

2017

## Building Bugs: Fort Building Connectors

Jacob Brosius

*Philadelphia University/Thomas Jefferson University*

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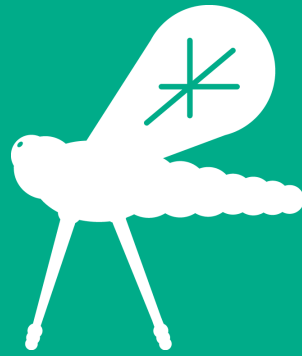
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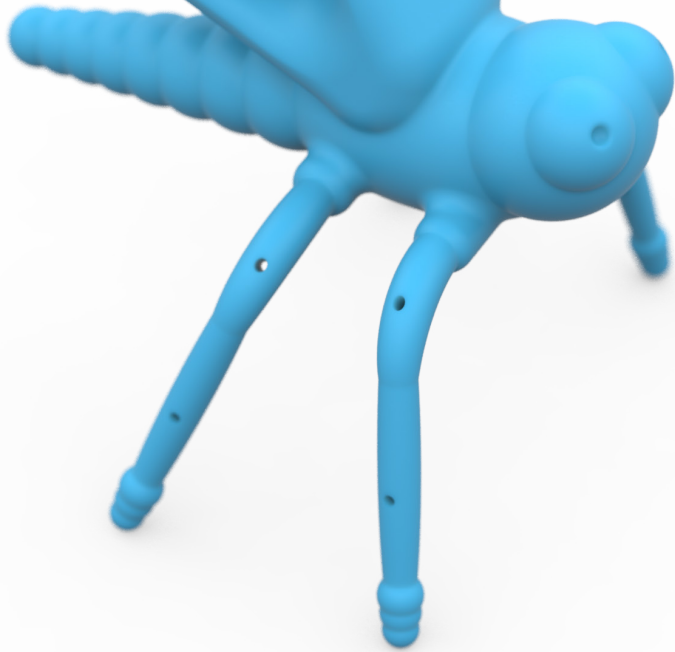
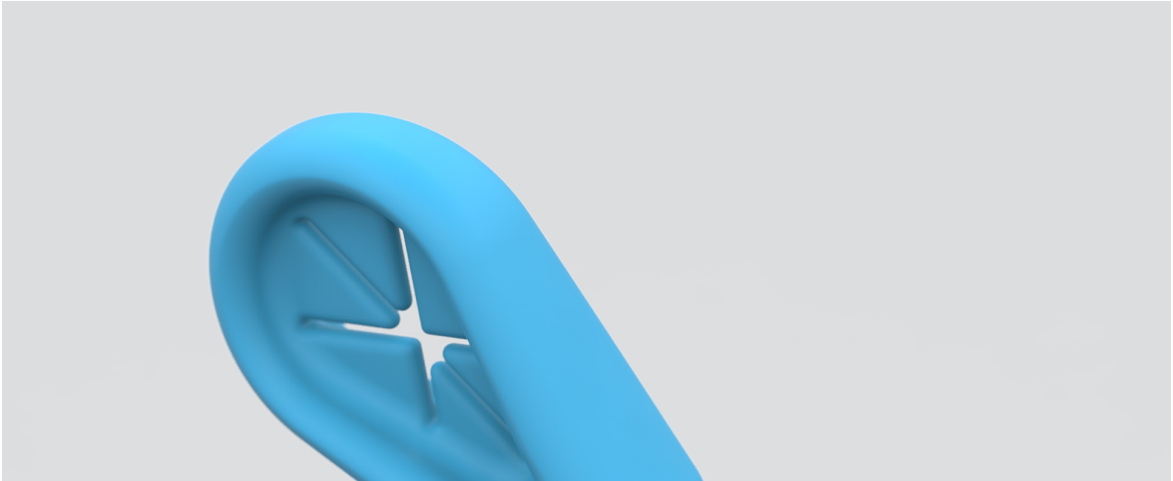
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# Building Bugs

Fort Building Connectors

*Designed By: Jacob Brosius*



# Special Thanks

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My Parents: *Bill and Julie Brosius*

The ID Faculty: *Todd Kramer  
Mark Havens  
Lyn Godley  
Mike Leonard  
Tod Corlett*

The ID Class of 2017: *Shane Siever  
Jasmine Meally  
And many more*

Building bugs Testers: *The Havens Family  
The Eppenstien Family  
The Petterson Family*

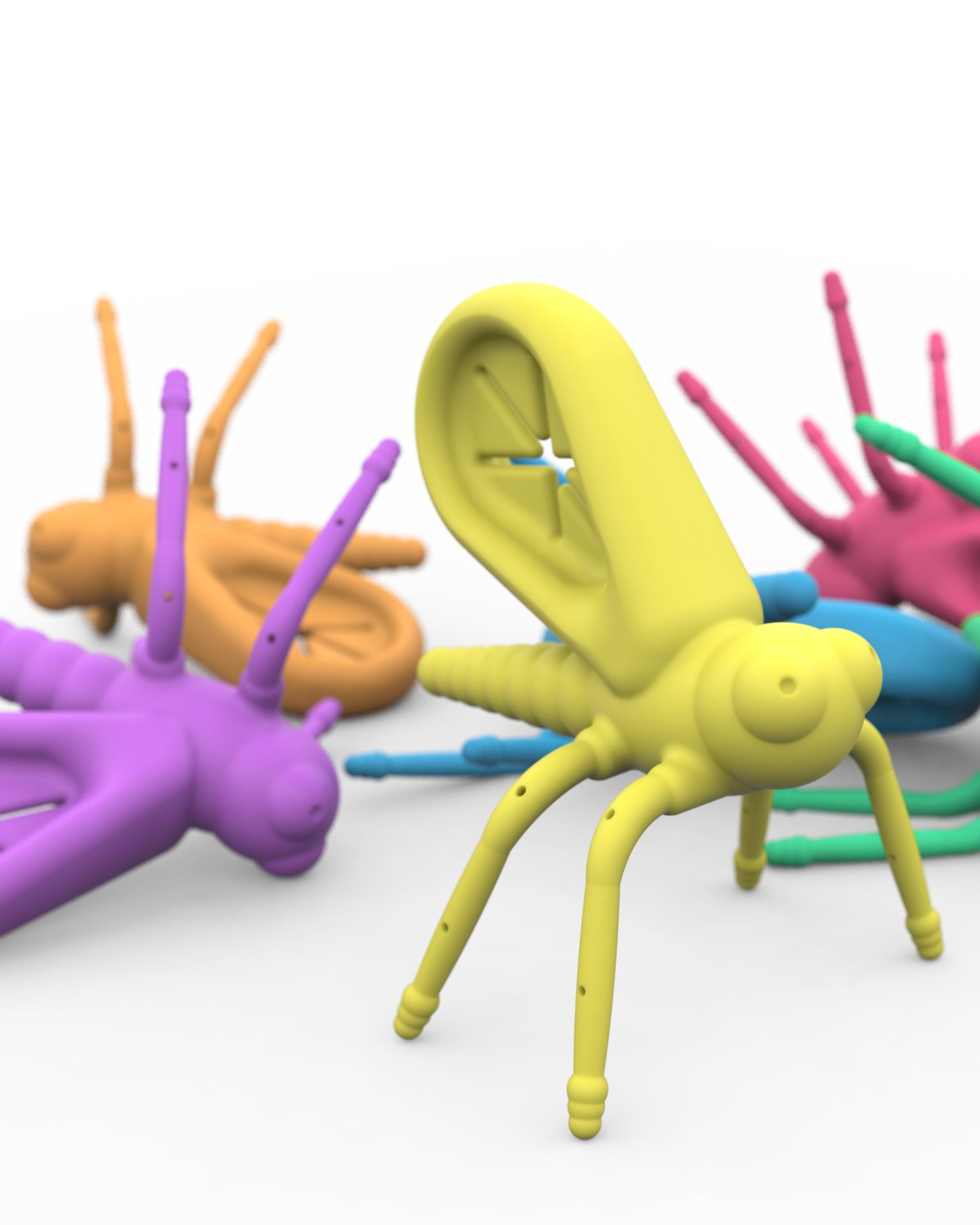
Funding: *Elleen Martinson*

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## Mission Statement

Building Bugs are a set of **indoor fort building** connectors that promote a healthy development of **creativity** and cognitive **problem solving**.



# Research



# "I'M GOING TO BUILD A FORT TODAY!"

[BEST LOCATIONS/SUPPLIES/EVENTS]

PICK LOCATIONS: Living Room Bedroom Basement Playroom Kitchen

Gender Supplies: Bedroom Hall Closet Living Room Bed Room Den

Time to Build!   
 Collected Supplies   
 Furniture in Room

Gender More Supplies: Blankets Sleeping Bags Pillows Sofas Coffee Tables Chairs

Build Some More: Pillows Cushions Sheets Ottomans End Table Table

What Supplies Would You Like?   
 Children's Furniture

Get it: Playing with other toys, Games, Hobbies, Games, Wheelchairs, Dinning Table, Sleepover

ETHER BUILD AS THEY GO OR GET SUPPLIES THEN BUILD

The "Real" (and some) (things are)

... TO BASKET ... TO ...  
 ...  
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*“IBM polled 1,500 CEO’s from 50 different countries and 33 different fields placing creativity as the No. 1 measure of ‘leadership competency’”*

# We've Got Ourselves a Problem

Currently in the United States as our IQ is going up, level of our measured creativity is decreasing. This is alarming as creativity is generally viewed as a positive attribute as well as CEO's are placing creativity as the number one measure for leadership competency. This poses the question of how in this time of creative decline, do we as a culture help to continue to promote the exercise of creativity and its development? It turns out much of the creative development comes through the early years of our childhood and the experiences that we endure. How do we help to inspire the future generation of creators?



**IQ**

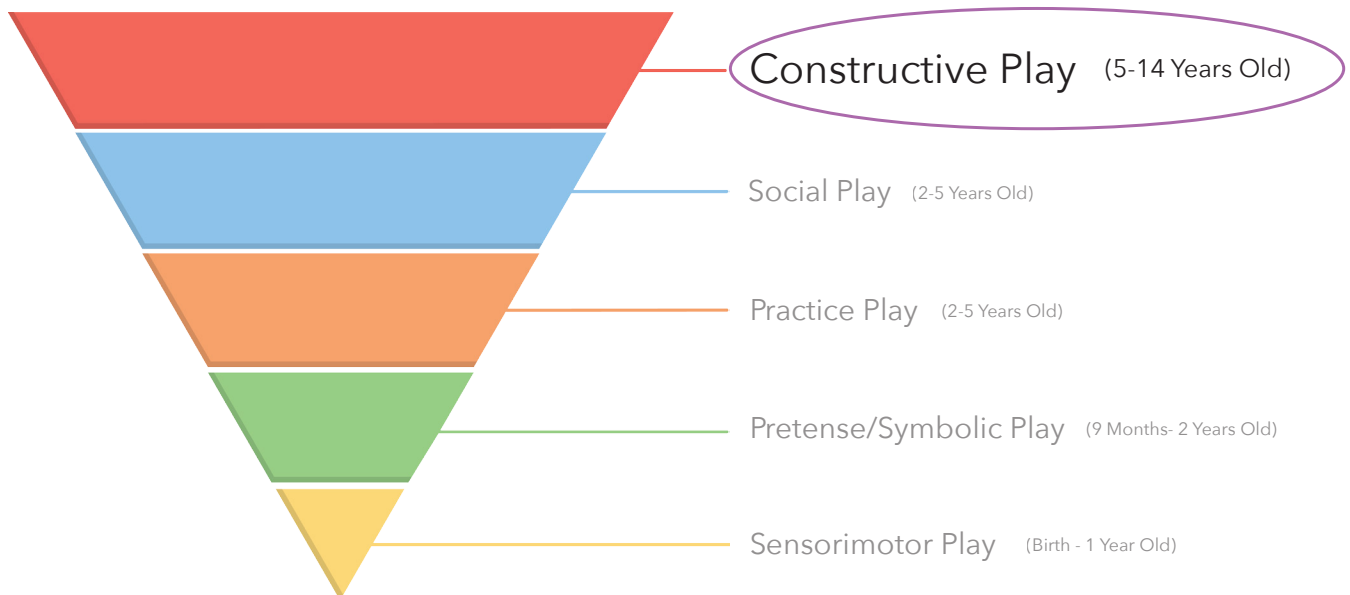


**Creativity**

# How Do People Develop Creativity?

As children, our minds are open to the countless possibilities that await around every corner. It is in a child's nature to be naturally curious and creative and to promote and encourage this is widely beneficial to their natural development. This development happens throughout play stages in our lives that help with key areas of skill building. The area that I identified as the most important is the Constructive Play Stage. This stage combines the Sensorimotor Play and Practice Play stages and is when kids are able to think outside the box.

## Stages of Play Development



### Sensorimotor Play

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- Visual and motor skill training
- The ability to pick things up and place them down
- Being able to orient them at your discretion

+

### Practice Play

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- Repetition of behavior when new skills arise
- These are typically observed and a recreation of action

=

### Constructive Play

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- Self-regulated creation
- Happens once child is able to learn they have the ability to "color outside the lines" and make their own



**Playful and Imaginative**



**Ages 5-8**



**Growing and Learning**

# Who is the Target User?

With such a great importance put onto the development of creativity early in life, it is important to create opportunities to ensure we are providing our youth with the best chance to build upon it. Taking hold of the nature play stages and giving children the tools they need to continue to grow.

Taking into consideration the multiple different theories of play, the ideal age to introduce toys to promote creativity would be when the child is between the ages of five to eight years olds. This places them in the beginning of the Constructive stage of Play Development and helps transition the child between through the Preoperational and concrete operational stages of Jean Piaget's cognitive developmental stages.

By introducing toys of this nature to children at this point in life, it will help to build creative characteristics for them to push further with more complex problems at age ten or twelve. Narrowing down the age demographic allows for a more catered product as a result to the research and studies and ultimately a more effective one.

*"If you want to be creative, stay in part a child, with the creative, stay in part a child, with the creativity and innovation that characterizes children before they are deformed by adult society"*

**-Jean Piaget**



**\$2,000,000,000**

2 Billion Dollar Industry

*“The Building Toy market has seen an increase of 20% in sales between 2013 to 2015”*

- Toy Industry Association INC.

# Building Toy Market

Currently in the United States, the building toy market is the fastest growing and one of the top grossing categories in the industry. This is a trend that as parents and grandparents become more concerned with the healthy development of problem solving. According to the Toy Industry of America Inc. current consumers are interested in three main areas.



## Family Matters

Parents have grown nostalgic for their own childhood board games, puzzles and other traditional toys while promoting socialization, face-to-face interaction, and family interaction, and family bonding.



## Brain Boosters

Reinforce science, technology, engineering, arts and math's standing as the top contenders in the toy market.



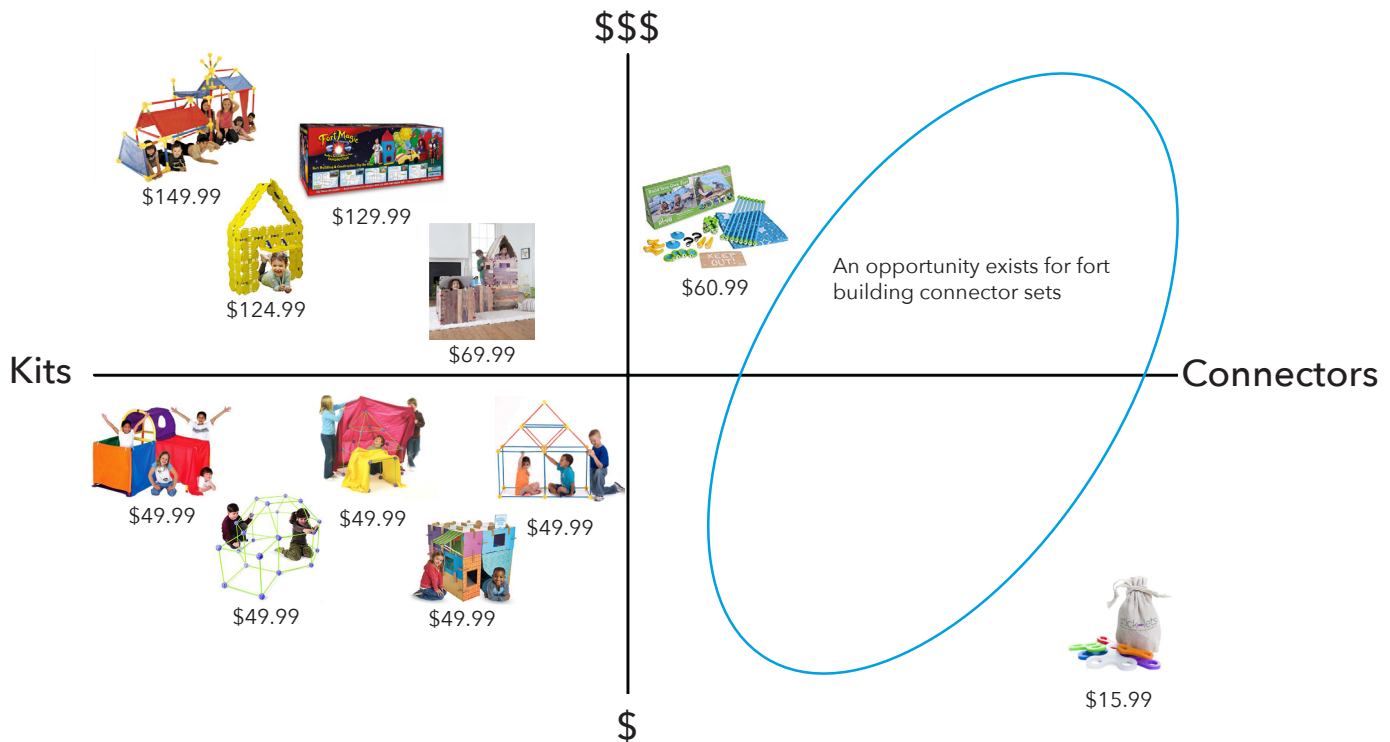
## Ultimate Builders

Elaborate culinary concoction, Pinterest worthy designs, and stop-motion movies are just a few of the many creative projects that the "ultimate creator" will be found working on.

# Market Opportunity in Fort Toys



Identification of fort building toy market within the building toy market



When looking further into the market, fort building toys could be broken down into smaller product categories. These are indoor vs. outdoor as well as limited vs. open construction. Many of the current products limit the type of connection and force the product to be used in a specific application. There are few products that allow for free exploration of use and discovery.



# Benefits of Fort Building

The activity is common among many children between the ages of five and fourteen. It is a way for kids to express themselves and help to develop skills critical to healthy development.

According to David Sobel Ph D. fort building is not only a common occurrence, it is a "universal drive that's rooted in the kids' healthy development." It helps to build multiple facets of children that carry over into adulthood. Things such as cognitive skills, stress relief, maturity, and practical skills.

Discovering this information, helped to further back the idea of Building Bugs. Not only was it validation, but it helped to show that there is a real need for more products to help promote fort building in children.

# Interviews and Surveys



Photos taken while observing fort building behavior

In order to better understand the current demographic, I had conducted a series of interviews and surveys to better understand the relivence of fort building. I had the data below was a result of 150 different partispants with childern between the ages 5-10. Below I present some of the findings I had made.

**80%**  
of kids engage  
in fort building

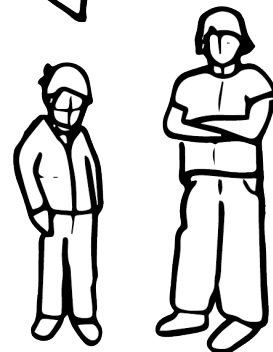
By going through and conducting this survey on individuals, it allowed me to support the findings in the market analysis. This is that kids are in fact building lots of forts, but they already have the building blocks to do so. These are the pillows, blankets, sheets, living room furniture, ect. What they are really in need of is that connectors to help hold these materials that are not supported to be used to build forts together.

There was still one thing missing before I could begin to design I needed to gain insight on one last thing. This was the parents and grandparents of children to see what influence they were having.

*"Reliable things to hold up blankets"*

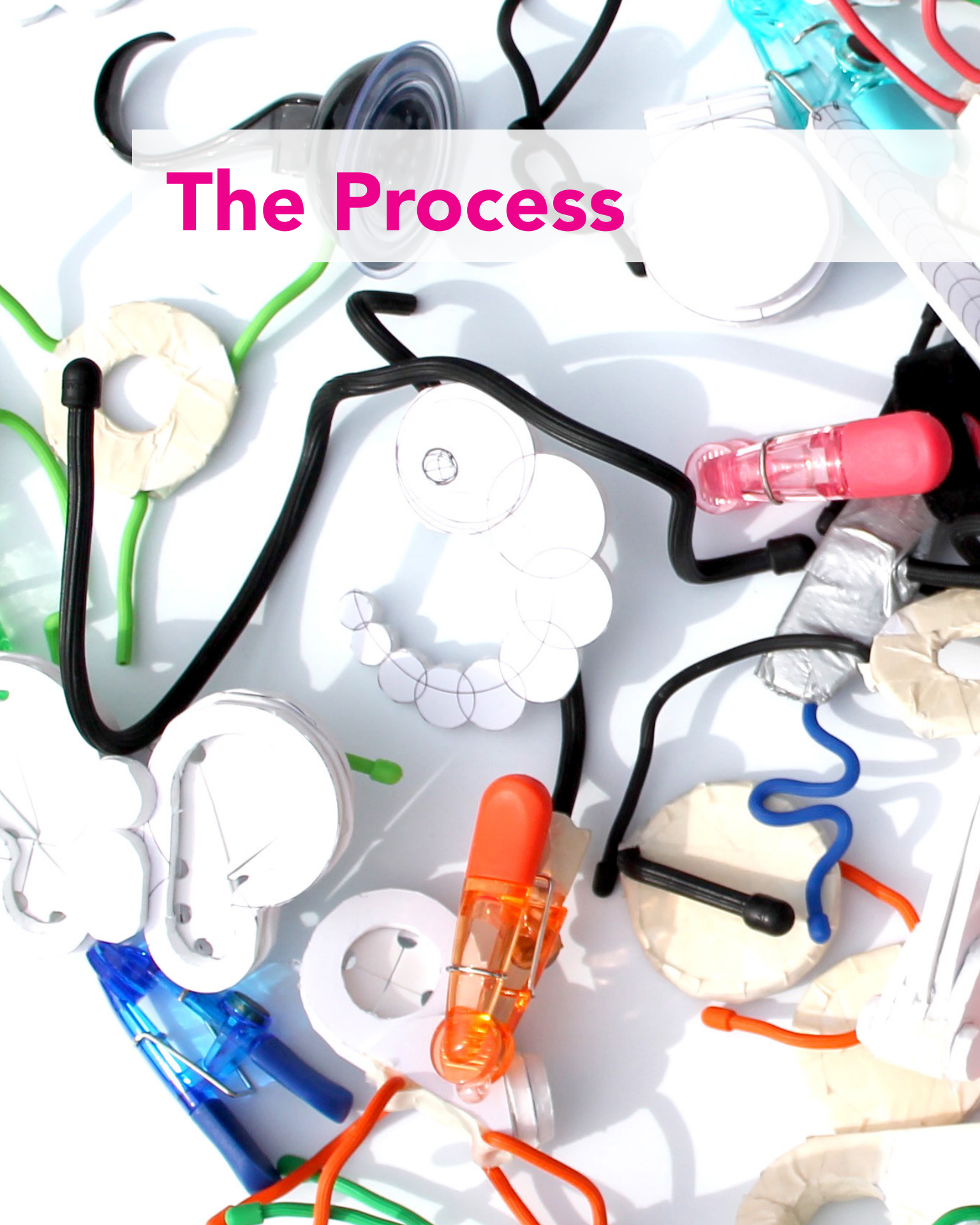
*"Ways to clasp blankets and attach to furniture"*

*"Ways to create more support for building material"*





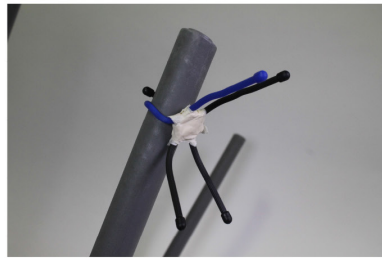
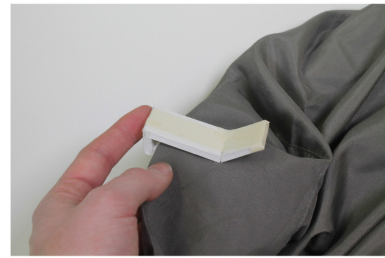
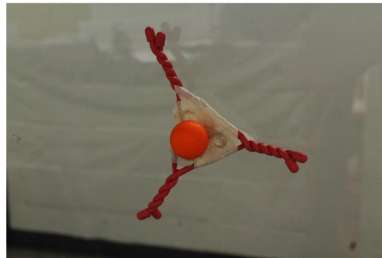
# The Process

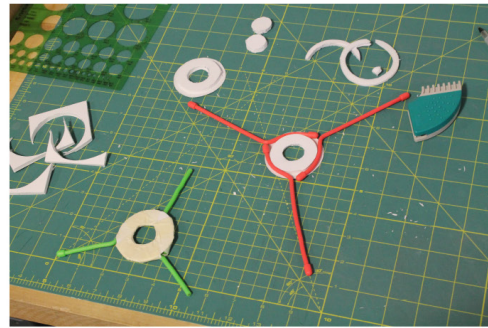
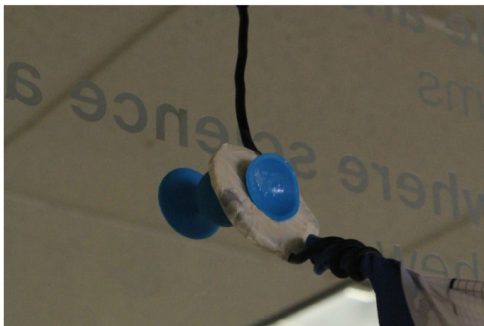




# Early Development

Starting off, it was all about making. Taking pretty much anything I could that either came directly from the research or worked similar in ways of locking things down. This led to a lot of “big ugly models”. Models that helped to communicate the working function to allow the for further developments to be made.





I was able to test many of the models myself seeing whether or not they were able to connect to a blanket or sheet and then attach that further to furniture around the room. The next step was to take these concepts beyond my own testing and to get them into the hands of the user. In this case the kids.



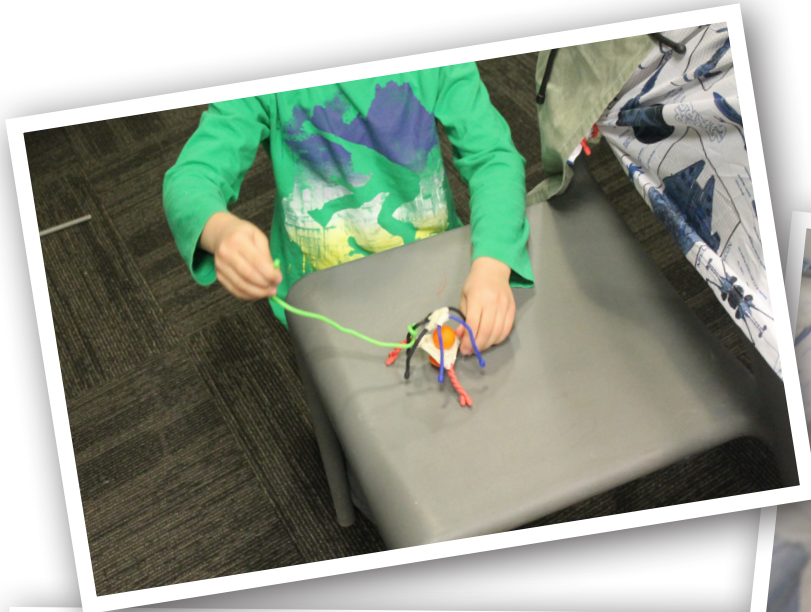
" It looks like a guy! He has really long legs. He could be a bug too!"

## Round 1 of Testing



Getting the prototypes into the hands of the children unveiled a lot about the design. With children who were avid fort builders they are able to easily understand how to use it and began building right away. With children who were not, they require some small instruction before they knew what they were doing.



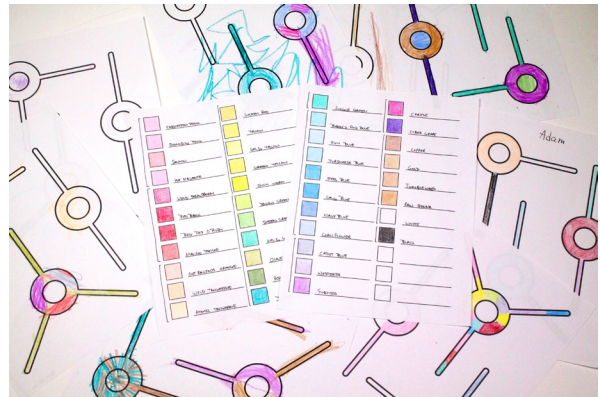


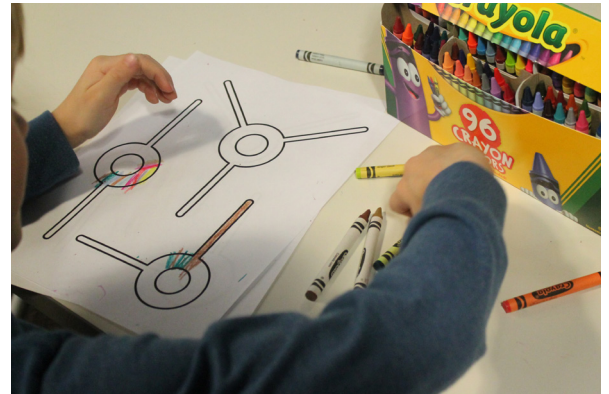
I was able to see throughout the testing the kids were drawn to what they called the "Daddy long leg." These were the connector with bendable armature allowing for multiple ways of attachment through bending, hooding and grabbing. Another type of connector that went over well was a pull through ring which worked by locking the sheets and blankets in place with small soft teeth.



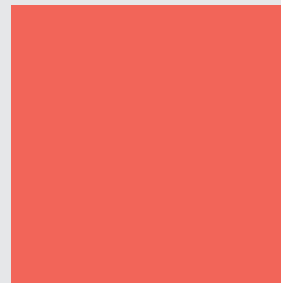
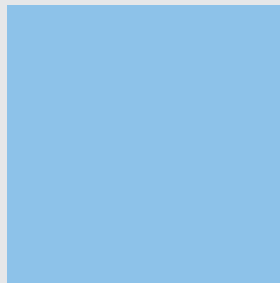
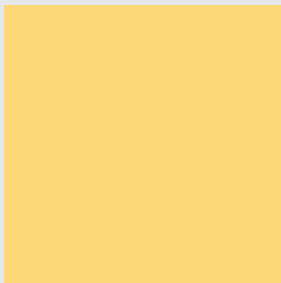
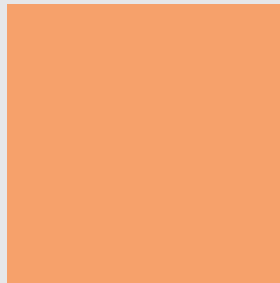
# Color Development

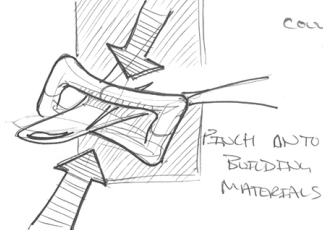
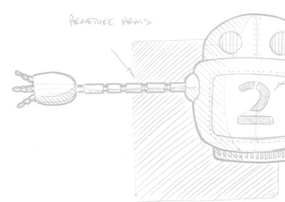
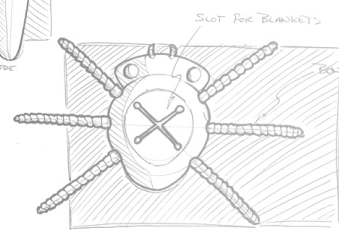
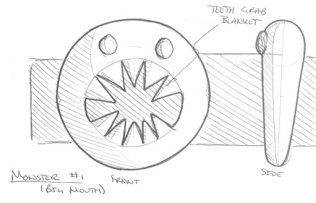
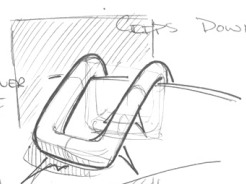
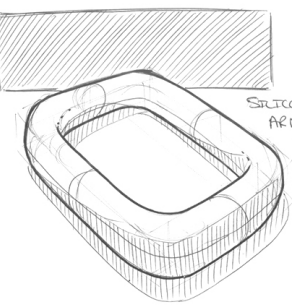
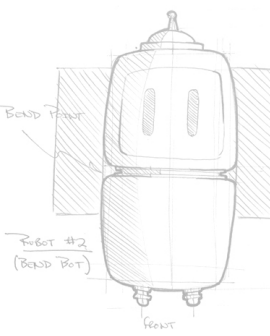
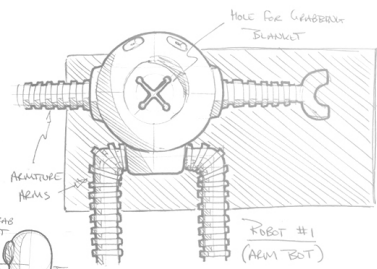
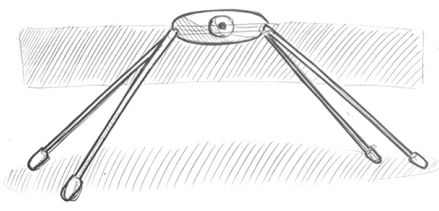
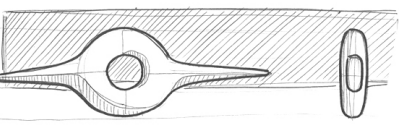
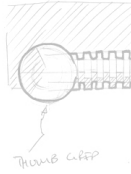
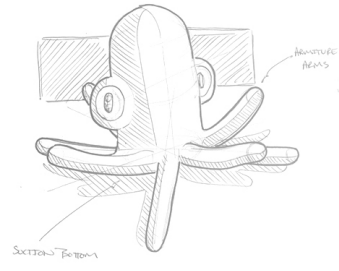
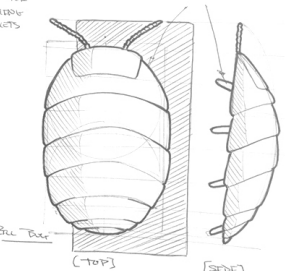
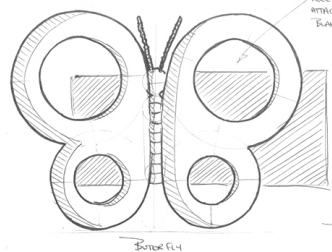
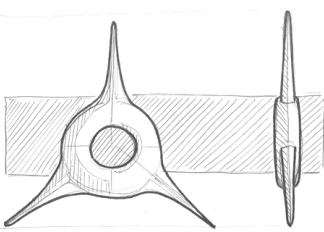
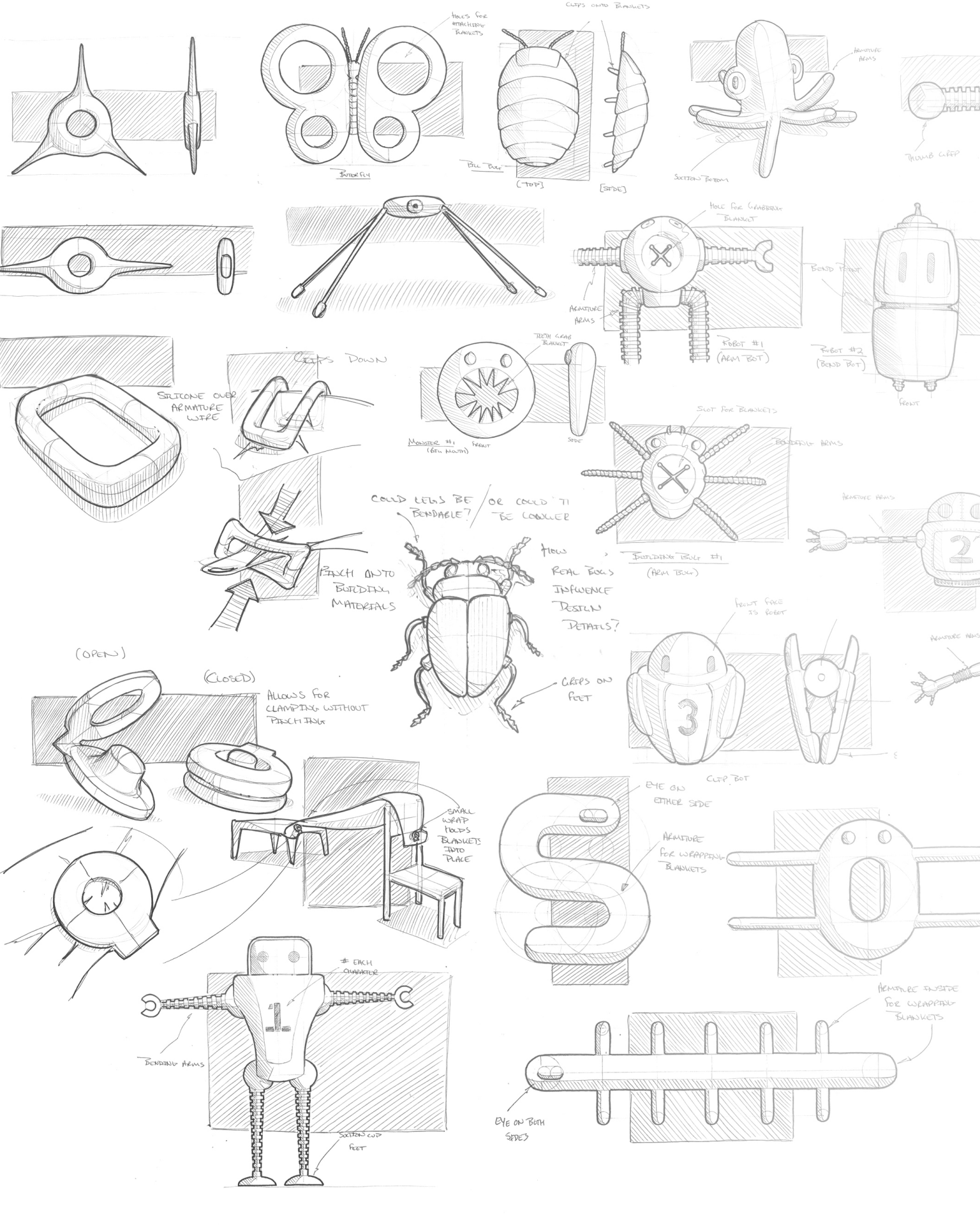
To better understand the colors the children were drawn to, I created color sheets of the current designs and asked them to color with their favorites. This test was interesting to see how the kids were viewing the final result.



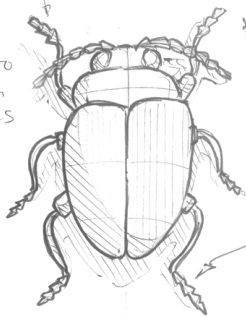


## Color Ways





COULD LEGS BE BENDABLE? OR COULD TI BE LOCKER



HOW REAL BOVS INFLUENCE DESIGN DETAILS?

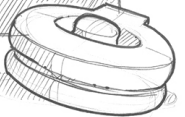
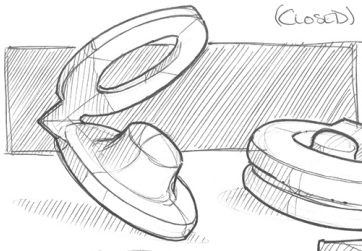
ROBOT #1 (ARM BOT)

FEET FACE TO FEET

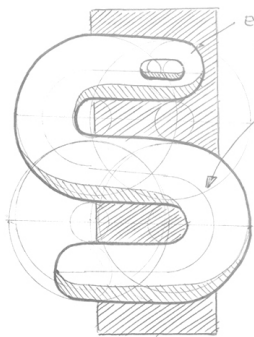
(OPEN)

(CLOSED)

ALLOWS FOR CLAMPING WITHOUT PIERCING

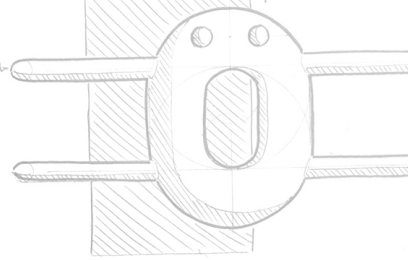


SMALL WRAP HOOPS BLANKETS INTO PLACE

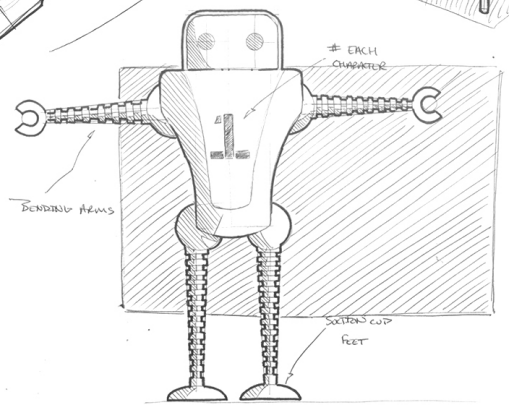


EYE ON EITHER SIDE

ARMATURE FOR WRAPPING BLANKETS



ARMATURE FASITE FOR WRAPPING BLANKETS



BENDING ARMS

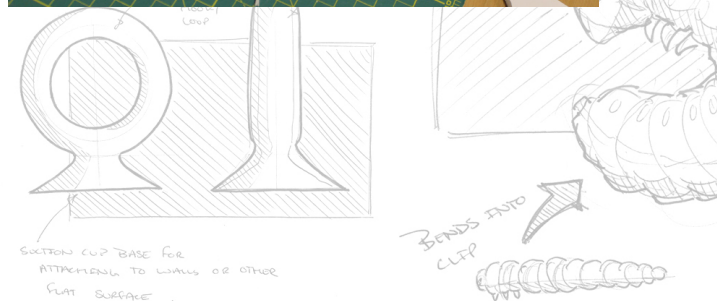
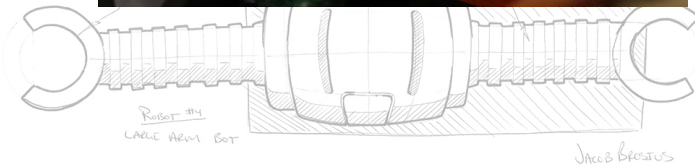
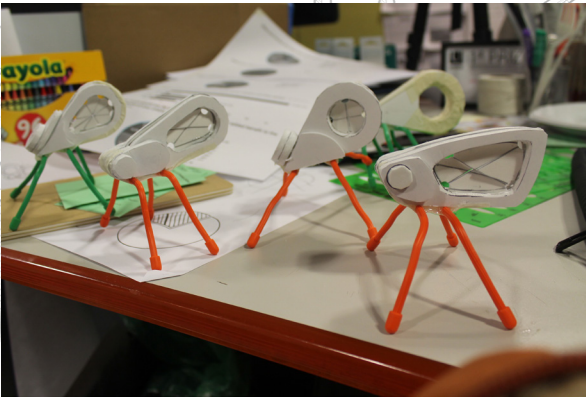
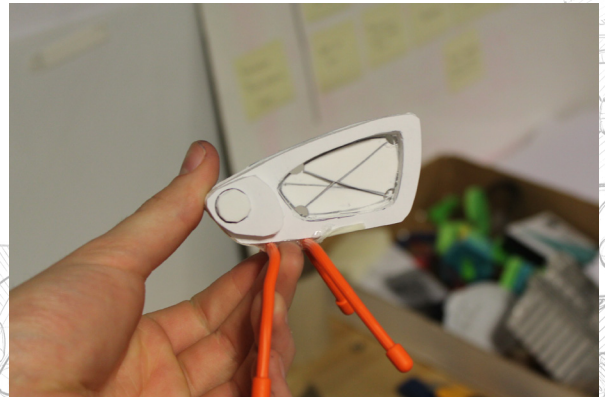
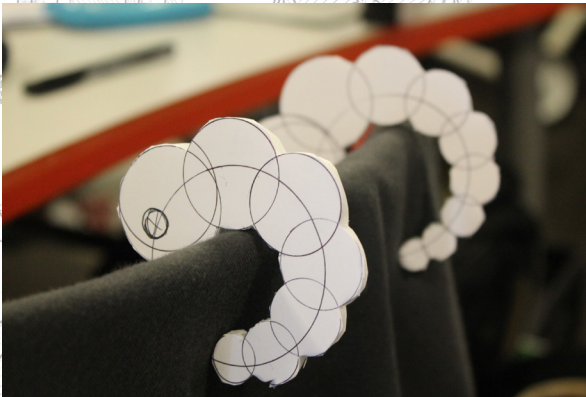
# EACH CLAMPABLE

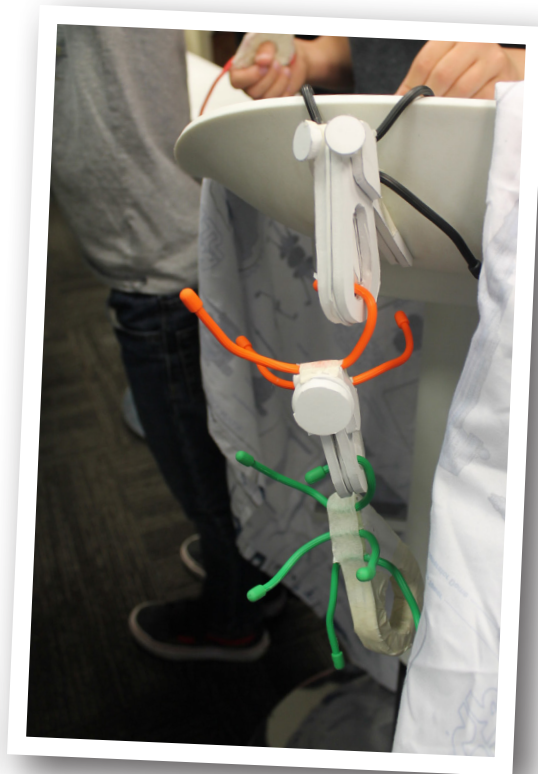
SPLITTING COU FEET

EYE ON BOTH SIDES

# Development Round 2

After the first round of testing it was back to the drawing board. I needed to be able to take insights from the interactions I observed and turn them into new designs for the next round of testing.

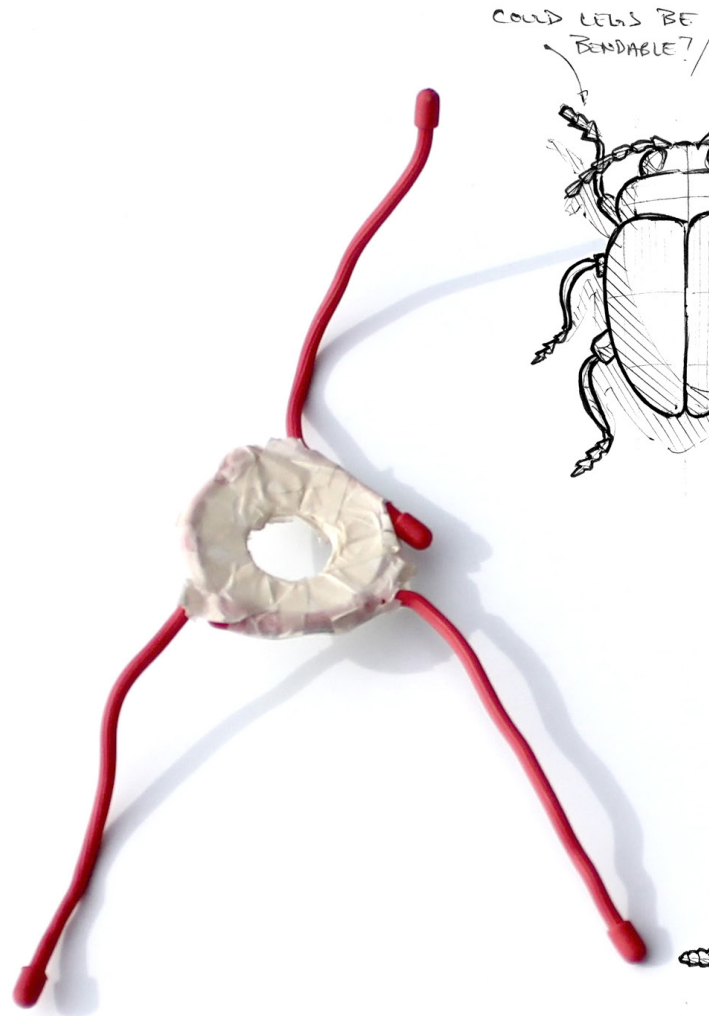
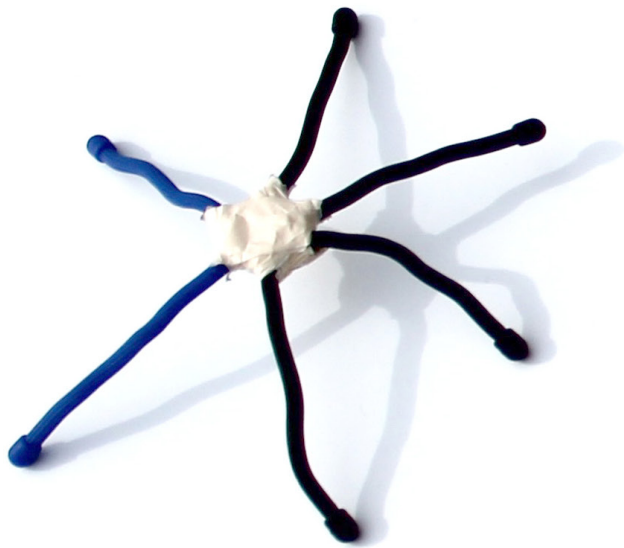




## Round 2 Testing

For the final round of testing, the product really was beginning to take shape. The connectors now were bug like characters and the able to incorporate many of the functions the final design would later embody. While testing in this round, I was able to confirm that the kids enjoyed the bug form the connecttors were taking. The kids felt they were more exciting and even said "woah, theses are creative!"

During this stage of testing it became clear that the creative quality in which I wanted the product to carry was coming through in that that kids were able begin developing other uses for the deisgn. The added playablity only helps to sell the product as a toy not only as a tool to build forts with.



Once I knew the modes of attachment, it was a matter of combining them all together into a single package. In the case of the Building Bugs, it began to take the space of a bug. This was coming from the insights of the kids when testing early concepts began to call them bugs as well as the goal to bring an animorphic quality to the product.

OR COULD THEY BE LOWER?

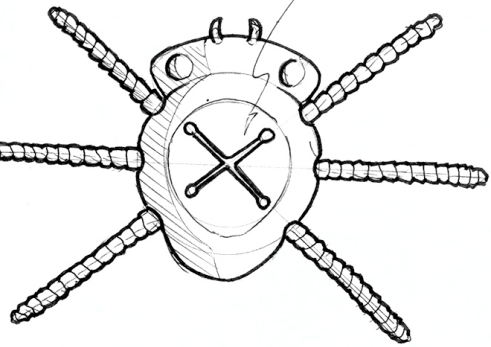


HOW COULD REAL BUGS INFLUENCE DESIGN DETAILS?

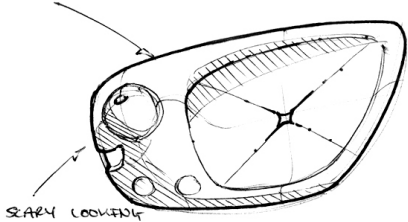
CLIPS ON FEET



SLOT FOR BLANKETS

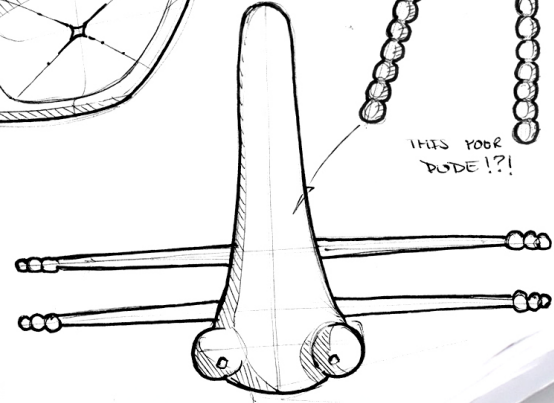
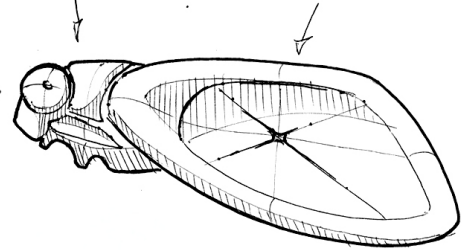


THAT AIN'T NO BOLT!



EARLY LOOKOUT

TOO REAL?

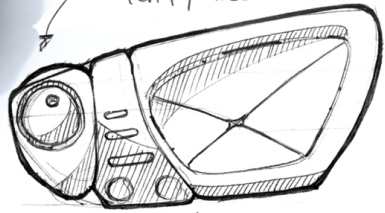


THIS POOR DUDE!?!

SOLID BODY



HOW COULD ANTENNA COME INTO PLAY / HOW WOULD YOU MOLD?



WITH LENS OF COURSE

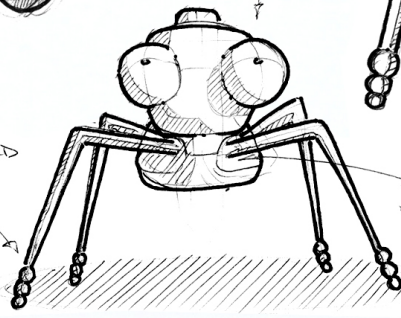


NEEDS MORE INTERESTING PROFILE

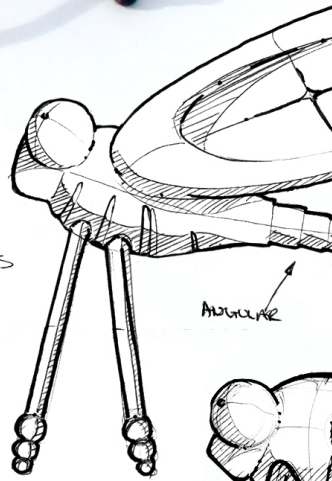
BIG EYES

ANGULAR

SECONDARY MOLD OVER LEFT TO COVER WIRE

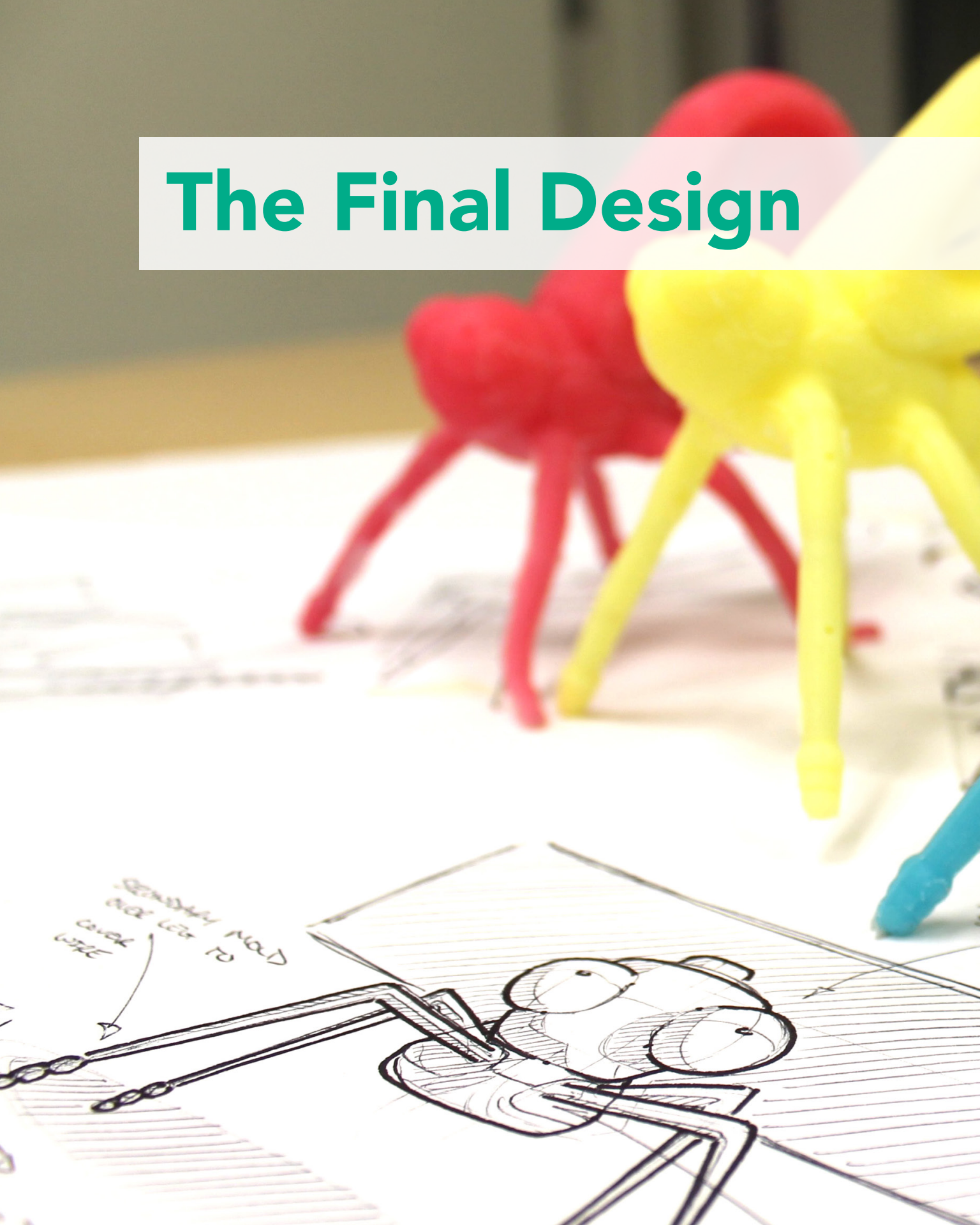


INCREASED WIDTH OF "WINK" TO CREATE MORE INTERESTING SILHOUETTE

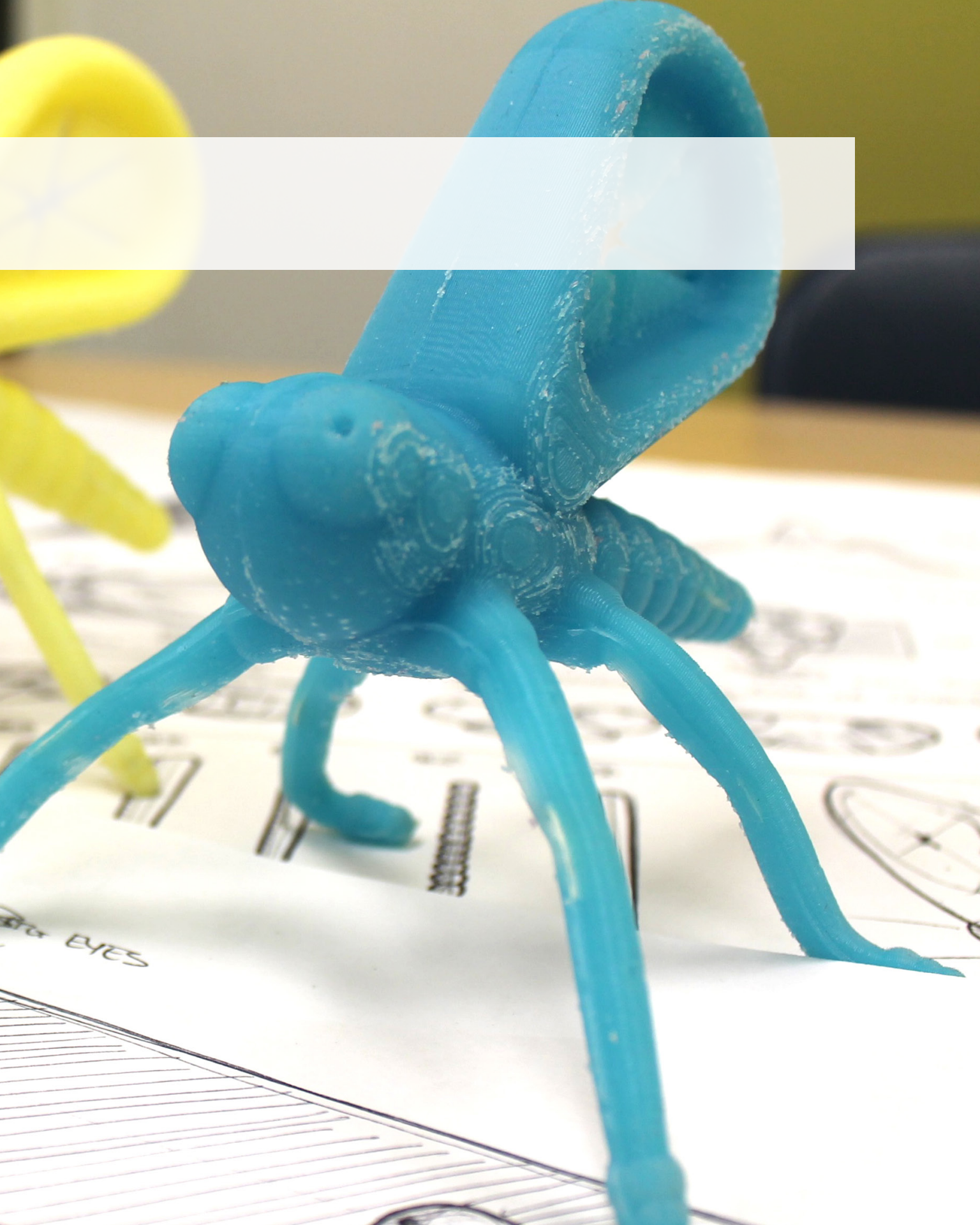




# The Final Design



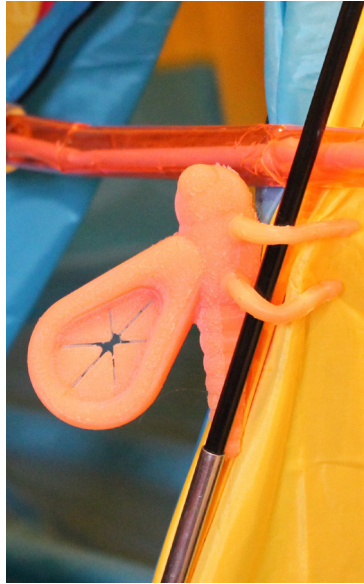
SEPARATE MOLD  
OVER LEG TO  
LIFE



# Understanding the Final Design



Locking

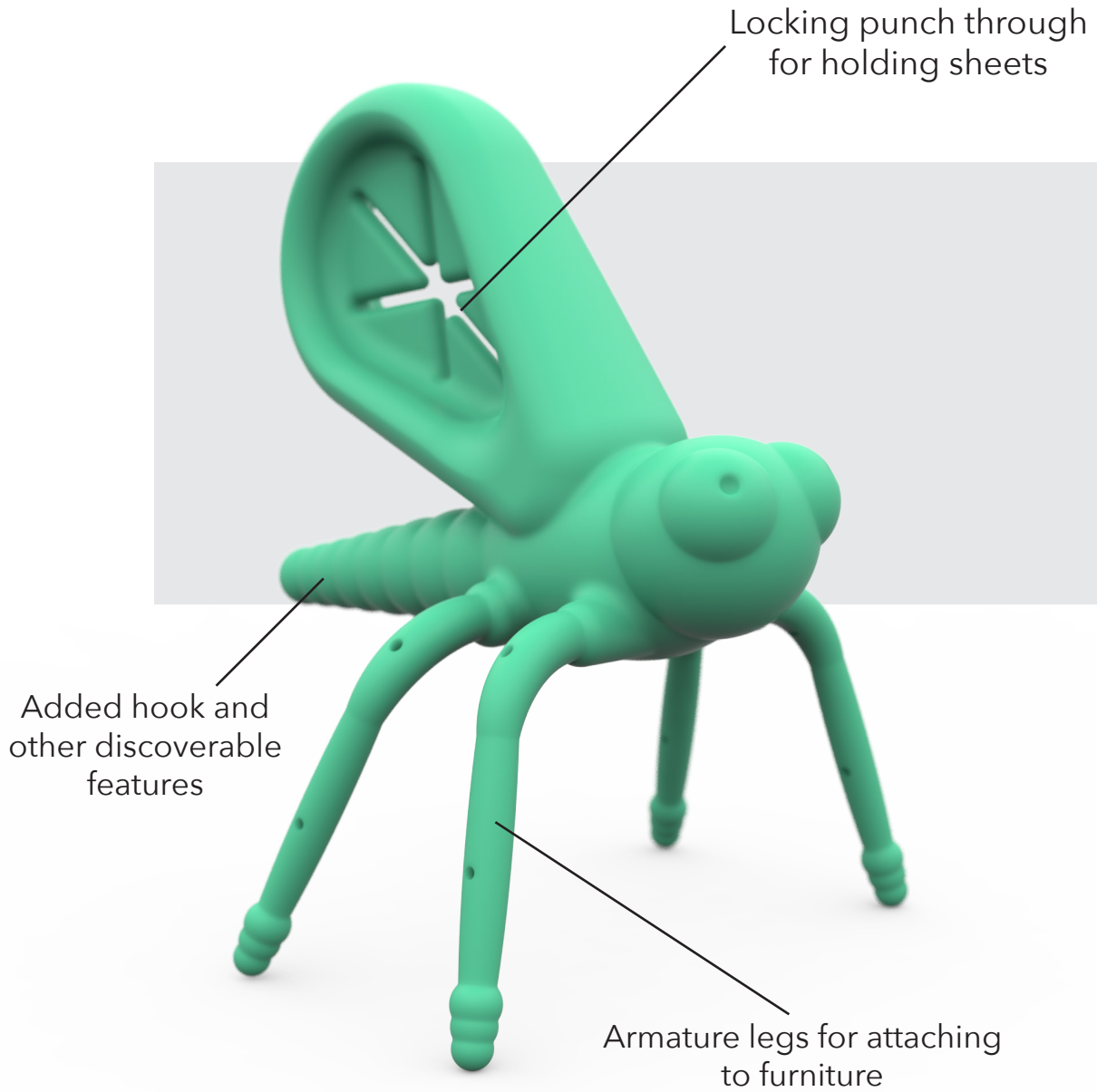


Holding



Clamping

When observing the early testing of the connector types, locking, holding and clamping were the major three ways of use and therefore I developed them into the characteristics of the final design. The combination of these features truly makes up what you see as the final design of the building bug. The wings act as a locking punch through for anchoring blankets and sheets. The legs act as a way of hanging or clamping onto furniture. The tail and head act as a way of hooking or holding things.



# Testing Materials

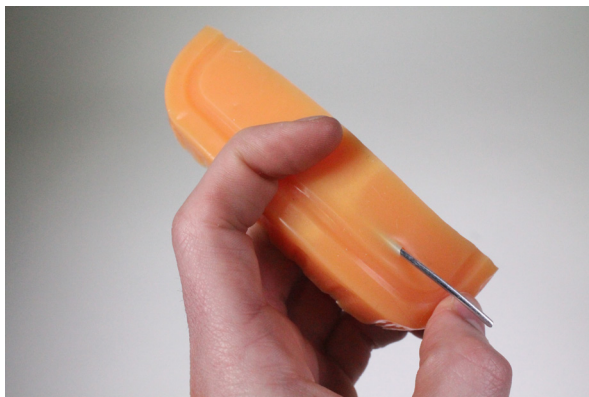
When trying to select a material to test, I knew that I was going to need something I would have ample access to throughout the project with a soft malubale propoerty. Silicone was the answer, but more specifically, Smooth-on Dragon Skin 20A.

With this matterial for prototyping, it allowed for dying to the desired coloring, it allowed for the ease of pouring into whatever mold was designed, and for the grip needed in the function of the product. before even testing for designs for the building bugs, I had run the matterial through a series of tests in order to help determine some matterial choices later on. I had tried overmolding the matterial to see how it would react to either an armature wire or thin gauage steel sheet were within. This helped to show that the wire needed to be kinked in order to provent the puncture of the silicone surrounding it, as well as that a steel sheet was going to prove too much material for the applicaiton the Building Bugs would be under.





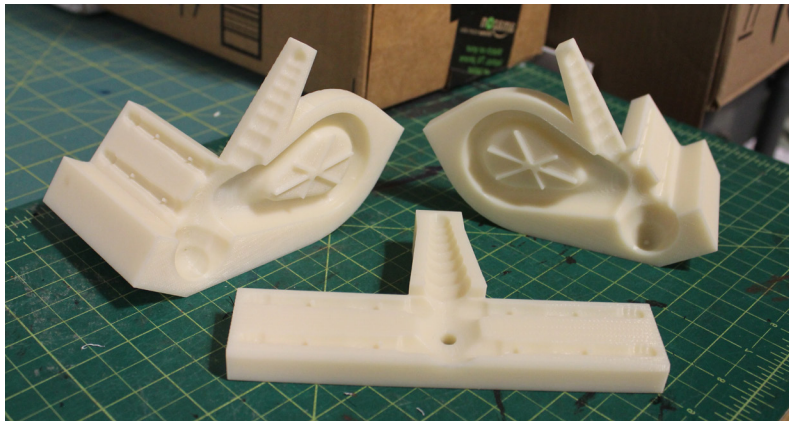
Photo of the silicone overmolding steel plate



## Creating the Molds

To create the final Building Bug models, I needed to first 3D print a negative mold. This allowed me to pour in the silicone and result in the form I desired. There were multiple areas of trouble shooting that occurred during this step. It needed to create the form while also being able to over mold the armature, and to resolve an issue with air being trapped in the mold.

To fix the air that was becoming trapped in the mold I was able to add in some small pin sized air holes into the bottom of the 3D print. This resulted in a much better result out of the mold. Utilizing a handsander to vibrate the air bubbles also resulted in a better final result. For the over mold, I had added in the pins in order to hold the armature into place as it would be in the production mold, but due to the quality of the 3D print, they were not as functional as first hopes. Tape was used to help support the armature in the molds I had created and it was removed after casting.



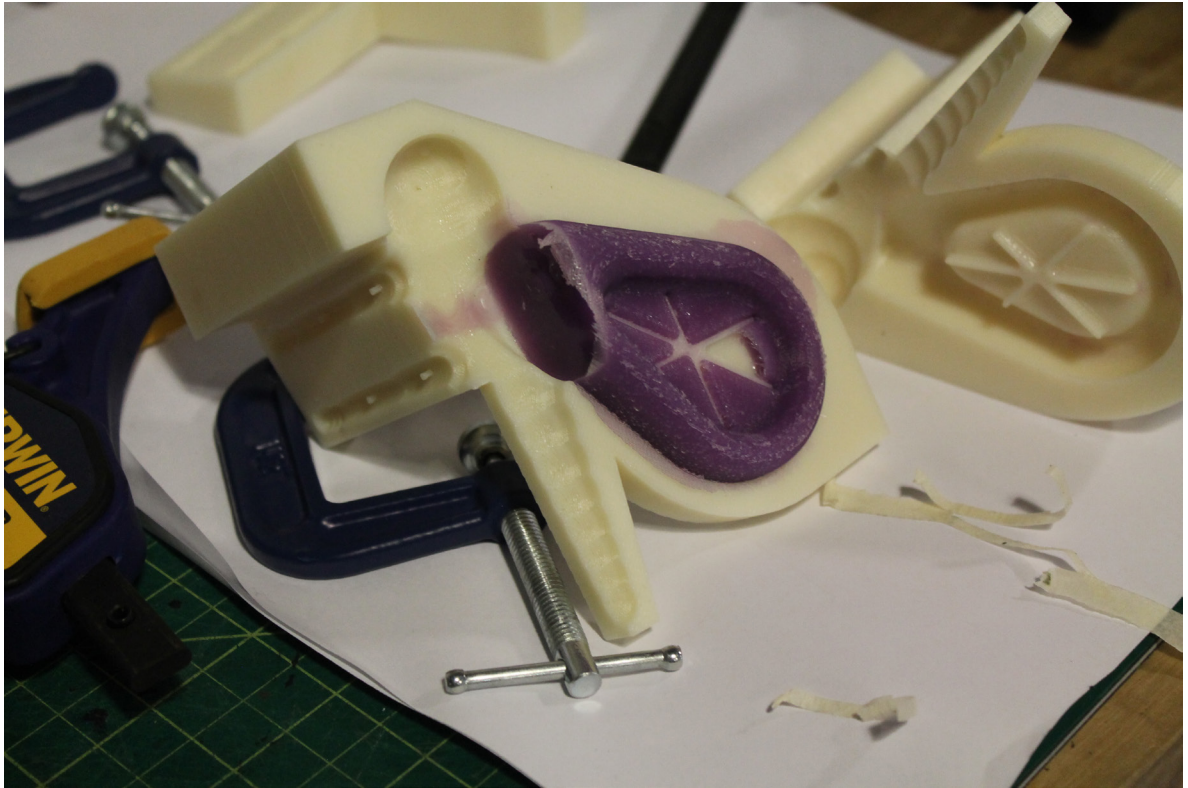
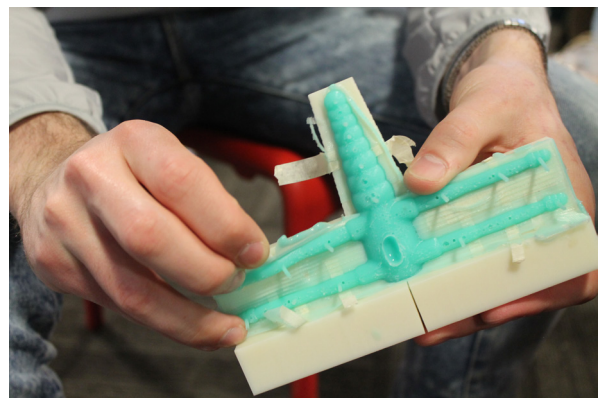
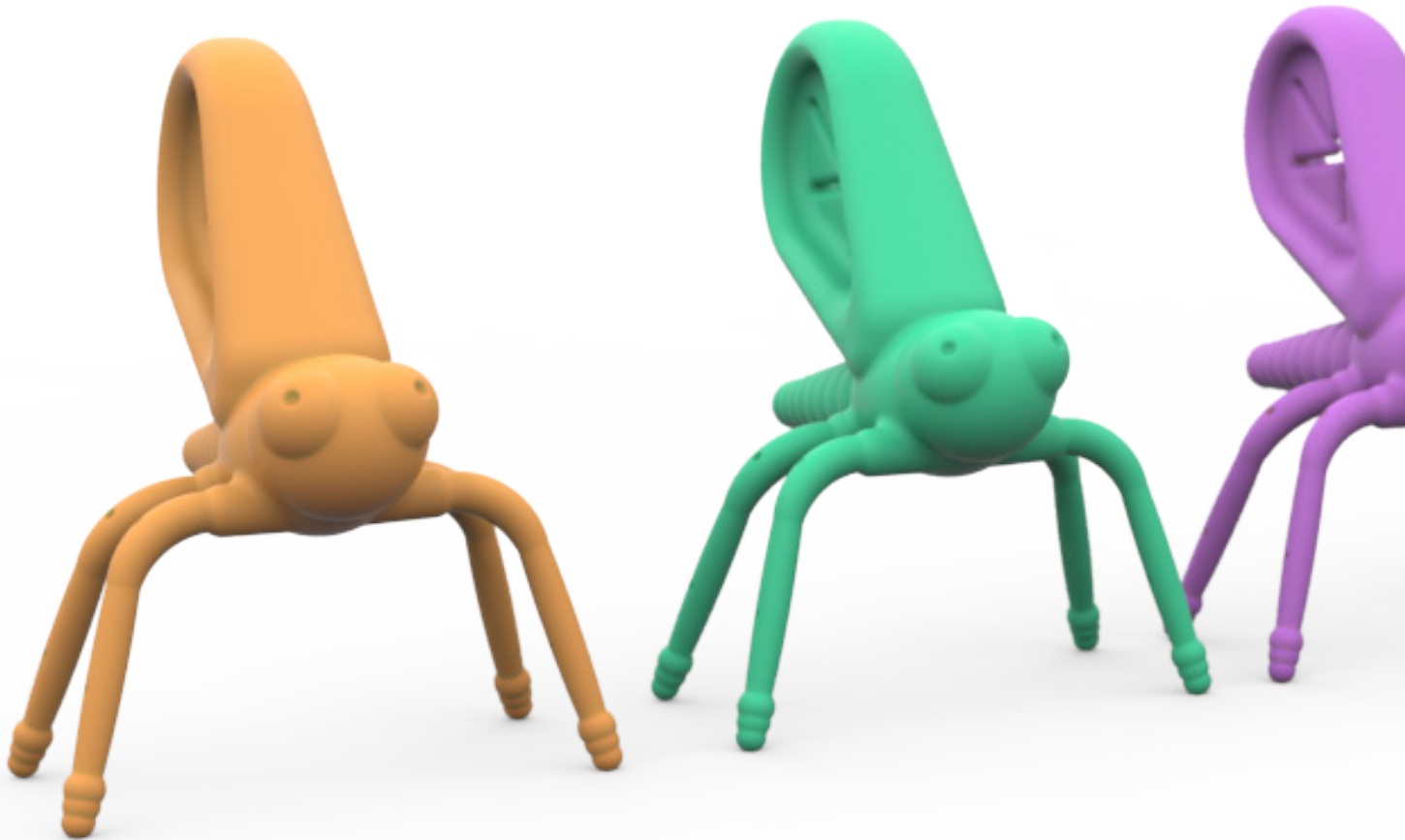
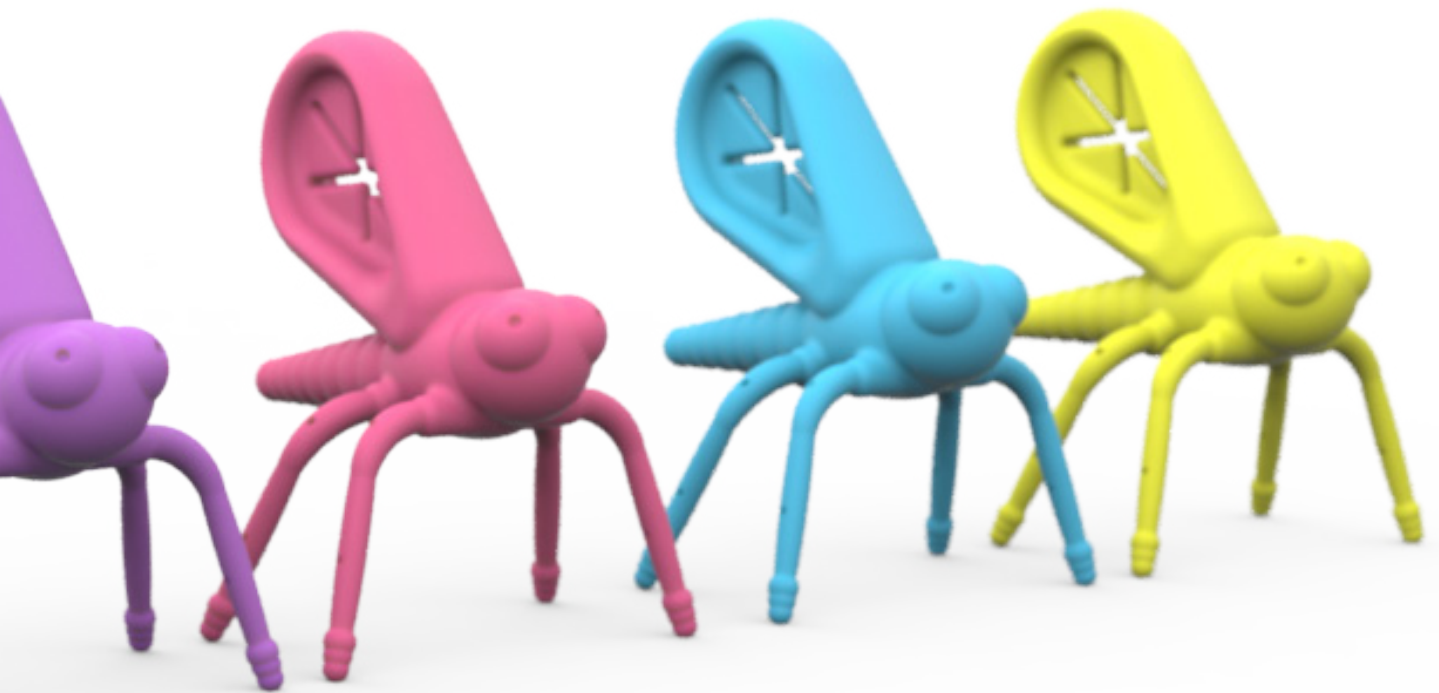


Photo of first mold attempt







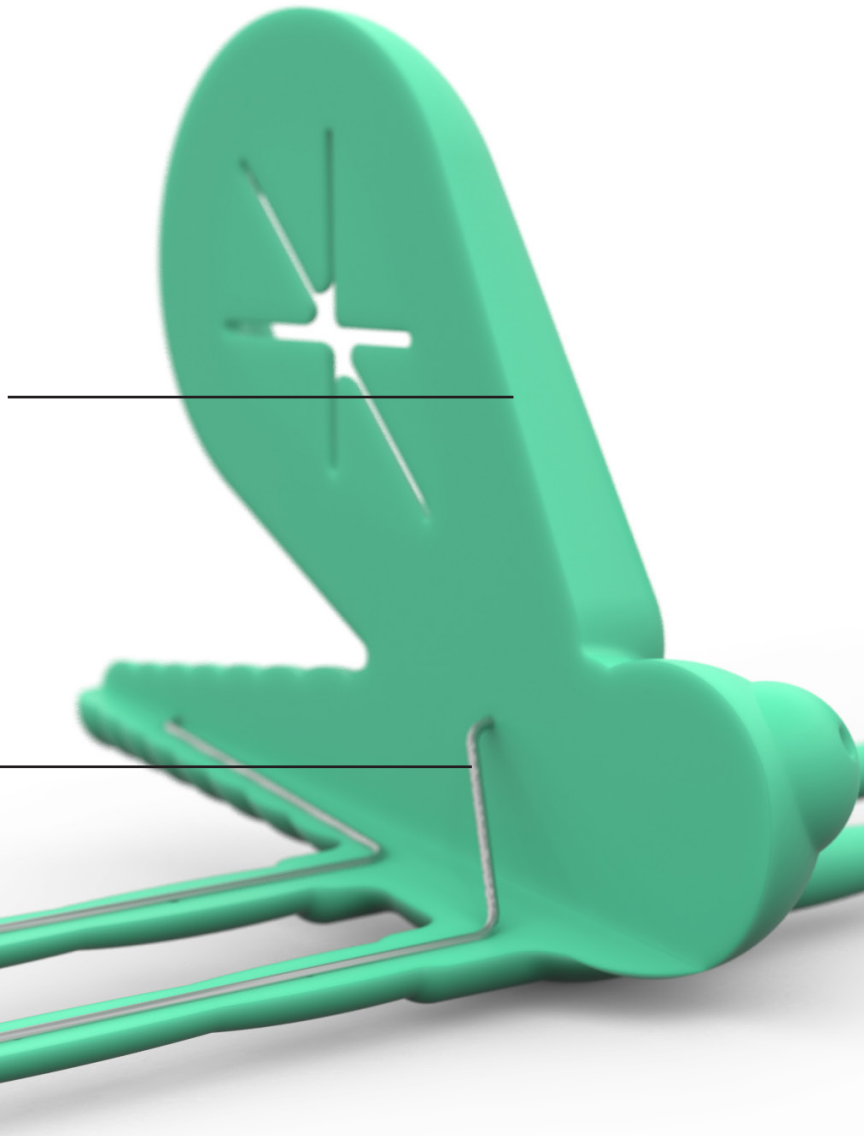


Relating back to the testing I had done with the coloring sheets and general research of the kids toy market, I had decided to create the Building Bugs in six colors. These consisted of hues of the primary and secondary colors.

# Designed for Manufacturing

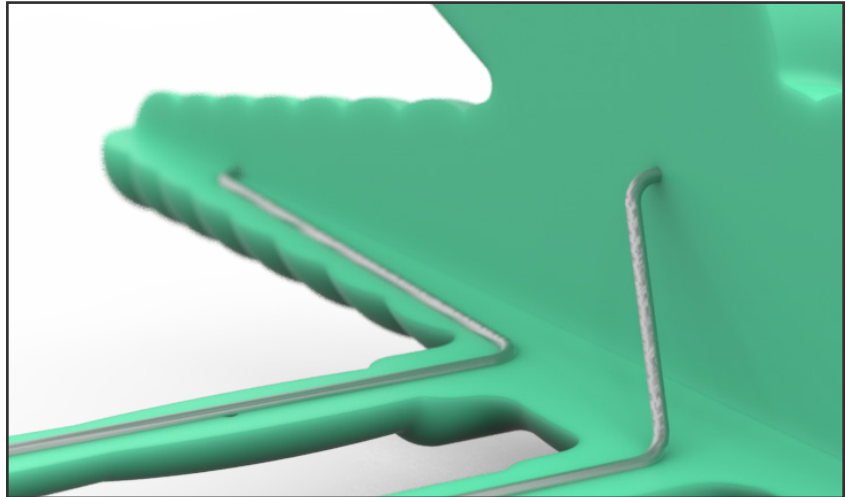
## Body

Injection Molded  
Silicone - 30A

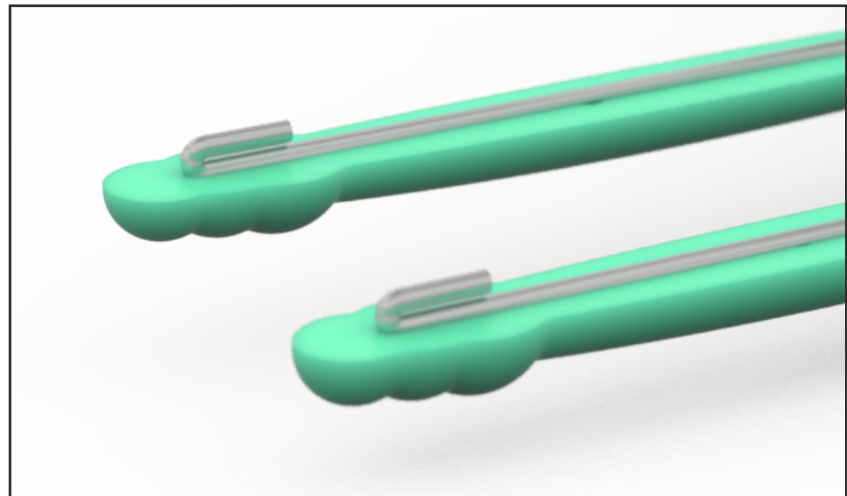
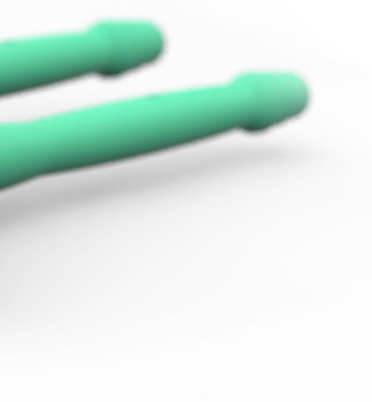


## Armature

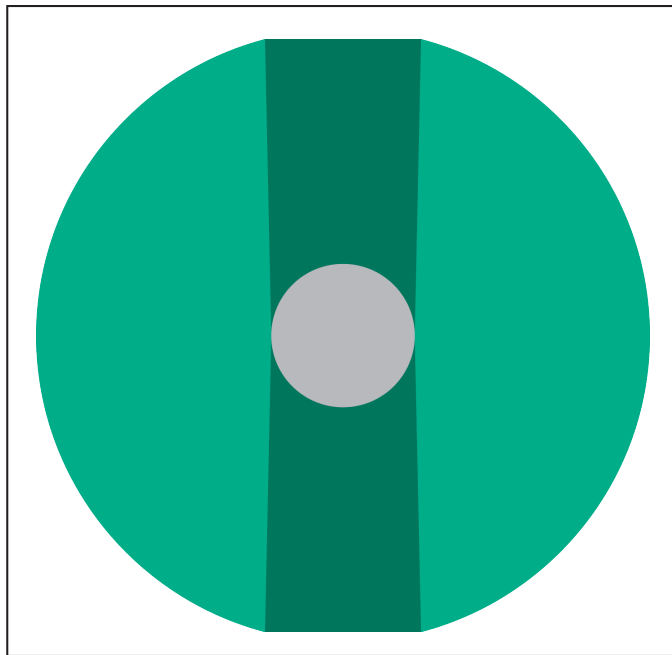
Overmolded  
18 Gauge Steel Wire



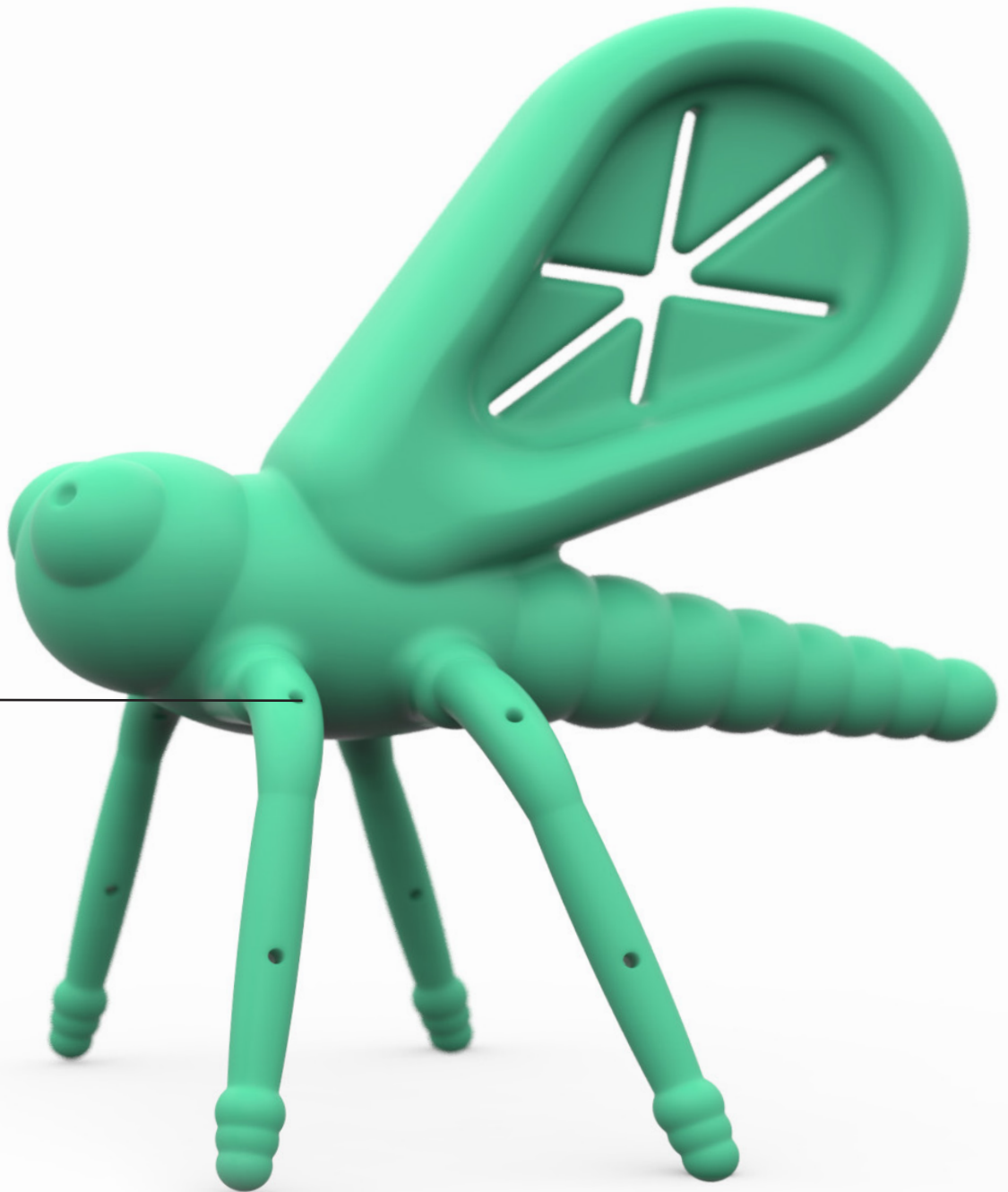
*Bends add solid hold in mold and lock them into place*




*Rounded ends on amature help to ensure durability of legs*



Holes from where pins hold  
armature in place during  
overmold process

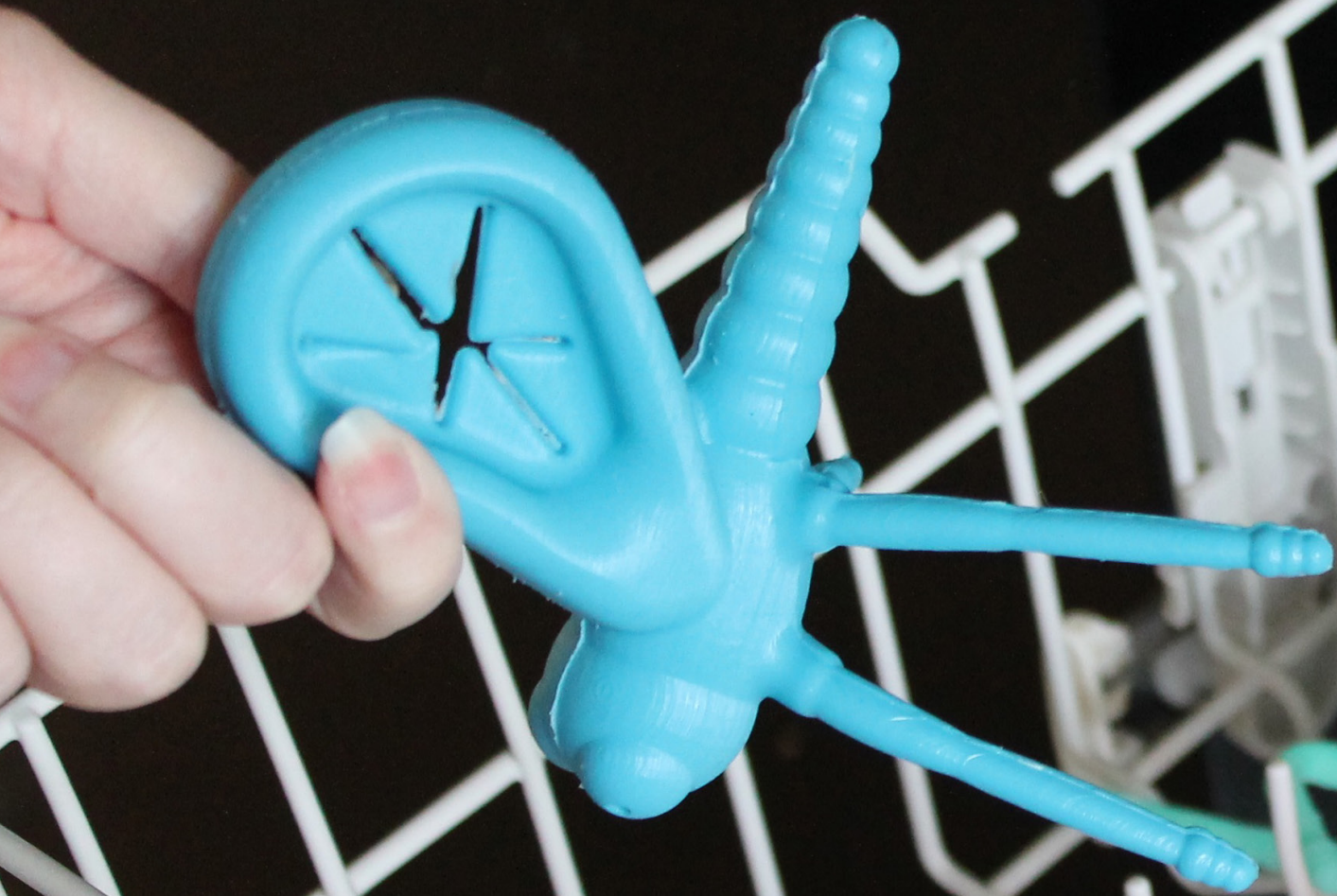






Designed with unpredictability of kids in mind, the material selections allows for them to be safe for indoor use as well as the unexpected outdoor use.

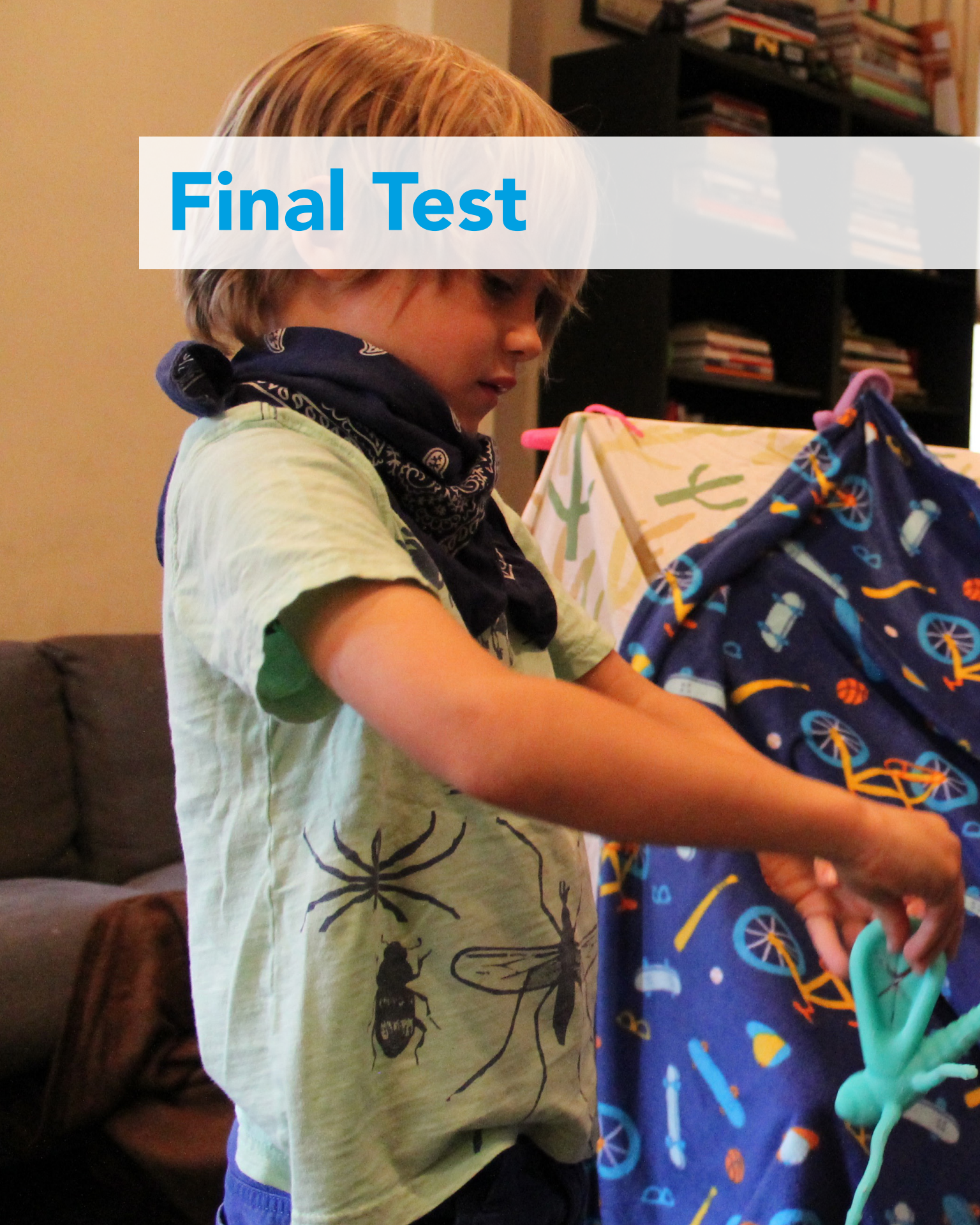




Along the same lines, the material allows for the Building Bugs to easily be thrown into the dishwasher for an easy clean



# Final Test





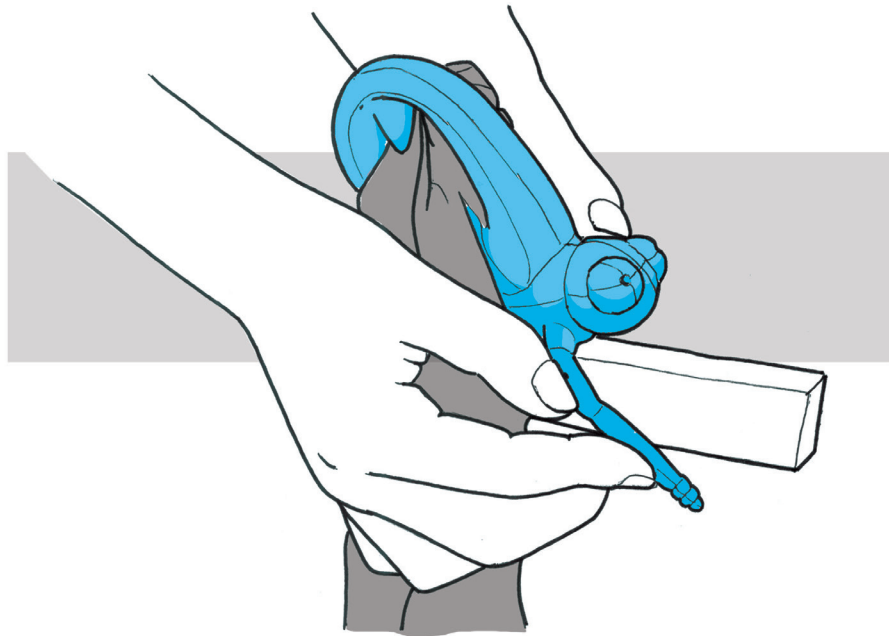
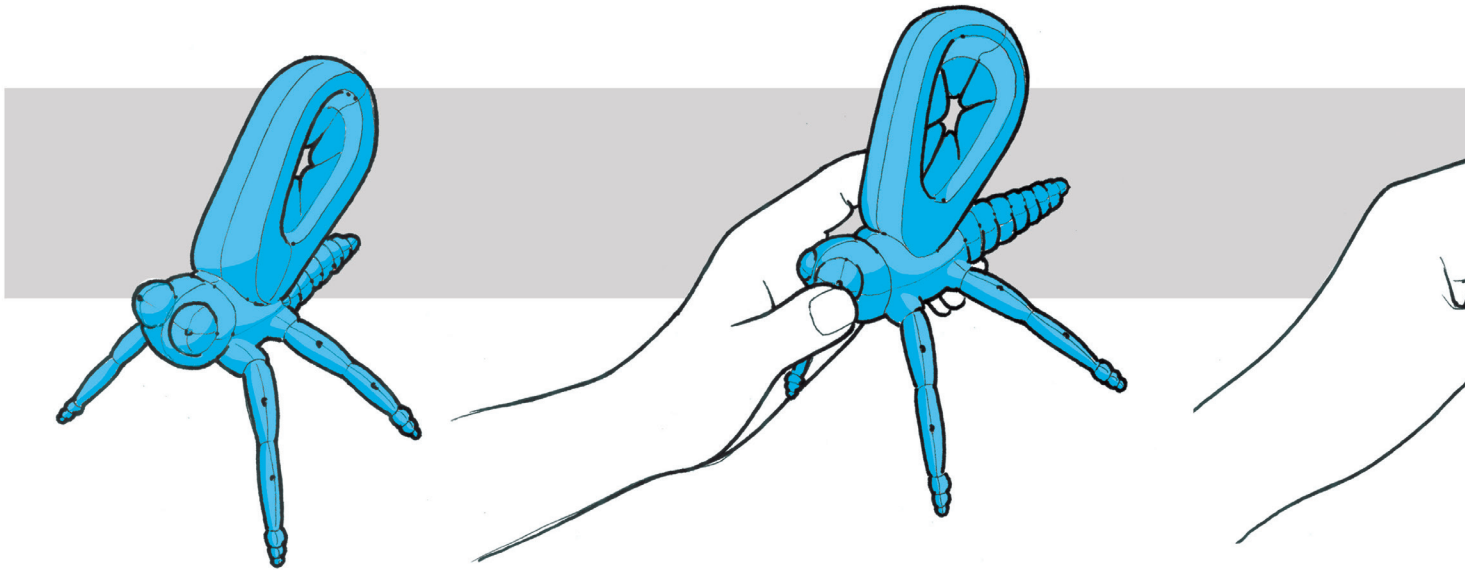
## Do They Build Forts?

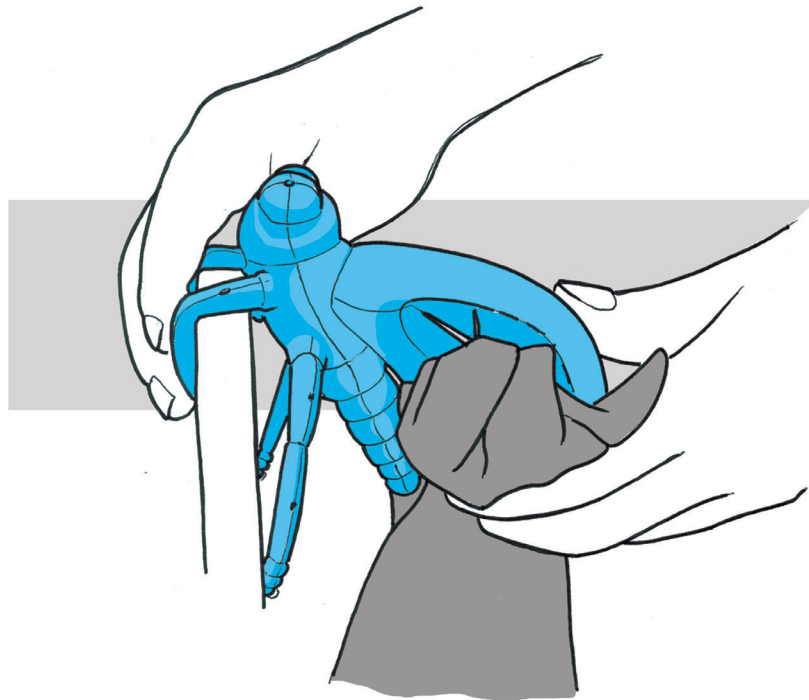
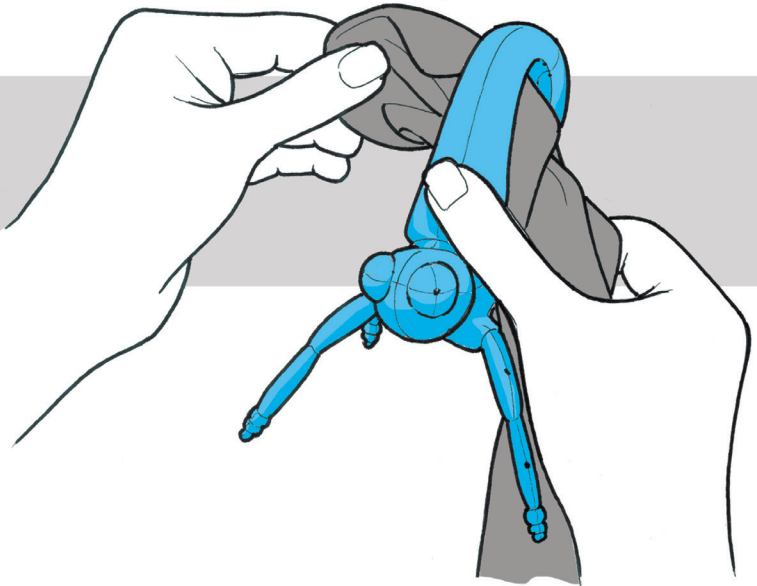
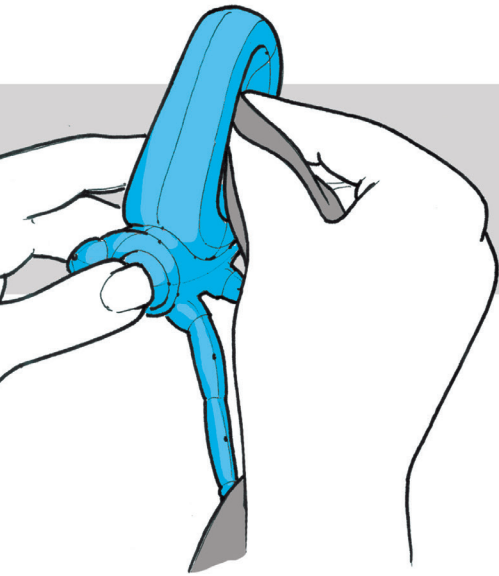




Testing the bugs for a final time helped to prove that they were able to build forts. They were well precived and the kids had built multiple different forts within the time I spent with them. They were excited to see the final toys and enjoyed playing with the

# How to Use







## What Else Do They Do?





*"Woah! These are so creative!"*

*"These are better than the clothes pins we have. I like how they bend and do more than just forts."*

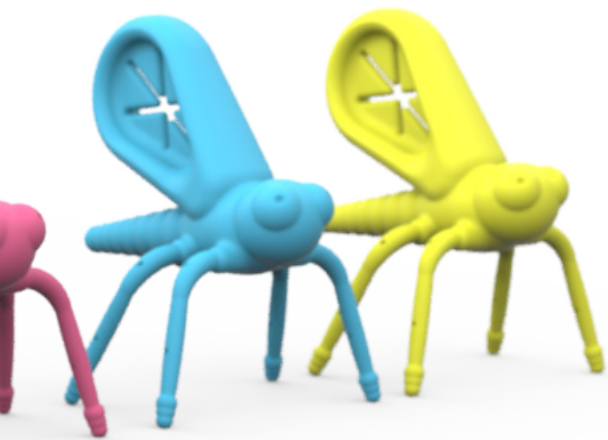
*"Mr. Jake, if I gave you two dollars, could I have one of your Building Bugs?"*

While conducting final testing, it was clear the amount of creativity of both building forts and finding clever ways of using the Building Bugs in play.

# What Do They Cost?



Name	Materials	Unit
Body	Elastosil (Silicone) 30A	\$0.84
Front Legs Armature	18 guage Steel wire	\$0.01
Back Legs Armature	18 guage Steel wire	\$0.01
Totals		\$0.86



**Intial 1,000 Packages**  
Each containing 6 bugs

$\$0.86 \times 6,000 \text{ Bugs} = \$5,160.00$

Duty Cost = \$1,450.00

Shipping and Handling= \$10,980.00

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\$17,590.00

# DEC Coriculum



