**Time-Measuring Device: making your own history of remembrance box with childhood's physical growth**

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Industrial Design / School of Design

M.F.A. Thesis

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# Time-Measuring Device: making your own history of remembrance box with childhood's physical growth


## Abstract

Memories, for most of us, are precious indeed. Reminiscing helps us recall long gone events and a wide range of emotions. However, our recollection is imperfect and we know our memory is limited. Our memories may change or we may forget. We are unwilling to entrust precious memories solely to the unassisted mind.

Children, in particular, undergo considerable physical, mental, and emotional changes. It is not easy for them to realize or later recall their growth process without assistance. At present, children can review their growth with different types of records: written data on a medical history, photos in family albums, or listening to stories told about their childhood from their parents. However, it is difficult for children to keep physical records together with other childhood memories. Childhood memories can be significantly assisted when a child can see a record at any time and share it with family members who recorded the growth with the child.

Therefore, I plan to design a device to record a wide variety of memories, including records of physical growth. We might call this a "time-measuring" device. I believe each family will be able to capture memories in their own way, and then use this device as an aid when sharing this interesting experience with their family.



## Key words

Memory, interaction between children and parents, children's physical growth, record, time, familial intimacy, promoting childhood development, structuring social ritual, measuring physical size, visualizing growth, measuring device

What is time?[1] Our behavior patterns of living are organized, and we put them into practice by time. In addition, we can measure and adjust time to use it efficiently. However, we hesitate to give a definite answer if someone asks about the time of the day.

### Four Different Levels of Time

There are four different levels of time: physical, psychological, philosophical and biological time.

*Physical time* refers to the intervals between durations of the events. Time, as defined in a dictionary, refers to a part of the fundamental structure of the universe, a dimension in which events occur in sequence.

*Psychological time* refers to the direction for remembering our past time. It is determined in our brain by the physical time. We can easily remember more specific events, which have a lot of meaning in our mind. A photo album is a prompt of psychological time. It is helpful for us to recollect our past memories, which lie hidden in the deep recesses of the mind.

"It is a law of psychology that the intensity of the original impression determines the degree of the future remembrance or recollection. And that the intensity of the impression is proportionate to the attention given the subject or object producing the impression."[2]

[1] Time is a component of a measuring system. The dimension of the physical universe which orders the sequence of events at a given place; also, a designated instant in this sequence, such as the time of day, technically known as an epoch, or sometimes as an instant. (http://www.answers.com/topic/time?cat=technology )

[2] William Walker Atkinson. 1997. Memory Culture: The Science of Observing, Remembering and Recalling. Kessinger Publishing. p.12.

*Philosophical time* has a subjective meaning. It can be changed depending on belief, thoughts, custom, or goals of the individual. It means that time is not a physical unit, but rather an independent concept because most people have different personalities.

> The belief in time as an absolute has a long tradition in philosophy and science. It still underlies the common sense notion of time. Isaac Newton, in formulating the basic concepts of classical physics, compared absolute time to a stream flowing at a uniform rate of its own accord. In everyday life, we likewise regard each instant of time as somehow possessing a unique existence apart from any particular observer or system of timekeeping. Inherent in the concept of absolute time is the assumption that the simultaneity of two given events is also absolute. In other words, if two events are simultaneous for one observer, they are simultaneous for all observers. (http://www.encyclopedia.com/doc/1E1-time1.html)

Finally, *biological time* is related to the life sciences. Biological clocks control the rhythms of our behavior. It means biorhythm is governed by biological time. Animals and even plants are influenced by biological cycle. In humans, it may be connected to certain rhythms in the brain.

### Psychology of Time: Memory

In psychological terms, memory is the ability to store, retain and recall information. The most often kind of studied memory is recall. What process is employed when we wish to recall an impression? Our mind is filled with numerous ideas, thoughts, and impressions. These are mixed in our field of unconscious and conscious. Many things are forgotten for a long time if we cannot bring them from the field of unconscious to conscious. We record our present events in various ways to remind us of past memories in the future. Our memory can be aided when we receive help in remembering. Aids come in different forms of records: taking pictures, writing a diary, keeping special items, communicating with friends and family, etc. These are helpful in reconnecting with the past and in preparing ourselves for the future. Having happy memories makes our future happy. Therefore, we are constantly trying to develop the existing ways or get better remembrance techniques.

### The Strength and Weakness of the Existing Methods

Following are tables about the strength and weakness of some common methods of recording memories. Each has unique qualities that the others may not have. For example, a weakness of taking a picture is that it does not record a detailed emotion. Writing a diary provides details of a specific emotion, or something similar. Thus, all memories are not available in all common ways. We can select an appropriate way of recording or create new ways by analyzing the strength and weakness. This is the best way to have the desired effect in the future if we record with a proper way, depending on what kind of memory what we want to record.

| | What are the advantages? |
|---|---|
| **Pictures** | - Take a short time to record<br>- Allow everyone to enjoy as it is easy and fun<br>- Can be shared with family or friends |
| **Diary** | - Can write about our feelings in detail<br>- Includes various recording methods such as a notebook or a blog<br>- Is a precious memory for only one person |
| **Kept items** | - May be entrusted to family<br>- Are easy to see whenever we wish as long as we do not lose them |
| **Communication** | - Creates friendly relationships with family or friends<br>- Allow us to learn memories of past generations<br>- Enhances interaction with family or friends |

***Figure 1. The Strength of the Existing Methods of Recording***

| | What is lost |
|---|---|
| **Pictures** | - May be a fragmentary memory<br>- Often be fun at the moment, but the feeling of that moment is often forgotten<br>- Difficult to record detailed emotions |
| **Diary** | - Often difficult to find a diary of a specific date<br>- Is a private document, not often shared with family or friends<br>- Is not written with any kind of regularity |
| **Kept items** | - Are often difficult to save for a long period of time<br>- Do not always elicit memory recall |
| **Communication** | - Is not always shared; people forget to entrust memories to family as it is assumed to be unnecessary<br>- May change memories or their meaning during the process<br>- Result in collective memory; not an individual's memory |

***Figure 2. The Weakness of the Existing Methods of Recording***

### Object Relations and the Development of the Self

The relationship with objects has powerful consequences for human experience. Past memories, present experiences, and future dreams of each person are linked to the object.

"Object affects what a person can do, either by expanding or restricting the scope of that person's actions and thoughts. And because what a person does is largely what he or she is, objects have a determining effect on the development of the self, which is why understanding the type of relationship that exists between people and things is so crucial."[3]

This table shows answers to the question "What are the things in your home which are special to you?" The interviewer used the word "special" throughout the interview to mean significant, meaningful, highly valued, useful, and so on. Three different generations answered this question. The young can gain meaningful especially memories or information from interacting with the most cherished objects. In addition, the visual impressions and direct experience with these objects are helpful for children to obtain a stronger effect. The meaning of objects involves other people; for example, family or friends. Gaining experience and sharing something with them gives us pleasure. Therefore, the relationship with them plays an important role in our memory.

[3] Mihaly Csikszentmihalyi, Eugene Halton. 1981. *The Meaning of Things: Domestic Symbols and the Self.* Cambridge University Press. p.53.

| Children | % | Parents | % | Grandparents | % |
|---|---|---|---|---|---|
| 1. stereos | 45.6 | 1. furniture | 38.1 | 1. photos | 37.2 |
| 2. TV | 36.7 | 2. visual art | 36.7 | 2. furniture | 33.7 |
| 3. furniture | 32.9 | 3. sculpture | 26.7 | 3. books | 25.6 |
| 4. musical inst. | 31.6 | 4. books | 24.0 | 4. TV | 23.3 |
| 5. beds | 29.1 | 5. musical inst. | 22.7 | 5. visual art | 22.1 |
| 6. pets | 24.1 | 6. photos | 22.0 | 6. plates | 22.1 |
| 7. miscellaneous | 20.3 | 7. plants | 19.3 | 7. sculpture | 17.4 |
| 8. sports equipment | 17.7 | 8. stereos | 18.0 | 8. appliances | 15.1 |
| 9. collectibles | 17.7 | 9. appliances | 17.3 | 9. miscellaneous | 15.1 |
| 10. books | 15.2 | 10. miscellaneous | 16.7 | 10. plants | 12.8 |
| 11. vehicles | 12.7 | 11. plates | 14.7 | 11. collectibles | 11.6 |
| 12. radios | 11.4 | 12. collectibles | 12.0 | 12. silverware | 10.5 |
| 13. refrigerators | 11.4 | 13. TV | 11.3 | 13. musical inst. | 10.5 |
| 14. stuffed animals | 11.4 | 14. glass | 11.3 | 14. weavings | 10.5 |
| 15. clothes | 10.1 | 15. jewelry | 11.3 | 15. whole room | 10.5 |

***Figure 3. Special Objects Mentioned at Least Once by Respondents of Three Different Generations***[4]

[4] Mihaly Csikszentmihalyi, Eugene Halton. 1981. *The Meaning of Things: Domestic Symbols and the Self.* Cambridge University Press. p.95.

### Problem Statement

Usually most people have difficulty remembering their childhood among various kinds of memories. Children, in particular, undergo considerable physical, mental, and emotional changes. However, it is not easy for them to realize or later recall, without assistance, their growth process. At present, children can review their growth with different types of records: written data on a medical history, photos in family albums, keeping their clothes or belongings, or listening to stories told about their childhood by their parent. However, it is difficult for children to keep physical records together with other childhood memories.

Many of us have memories of parents measuring our growing height and marking it on a wall. This process is pleasurable; it is something parents and growing children can do together and the process yields a memory they can later share. This sort of nurturing interaction promotes familial intimacy. A problem, of course, is that nobody can keep the wall to see it whenever they wish. Childhood memories can be significantly assisted when a child can see a record at any time and share it with family members who perhaps recorded the growth with the child.

Therefore, we need to design a device to record a wide variety of memories, including records of children's physical growth. We might call this a "time-measuring" device. With this device, each family will be able to capture memories in their own way and will be able to share these memories in interesting ways with their family.

*Figure 4. A Father Measuring Daughter's Height*[5]

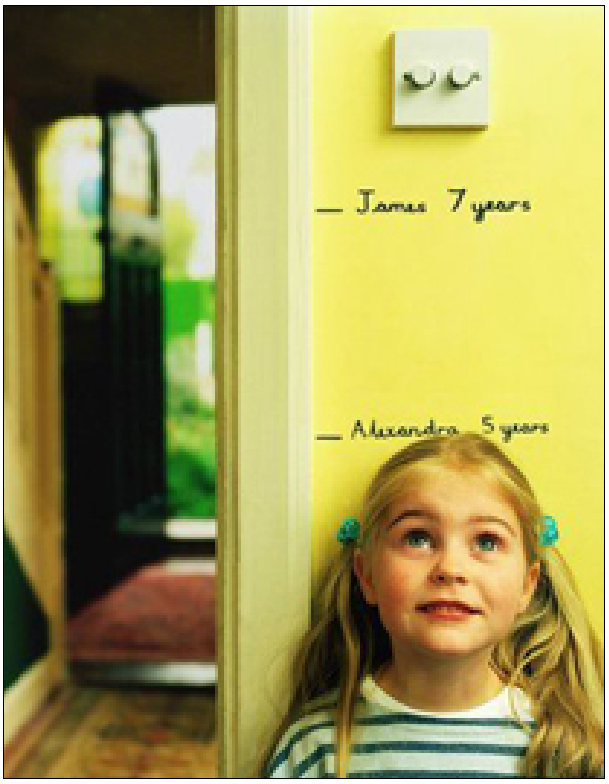



*Figure 5. Little Girl Standing Against Wall Marked with Heights*[6]

[5] http://www.gettyimages.com/Search/Detail.aspx?axd=DetailPaging.Search|1&axs=0&id=71928703
[6] http://www.gettyimages.com/Search/Detail.aspx?axd=DetailPaging.Search|1&axs=0&id=200117476-001

### Six Prototypes of Time-Measuring Device

I made several prototypes of a time-measuring device to record children's physical growth and encourage interaction between parents and children. The prototypes suggest how to measure children's physical size in different ways, have a great time with parents and children, and share the interesting memories later. Lastly, it will help to develop the process for this project and obtain additional ideas.

I will explain the prototypes of the time-measuring device, which includes the following six ways of measuring children's physical size:

1. Measuring Tape for height
2. Special Clothes for body size
3. Contour Line for feet size
4. Kicking Mat for footprints
5. 3D Scanning for physical size
6. Silhouette for physical growth

### 1. Measuring Tape for Height

A measuring tape allows you to measure children's height. Many of us have memories of parents measuring our growing height and marking it on the wall. It is pleasurable. We can later share. This interaction promotes familial intimacy. One drawback is that no one can keep the wall to see it whenever we wish. This device has several pieces. Each piece represents a child's height in every year. Parents measure their height, cut the measuring tape, and roll it up. These are as shown in the following figures. The Y axis represents time. So as time passes, they are growing. It may be a metaphor for a child's own "tree". Their "tree" grows as time passes. In addition, we can use the tape to write down special memories that occurred at the time the measuring took place.

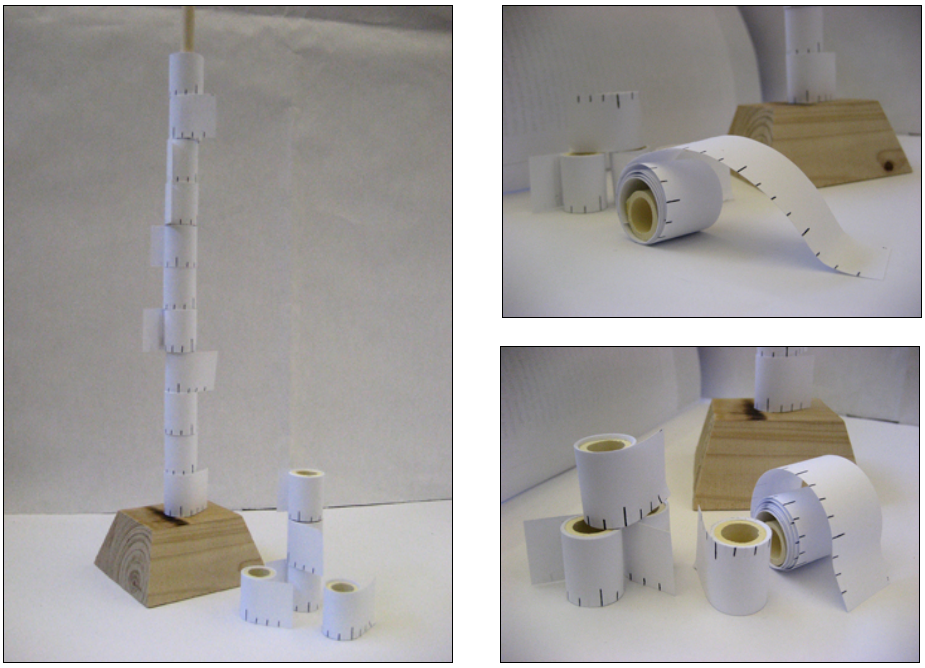


*Figure 6. Tree of Children's Height*

### 2. Special Clothes for Body Size

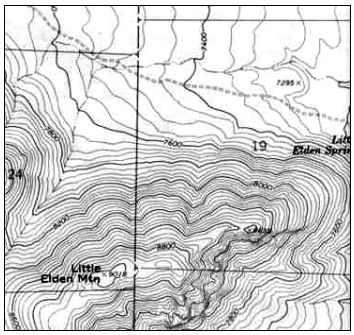
Children and parents can make their own dress with different materials or decorations as the child grows. This dress will be a special costume for a birthday, holiday, or any family days. Much like a quilt, they can make it longer, or they can add long-sleeves to make a shirt with various patterns or colors of textile as desired. This will be unique, with each part representing a part of their past.

*Figure 7. Examples of Clothes*

If a little girl was wearing the left example when she was six years old, the right example is for her use after a few months or one year later. The blue pattern textile is an added part that the parents and child created.

### 3. Contour Line for Feet Size

Children can create a unique line depicting their foot size. It looks like a contour line. As time passes, new lines will be more interesting. Some parts are overlapped and the other parts are getting wider. Overtime it becomes more interesting. They can make a foot's outline with different height like a contour line, similar to a mountain's height. Children can also hang it on the wall and see their changes more easily.



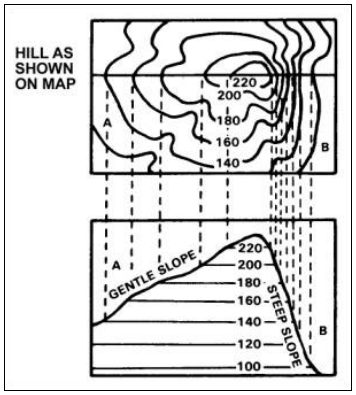




***Figure 8. Contour Lines***[7]

***Figure 9. Mountain Slope***[8]

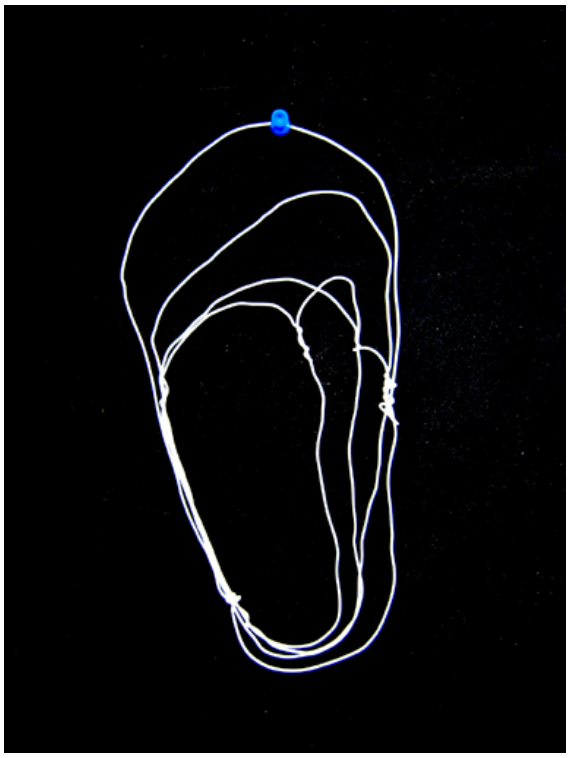


***Figure 10. Contour Lines of Foot Size***

[7] http://www.ghosttowns.com/Images/contor.jpg

[8] http://www.armystudyguide.com/images2/a0133.jpg

### 4. Kicking Mat for Footprints

Let us suppose there is a mat hanging on the wall. The mat's material is soft rubber, much like a yoga mat, which may be used flat or rolled. Children can then kick the mat as time passes. They make impressions by their power, pressure, or size of foot. As a result, they can leave their footprints of different sizes on it.

***Figure 11. Footprints on the Sands***[9]

***Figure 12. Study Mock-Up***

[9] http://www.itravelfootprints.com/Pictures/Paid%20for%20Pics/Footprints%20in%20sand1.jpg

### 5. 3D Scanning for Physical Size

This concept uses scanner technology to measure physical size. In this case, there is a three-dimensional scanner in the child's room. The machine is a floor-standing type. It reads child's body size, including a scar which was obtained a long time ago. After scanning, their three-dimensional body image is projected on the wall. Once projected, children and parents may control the image on the wall much like a futuristic movie. It has several functions: changing a unit for size, checking growth process as they grow older, creating an imagined body as they wish, comparing it with other family member's size, transmitting the images to mobile phone and computer, and providing children and parents with useful information about what they have to eat for a healthy body, etc.

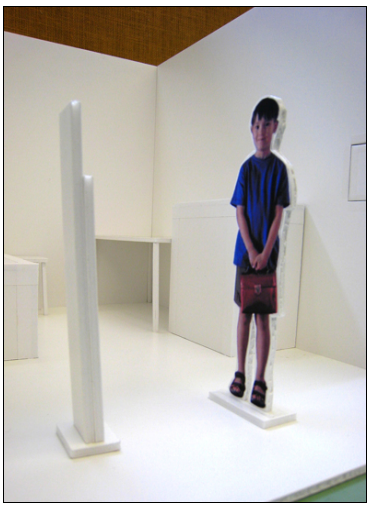


*Figure 13. Study Mock-Up for Scale of the Scanner*

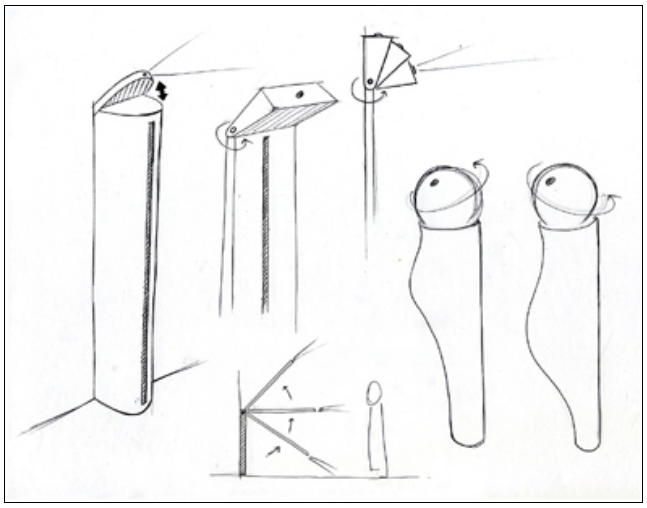


*Figure 14. Concept Sketch of the Scanner*

### 6. Silhouette for Physical Growth

This concept employs many identical blocks. Several lighting points are sticking out of the each block, which can be assembled and disassembled for moving. The basic block has terminal plates at both sides. All blocks can be charged with electricity when they are assembled. The assembled blocks can be one wall in children's room. Children pose in front of this wall, parents then draw a silhouette with yarn. Its length represents their body circumference. Each silhouette may be overlapped. The lighting points are connected with yarn and they can rotate the tip of the lighting points. It turns on a light according to the silhouette and is changed the color for rotating the point. In addition, the lighting of the silhouette represents a children's "constellation" at night. They can fall asleep with their shining star sign. Parents can also hang a tag with special memo or date on the yarn.

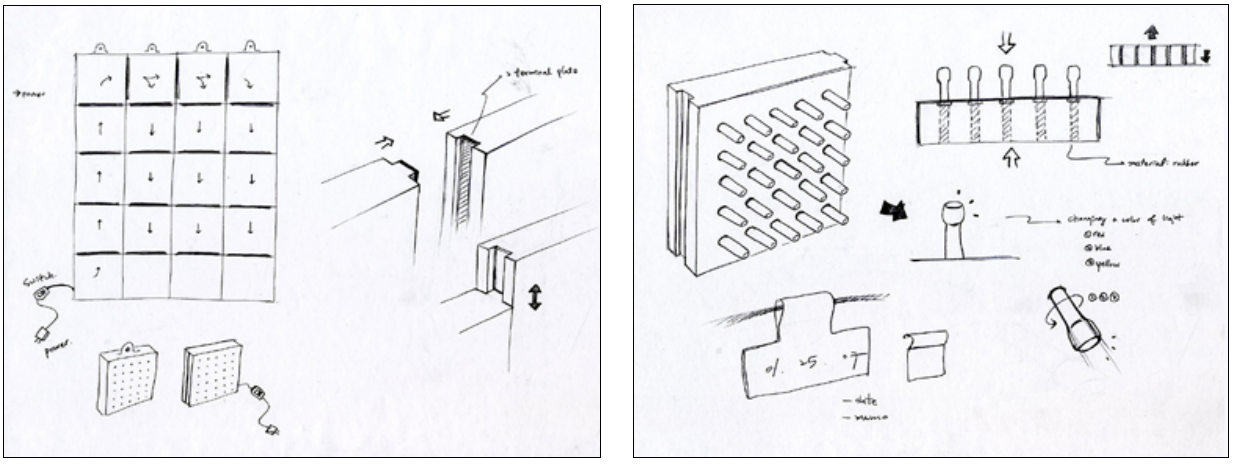


***Figure 15. Concept Sketches of How to Assemble the Blocks and Control the Light***

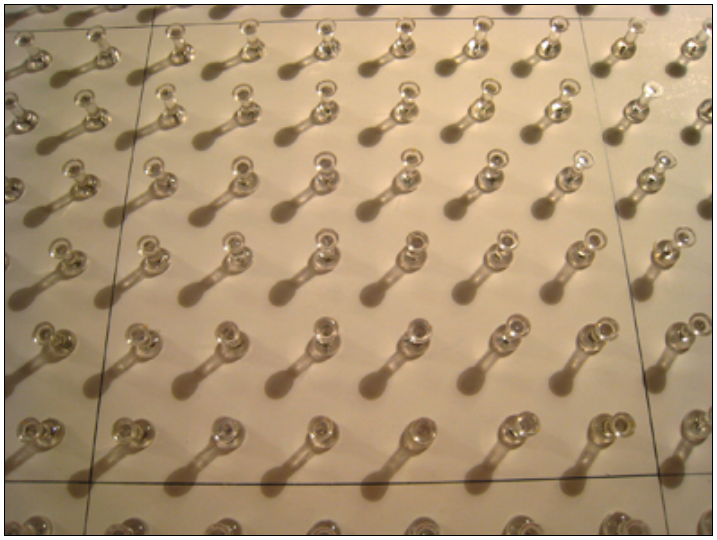


*Figure 16. Study Mock-Up of Basic Block with Lighting Point*

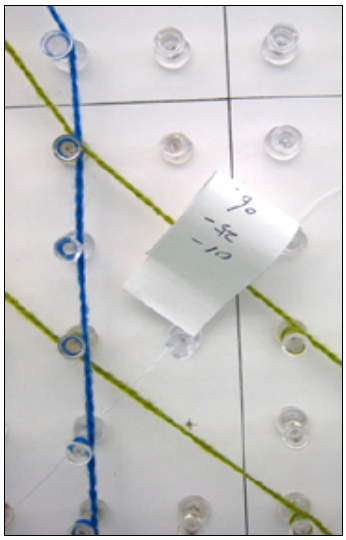


*Figure 17. How to Put on a Tag*

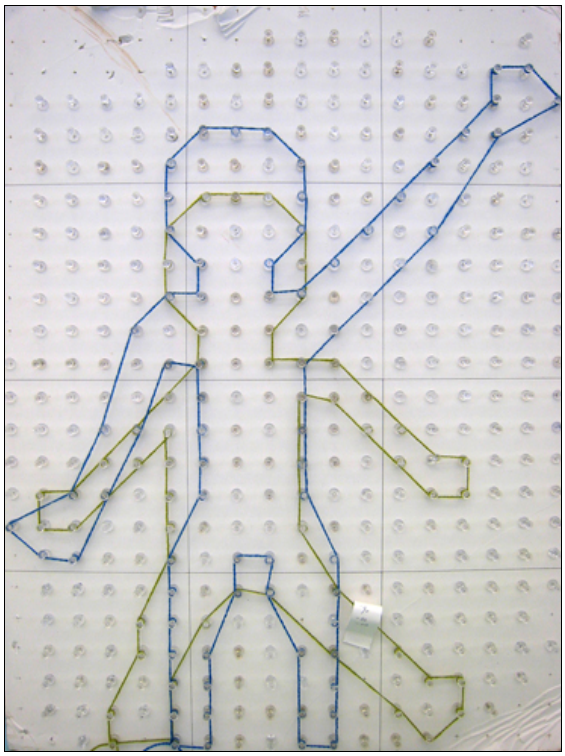


*Figure 18. The Finished Silhouette*

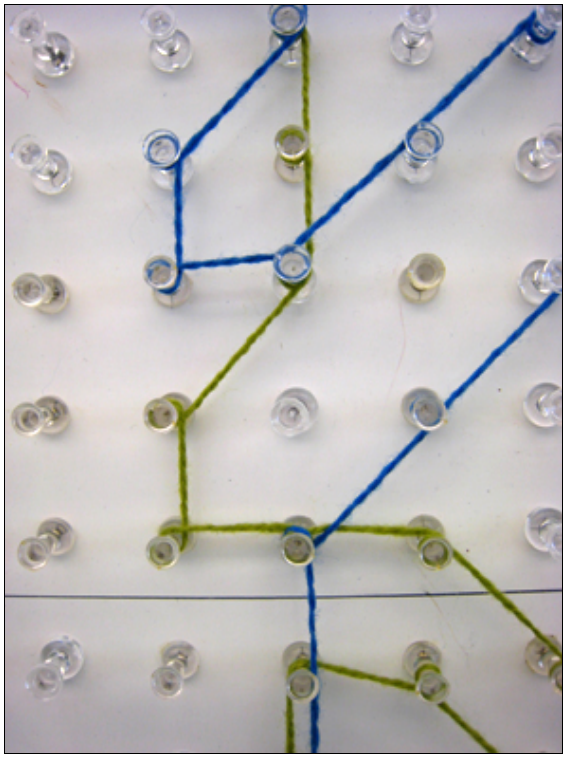


*Figure 19. How to Connect Lighting Points with Yarn*

### Analysis of the Prototypes

- I need a well-organized method of recording for the time-measuring device.
- This activity is not a one-time event, but a systematized way for seeing their growth at a glance and recording it easily every year.
- It can be more memorable if it includes a pleasurable interaction between parents and children while they are recording their physical size.
- Of course, the moment when they are recording is important, but also the permanent record of the result is even more important.
- Keeping children's record of physical history is also meaningful for them.
- The silhouette can accurately show children's physical growth, like an annual ring.
- A child's body silhouette is more useful and meaningful for recording than the specific physical sizes of individual body parts.

### Design Motive

I was motivated to design a time-measuring device from prototypes I had seen of a child's silhouette. Silhouette is a useful and attractive element for various fields of design. Above all, it includes children's physical size, and its overlapping can create interesting effects. I will apply a silhouette to the device.

> The silhouette is the plane image, means of art expressiveness, and a drawing kind. Quality of a silhouette is used by artists in all art forms. In a silhouette of a figure or subjects are drawn by usually continuous black stain on a light background or white on a dark background. The silhouette is one of the strongest, bright, truthful, and expressive means of a drawing. With its help it is possible to characterize a human figure or a portrait, to allocate it among other figures. (http://blog.dreamstime.com/2008/04/11/silhouette-as-expressive-means-of-a-drawing_art26059)

*Figure 20. The Overlapped Silhouettes*

*Figure 21. Footprints*[10]

*Figure 22. Silhouette of a Female*[11]

[10] http://www.cubanews.ain.cu/2007/1024icograda.htm
[11] http://www.silhouettesclipart.com/category/people-clip-art/

### Idea Sketches of How to Design the Device with Children's Silhouette

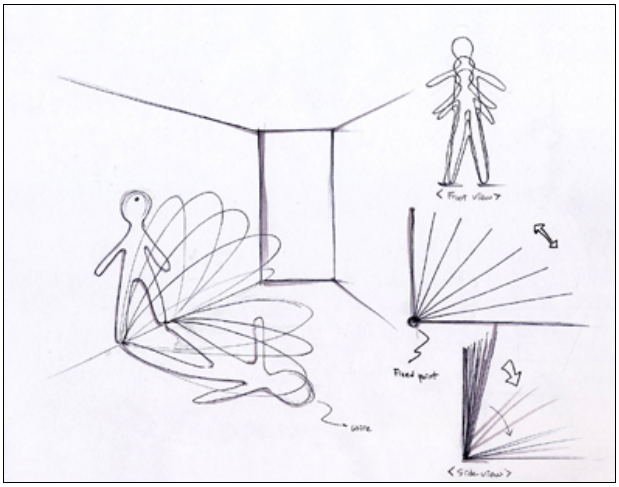


*Figure 23. Wired Silhouettes*

- Parents and children see the changes of physical growth through the silhouette.

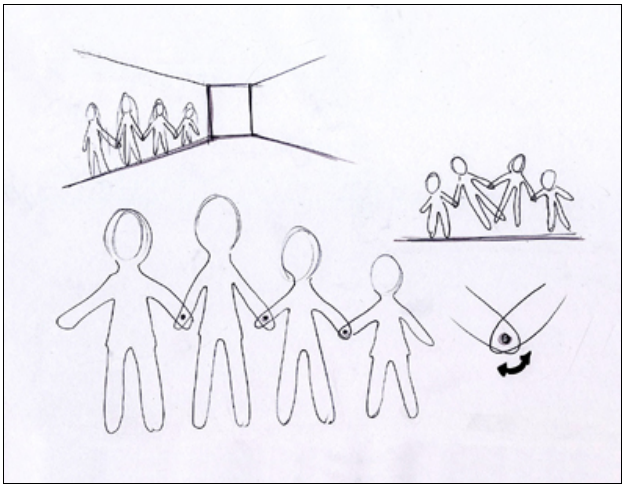


*Figure 24. Connected Silhouettes with Joints*

- All silhouettes express interesting movements with movable joints.

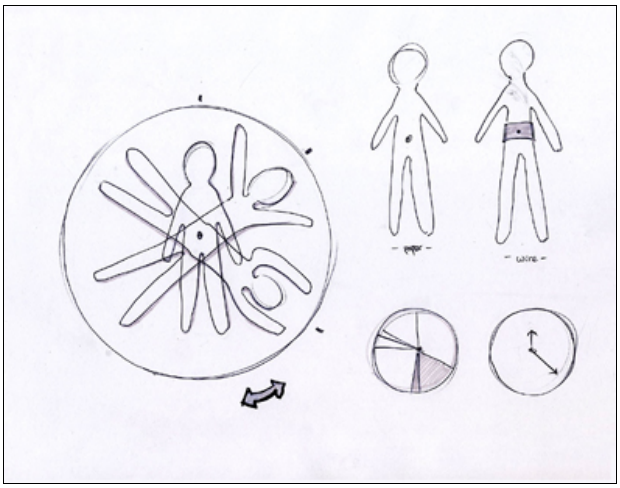


*Figure 25. Silhouette of Life Schedule*

- Each silhouette may be represented as a hand on a clock. It shows children's age.

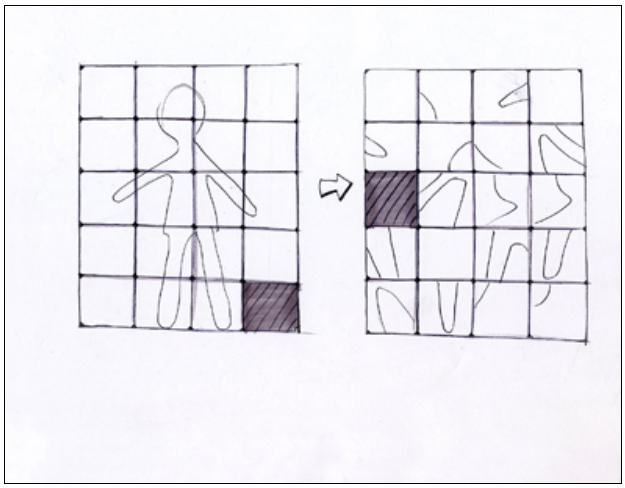


*Figure 26. Silhouette and Puzzle*

- Children and parents can rearrange mixed puzzle pieces to finish their silhouette.

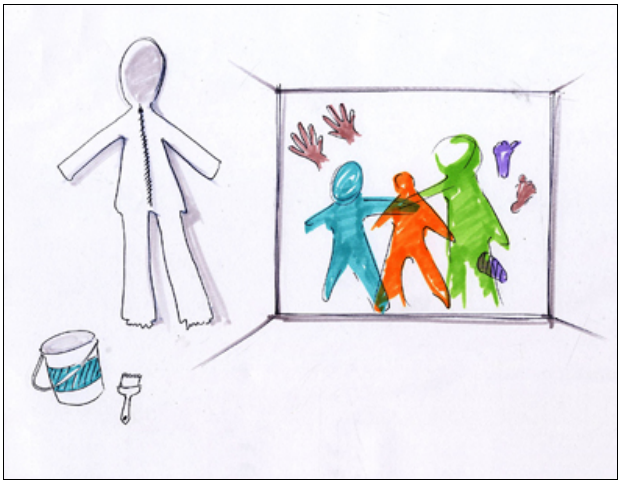


*Figure 27. Silhouette and Painting*

- Child wears a working uniform for painting.
- They can draw a picture using their body.

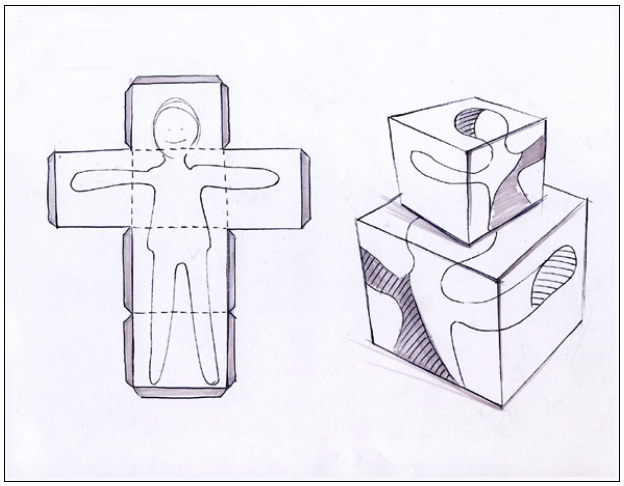


*Figure 28. Silhouette Box*

- A cube tells child's age and physical size.
- Its size corresponds with the child's height.

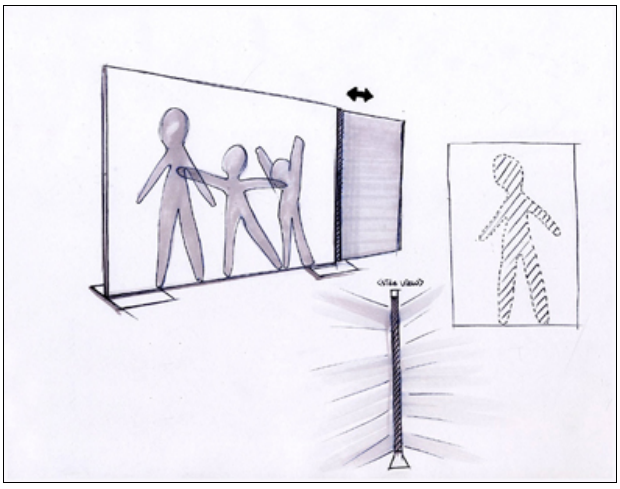


*Figure 29. Silhouette and Partition with Light*

- This is a partition in a children's room.
- They can see the brightness of an overlapped silhouette when a light is turned on.

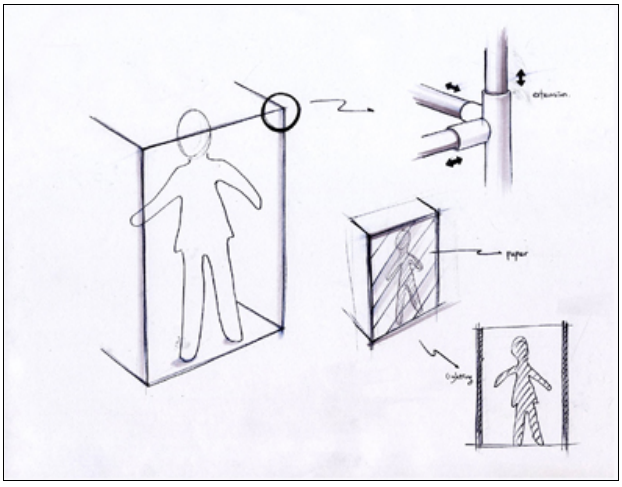


*Figure 30. Silhouette and Extensible Frame*

- They can extend the frame of a child's body size because children keep growing.
- It makes a shadow picture.

### Concept of Design

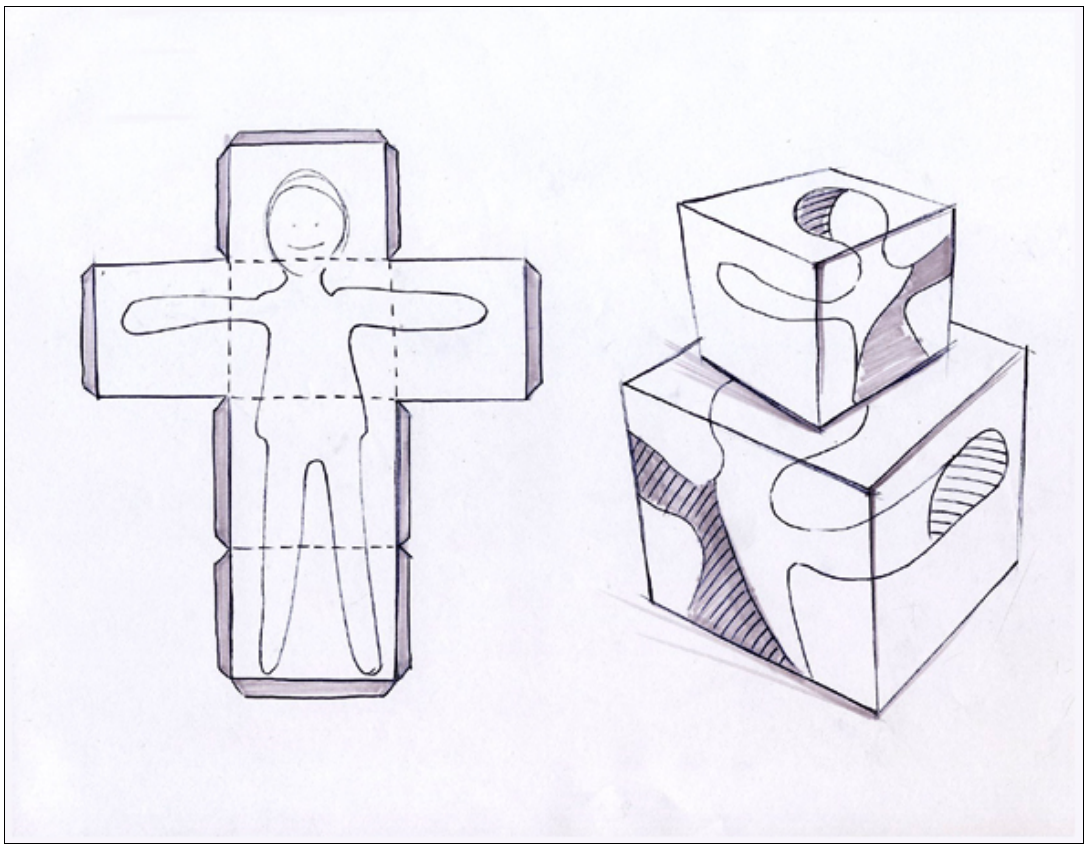


*Figure 31. Selected Silhouette Box*

I chose this idea for a time-measuring device, with children keeping their memorable items in this box. The box provides an interesting silhouette documenting their physical size. In other words, it is a storage box with a record of their physical growth on it. This customized box is much like a time capsule. This box size reflects the children's height and body size so every box size is unique. As they grow, the box size increases. Parents can help their children to create the box. In addition, they will have a great time together sharing their memories and experiences during the process of making a box. Their interaction promotes familial intimacy.

### Three Functions of Time-Measuring Device

1. Storage Box

   Children get a box which reflects their physical size and is used for storing precious items.

2. Children's Birthday Gift Box

   Parents prepare 'Time-Measuring Device' before children's birthday for giving as a present.

3. Decoration

   This box can be a decoration items as it is meaningful in itself.

   Children and parents can design the box in whatever way they want.

### Five Benefits of Time-Measuring Device

1. Measuring Physical Size

   This is measuring children's physical size in a memorable and pleasurable way.

2. Structuring Social Ritual

   They can set a date for measuring children's physical size and make their own box once a year, for example. It can strengthen the relationship between parents and children.

3. Visualizing Growth

   It is possible to visualize growth process and compare the present with their past.

4. Making a Children's Room

   Children can decorate their room with meaningful items.

5. Promoting Childhood Development

   It can foster a more rewarding childhood.

### How to apply the silhouette to the box

'Time-Measuring Device', which is joins a storage box and silhouette together, is a meaningful item in itself. It is not for only children but for both parents and children. Therefore, it has to be pleasurable and fun and must provide an interesting interaction between parents and children while making the box. It could be a process for applying the children's silhouette to the box reflecting their body size. If it involves only drawing a silhouette of the body, it may leave not much to remember. The 'Time-Measuring Device', however, becomes a memorable item for them when they use their creativity.

***Figure 32. Swoon's Artworks***[12]

[12] Swoon is a street artist from New York City who specializes in life-size wheatpaste prints and paper cutouts of figures. ( http://gammablog.com/gammablablog/featured/swoon-manchester.html )

This step is important in my project because parents and children participate together in drawing the silhouette on the box for recording their physical size, and to share happy memories while they are making a box. It means they create their own box with a unique way of image-capturing what they selected, not just drawing a silhouette with pen or pencil like most other silhouette applications. Therefore, I need to develop exciting and memorable ways to capture children's silhouettes.

I will explain the experiments on image-capturing, which includes the following thirteen ways of making a silhouette on the box:

1. Blueline Paper – Sunlight – Ammonia
2. Translucent or Opaque Paper – Colored Yarn
3. Transparent Paper – Marker
4. Opaque Paper – Color Powder – Glue (stick type)
5. Opaque, Translucent and Transparent Papers
6. Fabric – Colored Yarn
7. Opaque Paper – Newspaper
8. Opaque Paper – Glue (included a color powder)
9. Transparent or Opaque Paper – Pictures
10. Opaque Paper – Pen
11. White Paper – Color pencils
12. Transparent Paper – Cardboard
13. Wooden Plate – Corner Pieces

### The Experiments on Image-Capturing

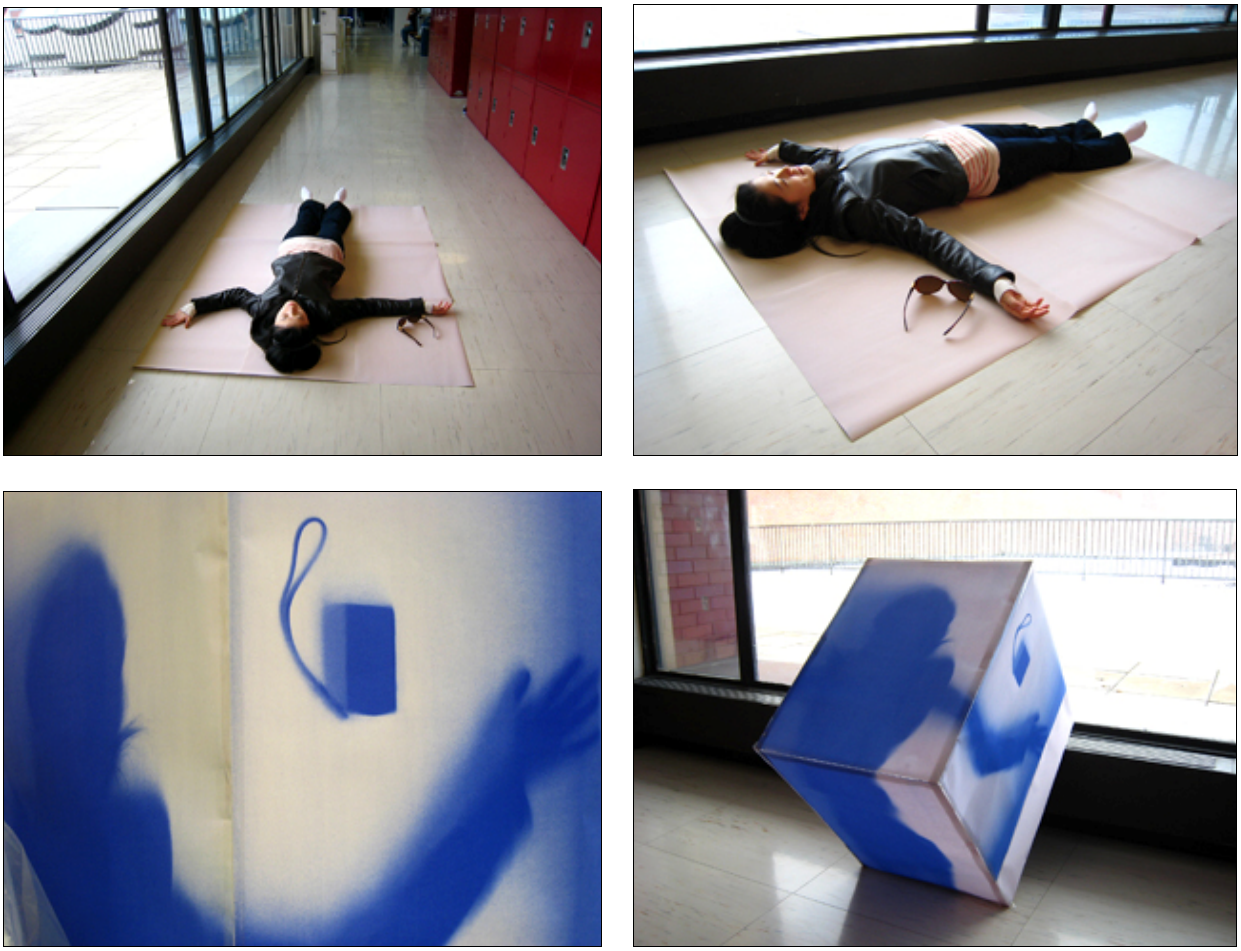


*Figure 33. Blueline Paper - Sunlight - Ammonia*

① Lie on the blueline paper, then expose body to sunlight for 5 ~10 minutes

② Pass the blueline paper through ammonia vapors

It is important thing not to expose the paper to the sunlight after the first step (posing – exposing).

- It is possible to express a unique silhouette.

- The shadow could not be perfect because the outline of children's body is not precise.

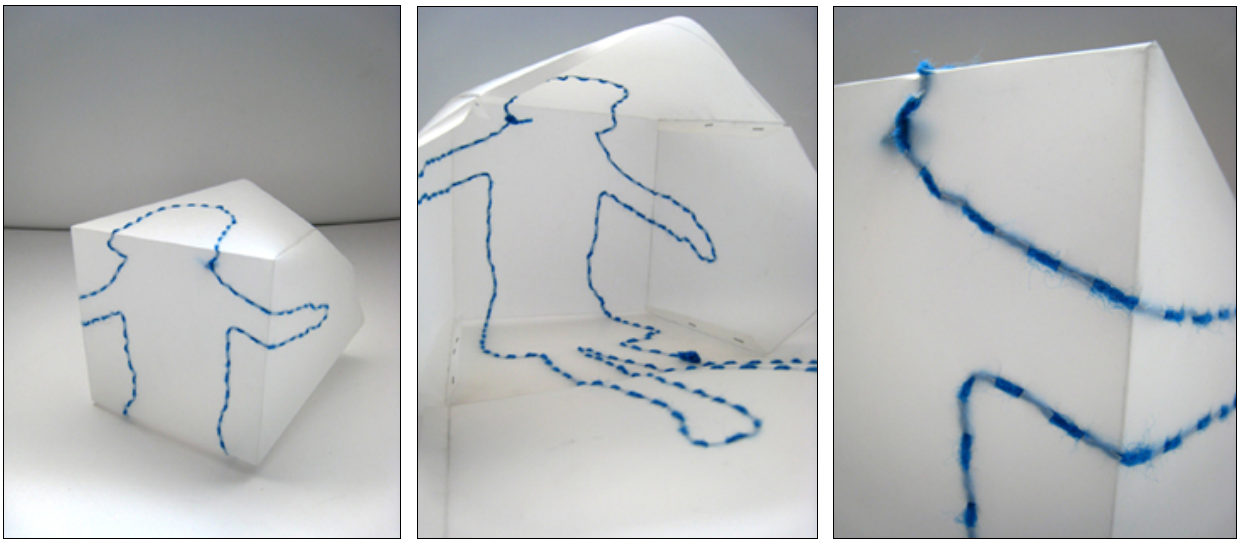


*Figure 34. Translucent or Opaque Paper – Colored Yarn*

① Make a lot of holes on the paper along the children's silhouette.

② Stitch with colored yarn

- They can get a same effect in both sides of the box (inside – outside) at a time.

*Figure 35. Transparent Paper – Marker*

① Draw a children's silhouette on a transparent paper with a marker or other kinds of pen

② Fold the transparent paper into a cube

- They see the silhouette through the any sides of cube.

- If the boxes are nested, they can see the silhouette which is made one year earlier.

*Figure 36. Opaque Paper – Color Powder – Glue (stick type)*

① Draw a silhouette with glue (stick type)

② Sprinkle color powder on it, then shake off the excess powder

③ The silhouette with color powder will remain on the paper.

- While there are no details, it is easy and fun for children to capture image.

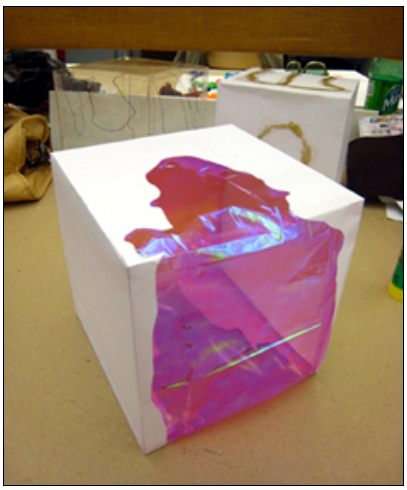


*Figure 37. Opaque, Translucent and Transparent Paper*

① Cut an opaque paper along the children's silhouette

② Make up with pierced silhouette with a translucent or transparent paper

③ Fold and attach for making a cube

- They can see the inside of the box through their silhouette.

*Figure 38. Fabric – Colored Yarn*

① Cut the fabric along the children's silhouette

② Sew the pierced silhouette in zigzag with colored yarn

- They can get a same effect with shoelaces.

*Figure 39. Opaque Paper – Newspaper*

① Cut an opaque paper along the children's silhouette

② Make up with pierced silhouette with a newspaper

③ Fold and attach for making a cube

- They can read the news coincident with making the cube.

- It could be a scrap book of children's life.

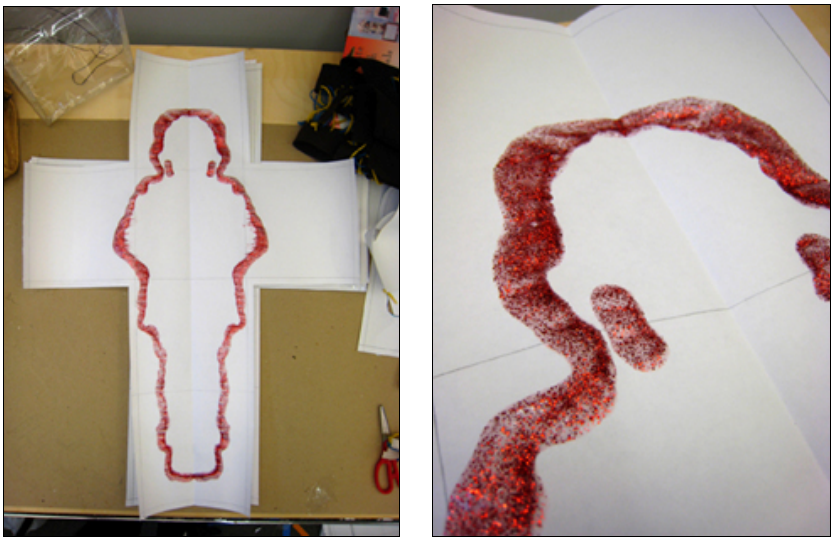


*Figure 40. Opaque Paper – Glue (included a color powder)*

① Draw a silhouette with glue only to half side of paper

② Fold the paper in half

- It is easy and fun to make a silhouette for children.

- There is a limit to draw a various silhouettes because it can express only symmetrical shape.

*Figure 41. Transparent or Opaque Paper – Pictures*

① Print out actual image of children

② Attach the image on the paper

③ Fold a paper for making a cube

- It is very realistic way to capture children's image.

- They can take a picture of various poses.

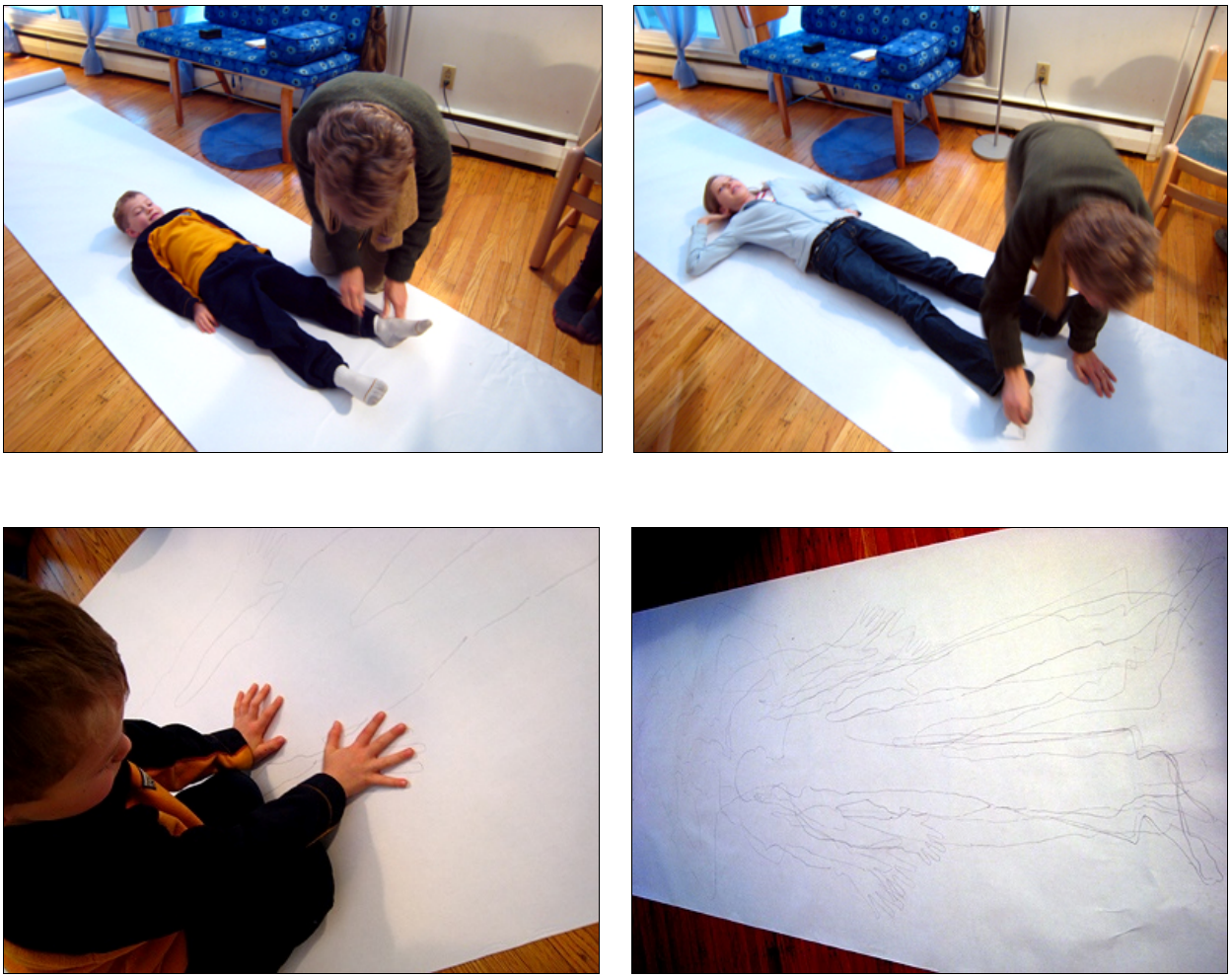


***Figure 42. Opaque Paper - Pen***

① Lie on the paper, then make a pose

② Parents help to draw a silhouette along the children's body on the paper.

- Parents and children can see the physical growth like an annual ring.

- It is easy and simple to make a silhouette.

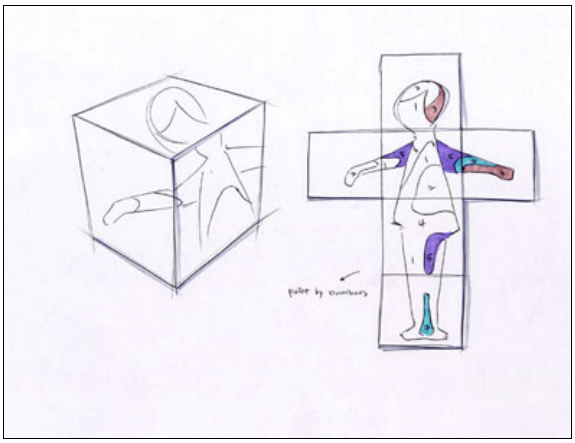


***Figure 43. White Paper – Color pencils***

① Draw a silhouette on the paper

② Make a 'Paint by Numbers'

③ Paint the silhouette with different colors

- Most children like 'Paint by Numbers'.

- Parents can help them to paint.

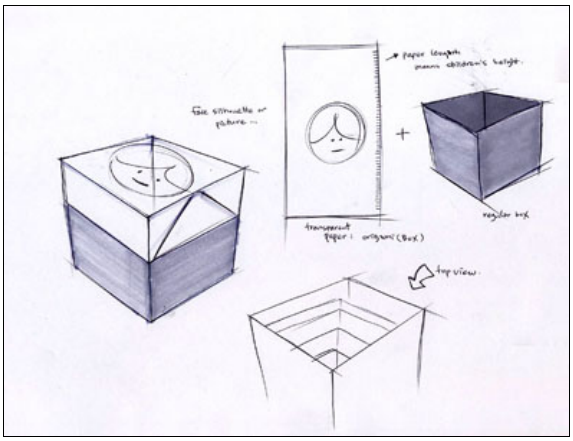


***Figure 44. Transparent Paper – Cardboard***

① Cardboard will make the bottom of the box.

② Fold a lid with transparent paper

② Draw a silhouette on top of the lid

- They can see the various silhouettes through the top of the box if boxes are overlapped.

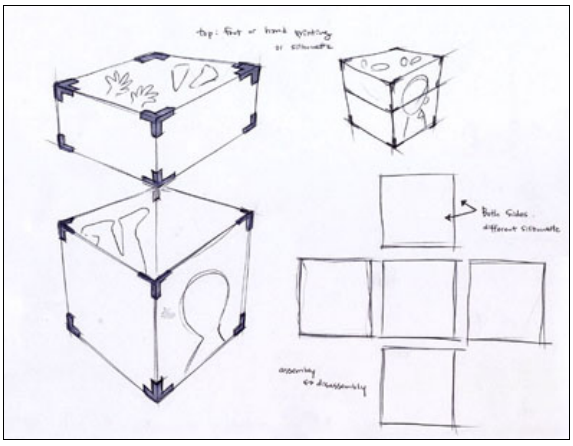


***Figure 45. Wooden Plate – Corner Pieces***

① Cut wood sheet into 10 plates for box and lid

② Engraving a silhouette on the wooden plate

③ Paint the engraving plates with colors

④ Assemble the plates with corner pieces

- The silhouette can be a permanent record.

### Selected Four Ideas of Image-Capturing

In choosing the final approaches, I considered the following criteria: it is an interesting and unique way for capturing children's silhouette, it shows children's physical growth well, children and parents can enjoy applying the silhouette to the box, it has interaction between parents and children during making the box, etc. These four ideas as below satisfy the purpose of image-capturing process.

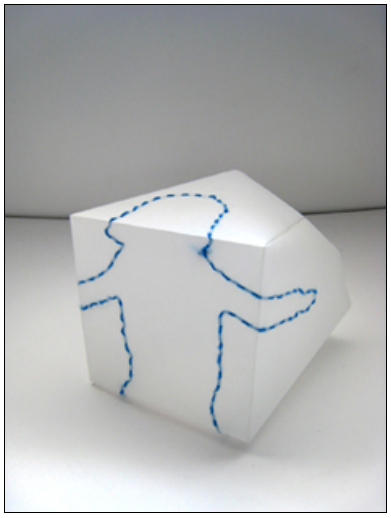


*Figure 46. Stitch*

*Figure 47. Image Printing*

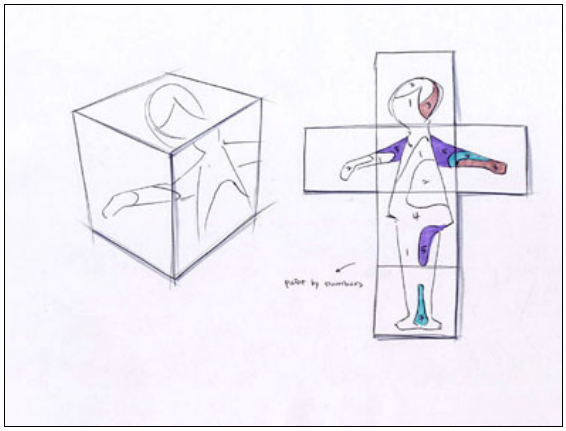


*Figure 48. Paint by Numbers*

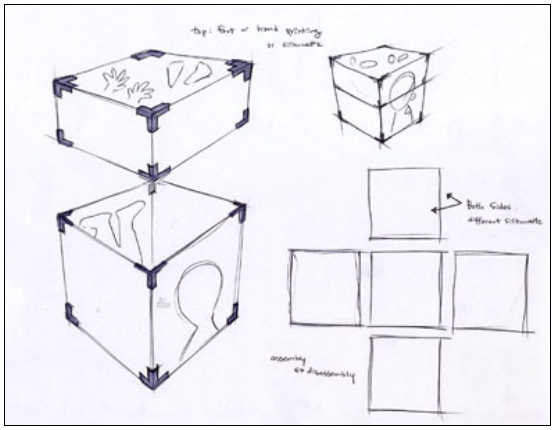


*Figure 49. Woodcut*

### How to Order the TMD

Let us suppose that there is a web site for the Time-Measuring Device (TMD). Parents and children can then visit the web site and order the TMD. If parents input children's physical size and choose the style of the TMD on the web site, then a package containing the contents for making a box is delivered a few days later. Parents and children can share their thoughts while they select styles of the TMD with associated details online. Once received, they can create the box. It makes for an enjoyable time for them. Information about their physical growth is saved on the web site for future visits. They will see for themselves how much they have grown.

### Ordering Process

1. Visit the web site of the TMD
2. Select the style of the TMD you want online
3. Find children's picture which reflects in the pattern of cube

   (They can try to adjust the image with the guide line we provide you on the web site.)
4. Choose the details of manufactures for making the box
5. Save the picture online
6. Input children's physical size
7. Check-out the order
8. The package is delivered.
9. Parents and children assemble and create the TMD together.

## Research of Web Site


***Figure 50. Wal-Mart Digital Photo Center***

(https://www.walmart.com/subflow/YourAccountLoginContext/1305112305/sub_generic_login/start.do?login=1)

: Order to print out photos and make a product with photos online

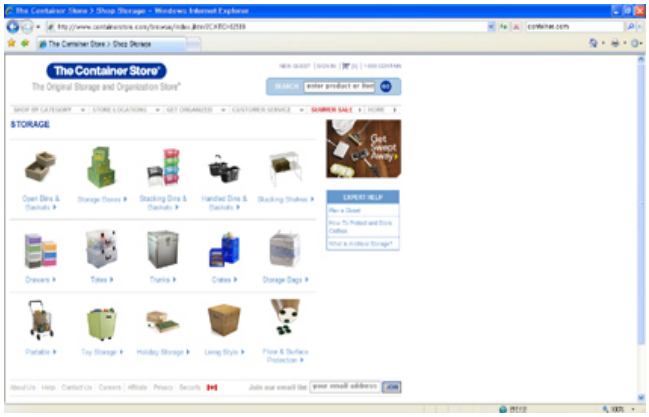



***Figure 51. The Container Store***

(http://www.containerstore.com/browse/index.jhtml?CATID=62519)

: Purchase various storage units online and get help in organizing your space


***Figure 52. Hallmark***

(http://www.hallmarkcontests.com/index.cfm)

: Create your own card with your unique ideas and pictures

### Introduction of Children for Final Models

I took pictures of children in my church and made my final models from the three children. I was measuring their height when I took a picture. The clinical growth chart was a good guide. Sung Wook and Sung Hee are brothers and sisters for reference. Their name, age, and height are shown below.

***Figure 53. Pictures of Three Children for Final Models***

Sung Wook

5-year-old

Approx. 46 inches tall

Sung Guk

4-year-old

Approx. 43 inches tall

Sung Hee

3-year-old

Approx. 40 inches tall

## Clinical Growth Charts of Children

The following clinical growth chart reflects modifications in the format of the individual charts. This chart shows the children's standard physical growth. It is targeted for children from 2 to 20 years: Boys

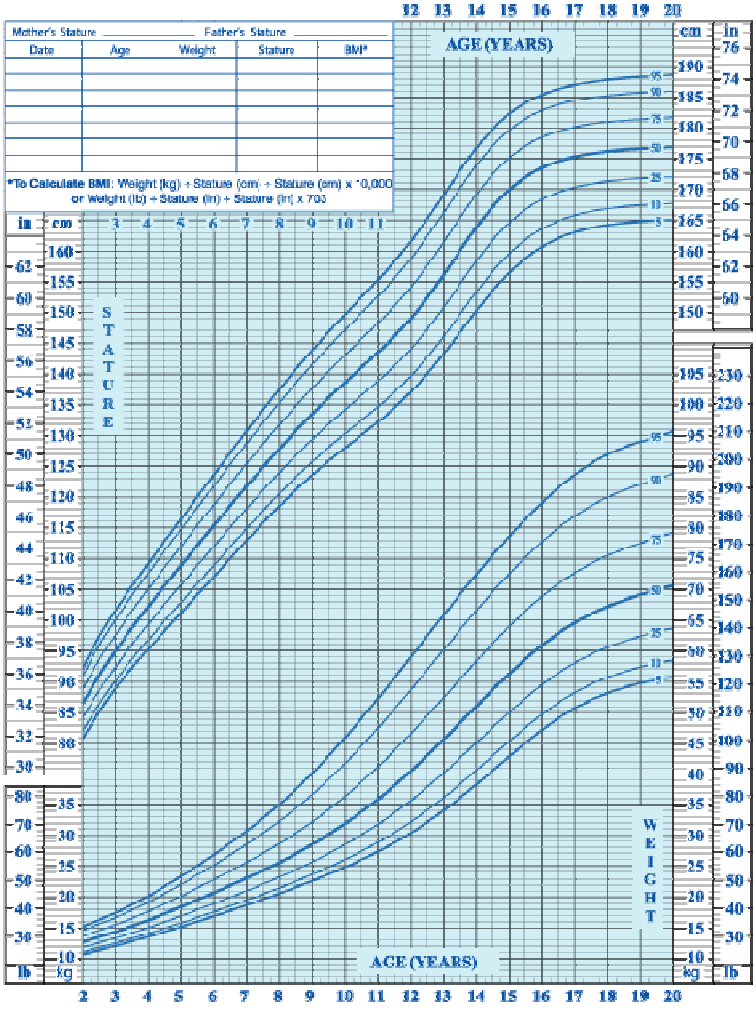



***Figure 54. Stature-For-Age and Weight-For-Age Percentiles of Boys***[13]

[13] Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000) ( http://www.cdc.gov/growthcharts/ )

### Clinical Growth Charts of Children

The following clinical growth chart reflects modifications in the format of the individual charts. This chart shows the children's standard physical growth. It is targeted for children from 2 to 20 years: Girls

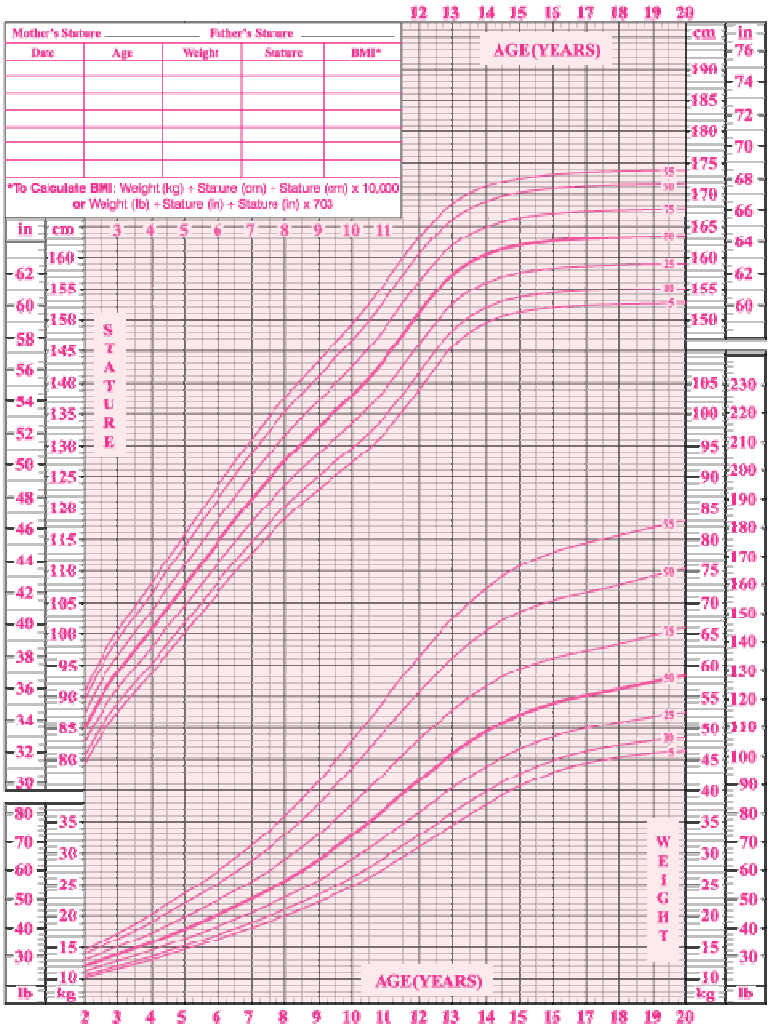



***Figure 55. Stature-For-Age and Weight-For-Age Percentiles of Girls***[14]

[14] Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000) ( http://www.cdc.gov/growthcharts/ )

### Style 1 – Paint by Numbers

Children's photo turns to 'Paint by Numbers' for creating unique artwork of their silhouette. Parents and children can enjoy painting the child's silhouette on the box. Each box could be a special artwork for them after painting.

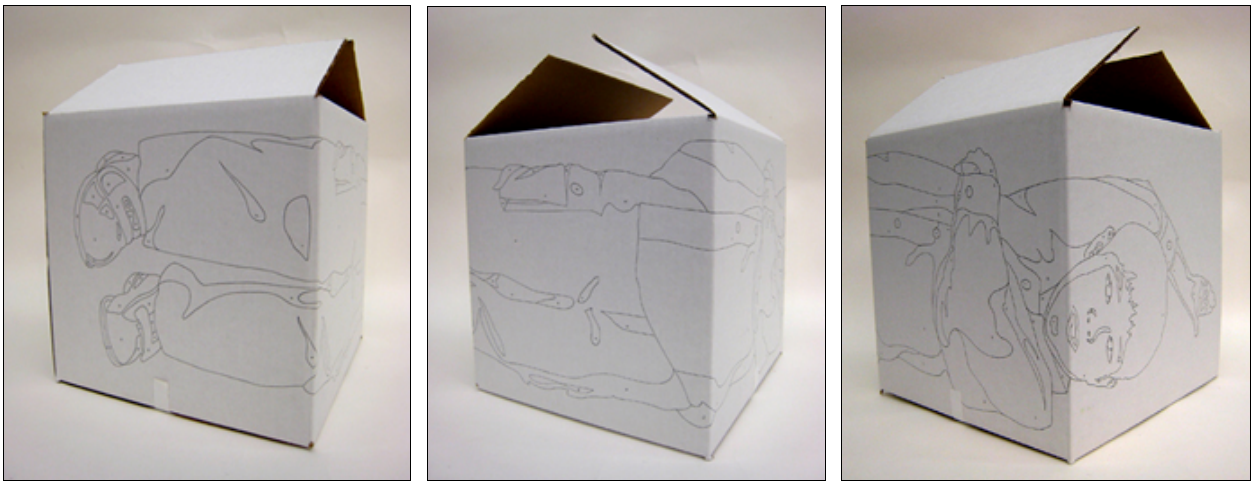


*Figure 56. Finished Box before Painting*

### How to Get This Box on the Time-Measuring Device (TMD) Web Site

1. Choose 'Style 1 – Paint by Numbers' on the web site
2. Upload the children's picture and physical size
3. Use the optional category on the web site to get a color palette for painting
4. The package is delivered a few days later.
5. Paint the silhouette on the box together
6. Make the box which reflects the child's physical size

### Contents of the Package

The package of 'Style 1-Paint by Numbers', which includes the following three materials for making their own box:

1. White corrugated box which is printed in 'Paint by Numbers' using the children's photo
2. Description of the color key
3. Color palette (option)

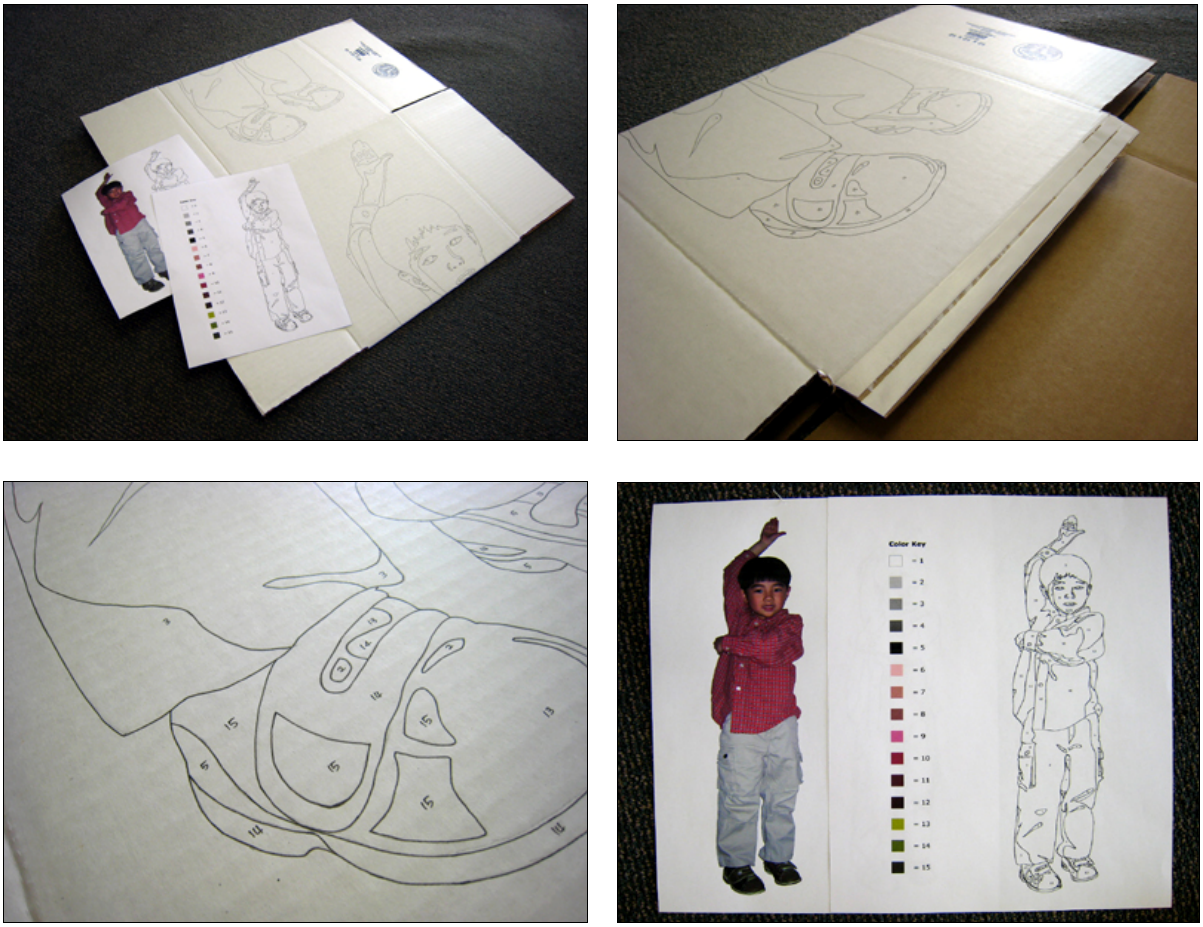



*Figure 57. Contents of the Package*

### Style 2 – Image Printing

Parents and children can see their past-through-present if the images on the different boxes are overlapped. It means they can check their physical growth at a glance.

*Figure 58. Finished Box*

### How to Get This Box on the Time-Measuring Device (TMD) Web Site

1. Choose 'Style 2 – Image Printing' on the web site
2. Upload the children's picture and physical size
3. The package is delivered a few days later.
4. Parents and children assemble the box and attach the image on the box.

   (The image is printed on decal paper. So they can attach the image on the box easily.)
5. Give the child the box, which reflects in their physical size

   (They can nest a smaller box in a bigger one.)

### Contents of the Package

The package of 'Style 2 – Image Printing', which includes the following five materials of making their own box:

1. Assembly description
2. Six clear acrylic plates
3. Children's photo printing
4. Four side connections
5. Four bottom-side connections

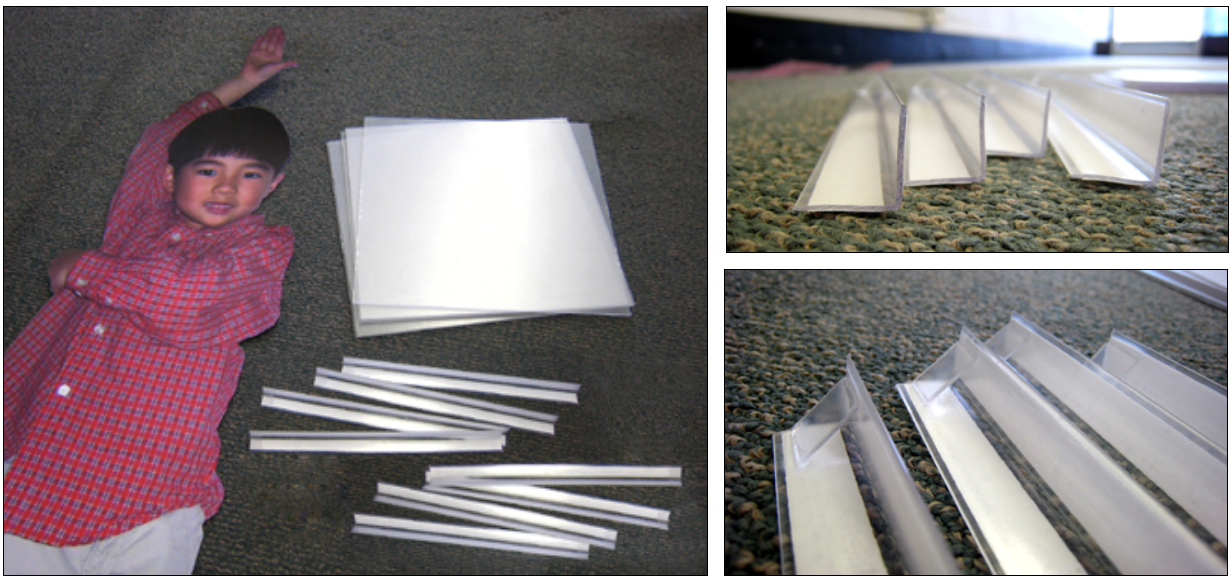


*Figure 59. Contents of the Package*

*Figure 60. Each Box of Three Different Ages*

Children can make a different pose as much as possible as long as their image can fit in the pattern of the box.

*Figure 61. How to Assemble Connections and Plates into the Box*

There are eight connections in the package. Four of them connect each side and a left connect side and bottom. I used a double-stick tape for attaching between eight connections and acrylic plates. This allows the lid to open for keeping memorable items.

### Style 3 – Stitch

Parents and children decorate this box with colored yarn. They can get the same effect on both the inside and the outside of the box a stitch at a time. In addition, children can better understand and appreciate the traditional aspect of a mother's sewing activity.

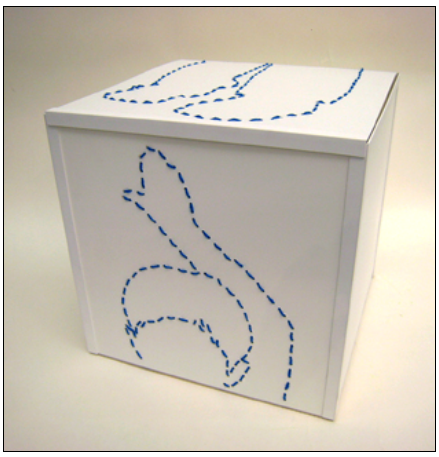


*Figure 62. Finished Box*

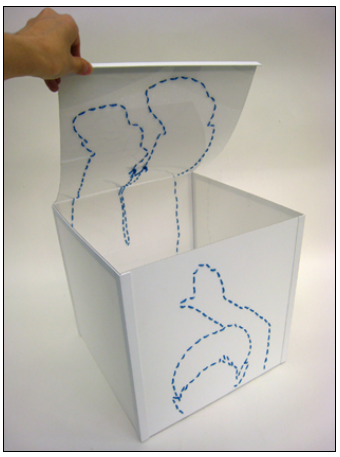
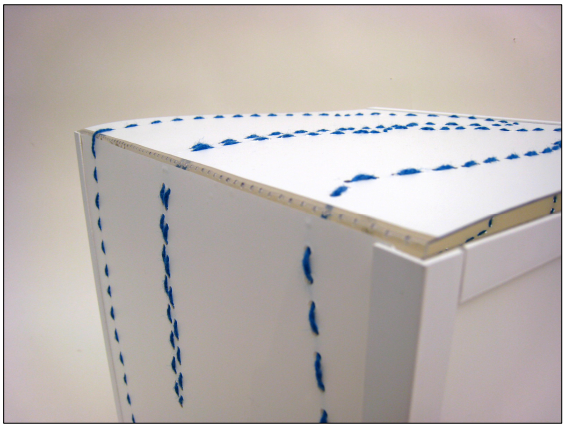


*Figure 63. Inside and Outside View*



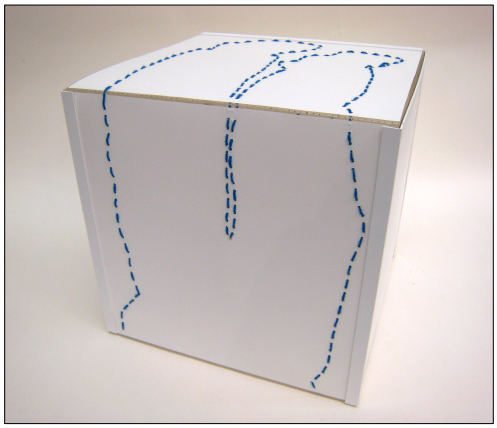


*Figure 64. How to Fold the Sheet*

There are perforated lines for folding the box. Therefore, parents and children can fold it easily.

### How to Get This Box on the Time-Measuring Device (TMD) Web Site

1. Choose ‘Style 3 – Stitch’ on the web site
2. Upload the children’s picture and physical size
3. Select the color of the sheet and yarn on the web site.
4. The package is delivered a few days later.
5. The ordered color sheets are already attached on the base sheet of the pattern of the box which has a lot of silhouette holes.
6. Fold the sheet along the guide line of the pattern of the box and attach each side with connections
7. Stitch the holes along the children’s silhouette with colored yarn
8. Give the child the box, which reflects their physical size

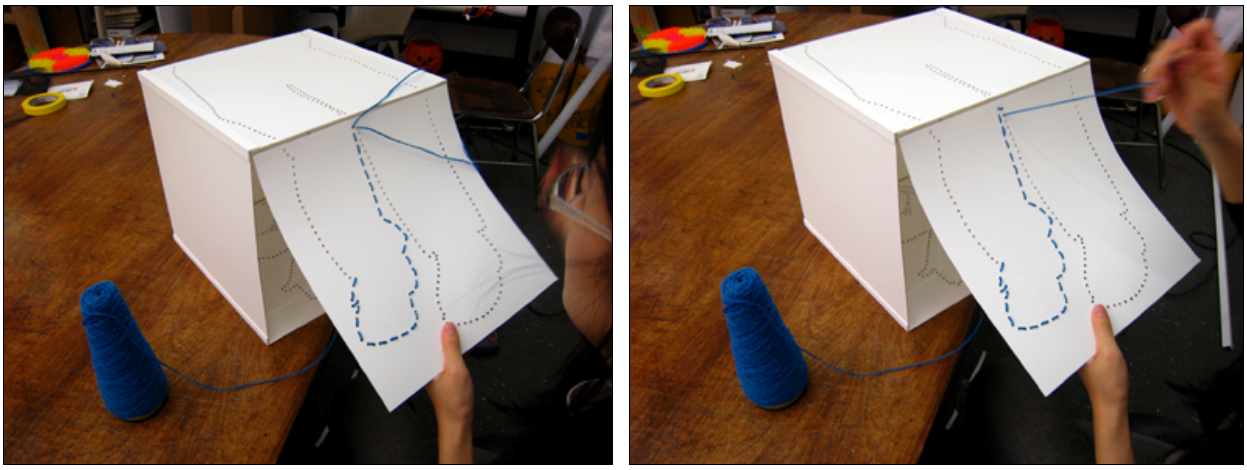


*Figure 65. How to Stitch the Silhouette*

### Contents of the Package

The package of 'Style 3 – Stitch', which includes the following five materials for a box:

1. Assembly description
2. PETG (Polyethylene Terephthalate Glycol) pattern of the box which has holes for stitching and color sheet of what they ordered
3. Colored yarn (option)
4. Four side connections
5. Three top connections

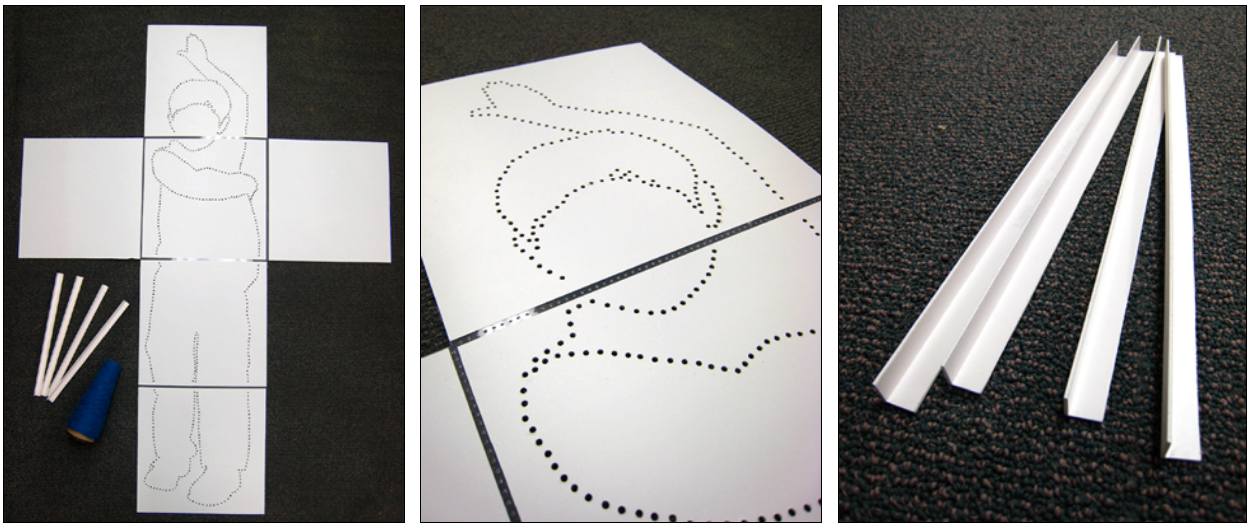


***Figure 66. Contents of the Package***

This package is delivered as above if parents and children chose white sheets and blue yarn. The color sheets they ordered are already attached on the clear PETG sheet.

### Style 4 – Woodcut

Permanent Silhouette is engraved on the wooden box. This box could be a woodcut when you choose the color and paint it. The silhouette looks more beautiful.

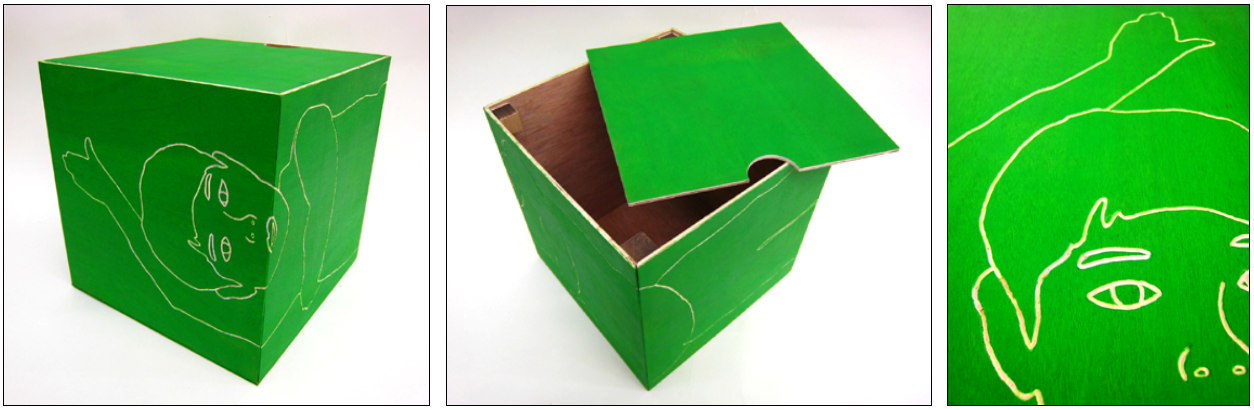


*Figure 67. Finished Box*

### How to Get This Box on the Time-Measuring Device (TMD) Web Site

1. Choose ‘Style 4 – Woodcut’ on the web site
2. Upload the children’s picture and physical size
3. Select an acrylic color for painting the wooden plates
4. The package is delivered a few days later.
5. Paint the box with roller and acrylic color as ordered
6. The silhouette remains neutral after painting as it is engraving on the wooden plates.
7. Give the child the box, which reflects in their physical size

### Contents of the Package

The package of 'Style 4 – Woodcut', which includes the following five materials of making their own box:

1. Assembly description
2. Six wooden plates with engraving of the children's silhouette
3. Eight wooden corner pieces for top and bottom part
4. Acrylic color (option)
5. Paint roller (option)

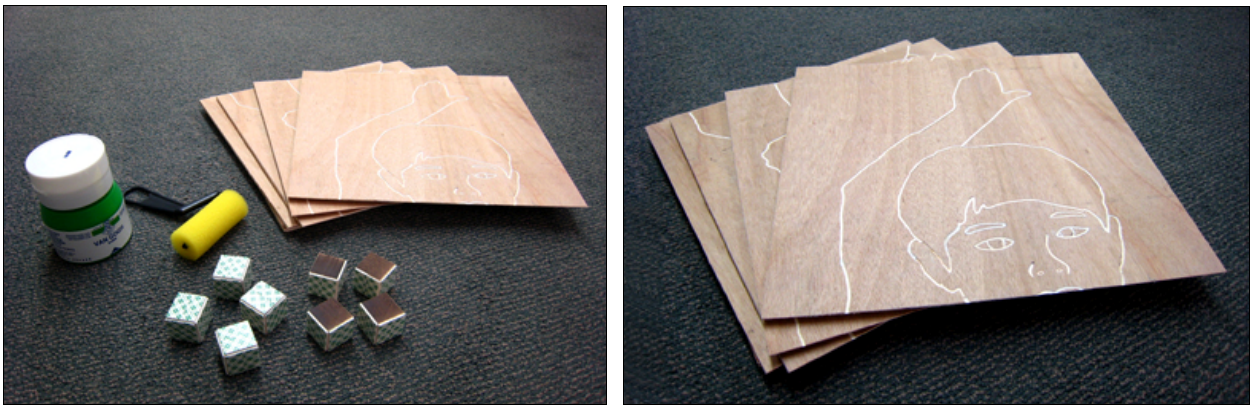


*Figure 68. Contents of the Package*

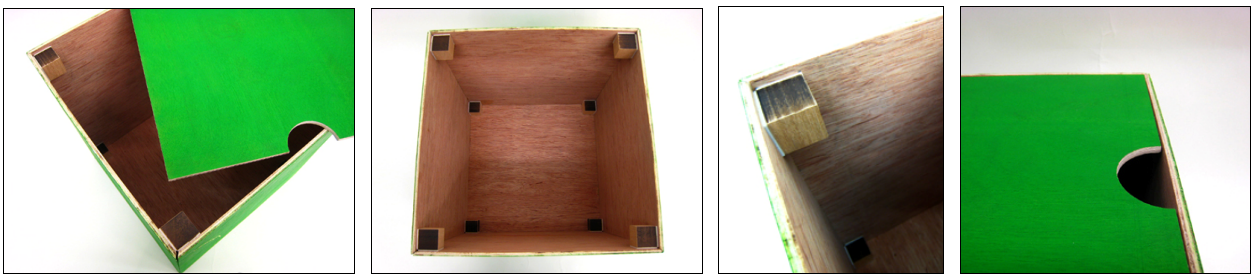


*Figure 69. How to Connect Wooden Plates with Corner Pieces*

### Pattern of the Box

They can download the pattern of box and adjust the size of picture on the web site. The length of the pattern is determined by the child's height.

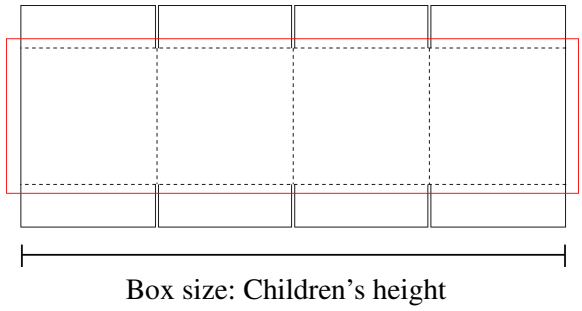



***Figure 70. Style 1 – Paint by Numbers***

The child's silhouette will be printed in the red areas.

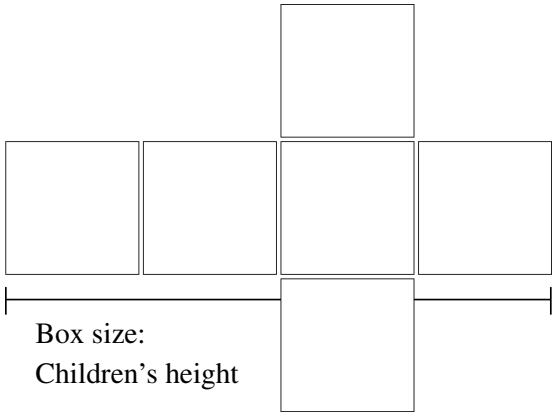



***Figure 71. Style 2, 4 – Image Printing, Woodcut***

This is not one sheet, but six plates. Thus, it will be a perfect silhouette when all plates are attached in making the box.

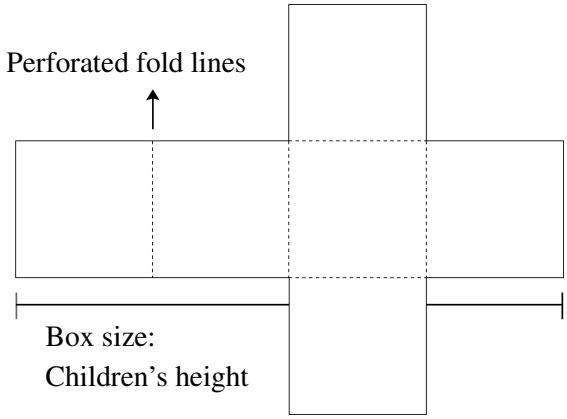



***Figure 72. Style 3 – Stitch***

This is one sheet of the pattern. There are guide lines for folding the sheet.

## Final Four Models

*Figure 73. Style 1 – Paint by Numbers*

*Figure 74. Style 2 – Image Printing*

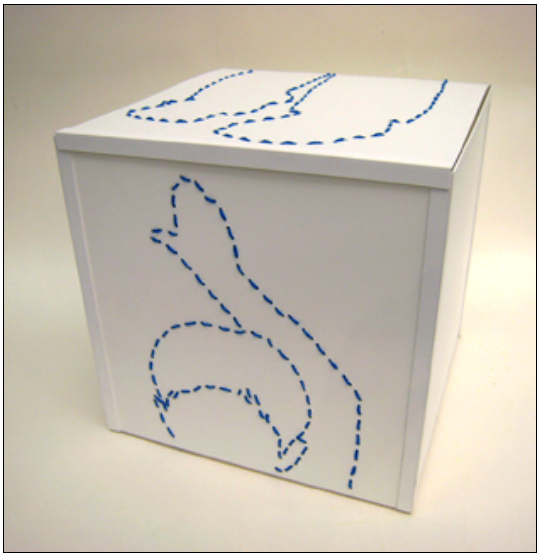


*Figure 75. Style 3 – Stitch*

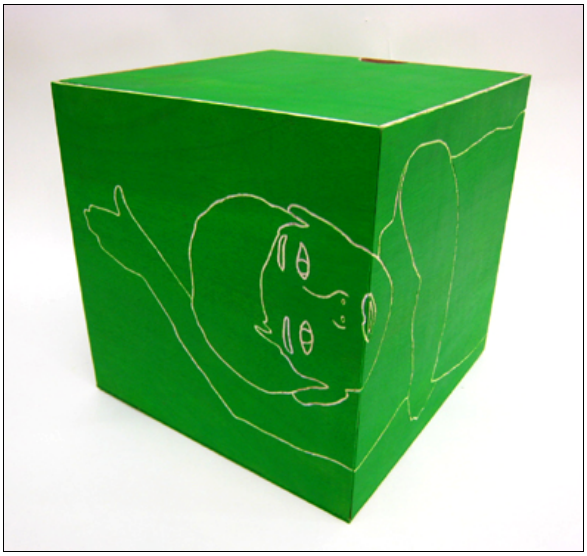


*Figure 76. Style 4 – Woodcut*

### Web Site for Time-Measuring Device

Let us suppose that there is a web site (www.tmd.com) for the TMD. We can get information about the TMD and order it online. However, it could be difficult for children to use the Internet and visit the web site. Children are also not capable of placing the online order. Therefore, parents are asked to help them in obtaining information about the TMD from the web site, sharing their opinion about making the box, managing children's history of physical growth online, and ordering the item. They are also encouraged to support and help their children in making the box when the TMD package arrives. Parents and children can have a very rewarding experience with happy memories to share during the entire process.

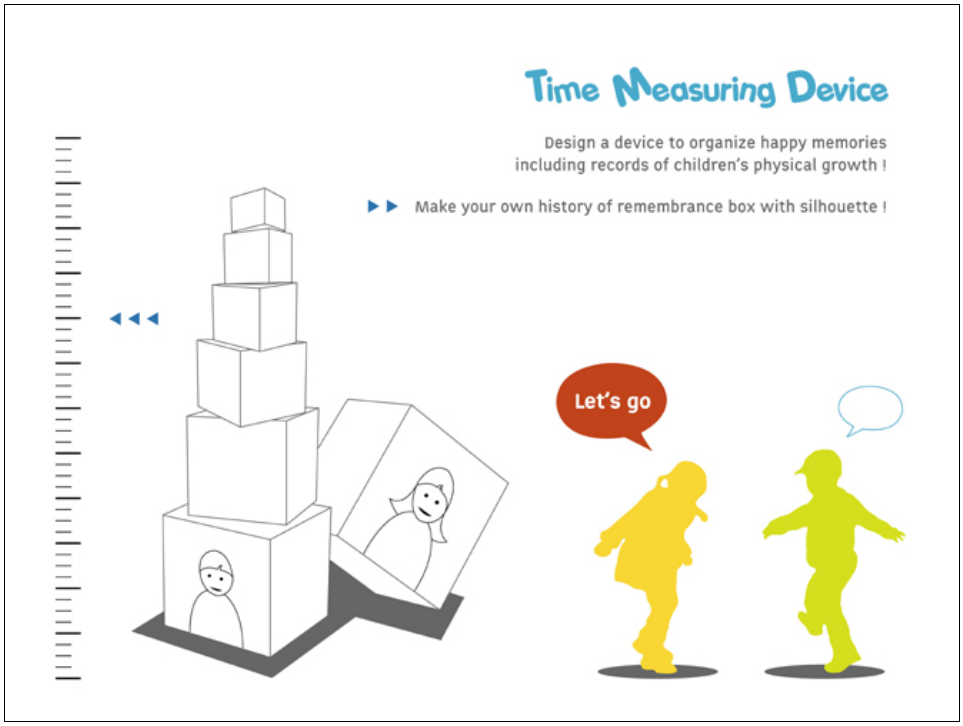



*Figure 77. The First Page of Web Site*

### Main Menu of Web Site

- **Background:** brief introduction to concept of TMD
- **Product:** obtain information about four different styles of the TMD,and download details.

  It has sub-menus, which include the following six categories:

  Ordering process, How to adjust the image, Style 1, Style 2, Style 3, and Style 4
- **Order:** select details and order the selected TMD online

  It has sub-menus, which includes the following four categories:

  My account, Customize it, My shopping cart, and My order status
- **Customer Stories:** share experiences about the TMD with other customers
- **Contact Us:** contact Time-Measuring Device Company

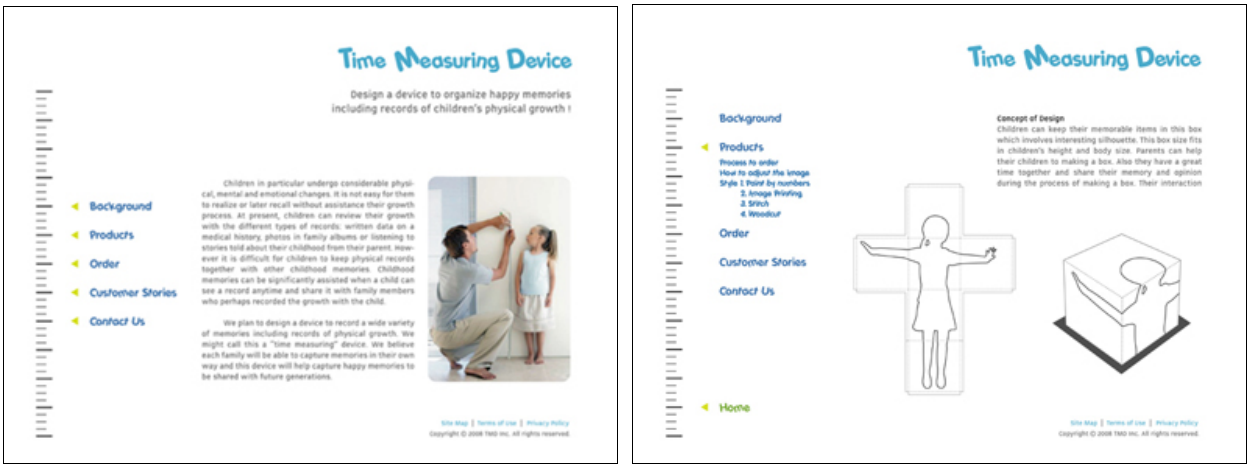



*Figure 78. The Pages of Background and Concept of Design*

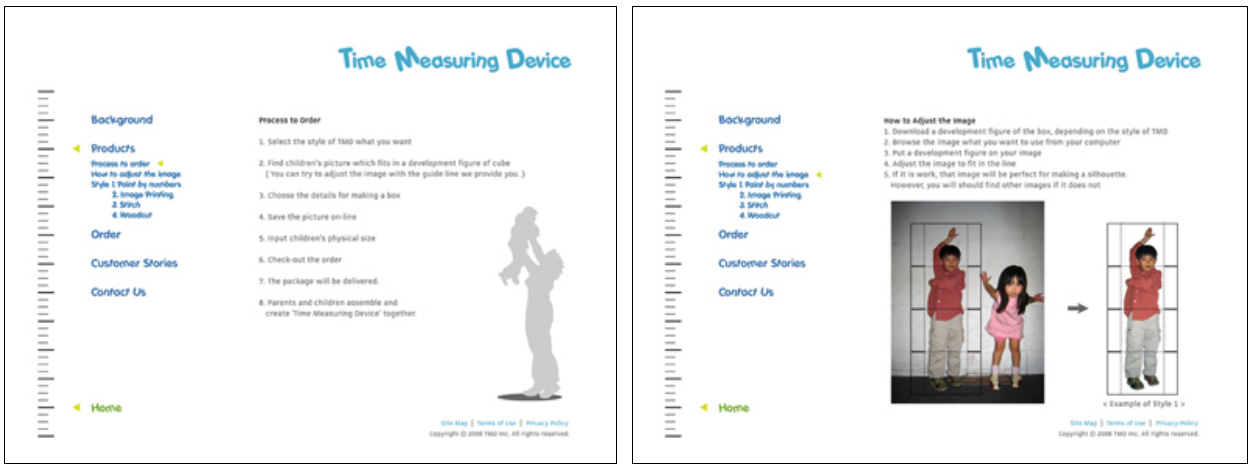
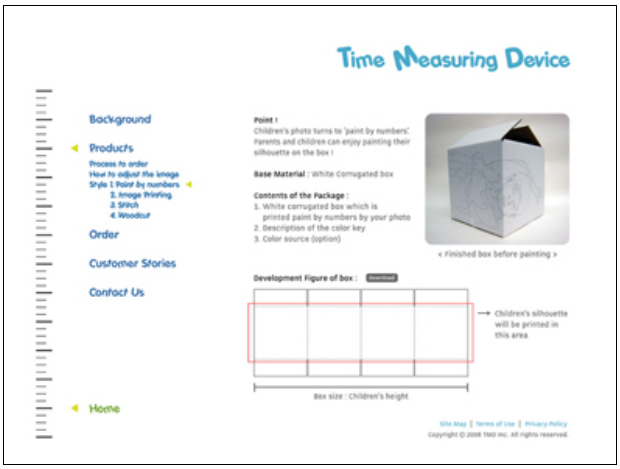
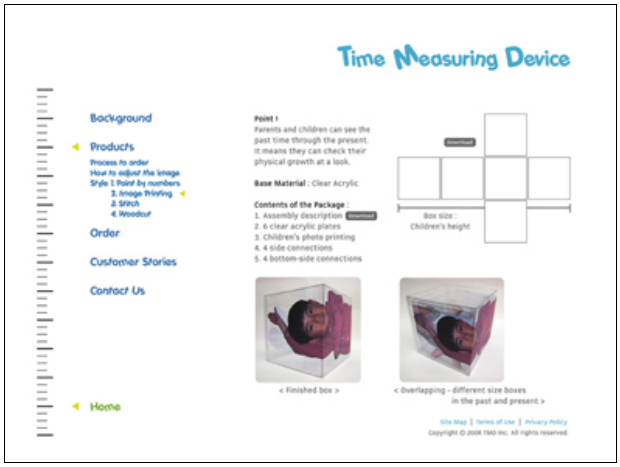
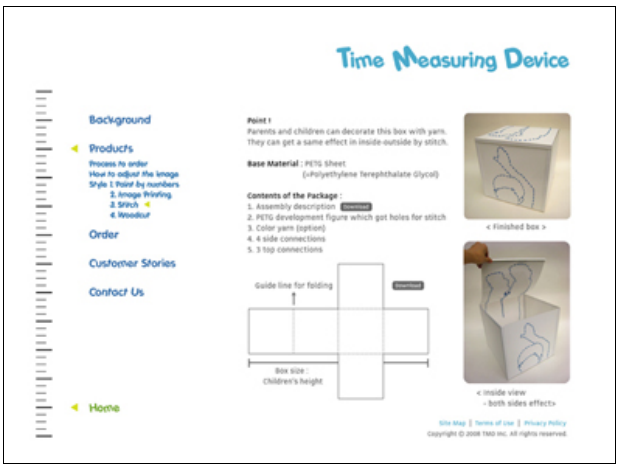
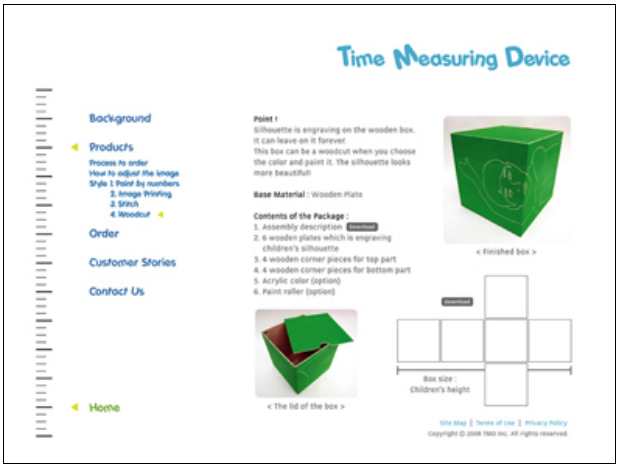



*Figure 79. The Top: Process to Order and How to Adjust the Image, The Bottom: Information about the Boxes*



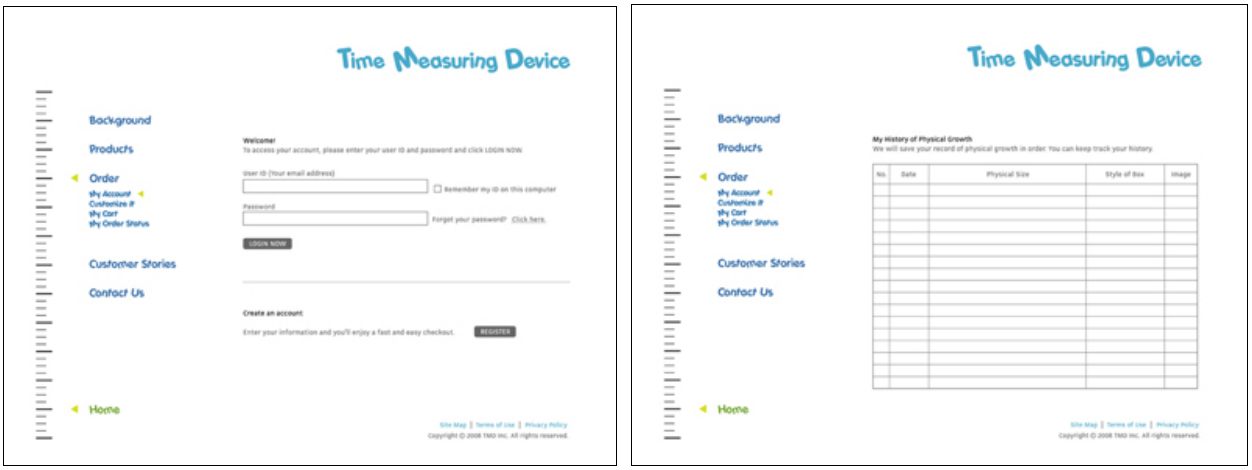
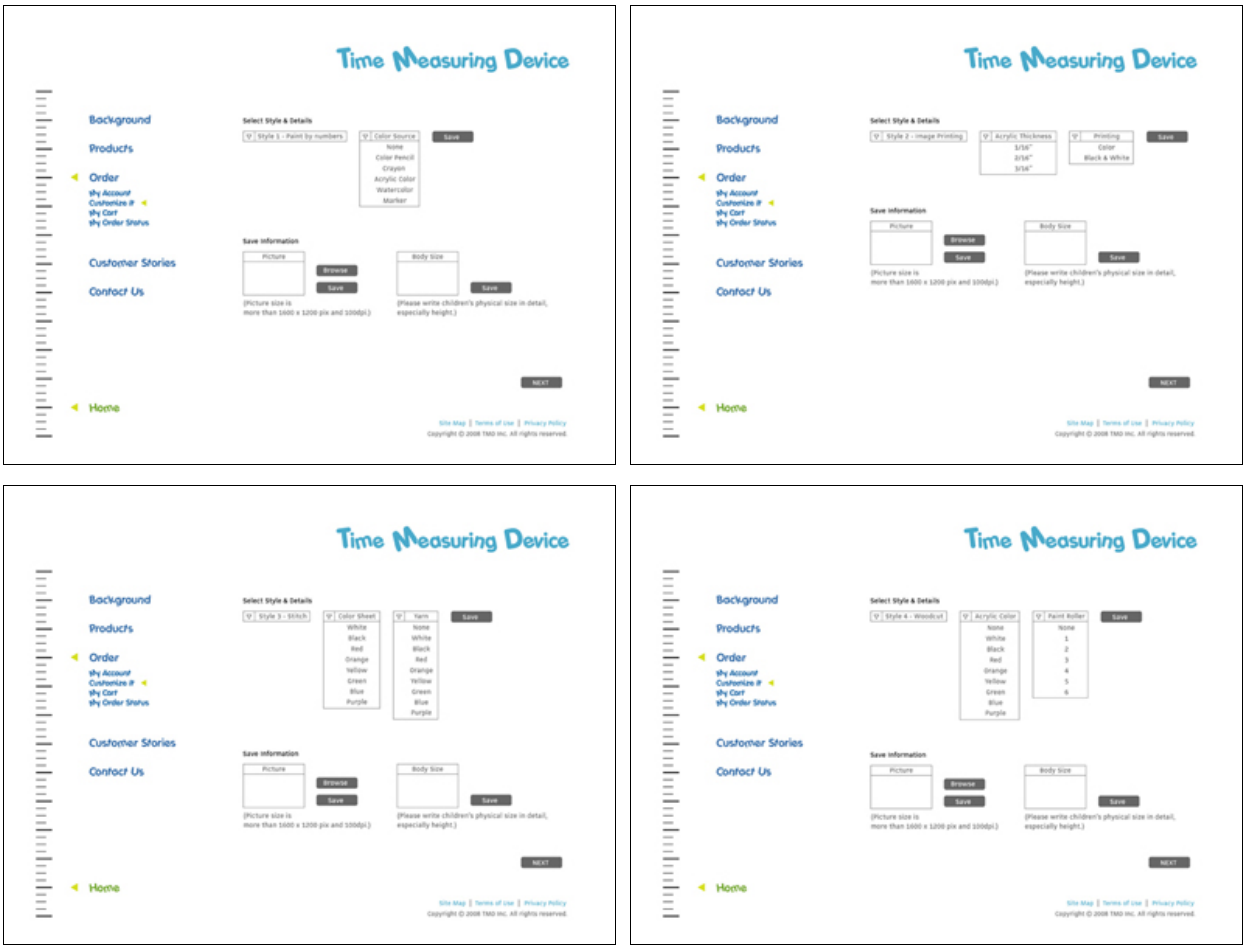



*Figure 80. The top: Account Information and Growth History, The Bottom: Detailed Order Categories of the Box*



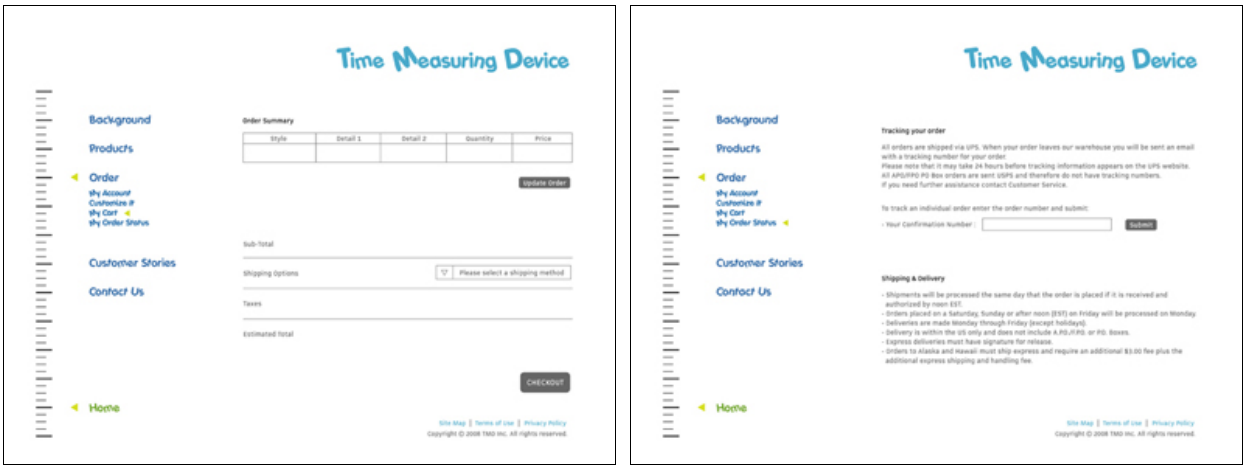



*Figure 81. Checkout and Order Status*

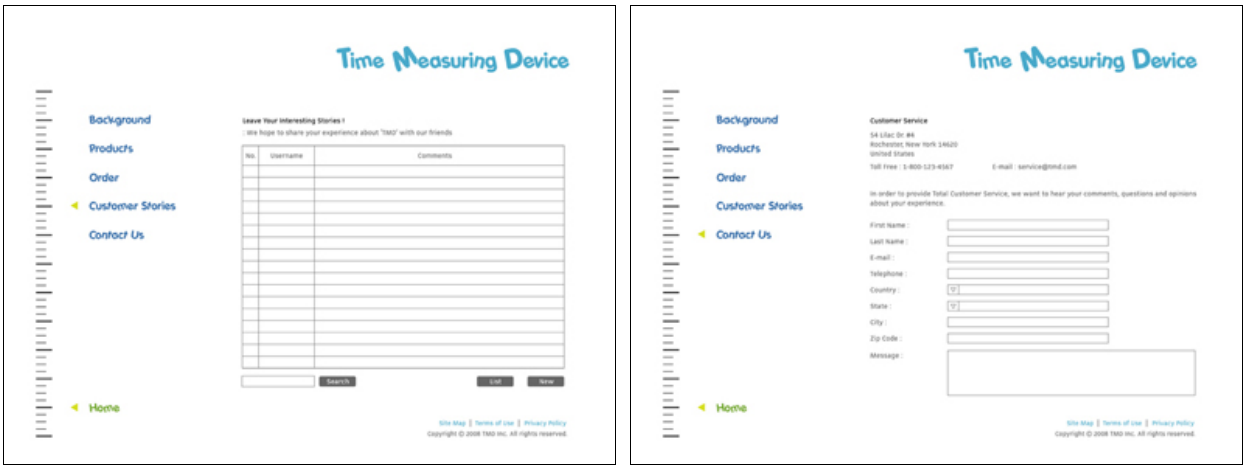



*Figure 82. Customer Stories and Contact Information*

I sent the package and already finished boxes to the family who acted as a model. I learned how they received the box, how they made and used it; and what memories they placed into the box. In addition, I learned what people cherished as well as the interaction that goes on between parent and child during the creative process. I hope to learn of their experiences with using the TMD. I believe their positive emotions of the experience will not only be helpful, but also very rewarding to remember.

### The Effect of Emotional Content

> It does seem clear that we remember emotionally charged events better than boring ones. The memory of strong emotional images and events may be at the expense of other information. Thus, you may be less likely to remember information if it is followed by something that is strongly emotional. It does seem that memories are treated differently depending on whether they are associated with pleasant emotions or unpleasant ones, and that this general rule appears to be affected by age and other individual factors. An investigation of autobiographical memories found that positive memories contained more sensorial and contextual details than neutral or negative memories. Besides, strong emotion can impair memory for less emotional events and information experienced at the same time. It is the emotional arousal, not the importance of the information. That helps memory. (http://www.memory-key.com/NatureofMemory/emotion.htm)

*Figure 83. Step 1 – Discussion about How to Make the TMD*

- Parents and children receive the package they ordered online (Style 1-Paint by Numbers).
- Parents explain what it is and how to make it.
- Children check their silhouette on the box and discuss it with their parents.

*Figure 84. Step 2 – Painting the TMD*

- Parents and children have a great time painting their own box.
- Parents can teach them how to paint it, and recommend other ways to paint using different materials.
- Brothers and sisters can make a box together, even if it belongs to only one of them.
- They can share their happy memories, which can make life pleasant.

*Figure 85. Step 3 – Finishing of Painting*

- Children finish painting the box with watercolor pencil and water.
- Parents check how children painted.

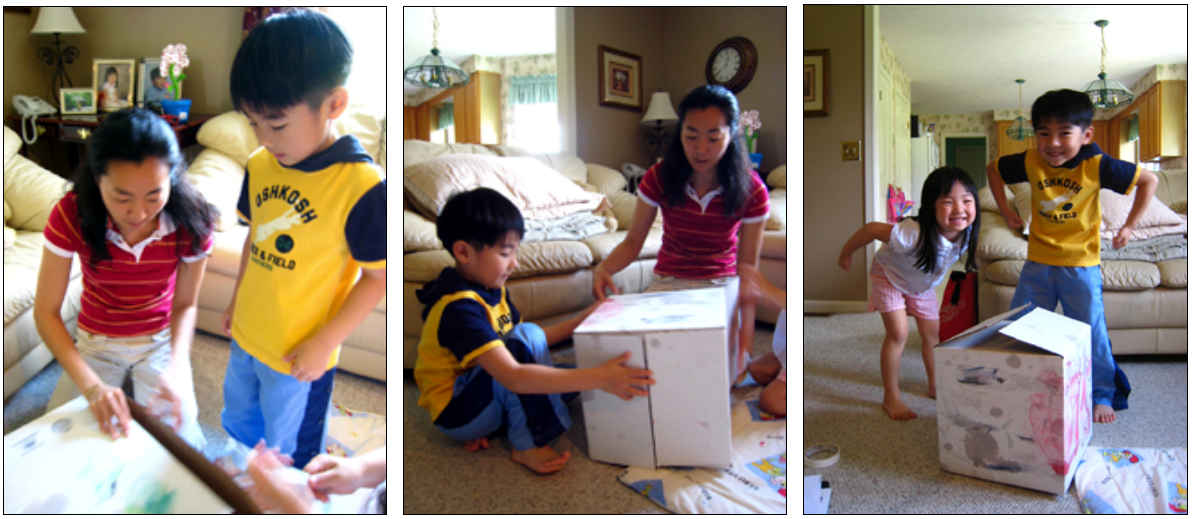


*Figure 86. Step 4 – Assembly the TMD*

- After finishing painting, they assemble the box together.

### For Children

- Children are surprised at receiving the package as their silhouette is drawn on the box.
- Children really want to participate in making their own box.
- The relationship between brothers and sister will be enhanced after making the box together.
- Children want to keep their toys, video games, and books in the box.
- Children became attached to this box.
- Children need assistance in using the Internet.

### For Parents

- Parents want to keep their children's items in the box.
- Parents try to help them to make a box and use the Internet.
- Parents know what their likes and dislikes such as taking a picture or painting using water.
- Parents do not want their children's room and house messed up in painting the box.

### For Both

- Parents and children like their artwork of silhouette.
- Parents and children hope to see this box last several years.
- Parents and children have a lot of interaction while they are making the box.
- This box will become a precious item for parents and children.
- Spending time with parents and children is meaningful for them.
- Parents and children can share their happy memories and experiences.

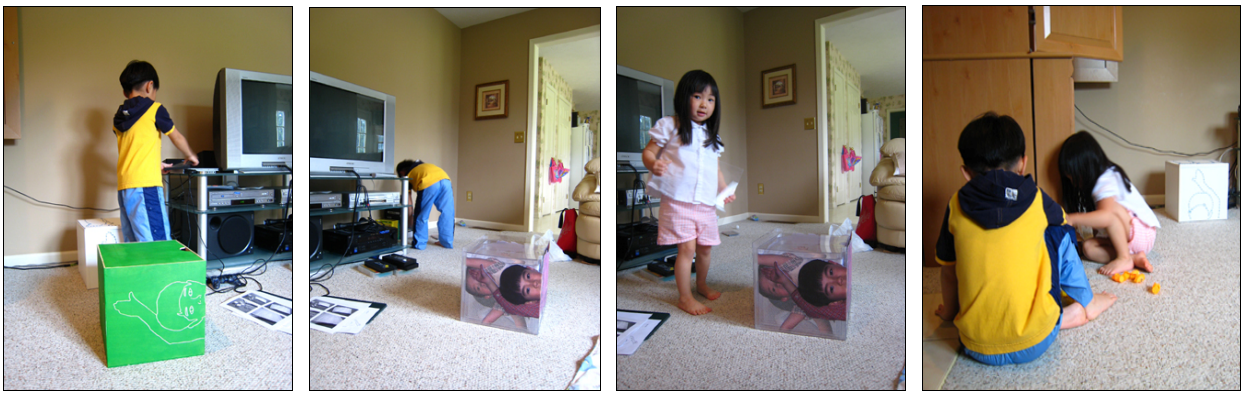


*Figure 87. Other Final Models with Children*

I asked them which one is your favorite box. Both of them answered ‘Paint by numbers’, which they painted themselves. As I mentioned, pleasant emotions are usually remembered better than unpleasant ones. In other words, their excited experience can help them to remember better than other finished boxes which require no interaction with children. However, it will be different if they have a chance to order other styles, get the package they ordered, and make the box themselves.

Children were interested in their silhouette for ‘Paint by Numbers’ on the box. They want to put the boxes with their figure in their room and keep their precious items. The box could be one of their meaningful belongings. Their beautiful artwork they drew on the box will help them to see the big picture of their future.

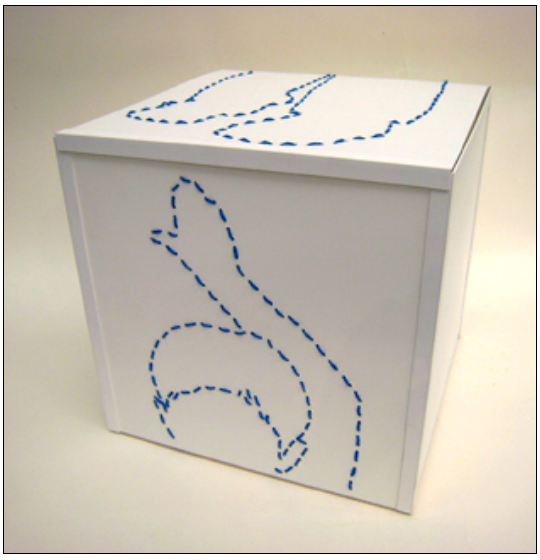
As stated in the introduction of this paper, this project began with a relationship between memory and children's physical growth. Recording childhood's physical growth cannot be significantly assisted for remembering our childhood if it is not connected with memory. Existing methods are not helpful enough in obtaining a well-organized remembrance of childhood's physical growth. We need to see a physical record at any time and share it with family members who recorded the growth with the children. I suggest a new method for it. I designed a device for recording a wide variety of memories, including records of physical growth. Known as a "time-measuring" device, it will help to measure children's physical growth as time passes. Along the way, parents and children gain reward interesting experiences when using the 'Time-Measuring Device'. Positive emotion from the experience enhances the memories. Each family will be able to capture happy memories in their own way, with this device increasing recollection of memories that can then be shared with their family.

***Figure 88. A Child who acted as a Model and the Finished the Time-Measuring Device (Style1-Paint by Numbers)***

**Style 1 – Paint by Numbers**

**Style 2 – Image Printing**

**Style 3 – Stitch**



**Style 4 – Woodcut**

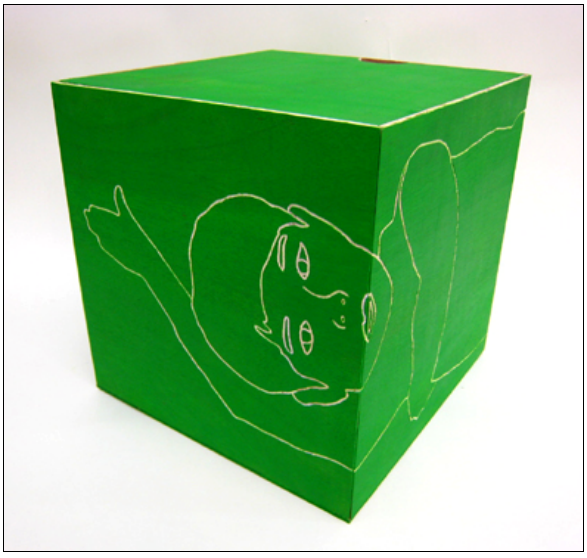


*Figure 89. Final Four Models*

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