annex X for full details)



## COMPARISON OF DESIGNS

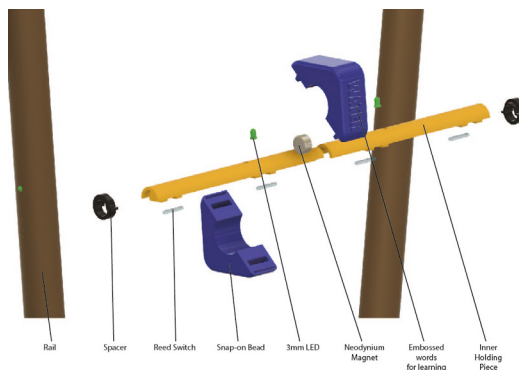
From test results and findings, we were able to compare the two designs and determine the most feasible one to implement. In terms of cost, the Externally Powered design is slightly cheaper as lesser neodymium magnets are needed. Prototyping results from the User Powered design indicate that proper information on magnets is needed as the calculated results do not match and actual results and it would be too difficult to fabricate. As such, the Externally Powered Design was chosen.

## LEARNING ASPECTS

The Root Railings are meant to provide eco-based learning through play. They would be able to cater for toddlers, stimulating curiosity as they interact with the railings. The proposed feature would teach children about plants, roots and the nutrients they absorb. For older children, they would be able to learn and identify the various nutrients. Other than water, roots absorb nutrients like calcium, ammonium, potassium and nitrates. The beads represent nutrients moving along roots and could be in various shapes and colors for children learning to identify these things.

## FINAL PROTOTYPE

A full-scale prototype was fabricated to show and test how it will look and work. This would also help us plan how we can implement the feature in the library. It features three rails that are able to light up, which we will call 'active rails'. From Figure X, these rails are the ones with the yellow, blue and red beads. Each active rail has two LEDs and four reed switches inside while the side of that rail will be flanked by two LEDs as shown below.



### 1. Mechanical Design

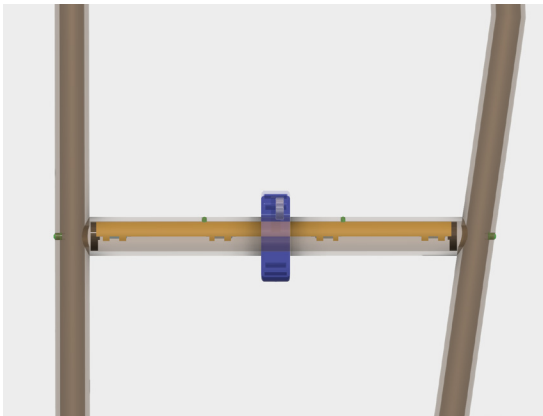
The prototype was made using PVC pipes and fittings but the proposed Root Railings would be made of brass pieces welded together, similar to the existing railing design with roughly the same dimensions as well. Brass is a common material used to make railings and it is non-ferromagnetic, thus it would not interfere with the magnetic field of the bead's magnets. (Refer to Annex X for full mechanical drawings)

## 2. Circuit Design

The circuit is low-cost of \$4 per active rail and requires low-power with a maximum of 60mA at 5V drawn for the entire setup. (Refer to Annex X for full details on electrical design)

## 3. Inner Rail Design

The inner rail is a two-part, 3D printed, detachable piece that fits inside the hollow active rail which would hold the reed switches and LEDs on place, as well as to make it easier to assemble (see Figure X). The inner rail assembly fixes the reed switches directly at the center of the rail and holds the LED towards the top of the rail.



## 4. Bead Design

Each bead was 3D printed in PLA but the proposed bead would be made of injection molded plastic. The bead will encase a magnet that activates the reed switches in the active rails and has the name of a nutrient embossed on it (as shown in Figure X). They can be snapped onto the rails (see Figure X), making them replaceable and customizable. Thus, the learning themes can be changed from the current one of 'nutrients' to others like 'animals' or 'plants'.

## 5. Signboard

A signboard like that shown in Figure X would be placed nearby or on one of the Root Railings as instructions for users on what to do with the railings.



## **SAFETY ASPECTS**

According to ISO/IEC Guide 50:2014 Safety Aspects – Guidelines for child safety in standards and other specifications, the top 4 safety concerns for this feature are 1) 7.2.1 Preventing Head-first Entrapment, 2) 7.2.5 Structural Integrity, 3) Electric Shock Hazards and 4) 7.12.3 High Intensity concentrated or flickering light. These guidelines were heavily referred to when designing the Root Railings. In this report, we will only go through the top 2 concerns.

## **PREVENTING ENTRAPMENT**

The initial concept posed a huge safety hazard as the gaps and bends of the railings could cause entrapment which may result in injury or strangulation. The proposed design seeks to prevent this hazard through better spacing of the rails to ensure that the gaps are not bigger than 13.4 cm wide, according to the anthropometric data for growing children. (Refer to Annex X for more on Preventing Entrapment)

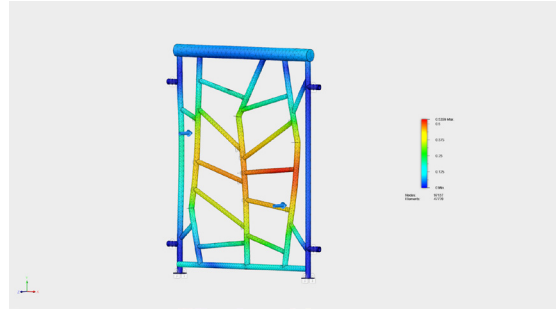
## **STRUCTURAL INTEGRITY**

Since the primary purpose of the railings is to prevent not only children, but also adults who accompany their children, from falling off the treehouse platform, it has to be sturdy enough to withstand their weight. A series of simulation tests on the proposed railings structure was conducted to ensure that the railings would hold. Forces of 400N and 1000N were applied at combinations of points on the railings to make sure the results are consistent. It is important to note that, only a single Root Railing segment was prototyped and in actual implementation, they would be connected side-by-side to other railings, making the entire fixture stronger. Therefore, the structural simulation assumed that the Root Railings would be fixed to other railings on both sides and at

the bottom. (Refer to Annex X for more on simulation results)

## **User Testing**

The final prototype was tested by users in the target group, in which we were able to observe usage behaviors and gain feedback on the Root Railings.



## **FUTURE DEVELOPMENTS**

### **1. Better Visibility of LEDs**

The 3mm LEDs used for the prototype may have been too small for users to see the lights. A bigger 5mm LED could be used instead. Furthermore, the LEDs in the active rails may be too far inside the rails to be seen well. A better design could be made for the inner rails to allow the LEDs to align further out of the rail.

### **2. Beads**

The words on the beads could be painted black to make them stand out, while a bigger font could be used. As suggested in previous iterations, each bead of a different nutrient could definitely be in a different shape.

### **3. Regarding Observed Behavior**

Structural simulations done indicate that the actual railings should hold and move minimally (less than 0.5359mm) with 1000N of such force applied. Additionally, again the prototype was a single segment that was not fixed at the sides, unlike the proposed design,

contributing to its apparent instability during testing. However, given that this would be an expected behavior, additional supports could be placed to guarantee a better structural integrity.





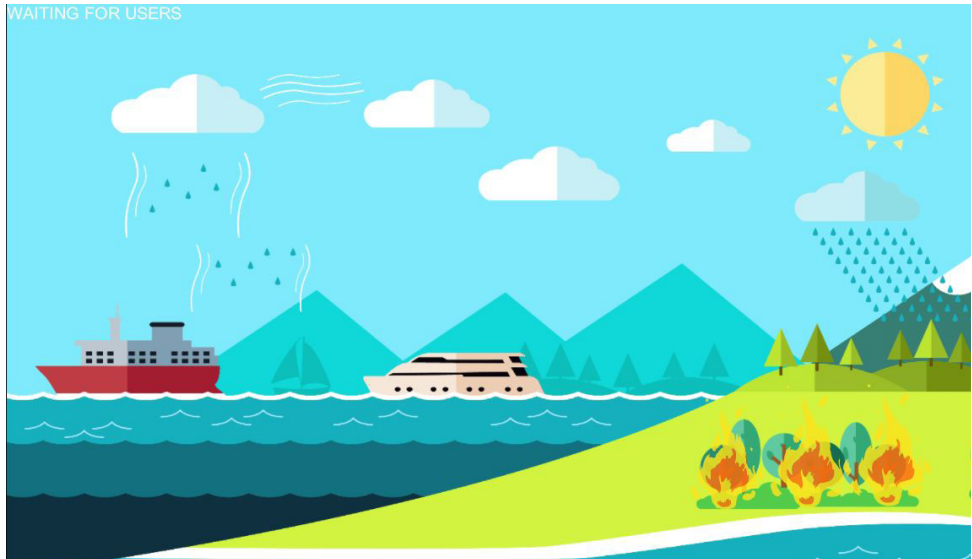
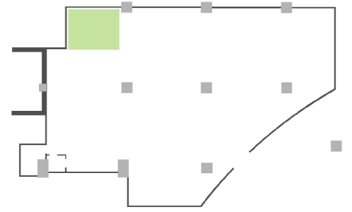
# i n t e r a c t i v e :

## e x p e r i e n c e w a l l

The Experience Wall makes use of the technology of Kinect, game design and projection techniques. This game is played using physical gestures, where the gestures are to help save the earth by completing missions. While other sections of the library may be catered more to specific age groups, the Kinect Experience Wall is designed such that children aged 4-12 will be able to enjoy it. Younger children can participate in the fun and interactivity of the gestures while older children will be able to learn more details about various environmental issues as they play.

### WHAT PROBLEM(S) DID THIS TACKLE?

1. Reactivate the shadow play wall space
2. Interactive wall instead of static content
3. Reduces noise from the previous feature but still provides the same amount of fun.



*Player interacting with the Kinect Experience Wall*

# Concept

## GAME OBJECTIVE

The original concept behind the game was to create an open-world or sandbox environment where players are given considerable freedom to “roam and change the virtual world at will”. (Techopedia, 2016) In the context of the Kinect Wall Experience, players are faced with a two-dimensional (2D) virtual environment, where they can interact with simulated environmental events on the screen using natural gestures.

The game attempts to simulate real-world environmental events to give young players a sense of ownership and engage players in this dynamic narrative and impress on them how their actions have an impact on the environment. Unlike traditional competition-style games, our game maintains the fun element of achieving certain in game goals but also immerses players in the cooperative narrative. After completing each action, fun facts or short videos of the environmental issue will be shown to educate children about the particular topic.

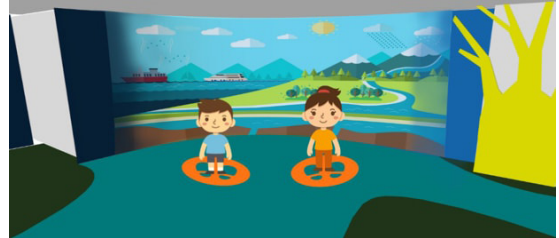
## CORE EVENTS

1. Using rain clouds to put out forest fires
2. Growing trees with seeds
3. Picking up waste from rivers
4. Stopping toxic waste from causing land/ water pollution
5. “Stopping” glaciers from completely melting by tapping on them

## SPATIAL DESIGN

As the Experience Wall will be placed in a public setting, we had to test out what the sensor could do and how many players can be accommodated. Simple testing of the data revealed that it is able to sense two players

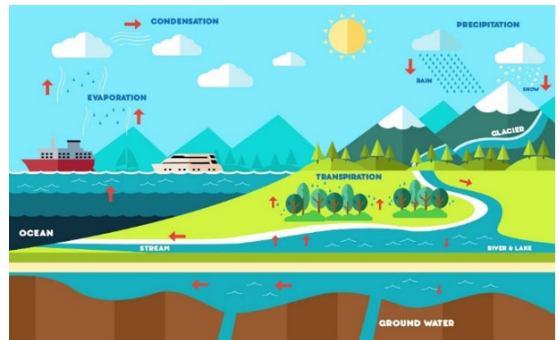
at once. The use of spatial design on the carpet or interiors to guide users in standing at designated spots. This way, users will have a clear indication that they are being sensed rather than becoming frustrated at a seemingly non-sensing game.



Tracking two players on spatial guidelines

## SWITCHING OF GAME MODES

By sensing the number of people in front of the screen, the system will be able to enter into animated/video mode should there be either too many people or no one standing at the designated spots.



Animated Water Cycle Mode

## MULTIPLE SENSORS

Combining several sensors in a parallel manner to be able to accommodate more players.

For the purpose of the proposed design, the first and second strategy seem to fair better in terms of feasibility. However, the use of multiple sensors can be considered for further developments.

## PLAYER SPECIFICATIONS

Also, the ideal distance for players from the sensor would be around 2.4m and the height recommendation would be for players of 100cm and taller- roughly the height of a 4 years old child.



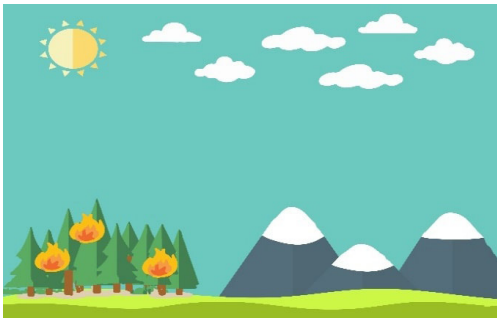
Recommended Distance of Players from Kinect Sensor



Recommended Height of Players from Kinect Sensor

## Design

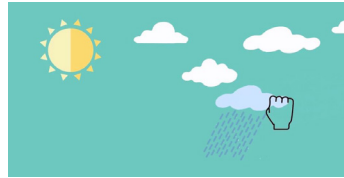
### APPROACH



Initial Concept - Forest Fire Scene

Using colourful graphics, we will be able to capture children’s attention. We have designed and created an initial concept storyboard for Core Interaction 1, where players use their hands to grab and move rain clouds to put out forest fires. Simple





icons can be used to illustrate what players must do.



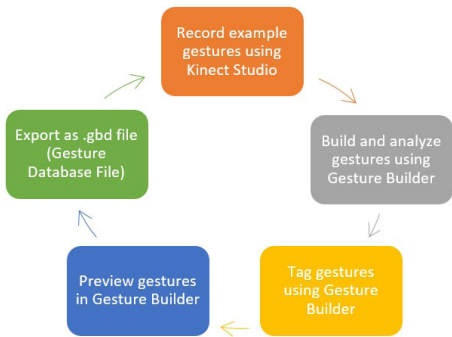
## GESTURES

### 1. Gesture Specification Sheet

In order to better understand the core interactions, we mapped out each gesture with its context of use and the characteristics associated with the gesture. The programming of gestures into the Kinect Unity system can be done through machine learning.

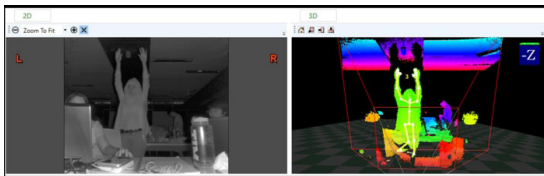
	<p><b>Gesture:</b> Raising hands  <b>Description:</b> innate, real-time, static  <b>Context of Use:</b> Initiate the game</p>
	<p><b>Gesture:</b> Squatting  <b>Description:</b> innate, real-time, symbolic, dynamic  <b>Context of Use:</b> Planting seeds in the ground</p>
	<p><b>Gesture:</b> Swiping  <b>Description:</b> learned, real-time, symbolic, dynamic  <b>Context of Use:</b> Removing waste from river</p>
	<p><b>Gesture:</b> Waving  <b>Description:</b> innate, real-time, symbolic, dynamic  <b>Context of Use:</b> Preventing toxic waste from polluting the land/water</p>

2. Machine Learning for Gesture Training  
 Gestures can be recorded via Kinect Studio, and subsequently learnt using the Gesture Builder application. Using this technique, we will be able to train the system to learn gestures from the users rather than tediously programming each human joint to be sensed by the system.



*Gesture learning process*

The training of the system allows it to be able to clearly sense the joints position as seen in Figure 11. Using the training data, we will be able to use the same gesture to trigger designated in-game actions. Beyond learning the gestures, some require working on the codes.

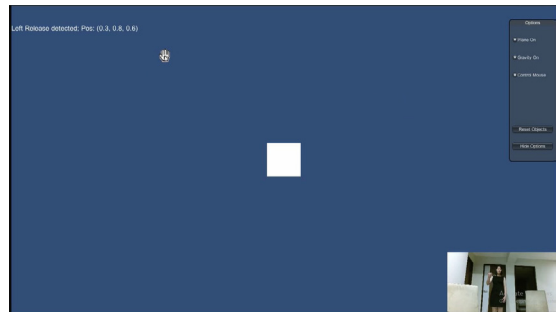


*Gesture Recording*

Using C# scripts in Unity, other game engine functions and various sprites, we would be able to achieve:

1. Create Game Objects in each 2D Scene as seen in the white rectangle below
2. Sense the player and gestures
3. Providing user feedback with the

- grabbing hand animation
4. Provide indication of user engagement with a user colour map at the bottom right hand corner



*Screenshot of Gesture Test 1.1 Grabbing and Letting Go*

We will further outline more details about how these gestures were implemented in the various stages of prototyping.

### ITERATION 1

Creation of animated illustration for first core event: Using rain clouds to put out forest fires



*Accompanying Graphics for Prototype 1*

Using two Unity C# scripts, Interaction Manager and Kinect Manager, we were able to map players' hands to the mouse cursor and provide user feedback via a user texture map on the bottom right corner of the screen.

The above code excerpt shows how the sensor would detect the position of the hand, and subsequently call a method for the mouse control to be activated.

## ITERATION 2

### Introducing animation to the “tools” for the core events

```
if(controlMouseCursor && (handEvent != lastLeftHandEvent)){
    if(controlMouseDown && !dragInProgress && (handEvent == HandEventType.Grip)){
        dragInProgress = true;
        MouseControl.MouseDown();
    }
    else if(dragInProgress && (handEvent == HandEventType.Release)){
        MouseControl.MouseRelease();
        dragInProgress = false;
    }
}

else if(userMapType == UserMapType.UserTexture && sensorData.depthImageTexture){
    KinectInterop.RenderTex2Tex2(sensorData.depthImageTexture, ref usersLb1Tex);
}
```

*Top: Mouse Control  
Bottom: User Texture Map*

The code excerpt shows how the UserTexture can be displayed using the Kinect Software Development Kit (SDK) script KinectInterop.

Next, we created a raining-cloud sprite object in the game screen of Unity, and wrote another GameObjectDragAndDrop script for that sprite to be manipulated by the drag and drop gesture. The above shows an excerpt of how the position of the sprite is reacting to the position of the mouse, hence creating the impression that the sprite is being moved around by the hand cursor.

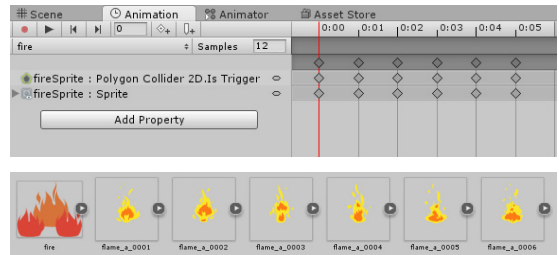
```
void OnMouseDown(){
    Vector2 currentScreenPoint = new Vector3(Input.mousePosition.x - distX,
Input.mousePosition.y - distY);
    Vector2 currentPos = Camera.main.ScreenToWorldPoint(currentScreenPoint);
    transform.position = currentPos;
}
```

*Game Object Drag and Drop*

Lastly, sprites representing fire was placed on the game screen. They were attached to Unity Collider2D and tagged as ‘Pickups’ to allow the game script to identify these tags and apply certain actions to it. In this case, we want the fire to disappear when it comes into contact with the rain cloud. The Collider2D components attached to the fire sprite Game Objects are marked as “Triggers” so that any collision will only result in in-game events. The fire sprites are made inactive when collided with the raining-cloud sprite, creating the appearance of it being put out by the rainwater.

```
//OnTriggerEnter2D is called whenever this object overlaps with a trigger collider.
void OnTriggerEnter2D(Collider2D other)
{
    //Check the provided Collider2D parameter other to see if it is tagged
    "Pickups", if it is...
    if (other.gameObject.CompareTag("Pickups"))
    {
        other.gameObject.SetActive(false);
    }
}
```

*OnTriggerEnter2D*



*Unity Game Engine Animation*

The idea of animating the cloud came to mind as players could receive visual cues from the game. In-built animation as seen above could not be implemented in this case as animating the clouds in loops would cause all the original functions to be defunct. To do this, we drew inspiration from an undulating sine graph and created a CloudScript. The code below shows how the position of the raining-cloud is changed over time according to a sine graph and various constants.

```
transform.position = new Vector3(transform.position.x,
transform.position.y + ((float)0.7*(float)Math.Sin(2*Time.time)
*floatStrength), transform.position.z);
```

*CloudScript*

## ITERATION 3

To see how much we could develop the prototype to demonstrate the potential that the Kinect Experience Wall, we implemented several scenes for players to be able to get a more complete experience and conduct further testing.



Screenshot from River Pollution Scenario

Recalling the first scenario to be using rain clouds to put out forest fires (insert image), we created the second scenario to depict the situation where a river is polluted. To get rid of code redundancy, we re-used the CloudScript function to simulate rubbish game sprites floating in a virtual river. With a grabbing action, players can then remove these impurities from the river. These items have been carefully curated to teach children about what does and does not belong in a river. All these trash objects such as food waste and used light bulbs depicted here clearly do not belong in a river.

The VisualGestureManager takes in the gesture database file and initiates it as VisualGestureData. The system would respond with “gesture detected” when the confidence level is above the minConfidence level set by the game developer.

```
VisualGestureData data = gestureData[gestureName];
if(data.isComplete && !data.isResetting
  && data.confidence >= minConfidence){
  Debug.Log(gestureName + " detected.");
```

Visual Gesture Manager Script

## USER TESTING AND FEEDBACK

### 1. Improved in-game objectives

The goal of Scenario 2 was for players to remove the rubbish from the river by grabbing them. However, as they tried to do so, players intuitively tried to throw the rubbish away in the game but found that they were unable to do so.

We had assumed that it would be easier for players to just grab the rubbish, but some of

them gave feedback that it would prove to be more educational if children are able to throw these items away into a rubbish bin or even to recycle them. Improved versions of the game could include such possibilities, and grasp the opportunity to teach children more about recycling as well, rather than just river pollution.

### 2. Sensing of users

One strength of the Kinect sensor would be that it is able to sense a large range of gestures. This strength also means that that each player has to be tracked in real-time. As much as we had tried to detect the closest user to the sensor for the game, the system had a tendency of malfunctioning when there was too much ‘noise’ in the background i.e. people walking around. While this created some confusion for the players, we believe that there are ways to mitigate this issue. The problem of ‘noise’ can be moderated when the Kinect sensors are placed at an angle to sense only specific players who are engaging with the game. Other alternatives include using the Kinect as a ceiling to floor sensor.

## FURTHER DEVELOPMENTS

To further develop this feature, we can create more modular scenarios such as what we have done here in the prototype. Each scenario portrays the potential use of the Kinect sensor in making creative and educational games for children. As such, each scenario also clearly frames the learning objective such as learning about forest fires in one, and river pollution in the next. There are numerous possibilities that can be explored by creating more scenarios that can be suited to the particular learning objectives as outlined by our clients.

In further development, these two approaches, open world and modularity, can be explored in their effectiveness in bringing fun and learning to the children at the library.



# i n t e r a c t i v e :

## c l o u d y s k i e s

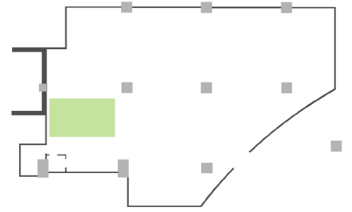
Cloudy Skies is a simple digital display of meteorological and weather data, translated using colours and other related visuals to aid understanding and processing of information.

This features aims to replace the weather stump and to effectively share information about the weather (data from NEA or other sources) and simplify the complicated data available to generate awareness about the weather and the environment. It also helps children understand and correlate colours and weather for example bright means good weather while darker colours may signal an onset of bad weather.

### WHAT PROBLEM(S) DID THIS TACKLE?

1. Data visualization
2. Underutilization of the weather stump
3. Incoherent and inconvenient design
4. Desemination of overly complex information

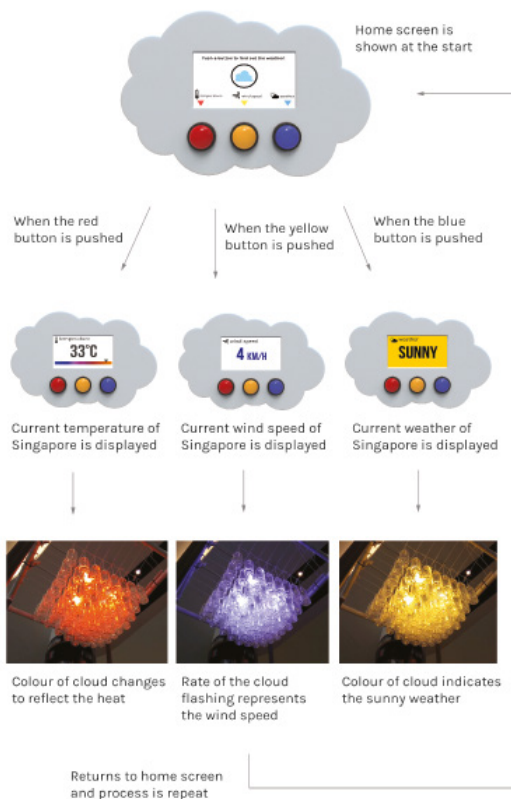




*The Cloudy Skies:  
Top: The Clouds and Bottom: The Weather Station*

## HOW IT WORKS

The Cloudy Skies are made up of two parts: the Cloud, and the Weather Station which controls the Cloud. The Weather Station has three buttons, “temperature”, “wind speed” and “weather”. When children want to know about the current weather information, they will press on any of these buttons. Information about the current weather will be reflected on the screen respective to the button pressed. The Cloud will change its colour to reflect on the information.



## PURPOSE

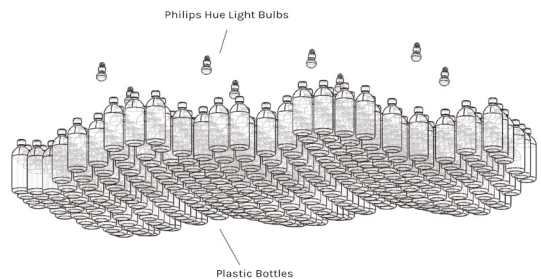
When we designed the Cloudy Skies, we want to maximise its visual impact on the children when they visit the library, regardless whether if the duration of their stay is short or long. Firstly, the children should be able to understand the data that is presented to

them without much difficulty. They would be able to comprehend it without assistance from their parents. Secondly, the interactive feature must be attractive to the children. The Cloudy Skies must be eye-catching to them the moment they enter the library and be curious about it. Thus by maximising visual impact, we would be able to create awareness about the weather to the children, and be able to enjoy the interactive feature at the same time.

## COMPONENTS

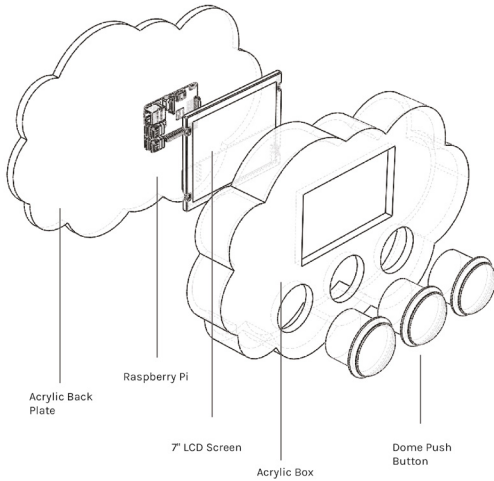
The Cloud consists of the following components:

- Water bottles
- Philip Hue lighting system



While the Weather Station consists of the following components:

- Raspberry Pi
- 7” screen display
- 3 x large push buttons
- Acrylic box



### CHOICE OF CLOUD MATERIAL

We explored different forms and materials to use for the Cloud, and we concluded with using water bottles in the end. Initially, we tried to use cotton as it closely resembles clouds. However, after the initial prototyping of the cotton cloud, we realized that it is not a viable material for the library as it is a fire hazard.

We realized a need for a Pugh Chart for the selection of material, and have five criteria:

1. Durable
  - The robustness of the structure in the long run
2. Aesthetic
  - Visually seamless with current design of the library
3. Cloud-like
  - Degree of resemblance to a cloud
4. Safety
  - Freedom from the risk of injury or danger for children
5. Maintenance
  - Cleaning and upkeep of the structure

	Durable	Aesthetic	Cloud-like	Safety	Maintenance
Cotton	X	X	✓	X	X
Styrofoam balls	✓	X	✓	✓	X
Styrofoam cups	✓	✓	✓	X	✓
Cardboard strips	X	✓	X	X	X
Plastic bottles	✓	✓	X	✓	✓

From these criteria, we decided on using water bottles as it meets most of our requirements. Water bottles are made of a durable structure, it is in line with the library's eco-friendly design theme, it is safe for children and it is easy to clean the structure. Even though it look less cloud-like relatively to the other materials, we felt that the other benefits far outweigh its disadvantage.

### CHOICE OF TECHNOLOGY

When deciding on which lighting system to use, we wanted the light to be able to illuminate every bottle. Thus the light source have to be positioned on top of the water bottles, such that the light will diffuse throughout the bottles. Furthermore, to reduce the amount of wires connecting to the Weather Station, we want a lighting system that is able to control the lights wirelessly, and without the need to charge the battery. In addition, Philips Hue uses LED light bulb which are low in power consumption, which makes it environmentally friendly. Thus we decided on the Philips Hue lighting system as it fulfils our criteria.



The Philips Hue lighting system is originally designed to be controlled by a smart phone, which communicates to the Philips Hue Bridge through Wi-Fi. In turn, the Bridge controls the brightness, hue and saturation of the light bulbs through ZigBee. In order to have an interface built for children, we have to develop a different method of sending information to the Bridge, rather than through a smart phone. Hence, we chose to use Raspberry Pi, a mini computer, to achieve this task. In addition, the Raspberry Pi is able to be connected to buttons and screens, which is a key component for our interface for the children.

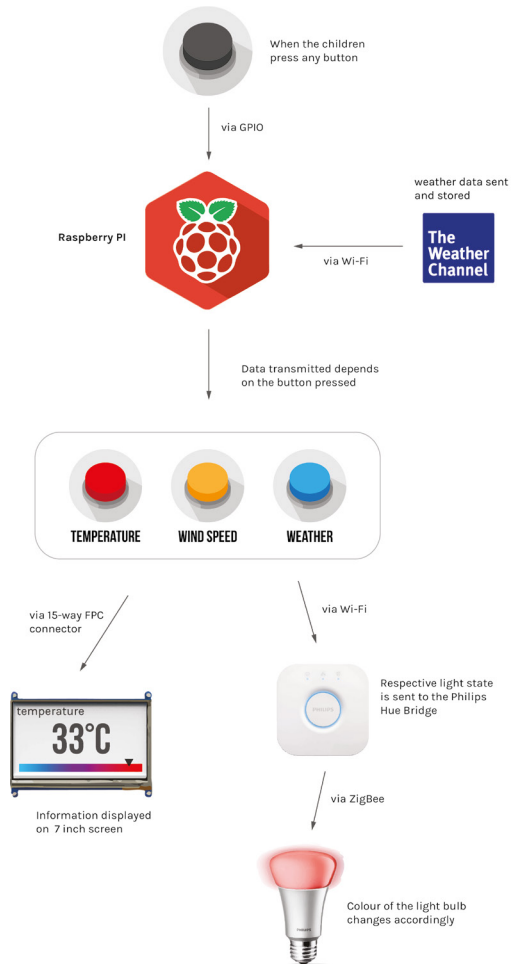
### DESIGN OF WEATHER STATION BOX

The Weather Station is the main hub of interaction for the children about the weather. Thus when designing the box, we want it to be safe for children and be attractive to them simultaneously. In order for the box to be robust, the body is made of thick acrylic to make it durable, and another transparent acrylic over the LCD screen to make it shatter resistant. For the box to be attractive, large coloured push buttons is utilize to inspire a notion of play and interactivity to the children. In addition, the box is shaped as a cloud to make it eye-catching, at the same time communicating to the children that it is used to control the Cloud that is above it.

### PROCESS FLOW AND EXPLANATION OF CODE USED

A combination of Python programming language and Bash Unix shell is used to program the interactive feature. On Python, Weather information about Singapore from weather.com is constantly updated and stored using Dictionary. The three buttons are connected to the Raspberry Pi's GPIO pins. In a While loop, when a user pushes one of the three buttons, it will register an

input through `GPIO.input()`, and it Return the respective data. Using `If` function, it will then open stored images of the weather information using `cv2.imread()` and `cv2.imshow()`. After displaying the image, Python will immediately turn on the desired colour lights using `subprocess.Popen` to execute the Bash script. As Philips Hue is controlled using HTML, the Bash script uses `cURL` to program the light bulbs' hue, brightness and saturation, using the `PUT` request. After turning on the light bulbs for a few seconds using `time.sleep()`, the light bulbs are programmed to turned off. The screen will then display the home image and waits for the next button input.



**FUTURE**

## **The Future of “My Treehouse”**

The library is a space of constant fun and learning, where children have the space to grow. As such, we also expect the same of our framework and features. Even though the project has come to a conclusion, we feel that as NLB continues to bring libraries closer to Singaporeans and to connect Singaporeans closer to the outside world, the children’s library should still continue to grow and expand in terms of the features and also its influence/impact on the children in the space. So in the spirit of self-improvement, the following will outline some of the ideas and intentions we hope that will help the features and designs grow as time passes.

### **TOLO THE TREE GUARDIAN STORYLINE:**

The point of having a character that encompasses the main theme of the library is to create an easily recognisable reference point for the children. This also makes the eco-theme of the library very obvious and this tunes the children towards the natural environment.

The storyline is as follows: Tolo the Tree Guardian is the centerpiece of the library. As a guardian, his purpose is to protect all trees and wildlife across the world, and he can only do so with enough help from the Tree House Rangers. By carrying out environmentally friendly acts through the features, Tree House Rangers earn Earth Tokens individually. The accumulated Earth Tokens cumulate from all the Rangers to sustain Tolo as a Guardian thus enabling him to save the trees and all wildlife. Unfortunately, an amount of Earth Tokens is consumed daily to represent the environmental degradation that is ongoing every day (e.g. 6 billion trees cut down per

year, 2 animals being poached per day, 39.8 billion tons of CO<sub>2</sub> released a year). Hence, it is up to the Rangers to generate Earth Tokens to ensure that the collection of Earth Tokens is sustained all year round.

We chose a tree to be the guardian because:

1. Easily recognisable as character representing an extension of the treehouse
2. Relatable mascot for the children
3. Relevant to the eco-theme

We see the tree as a unit that links the different parts of the library into a single cohesive body representing the concept of growth.

The purpose of the implementing such a system within the library is to:

1. Give the children a sense of responsibility
2. Encourage commitment to the system through the rewards
3. Give the children a sense of achievement through the set goals
4. Allows monitoring of eco-activities that reflects the children’s learning progress

### **EARTH TOKENS - POINT SYSTEM:**

The goal of introducing a point system was to go hand-in-hand with the storyline so that children can participate in a collaborative environment. Instead of competing against each other in the games, children can cooperate to earn Earth Tokens for Tolo the Tree Guardian.

### **REINTRODUCTION OF THE MASCOTS:**

Before our intervention, there exist 5 mascots that were used by the library to build the existing concept identity. However, we believe the mascots can be used to impart eco-knowledge through the various features and events in the library.

## CONCLUSION

The nature of this project we have undertaken is that we are tasked with recreating the children's library into an immersive and interactive eco-space, where reading and playing generates positive outcomes.

This project has a focus on spatial integration, with an approach specifically tuned towards environmental issues, which engages on how actions impact environment. The design focus in this case is on the integration of hardware and software through spatial design and interactive features.

As this is vastly different from producing a single product or even a single component of the concept, we adopted the fundamental strategy of first establishing a strong foundation of concept, storyline and frameworks from which our ideas would stand on.

By doing so, it helps inform the decisions that we make as a team. The key strength of using such a strategy would be that the team can immediately embark on developing prototypes for the ideas further down the road and have clear guidelines on how this idea would fit within the bigger picture.

Although, there were major changes halfway through the project, we thankfully did manage to keep to our initial strategies and ideas. The overall concept remained the same although we were sad to see some of our interventions and initiatives shelved.

However, we believe that spaces like this library can and will continue to grow even as our time with this project come to an end. As, such the interventions and initiatives could make a comeback and continue to make the library a well-integrated eco-space that gives unique and fun learning experience for the kids.

The journey up to this point has been filled with ups and downs. Nonetheless, the experience is one that was fulfilling and enriching for all of us. It has given us a wonderful opportunity to do more than our capabilities and challenged our skills and knowledge.

## **MANY THANKS**

Special Thanks to: Kam Tam, Lucienne Blessing, Teo Tee Hui and Angeline Ang for their continued guidance and mentorship throughout the project.