Project Little Luxelakers

Implementing IoT to Create a Children-Friendly Community

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Introduction

As the society started to consider more and more on the children's education, it seems that the traditional educational system, which centers around home and school, cannot satisfy the need for the children's multidisciplinary development. According to the architect Christopher Day, who has extensive experiences in designing schools and early childhood centers, the environment is not only a space where they live and grow up every day, but also contains the day-to-day, dynamic yet "hidden curriculum". Such hidden curriculum would incentivize creativity, elasticity, social responsibility for children, which is missing in the traditional format of education. But environment education can be limited by a lot of factors in urban environments, and most children are still experiencing the linearity between the two points of home and school. On the other hand, Luxelake's geographical qualities and its natural environment provides the best site for children's environment based education. With design and technology going hand-in-hand, our project aims to transform the Luxelake site to a playful classroom, and an educational playground. Through the interventions of smart technology and the organization of communal events, we intend to enable children to learn through exploration and play.

Onsite Research

When we were in Luxelakes, we made a series of observations that helps us to draw a conclusion on how Luxelake development is doing on providing a children-friendly community.

Current Children's Facilities at Luxelakes

The master plan of the development shows that they are planning to build 15 schools, ranging from pre-k to 12th grade, from public to private, from conventional to international. The distributed schools ensure that most of the commute time for students is under 25 minutes of walking.

There are 3 designated playground areas for children, and all of them open to the public through a reservation system. Both sides of the Luxelakes have a large area at the central and accessible location for the children in any part of the residential area. For the detailed locations of the playgrounds, please refer to the map we have attached.

The Adventure Island is the most public and central park designed specifically for the children. It is seen as an amusement park for both the resident and visitor children that contains various water and land sports and other natural programs. There are a lot of facilities that have the capacities to host seasonal or regular sports, including horse equestrian, surfing, kayaking, grass-skiing, and swimming. There are also spaces planned on the island that allows the children to participate in all kinds of activities, such as animal farm, and planting vegetables.

01 Image taken at the Cloud Park, 2020.01

The Cloud Park [01] is located on the north of the adventure island, and is accessible by both land and water. Compared to the Adventure Island, the Cloud Park is more designed for the resident children. It focuses more on the interaction between the playing facilities and the children. The facilities the design team has proposed are novel and innovative, encouraging the children to explore the different types of interactions they can have with the curated landscape installations. Children can get onto the bicycle facility, and when they start biking, they will see the water fountain will splash water. Children run across the wooden bridge and music notes will be played[02].

02 We have conducted an interview with the design team of the Cloud Park and the Red Stone Park to gather more information on the design process. Please refer to the section of "Onsite Interview" for the transcription and notes.

The Red Stone Park, located on the other half of the Luxelakes, is even more closely embedded in the residential area. The Red Stone Park is more private and larger than the Cloud Park. It also contains a range of playing facilities and sports grounds for the children to hangout.

However, all of the playgrounds are half-enclosed and only concentrated at certain locations, disconnected from each other. Thus, when children want to go out and play, they have to be accompanied by adults, and constantly watched by parents. Even though Luxelakes might be a safe little town, going to the playground and playing with the playmates still needs to be scheduled between the children and the parents, rather than a spontaneous and free-spirited journey.

Besides the three designated playgrounds in Luxelakes, most of the landscape, the routes, and the water area are not designed for children. The scale of the landscape is not suitable for the children, who are likely to get lost. Being close to the water raises safety concerns for children, which means the parents are not likely to allow their children to roam around onsite on their own. As a result, children currently are not able to enjoy the full environment of the Luxelakes.

We have also observed some safety concerns of the playing facilities. Even though modifying the existing playing facilities is not the main goal in our design project, we hope that by documenting our observations here, we could bring up a broader discussion on the safety issues when designing children facilities.

In the Cloud Park, the sand field that provides the children a buffering space when they slide v a steep slope might not be big enough. When a child slides down from the slope, it is possible that he/she will not be buffered enough to stop himself/herself in the sand field. We have also confirmed the designers, and they said that they were not planning to make any modification to the current sand field, but will definitely consider to change the dimension of the sand field, or the angle of the slide slope in their next project.

03 Image taken at the Red Stone Park, 2020.01

In the Red Stone Park [03], there are two really high tube-like slides that are made of metal. The metal tubes are completely closed off, that if a child enters, he/she would not know where exactly he/she is inside the tube. Since the slides are relatively long, we were concerned about children being afraid of experiencing the “forever” darkness in the tube, potentially moving too much in the tube due to their fear, and eventually getting stuck.

On the other hand, the metal material of the slides can also be hazardous. Since in summer, the completely closed-off metal slide can be too hot due to the sunlight absorbed.

There was actually a sign at the top of the slides saying that the slides should not be used during 1pm - 6 pm in the summertime. The sign shows that the designers were well-aware of the potential overheat of facilities. But at the same time, we don't think sticking a note on top of the slides is a sufficient way to protect children from getting hurt. We think that there should be more consideration put in when designing the children facilities and managing them.

Onsite Interview With the Elementary School Principal

04 Interview with Nichole Huang

We have interviewed Nicole Huang[04], who is the Director of International Education Service Center at the New Horizon education company.

School Planning in Luxelake

She talked about several schools they are planning to bring into the Luxelakes community. Currently, Hamilton elementary school is the only school in operation, but they are planning for a K-12 private school's opening in September 2020. A kindergarten with the name of "Wonder Mountain" will be open in March 2022. They are planning to cover all age groups with different categories of schools. They are looking at various international education programs as their references, including the attitude school company in the United States, and educational app development companies in the United Kingdom. Because there has recently been a lot of sales and confirmation of the houses, and they truly believe that more education opportunities can bring up the maturity of the community. Also, they think they could bring more choices of education for the community.

Hamilton Elementary School

Hamilton Elementary School was founded in 2019, and they only have two grade years. The first grade is a complete grade and the second grade is not filled. The first grade has 4 classes, and they are planning to have 300 children in kindergarten, with each of the class capacity of 20 - 25 children. They are also planning for the elementary school to have more than 1000 children. This school is a collaboration between the local government and the community. They have started to plan for the school 3 years ago, and just started in September 2019.

Students and Parents

80% of the students are from the community of Luxelakes

or Luxehills. The other 20% children need to satisfy a family requirement to join the school. The parents work for the important industries or companies in the Tianfu New District. Giving their children admission to the school is definitely an appeal for the parents to work in the area, and eventually settle themselves in the area.

Commute to School

She has mentioned that there has been discussions on the commute methods for the children. The current commute method for the children is that they are driven by their parents to school and to their home every day. One of the main reasons is that the site of Luxelakes is not completely developed yet, so there are not enough infrastructures, such as other transportation, or green spaces, for the children to use as another way of commuting to school. Interestingly, they have mentioned some magical solutions of creating a commute journey of railroad dedicated for children. The school's concern of the commute matches our onsite observation, as well as the survey results

Technology in Education

They are in discussions of bringing more technology into education and education management. One of the neighboring schools in the area was already implementing the smart band that helps them to organize the student activities. Some topics they looked into include using facial recognition, or blockchain technology to track the supply chain.

Architecture of the School

During the interview, there was a lot of discussion already on the children's living and studying environment. For the current elementary school, the educators keep a close eye on how the architecture is suting the children's need for educational and play spaces. The school is designed in a way that it does not have the most open spaces. The school is closed off from the outside environment for safety reasons. But the entire school encourages children to move around and explore. One of the observations they recently made was that the circulation of the school is not designed so wll. The bathrooms are designed to be relatively far from the classrooms. And the children need around 5 to 6 mins to go to the bathroom. The class time is 45 mins long, and the break time between two classes is 5 mins, and that means the children would not have the time to go to bathrooms and also hang out and play.

Classroom in Nature / in Luxelakes

After the third year in the elementary school, there are after school activities planned for the children. There are outdoor education planned for different years of the students. Next year, they planned for an overarching theme of humans and nature. They wanted to plan educational programs about the protection of the water in Luxelake, about classifying different garbages, environment protection, and water engineering. They are trying to extend the classroom to not only the Luxelakes community, but also the greater city of Chengdu.

Clubs and Events in Communities

The school has clubs themselves, but they also want to collaborate with the clubs in the Luxelakes community so that they can have closer connection with the parents in the community. The clubs they are trying to organize include education for parents, parents-children relationships, and child psychology.

They are also trying to set up a system where they can collaborate with the community administration to set up both temporary and recurring events. Some of the clubs or the facilities they want to collaborate with include.

Broader Platform for the Educators

They are in contact with other educators in Chengdu, and arranging training and forums for all of the educators. Not only do they host forums among educators and principals, they also arrange business trips to other cities and countries to learn more about different educational programs.
They created a point system where the educators would accumulate points to earn certificates in the organization.

Onsite Interview With the Designers of the Children's Facilities

We have been in a conversation with the landscape architects of the Cloud Park and the Red Rock park.

The Cloud Park is by the main water way, and has greenspace that spreads horizontally.

It is open for all age groups and is around 2500 square meters. The construction was finished in June 2017. There are four sub-district in the park. One of the main design concepts is the closeness with water, the bio-system, fishes, and plants.

One of the other interesting features is “the Global Fountain”, where there is water installation with a world map. The set can be used as a theater. Because it is close to the community gathering center, a lot of community events were hosted here.

It is open to the public. It attracts the crowd, helping with the situation of tourism in Luxelake. It is open to collaboration to the community and the school system. The maintenance of the facilities and the landscape is done by Luxelake, even though it is open to the public. The maintenance includes the security, the cleaning, and fixing the facilities. It attracts the crowd, helping with the situation of tourism in Luxelake.

There were security cameras on the site, in order to lower the management cost.

The Red Rock Park is bigger than the Cloud Park. So there is a gradient of public and the private. From a more public place where children can play and make noises. And there are more quieter areas for the adults and the elders to have morning exercises. It is 230000 square meters, and open to the public. It is closer to the residential area. There is a faster way to walk from the residential area.

They have controls for helping the lost children in the park.

In terms of considering the redesigning or making modifications to the site, they would love to enhance the designs of the site from a more human centered design. A substantial amount of cost went into designing and redesigning during the construction.

They seek the consistency of the site. They designed the waterway system, wandering system, and state roads. They wanted to have a closer communication with the local government to add more efficient roads to the site, such as adding the roads under bridges.

For the bio-system the site allows the self-sustained water environment.

Onsite Interview With the Club Heads

We have also talked to several heads in Luxelake’s community groups.

One of them is the head of the surfing team, and one of them is the head of the tennis team.

They have organized opportunities for the children to have

access to the community events. They have also planned for events in the units of families.Some of the specialized opportunities they have offered for the children include choir, drawing classes, tennis, soccer, drums, and English corner.

Their mission is to create a society with acquaintances and closer friends, where everyone can say hi to everyone in the community.

They care a lot about the safety of the children. Some of the things said was that 99% of safety is drastically different from 100% safety. They appreciate the technology of smart devices to better protect their children. On the other hand, they also think it is important for the community groups to take the initiative to organize events, and that will also be safer. They would also appreciate some onsite interventions to remind the children the potential safety risks.

One of the topics they brought up was socialization among the children. They realized that at this time there is no kindergarten or complete elementary school in the local community, so that there is not a lot of socialization happening among the children after school. They are hoping that there will be chances they can enhance the socializing experience.

They want to better organize the structure of the clubs, to make a club 2.0. There will be more and more subcategories such as groups, clubs, or associations. They want to have a more structured system for the fund.

The structure of the community will help set up the trusting atmosphere. The older residents will have influences on the newer residents. The newer residents using the communities as the vehicle to immerse into the environment, and then influence the making of the environment

Right now there are a lot of interactions between different clubs, especially among the same categorized ones.

There is also potential in developing the community and clubs in the local business.

There is a lot of flexibility in starting a club. The approval process of starting a club need the recommendation of 3 heads, and the registration of20 members, and of hosting 2-3 events in 3 months.

They received sufficient support from the development. Every year the company is giving 10% of the power to the community.

Conclusion

All of the observations and experiences we had when we were visiting Luxelake were distilled to our belief in transforming Luxelake into a children-friendly community. We see that Luxelake already has a lot of potential, especially in their efforts in designing children's facilities, creating children's clubs, and ensuring a local educational system. But we believe that our project can push the community to a wider horizon.

For Luxelake, creating a children-friendly community is not only a unique education experience as a marketing strategy. Rather, the children are in essence the linkage between the community and the individual families. Only when the children are more engage with the site and the community, the sense of community bonding and collective responsibility will be realized.

Online Survey Results

In February 2020, We distributed around 100 online surveys to parents from Hamilton Elementary School in order to know more about the user persona of Luxelake families, as well as their opinions on children's education with smart technology, nature and education.

Here are some of the important findings from the survey:

83.3 % of the children are 7 - 9 years old;

84.5 % of the children are picked up by their parents after school, 11.9 % by their grandparents;

97.6 % of the children commute by car; 60.6 % of the children's car rides are between 10 - 30 mins;

36.4% of the parents sign their children up for after-school classes; 36.8% of the parents would allow the children to play in their houses or in the community;

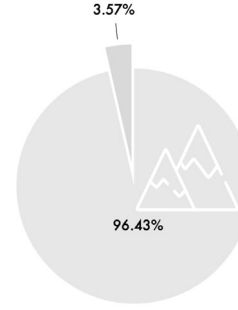
When the children are playing in the community, 85.7 % of them are accompanied by adults;

50 % of the parents worry about their children's safety or getting lost;

96.4 % of the parents would take their children to nature on weekends [05].

83.3 % of the children have access to smart devices but with parental control;

76.2 % of children own an iPad;



05 Survey Result: 96.43% of the parents take their children to nature on weekends.

11.9 % of the children own smart watches

83.3 % of the parents are willing to allow their children to use smart devices to learn

89.3% of the parents considered buying their children smart watches.

To conclude, what encourages and even surprises us is that a lot of families would go to nature with their children on weekends; a lot of parents have already considered buying their children smart wearables; a lot of the parents are super open about using technology to enhance the learning experience.

Literature Review

We would like to discuss our research process on creating a theoretical framework by presenting some of the keywords and key concepts we have looked into, which then significantly steer the direction of our designs. Some of the topics are more theoretical and abstract, while some of them are detailed observations or commentaries that intrigued us. While we are doing the literature review, we took notes and considered their relevance to the Luxelake site.

Environment Based Education

Environment based education [06] aims to develop environmentally literate citizens. It is more than just teaching the children about environmental science, but rather defining a much broader learning environment for the children. The community is at the core of the learning experience. It uses a popular subject matter to improve students' learning skills and create a wider learning context for students, teachers, and the community. It encourages active learning experience immersed in the community.

06 "Using Environment Based Education to Advance Learning Skills and Character Development, A Report, Annotated Bibliography, and Research Guide" by The North American Association for Environmental Education

We think that Luxelake has the opportunity to become one of the first experimental fields for implementing environment based education. We have the environment to activate, to transform into an educational playground.

The "Hidden Curriculum"

The Environment is sometimes called a "hidden curriculum" that incentivizes creativity, elasticity, social responsibility for children, which are usually missing in the current format of education. Children's activeness is directly related to their access to the environment. Children are always observing. Every moment is a novel opportunity for children to learn about something new. Through interacting with the living

and nonliving world and dealing with the complexities, children are encouraged to explore and find the balance between the two.

Connecting back to our survey results, we see that the parents in the Luxelake community care a lot about their children's education, as well as engaging in nature. And we believe that our proposal can effectively manifest the value of hidden education in the environment.

Boredom and Explorations

We also read a lot about the boredom and engagement of the site. We see that in most of the previous community, children are always looking for new things that excite them. In discussion of children looking for opportunities to play, our project aims to address the issue of boredom by present more opportunities.

"There is little to do or see that is new...The children seem to suffer from experiential starvation. They are waiting for something to happen. They enjoyed the novelty of walks and the experiment"

"In most settlements there is little for the children to be responsible for - no place they control and manage. The landscape is divided into ownerships (public or private) and the children are not the owners even though the vacant lots, the back lots. and the factory yards may not be actively used by anyone else. [07]"

07 Growing Up in Cities Kevin Lynch

Active Engagement in the Environment

Continuing the discussion of implementing educational opportunities in the environment, we want to both allow children to encounter new things, and gain something from every encounter. We therefore looked into educational theories on what they can gain when they are actively engaging with the environment.

"The children who often share in the management of the places, are more connected to the community and the place."

"At the beginning of the 21st century, children and the environment is an active area of inquiry seeking to understand rapidly changing conditions for children as the world urbanizes, opportunities for free play outdoors and independent mobility erode in many parts of the world, media environments consume more of children's time, and awareness grows that children need opportunities to creating sustainable societies. [08]"

08 Children and the Environment by Chawla, Louise

The Use of Unprogrammed Space

We have read quite a bit about how the children are always prone to activate unused spaces and really repurpose them with their own imagination. In safe suburban spaces, more free and undesigned spaces are more often occupied by the children.

"Children use the "unprogrammed" spaces near their dwellings: the local streets, the courtyards, the apartment staircases. They talk and meet and wala'bbout together, they play informal pick-up games, they "mess around," in a seemingly aimless fashion, which their parents often appear, not wrong, but idle."

09 Growing Up in Cities by Kevin Lynch

"Just beginning to assert their independence of the family, they are testing a society of their own, and the street is the place for it. Streets are immediately at hand, and it is legitimate to be in the,. Interesting things happen in the streets, and yet street behavior is not rigidly prescribed. [09]"

Children's Wearables in Education

As our project involves adapting smart technology to allow more educational opportunities in the field, we looked into theoretical support for the benefits and drawbacks of implementing children's wearables in education.

The smart watches allow children to be more independent and give children more autonomy, under the condition where parents still have access to their children's location to ensure safety. Also, smart watches provide the opportunities of learning and playing on-the-go.

"Characteristics of the smartwatch in terms of portability, glanceability and ability to receive and capture information straight on the user's wrist positions it as a unique platform for learning and attitude change that takes place at micro-moments on-the-go and in-the-wild. [10]"

10 "Wearables for Learning: Examining the Smartwatch as a Tool for Situated Science Reflection" by Brittany Garcia

Design Statement

Stemming from what we have theorized in environmental based education, our proposal is to implement IoT to activate the site and adapt the site for the environment based education program. We want to transform Luxelake into a playful classroom, which means making the environment as passive lessons, an educational playground, creating an autonomous place where children can engage in planning. The experience of a child's after-school route from school to home will become much more dynamic from the point to point experience before.

Overall, we are introducing three ways of intervention, program design, on site physical installation design and children smart watch UI design.

Program Design

There are two types of program design we are proposing. One of them is community planning, and the other one being planned spontaneously by the children themselves.

The design of each program and activities are most conducted through the partnership with school and community. There will be templates for planning the events. The potential programs include but are not limited to citizen science, art and culture, sports, and socialization[11].

When designing the program, there are a series of criterias and qualities that help the organizers to define and plan out their programs.

Community: Does the program enhance the children's sense of belonging to the community? The children will be able to gain more responsibility through participating and collaborating?

Activeness: Does the program encourage the children to go out, be active, and roam around? Are the children encouraged regularly?

Creativity: Does the program inspire the children to be creative? The creativity can be shown in problem solving, artistic expression, or community engagement.

Leadership: Does the program stimulate the children to interact with their peers?

Learning: Does the program provide a novel opportunity for children to learn about something new? Does the program encourage children to try for new things?

11 See Appendix for the full list of potential programs, and a sample program planning manual.

Other than participating in events planned by adults in luxelakes, the children will also be able hang out with their friends in some of the unprogrammed spaces by planning their own events. As the children interact with the physical installations near the unprogrammed spaces, they will be able to initiate planning an event and then invite their friends. There are also some suggested pre-programmed events at some certain locations, including but not limited to “Little Marathon”, “Long Long Jump Rope”, “Book Club”, “Music Jamming”.

Physical Installation Design

Our proposed on-site installation is the Lu Hut, an interactive object which links the smart watch with the program. It’s designed in the form of a bird house. When children are wearing the smartwatch and knock on the hut, it’s provoking an imagined character living in the hut and talking to the children through the watch.

It can be placed anywhere, at the playground, meeting spot, on natural plants, or some community garden space.

The physical design consists of a few components: the solar panels for wireless self-sustaining power, arduino board, modular sensors and NFC sensor which allows the interaction between the virtual and the real.

UI Design

In order to better support the event planning and organizations, we have designed a series of watch use interfaces that demonstrate how the children at Luxelakes can use the watch to better engage in the community.

There are two main user interface system, one of them is the smart watch interface for the children, and the other one is the phone software on their phones.

Our design principle is that the children’s interface will be dominantly using icons and sound to communicate the information, whereas the parents will have more access and details to the activities, and the status of their children.

Children’s UI

The main interface includes three pages, the friend list, the navigation, and and the rewards page

Navigation is a major interface for the project, as on this interactive map, children will be always seeing the colorful

bubbles popping off the screen.

Friend List: there are three categories to allow for various social scenarios.

Reward: children can see their progress of getting a badge.

Parents' UI

On the other side, the parents have an app user interface that provides more detailed information.

For safety reasons, they will have access to their children's location.

They will also be able to scroll through all of the opportunities and fun their children might encounter.

They will be able to set up free time for their children everyday to have fun in Luxelakes. They will also be able to check the status of their children's activities.

Cherry Blossom Program

For an example program, we are suggest an collaboration with the educational programs in Luxelakes. Teachers in the elementary schools can plan for the Science classes in alignment with the events.

We have done some research in the Science curriculum [12] in China, and have proposed for a potential curriculum. The learning concepts are adapted from the existing curriculum, while we have added new learning concepts specifically for cherry blossoms and handson experience.

Goal: Children can get closer to learning about cherry blossoms, such as the growth of plants; plant species; the cultural, economic significance of the plant.

Location: Cloud Park

Program Design: Children can become the little forecaster of the cherry blossoms. The program may be connected to their coursework, where the teacher can see the progress and then give out rewards for the best[13]!

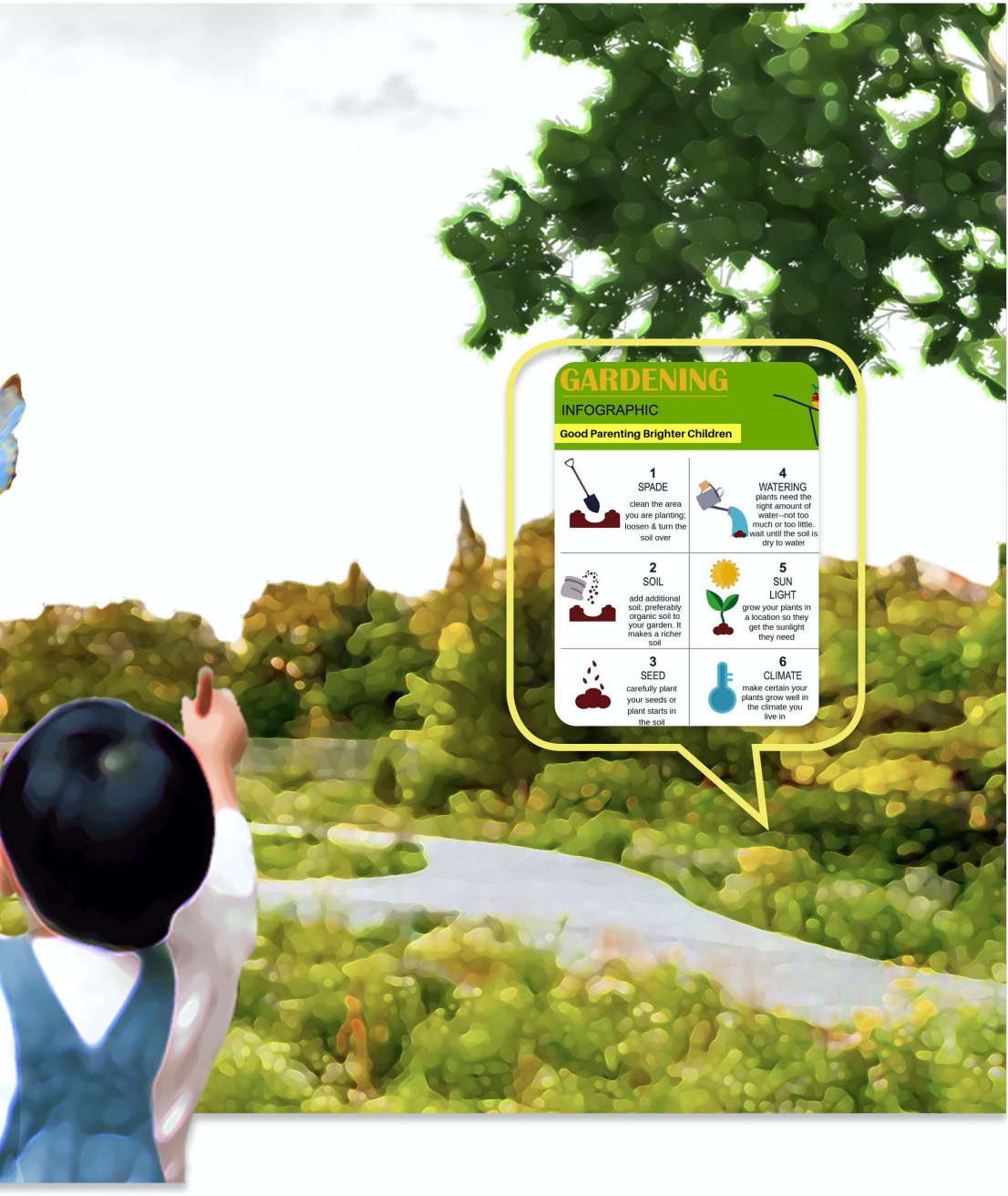
Physical Design: Setting up the smart bird houses at the entrance of the tree cluster. The cherry blossom trees are numbered, and the numbering system will appear on the watches.

UI Design: Visualization of the numbered cherry blossom trees in the Cloud Park;Data collection of the pictures uploaded to the platform, reward progress for the children.

12 First Grade Science Textbook, unit in "Flowers and other plants"

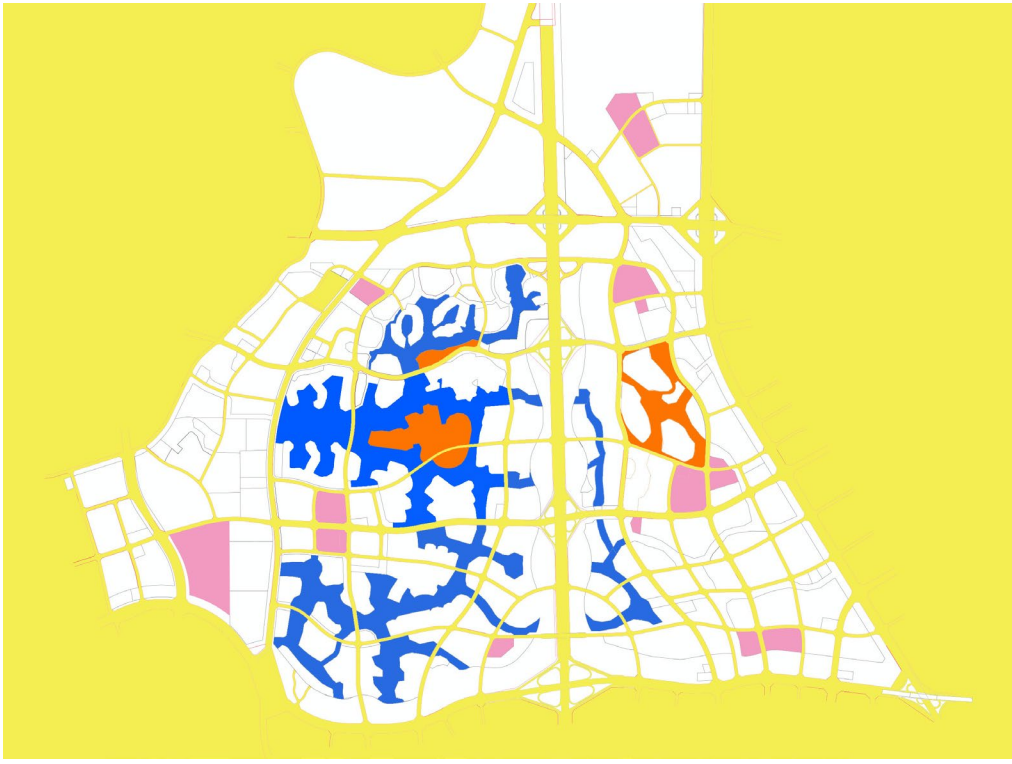
13 See Appendix 3 for the Program Manual for teachers, parents, and community planners.

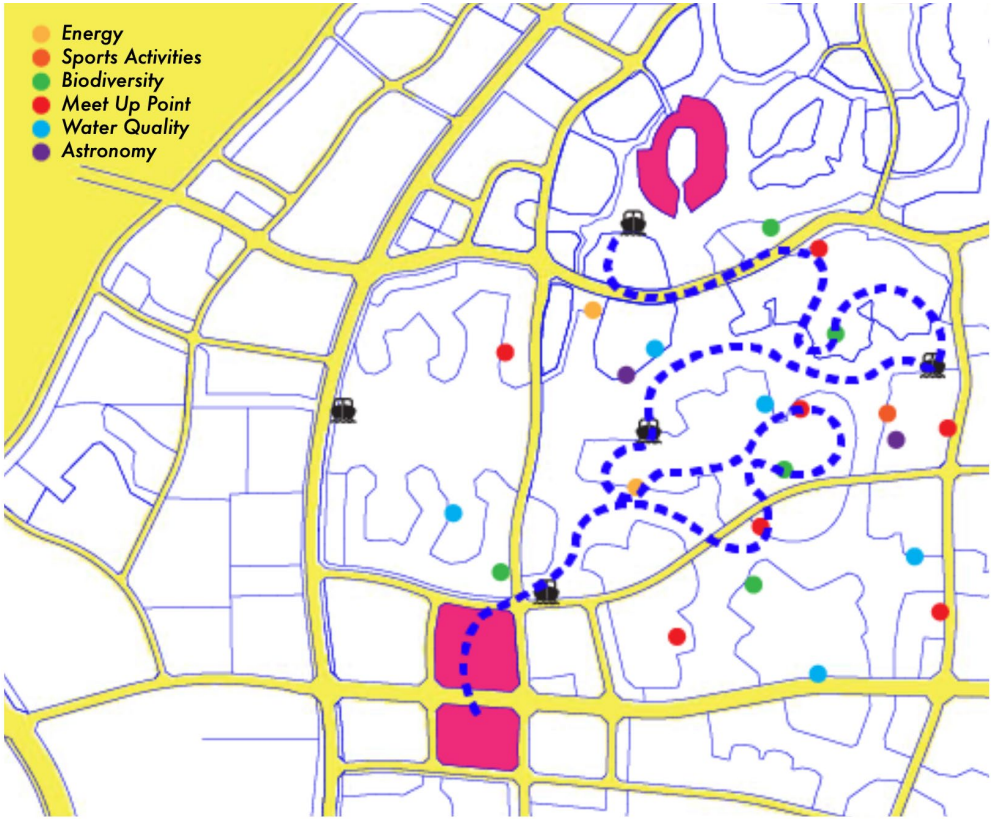
Preschool Inspirations
Butterfly
Facts for kids
Trees Give Us.....
What do you get
from TREES?

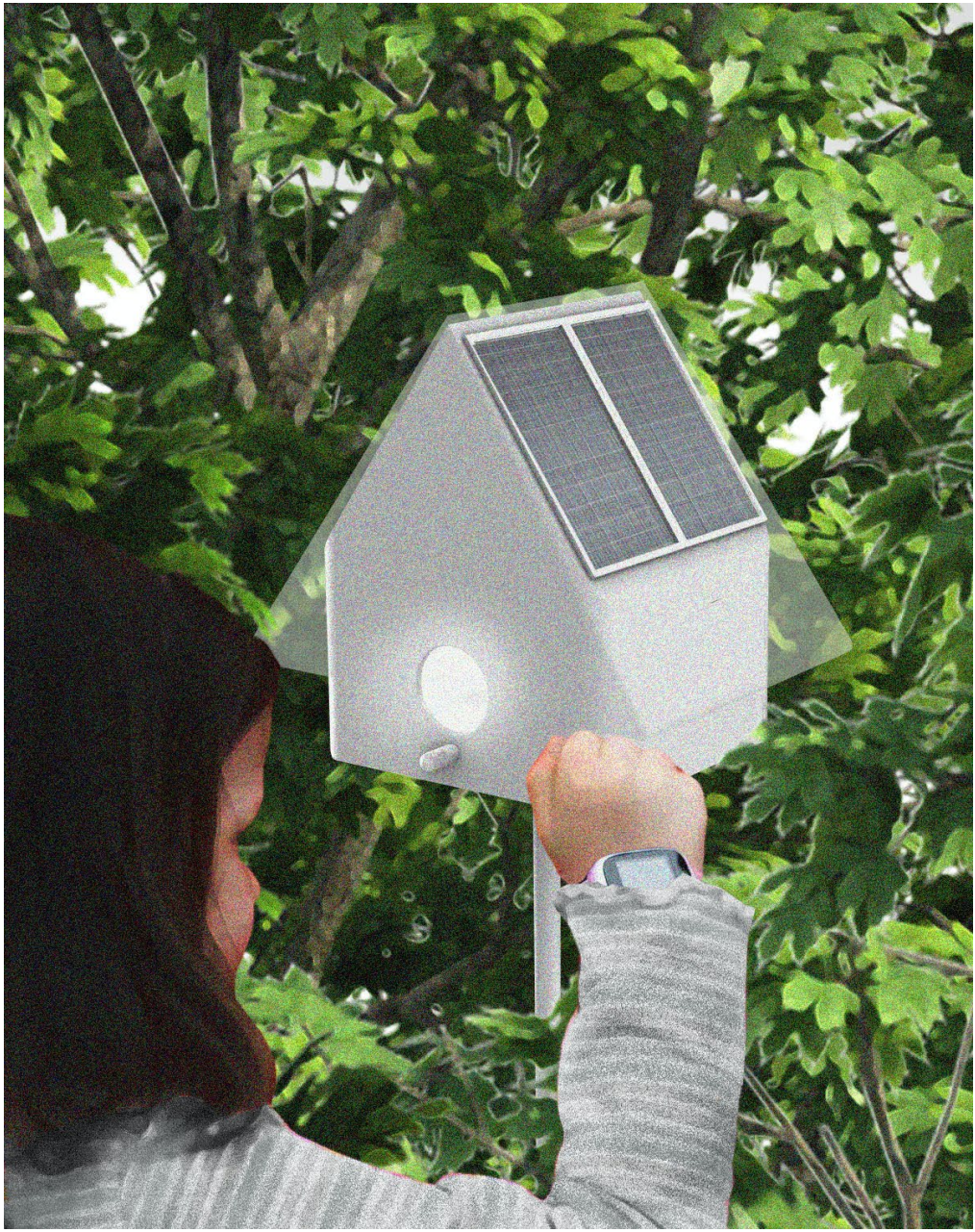

GARDENING
INFOGRAPHIC
Good Parenting Brighter Children
1
SPADE
clean the area you are planting; loosen & turn the soil over
2
SOIL
add additional soil; preferably organic soil to your garden. It makes a richer soil
3
SEED
carefully plant your seeds or plant starts in the soil
4
WATERING
plants need the right amount of water--not too much or too little. wait until the soil is dry to water
5
SUN LIGHT
grow your plants in a location so they get the sunlight they need
6
CLIMATE
make certain your plants grow well in the climate you live in

Original Map of Luxelake
[Left]

Map After the Project
[Right]




Energy
Sports Activities
Biodiversity
Meet Up Point
Water Quality
Astronomy



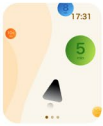
Children's Interaction with the Lu Hut[opposite]

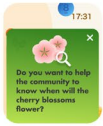
Front View of Lu Hut [below]

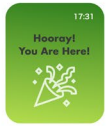
Just Met
Xiaoi
Today @ 15:00
Cloud Park
Lanlan
Today @ 15:00
Cloud Park
17:31
My Friends
Fanfan
Xiaoxiao
Nannan
Oliver
Best Friends
Lulu
Meimei
Little Marathon
Adventure Land
Today 10:00
3/12
Gold
Silver
20/01/13
Knock!
35%
Do you want to set up the event on your own?
First, what kind of activity do you want?
New full me, who should I invite?
Cooperation Mode
It is then the time our community gather together, cooperate and enjoy the spring time!
Cooperation Mode
Now, it is then the time our community gather together, cooperate and enjoy the spring time!
Cooperation Mode
Now, it is then the time our community gather together, cooperate and enjoy the spring time!

Children's Watch UI [opposite]
Children's watch interface in a series, mostly communicating through icons and sound.

Parents' App UI [below]
Parents have more detailed information.


17:31
5


17:31
Do you want to help the community to know when will the cherry blossoms flower?


17:31
Hooray!
You Are Here!

17:31
Knock!

17:31
covered with flower petals! It is then the time our community gather together to celebrate and enjoy the spring time!

17:31
petals! Can you tell me which stage is the bud at?
2
3
4
I forgot!

17:31
covered with flower petals! Do you who's the pollinator?

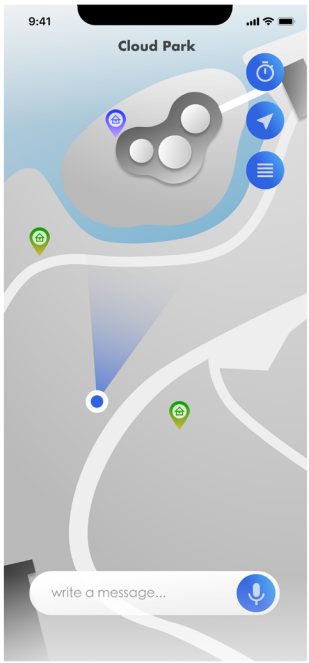
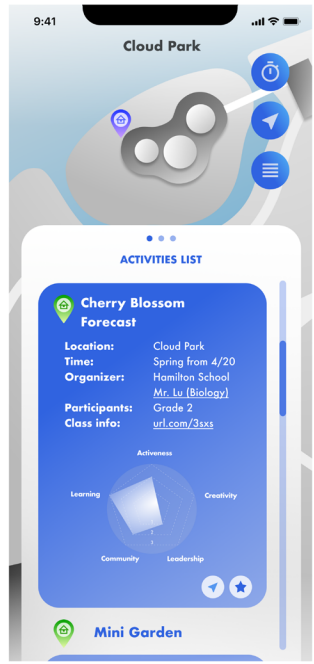
17:31
covered with flower petals!

17:31

17:31
petals! Second stage is when florets are visible. Like this:
Got it!

17:31
Great! Please take a photo for the hard-working little cherry blossom!

17:31

Children's Watch UI for Cherry Blossom Program [opposite]

Parents' App UI for Cherry Blossom Program[below]