

# DESIGN OF A TOY THAT GIVES TODDLERS (3-5 YEARS) INSIGHTS INTO THE DIFFERENCE BETWEEN HEAVY AND LIGHT OBJECTS



# TOY DESIGN FOR TODDLERS

*A toy that gives children (3-5 years) insights into  
the difference between “heavy” and “light” objects*

## Master Thesis

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Master Integrated Product Design

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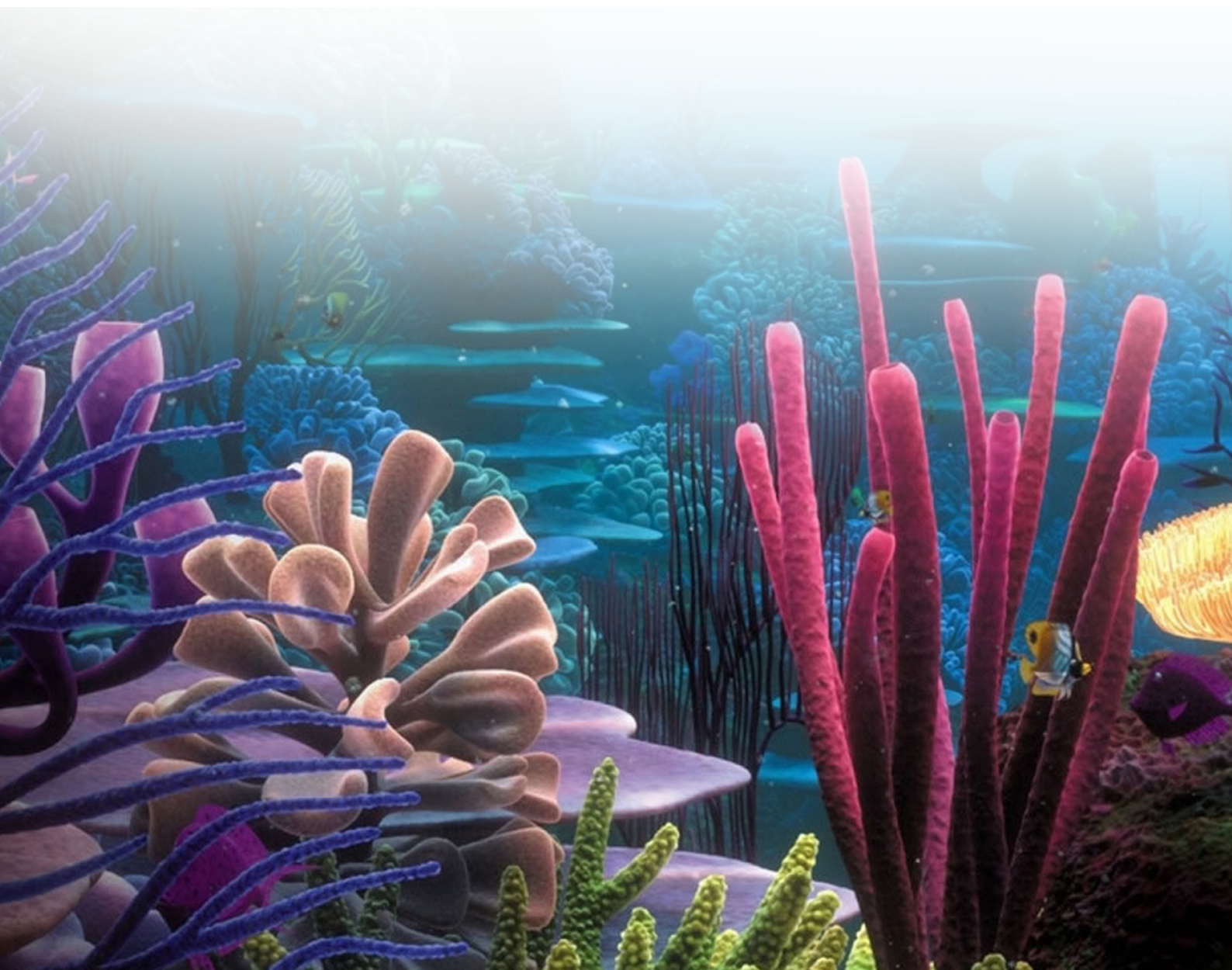
# Foreword

This master thesis is written as part of a graduation project, for the company ID-8 and Delft University and Technology.

The assignment was to design a product for toddlers, to teach them a new skill playfully, without being perceived as an educational toy. This report describes the entire design process, starting with the formulation of the assignment to the design of a the toy.

I want to thank ID-8 for this graduation assignment, as well as my supervisors ir. Jos Oberdorf, ir. Alex Visser and ir. Johan Land for the support and all the participants who helped me during the project to get the most out of it.

I hope you enjoy reading this thesis and start to understand the importance of toys for children..



# *Executive Summary*

The assignment of the graduation project was to design a new toy for toddlers to teach them a specific skill playfully. Therefore it was necessary to understand the subjects that have to do with the child, for example the market, child, play, learning and the toys.

The European Market is one of the biggest toy markets of the world. The toy market consists of both educational and fun toys. During the pre-school years the border between these toy types is neglectable, because children learn while playing with toys.

During these pre-school years, children go through several stages to develop motor, cognitive, perceptual, language and social-emotional skills. The stimulation of these skills is necessary for the physical development of the brains. Toy Manufacturers try to stimulate these development stages with toys. However, they try to elicit all the development stages within one toy and that works counterproductive for the development of the child.

At the kindergarten they emphasize the importance of open-ended play. This type of play lets a child decide how to use the toy instead of the other way around. Also, the 21st century skills seemed to be immensely important for the future of children. Via the VVE program, kindergartens try to prepare the child for the future.

During the important formative years, each child learns differently. It is therefore important to understand the differences between children's learning styles. Also, the behavior types are of importance when designing for children. However, ID-8 do not want to eliminate children by focusing on specific learning styles or behavior types.

The toy analysis has shown that there are enough toys for children, but there is a lack of variation in cognitive and language toys. Existing toys are focusing on memory and shape sorting. Cognitive development is more than shape sorting. Trend analysis has showed that open-ended play and focusing on 21st century skills is getting more popular. The children of today should fulfill the occupations of the future. However, toddlers do not have yet the basic skills to teach them the 21st century skills. Therefore it is important to create the right foundation to make it easier for them to learn the 21st century skills at a later age. The basic development skills of the 21st century skills are especially cognitive skills. The ideation phase specified the focus to a toy for cognitive development.

The ideation and concept phase has shown that the understanding of the relation and differences between objects gives the child the possibility to think critically about what he is doing. When a child gets another reaction by each action he will think about the reason why it happens. With this knowledge in mind, WaterTheater was designed.

WaterTheater is a toy that lets children to recognize the difference in weight between objects. It is a toy that gives the child the possibility to create a story in water using heavy and light elements of a certain theme. Heavy objects will sink, light objects will float. Because a child can fill and empty elements, each action in water, will give a different visual feedback . This toy lets the child to learn playfully in an open-ended way with enjoying play as main result. Learning something about the difference between objects could be an additional benefit.

Important in toy design is keeping the toy as open as possible. Making mistakes do not fit in the formative years of the child.

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*Project*



# Company

*The project was done for the company ID-8. ID-8 is an Amsterdam-based agency, founded by two former TUDelft Industrial Designers, which is specialized in toy design for children.*

The focus of ID-8 lies on design and engineering, especially with plastic and injection molding. They work for big clients in the toy industry, for example Royal Jumbo, Ravensburger, Goliath and other main players in the toy industry.

The assignments vary from “styling of a product” to “the whole design process”. Besides designing for toy companies, ID-8 also creates their own concepts and sells them to matching clients, for example a board game-concept will be sold to Ravensburger.

Their design process of ID-8 takes of ID-8 approximately around 30 days for a whole project. Design and engineering covers 80 percent of the project. Packaging design depends on the project: sometimes this is done by ID-8.

Due to their work for several clients, ID-8 has created a strong network and name in the toy industry.

# Assignment

*The assignment of the project is to create a new toy that teaches a toddler a specific skill playfully.*

A toddler rapidly develops himself at different fields. They start to actively explore the environment. The toy industry creates products that should facilitate a toddler in the development of these milestones.

However, with these existing commercial toys it is not clear if the toy industry is taking the child, and thus child’s development, as the middle-point of the design process or that the toy industry is creating products that should sell well. The focus of these toys is not clear and there is a lack of a connection with a specific milestone. They want to teach them everything, but in fact they do not learn each skill to the fullest.

Looking at the toys that stimulate the development of children, it seems like there are gaps in the market that can fulfill the need differently than existing toys are doing.

In short, the assignment for the project could be formulated as:

***Design a physical toy that stimulates  
toddlers to develop a specific skill playfully***

# Approach

*The project will be divided into three phases: the analysis phase, ideation phase and the concept phase. Figure 1 gives a global overview of the project. Via literature research, interviews and surveys the following question will be answered:*

*Which skills are important for a child to develop during the pre-school years and how can a toy stimulate the toddler to develop this skill playfully?*

## Method

The method that is used during the project is the Delft Innovation Method of Jan Buijs (2012). The model describes several phases each innovation process goes through: the strategy formulation, design brief formulation, product development and the market introduction.

The focus of the product will lie on the first three phases. Market introduction will not be included in the project. The main-approach is to create a strong concept that fits to toddlers and teaches them a specific skill playfully. The result of the first phase is the start of the ideation/concept phase.

## Analysis Phase

The main-goal of this phase is to formulate a specific design goal. In order to achieve the main-goal, the analysis phase is divided into five main-topics: Market, Child, Learning, Play, Toy and Trends & Developments;

### Market

Understanding which toy categories and main players there are, gives an overview of the existing market and what the opportunities and threats are.

### Child

Understanding the child is one of the most important parts of the analysis phase. The child is the end-user, therefore the development of the child has to be understood: which phases does a child go through during the early childhood? Also, it is important to understand the initial buyers of the toys, their parents. The brain develops rapidly during the early childhood. Which brain parts are necessary for the development stages?

### Learning

A child learns during the first years, but what is learning and how does a child learn?

### Play

Play is a important activity for children, but why do children play and what types of play are there?

## Toy

The toy industry is an immense industry. Which existing toys are there and where do they come from? Which toys stimulate each development skill and how do they do that?

## Trends

To know which direction the toy industry is taking, insights in the trends around the toy industry are necessary. Taking trends into account will create a stronger foundation for the product.

Last but not least, a design vision and finally a design has been formulated, based on the analysis of the discussed topics.

## Ideation/ Concept Phase

During this phase the design direction has been elaborated and further specified. This led to game play and later on concept ideas. The most promising concept is further developed in the final design phase

## Final Design Phase

This phase was about materialising the chosen concept of the second phase. During this phase, the concept was made tangible. The material, production process, working principle and use were developed. The result of this phase is a toy that fulfills the design goal and meets all the requirements stated in the List of Requirement.

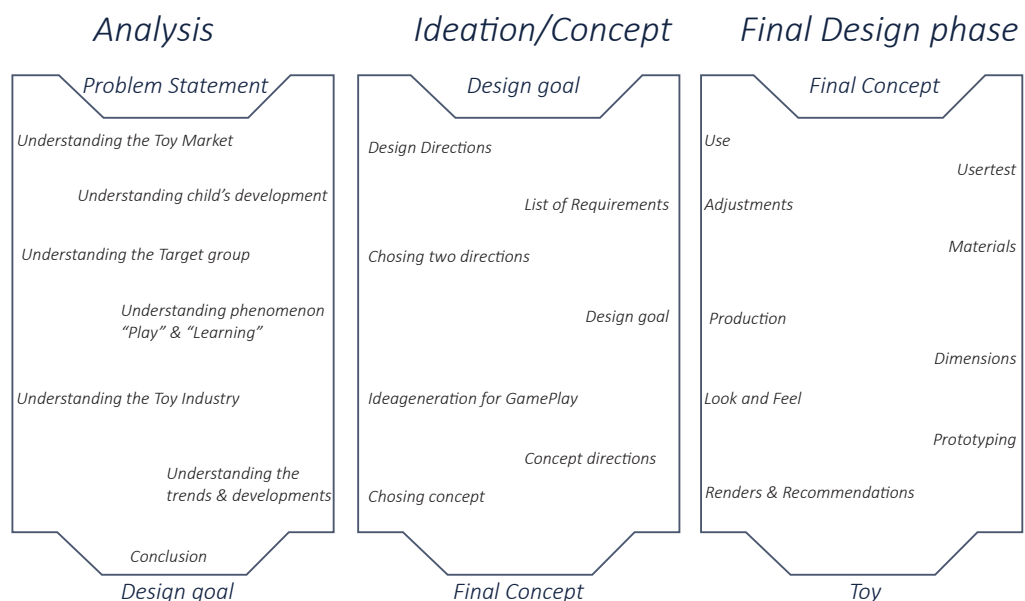


Figure 1: Project Overview

# Stakeholder Map

*The Stakeholder Map (figure 2) gives an overview of the individuals, parties and organisations who benefits this project at a certain way.*

## Individuals

### Child

The main stakeholder and literally the middle-point of the chain is the child. The child is the end-user and the requirements for the design, should fit a child. The main-goal of this project is also to stimulate the development of the child. Thus, the child is the main stakeholder.

### Parents

The parents are the second individuals who are stakeholders in this project. The parents are buyers of the toys and they buy only toys for their children, if it benefits the development of their child in a certain way.

## Companies

### ID-8

The main stakeholder under the companies is ID-8. Designing a concept that fits to toddlers, will help the sale of the concept to toy companies. With this manner ID-8 will not take the risks, but generate only benefits.

### Toy companies

If the product fits well to the company's product portfolio and philosophy, the company will buy the concept, produce it and sell a big amount of products to retailers. This will generate for them a turn-over. The companies named in the scheme are just examples of this category.

### Retailers

Retailers will benefit this product if it sells well. The higher the sale, the bigger the benefits will be. Examples of these retailers are Bart Smit, Intertoys and the online seller, for example Bol.com

## Education Institutes

### Kindergarten

This product should indirect benefit the kindergarten, because children will then be on "scheme" with their development. If a child is also stimulated at home with qualitative toys, this will help the child at the kindergarten.

### School

Indirect is the school also a stakeholder. The better a child is prepared for the school-years, the better the child can become at school and in his further carrier. Having products that stimulates the development is thus also positive for the school where the child will go to.

## TU Delft

Another indirect stakeholder is the TU Delft. They provide a designer and when the project becomes a success they will get positive publicity. Also, a successful end-product can benefit the university financially.

## Organizations

### Government / European Union (EU)

The government and EU should benefit the product at the certain way, because children become the generation of tomorrow. If the children get enough stimulants, they will become smart, well-educated children and this will benefit the government and the society. Also if a product sells well, the government and EU Union can benefit it financially.



Figure 2: Stakeholder Map

## Conclusion “Stakeholder Map”

This chapter has shown the complexity of designing for children. At first sight, the child seems to be the only stakeholder, but as this chapter has shown, several parties, organisations and individuals are part of this subject and have a certain stake in this project.

The main stakeholders within this project are ID-8 and the child. These are the parties who have direct benefits within this project.

Important is to find a direction where all parties will benefit.



# Analysis





*Market*

# Market Analysis

## Product Category

*The toy industry is an immense market which changes rapidly. The toy industry consists of two types of toys: traditional toys (later on called “toys”) and digital games. The focus of this market analysis will lie on traditional, tangible, toys. This analysis is based on data of European Competitiveness and Sustainable Industrial Policy Consortium (ECSIP, 2013).*

### Educational vs. Fun toys

Educational toys are toys that teach children something new. It helps them to form skills which are necessary to have during lifetime, for example counting, reading and problem solving. Fun toys are toys that let children to have pleasure, without the purpose of learning.

The border between educational and fun toys can be quite vague. Especially in the early infants/pre-school years toys are both fun and educational. Due to this reason, toys will be divided in nine categories, based on their function, instead of age, gender or skill;

- *Movement toys*, like walkers and steps
- *Fantasy toys*, like dolls and kitchen sets
- *Sensory toys*, like a shapersorter and clay
- *Construction toys*, like blocks and LEGO
- *Expression toys*, like music instruments and drawing pencils
- *Puzzles*, like floor puzzles
- *Board games*, like Monopoly.
- *Multi-purpose toys*, 5 in 1 toys (phone, numbers, walking, sound etc)
- *Hybrid toys*, toys consisting of both physical as online part, for example SkyLanders

The extent to which a commercial toy is actually educational, like brands are claiming, is not clear. There has never been studied if a commercial, educational toy stimulates the development of children (Nelson-Rowe, 1994). Gielen (Gielen, 2010) stated that multi-purpose toys are toys that want to elicit every skill, but in fact they cause a conflict in the necessary skills and end up doing nothing well enough.

Non-commercial toys are more reliable on what they are claiming. These toys must satisfy strict rules and norms of the government, before they can be used at schools and kindergartens. The purpose of these toys is clear: stimulating the development of children.

## Toy Markets

The global toy industry can be divided into four main markets: *China, Europe, US and others*. This division is based on sales over the years. The EU market takes 28 % of the total industry; US market 24% and the Chinese market 8%, “others” include all the small markets together.

### Leading toy companies

In Europe, there are approximately around 5000 enterprises. In 2013, the Netherlands had about 342 companies. 99 % of the enterprises are SME (Small- or medium-sized enterprises) (Toy Industry of Europe, 2014). In the European toy market, there are five leading toy companies:

#### Mattel Inc .

Mattel Inc. is known from the Barbie-doll and Hot Wheels. The company started as a gift-store and changed into a company that produces toys for several target groups and categories.



#### Lego Group

In Europe LEGO is the leading company in the toy industry. This company is founded in 1932 and changed from a company of wooden toys into a company of LEGO plastic blocks. These blocks are still the core business of LEGO. Nowadays LEGO is beside the patented plastic block also a popular brand among children. Even there is a decline in the sales of traditional toys, LEGO has kept growing.



#### Hasbro Inc.

Hasbro is a company that is especially known from the popular game Monopoly. They produce both toys as board games. Nowadays they have several subsidiaries, like Fisher Price.



#### Private Label

Private label are companies who sell products made by another manufacturer, but with their brand-name on it.



#### Simba-Dickie group

This company is based in Germany. They are known from the popular Simba Toys. They produce both toys as board games for young and old.



In the Netherlands important players on the toy market, are *Royal Jumbo, Ravensburger and Goliath*.

## Distribution Channels

*In the past decade it was only possible to buy toys at the traditional retail stores, like Bart Smit, Intertoys and Toys 'R Us, but nowadays there are several channels to buy toys:*

### Grocery / Discount store

The grocery and discount stores are selling both foods as non-food products. These stores sell A-brand toys for a lower price and because consumers prefer convenience, they buy all their products in one store. This channel is a solution for the busy worker, who wants to have all the necessary products under one roof. The discount stores buy remnants of A-brands and sell them for a lower price than in a traditional retail store. In the Netherlands, Albert Heijn and Action are important players.

### Online channel

Online shopping has grown rapidly during the last years. Each industry tries to enter this fast-going train and consumers are buying more and more online. Online shopping makes it possible to buy products which are not available at the local retail store. This fact and the convenience of online shopping make this channel a bigger player in the distribution of toys. In the Netherlands, Bol.com and Amazon are important players in online shopping.

### Chinese web shops

This channel is similar to online shopping, but the difference is that consumers can buy products directly from Asia, for a significant lower price/quality ratio than offered in local web shops/stores. Mostly consumers buy big amounts to avoid shipping and import costs.

## Market size

The children population has declined. Each year the population of children becomes smaller. If we look at children's population between 0 and 4 years old in the Netherlands, we see that this trend continues. According to CBS, (figure 3) between 2000 and 2015 the population declined with approximately 87.000 children. In 2015, there were 703.142 children aged between 0 and 4 years.

onderwerpen	jongeren								
herkomst	Totaal herkomst								
Regio's	Nederland								
Geslacht	Totaal mannen en vrouwen								
Perioden	2000	2005	2010	2011	2012	2013	2014	2015	
leeftijd	aantal								
Totaal jongeren 0 t 25 jaar	4 828 894	4 957 309	4 941 244	4 948 548	4 944 291	4 927 460	4 908 349	4 897 091	
tot 4 jaar	790 157	802 575	737 359	737 376	736 046	726 203	711 973	703 142	
tot 12 jaar	2 372 739	2 397 675	2 330 414	2 317 113	2 297 650	2 266 859	2 236 117	2 213 216	
tot 15 jaar	2 945 543	3 008 574	2 912 911	2 907 075	2 896 659	2 877 922	2 850 074	2 827 066	
tot 25 jaar	4 426 129	4 562 224	4 571 443	4 579 253	4 579 897	4 571 807	4 561 414	4 550 823	
tot 12 jaar	1 582 582	1 595 100	1 593 055	1 579 737	1 561 604	1 540 656	1 524 144	1 510 074	
tot 18 jaar	1 506 237	1 599 049	1 586 348	1 593 748	1 599 342	1 601 305	1 608 971	1 611 216	
tot 15 jaar	572 804	610 899	582 497	589 962	599 009	611 063	613 957	613 850	
tot 25 jaar	2 456 155	2 559 634	2 610 830	2 631 435	2 646 641	2 660 601	2 672 232	2 683 875	
tot 18 jaar	545 855	589 017	601 567	595 008	590 111	585 571	592 728	602 127	
tot 20 jaar	927 465	979 383	1 015 423	1 006 744	998 095	992 851	995 966	1 000 993	
tot 23 jaar	1 493 748	1 550 044	1 623 316	1 627 882	1 631 251	1 631 260	1 630 072	1 633 556	
tot 23 jaar	947 893	961 027	1 021 749	1 032 874	1 041 140	1 045 689	1 037 344	1 031 429	
tot 25 jaar	1 337 496	1 359 718	1 426 766	1 446 465	1 457 521	1 463 967	1 465 947	1 467 898	
tot 25 jaar	955 886	969 352	1 012 910	1 034 729	1 049 537	1 056 687	1 062 309	1 069 032	
tot 25 jaar	389 603	398 691	405 017	413 591	416 381	418 278	428 203	436 466	

Figure 3: Population children aged 0-4 years ( CBS, 2015)

## SWOT

To get an overview of the strengths, weaknesses, opportunities and threats for ID-8, an SWOT analysis (Ansoff, 1987) is made. The SWOT analysis shows necessary aspects that are important to take into account. (figure 4)

STRENGTH	WEAKNESSES
<ol style="list-style-type: none"> <li><b>Expertise</b> Toy design &amp; engineering</li> <li><b>Outsourcing manufacturing</b> No financial risks</li> <li><b>Independent</b> Has control on whole design process</li> <li><b>Loyal clients</b> Good image, qualitative, known in toy industry</li> <li><b>Strong network</b> Connections with (main) players in toy industry</li> </ol>	<ol style="list-style-type: none"> <li><b>Funding</b> Dependent on clients to finance development</li> <li><b>User test difficult</b> End-user difficult to reach for user tests and research</li> <li><b>Supplier</b> If product will lie in the store is dependent of buy behavior supplier</li> <li><b>Marketing-driven industry</b> Sale products depends on marketing and brand</li> <li><b>Intellectual Property</b> No budget to protect concepts of design agency</li> <li><b>Buyer toys ≠ Enduser</b> Designing for end-user, but other person buys it</li> </ol>
OPPORTUNITIES	THREATS
<ol style="list-style-type: none"> <li><b>Crowdfunding</b> Proves need of customers and keeps Id-8 independent of investors</li> <li><b>Eco-friendly toys</b> Corporate Social Responsibility</li> <li><b>Technology-driven products</b> Technology driven innovation leads to radical improvements</li> <li><b>Unisex-toys</b> Creating products that eliminate the gender-roles</li> <li><b>Social problem</b> Addressing social problem, for example Obese</li> <li><b>21th century skills</b> Prepare children via toys on Internet of Things</li> <li><b>Hybrid toys</b> Physical toy icw smartphone</li> <li><b>Online market sale</b> Selling product online to eliminate dependence on supplier</li> <li><b>Trends</b> Innovation that reacts on trends</li> </ol>	<ol style="list-style-type: none"> <li><b>Smaller marketsize</b> Child population declines</li> <li><b>Electronic products popular</b> Videogames &amp; digital products becoming popular</li> <li><b>Market constantly changing</b> fickle behavior of children</li> <li><b>Strict regulation</b> Safety &amp; government rules</li> <li><b>Low cost-price</b> Customers wants to buy cheaper toys</li> <li><b>Conservative industry</b> Toy industry is outdated, innovation remains off</li> </ol>

Figure 4: SWOT-Analysis

## Marketing Communication

*In the toy industry marketing takes an important place. A lot of attention goes to the placing of a toy in the market. As a result, buy behavior of caregivers is being influenced. Examples of marketing tools are: packaging, brochures, commercials, Toy of the Year Award and Licensing.*

### Brochures

This way of promoting toys is especially being used by toy stores. The brochures give an overview of a toy selection. Each week there is another brochure with different toys. The selection is based on trends, themes, season and sale. The brochures are mostly, colorful, sorted by age and gender.



### Video Commercials / Movies

Nowadays this marketing tool has become more popular and important for toy companies. Children watch more videos and TV and during these videos the commercials suddenly appear.



Also a new movie can promote toys, for example Star Wars movie can promote Star Wars-Toys

### Packaging

The packaging of a toy plays an important role in the creation of willingness to buy. It should be striking and attractive so that a customer wants to pick it up. Packaging also contains important information to communicate, like safety regulations, parts and the use of the product.



### Toy of the Year Award

Toy of the year Award ([www.toyawards.org](http://www.toyawards.org)) is an award for the best toy of the year. Within this election, for each toy category a winner is chosen. The toy companies vote on a toy they prefer. During the whole year the winners can call themselves the "TOTY". These toys are being more marketed in brochures and commercials. A misconception is that winning toys are the best or most sold toys. On the contrary, these winners are not chosen by customers or children, but chosen by companies. These prices have nothing to do with the preferences of customers.





## **Licensing**

Another way manufacturers promote products is “licensing”. Licensing is to market a certain product with a known, popular brand/image under children. Using this way of promoting stimulates the sale of these products. Mostly this is used when a new movie is released. For example, Frozen: after the release of the movie Frozen, several Frozen-products became popular among little girls.

## **Conclusion “Market”**

The market analysis has shown two main toy categories: educational and fun toys. During the pre-school years the border between fun and educational toys is neglectable.

The European market is one of the biggest markets in the world, with Mattel, LEGO, Hasbro and Dickie Toys as main players. The way toys are marketed has a big influence on the sale of the products. Especially commercials and packaging are important communication channels.

The SWOT analysis has shown that Internet has grown to an important distribution channel, but parents still want to experience toys in a toy store. For ID-8 interesting directions lie in the 21st century skills. These skills become important for future children.



*Child*

# Child's Development

*A child develops rapidly during the first five years, the so called the formative years (Socio emotional development of infants and toddlers, 2015). These changes influence the brain development of children. To understand these changes, literature research will put a light on this subject. There are several theories that describe the development of children. Two important researchers have put the study to learning and child development on the map.*

## Jean Piaget's theory

The founder of the pedagogical theories is Jean Piaget (1936). Jean Piaget was a Swiss psychologist who was the first person that studied the brain development of children. By means of observations and interviews, he states that development process of the child could be divided into four main stages (Piaget & Inhelder, 2000)

### Sensori motor stage

The first stage is the sensorimotor stage. These stage ranges between birth and 2 years. According to Piaget, the child explores his surroundings by using his senses and motor skills. In the first months the actions are especially reflexes. Later on, the baby learns to use his movements and senses with a goal and visualize objects, even when they are not present. During this period, children will start to develop object performance: the infant will not understand it when a person is taking a toy away . Later on, around 18 months, this skill will be fully developed.

### Pre-operational stage

At this stage, the so called pre-operational stage (2-7 years), children learn more representational and language skills. At the beginning of this stage, children are egocentric: they cannot think from another viewpoint, than "I". They also do not understand where their actions will lead to. In the context of play, they are more into parallel play. At a later age, they learn to play with other children and prefer pretend play.

### Concrete operational stage

Piaget describes this stage as the concrete operational stage. Between the 7th and 11th year the child learns to use logic and understands other's viewpoint. Concrete refers to the ability of thinking logic in concerning physical objects. Abstract thinking is still difficult for the child.

### Formal operational stage

The last stage is about the thinking ability and manipulating ability of children. When children can answer questions where they have to think about, without a concrete visualization, he entered the formal operational stage. It is still not clear if a person can finish this stage.

## Vygotsky's Social Development Theory

Another important researcher was the Russian Vygotsky (Vygotsky, 1978). The main idea of his theory is that social interaction is necessary for cognitive development. It is, in contrary with Piaget's theory, not limited to certain age-ranges.

Vygotsky (1978) states that learning occurs when the brain is being challenged by other peers. Social behavior stimulates the cognitive development. Vygotsky developed a model that shows the zones a child go through: when a child reaches the "zone of proximal development" (figure 6), he actually develops his brain.

Social behavior helps the child to fully develop the cognitive skills, more than with solely behavior.



Figure 6 : Vygotsky's Zone of Proximal Development

## Development stages

*During the first five years a child goes through stages every child has to go through, the so called “milestones”. Even though children differ from each other a lot, some important milestones could be defined which a child has to fulfill at a certain moment.*

The first eighteen years could be separated into four age-categories. Several experts differ in the age-division of each category, but in main lines the categories could be divided into (Child Development Institute, 2015) :

- Infants/babies
- Toddlers / Pre-Schoolers
- School age children
- Adolescents / Teenagers (10-18 years)

During these ages, children experience their surroundings and develop themselves at five levels:

### **Motor Development:**

Motor development has to do with the development of motor skills of a child. Motor skills can be divided into gross and fine motor skills (Beran & Brown, 2008). Gross motor skills are all the gross movements that a child makes with legs, arms and head, like walking, swimming and crawling. Fine motor skills are movements like writing, drawing and cutting. A child first learns fine and later on gross motor skills.



### **Perceptual Development:**

Perceptual development has to do with the development of sight, hearing, smell and taste. The physical environment of the child plays a big role within this stage.



### **Cognitive Development:**

Cognitive development has to do with thought, including remembering, problem solving, and decision-making, during the whole life.



### **Language/Speech Development:**

This development has to do with the learning to communicate both verbal as non-verbal in early childhood.



### **Social/Emotional Development**

Social-emotional development has to do with the process of creating a relationship with others and the expression of emotion (Cohen, 2006).



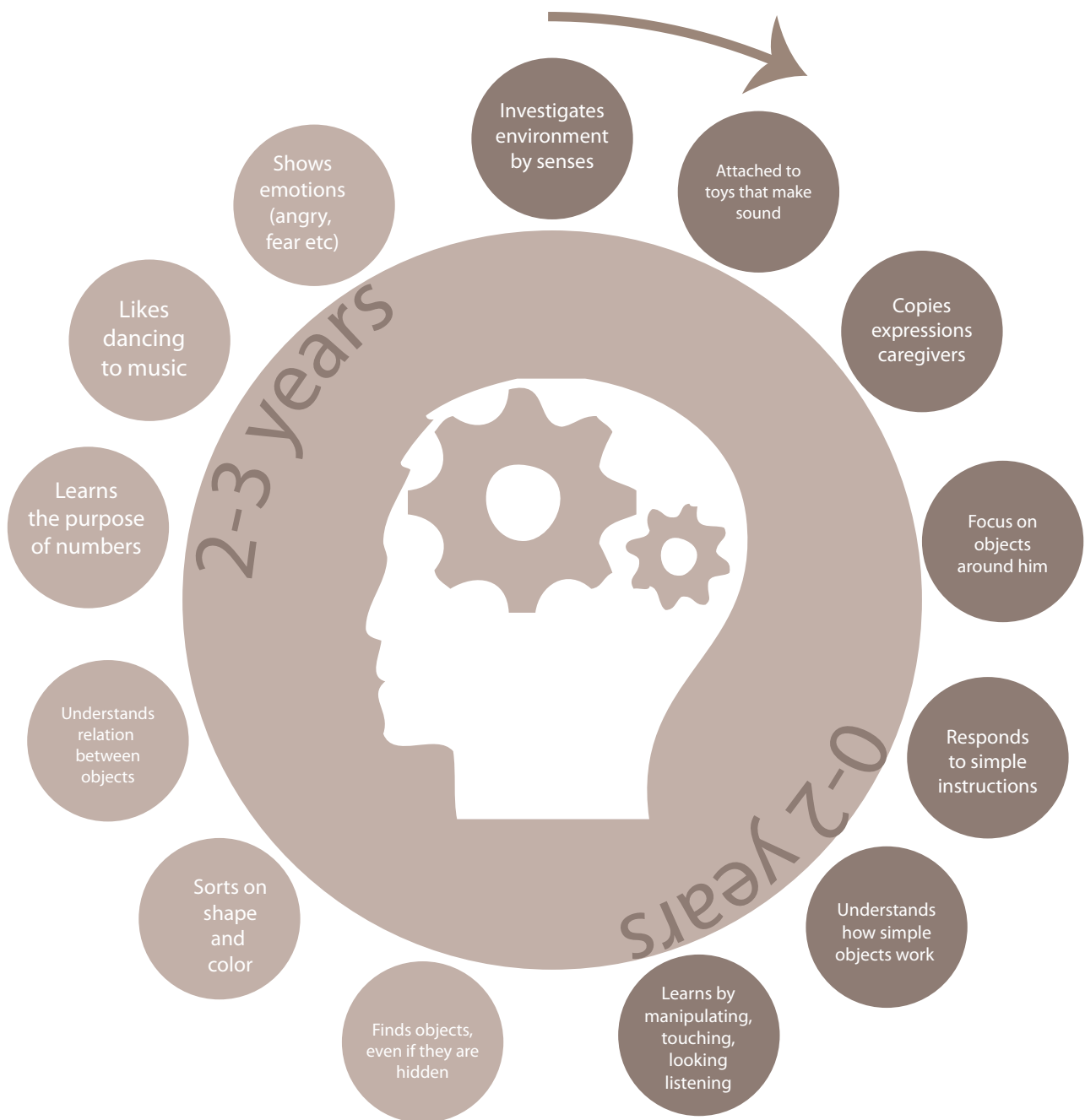
*I shall now explain these development levels in more depth as these levels are very important in the role a toy can play for a child. For more information on the development stages, see appendix E.*

### Motor Development stages

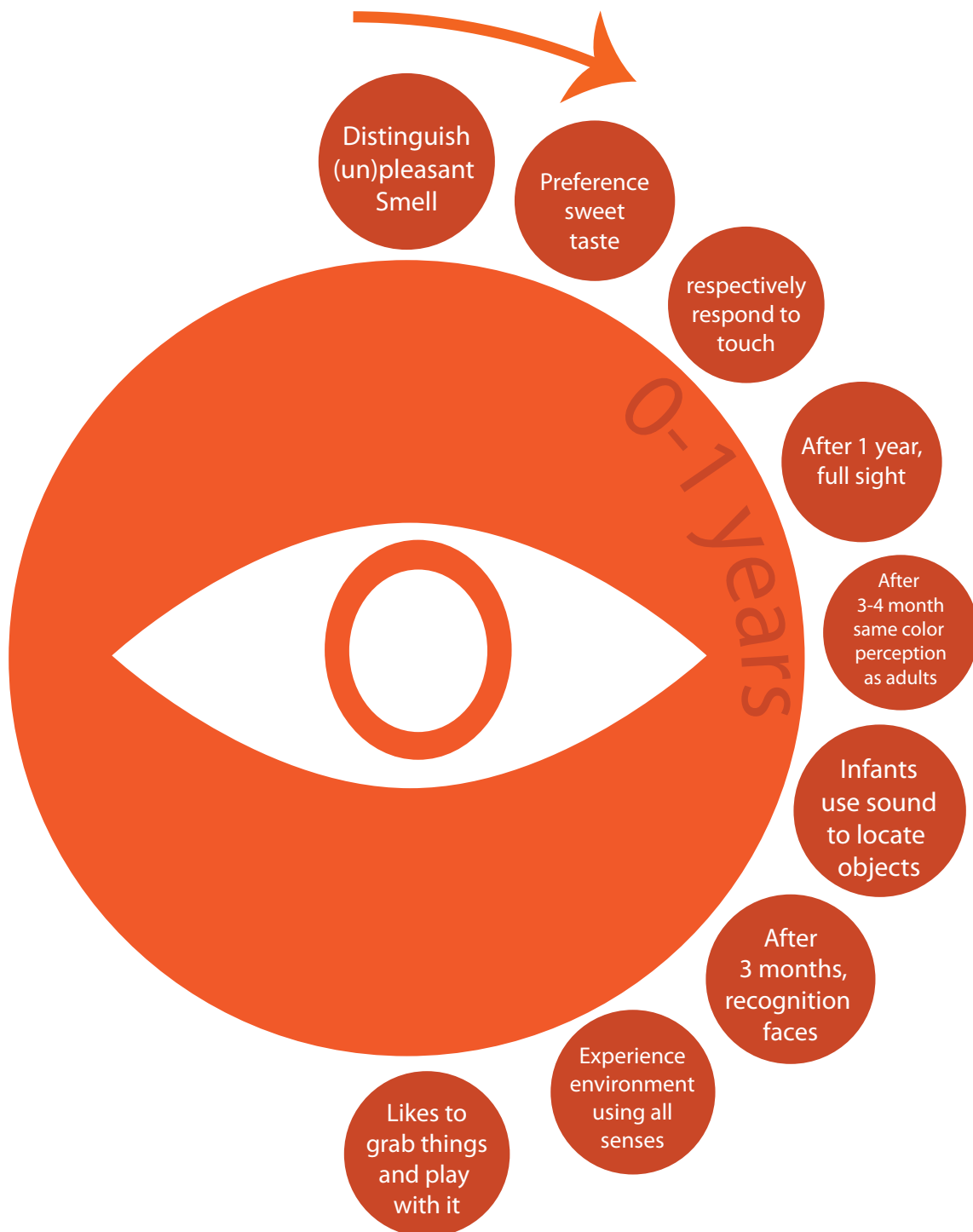




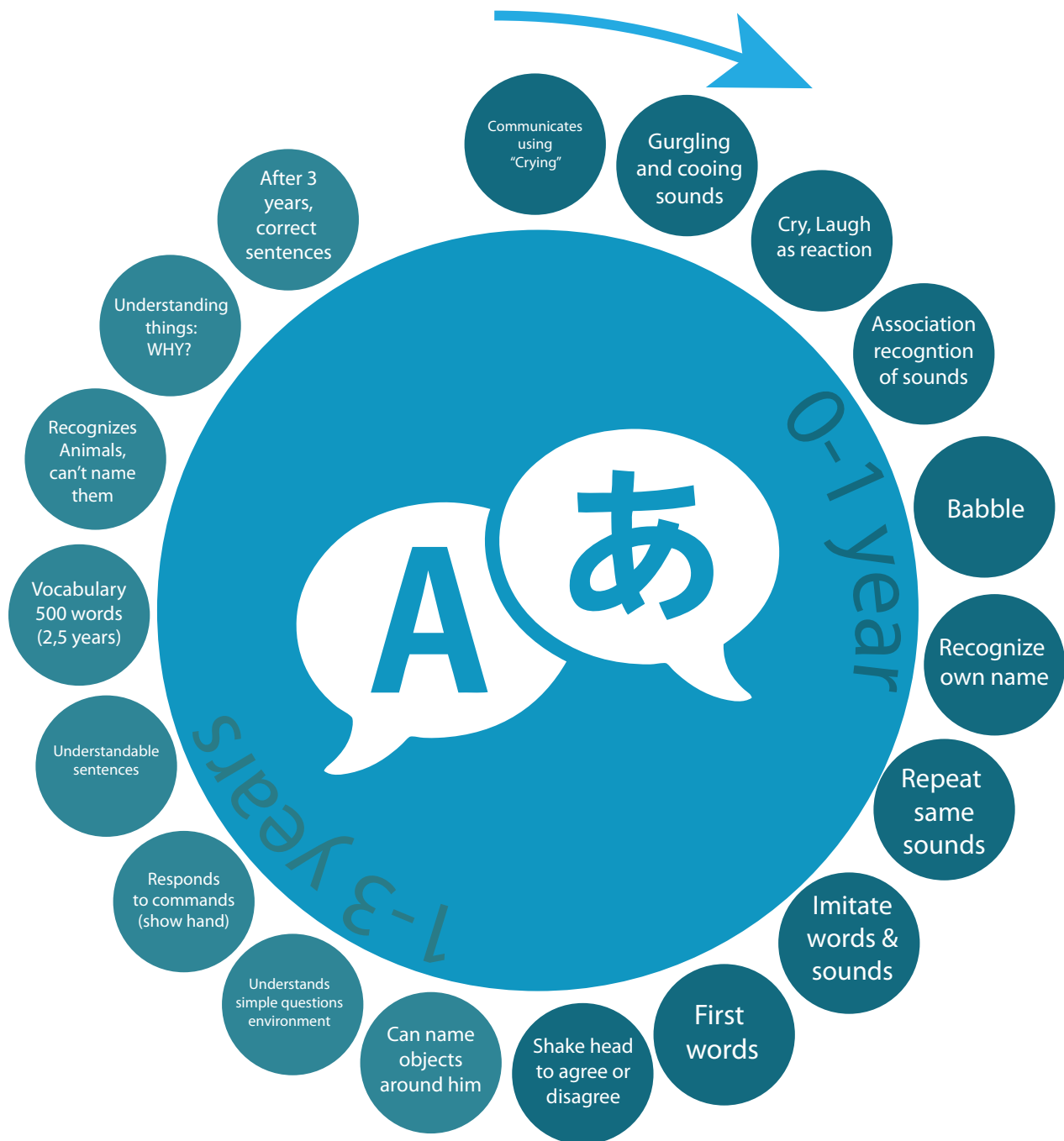
## Cognitive Development stages



## Perceptual Development stages



## Perceptual Development stages



## Social-Emotional Development stages



## Autonomy of the Brain

*Each part of the brain is responsible for certain functions. Stimulation of the development stages will help the brain to make connections in the brain to develop each part as good as possible (Naturalis Biodiversity Center [NBC], 2007).*

Most of the brain parts are being developed during the early childhood. Figure 7 gives a overview of the parts that play a role in the development of motor, cognitive, social-emotional, perceptual and language skills. For further reading about the autonomy of the brain, see appendix D.

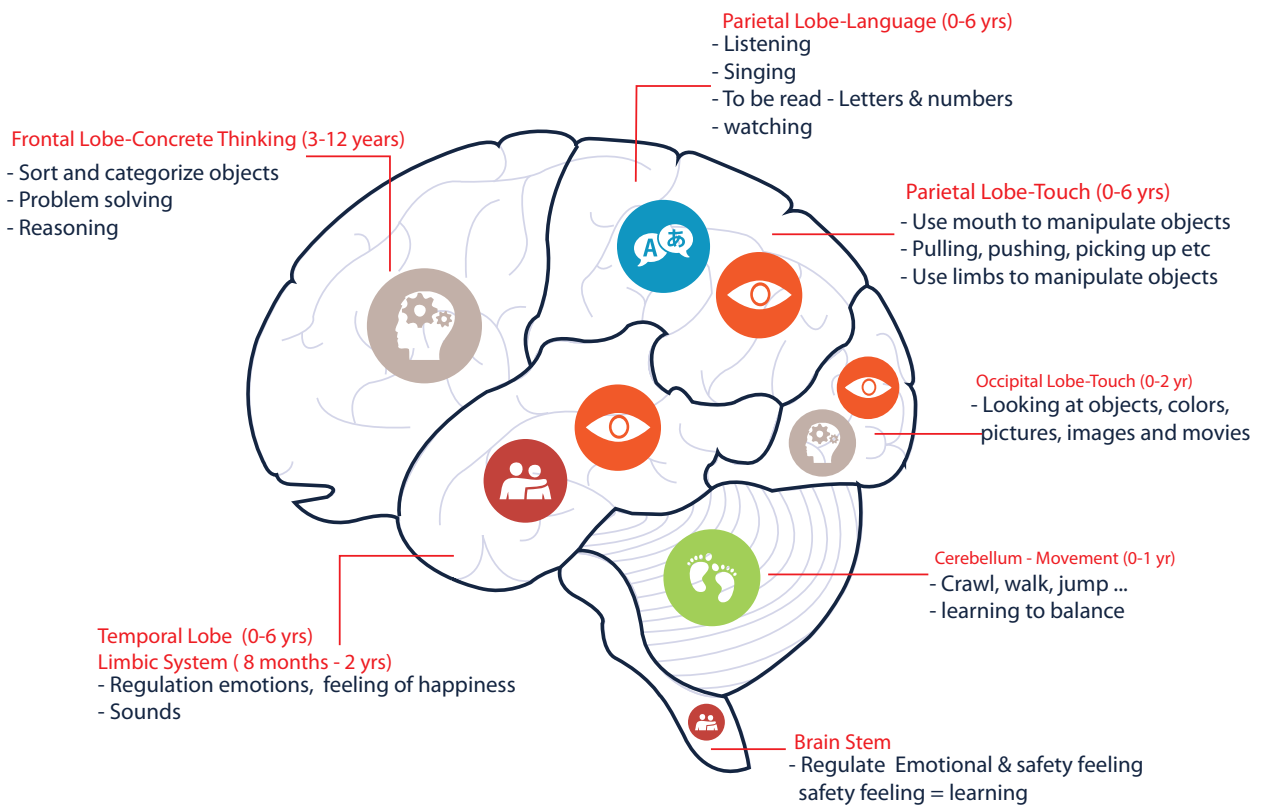


Figure 7: Brain part vs Development stages

## Survey & Interviews

### Parents

*Parents are mostly the buyers of the toys. Surveys and interviews held with parents have shown some interesting trends. The main-focus of the survey was to understand the buy-behavior of parents. (See appendix A)*

- Most households are two-income households. Quality of the toy and the educational value are the main-criteria parents have when buying toys.
- Opinion of the child, is more important than marketing, but children mostly base their preference on marketing videos or when a child sees a certain toy he likes (in the store or in a commercial), the parent buys it.
- The average of what parents are spending on toys is between 10 and 15 Euros. At special moments a toy may cost more, for example at his birthday, then around 50 Euros.
- Children love licensed products, for example Frozen, K3 and Lego.
- All kinds are allowed to play on the iPad, but parents limit this time-frame (approx. 1 hour per day). Children especially play online games or watch movies (Netflix).
- Mothers do their best to make time for their children. Especially in the weekend or at a day off this lack of time is being compensated.

The focus of the interviews with the mothers was to get insights on the time they have with their child. The main-insights were (see appendix B);

- The time parents spend with their child after the kindergarten is valuable for them.
- Nowadays, children are during the day at a kindergarten/child minder care.
- Homework like cooking, doing the laundry etc makes the time that is left to spend on the child small.
- Mothers try to read their child every evening before sleeping, but sometimes this is not easy.
- Toys that help the child to develop his skills are preferred by the mothers.

### Kindergarten

*To understand the opinion of a professional caregiver on the development of children interviews are held at Partou Kindergarten ([www.partou.nl](http://www.partou.nl)). Due to privacy, it was not possible to observe the children. Main insights of the interviews are structured in four categories (see appendix C)*

### Kindergarten

- Especially for children of parents who can afford a kindergarten. Per child a kindergarten costs about 6,90 euros per hour
- Via observation a caregiver decides what each child needs, and if a child needs support he gets it from the caregivers.



- They prefer the so called vertical groups. Those are groups which consist of several ages so that children will be stimulated to get out of their comfort zone. Nowadays they have horizontal groups. The same ages in the same group. The group-dynamic is an important part of the activities. Doing exercises together to enhance the social play.

### Development

- Main-focus of the activities during the day is to stimulate the development of all the development stages based on a VVE-program: playful learning ([www.nji.nl](http://www.nji.nl))
- The caregivers state that imagination is an important development-skill where should be focused on more with toys. The word “discover” is frequently used during the interviews.
- The question if 21st century skills should be learned during the early childhood is to their opinion not a good idea. Creating the foundation for these skills is important. With the VVE-program they prepare the child for future occupations.
- Vocabulary of the child depends on the amount of time that is spend on language development at home. They see a division in the group of children who are good at language and those who are less good.
- Doing a course on playing with natural materials like fabric and peas. These objects can be used on different ways and stimulates the imagination of children.
- Music is the tool that they use at the kindergarten to let children move. Especially when all the children participate.

### Toys

- The toy category used at the kindergarten is mostly educational, simple toys, like blocks, dolls and fantasy-toys.
- Their opinion about commercial toys is that they stir too much. Toys should stimulate freely playing. A child should decide how to use the toy, for example:,,a puzzle could only be solved in one way,,
- They worry about the rising use of smartphones and tablets. They like to play more online games, than offline and that has a negative effect on their development.

### Parents

- Caregivers give “homework” to parents to stimulate the development at home, but lot of parents do not do the homework. For example, attending play when child is alone. The conversation between parents and child helps children to develop their personality.
- The question if children are being read at home they said: “*approximately around 50 percent of the parents who read for their children*”. This depends also on the social status of the parents. We try to stimulate this, but we can’t see if they really do it. Mostly this depends on their own youth and good memories”

## Conclusion “Child”

The theory of Piaget is recognizable in the milestones a child has to go through.

However, the phases Piaget is speaking about are too rough. He divides the life of a person into four major phases. This makes his theory less accurate.

The statement that social interaction has a positive influence on development is an interesting conclusion of Vygotsky. Other studies also have shown the relation between social interaction and brain development: interaction with parents and other people (like children) involve behavior that needs memory, attention and control (Fernandez & Goldberg, 2009). Experiences from children are mostly based on social interaction.

Toddlers walk, jump, run and experience the world with their senses. They become curious and ask why-questions. They learn to sort and name objects, animals and enlarge their vocabulary. They are also in the phase that they start to express their emotions. This makes the pre-school phase an important one. Stimulating this phase with toys will help the child to get the most out of this phase.

When a parent buys a toy he bases the purchase on the quality and benefits the toy has on the development of their child. They want the toy to stimulate this. The average spending on toys is between 10 and 15 euro and on special occasions the toy may cost more. The time spent with the child is valuable for the parents, but this is not always easy due to the homeworks that also cost time.

At the kindergarten, they emphasize the “discovering skills” of children. For pedagogical staff, imagination is an important development skill. This should be more emphasized. They want toys to be more open-ended to let children decide how to use the toy instead of being told by the toy.

With the VVE program, the kindergarten prepares the children of today for the future by focusing on 21st century skills.

Stimulation of the development of the brain will help the child to become a strong person, both physically and mentally, but each child differs in the degree of development of each part.



*Learning*

*Learning is a valuable source for a human being. Learning helps a person to understand the world and translate his experiences into valuable information. From the early childhood until the adult's years a person always keeps learning. But what is it, how do children learn and how to translate this information into toy design?*

### What is learning?

Learning is something every person is doing through life. A misconception is that learning only is about gaining knowledge at school. Learning is an activity that never ends. Skills are also necessary handles to conquer the world. Kolb (1984), a researcher on learning, stated that learning is about the transformation of experience into knowledge (Kolb, 1984). Oxford Dictionary (2016) defines learning as: *"The acquisition of knowledge or skills through study, experience, or being taught"*.

Although learning happens through life, there is a difference between learning as adult and learning as a child. Which learning styles of children are there?

### Fleming's Learning Styles

During the early childhood, children especially use their senses to play. Children first start to use their mouth and later on other ways to learn about people and objects.

The researcher Fleming (1939) created the so called VARK-model (Leite, Svinicki and Yuying, 2009). This model describes several ways a child or student can learn. Fleming (1939) states that there are five types of learning styles (figure 8). When a child prefers a certain learning style, this does not mean that he will never use the other learning styles. Indeed, a child can change his preference during the childhood. Important for a child is to be part of all the learning styles, so that he will learn all the skills and can make a choice.






				
<b>VISUAL LEARNER</b>	<b>AUDITORY LEARNER</b>	<b>KHINESTETIC LEARNER</b>	<b>TACTILE LEARNER</b>	<b>VERBAL LEARNER</b>
A child with a visual learning style will remember information best when presented with pictures and images	A child with a auditory learning style will remember information best when they hear it. This child prefers to listen to stories.  This child also likes to hear and make music	A child with a kinesthetic learning style will learn best when they do and experience things and engage in physical activities	A child with a tactile learning style will learn best when he manipulates objects and feels with touch.	A child with a verbal learning style focuses more on words rather than only sounds.  Similar to visual, verbal learners prefer to listen to stories and gather information by listening

Figure 8: Learning styles of Children  
Learning

## Behavior Types

According to Oxford dictionary (2016b), the definition of behavior is: *“the way in which one acts or conducts oneself, especially towards others. Also during playtime a child has play preferences, or in other words: can behave at a certain way”*

According to Gielen (2010) behavior during playtime can be placed in a diagram of two axes with each two extremes (figure 9). The vertical axis consists of “active” and “receptive” behavior. The horizontal axis consists of “realistic” and “imaginative” behavior:

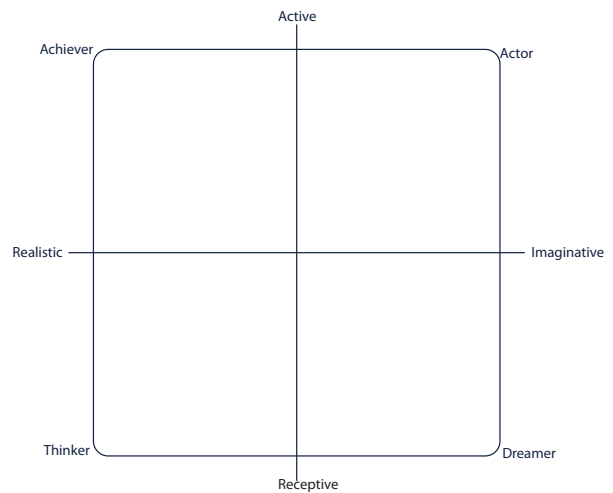


Figure 9: Gielen's Behavior Types

Each quadrant of the diagram is a combination of two types of behavior which can be seen as a certain behavior type. The four behavior types that a child can have, according to Gielen, are:

- **Achiever (Active-Realistic):**  
This behavior type fits to children who like to play actively, but still being realistic.
- **Actor (Active-Imaginative):**  
This behavior type fits to children who like to use their imagination and acts out a story actively.
- **Dreamer (Imaginative-Receptive):**  
The dreamer likes to use his imagination and sensory to play.
- **Thinker (Receptive-Realistic):**  
Within this behavior style, the child loves to use logic in playtime. The child experiments and discovers the characteristics of the environment.

## Behavior types vs. Existing toys

Children prefer to play with a certain toy. This preference can be related to the preference for a certain behavior type during play. For each behavior type there are specific toys that stimulate this way of play.

This diagram is not black and white as it seems. Like with the learning styles, it depends on the preference of the child what he wants to play, but it is important for the development of a child to have experience in all behavior types.

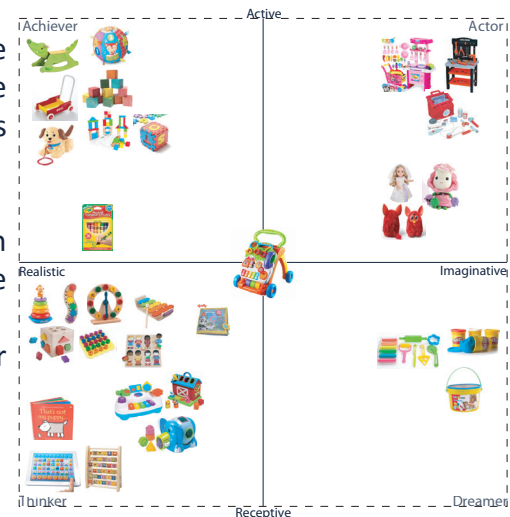


Figure 10: Behavior Types vs. Existing Toys

Figure 10 shows which existing toys fulfill the play preferences. For example, the “actors” prefer to play with fantasy games, like doctor-patient role play. “Dreamers” like to play with sensory toys that let them express their imagination, like magic sand. “Thinkers” like to use logic and reasoning, like puzzles and an achiever likes to play with toys that stimulate them to be active, like a ball.

In the center of the diagram, the multi-purpose toys are placed. These toys want to cover all the behavior types.

This diagram gives also insights about which kind of toys are in majorit, for example perceptual and motor toys. The toys for imaginative, receptive children seem to be in minority.

## Conclusion “Learning”

This chapter has shown the importance of understanding the child. Children are all different personalities. This means that each child has his own preferences and not only in the toy industry.

However, even this theory is clear and logic, ID-8 is a company that do not want to eliminate groups of children when designing products. They design for the child with normal development, so they do not focus on a certain behavior type or learning style. They also do not want to design for niche markets, like children with disabilities.

This does not mean that these insights are not applicable. Designing for all, still needs a focus and this focus could be based on these learning styles and behavior types.





*Play*

*To understand how a child plays it is necessary to recognize the play types and forms. Play is an umbrella term that covers several types and forms that appear during the childhood. All these types and forms teach a child different skills to be prepared for the school years. But what is play and which play forms and types are there?*

### **What is Play?**

Play is an abstract term which is difficult to define. Every person understands what is meant with play, but what is the concrete definition? Several experts already tried to give a specific definition. Even the dictionary has about 23 definitions, but to date there is still no clear definition. However, play can be described in terms of key characteristics (National Council for Curriculum and Assessment [NCCA], 2009) where play consists of. Play should be;

- *Active* – Play lets children to use their body and mind to interact with environment, with materials and with other people
- *Adventurous and Risky* – Play lets children to reach the unknown and take risks between the boundaries of safety
- *Communicative* – Play lets children to communicate (verbal and non-verbal) and share (indirect) knowledge
- *Enjoyable* – Play lets children to have fun at a certain moment
- *Involved* – When children play, they are concentrated, focused and thinking about what they are doing
- *Meaningful* – Play lets children to expand their skills and knowledge
- *Sociable and interactive* – Play let children to play alone, together or along each other
- *Symbolic* – Symbolic play lets children to explore the world there are seeing and admire
- *Therapeutic* – Play lets children to express their emotions via their experiences
- *Voluntary* – Play lets children to decide when, how and with whom they play

The most suitable definition, to my opinion, is Frost's definition.

*"Play is the chief vehicle for the development of imagination and intelligence, language, social skills, and perceptual-motor abilities in infants and young children" – Frost 1992, p.48*

### **Importance of Play?**

Several studies on the importance of play have been conducted. All these studies agree that play has a positive effect on the development of children (Beran & Brown, 2008b). Play is the way children are experiencing and learning about the world. It is the way to "leave" the real world and enter the world of fun. When playing is stimulated by relatives and care-givers it will benefit the child during the whole life (Goldstein, 2009)

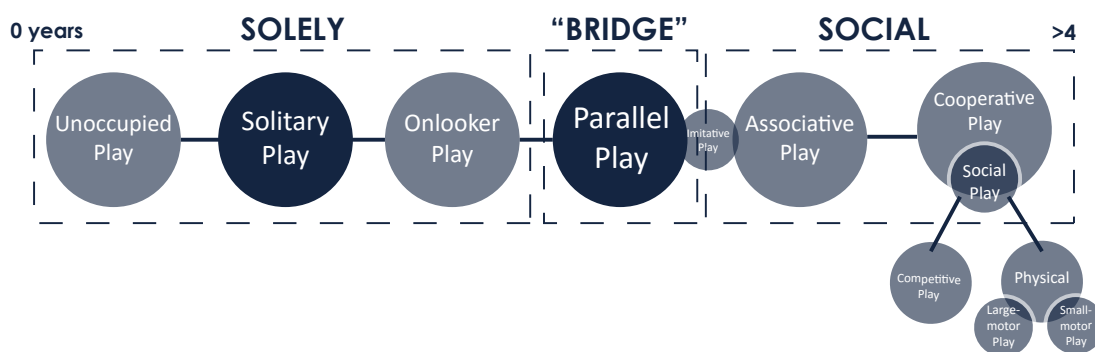
Play help to develop the brain (Shonkhoff, 2000; Sutton-Smith, 1997): Sutton-Smith (1997), a play theorist, stated that children train their brain when they are playing: the brain has an over-capacity of neurons and when they are not used, they will stop working, so it is important to stimulate these connections to work. Play is also the way to develop motor, cognitive, social-emotional and speech, creativity and other necessary skills on a fun way.

Playful children are happier (Singer, 1994), develop a better emotional self-regulation, can socialize easier (Tamis-LeMonda, 2004) and are better prepared for (pre)school. Both solely and social play are important for children to master concentration, sharing, communicating and become an independent and social child.

In short, it is clear that play fulfills a crucial role in the life of children and their further life, but which forms of play are there?

### Forms of Play

Children can play in different ways. They can play solely, together or along each other. According to Parten (1933), who observed children between 2 and 5 years old, there are six forms or stages of play (figure 20). Parten (1933) states that the older a child becomes, the less solitary play he wants to practice (Fergus P. Hughes, 2009; Amanda, 2015). Each child has his own play-process. The age-range between brackets is a rough estimation.



#### SOLELY

Figure 11: Forms of Play (Parten, 1932)

##### Unoccupied play (<2 years)

Children do movements without any purpose, but enjoy what happens around them. The newborn or infant seems not to play at all, but nothing is less true: the infant is playing, but without a goal. There are random movements, but unoccupied play forms the base for further play exploration.

##### Solitary play (2-3 years)

Within this form, a child starts to play actively. The child plays solely and does not share toys or communicates with other children, but focuses on his own toys and objects. This seems selfish, but it is a phase where each child goes through.

The lack of communication/social skills and shyness make that children choose for this type of play (figure 12).

##### Onlooker play (2,5-3,5 years)

Onlooker Play is also a way of playing on "distance". The child loves to look at children who are playing, but does not join. The child could be shy or not yet ready to join in social play. The child is especially an observer or spectator (figure 13)

## **BRIDGE**

### **Parallel play (2,5-3,5 years)**

The parallel play-stage is the bridge between playing solely and with other children. In this stage, children play next to each other and share toys, but do play solely with limited communication (figure 14). Even they have limited communication, they do have eye contact and watches what each child is doing. This leads to another sub-play, namely;

#### **Imitative Play**

This stage occurs mostly within the Parallel play. In this stage, children look at other children and try to copy the actions and proceedings. Imitation is important, because children are then being challenged to do things they not yet capable of.

## **SOCIAL**

### **Associative play (3-4 years)**

Associative play is comparable with parallel play, but the difference is the communication that plays a role at this stage. When children are in this stage they play next to each other but could do things together and speak to each other. This stage is the start for friendships and the step towards cooperative play (figure 15)

### **Cooperative / Social play (> 4 years)**

Cooperative/Social Play is the stage that the child likes to play with other children. From puzzles till doctor-patient: children communicate both verbal as non-verbal. Playing with other children is the base for future social contact. Within cooperative play there are three types of play (figure 16):

#### **Competitive play**

Competitive play is playing with other children, but then with a competitive purpose: it is about winning or losing. Children learn to play with rules and learn how to deal with a negative feeling after a game.

#### **Physical play (Small & Large motor play)**

This type of play has to do with gross en fine motor skills. During this stage children learn to be active and to use their gross and finemotor skills. This physical play could be both social or solely.



Figure 13 Onlooker Play



Figure 12: Solitary Play



Figure 14: Parallel Play



Figure 15: Associative lay



Figure 16: Cooperative Play

## Types of Play

Within the forms of play there are play types (Almon & Miller, 2009) (figure 17). These play types all stimulate different skills and are necessary for the development of children. These types could be performed both outside and inside, alone or in company of other people.

### Constructive play

Constructive play has to do with building, manipulating and fitting objects in each other. These types of games teach a child to use fine motor skills, reasoning and problem solving.

### Manipulative play

Manipulative play is playing with objects, observe and change them to understand the objects. Mostly children love to play with objects that are not really toys, for example phone of their parents and kitchen pots. These products look very interesting for children and helps them to learn them understand objects.

### Rough-Tumble play

Within this type of play children learn to find the acceptable boundaries without hurting other children. They learn to be wrestle, chase and jump, but most important, having fun actively.

### **Sensory play**

Sensory Play is playing with toys and objects that differ in roughness, material and texture. These objects are mostly interesting for perceptual play. An example is mud and sand. It gives toys the freedom to play in a way they prefer.

### **Language play**

Language play has to do with playing with letters, words and stories. Children learn playfully how to use language to express them and communicate.

#### **Small world play**

Small world play is also a way to learn language for children. When they have a small replica of a certain setting, for example a farm, they use language to create a story. Using the small objects to create a conversation, children learn to communicate verbally.

### **Games with rules**

Within this type of play, rules is an important factor. Children learn to play within boundaries and learn that they are not free to do what they want, but that they are limited to specific rules. Board games and football are a good example for this type of play. Playing these type of games teach children to use strategy and logic and let them experience happiness or disappointment.

### **Risk-Taking play**

This type of play is similar to rough-tumble play. Children search the boundaries by taking risks that challenge them. This teach them to conquer fear.

### **Mastery play**

The goal of this type is to master skills. Children keep on trying things, till they can do it independently. When they reach the goal, they feel pride. Mastery play teaches children to carry on when situations become difficult.

### **Pretend play**

Within this type imagination plays a major role. Children like to use their fantasy to get into roles they admire or recognize from their parents life. Dramatic/Fantasy and Make-Believe play are all types that need imagination. These types stimulate the development of children in different ways: they develop their intellectual, physical, social and emotional skills.

### **Open-ended play**

Open-ended play is a type of play that lets children to play how they want, without being limited by rules or the working principal of the toy. Open-ended play is a fun way to give children control about their play-time.



Here is an overview of the types of plays as explained earlier.

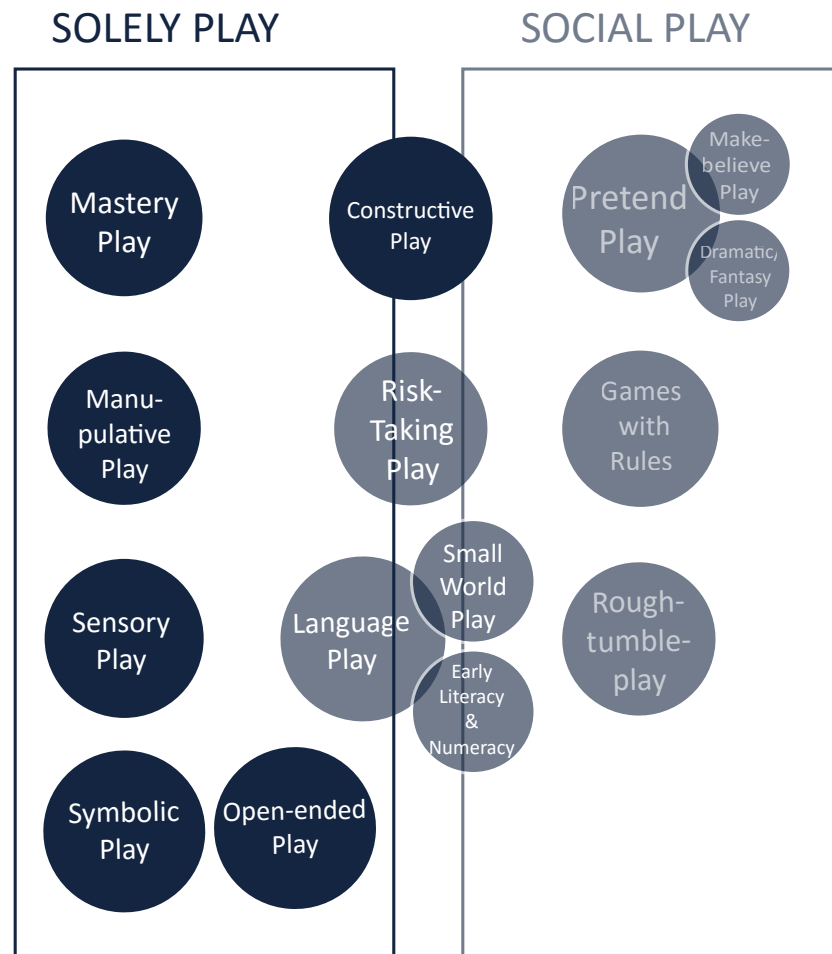


Figure 17: Types of Play

### Conclusion “Play”

The benefits children have from qualitative playtime are of immense value for their life. The early childhood is the foundation for the child’s carrier, social contacts and happiness.

A toddler is in the phase that he can not yet play cooperative. He plays most of the time solely, but there should be space for parallel play.

Toys for toddlers should stimulate solely and parallel play. Open-ended play is a good way for a child to develop himself. This way of play lets a child to have control over the toy instead of the other way around.



*Toys*

*For children toys are products that give them the freedom to enjoy the early childhood, to make friends, to take risks, to fantasy and to learn new things about the world. These toys are for immense value for the children: these “play tools” can prepare children on the school years.*

*The toy industry is an immense industry that already exists for decades. An industry that consists of three main categories: non-electronic toys, electronic toys or a combination of both. Electronic and digital games are neglected in this analysis.*

*The main-function of a toy is providing the child a fun playtime, but especially for young children, they also help to create the foundation for further life. But what is a toy, which toys are there and what is their main focus?*

### **What is a toy?**

A child plays with every object he finds. Does this mean that every object is a toy? The European Commission defines toy as: “each product that is designed to be used by children younger than 14 years old to play with” (Eur-Lex,2010).

According to Gielen(2010), expert on design for children, a toy is product that is designed with a core play-use in mind. Toys are tools for children to learn new things, so they must be products where designers have thought about. Indeed, toys should have a certain play value that motivates the child to pick up the toy and play with it. If this play value is high enough, the child will play again with it at a later moment (Gielen, 2010) According to these two definitions, a kitchen pot is not a toy, but a replica of a kitchen pot is.

## Toys: Then & Now

Comparing toys which were used in the history, with some toys that are used now, gives a striking overview (figure 29).

It seems that some modern toys are “inspired” by old concepts. Or better said: copied from old concepts. Although, safer heaper with brighter colors and made from plastic sponge or wood: they are still the same concepts. The toys that were used in history are not or less based on child development studies, but the toy manufacturers still use these toys as an inspiration for new toys.

Toys that could not be based on early concepts are traditional toys with electronic components. These toys are more inspired on “grown up” products or nature. For example, police car toy with sirens or a duck toy that croaks.



Figure 18: Toys: Then & Now

## Puzzle, Game & Toy

The figure below shows the difference between a puzzle, game and a toy. For this project, a toy will be developed.

One answer (right/wrong)

The player is a actor

Puzzle, Shap sorter

Puzzle

Rules

There are some limitations

Tetris, Chess

Game

No rules

The player is the author

Lego, Ball, Blocks

Toy

## Existing toys

Nowadays children can choose between several toys and each toy addresses another play type, development skill and age. Figure 19 gives an overview of examples of existing toys. The toys are sorted, based on the development skill they address. The figure also shows the non-commercial toys to compare them with each other. The main difference between these products is the material and color use.

Commercial toys contain mostly bright colors and plastic. Non-commercial toys are especially made of wood and with fewer colors. Wood lasts longer than plastic and at schools toys should be used for a longer period.

Another difference is the simplicity of non-commercial toys. These toys do what they have to do, without too much features.

### Motor-toys:

These toys address the development of fine and gross motor skills, for example walking, jumping and drawing. Main toys in this category are walkers, balls, pull dog and blocks.



### Cognitive-toys:

These toys stimulate the development of cognitive functions, like reasoning, problem solving, understanding and counting. Popular examples are shape-sorters, puzzles and gears.



### Social-emotional-toys

These toys are meant for the development of social-emotional skills, like playing with other children and expression of emotion. Examples of these toys are dolls, board games and fantasy toys.



### Language toys

These toys stimulate the development of verbal-, non-verbal communication, literacy and numeracy. Examples are word games, books and crayons.



### Perceptual toys

These toys stimulate the development of the senses, like hearing, feeling and seeing. They could consist of several textures, colors, materials and sounds.



### Multi-purpose toys

The so called “multi-purpose toys” are toys that want to elicit several development skills in one piece.



According to toy manufacturers, a child is getting bored easily. These toys should give the child more ways to play, so that the child will be entertained for a longer time and learn more skills at the same time.

However, according to Gielen, these kind of products do not have a core use and that works counterproductive to the development of children.

DEVELOPMENT STAGE	COMMERCIAL TOYS	MULTI-PURPOSE TOYS	NON-COMMERCIAL TOYS
			
			
			
			
			

Figure 19: Existing Commercial & Non-commercial toys

## Trends & Developments

The figure below gives an overview of the trends and developments in the categorie Technology, Business, Toys and Human. For extra information about each trend, see appendix F.

The trends that are most interesting to respond to are open-ended play time, 21st century skills and reducing screen-time. Replying to these trends and developments could help a child to prepare himself for the future occupations.

Trying to solve social problems like obesitas or improving social contact between parent and child are not possible with a toy. The cause of these social problems do not lie in the hand of a designer.

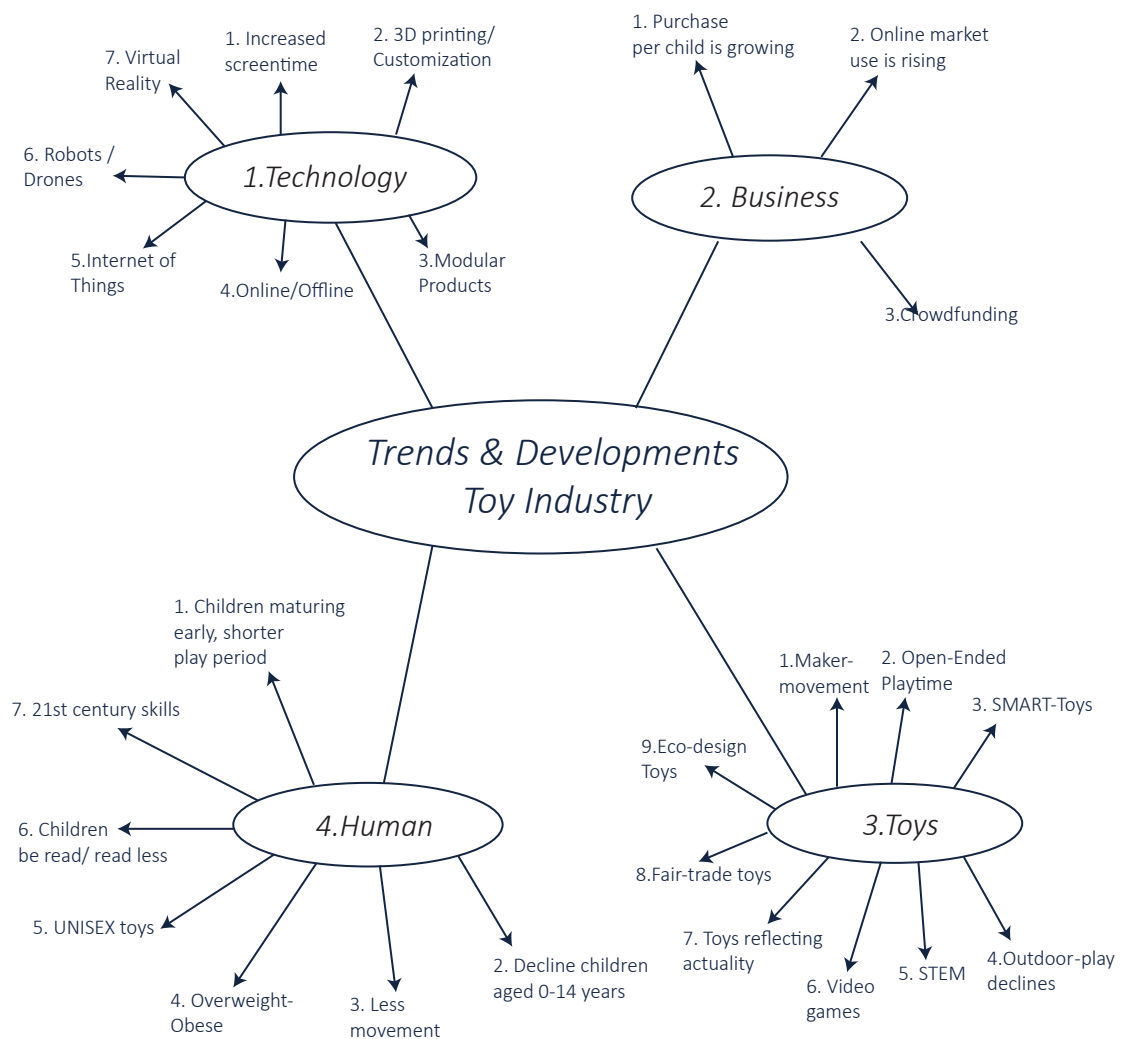


Figure 20: Trends & Developments Toy Industry

### **Conclusion “Toys”**

When taking a look at the existing toys, it is clear that all the development stages are being mentioned in the toy industry. A conclusion is that there are enough toys for each development stage.

However, when zooming in at the existing toys of each skill, it seems that there is a lack in variation in cognitive and language toys. Cognitive toys focus especially on memory and shape sorting. Cognitive development is more than only shape sorting or color understanding. What about spatial awareness and other sub-skills?

Language toys focus especially on animals, nouns and letters. What about abstract terms, which are not explainable with pictures, like emotions ? Toys should vary in what they do, so that a child will learn each skill to the fullest.



*Design*

# Toy Regulations

*Toys are made to give children the time of their life. Toys may never harm children's life. Safety is one of the most important aspect in toy design. To ensure the safety of toys, toys should meet the NEN-standards which are formulated by the standard-commission. The NEN-EN 71-serie is applicable for toys. (NEN, 2015).*

All toys should have the CE-mark. This means that it meets all the safety requirements. This mark can be found on the backside of the package. Also warning signs should be placed on the package. (figure 21). The main requirements for toys are as follows (European Parlement, 2009):



Figure 21: Toy warning

## Physical & mechanical

- The mechanical properties are sufficient:  
The toy is *strong and stiff enough*.
- Cables, cords, corners or protuded parts may not cause injuries.
- No strangulation possible.
- No choking hazard for children under 3 years old (figure 22).
- The maximum temperature does not cause injuries.

## Inflammability

- The toy may not be an inflammable object in the child's environment.
- The materials, where the toy is made of, should also not be inflammable.

## Chemical

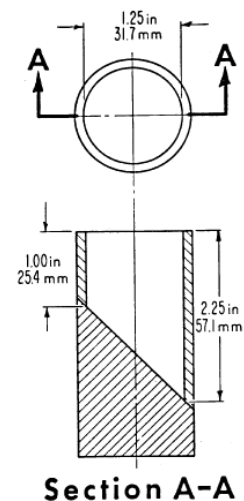
- The toy does not contain dangerous chemical substances that can harm the child.
- The chemical substances in the toy may not exceed the maximum allowed amount of that substance.

## Electrical

- The maximum voltage allowed in toys is 24V.
- The toy may not cause electrical shocks.
- The toy protects the child from electrical shocks and inflammable danger.
- The child can't pull out the battery of the toy, to avoid choking hazard.

## Hygiene

- The toy should not cause infections or diseases.
- Toys for children under 36 months, should be cleanable, textile toys should be washable.
- After washing or cleaning, the toy should still meet all the safety-requirements.



G1-SMALL PARTS CYLINDER

Figure 22: Choking hazard measurement

# Conclusion “Analysis”

*The analysis gave interesting insights and opportunities for the design phase. The main insights of each chapter will be summarized.*

## **Market**

The toy market consists of two main toy categories: educational and fun toys. During the pre-school years the border between fun and educational toys is neglectable. This means that toys are both fun and educational.

The European market is one of the biggest markets in the world, with Mattel, LEGO, Hasbro and Dickie Toys as main players.

In the Netherlands there are about 720.000 children in the age of 0-4 years.

## **Child**

The chapter child has shown the importance of the basic development skills, because the motor, cognitive, social-emotional, language and perceptual skills stimulates the development of the brain-parts.

When a parent, buys a toy, he bases the purchase on the quality and the benefits the toy has on the development of their child. They want the toy to stimulate this. The average spending on toys is between 10 and 15 euro and on special occasions the toy may cost more.

At the kindergarten, they emphasize the “discovering skills” of children. For pedagogical staff, imagination is an important development skill. This must be more mentioned with toys. They want toys be more open-ended to give children control on how to use the toy instead being “told” by the toy.

With the VVE program, the kindergarten prepares the children of today for the future by focusing on 21st century skills.

## **Learning**

This chapter has shown the importance of understanding the child. Children are all different personalities. This means that each child has his own preferences and not only in the toy industry.

However, ID-8 is a commercial company that do not want to eliminate groups of children when designing toys. They are designing for the child with normal development, so they do not focus on a certain behavior type or learning style or disability.

## **Play**

A toddler is in the phase that he can not yet play cooperative. He plays most of the time solely, but there should be space for parallel play. Toys for toddlers should stimulate solely and parallel play.

Open-ended play is a good way for a child to develop himself. This way of play lets a child to have control over the toy instead of the other way around.

## **Toy**

When taking a look at the existing toys, it is clear that all the development stages are being mentioned in the toy industry. A important conclusion is that there are enough toys for each development stage.

However, when zooming in at the existing toys of each skill, it seems that there is a lack in variation in cognitive and language toys. Cognitive toys focus especially on memory and shape sorting. Cognitive development is more than only shape sorting or color understanding. What about spatial awareness and other sub-skills?

Language toys focus especially on animals, nouns and letters. What about abstract terms, which are not explainable with pictures, like emotions ? Toys should vary in what they do, so that a child will learn each skill to the fullest.

## **Trends & Developments**

The trends that are the most interesting to respond to are open-ended play time, 21st century skills and reducing screen-time. Replying to these trends could help a child to prepare himself for the future occupations.

Trying to solve social problems like obesitas or improving social contact between parent and child are not possible with a toy. The cause of this social problems do not lie in the designer's hand.



# Future vision


*The occupations and the society of the future will be different than that of today. With occupations the general interaction forms are being meant. Occupations will focus on problem solving, Internet of Things and IT. Virtual Reality and 3D printing will be more embedded in people's life. The occupations of the future will change the way children play.*

This child of the future should have the necessary skills to have the ability to execute an occupation in the future. The skills, the so called 21st century skills, a child should have are for example problem solving, creativity, communication, cooperation and critical thinking.

However, the 21st century skills could only be learned if children have the skills which are necessary to have the ability to learn the 21st century skills.

Toddlers do not yet have the basic skills: they start to learn to communicate and learn to understand the relation between objects. First this should be optimal developed. Therefore, the focus of the 21th century skills should be shifted to a later age.

The child of the future should also participate in the changing society. Households will become more two-income households, so the child should have the ability to learn skills independently, without the necessary input of parents.



F U T U R E

# Design brief

In the beginning of the project the assignment as given was as follows:

***“Design a physical toy that stimulates toddlers to develop a specific skill playfully”***

Toddlers walk, jump, run and experience the world with their senses. They become curious and ask why-questions. They learn to sort and name objects, animals and enlarge their vocabulary. They are also in the phase that they start to express their emotions. This makes the pre-school phase an important one. Stimulating this phase with toys will help the child to get the most out of this phase.

There are enough toys that stimulate these development stages. However, the toy analysis has shown that *cognitive and language do not variate in what they teach*.

Also, toddlers of today should be *prepared for the future*. This means that a toddler should have the right foundation, to make it easier for them to learn the 21st century skills at a later age. This is already focused on at the kindergarten and via education, but this should be more done playfully with toys.

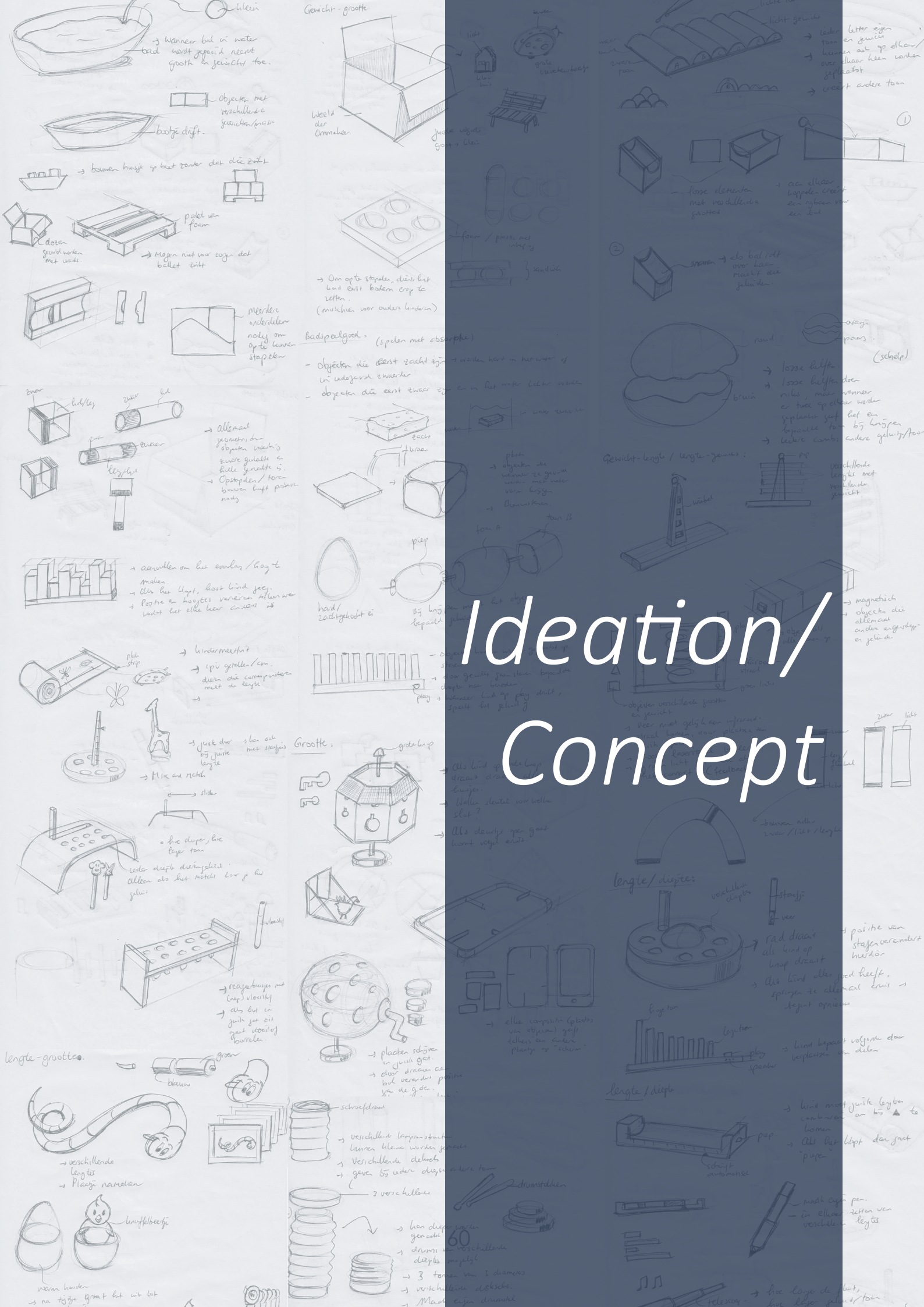
Another important direction that should be more emphasized is the growing popularity for *open-ended play*. Giving the child the freedom to decide how to use the toy is a trend that stimulates the development. Actions of children during play should not be “wrong” or “good”.

These important insights led to a revised assignment which is:

***“Design of an open-ended toy, that gives a toddler (3-5 years) the possibility to play solely, which stimulates the development of cognitive or language skills to prepare them for future-occupations”***

Via design sketching, the assignment has been specified further.





Gewicht - grootte

→ Wanneer bal in water  
bedrukt wordt, drijft hij op  
grootte en gewicht toe.

Objecten met  
verschillende  
gewicht/maat

beetje drift.

Wolfs  
der  
Criminals

juiste afgifte  
grootte klein

→ laden letter eigen  
toon en gewicht  
→ kunnen ook op elkaar  
over elkaar heen worden  
geplaatst  
→ creëert andere toon

→ bouwen huize op best zonder dat die zinkt

palet van  
foam

→ Moeten niet voor zijn dat  
ballet zinkt

→ Om op te stapelen, dat het  
niet eerst bodem oop te  
rekenen.  
(mushies voor andere kinderen)

Badspelgoed (spelen met absorptie)

- Objecten die eerst zacht zijn  
in water worden harder  
in water worden zachter  
- objecten die eerst zachter zijn  
in water worden harder

→ Alleen  
gebruiken van  
objecten waarbij  
zware gedeelte en  
lichte gedeelte is.  
Opstapelen / form  
bouwen blijft prima  
nuttig

zacht

hard

hard/  
zachtgevoel is

piep

bij lang  
bepaald

Grootte:

grootte laag

Als kind op  
draait draait  
draait draait  
draait draait

Wat kan sleutel voor welke  
slot?

Als deur open gaat  
komt vogel eruit

→ bouwen aan  
zwaar / licht / lengte

lengte / diepte:

verschillen  
diepte

stapels

rad draait  
als kind op  
knop draait

→ alle kind alles goed heeft,  
springen ze allemaal eruit  
→ begint opnieuw

lengte / diepte

→ kind moet juist legten  
combineren om te  
komen  
→ Als kind klopt dan gaat  
"pomp"

→ kind moet juist legten  
combineren om te  
komen  
→ Als kind klopt dan gaat  
"pomp"

→ kind moet juist legten  
combineren om te  
komen  
→ Als kind klopt dan gaat  
"pomp"

lengte-grootte.

groot

klein

→ verschillende  
lengtes  
→ Plaats namen

knuffelbeestje

→ na tijdje gaat het uit het

→ plaatsen schijven  
in juiste get.  
→ dan draaien aan  
bal veranderd positie  
van de geten.

schroefdraad

→ verschillende lengtes/structuur  
kunnen kleine worden gemaakt

→ Verschillende diepte  
→ geven 65 andere dingen andere toon

→ verschillende

→ kan diepte worden  
gemaakt  
→ drums met verschillende  
dieptes mogelijk  
→ 3 toeren van 3 diameters  
→ verschillende dekjes  
→ Maak eigen drums

drumstokken

drumstokken

drumstokken

drumstokken

drumstokken

# Directions

## Basic Development Skills

Figure 23 shows that the cognitive, social-emotional and language skills underlie the 21st century skills. This means that a toddler should develop these basic development skills well, so that it becomes easier to learn the future skills.

However, the social-emotional skill, the contact between parent and child, does not lie in the hand of the designer, but in parents' hand. This is the reason, why there will not be a focus on the social-emotional skill.

### 21st Century Skills

### Basic Development skills

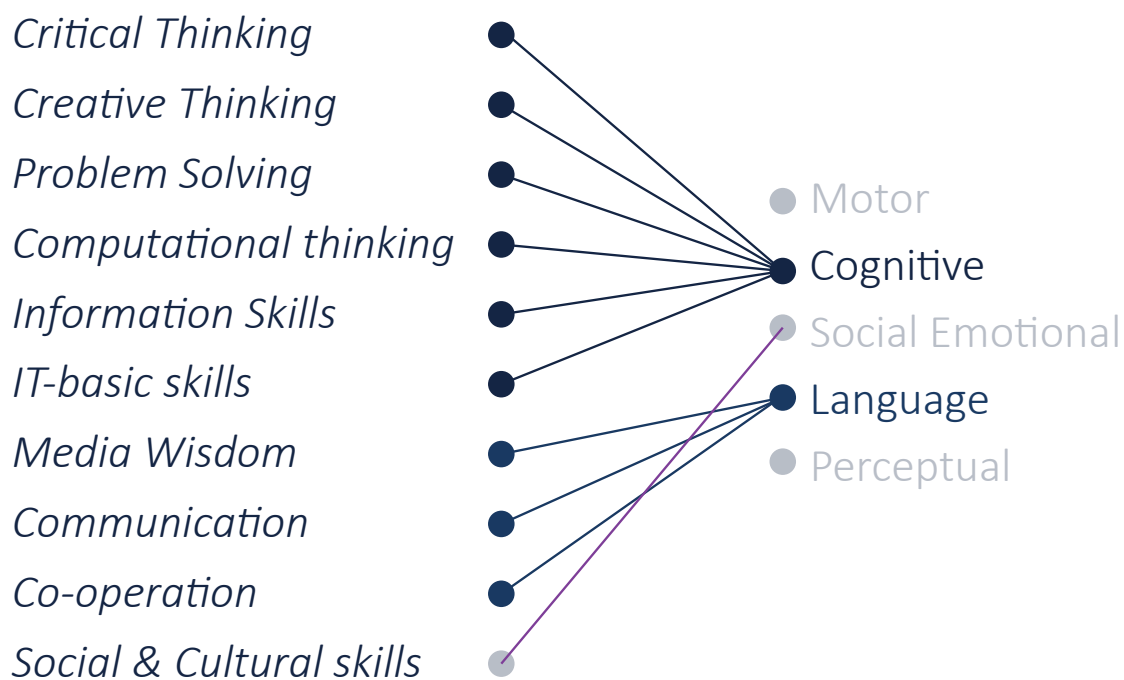


Figure 23: Basic Development skills



## **Sub-skills**

Cognitive and language skill can be divided in sub-skills. Cognitive skills consist of logic reasoning, memory, spatial awareness, abstract thinking and problem solving. However, abstract thinking is a skill that a child can learn around 11 years, so this skill has been eliminated. Memory has already a lot of focus in the toy industry and does not fit to the 21st century skills, so this skill is also eliminated.

## **Position/Time**

Language can be divided in letters, nouns, understanding “position” and phenomenon “time”. A toddler cannot make sentences yet, therefore he should first understand separate words.

Letters and nouns is already a lot of focus in the toy industry, but abstract terms that could not easily be made visual, are getting less attention. position and time are chosen as a possible subject for the toy (figure 24)

## **Smaller/Bigger**

Understanding and sorting shapes are skills a toddler already learns, but understanding the difference between objects is underexposed in the toy industry. Understanding the relation between objects needs logic reasoning, spatial awareness and problem solving skills. This umbrella term for this category is smaller/bigger”.

“Smaller/bigger” can also be divided in sub-layers

### **Length**

What is the difference between long and short? for example between animals or buildings.

### **Size**

What is the difference between big and small? A child will recognize the difference between, for example a big car and a small car.

### **Amount**

The child will learn what “amount” means. This will teach a child to count.

### **Sequence**

What does “sequence” mean?. A child will then understand that sometimes consecutive actions are necessary to get a certain result.

### **Volume**

What is the difference between full and empty? A child can then, for example, recognize the difference between a full and empty bath or glass.

### Weight

What is the difference between light and heavy? A child can then recognize the difference between a heavy and light object.

### Time

What does time mean? What is yesterday, today and tomorrow? This term will give the child insights in understanding time.

### Position

What is before, behind, above etc? Understanding position is abstract and it depends on position of the “viewer”.

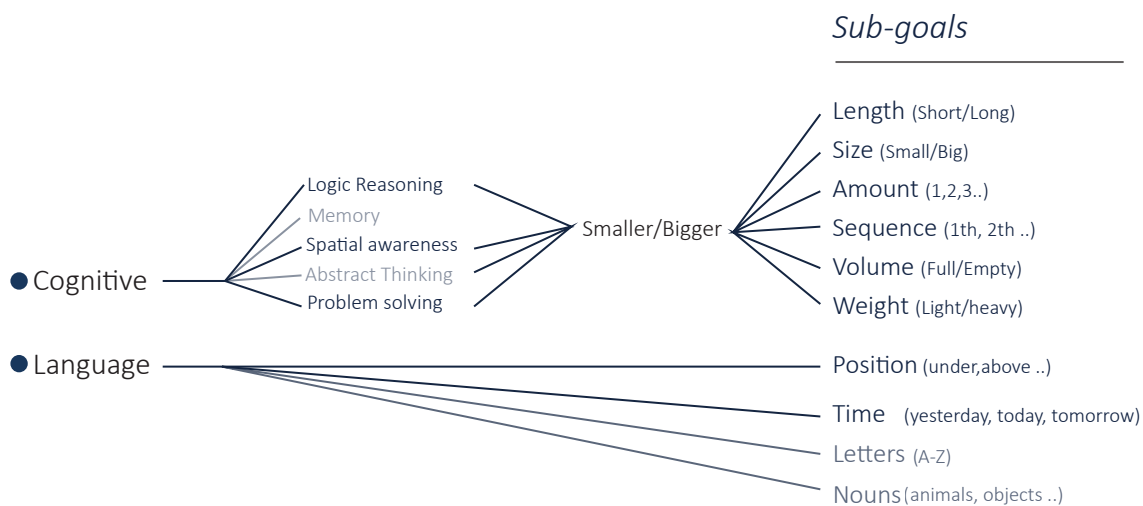
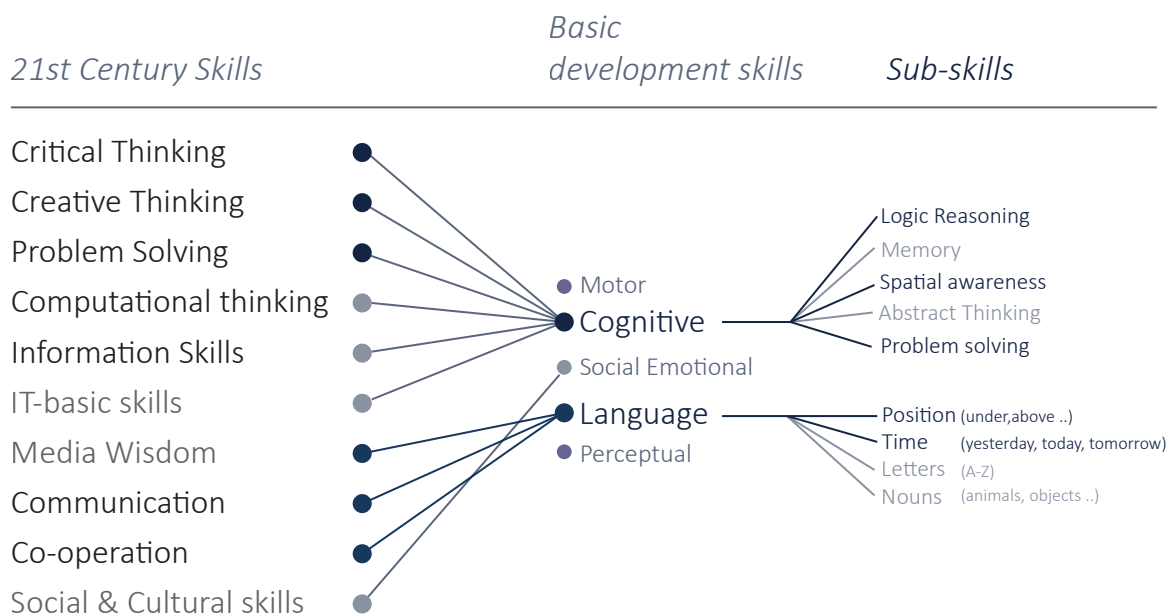


Figure 24: Subskills & Sub-goals

# Ideas for Gameplay

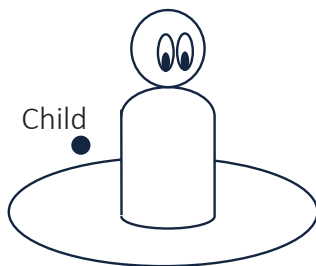
*Before a physical product could be designed, the first question that had to be answered was how to integrate each sub-goal in game play?*

*Therefore two ideas were generated for each sub-goal. Each idea tries to implement the sub-goal in a different way.*

## Position / Pre-positions

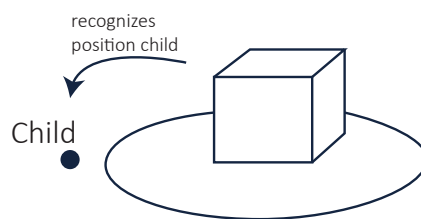
Goal: Teaching to children what in front of, behind, above etc is.

### Idea 1



Fixing a object in the middle where is clear what the front is. For example: Child is behind the puppet

### Idea 2



Object recognizes position of the child. Object defines what front, back, above etc is, based on child's position

## Time

Goal: Teaching children what today, tomorrow and yesterday is.

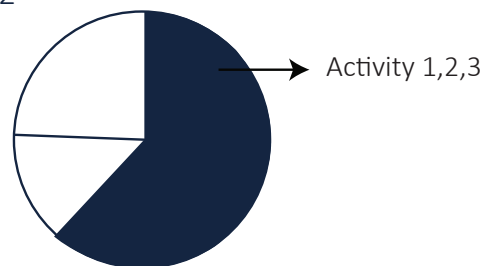
Toddlers do not yet understand these terms. They think in moments and activities

### Idea 1



By creating a product that is based on the moments and activities of the child

### Idea 2



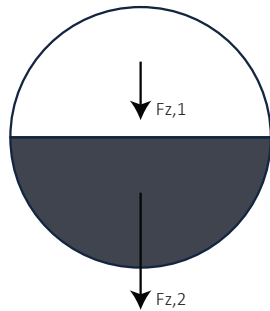
By creating a clock that shows the activities and what is already done and still has to be done.



## Weight

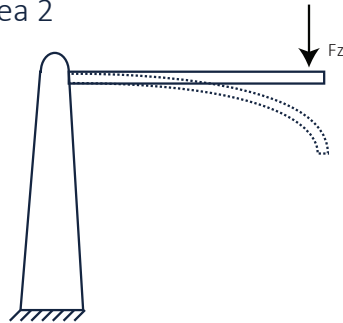
Goal: Teaching children to recognize the difference between heavy and light

### Idea 1



Two weights in one object. The earth will always pull the hardest on the heaviest part of the object

### Idea 2

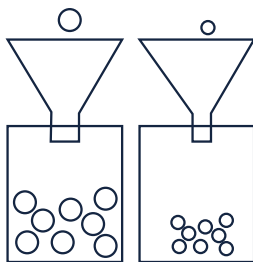


Variation of mass on one point (constant arm)  
This will create for each weight another depression.

## Size

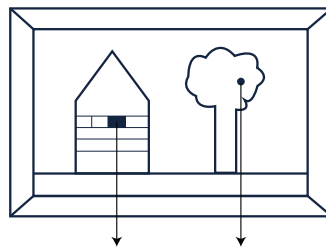
Goal: Teaching children to recognize the difference between small and big.

### Idea 1



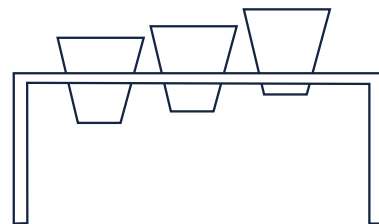
Sorting objects which differ in size.  
This will learn a child the difference between small and big

### Idea 2



Creating a product that shows the relation between parts. For example, a stone that is part of a house, a apple part of a tree.  
The products deconstructs from big to smaller to smallest.

### Idea 3

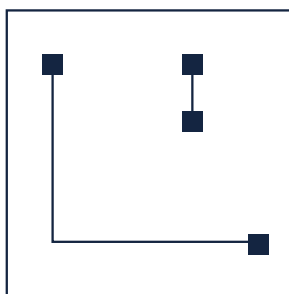


A table with three different openings. One size of a cone. In each opening the cone gives a different result.

## Length

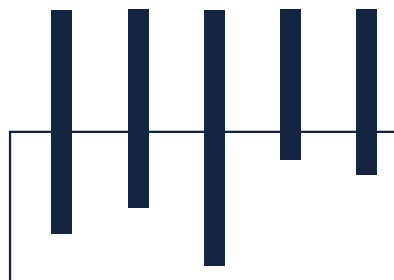
Goal: Teaching children to recognize the difference between short and tall

### Idea 1



By connecting two points, a child learns difference between a short distance and long distance.

### Idea 2

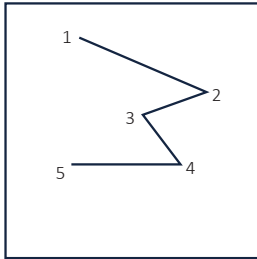


By creating a product with different lengths and depths, each action gives another reaction.

## Sequence

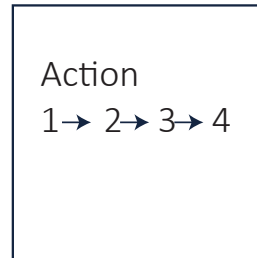
Goal: Teaching children what sequence is

### Idea 1



By connecting following numbers, that leads to a certain result, for example figure.

### Idea 2

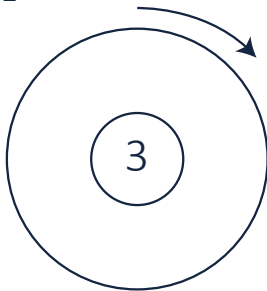


By doing following actions. Each sequence gives a different result

## Amount

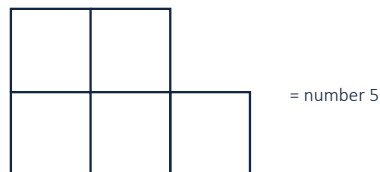
Goal: Teaching children what amount is

### Idea 1



The amount of times the wheel is turned, corresponds the number in the middle

### Idea 2

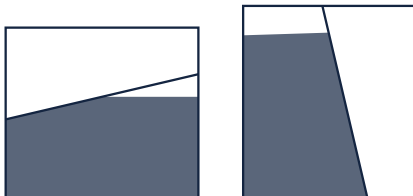


By corresponding the amount of pieces with a number

## Volume

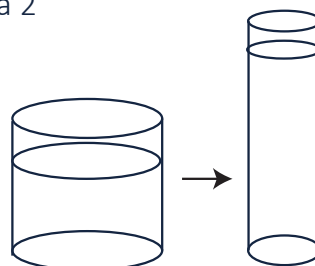
Goal: Teaching children to understand the difference between full and empty

### Idea 1



By creating a piece that gives each time another pattern, due to the volume of the object. The volume will always go to the bottom.

### Idea 2



By creating a product that can change in size so that it will show the change in volume.

# Idea choice

For the next step, translating an idea into a physical product, a choice has to be made between all the ideas. To make this choice communicative, criteria have been formulated.

These criteria will show the most promising ideas for concept ideas.

## Discover/Open-Ended Play

To which extent is the idea open-ended? It is possible for a child to play freely and does it have an end?

## Feasibility/Potential

The feasibility of the idea is based on the aspect if it could be done with existing stuff. Does the idea have potential for the company ID-8? Does it fit to ID-8's portfolio?

## 21st century skills

To which extent does the idea cover 21st century skills? This is based on assumptions, because it is not auditable if this idea will really stimulate these skills. And how much skills does it cover?

## Chosen direction

The Weighted Objectives Method (Roozenburg & Eekels, 1995) has been used to give each idea a score between 1 and 10. Each skill is weighted with 1. The ideas that has been chosen are

- Length
- Size
- Weight

Length and size have been merged, because they are very similar to each other. The reason why they are chosen is the open-endedness, the potential and feasibility that they have. There is chosen to continue with three 21st century skills for further product development, because these skills fits the best to open-ended play.

Understanding the difference and relation between objects could help the child to think critical, solve problems and think creative.

	Cognitive skills: Smaller/ Bigger														Language skills			
Sub-goals	Length		Size			Weight		Volume		Sequence		Amount		Time		Position		
Idea	1	2	1	2	3	1	2	1	2	1	2	1	2	1	2	1	2	
Open-endedness	8	4	1	2	5	4	3	8	3	1	3	1	1	3	1	2	2	
Feasibility / Potential	1	8	1	7	8	8	6	3	3	3	1	3	1	6	6	8	5	
21st Century Skills	3	3	3	2	3	3	3	1	2	1	1	1	1	1	1	1	1	
TOTAL	12	15	5	11	15	15	13	12	8	5	5	5	3	10	8	11	8	

Figure 25: Weighted Objectives Method

The ideation phase for gameplay eliminated directions. This lead to a more specific assignment. The revised design goal is as follows:

***“Design of a open-ended toy, which stimulates solely play, that teaches toddlers (3-5 years) the difference between heavy/light, hard/soft (material) or long/short- small/big, to develop critical and creative skills to prepare them for the future”***

# Concepts

*Via sketching and a creative session, the three chosen ideas have been translated into sub-goals to define the potential and feasibility of the ideas.*

*The three most promising ideas were developed into concepts.*

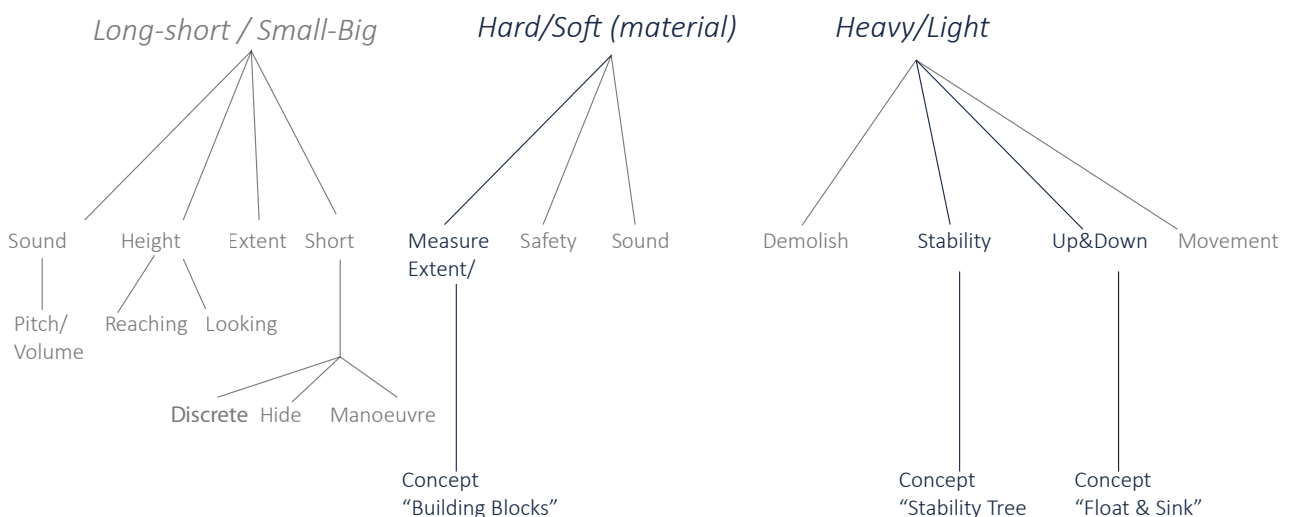


Figure 26: Concepts

## Concept “Building Blocks”

This concept consists of building blocks which look the same at first sight, but differ in the material flexibility. Each building block could be hard, soft, flexible or inflexible. This difference in material properties could give the child new ways to build trains, houses and bridges using his imagination.

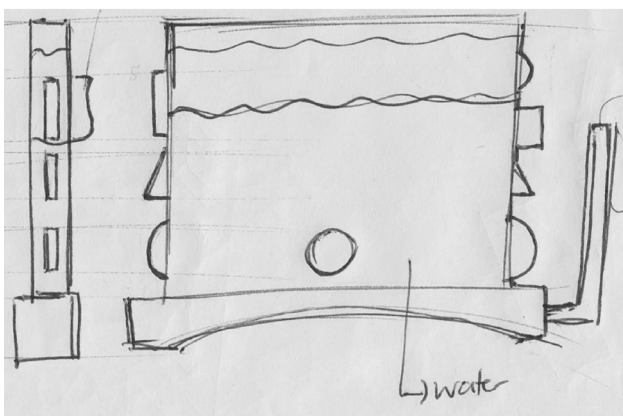
## Concept “Stability Tree”

The Stability Tree is an empty stump that should be grown to a tree. The product exists of a stump with holes and branches. These branches could be turned in the holes. Each branch has different lengths. The child should make the tree as big as possible, without the tree falling down/ losing stability.

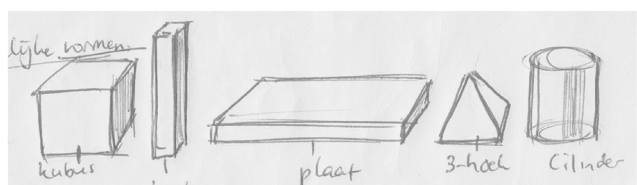
## Concept “Float & Sink”

“Float & Sink” is a toy that lets a child recognize the difference between heavy and light objects. This concept is a waterbox that gives the child the possibility to sort shapes under water. Some elements sink and other float, based on their volume.

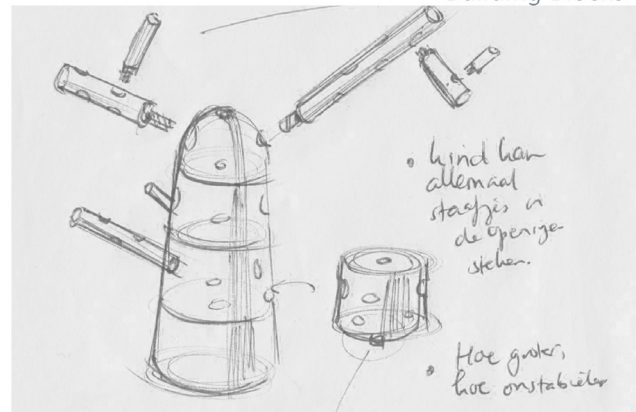
The child can control the shapes under water with a magnet that could be placed on the front surface. By deciding which shapes should float or sink, a child can fill the holes with the right shape.



Float & Sink



Building Blocks



Stability Tree

Figure 29: Concepts

# Chosen Concept

The weighted Objectives Method (Roozenburg & Eekels, 1995) has been used to choose the final concept, to develop further into a product.

Each criteria has been given a weight. Each concept has been given a score between 1 and 10. The concept with the highest total, is the chosen concept.

The method has shown that **“Float & Sink”** is the most promising concept. In the next phase, this concept has been further developed into a product.

	W	Concept Float & Sink	Concept Stability Tree	Concept Building Blocks	
<b>ID-8</b>	4	8	2	5	How much does it fit to ID-8 ?
<b>Potential</b>	4	8	3	6	How much potential does it have ?
<b>Feasibility</b>	3	7	7	7	How feasible is it ?
<b>Challenge</b>	3	8	4	5	How challenging is it as Graduation Project ?
<b>Parents</b>	2	8	6	4	Which concept do parents like the most ?
<b>Learning Curve</b>	1	8	5	2	Is there a learning curve needed? (1=yes a lot , 10= not at all)
<b>TOTAL</b>		<b>133</b>	70	80	

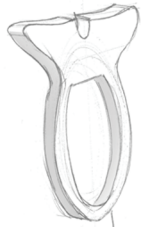
Figure 30: Weighed Objectives Method

# Final design goal

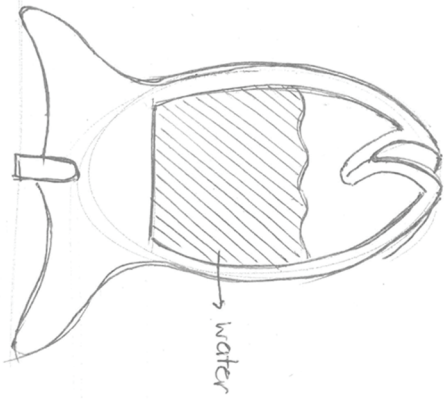
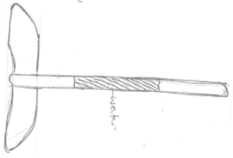
The final concept makes the design goal more specific, because now it is clear what the toy should do:

This final design goal is as follows:

**“Design of a toy that gives toddlers (3 and 5 years) the possibility to play open-ended while learning about the difference between “heavy” and “light”, to develop critical and creative thinking skills**

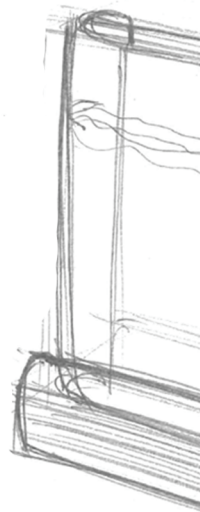
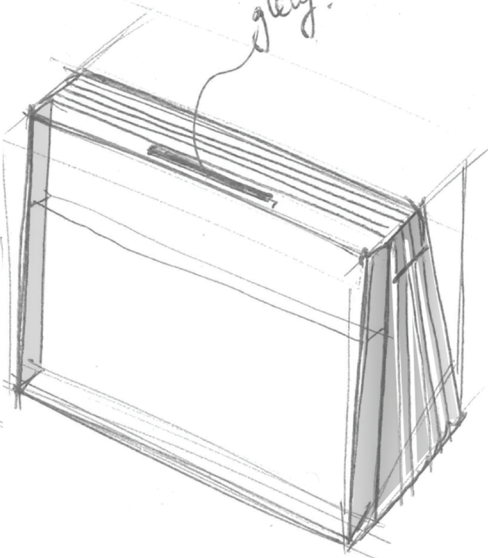


has injectie  
moudeel pot



water

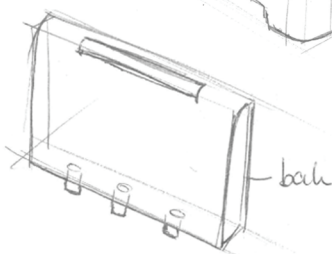
gleuf.



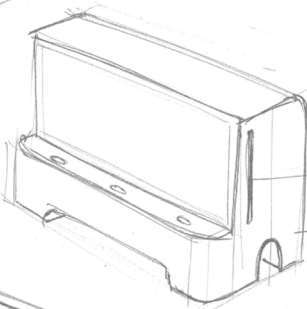
water



scenes/themes

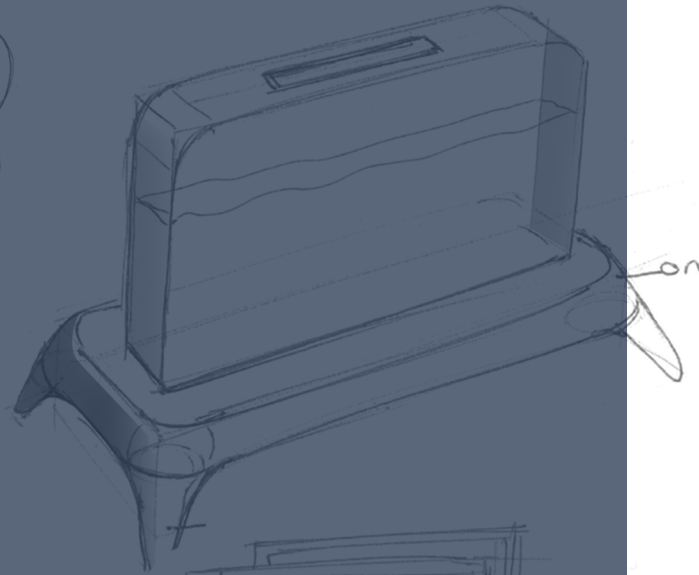


bal



plek voor

houder



onders

scenes /  
themes

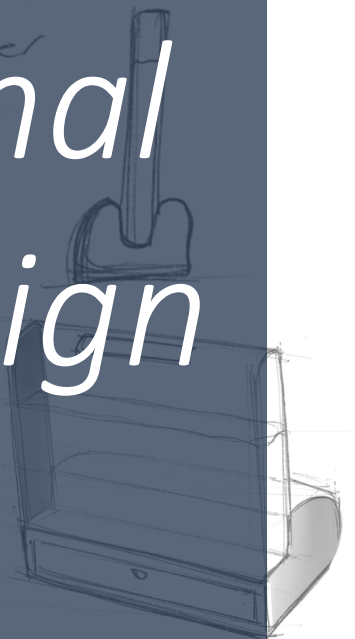
place for  
picture  
water

# Final Design



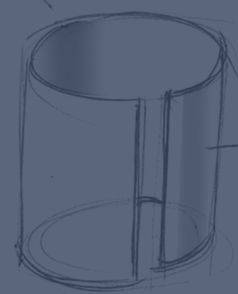
water

water  
noting to turn



water

71



scene/  
themes

setting 1  
zichtbaas



# WaterTheater

*WaterTheater (figure 31) is designed for toddlers (3-5 years) to give them the freedom to play open-ended and use their imagination, to recognize the difference between heavy and light objects by creating their own story in water.*

## Background information

A difference between objects could only be seen if objects are being compared to each other. "Heavy" and "light" are terms which need a certain reference to understand them: the same with big/small, tall, short etcetera.

Sink, float & swim

For heavy and light, a scale or balance could be used to compare them, but another way to show the difference is to place objects in water. When objects are throw, for example, in a empty basket, they all will fall at the bottom, but when there is a medium with a certain density, each object does something different in this medium. This gives a certain *visual feedback*. If the object is light, it floats, if the object is heavy it sinks and if it is constant, it swims. The concept is based on these theory.

## Description

### What does it do?

WaterTheater gives a child the possibility to think critical, because each action of the child gives another reaction.

It also lets a child to use his imagination and play open-ended to create a certain story with the provided elements, using the weight. This stimulates creative thinking of the child. Because the design is neutral, it is for both boys as girls. The elements and scene define the theme of the story. The open-endedness of the toy makes that it is not possible for children to make mistakes.

## Parts

WaterTheater consists of a *transparant waterbox, elements, scenes, storagebox and a magnet*.

### Waterbox

This part is the main part of the toy. It is a transparant box, where water is placed in. This waterbox is the play field for the child. The child can drop elements in this waterbox and control.

### Elements

Elements are small objects that form the play tools for the child. These elements are shapes of realistic or fantasy objects which are hole of massive, for example a boat or a princess. The child can manipulate these elements by filling of emptying them. A child can use the float, sink and swim principle to create a story with the elements, by throwing them in the waterbox. These elements are based on a certain theme. In this case the theme is "UnderWater World" because it fits both girls and boys.

## Magnet

The magnet gives the child control over some elements. The child can control elements by placing the magnet on the front or back surface of the waterbox.

## Storage box

The function of the storagebox is to provide stability to the waterbox. Because the box is filled with water and it has a small width, the waterbox can tilt when a child pushes the waterbox. To avoid this, the storage box provides stability. The storage box is also the leak-box for water and wet elements. After play the waterbox, elements and scenes can be placed in the storagebox to store them.

## Transparant Scene

The transparant scene can be placed behind the waterbox to create a certain atmosphere, for example a desert. This scene in combination with matching elements gives the child the possibility to use his imagination during play (see next page for examples). In this case the theme is Underwater World because it fits to both girls and boys.

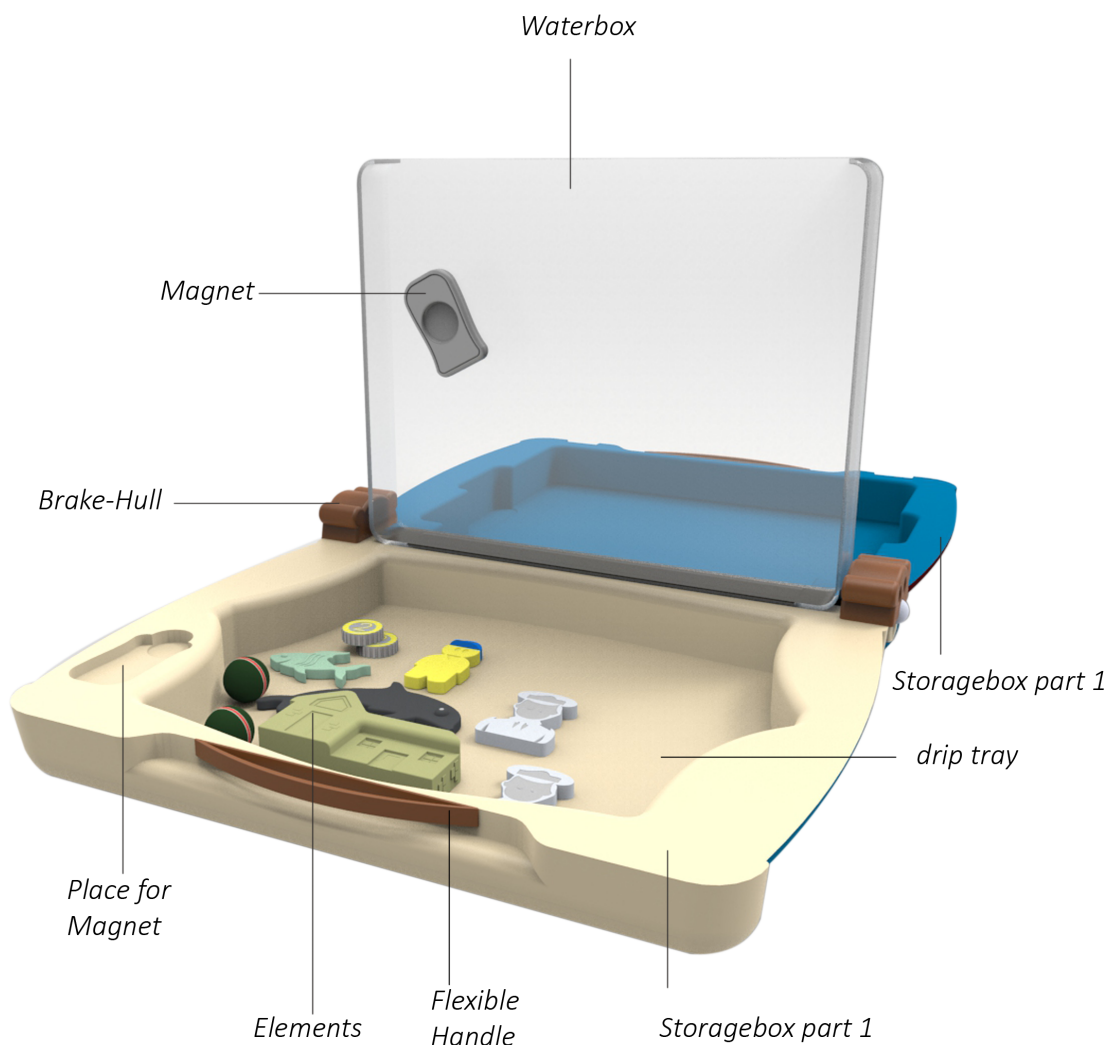
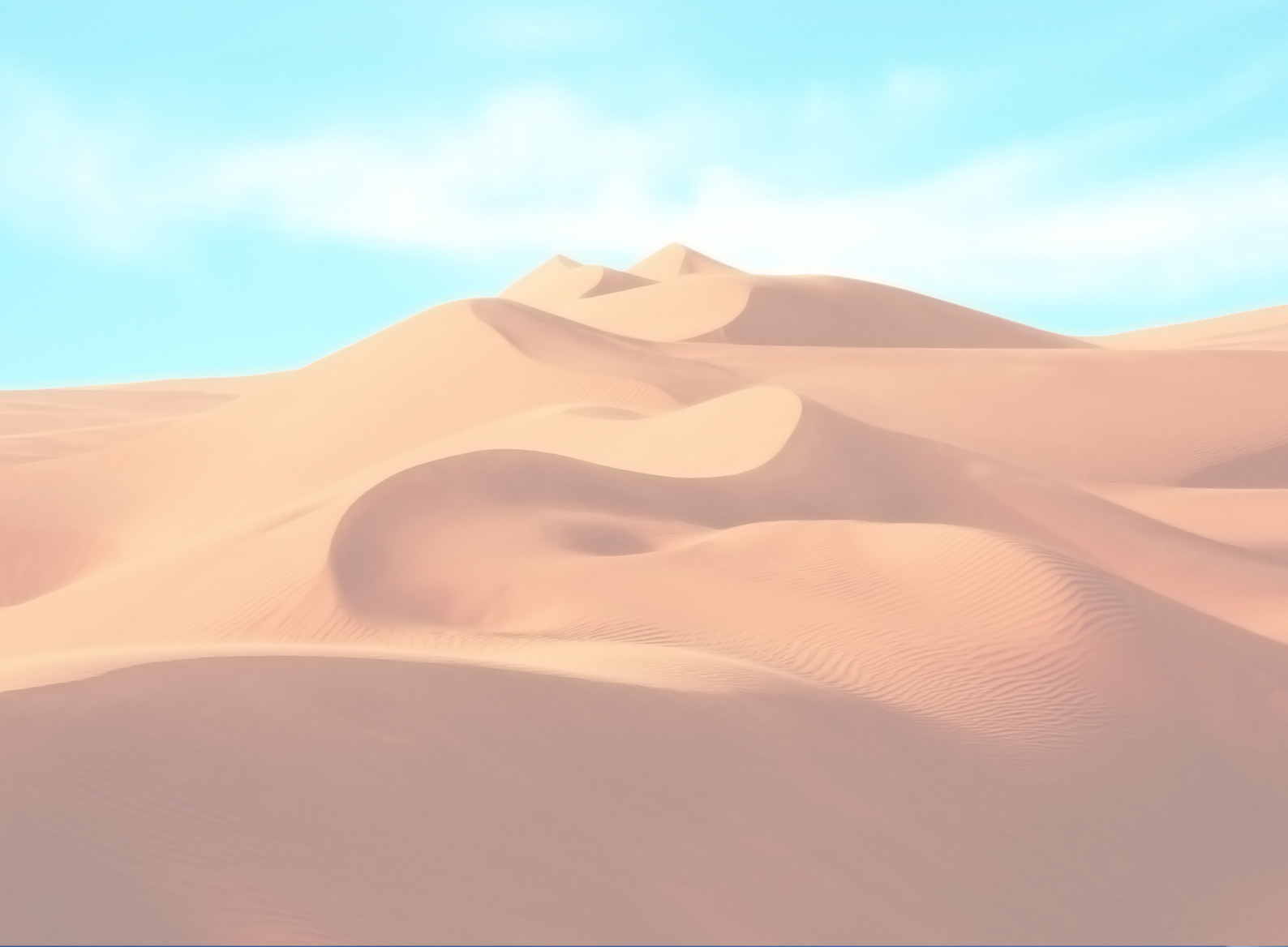


Figure 31: WaterTheater

Elements with theme “UnderWater World”. It could also be another theme, for example “desert.









# Process Tree

To get insights in what WaterTheater should do, which functions it should have and which requirements are necessary, a process tree is made (Roozenburg & Eekels, 1998). This method describes all the steps the user should do and the functions the toy should have to provide the possibility to do these functions

		Function
Buy	Parent buys toy at store	Package should fit in the store-shelf
	Child picks case	Possibility to pick up the case
Preparation	Child opens case	Possibility to open the case
	Child places case/storagebox on table or floor	Possibility to place toy on table or floor
	Child picks the waterbox out of the storagebox	Possibility to pick the waterbox out of the storagebox
	Child slides waterbox in the slot	Possibility to place waterbox in the storagebox
	Parent fills the waterbox with water till the line	Possibility to fill the waterbox with water
Play	Child picks a transparant scene	Possibility to pick out the scene
	Child places the transparant scene at the backside of the waterbox	Possibility to place scene behind waterbox
	Child picks the elements he wants	Possibility to pick out the elements
	Child fills elements with weight	Possibility to fill the elements with weight
	Child sees what elements do in water (float, sink, swim)	Possibility to see what elements do
	Child can create his own story with the elements using his imagination.	Possibility to play with the elements
	Child can manipulate the elements with a magnet	Possibility to manipulate elements with a magnet
Clean	Parent carries the toy to the sink	Possibility to cary the storagebox
	Parent walks to a sink to throw the water, without losing elements	Possibility to throw the water in the sink
	Parent cleans elements, waterbox and storagebox	Possibility to clean the elements, waterbox and storagebox
Store	After cleaning, the elements could be placed back in the storagebox	Possibility to store the elements in the storagebox
	Parent places waterbox in storagebox	Possibility to store the waterbox in the storagebox
	Parent closes storagebox	Possibility to close the waterbox

# List of Requirements

*This list describes all the necessary requirements the product should meet  
(Roozenburg & Eekels, 1995)*

## Use

- Toy will be used by toddlers between 3 and 5 years old.
- Toy may not have game rules.
- Toy should stimulate the child to play open-ended: the child has the freedom to decide how to play.
- Toy should give the child the possibility to play individual (solitary play).
- Toy should be portable.
- Child should have the possibility to control the elements with a magnet.
- Parent should have the possibility to empty the waterbox without losing elements in the sink.

## Functions

- Toy should give the child the possibility to play with weight: heavy and light objects
- Toy should stimulate critical thinking.

## Technology

- Toy may not tilt at an angle of 15 degrees (for stability)
- Toy should be mass-producible.
- Toy should be made of plastic to keep the cost price low.
- Elements should be fillable with weight, to make them float or sink.
- Toy should contain max three parts and a set of elements of a certain theme.
- Waterbox should be fillable with water.
- The maximum amount of water in the waterbox is 3 liters (=75 percent of the waterbox)
- The maximum width of the opening should be max 5 cm.
- The opening of the waterbox should not be smaller than a standard water tap ( 25 mm)
- Toy should have a drip tray to collect the leaked water and to place the wet elements in, during play.
- Toy should have a storage place for the elements.
- Toy should be compact (for storage) and portable (to carry easily)
- Toy should give the possibility to place a theme-scene behind the waterbox to create a certain atmosphere.



## **Form**

- Toy should be colorful
- Toy should be for both boys and girls.
- “Scenes” and “elements” define the atmosphere of the toy.
- Toy should pass day-light from the back.
- Toy should fit be max. 260 mm height.

## **Safety**

- The toy should meet the EN71 norm
- The toy should meet the CE-mark
- The toy and elements should be cleanable
- The toy should make it possible to renew the water, to avoid diseases.



*Use*

# Ergonomics

The end-users of the toy are toddlers between 3 and 5 years. To make the toy user-friendly it is important to be aware of relevant antropometrical values. To chose the dimensions of the parts, for example the size of the opening , these measurments are of great value.

## Dined

For the determination of the values, Dined (dined.io.tudelft.nl) has been used (figure 32). This database is a well-known, reliable tool from the Delft University of Technology that updates the data frequently.

For children, data from 1993 is most recent, so this data was used as reference for the project. Because the targetgroup consists of boys and girls between 3 and 5 years, only this category was taken into account.

There is chosen to take the P5 and P95 into account to include both extremes.

The armlength (20) is important for the maximum distance of the waterbox to play comfortable.

The hand thickness (48) is important for the size of the opening of the waterbox.

The other measurements are less imporants, but still important to be aware of.

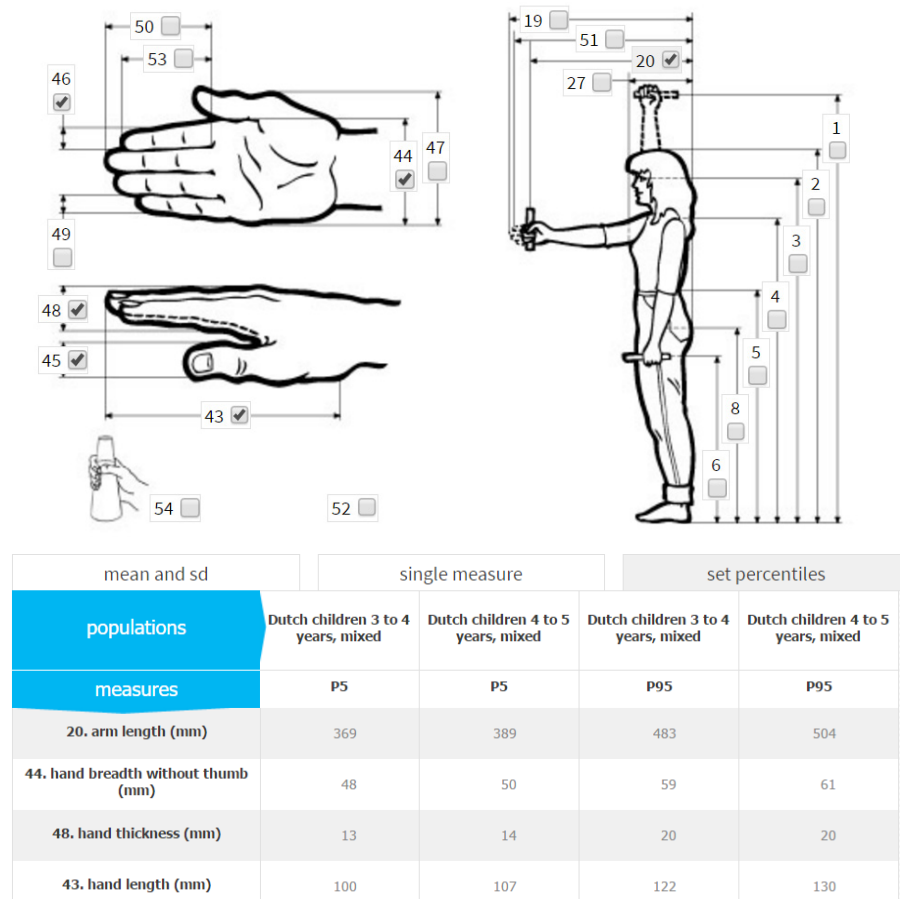


Figure 32: Ergonomics, Dined

# User-test “float/sink”

*To test if the toy will be used like assumed, user-tests with quick models were done.*

*Because kindergartens and schools did not want to participate in user-tests, due to privacy, it was only possible to do a user-test with a relative. My nephew Reda fits well in the targetgroup, because he is 4 years old now.*

## Goal:

To varify if the test-user understands what float and sink is and if he likes to play with the magnet.

## Materials



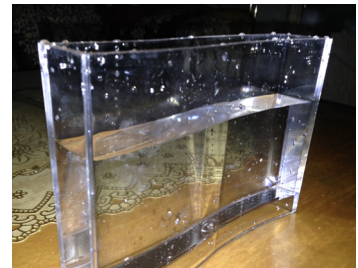
*A heavy diamant  
with a magnet*



*Magnet*

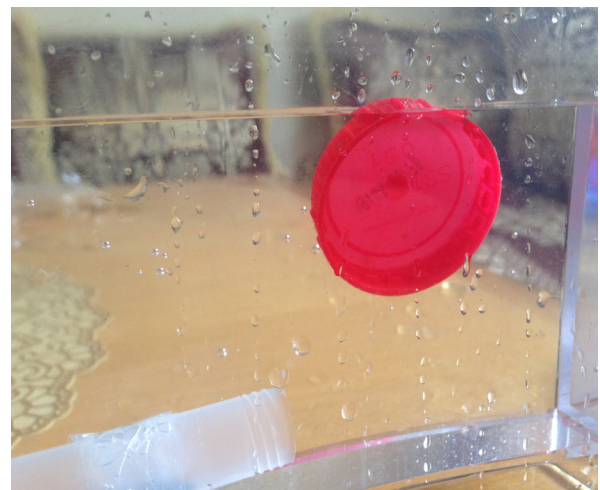
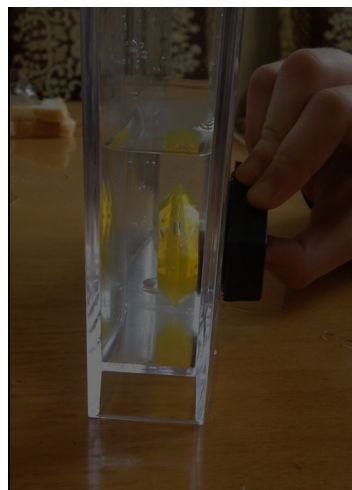
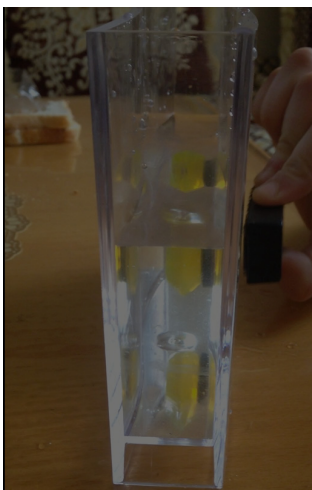
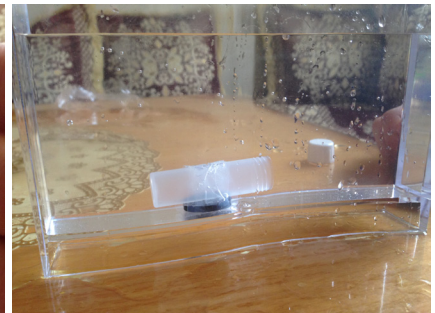
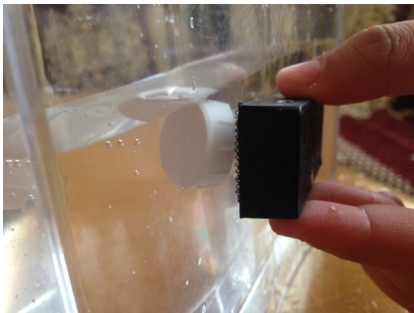


*Small tube could be  
filled, opened and closed*



*Small waterbox  
170x130x30 mm*

## Results



## Observations

- User places elements on table, even if they are wet. This creates a chaos on the table.
- User picks the elements out of the waterbox, during play.
- User opens and closes the tube. He mentions that the tube sinks when it is open, because it is filled with water and it floats when it is closed.
- During play water leaked on the table.

## Conclusions

- There should be a drip tray to collect the leaked water during play
- There should be a storagebox to collect the elements in when they are wet.
- The magnet is very fun for a child to play with. It looks like it is magic to control elements from outside the box.

# User-test “elements”

## Goal

To get insights in the right size of the elements and if a child can play with them. Because it is not possible to place wood in water, the test was only done to observe if the child can play with the elements and if the size is right.

## Materials

For the test, elements are made of wood (mdf).





## Results



## Observations

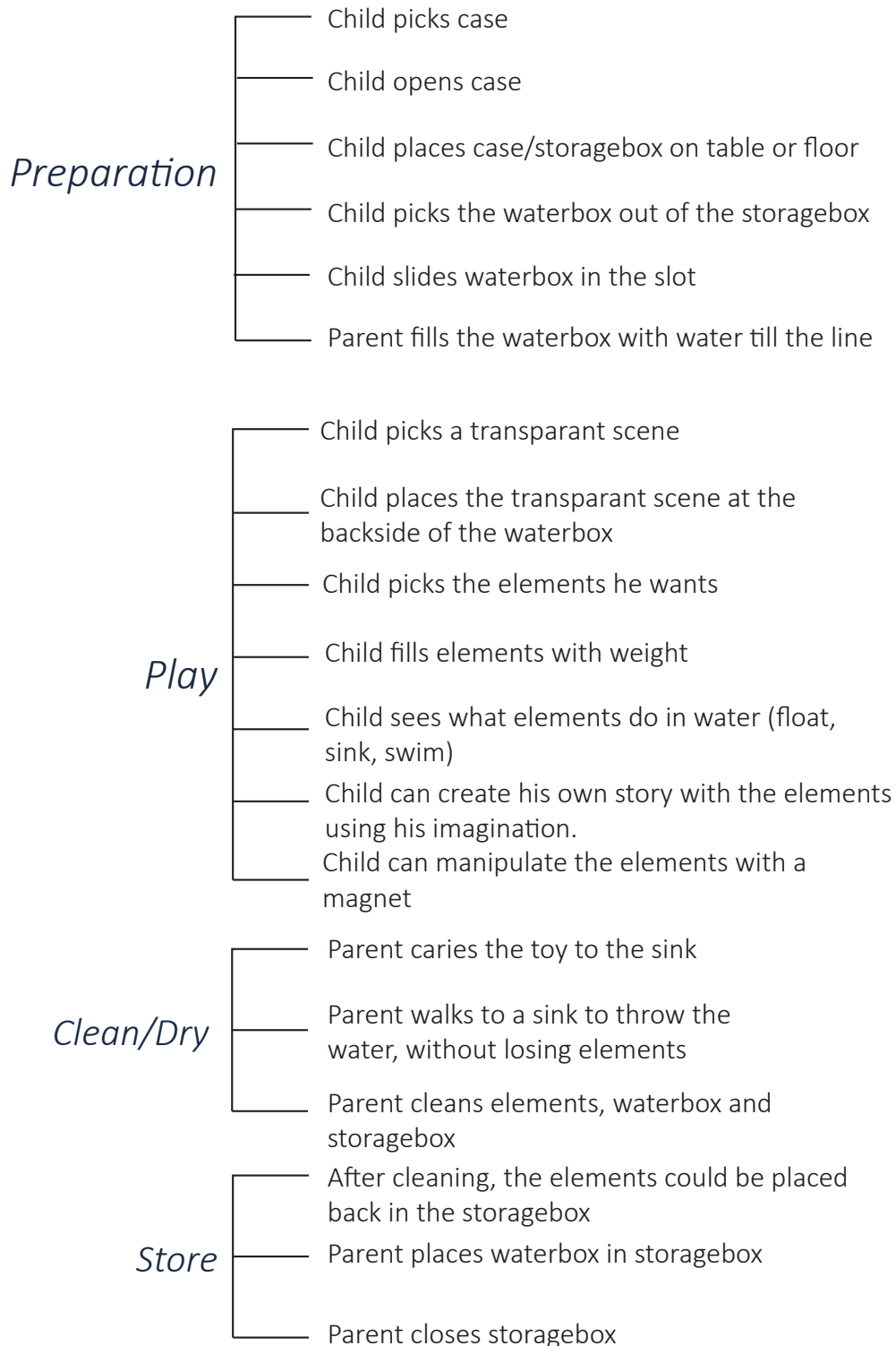
- My niece really liked to play with the elements. Unfortunately it was not possible to play with them in water, but she named all the objects and she liked the fish a lot. Singing a dutch song “visje visje in het water”.
- She placed smaller objects in bigger objects, even if it was in real-life not a match, for example a fish in a boat.

## Conclusion

- The opening is too big. In the test model this is 35 mm. This could be reduced to a smaller size to make the elements thinner and thus the waterbox also thinner.
- The width and height of the boat and house are too big. This could be smaller. (at the picture they are 110x80 mm.
- The coins and other objects have the right size.
- Niece understood that she can fill and empty objects with smaller objects.

# User-scenario

*This scheme gives an overview of all the steps a user has to take. At the next pages, each sub-phase will be elaborated.*



# *(Game)Play*

*The way the child plays with WaterTheater is the most important aspect of the toy. Therefore it is important to have a fun gameplay.*

Figure 32 gives an overall overview of the gameplay. The child can play on two ways:

1. With empty elements of a certain theme and a magnet
2. Playing by filling the elements with weight.

The child has also access to a magnet. With this magnet the child can control some elements. There is chosen to make some elements magnetic, to avoid that a child will get frustrated when the elements will all be attracted by the magnet. The child should use the magnetic element to interact with the non-magnetic elements.

Moreover, with this magnet the child can lift the elements from the waterbox when he wants to erase an action. This will avoid that the child will try to put his hand in the waterbox.

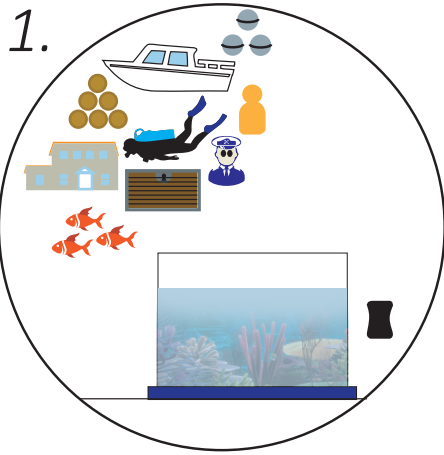
## *Possible gameplays*

There are more ways for a child to play. Figure 33 gives an overview of possible actions during play. Each step has an A, B and C. This does not mean that, for example, step 4A is automatically followed by 5A. Each step could be followed by another step, randomly. This figure is just an overview of possible scenarios.

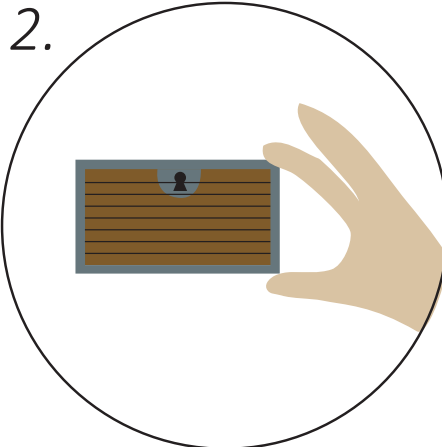
Important aspect of this toy is that there is nothing wrong. If the child wants to use the toy differently, he is free to do that.

A child should have fun when playing. It does not matter HOW he plays.

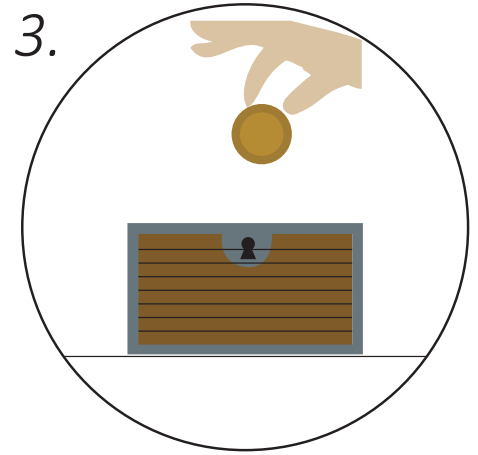




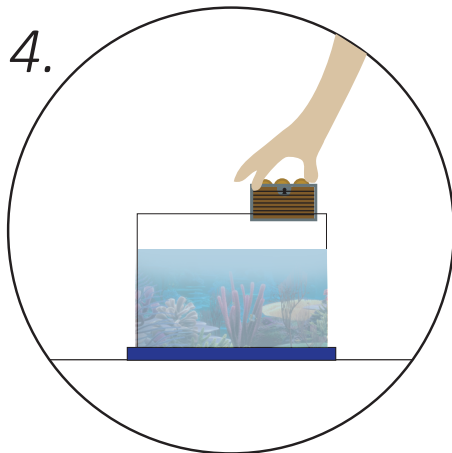
Child has access to theme-elements, a magnet, a scene and a waterbox



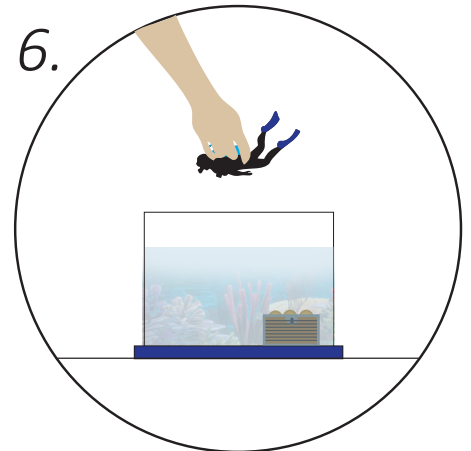
Child choses element he likes



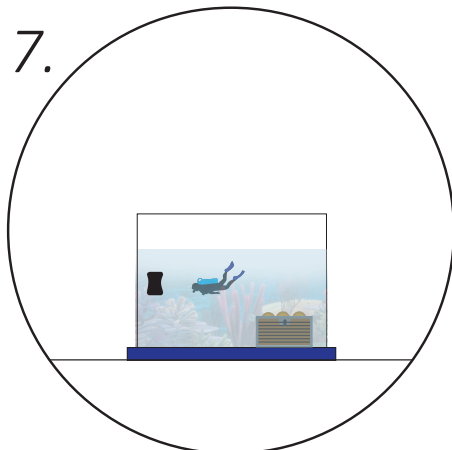
Story starts outside the waterbox. Child fills chosen element with weight



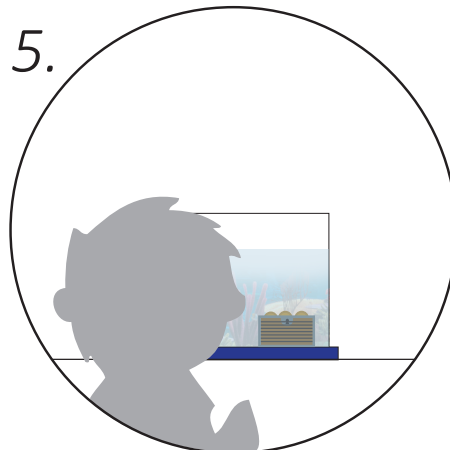
Child moves filled element to the waterbox



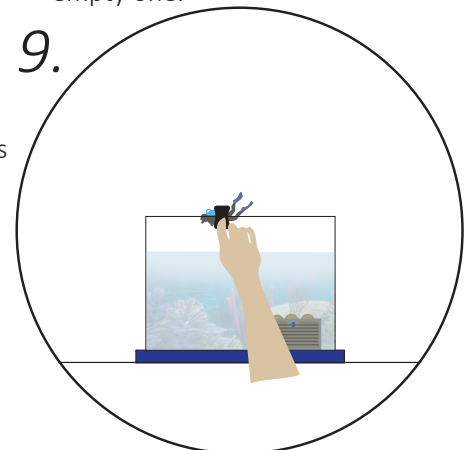
Child places another element in the waterbox. This time it is an empty one.



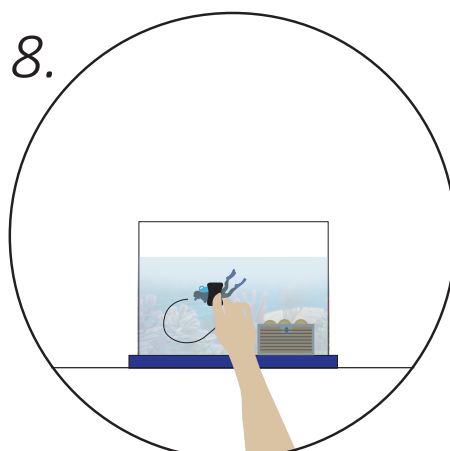
Child places magnet at the waterbox



Child sees what the filled element does in water (float, sink or swim)



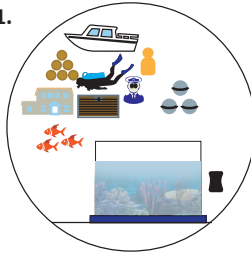
Child can use the magnet to pick out the elements from the waterbox



Child can control/move the elements with a magnet (from outside the waterbox)

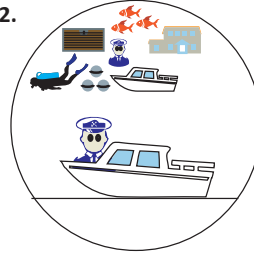
Figure 32: Gameplay

1.



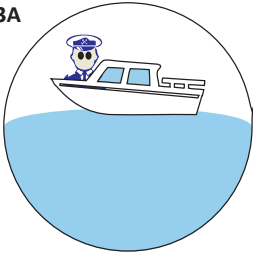
Child has **access** to **theme-elements**, a **magnet**, a **scene** and a **waterbox**

2.



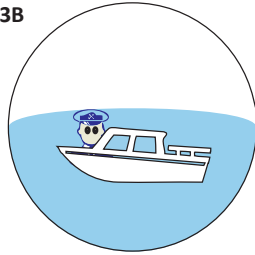
Child **fills** an **element** with **weight** and **uses magnet**

3A



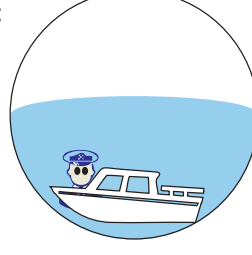
If the **element** is **still light**, it **floats**

3B



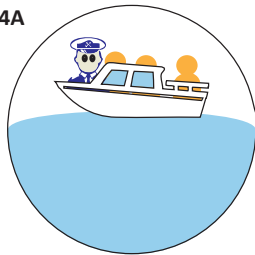
If the **element** has the **same weight** as **water**, it **swims**

3C



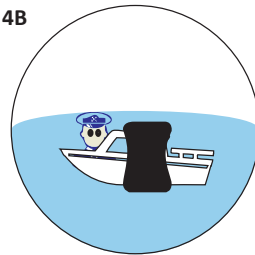
If the **element** is **heavier** than **water**, it **sinks**

4A



Child **fills** the **element** with **more weight**

4B



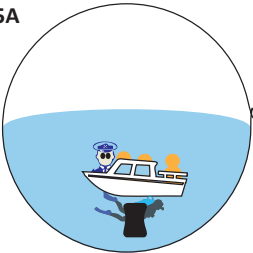
Child **moves** **element** with **magnet**

4C



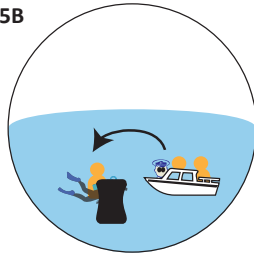
Child **throws** another **element** in **water**

5A



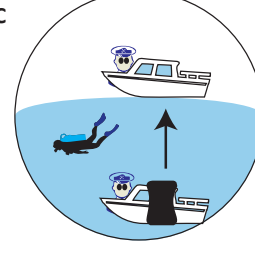
Child **uses** another **element** to **push up** the **sunken element**

5B



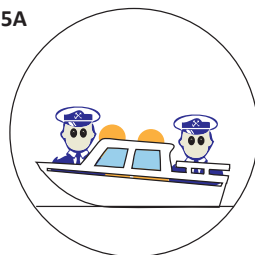
Child **moves** **weight** of the **first element** to the **second element**

5C



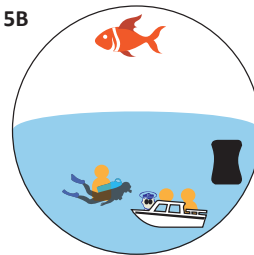
Child **uses magnet** to **take out** the **sunken element**.

5A



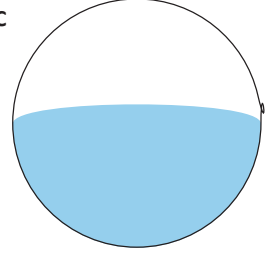
Child **fills** the **element** with **more weight** (*outside the waterbox*)

5B



Story **continues** with **new elements**

5C



Story **ends**

Figure 33: Possible gameplays

# Prepare, Clean, Store

*Next to the gameplay, the preparation, cleaning and storage of the WaterTheater are also aspects a user has to deal with. Therefore it is necessary to make this process as efficient as possible.*

## **Preparation**

The preparation is the phase that the child holds the toy for the first time until the moment that he can start with playing. During this phase, the child opens the case, pick-outs the waterbox, fills it with water and slides it into the slot (figure 34).

## **Cleaning/Drying**

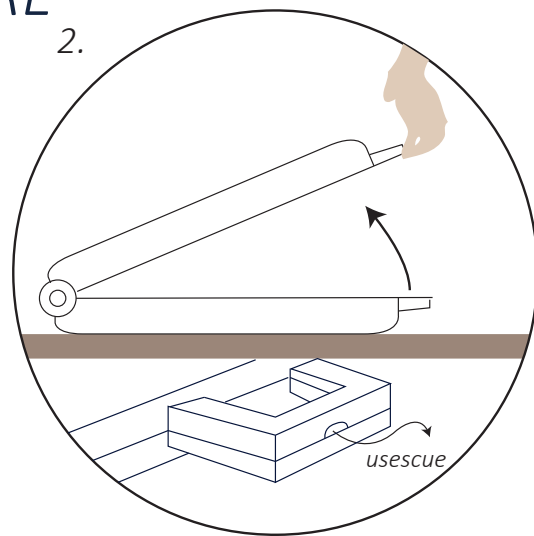
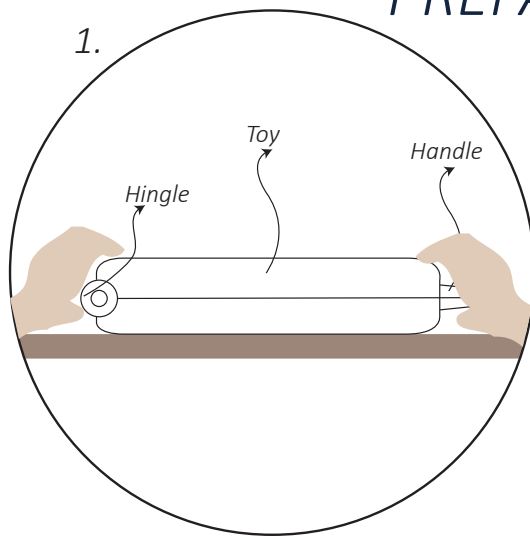
For safety purposes, it is important that the elements and waterbox are well-cleanable and dryable. The product will contain water and ditch-water that remains in the waterbox can contain legionella-bacterium. This bacterium can cause diseases, if a child drinks this water. (figure 35)

## **Storage**

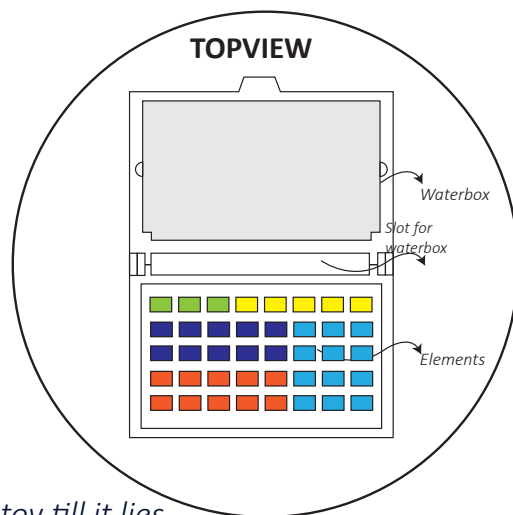
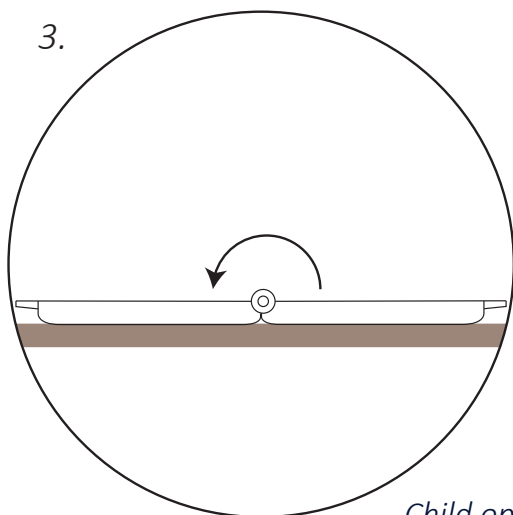
This phase starts when the elements, waterbox and storagebox are dried. In this phase the user puts all the parts back in the case and ends the playtime.

The schematical figures 34 and 35 give an overview of the intended preparation, cleaning and storage steps. In this overview the play-phase is neglected. This is mentioned in the chapter “Gameplay” and “Possible gameplays”

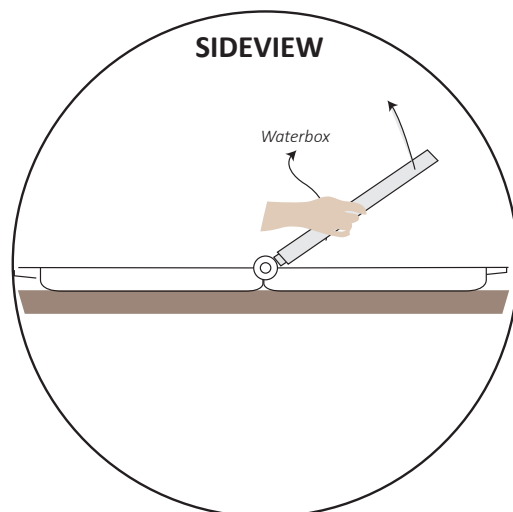
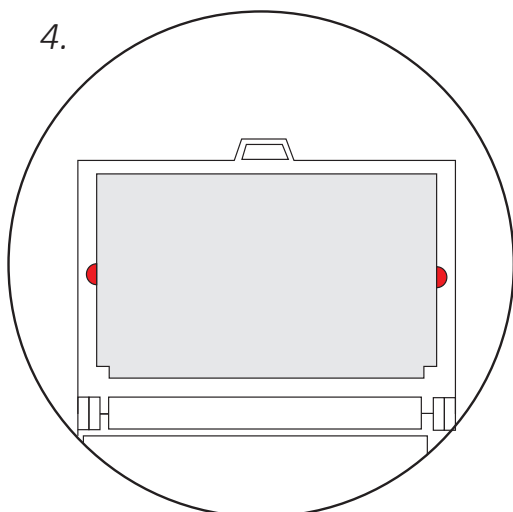
## PREPARE



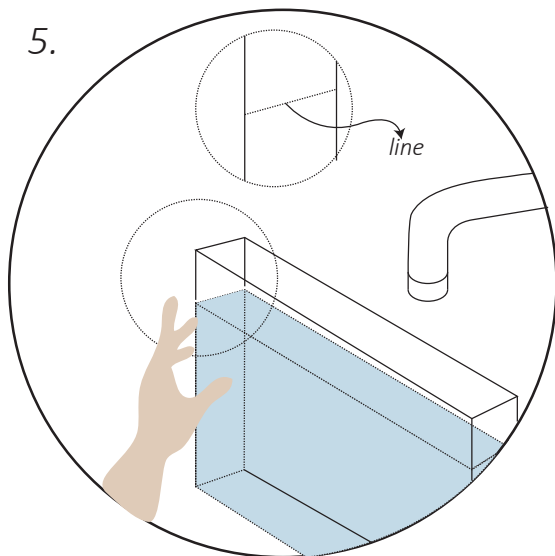
*Child places WaterTheater at the table    Child opens toy at the handle*



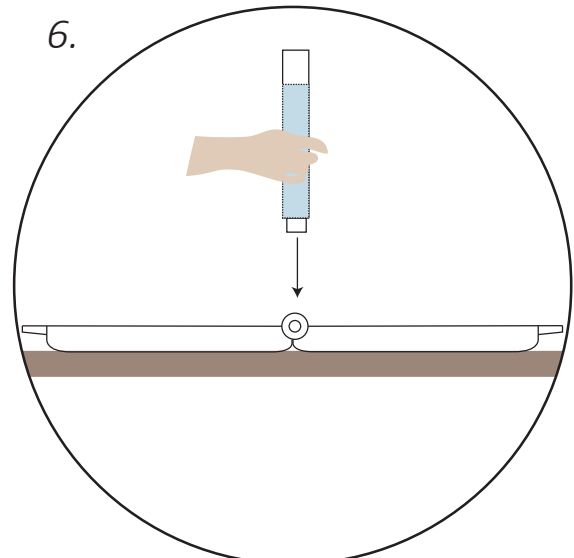
*Child opens toy till it lies flat on the table*



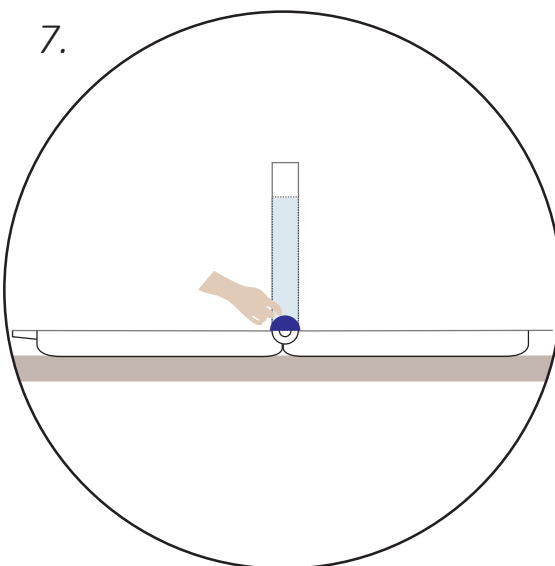
*Child picks out the waterbox using the notches (red marked)*



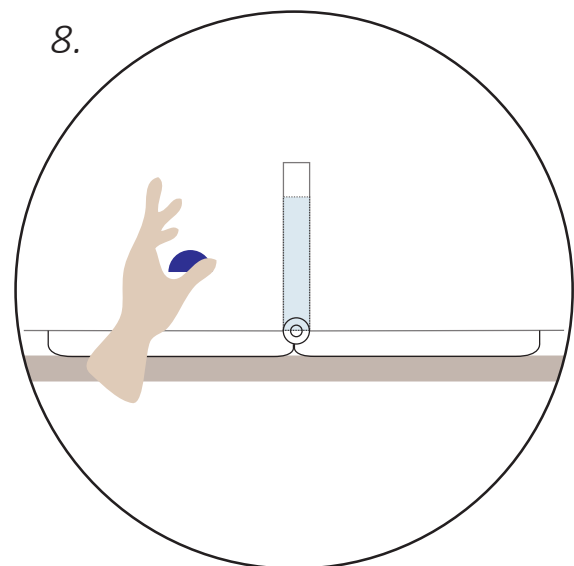
*Parent fills waterbox under the watertap till the line*



*Parent slides waterbox into the slot*



*Parent puts the brake-hull in the hinges to prevent rotation during play*



*Parent takes out the brake-hull.*

Figure 34: Preparation

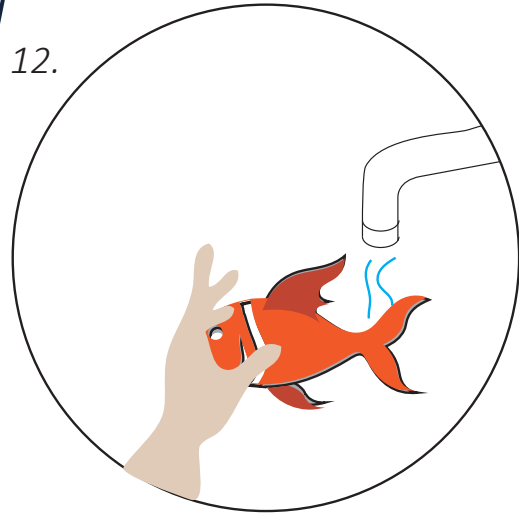
## CLEAN

11.



*Waterbox could be cleaned with magnetic sponge and magnet*

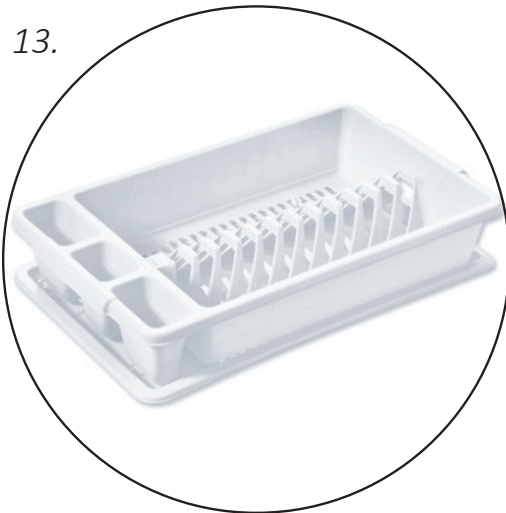
12.



*Elements could be cleaned under the watertap*

## DRY

13.



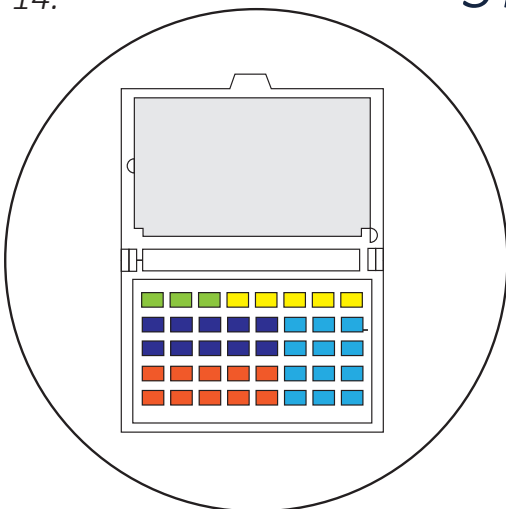
*Elements and waterbox could be dried in a drainer*



*Or with a dish-towel*

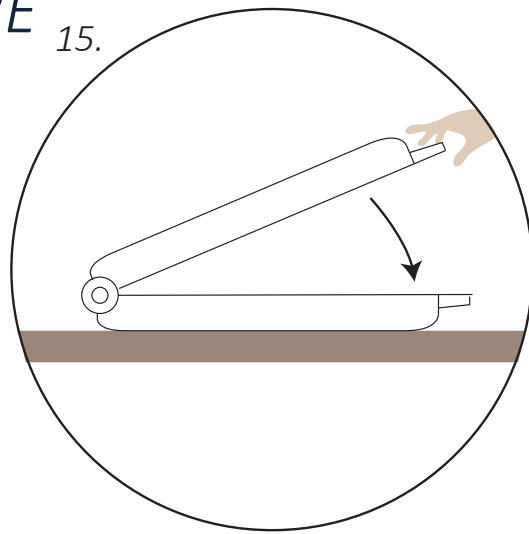
## STORE

14.



*After drying, elements and waterbox are placed in the storagebox*

15.



*Storagebox can be closed again.*



*Technology*

# Materials

To decide which materials are suitable for WaterTheater several plastics has been evaluated based on pre-determined criteria. These criteria are based on the list of requirements.

There is chosen to use plastic, because ID-8 is a company that is specialised in plastic toy design. Also, for mass-production plastic is the ideal material to keep the cost price low. Using one material makes the production of the parts more efficient.

## Storagebox & Elements

Figure 36 below shows the comparison of the most used plastics for toys. Each material was marked with a green, orange or red dot, based on how far it meets the requirement: green is positive, red is negative, orange is in-between. The material that meets all the criteria as best, has been chosen.

The storagebox and elements should be water resistant, strong and stiff enough, cheap, should not contain plasticisers and be cleanable. The most suitable material for the base and elements, based on the criteria, is **ABS**. For the backside of some elements transparent ABS will be used to make it possible to look inside the element.



ABS is a material that is already used for several toys, for example building blocks.

	PP	ABS	PVC	PS	PE	
Waterproof	●	●	●	●	●	Does it absorb water?
Cleanable	●	●	●	●	●	How cleanable is it?
Density +/- water	0,94 g/cm <sup>3</sup>	1,05 g/cm <sup>3</sup>	1,30 g/cm <sup>3</sup>	1,05 g/cm <sup>3</sup>	1,05 g/cm <sup>3</sup>	Similar density as water
Print possible	●	●	●	●	●	Is a print possible?
Strong/Stiff	●	●	●	●	●	Is the material strong and stiff ?
Plasticisers	●	●	●	●	●	No plasticisers allowed
Price	0,61 euro/kg	0,72 euro/kg	0,47 euro/kg	0,61 euro/kg	0,61 euro/kg	How much does 1 kg cost?

Figure 36: Material selection



## Dishwasher-proof

ABS products could be placed in the dishwasher, but PMMA products are not dishwasher-proof. Still, it is recommended to wash the products with hands, because the print could disappear because of the dishwasher

<i>Material</i>	<i>Dishwasher proof</i>	<i>Microwave - proof</i>	<i>Freezer-proof</i>	<i>Maximal use temperature</i>
<i>ABS</i>	<i>yes</i>	<i>no</i>	<i>no</i>	<i>+80 °C</i>
<i>PMMA</i>	<i>no</i>	<i>no</i>	<i>no</i>	<i>+70 °C</i>

## Waterbox

The material choice for the waterbox is based on other criteria than the storagbox and elements. The waterbox should be transparant, so only the clear plastics are included in this material choice. The waterbox should be shockproof to avoid fracture, it should resist scratch as good as possible and it should not become yellow when exposed to daylight.

Figure 37 shows that **PMMA** is the most suitable plastic for the waterbox. The main-advantage of PMMA above PC is the restoreeness of the clarity and the light resistance.

	<i>PC</i>	<i>PMMA</i>	
<i>Shock proof</i>	●	●	<i>How shock proof is it?</i>
<i>Scratch proof</i>	●	●	<i>How scratch proof is it?</i>
<i>Light resistance</i>	●	●	<i>Does it resist light?</i>
<i>Strong &amp; Stiff</i>	●	●	<i>How strong and stiff is it?</i>
<i>Restore clarity</i>	●	●	<i>How possible is it to restore the clarity?</i>
<i>Price</i>	<i>0,89 euro/kg</i>	<i>0,65 euro/kg</i>	<i>What does 1 kg cost?</i>

Figure 37: Material selection Waterbox

## Transparent Scene

For the scene there is chosen to use a static sticker.

This type of sticker can be placed behind the waterbox without the use of extra connection parts. Because the scene should be used different times, the sticker should be re-usable.

Also, it was necessary to have a transparent sticker, so that the backlight will go through the sticker. For an overview of the other options.



## Material of each part

Figure 38 gives an overview of the chosen materials for each (sub)part of WaterTheater with the theme “UnderWater World” . Note that this theme is only for this case. It could be another theme. ABS stays the material.

<i>Main parts</i>		
	<i>Waterbox</i>	<i>PMMA</i>
	<i>Storage box</i>	<i>ABS</i>
	<i>Magnet</i>	<i>Magnet</i>
	<i>Scene</i>	<i>Static Sticker</i>
<i>Elements</i>		
<i>Fillable elements</i>	<i>Boat</i>	<i>ABS + transparant ABS</i>
	<i>Sub-marine</i>	<i>ABS + transparant ABS</i>
	<i>Diver</i>	<i>ABS + transparant ABS</i>
	<i>House</i>	<i>ABS</i>
	<i>Treasure</i>	<i>ABS</i>
<i>Non-fillable elements</i>	<i>Fish</i>	<i>ABS</i>
	<i>Dolphin</i>	<i>ABS</i>
<i>Weight</i>	<i>Captain</i>	<i>ABS</i>
	<i>Passengers</i>	<i>ABS</i>
	<i>Marbles</i>	<i>ABS</i>
	<i>Coins</i>	<i>ABS</i>

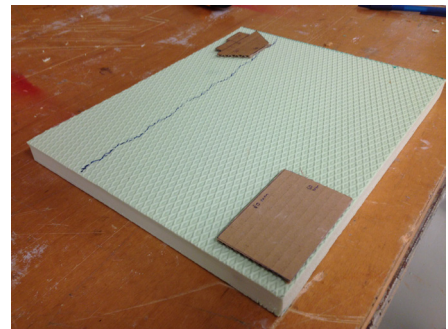
Figure 38: Material for each part

# Dimensions

*Each part has an impact on the play experience and user-friendliness of WaterTheater. Therefore it is important to know which dimensions each part should have. The dimensions are based on user-tests and literature research.*

## Waterbox

The waterbox is the most important part of the WaterTheater. The waterbox is the playfield for the child: in this part the elements are being placed, it is literally the center of the toy and the surface where the magnet is placed on to control the elements.



### Play Surface

To make playing with the toy comfortable, it was necessary to test which screen-size fits best to the child. Therefore foam boards are used to test which size children prefer. Again, this test is done with my nephew Reda and niece Zayneb.

The three screens were based on Ipad-sizes (12,9 inch, 9,7 and 7,9 inch) , because these screens are also used to interact with touch.

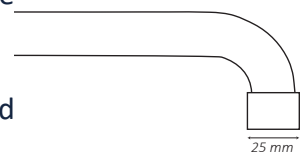
- screen 1: 300 mm x 250 mm
- screen 2: 240 mm x 170 mm
- screen 3: 200 mm x 130 mm

Both my niece and nephew liked 300 x 250 mm. The reason for this could be the space that they have to play at. This size is comparable with an A4 paper. Ofcourse my niece and nephew do not represent the targetgroup, but I think it is assumable that the bigger the screen, the better the experience is. However, because of the limited height that is possible (260 mm), it could be possible that the final size will be smaller due to the dimensions of the toy

## Opening

The width of the waterbox is based on several aspects:

- Maximum allowed volume of water in the waterbox per playtime (3 liters)
- The thickness of a child's hand.
- Because children can only manipulate the objects horizontally and vertically, the depth is not really needed.
- The depth is only needed to make it possible to fill elements with weight. 2D objects could not be filled.
- The bigger the opening becomes, the higher the storagebox becomes. This makes playing with the toy less comfortable.
- The standard size of a tap hole (25 mm): This makes it possible to fill the waterbox.



## Storagebox

The storagebox is during play the drip tray and place where the child can put the elements in. To make the play comfortable, the height of this storagebox should not be too high.

### Height

The height is based on:

- Half of the waterbox width: the bigger this becomes, the higher the storagebox. Because the storagebox is divided into two parts, each part will cover a half waterbox.
- The width of the elements: together with the waterbox they should fit in the storagebox
- Wall thickness of the storagebox.

### Length x width

The length and the width of the storage are based on the size of the waterbox. The waterbox should fit in the storagebox.

Also, the reach distance of the child should be comfortable to avoid injuries. Therefore the armlength of the child (P5= 369 mm) influenced the size of storagebox.



To test if the height is acceptable, a quick dirty mock-up was made.

## Elements

The elements are the “tools” during play. For the determination of the size of the elements there were two options:

1. Each element has the same size, even if it is not realistic, for example a boat has the same size as a fish.
2. The elements represent real-life objects in the right proportion, for example a boat is much times bigger than a fish.

There is chosen to go for option 2, because children will then see the relation between objects. Another reason is the fact that children should fill objects with weight. Therefore objects should differ in size to make it possible to fill objects.

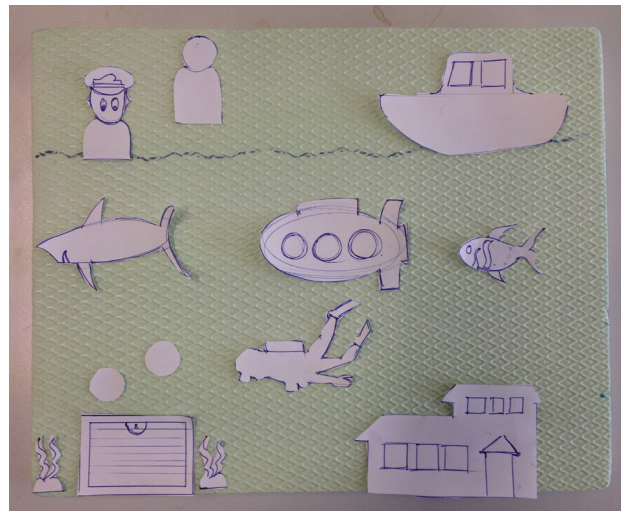
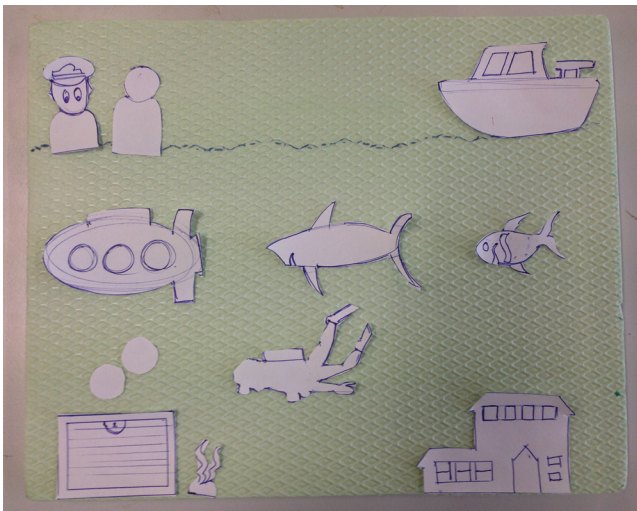
For the sizes, it was not necessary to take the choking hazard into account, because it is only applicable for children under 3 years. The targetgroup I am designing for is 3-5 years. On the package the warning sign should be placed.

An important limitation for the size of the elements is the opening of the waterbox. The smaller the opening is, the smaller the elements become.





The size is based on tests with paper-models. The shapes were cut in different sizes and placed on the screen. Elements and proportions were compared to create the right size. The elements have a minimum size of 20 mm to avoid losing them in, for example, a sink while cleaning.



To check if the elements are also in the right proportion when they are in 3D, the elements were lasercutted:



## Weight

A part of the elements is the weight. With this weight, bigger objects can sink. Therefore it was necessary to calculate how much weight there is needed to make a object sink and how much parts of this weight should be included in the toy. For the calculation a mathematical model is used. The mathematical model is placed in Excel, so the weight could be calculated (Appendix H).

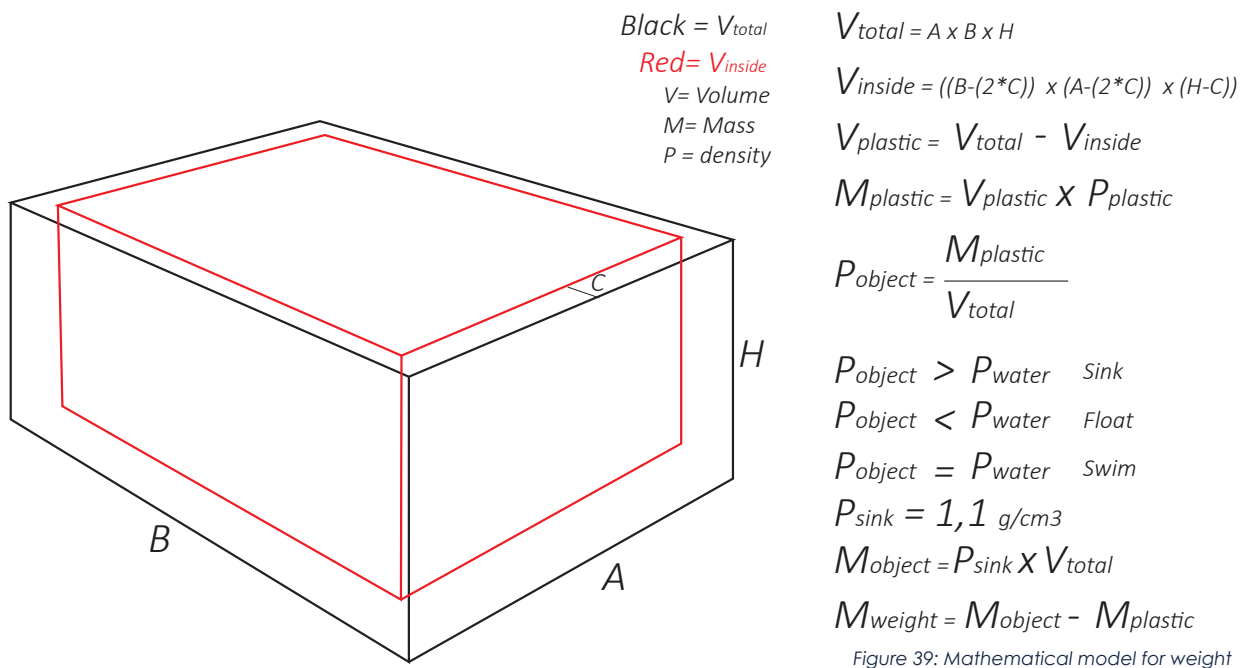


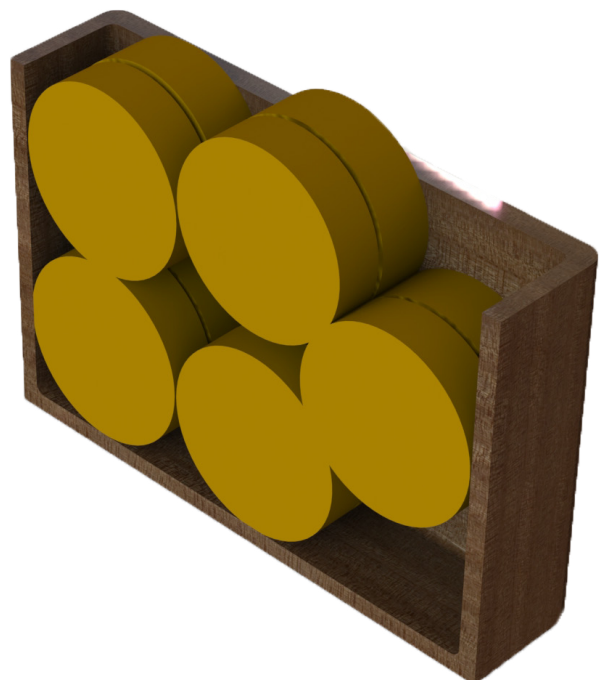
Figure 39: Mathematical model for weight

## Example

Via calculations there is counted how much parts are needed to make each element float or sink.

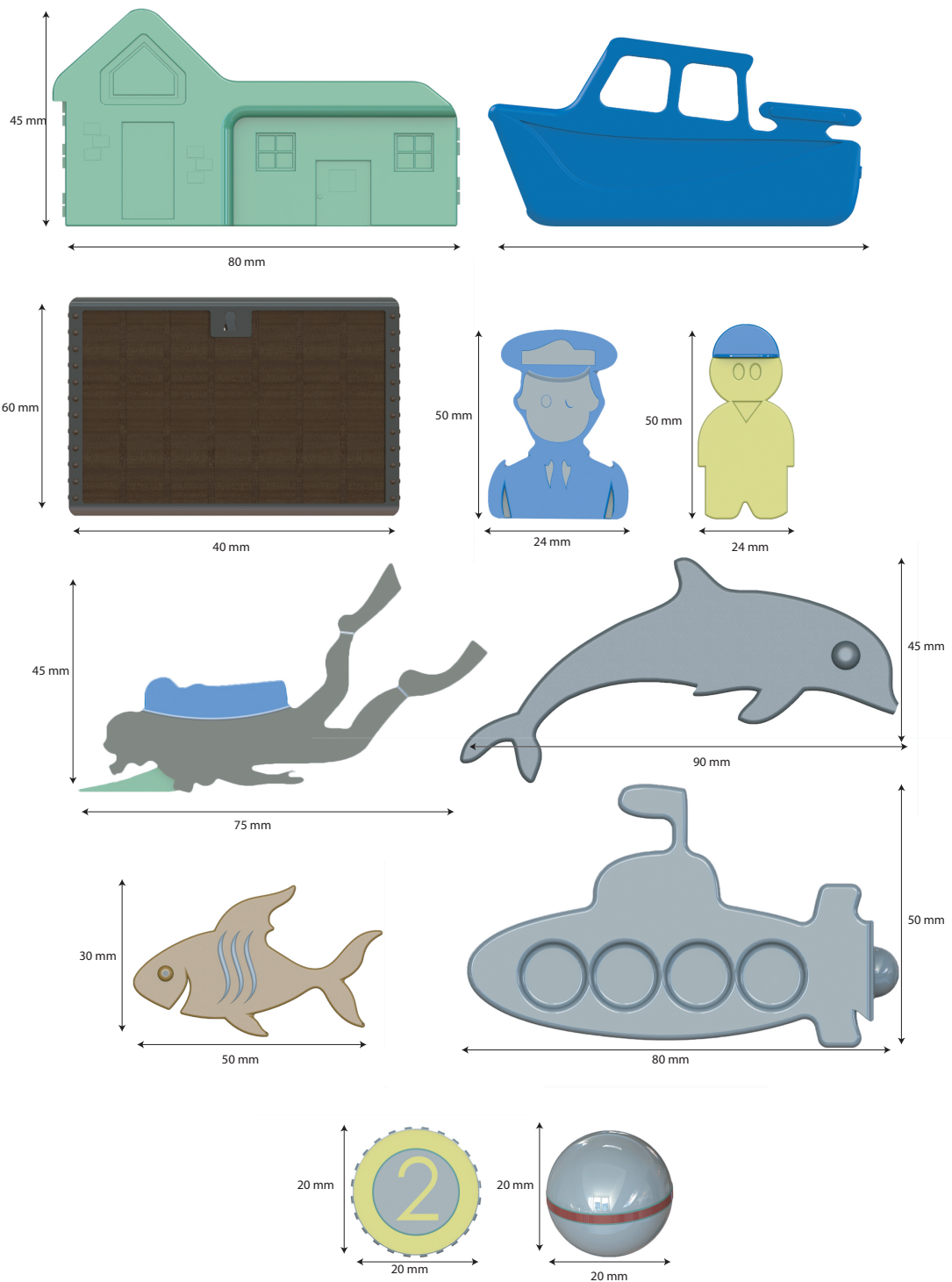
The figure gives the section view of a filled treasure. This section view is made to check if the calculations are correct.

There is chosen to make the coins small to create a realistic image of the proportions.

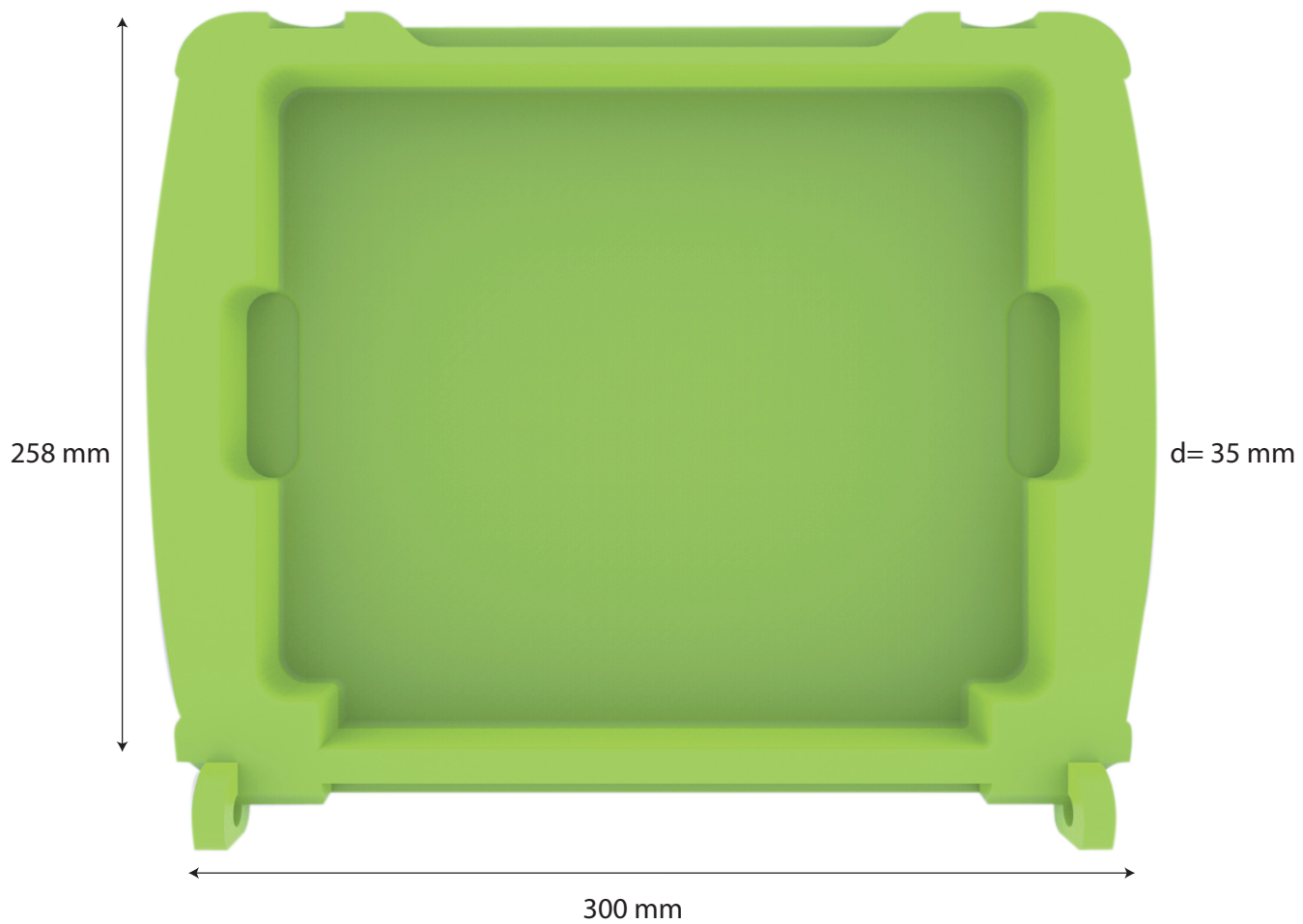
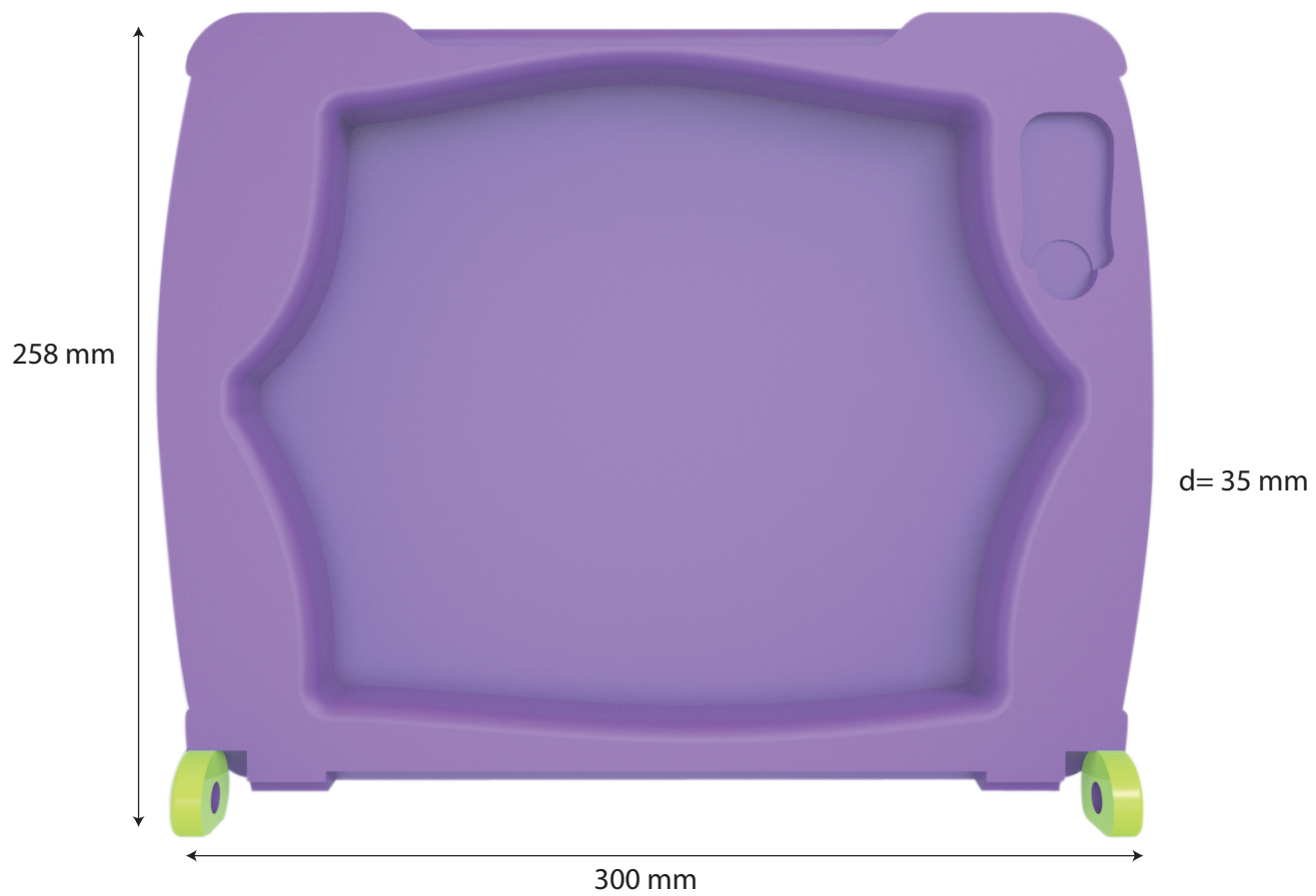


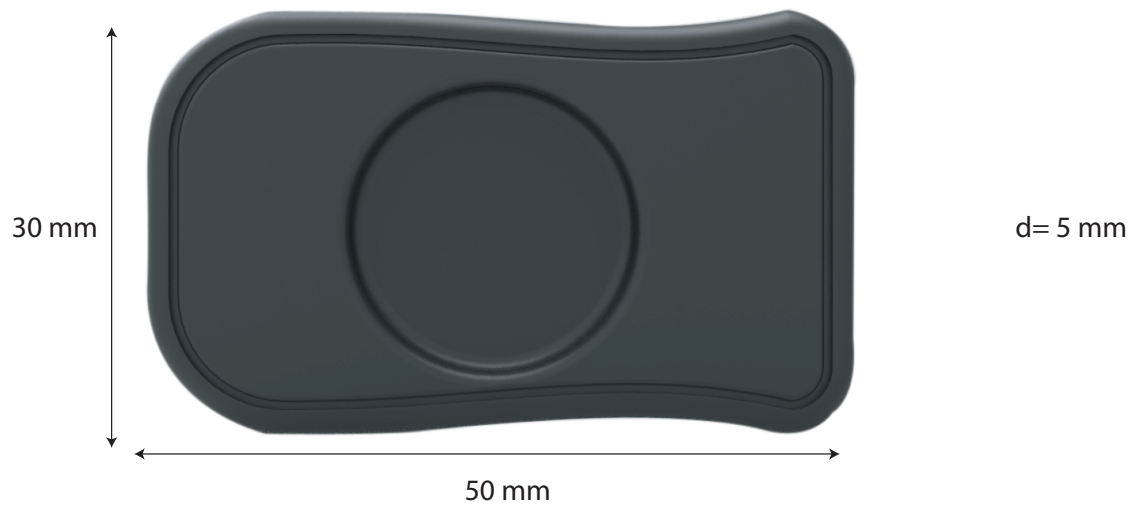
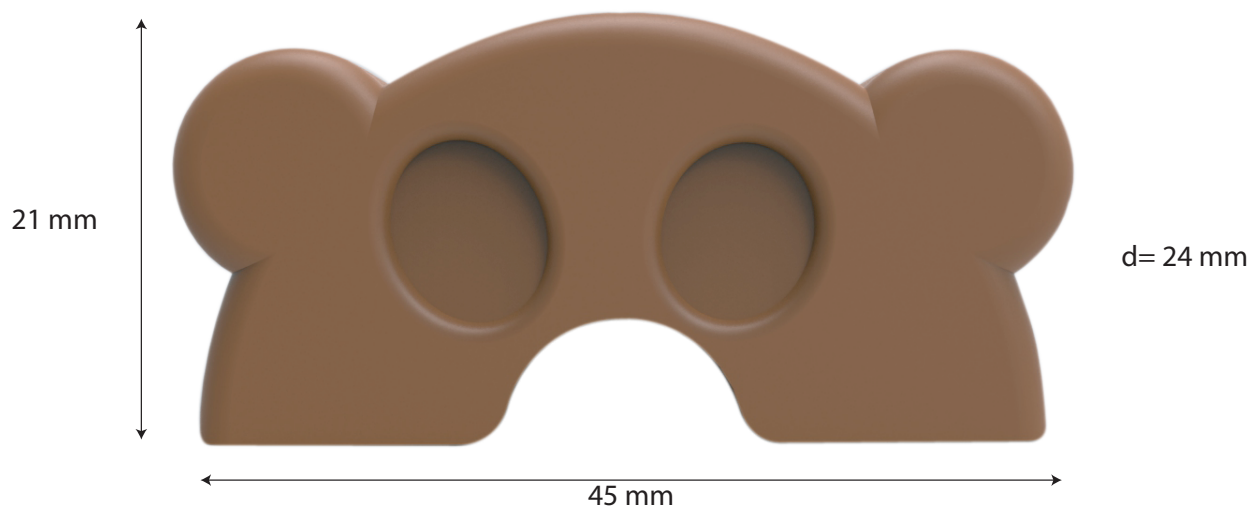
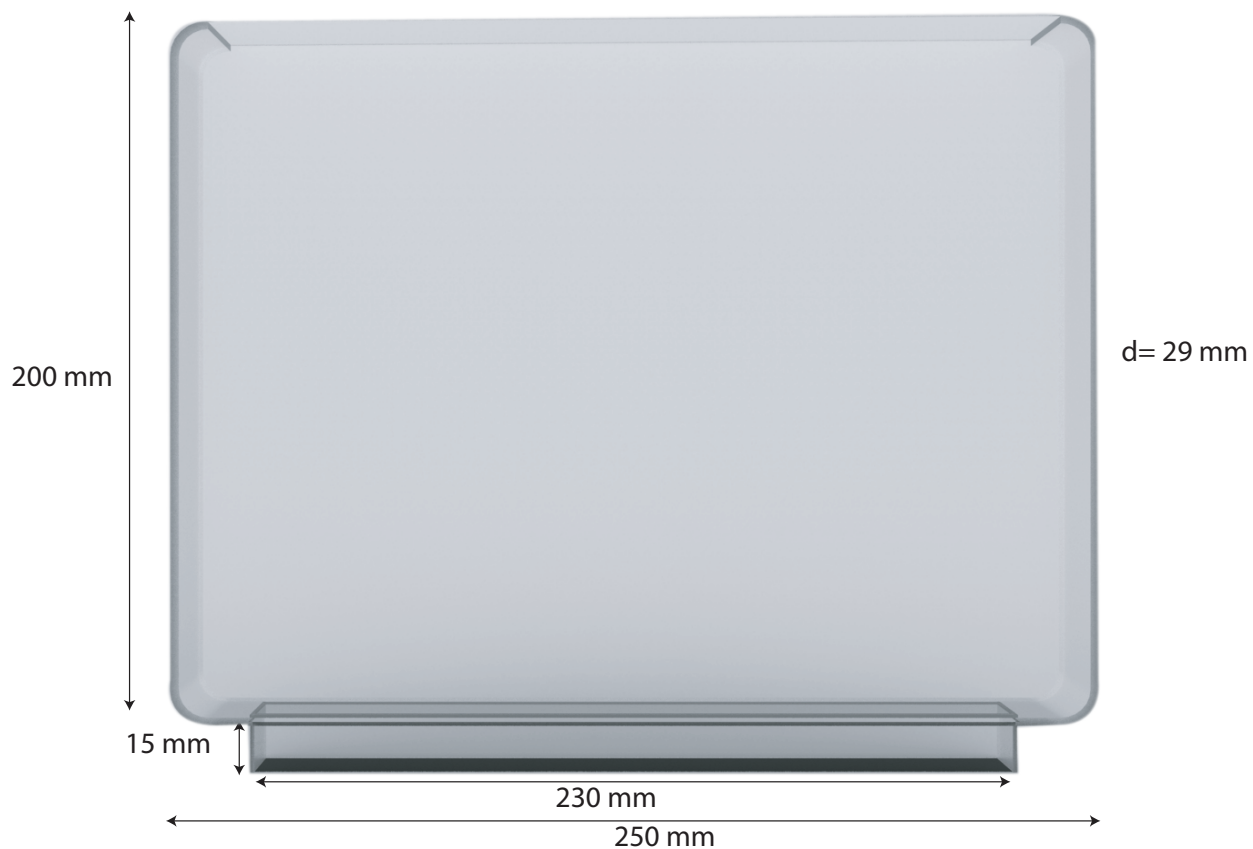
## Main Dimensions

The next pages will show the main-dimensions of the parts. For technical drawings see appendix G









# Production

The chapter “Materials” has shown that the chosen materials for WaterTheater are ABS and PMMA. The production process that fits best to plastics are “Injection Moulding” and “Thermoforming”.

WaterTheater will be produced with Injection moulding because:

- Injection moulding is much cheaper for bigger series
- The quality of injection moulded products is better than thermoformed products
- ID-8 is specialised in injection moulding

## Waterbox

For the production of the waterbox there were two possible options:

1. Producing the waterbox as one part
2. Dividing the waterbox in two parts

### Option 1

A positive aspect of production out of one part is that the waterbox will then be automatically waterproof.

Figure 40 shows what a negative effect of option 1 is: due to the draft angle of the mold-core, the inside of the waterbox becomes smaller at the bottom ( $d_2$ ). This means that the elements could be trapped during play.

Another negative effect of choosing option 1, is the high investment: the deeper the mold, the more expensive it becomes.

### Option 2

A positive aspect of two parts is the fact that there is no trapped form. This will not create problems during play. Another positive effect is the thin mold: this makes the production much cheaper.

A negative effect is that the waterbox should be made waterproof. This could be done with *ultrasonic welding*. This technique melts materials together using sounds.

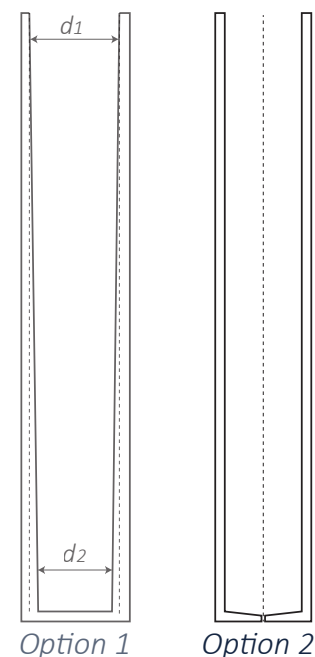


Figure 40: Section view Waterbox

## Choice

There is chosen to go for **Option 2**, because the play experience should not be limited due to the production and the production costs should be as low as possible.

## Storagebox

The figure 50 gives a schematical overview of the producing parts. The storagebox will also be made with injection moulding. After production, both parts will be assembled together to make them rotate.

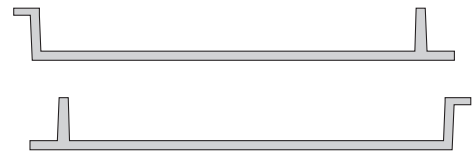


Figure 41: Section view Storagebox parts

The negative form for the waterbox and elements will be made separately and assembled within the storagebox.

## Transparent Scene

Illustrations of interesting themes will be printed on transparant (static) stickers.

## Elements

The elements will also be produced with injection moulding. However, each element needs a different way of production, because each element has other characteristics during play. There will be three types of parts. In figure 41 the Underwater World" theme is taken as example:

### 1:

These elements will be made of two shell parts. The backside is made of transparant ABS, so that the user can see the content. Both parts will be connected with ultrasonic welding. These elements are open from above, so that a child can fill them with weight. The treasure will also have holes at the backside, so that this element will always sink.

### 2:

These elements will be made of two shell parts. Because these parts will not be filled with weight they will be closed via ultrasonic welding.

### 3:

These elements will be used to fill the bigger objects with, so that they will swim or sink. These elements are small, but not hollow.

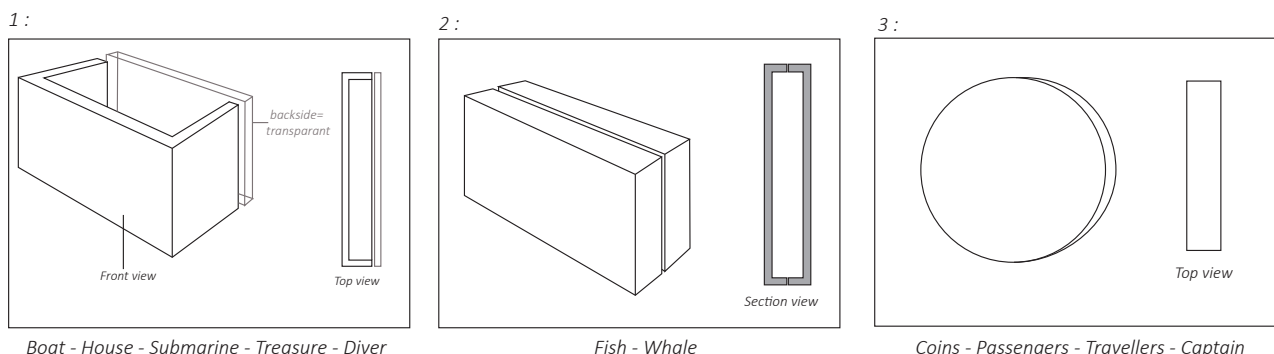


Figure 42: Production types of element

## Magnetic

Some elements will be magnetic. This will not be done during the injection molding process, but after the production of the elements. This is much cheaper. A metal plate will be encapsulated between plastics and then connected to the element in the inside.

## Rotation

To make the two storagebox-parts rotate, they should be connected with a hinge. Because the waterbox will be placed in the middle of the toy, it was not possible to place the hinges in the middle, which is normally done with toys. The hinges are placed at the extremes

There is also chosen to make them flat at the bottom side, because this makes it possible to place the WaterTheater upright. For the connection of the two parts a metal hinge will be used. This is done, because this is used a lot in toys.

## Brake-hull: Preventing rotation during use

To avoid rotation during use, there is chosen to make brake-hulls for the hinge. Because it is a toy for children, this hull is made in the form of a beer. The brake-hull and the hinge form together a beer. This hull should be clicked in both storagebox-parts from above (figure 43 & 44).

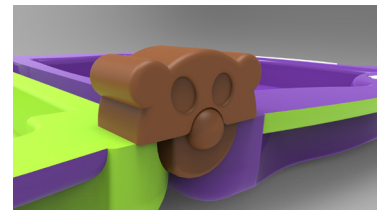


Figure 43: Preventing rotation: Brake-Hull

## Clamping waterbox

The two parts of the storagebox and the brake-hull will clamp the waterbox. Therefore it is not necessary to include an extra connection

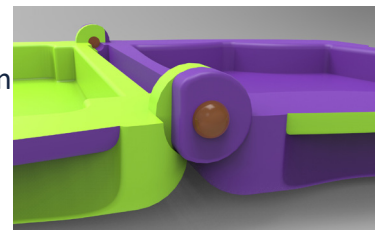


Figure 44: Hingle



*Look & Feel*



# Form study

To define the shape of WaterTheater the functionality was an important aspect. Therefore the shape is based on the following statement: "form follows function".

First, the shape is defined based on the functions of the product. After that, the definitive form is based on moodboards.

## Stability, Filling, Storage and Cleaning

To find the main-shape of the toy, a form study has been done. Each drawn shape is evaluated based on criteria. The shapes could be found in the appendix.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Amount of Parts	--	--	+	-	-	-	-	--	--	--	--	+		+	-	+	-	-	-	-	+	+	-- >4   -3   +2   ++1 parts
Cleanability	-	+	+	++	++	++	++	++	+	+	-	++		++	--	+	++	++	++	-	+	-	-- very difficult   -difficult   +easy   ++ very easy
Stability	+	++	++	++	++	++	++	++	++	++	++	++		++	++	++	++	++	++	+	+	+	-- unstable   +stable   ++ very stable
Storing elements	+	+	+	-	-	-	-	-	-	+	+	-		+	+	+	-	-	-	+	-	-	-- no storage place   + storage place
Shape fits to theme "Water"	--	--	+	--	--	--	--	--	--	+	--	--		++	--	++	--	--	--	--	--	--	-- does not fit   + fits   ++ fits very well
Collecting water	-	-	-	-	-	-	-	-	-	+	+	-		+	-	+	-	-	-	-	-	-	-- no collection of water   + place that collects water
Portability	+	-	+	-	+	+	+	+	-	+	+	-		+	+	+	+	+	+	+	-	+	-- not portable   + portable
View	++	-	--	++	++	++	++	++	++	++	++	++		++	++	++	++	++	+	++	++	++	-- only front   - front, back   + front, back   ++ front, back, side

Figure 45: Choice

## Chosen shape

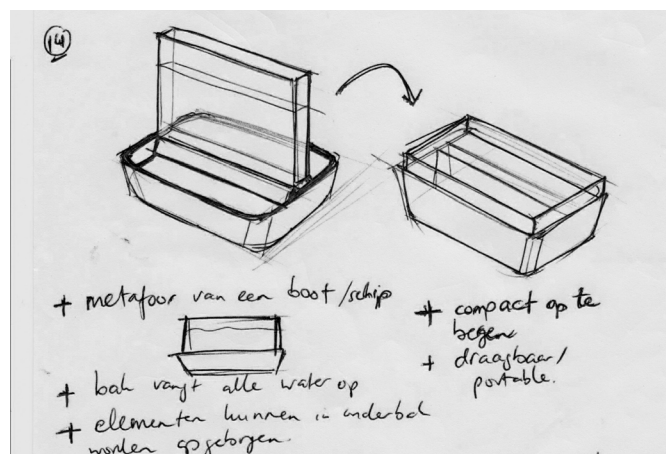
The following shape is chosen as main-shape for the toy. A base that fulfills both the storage as drip-tray-function and a waterbox. The waterbox is also the cover of the toy for storage.

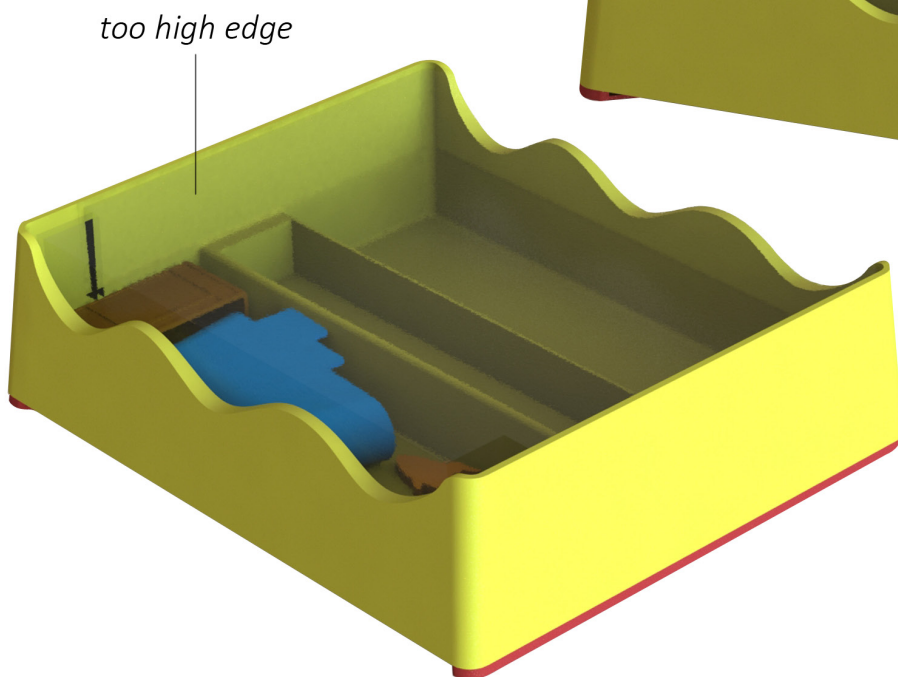
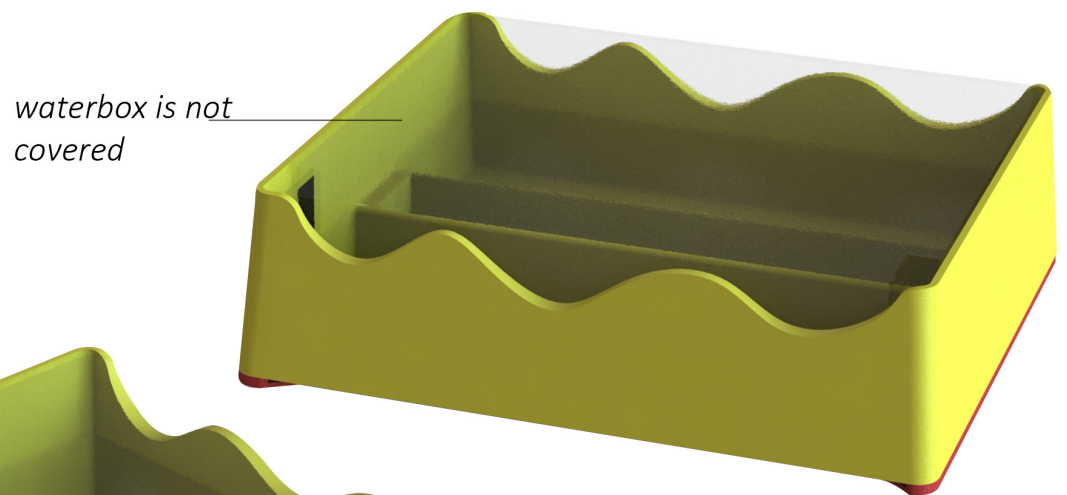
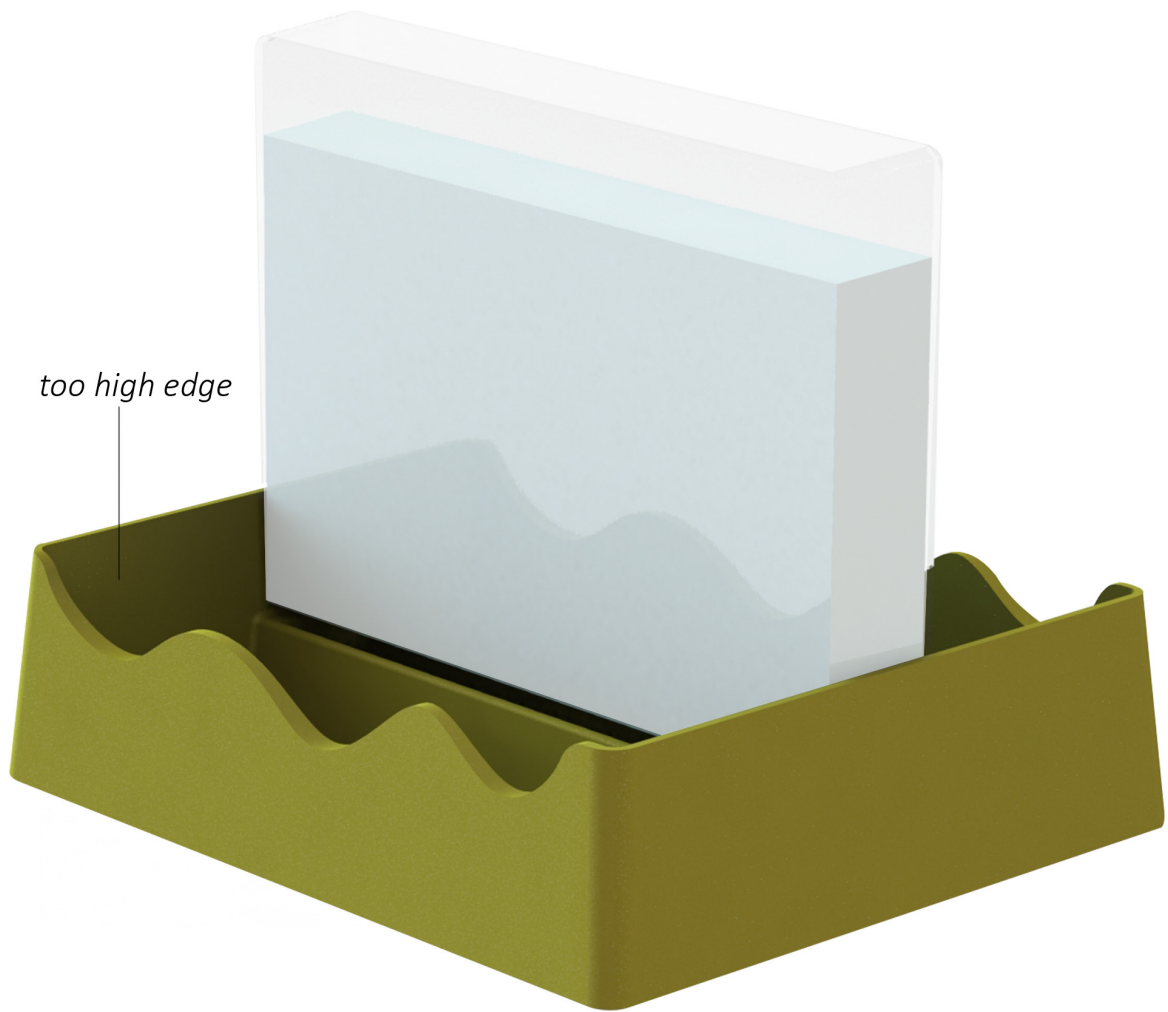
## 3D test-model

To test if the chosen shape also works in 3D, a quick-dirty model is made in wood and in CAD.

These models has shown that the border, where the waterbox will lie, is too high. The models shows that the total high is 8 cm. This makes playing with the toy less comfortable.

Also, these models has shown that the waterbox should be covered when the toy is carried. In this version the waterbox is too fragile.





# Toys overview

*For inspirational purposes, an overview of existing toys was made. In the overview toys with a certain vertical playfield or case were included (figure 46).*

The toy is inspired on the *Battleship* (middle) and *Tool case design* (upper-right).



Figure 47: Toys overview

Based on the new insights and the “Toys overview” there is chosen to divide the base in two parts with a hinge. On this way, the height is divided into two parts. The chosen shape is comparable to the Battleship-design.

Via moodboards, the final shape will be defined.



# Moodboard “Story”

*WaterTheater should be attractive to both boys and girls. This means that the shape should fit to the targetgroup and indirectly give hints in what it does.*

A part of the toy is creating a story with the provided elements. For a child there are more ways to create a story. To get an impression of “storytelling” a moodboard is made. The first thing that pops-up when the word “Story” is said, is ofcourse a book. But for children there are other ways to create a story. Drawing or fingerpainting is a well-known way to use the imagination to express what a child thinks. Other “storytelling” ways are puppet-shows and sand drawing.

## Metaphor

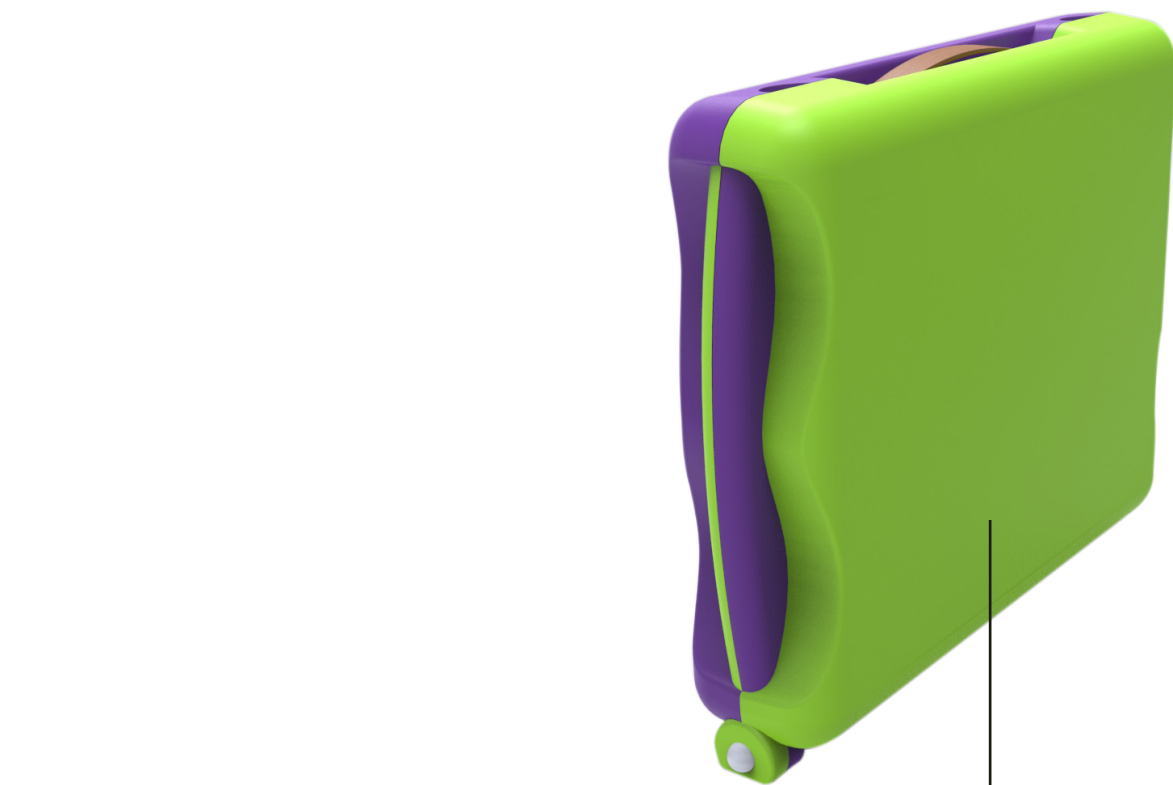
For the toy a metaphor is used, to define the form of the toy. The metaphor of a book is used:

*“When a book opens, the story starts and  
when a book closes the story ends.”*

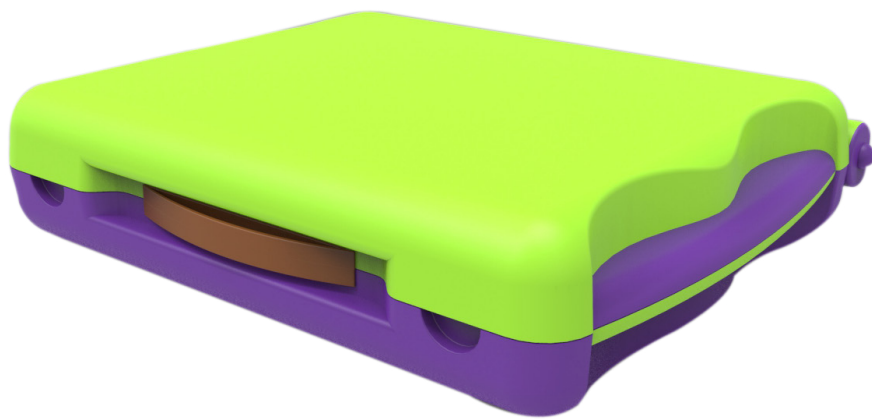
The same with the toy When the toy is being opened, the play time starts. When the toy is being closed, the playtime ends.



*Renders*



WaterTheater  
(Closed)



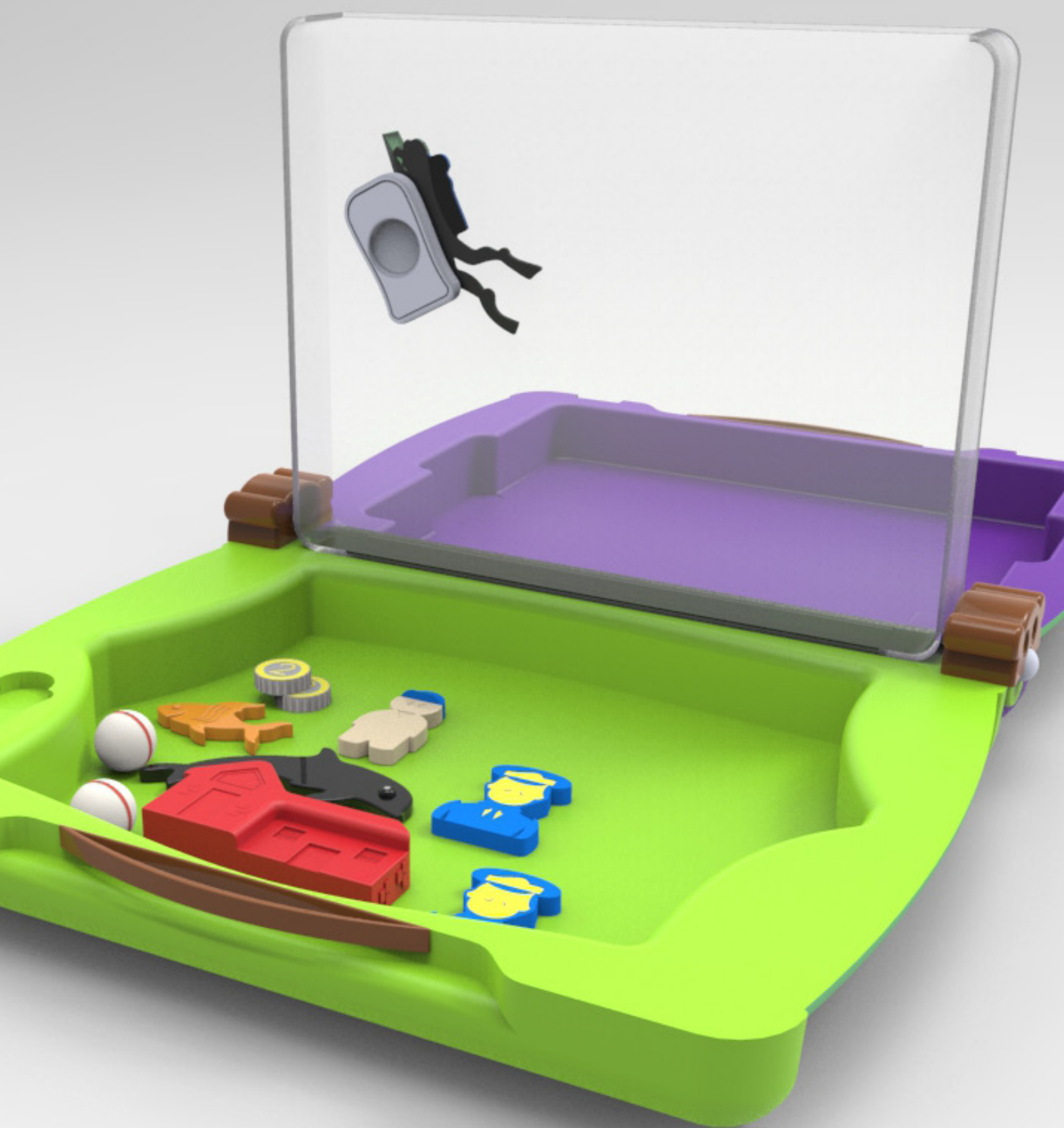


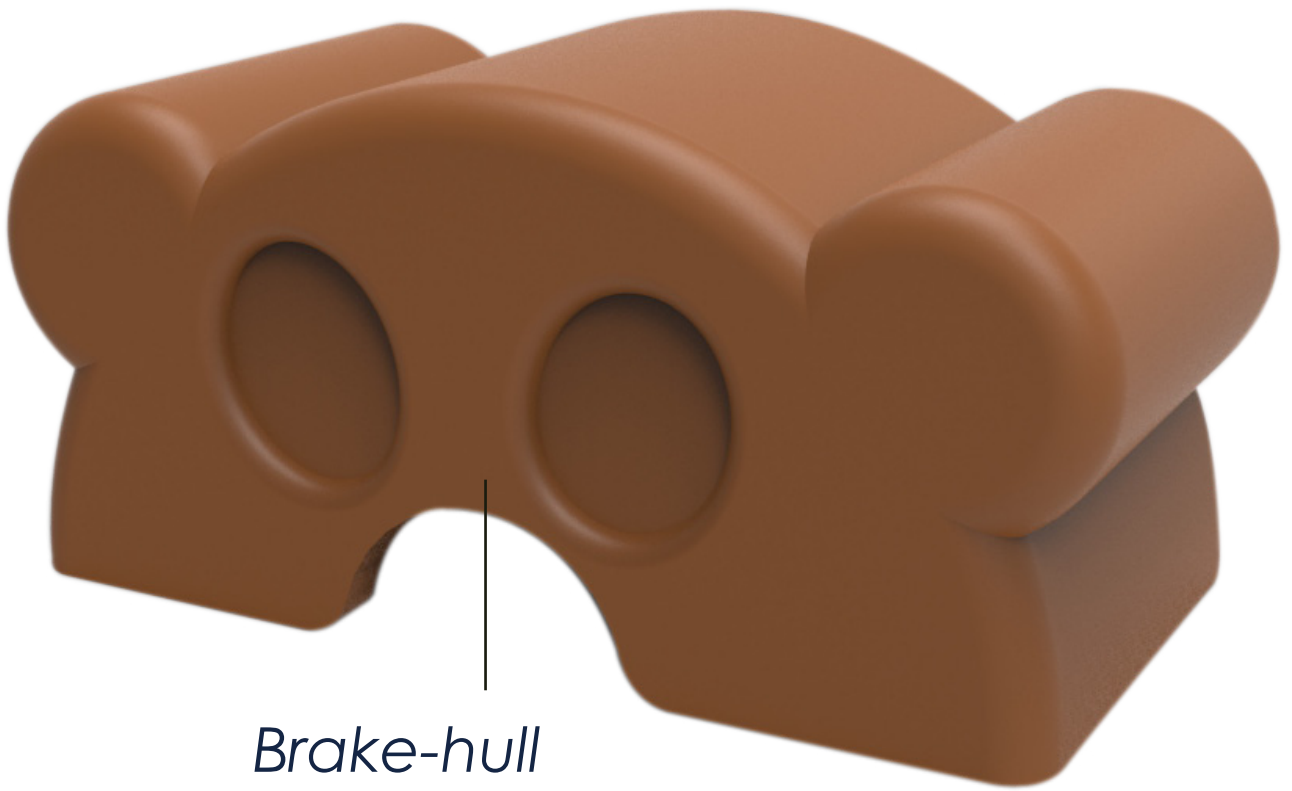


WaterTheater  
(partly open)

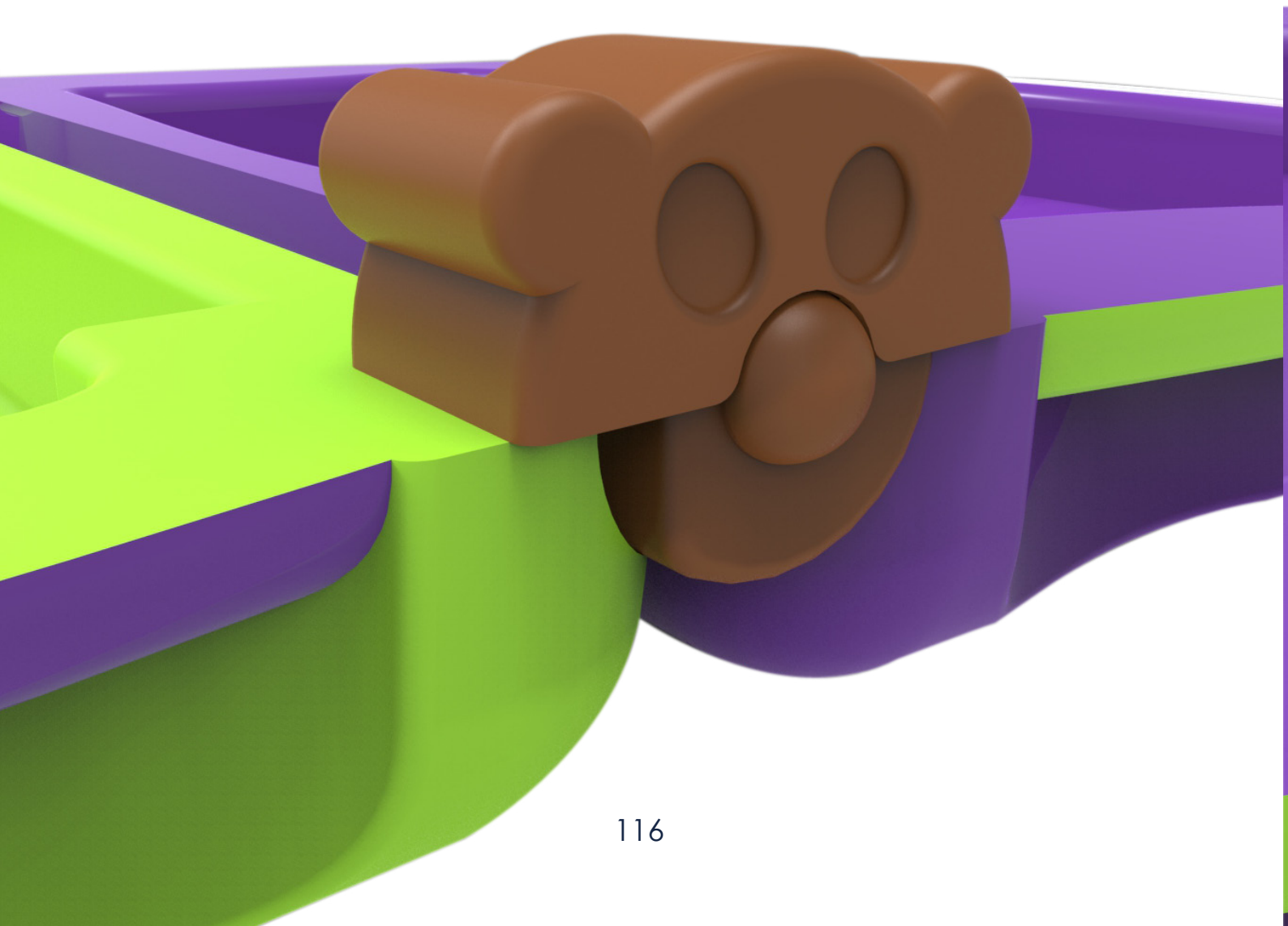


Flexible  
Elementscover

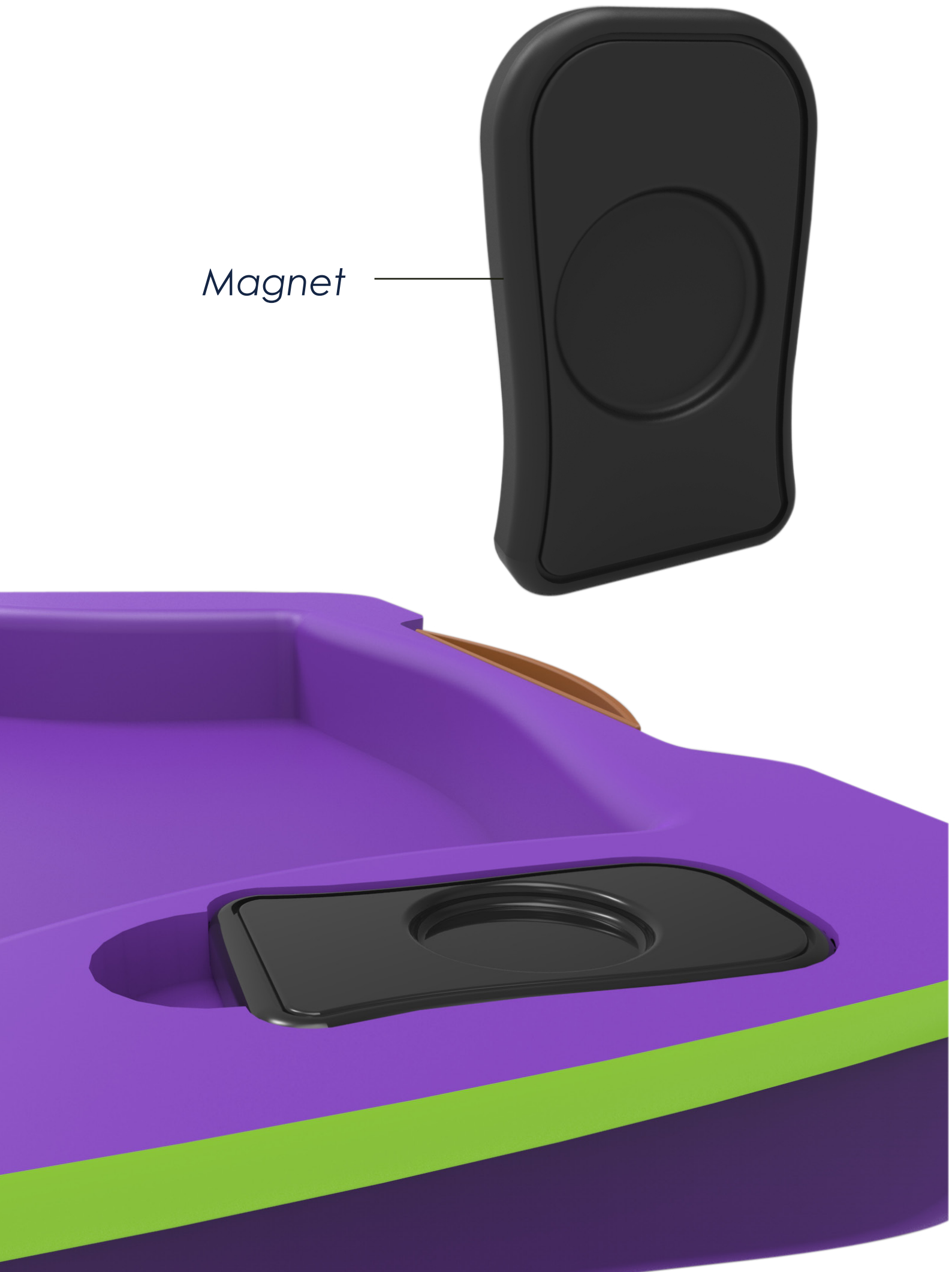




*Brake-hull*

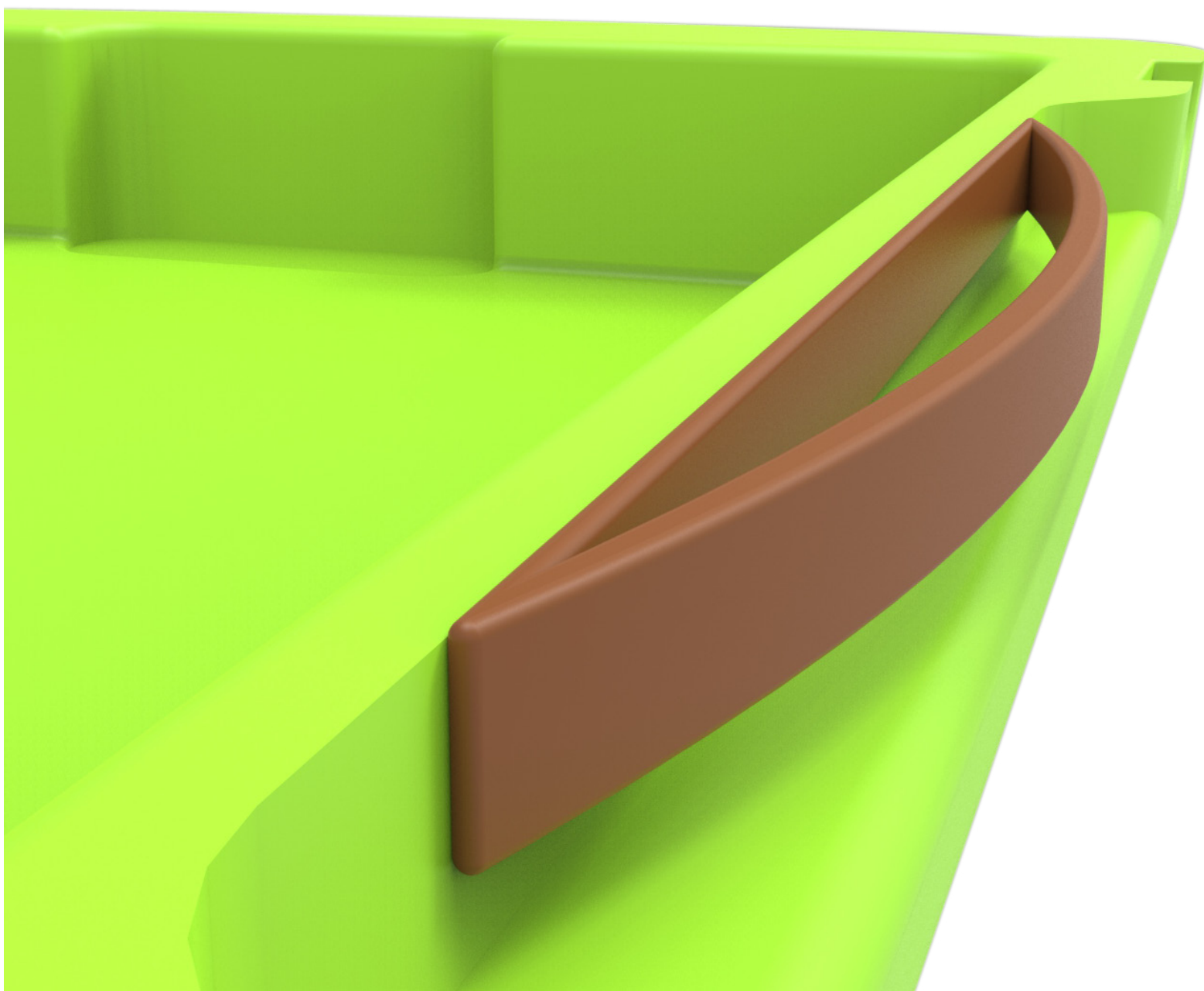


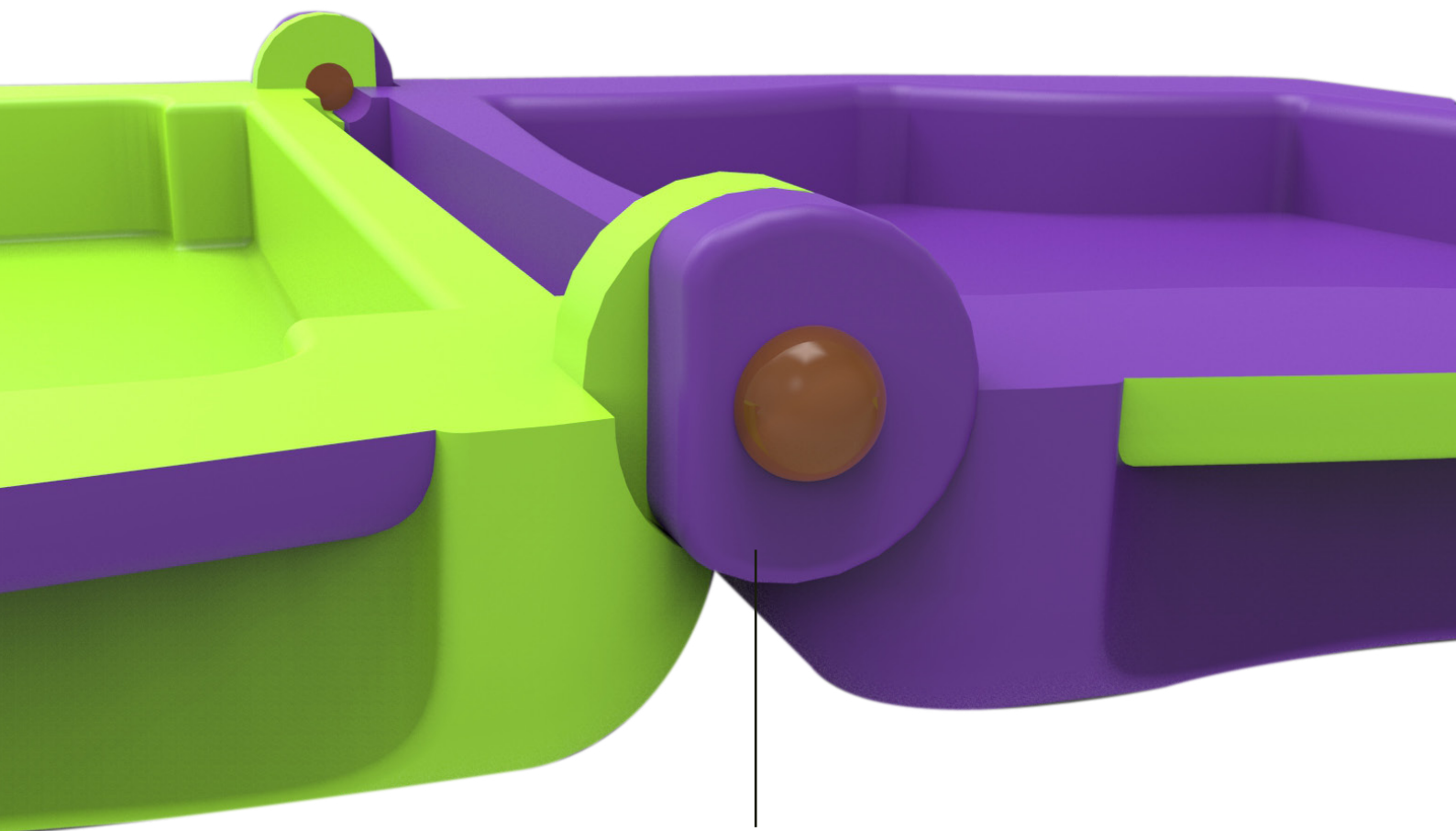
*Magnet*



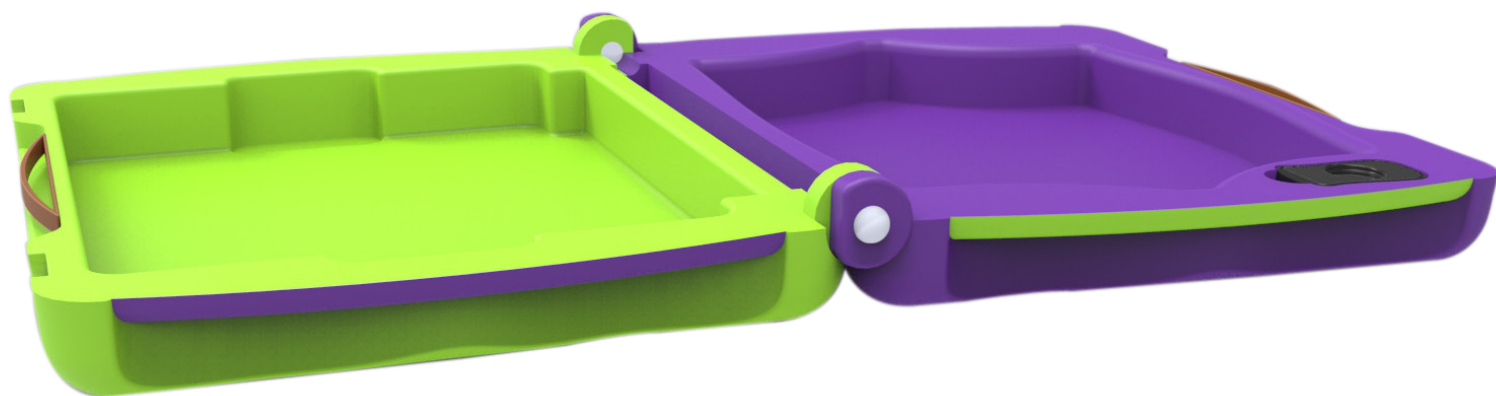


*Handle*

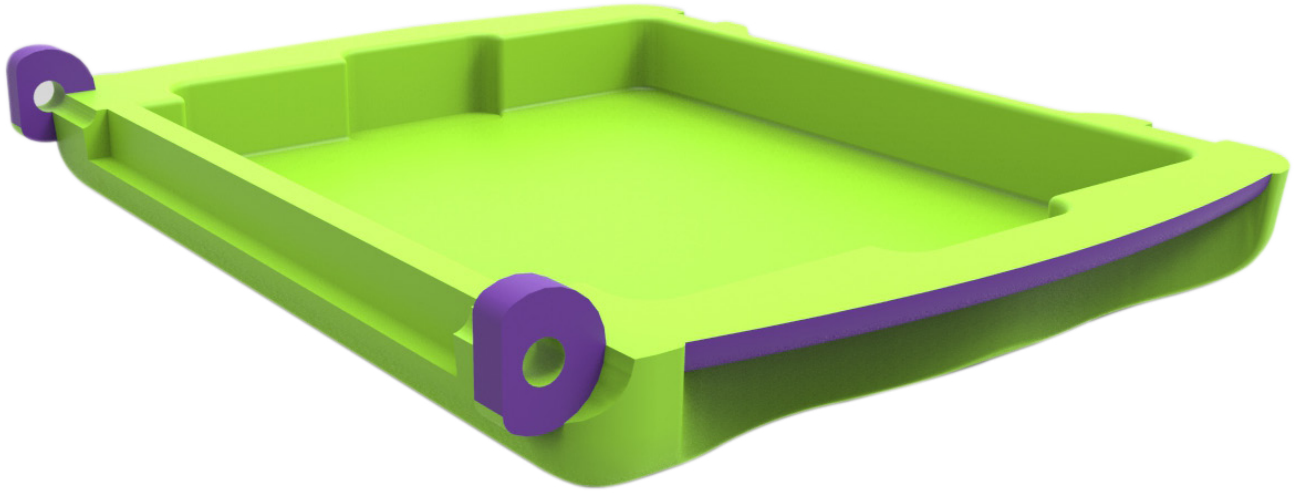




*Hingle*





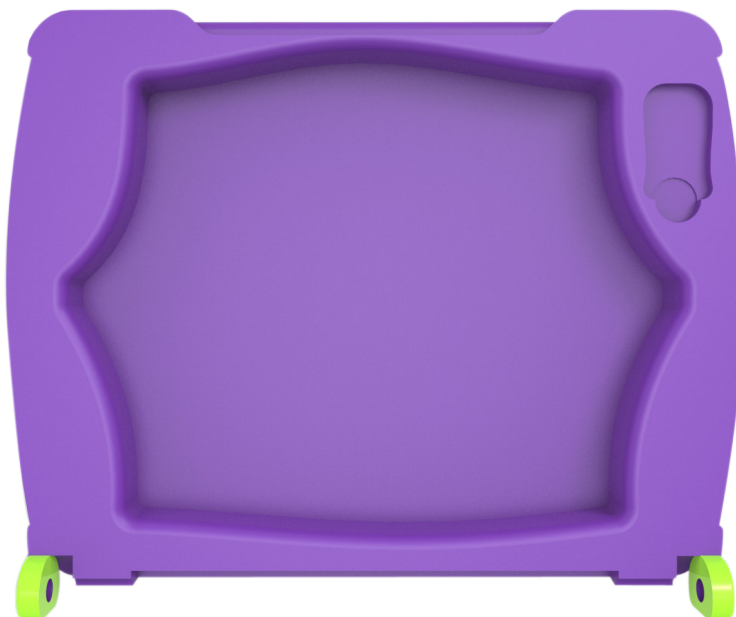


Storagebox  
Part 1  
(for waterbox)





Storagebox  
Part 2 —————  
(for elements)





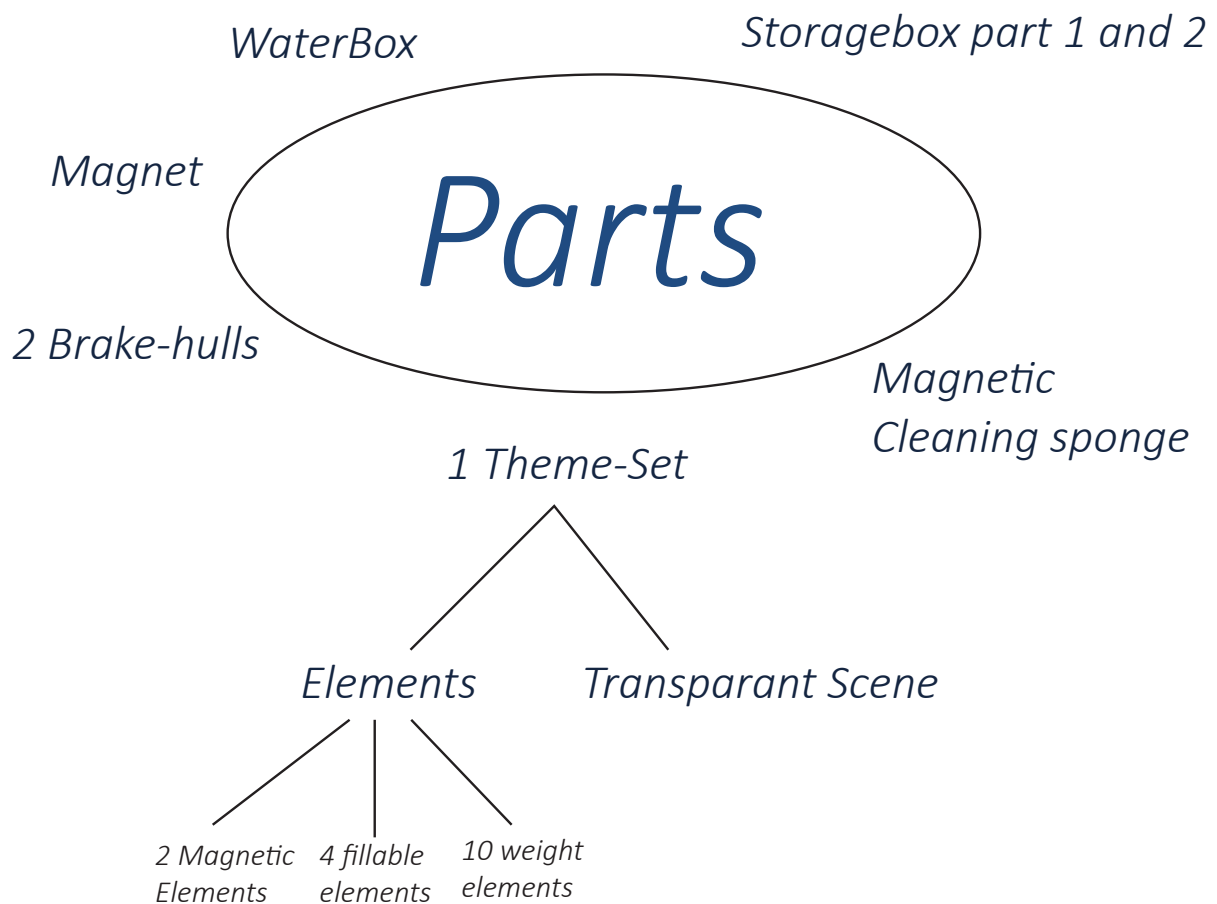
*Waterbox*



# General Part-list

*The box will contain several parts which are necessary to make the play experience fun.*

The theme is in this case “UnderWater World, but it could be any other theme. The box that will be sold, will contain:



# Recommendations

*In the previous chapter the WaterTheater was being introduced. Still, there are more interesting ways to extend the play experience with the WaterTheater.*

## Extension Sets

### Elements and Scenes

Because the WaterTheater is a playfield for stories, these stories could be extended. In the example the theme Underwater World is used, because this fits to both girls and boys.

However, it is commercially interesting to create *Extension Sets* for the WaterTheater. Parents can buy sets of several themes. In these sets elements and transparent scenes could be included.

### Gadgets

Another extension possibility is the introduction of gadgets, for example a slide or a land

## Licensing

A second way to extend the WaterTheater is via licensing. Licensed toys are very popular under children, so when there are extensions or limited editions for the WaterTheater, this will make the toy more fun. For example, Spongebob or Cars. Because children are very imaginative, it doesn't matter if it fits to water. In the Play World everything is possible.

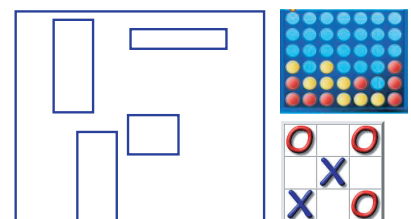
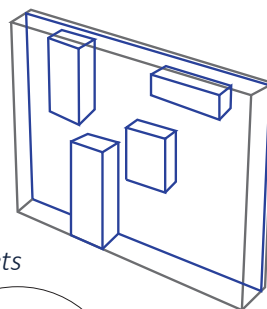
## Games

A third way to extend the WaterTheater is to make game-platforms which could be placed in the waterbox. This will make it possible to play a game together, for example Tic-Tac-Toe. The difference is that this game will be played with float, sink or swim. The heavy objects will sink, the light objects will float.

*Licensed Themes*



*Games*



*Example MazePlateau*

*Gadgets*



Figure 48: Recommendations

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