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HCI 595X - Visual Design of HCI

July 2nd, 2012

# Sort Six, A Play•IT Product

## Objective

My goal in this project was to design a product that was fun, educational and encouraged social interaction between children with autism and typically developing children. By gathering information and performing extensive research on autistic children I was able to make decisions within my design that were based on evidence and not speculation. Armed with this deep understanding and empathy for these children I aspired to design a thoughtful product that was educational and motivated social interaction while at the same time produced an enjoyable and enthralling experience.

## Target Audience

My target audience covered both typically developing and autistic children, boys and girls, ages 6 to 12 years of age. I focused my research specifically on autistic children but ultimately designed my product with elements that I believed would be appealing to both autistic children and typically developing children.

## Research

Autism is a developmental disability that affects social interaction, communication, imagination and cognitive abilities. Symptoms of the disorder usually appear and can be diagnosed before the age of three. Autism is defined as a “spectrum disorder” where the disorder is a range of impairments where each type of impairment can affect individuals with a different degree of

severity. Some characteristics of children with Autism Spectrum Disorders include having a hypersensitivity to sound, touch and sight. Also, some have a strong desire to repeat certain actions or have a compulsion to place items in order.

As I plan to design a product for autistic children with the purpose of encouraging social engagement it will be important to take into consideration these special characteristics in order to accommodate the needs of these children and to provide a compelling and positive experience.

## **Motivating Social Interaction**

A defining characteristic of autism is an extreme difficulty with social interactions. These social deficits manifest themselves as low social engagement as well as an avoidance of eye contact and a preference for being alone. Without intervention children with autism may fail to develop close friendships and relationships in later years.

To address these social impairments among autistic children researchers have performed a number of measures to encourage social behavior. One such measure was to use an obsessive behavior exhibited by a group of autistic children as motivation to interact with others socially. To accomplish this researchers incorporated the obsessive behavior as a theme within a game. Playing the game was beneficial to the autistic children as the game reinforced appropriate behavior and encouraged social interaction. Also, each child was intrinsically motivated to play the game because it incorporated the behavior or activity the child was naturally compelled to engage in.

The investigation demonstrated that games can be designed with themes that translate typically problematic, compulsive behaviors into positive social interactions between children with autism and their typically developing peers. Because the autistic children were experts at the theme incorporated into the game they did not need additional assistance from their nondisabled peers and were viewed as socially competent and inherently valuable members of the game. Throughout the gameplay mutually meaningful relationships were formed. In follow up sessions, the autistic children continued to engage in appropriate social play in both obsessive and non-obsessive themed games. (Koegel, Vernon & Koegel, 2009)

I plan to use the same technique within the design of my product. The obsessive need to maintain order is one such compulsive behavior, perceived as a problematic, that I plan to incorporate into my design to encourage, through intrinsic motivation, autistic children to engage with my product.

## **Perception of Color**

The findings from the article *Reduced chromatic discrimination in children with autism spectrum disorders* detailed results that demonstrated a reduction in chromatic sensitivity among autistic children. The participants in the study did not have a specific difficulty with either red-green or blue-yellow subsystems of color vision but instead demonstrated a general reduction in sensitivity across the color spectrum (Franklin, Sowden, Notman, Gonzalez-Dixon, West, Alexander, Loveday & White, 2010).

The results of this study is informative to a design for autistic children as it influences color selection. It will be important, when choosing the color pallet for a design, to refrain from choosing colors that are similar in value, as it will be difficult for a child with an autistic disability to discriminate between the colors. Also, since the sensitivity is not biased towards a specific subsystem of color vision it would be worthwhile to avoid a monochromatic color scheme and possibly to choose complementary colors as they are the most dramatically distinct from each other.

## **Other Considerations**

Because noises and intense lights can have an adverse affect on some children with autism to a degree where these stimuli can be painful to the child, it will be important to avoid loud sounds or music as well as intense lights in my design.

According to an interview with Diana Sherman Whittles, mother of child on the autistic spectrum, autistic children like games that they can control and provide feedback in the form music and sounds in which actions produce a result. She feels that a good color scheme for a toy incorporates bright primary colors which are gender neutral. She also finds that her child learns well through repetition and likes to encourage her child to play games that incorporate motor skills. (personal communication, June 20, 2012).

Finally, it will also be important to design a product that has reasonable production cost in order to produce a final product that these families will be able to afford. The cost of raising an autistic child can take a tremendous financial burden on the family. According to a study funded by the advocacy group Autism Speaks, the estimated cost of providing care for a person with autism in the U.S. can be \$1.4 million over the individual's lifetime and be up to \$2.3 million if the person is affected with intellectual disabilities which is nearly half of the autistic population.

## **Product Concept**

The concept behind the design of the Play•IT product Sort Six is a game in which two participants must collaborate together to reach a goal of placing six unordered discs in order from smallest to largest value. This product should be engaging for autistic children who have a strong inclination for placing items in order.

At the beginning of the game the six discs are suspended in the game wall in an unordered sequence. On each side of the wall there is a control panel which contains a touch screen display and six buttons. The touch screen display is used to start a new game, select a level of difficulty and provide in game progress feedback. Each of the six buttons in the control panel correspond to one of the six discs. Because there are two control panels, one for each side of the wall, each with six buttons there will be two buttons that are associated to each disc. To drop a disc and sort it in order both buttons that correspond to that disc need to be pressed at the same time. The size of the wall acts as a physical constraint against allowing one player to press both buttons at the same time thereby requiring two players to collaborate together in order to complete the game.

To figure out which button in a control panel is associated with a given disc a logic or math problem will be displayed on each button where the answer to the problem corresponds to a value displayed on a disc and thereby associates a button with specific disc. The requirement for players to solve these logic or math problems to advance within the game incorporates an educational component into the gameplay. The problem displayed on a logic button could be as simple as a pattern of numbers or as advanced as a calculus problem. Also, when one player selects a button and presses it that selection will be communicated to the collaborating player or teammate by lighting up the complement button in the control panel on the other side of the

wall.

Because of the technology used within the game, there is a potential for unlimited continuous gameplay with several levels of difficulty. Each disc and each button will be made from a LED display. This will allow the game system to update the logic problems displayed on each button as well as the values on each disc. New value information will be communicated to the movable and disconnected discs via bluetooth. The discs will be made from two discs an inner and outer disc where the inner disc contains the LED display and the outer disc can move independently of the inner disc. A small weight will be contained within the bottom of the inner disc which will cause the inner disc to remain upright while the outer disc rotates.

At the beginning of a new game a starting score of 20 will be given to the participating team. If the team makes an incorrect button selection for the next disc value to be sorted a point will be deducted from their score. If the score reaches zero the team loses. If the team successfully sorts each of the six discs in order, then the team will advance to the next level of gameplay until ultimately the final level is completed and the team masters the game.

After each level has been completed and the discs are all sorted into the queue at the bottom of the game wall the game will reset the discs back into a start position with automated internal machinery. In order for the system to keep track of the location of the discs each disc will be of a different size and its start position will be a designated slot that only that disc will be able to fit into.

The game will take into consideration conditions that affect autistic children such as avoiding loud noises or bright lights which cause emotional stress to those who are overly sensitive to such stimuli. Also, based on research the game wall and components will have a color scheme with colors that differ significantly in value because of an autistic child's reduced ability for chromatic discrimination.

This game should be appropriate for a wide range of ages, 6 to 12, because the gameplay will advance in difficulty as the participating team demonstrates their level of skill.

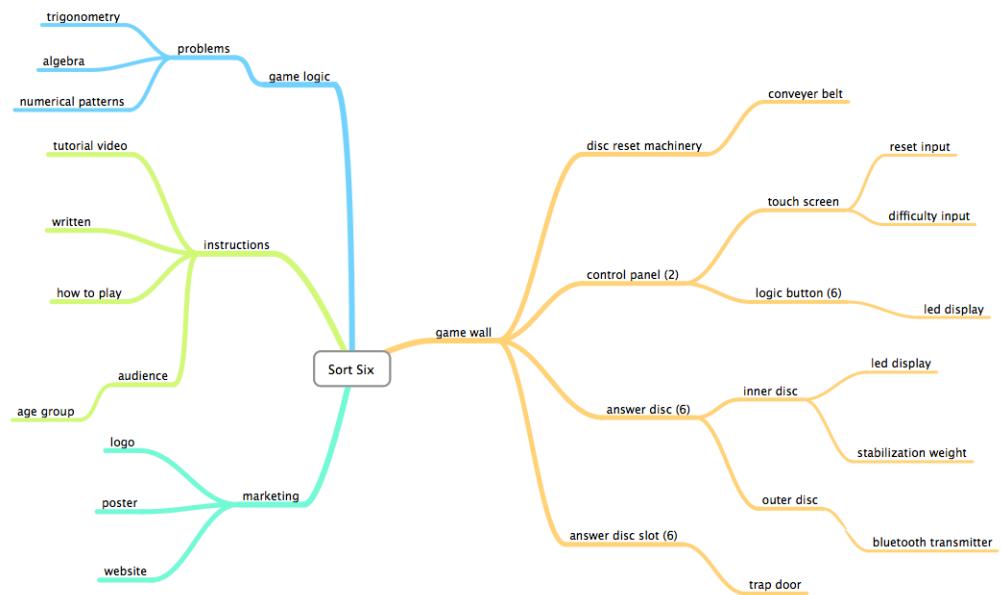
# Keywords

The following are the keywords I used to help inspire the direction of my design:

- Collaborative
- Engaging
- Challenging
- Compelling
- Fun
- Logical
- Entertaining

# Mind Map

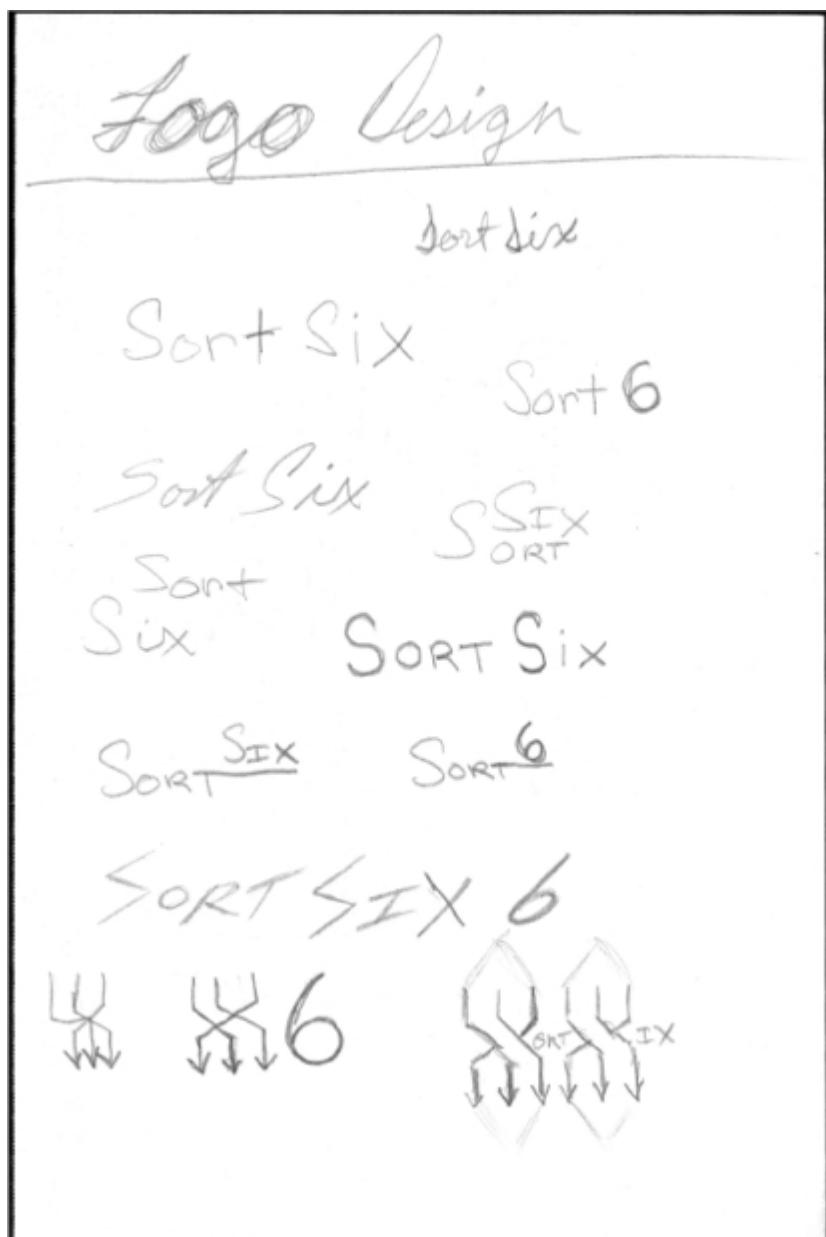
The following is the mind map flowchart I generated to explore all the content and materials needed in to produce the Sort Six product.



# Logo Sketches

## First Iteration

In my first iteration of logo sketches I explored a wide variety of concepts but ultimately two stood out as promising options.



Logo cont...



final

too harsh/sharp

Logo Cont...

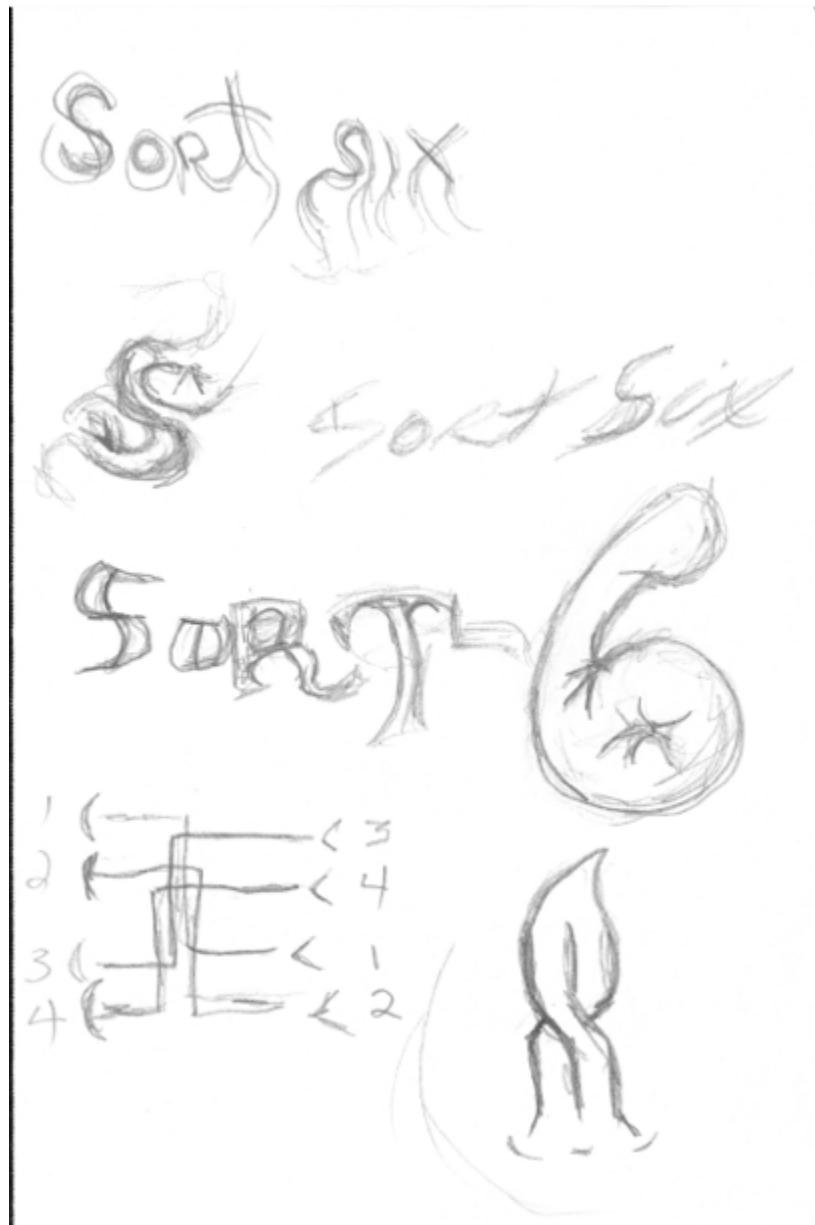
SORT6

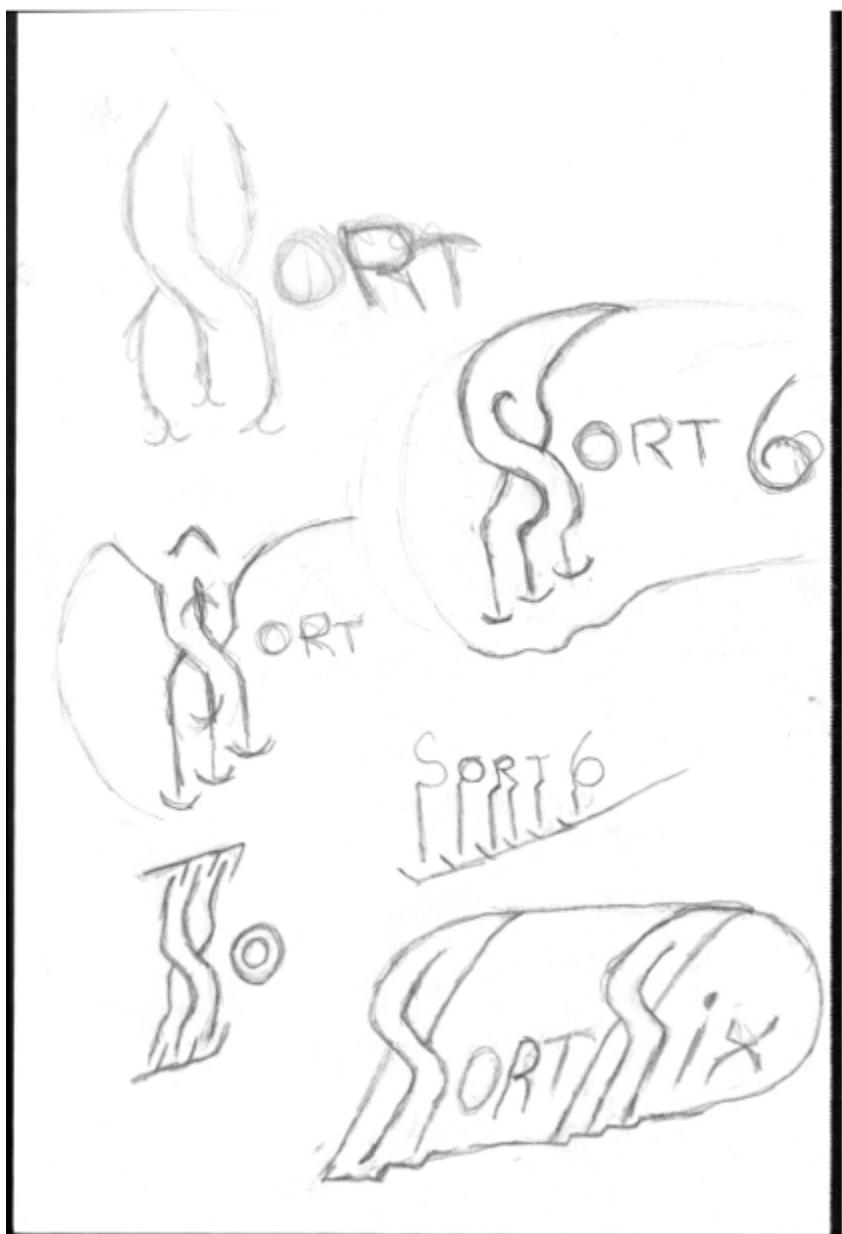
SORT6

SORT6

## Second Iteration

In my second iteration of logo sketches I explored both potential concepts from iteration one a bit further but ultimately I narrowed in on one of these concepts and explored alternate renderings of that concept.



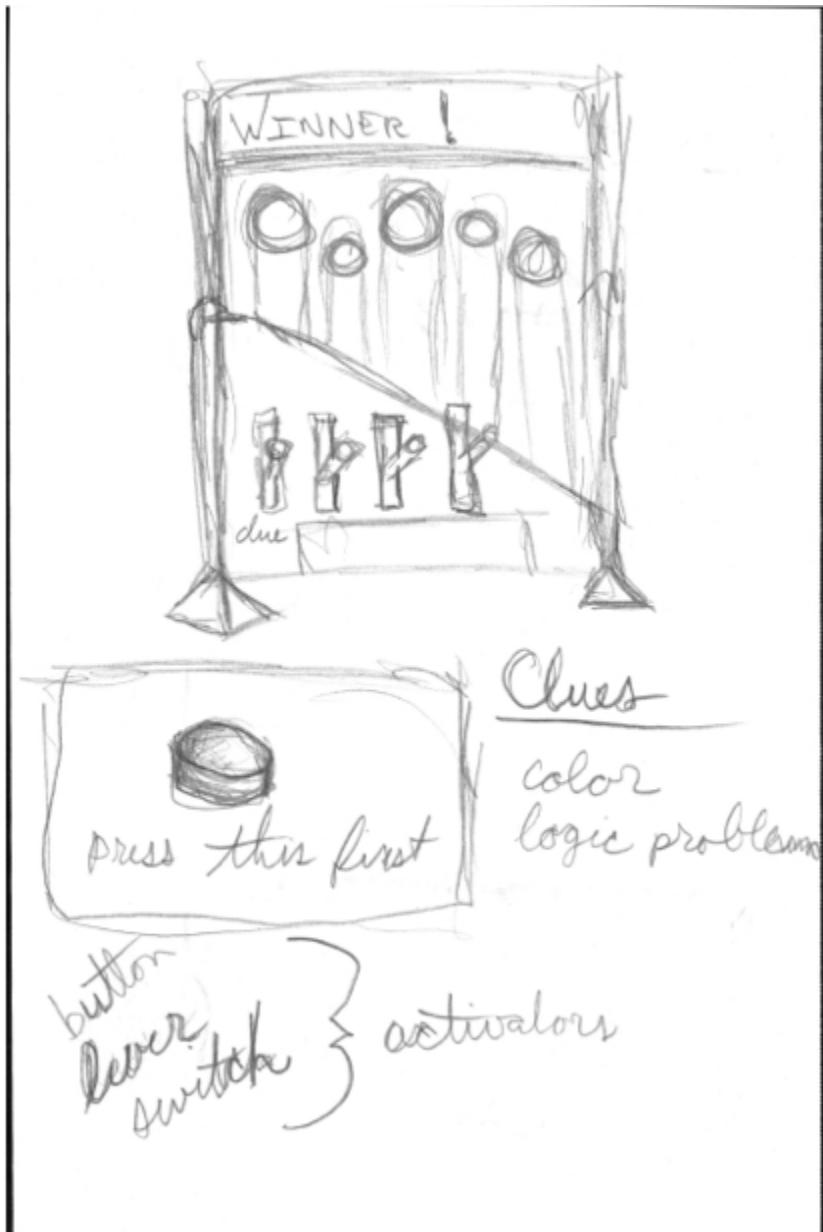




# **Product Sketches**

## **First Iteration**

With my first iteration of generating sketches of my product I worked on exploring how each of the components within my product would look and function. I needed to envision how problems would be displayed and chosen by the participants as well as what type of problems would work. I also needed to perceive how the discs would be suspended in the wall as well as understand the mechanism required to reset the disks back into the starting position.



## Activators Continued . . .

2, 4, 6, 8, . . .



Switch in  
natural flow  
of left to right

2, 4, 6, 8,



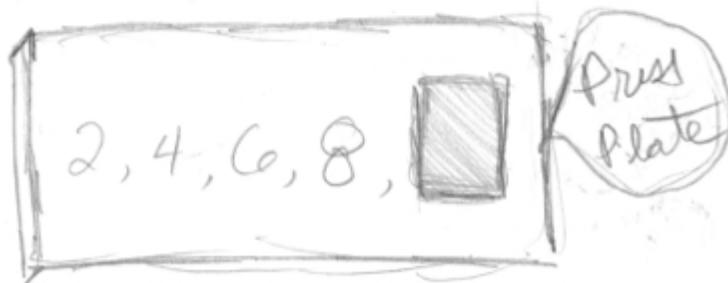
## Activators



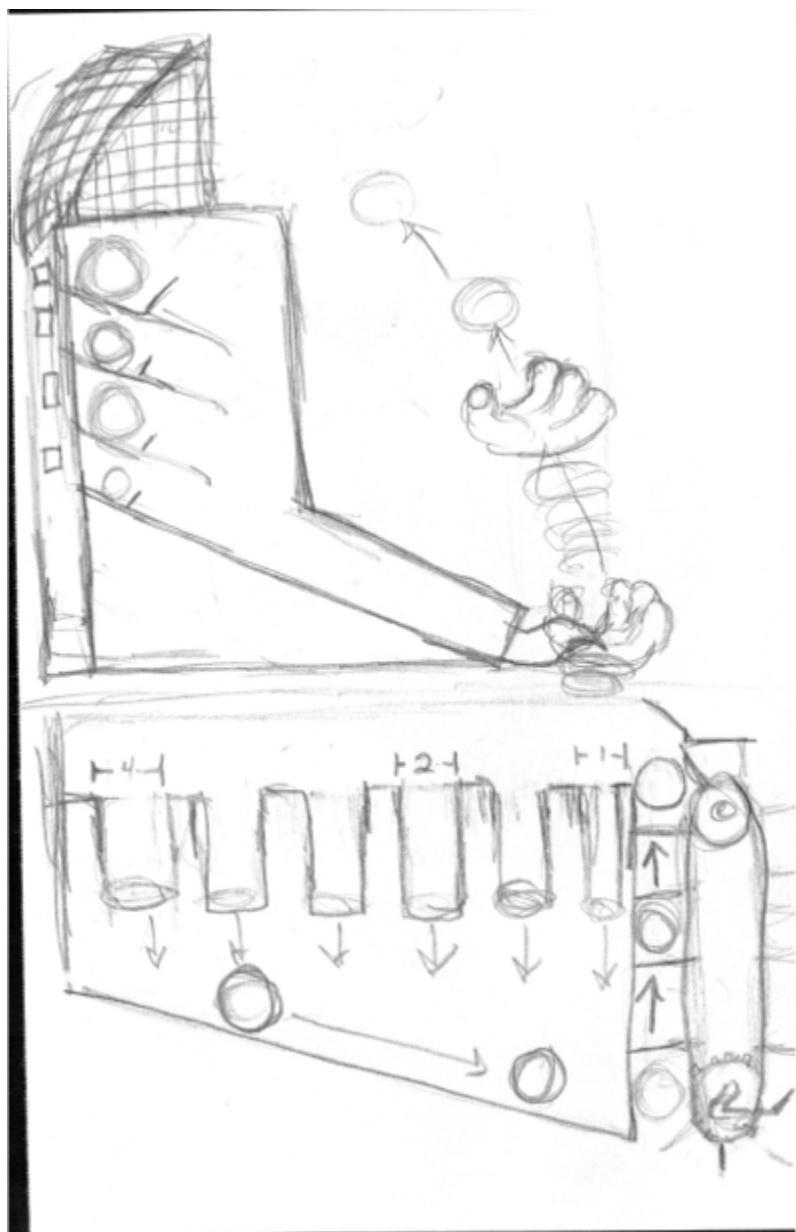
2, 4, 8,

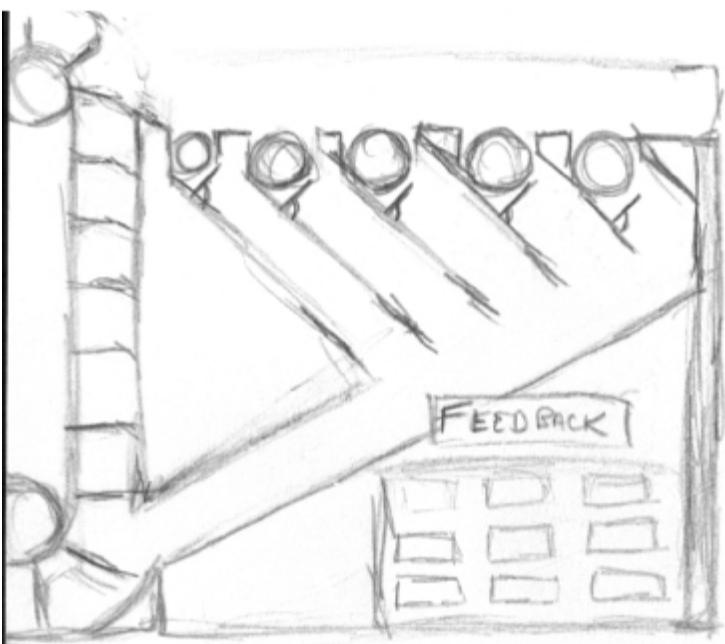


2, 4, 6, 8,

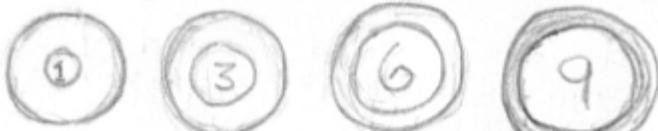


2, 4, 6, 8,





Discs are same size?

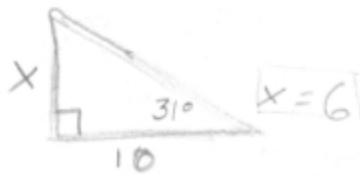


but with vertical indication  
of amount represented

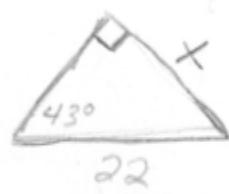


**⚠ This doesn't work**  
because, in start position,  
the discs must appear out of order  
so each disc must have a designated  
slot for the system to maintain this disorder

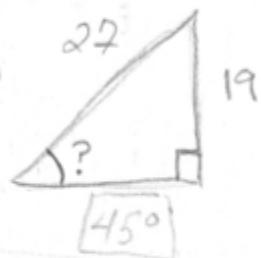
## Example Problems



Trigonometry



$$x = 15$$



$$? = 45^\circ$$

Algebra

$$21 = -7n$$

$$n = -3$$

$$-6 + \frac{x}{4} = -5$$

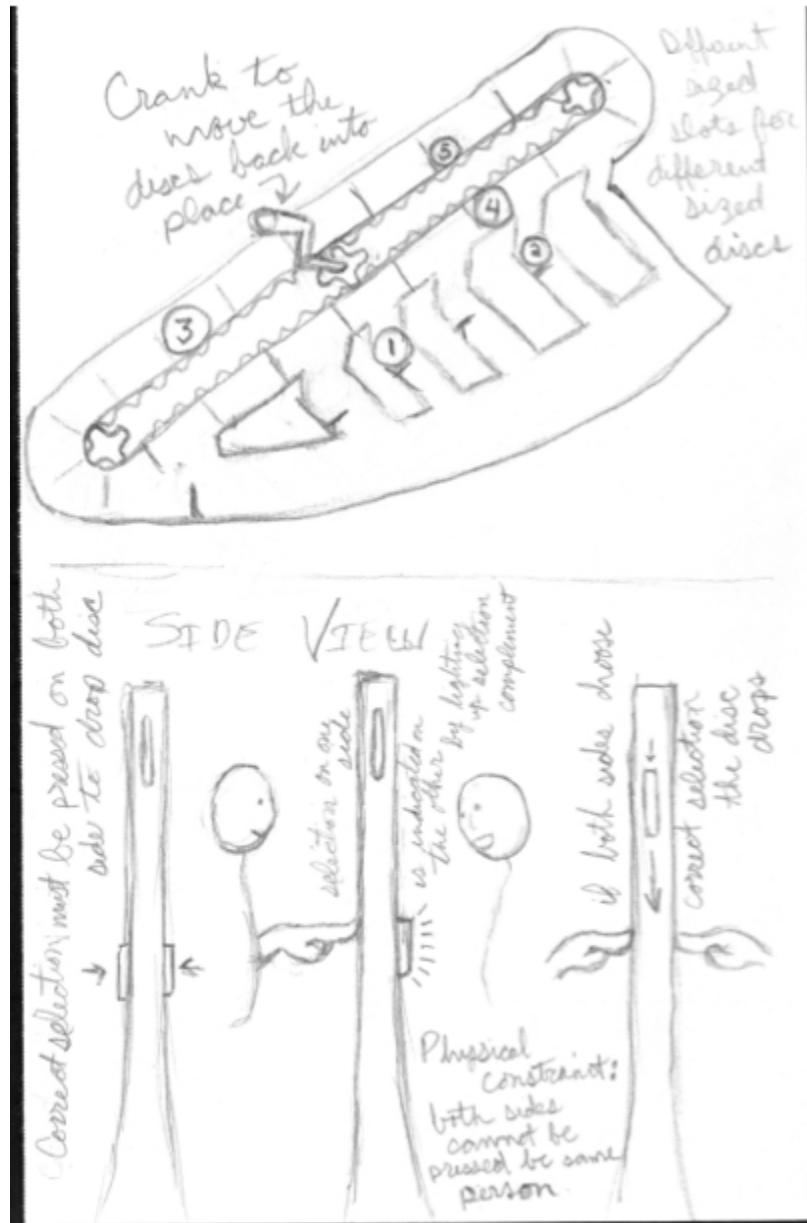
$$x = 4$$

$$6 = 1 - 2n + 5$$

$$n = 0$$

## Second Iteration

In the second iteration I refined the ideas I generated in the first iteration and then annotated the sketches with details on the technology that would be required to build the components of the product.



## Technology

### Disc

Each disc is made of an inner and outer disc.

The inner disc can rotate independently of the outer disc.

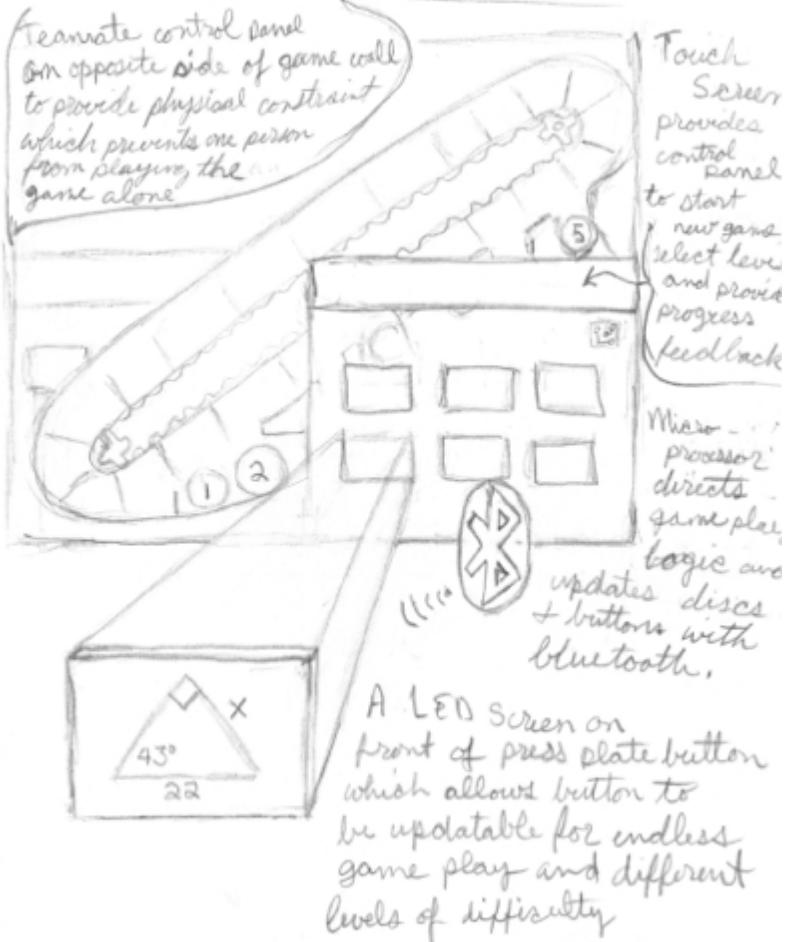


Bluetooth and a micro processor are used to update the value of the disc and communicate with the rest of the system.

A LED screen is to display the value of the disc which allows the disc to be updatable for endless gameplay.

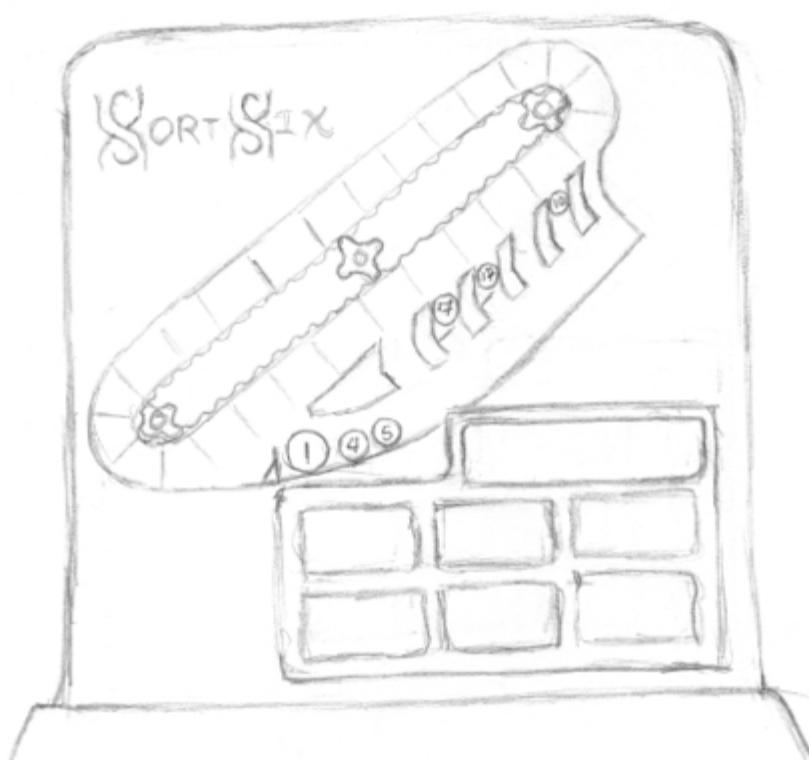
A weight at the bottom of the inner disc keeps it vertically upright, for endless gameplay.

## Technology cont...



## Third Iteration

In the third and final iteration I produced a complete product sketch.



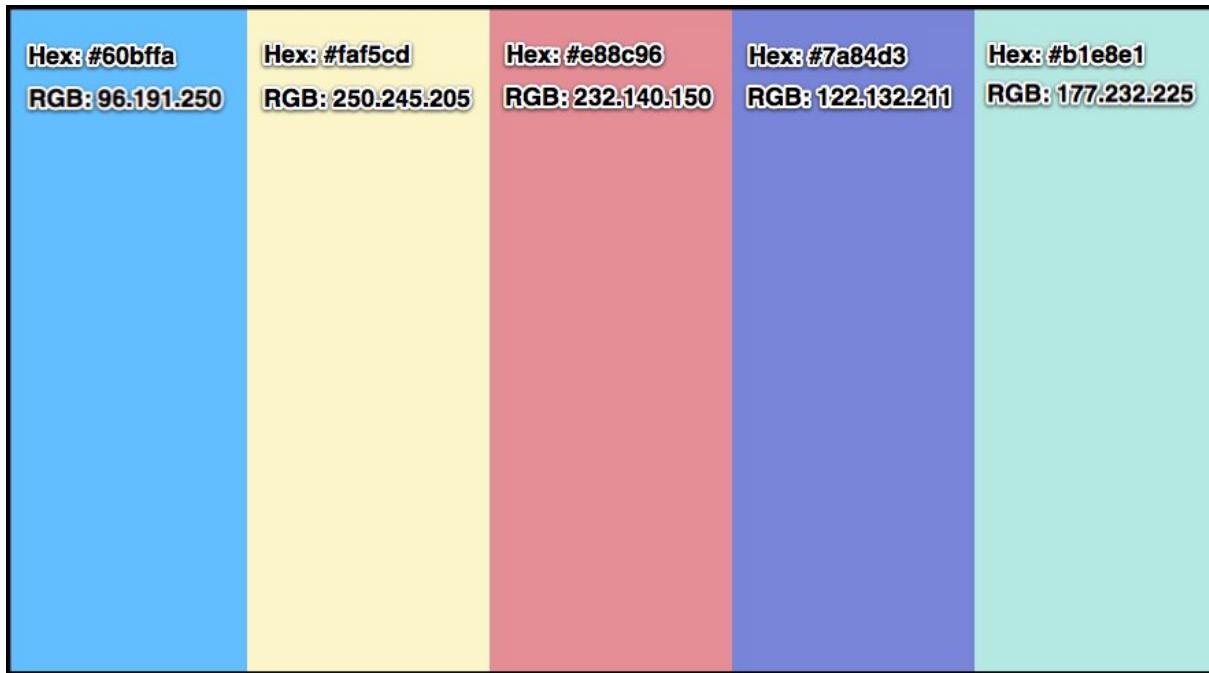
# Color Exploration

Because the gameplay will have a slow pace and a thoughtful emotional tone as players collaborate together to figure out which logic button sorts the next disk I decided to go with a cool color scheme.

The process I used to compose my color scheme was first I started out with a nice light sky blue color and then, to avoid a monochromatic color scheme and to add a little excitement to the scheme, I added the split-complements of the blue color. I then added the complement of each split-complementary color to bring the color scheme back to an overall cool palette of colors. Finally I adjusted the intensity of each color until I was finally happy with the outcome.

The tool I used to compose my color palette was ColorSchemer for Mac:

[http://www.colorschemer.com/osx\\_info.php](http://www.colorschemer.com/osx_info.php)



# Typography Exploration

I evaluated 9 different font families when deciding on the typography to use within my design. Of these font families 3 were sans-serif fonts, 3 were serif fonts and 3 were display or handwriting fonts. I evaluated each font by labeling it with three descriptive words which I felt best represented the emotional properties it conveyed.

## Sans Serif Font Families

### Sort Six

Font Family: **Fresca**

- fluid
- relaxed
- loose

### Sort Six

Font Family: **Acme**

- playful
- compelling
- youthful

# Sort Six

Font Family: **Rationale**

- digital
- analytical
- organized

## Serif Font Families

# Sort Six

Font Family: **Belgrano**

- casual analytical
- informational (elements of newspaper text)
- smooth
- readable

# *Sort Six*

Font Family: **Kotta One**

- dynamic
- rough
- crooked

# Sort Six

Font Family: **Junge**

- delicate
- simple
- ancient

## Other Font Families

Sort Six

Font Family: **Just Me Again Down Here**

- temporary (erasable like dry-erase)
- crude
- spontaneous

Sort Six

Font Family: **Tangerine**

- fancy
- formal
- subtle

# Sort Six

Font Family: **Chewy**

- fun
- spongy
- airy (like a balloon)

## Favorite Font Families

Ultimately I decided on the following font families because I felt they best represented the keywords used to inspire my design as well as the emotional tone I wished to convey in my design:

- Acme
- Rationale
- Belgrano

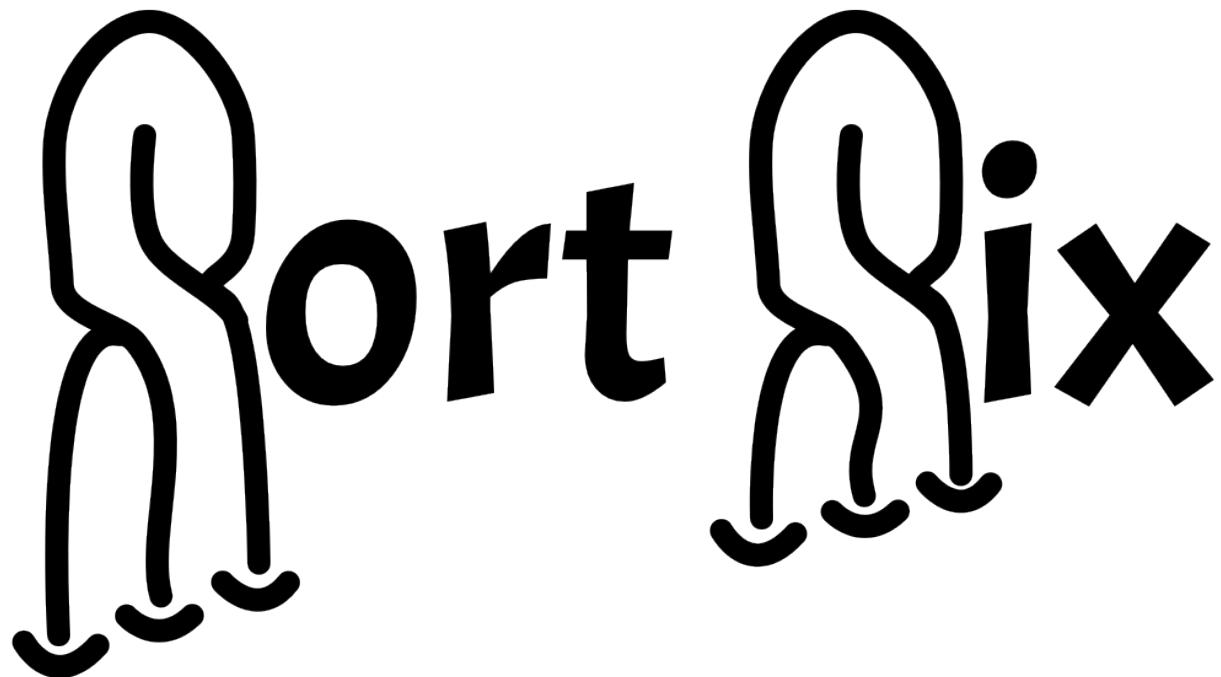
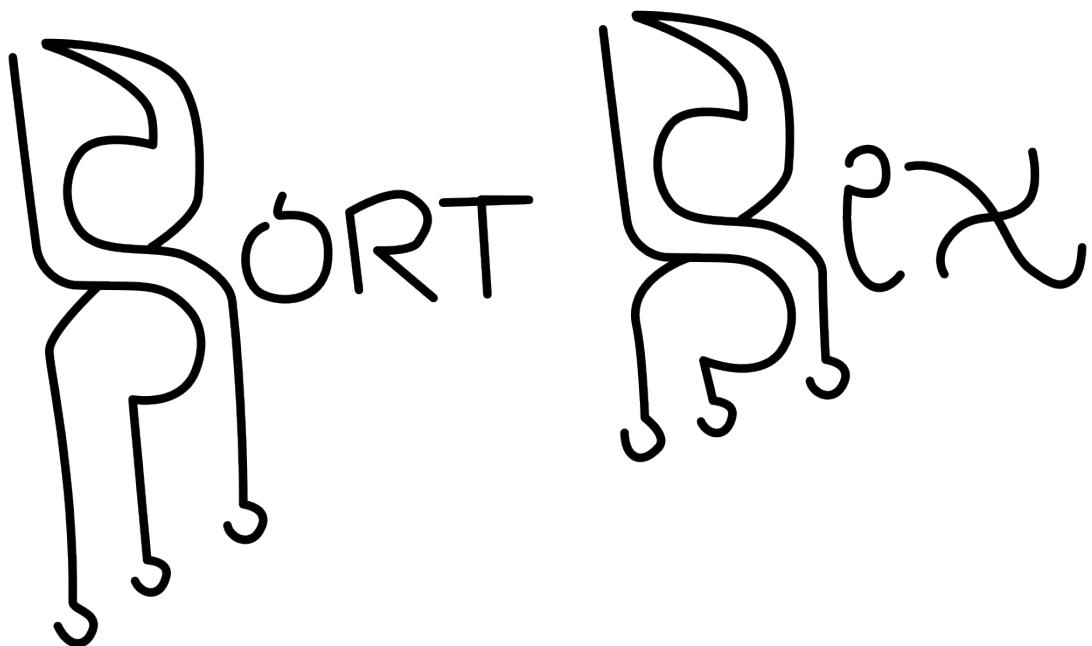
Here is an example text using these favorite font-families:

# Sort Six

## Product Description

Sort Six is a fun and challenging game for children that teaches logic, mathematics, and teamwork. Teamwork is incorporated into the gameplay as two children must collaborate together in order to progress through the levels of the game. The game play is a physical experience as the children interact with the game wall and game progress is indicated through visual, auditory and tactile feedback. The game is engaging for children as playing the game is an entertaining and social adventure that will not discourage young children as they will be presented with gradual increases in difficulty that will reinforce a desire to succeed.

## Progression to Final Logo Design





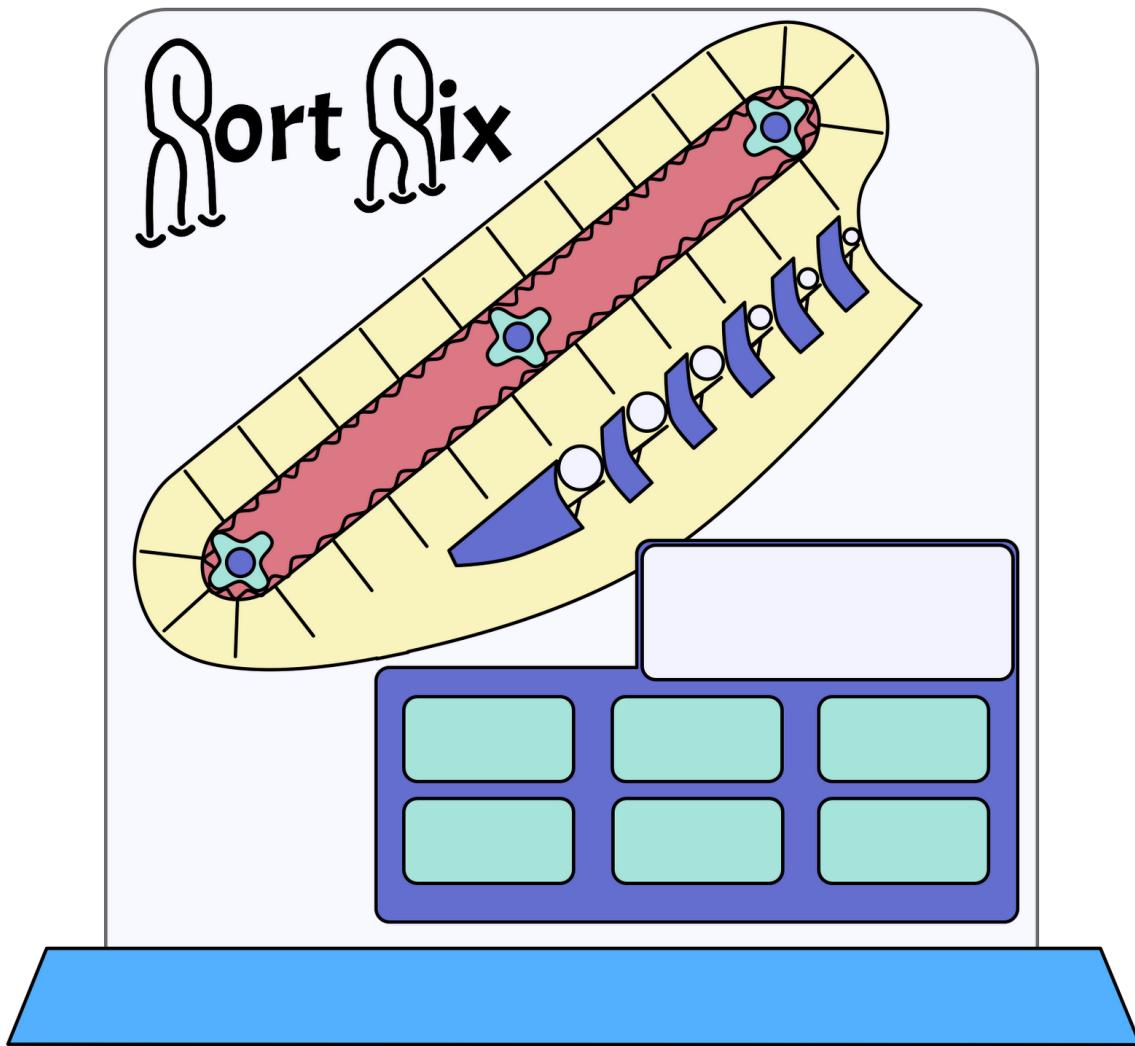
Sort Six



Sort Six



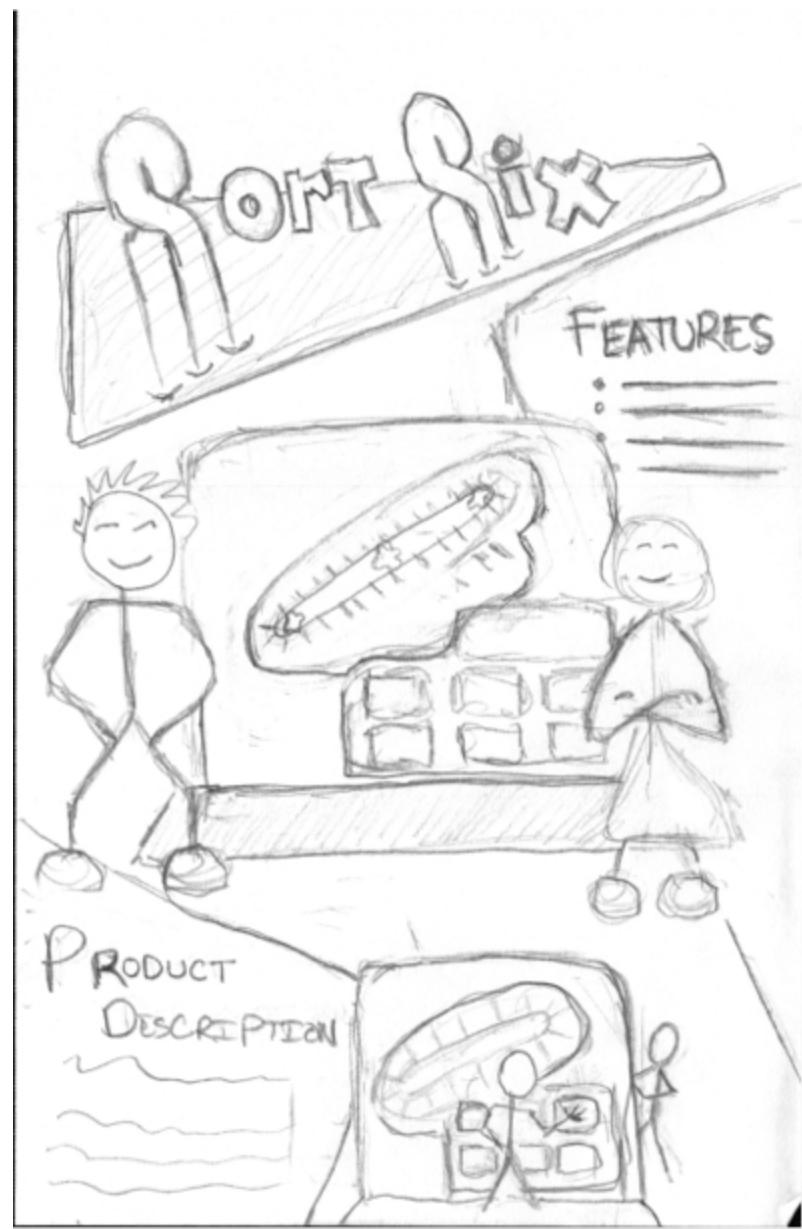
# Final Product Design



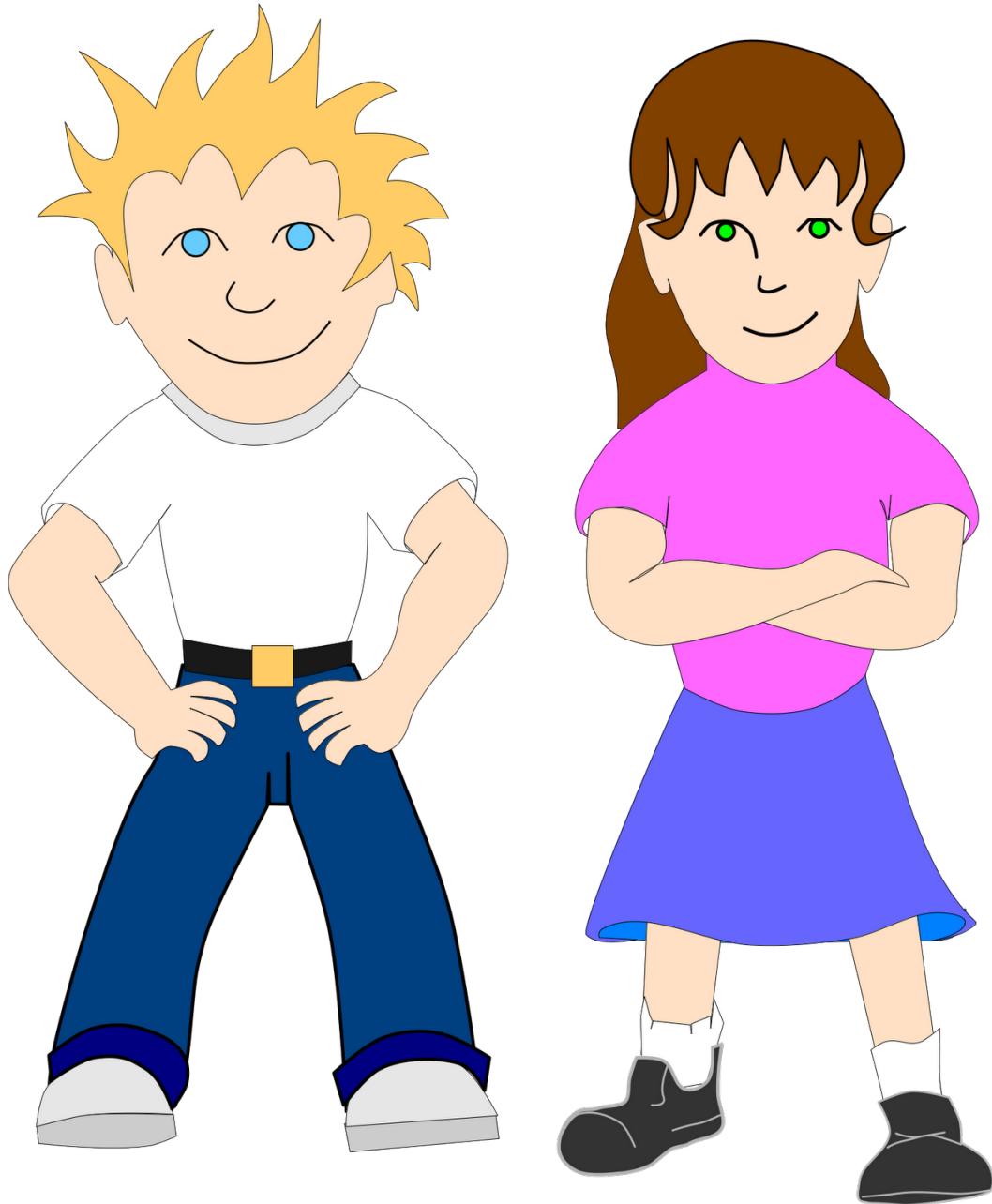
## Poster Design Sketches

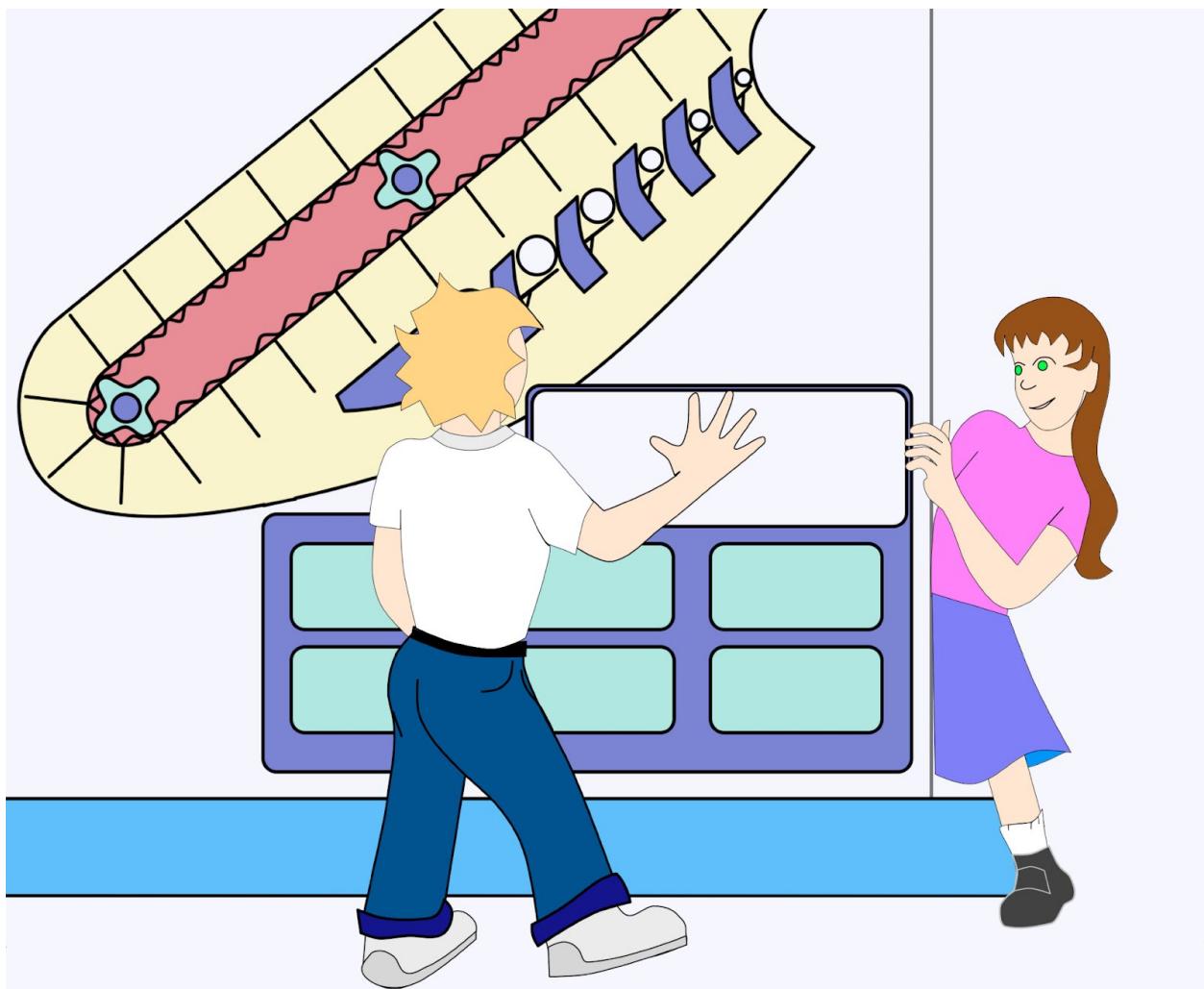






## Renderings for Poster





## Research Citations

About Autism. (n.d.). Retrieved June 1, 2012 from the Autism Society website:

<http://www.autism-society.org/about-autism/>

Baker, Mary J., Robert L. Koegel, and Lynn Kern Koegel.

"Increasing the Social Behavior of Young Children with Autism using their Obsessive Behaviors." *Journal of the Association for Persons with Severe Handicaps* 23, no. 4 (1998): 300-308, <http://search.proquest.com/docview/619414066?accountid=10906> (accessed June 2, 2012).

Dickler, J. (2012, April 2). The financial toll of autism.

Retrieved from <http://money.cnn.com/2012/04/02/pf/autism/index.htm>

Franklin, Anna, Paul Sowden, Leslie Notman, Melissa Gonzalez-Dixon, Dorotea West, Iona Alexander, Stephen Loveday, and Alex White. "Reduced Chromatic Discrimination in Children with Autism Spectrum Disorders." *Developmental Science* 13, no. 1 (2010): 188-200, <http://search.proquest.com/docview/622013297?accountid=10906> (accessed June 2, 2012).

Understanding Autism & Autistic Disorders. (n.d.). Retrieved June 1, 2012 from the Child Development Institute Parenting Today website: [http://childdevelopmentinfo.com/child-psychology/understanding\\_autism.shtml](http://childdevelopmentinfo.com/child-psychology/understanding_autism.shtml)