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Product / Service for children with learning difficulties

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Project elaborated to obtain a Masters Degree in Product Design

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Abstract

This dissertation has the objective of understanding and conceiving a prototype and a service that will help children in their learning experience between the ages of 3 and 7 years old. The objective is to understand children: psychologically and their cognitive ability, in order to improve their development and to make it more creative and fun rather than stressful and unpleasant. The methodologies used are: Literature review; Mind mapping; Questionnaires; Cultural probes; Study group; Case studies analysis. Using all of the above to analyse different types of information, providing the best outcome. We hope to see results as in understanding the teaching methods being used currently and how we can better them, helping children have less stress during their learning processes, less lack of attention, creating more interest and participation in learning and bettering their performance.

Creating a prototype of a product/service at the end that would provide the connection between the caregiver, psychologist, therapist, parents, and the children, helping all of them directly or indirectly in the development process.

Keywords

Children
Cognitive development
Product design
Toy
New technologies

Resumo

Esta dissertação tem o objetivo de compreender e conceber um protótipo e um serviço que irá auxiliar crianças na sua aprendizagem na faixa etária dos 3 aos 7 anos. O objetivo é compreender as crianças: psicologicamente e cognitivamente, de forma a melhorar a sua aprendizagem e torná-la mais criativa e divertida, diminuindo o stresse e o desconforto. As metodologias utilizadas são: Revisão de literatura; Mind mapping; Questionários; Probes cultural; Grupo de estudo; Análises de estudos de caso. Usando todos eles para analisar diferentes tipos de informação, tendo uma melhor visão das crianças. Esperamos ver resultados no entendimento dos métodos de ensino e como podemos melhorá-los, ajudando as crianças a diminuir o stresse durante a aprendizagem, aumentando a atenção, gerando mais interesse e participação na aprendizagem, melhorando o desenvolvimento.
Criando um protótipo de um produto / serviço que no final proporcionará uma conexão entre o educador, o psicólogo, terapeutas, os pais e a criança, auxiliando-os direta ou indiretamente no seu percurso de aprendizagem e crescimento.

Palavras-chave

Crianças
Desenvolvimento cognitivo
Design de produto
Brinquedo
Novas tecnologias

List of acronyms and abbreviations

ABS – Acrylonitrile Butadiene Styrene
AI – Artificial intelligence
MMO – Massively Multiplayer Online Game
RPG – Role–Playing Game
OECD – Organisation for Economic Co–operation and Development
PC – Personal Computer
WHO – World health organization

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Chapter 1 – Introduction

1.1 Problematization

In the making of this dissertation, we had as an objective to produce a prototype project/service to help children learn. This was made in the scope of product design, connecting it with education, social innovation, and cognitive development.

This project is relevant for the children's learning experience which currently is not, in our opinion, very well adapted to technology. With a society that is more and more connected to technology, this creates a big gap between the kids and the classroom, inducing stress, lack of interest and other cognitive deficiencies. The objective of this project is to help build a bridge between new technologies by creating more interest in learning and helping the caregivers and children have better interactions and experiences.

For that reason, this is a project that opens a lot of doors for different disciplines and different learning experiences. Connecting different subjects that all together create innovation and improve the learning process, not just for the kids, but for the people that are around their learning experience. Creating a learning experience adapted to these new generations that clearly need more stimulation than their parents needed.

INVESTIGATIVE TOPIC

Product/Service for children between the ages of 3 and 7, with difficulties in learning. Helping in captivating and improving their learning experience.

THEME

The objective of this research is to work on the following themes: Children's education between 3 and 7 years old; Children's cognitive development; Preschool use of technologies; Understanding of the general difficulties and how product design can help the children; Help children in their

development. This will start by understanding their difficulties, with investigating their development and helping to find new ideas where product design can help. Understand technologies that can be adapted and used in the classroom and at home, while helping children and parents with homework and learning exercises for more independence.

PROBLEMATIZATION

The problem that we are trying to solve is the lack of interest and learning difficulties in the development of the child, to improve their learning experience , considering children between the ages of 3 and 7 years old.

Trying to understand the difficulties in the classroom for different kids and different experiences, and how we can help them with product design, understand if it can even help them concentrate, reduce their stress, and enhance their performance. This could also even create a more personalised, interactive, and more stimulating learning experience for the new generations.

Understanding if this new generation really needs more help and stimulation during the first learning experience and even if we could help it with product design.

1.2 Research questions

MAIN QUESTION:

- How can product design develop a toy that is inclusive and didactic that promotes children's development in the ages between 3 and 7?

SECONDARY QUESTION:

- What can be defined as a didactic inclusive toy, and how can it help the interaction between children (3-7 years old), adults, caregivers and therapists?

- How should we combine physical and digital features in a toy that has inclusiveness as the main goal?

- More personalised and interactive education can help this new generation of kids that need more stimulus learning, maybe helping in the change of education?

1.3 Objectives

GENERAL OBJECTIVES:

- Improve the general (physical/cognitive/emotional) development of children (3 to 7 year olds).
- Create an inclusive toy for children between the ages of 3 and 7.
- Stimulate children and help make learning more amusing.
- Create a toy that stimulates children with the help of the adult, caregiver or therapist and also build more independence.

SPECIFIC OBJECTIVES

- Understand what are the advantages and disadvantages of both physical and digital toys.
- Develop interaction between adults and children in the ages of 3 and 7.
- Understand the principles of children's cognitive development and deficits.
- Provide more motivation for kids to explore new stories, games and activities gaining more interest in learning.
- Create a narrative between the toy and the kids who play with it, creating a more interactive toy.

1.4 Research design

In the development of this research a **mixed methodology was applied, interventionist, and non-interventionist of a qualitative base.**

At the exploratory phase **a literature review, a qualitative and non-interventionist** evaluation will be made in different areas like: education and learning, product design, emotional design, interaction design and communication design, inclusive design, video games, stories, engineering and new technologies used in education. This literary review will be made in four phases: finding information with the help of the key words, selecting the information, analysing it, and then critically synthesizing it. There should also be a case study to analyse what the market already has and how to improve.

Then the research will proceed to a more interventionist phase by using a **participative design methodology.** And then for a non-interventionist qualitative methodology approach we will make use of **questionnaires, and cultural probes,** collecting information about education, development, and how children interact with an activity.

This **study group** is a group of children between the ages of 3 and 7 in preschool in Portugal, some are from the *O Jardim de infância o Farol*.

In the **first phase** we will have to plan, define the idea and research, using the **literature review and case study analysis.**

In a **second phase** we will have to explore, synthesise, and explore the design methods. Using for example the **Mental model diagrams, questionnaires, cultural probes,** that will also help on the third phase complementing it and helping to understand children's behaviour and development. Also, **the focus group** that will be used in the next phases.

In the **third phase** we will have the concept generation, generative phase, the early prototyping, and generative design activities. In this case a more personalised evaluation will be made, using the **quasi-experience (sample group) and the participatory design** to help the development of the project.

In the **fourth phase,** we will evaluate and redefine the product to go to the production phase, doing tests and receiving feedback. To create the **final conclusions.**

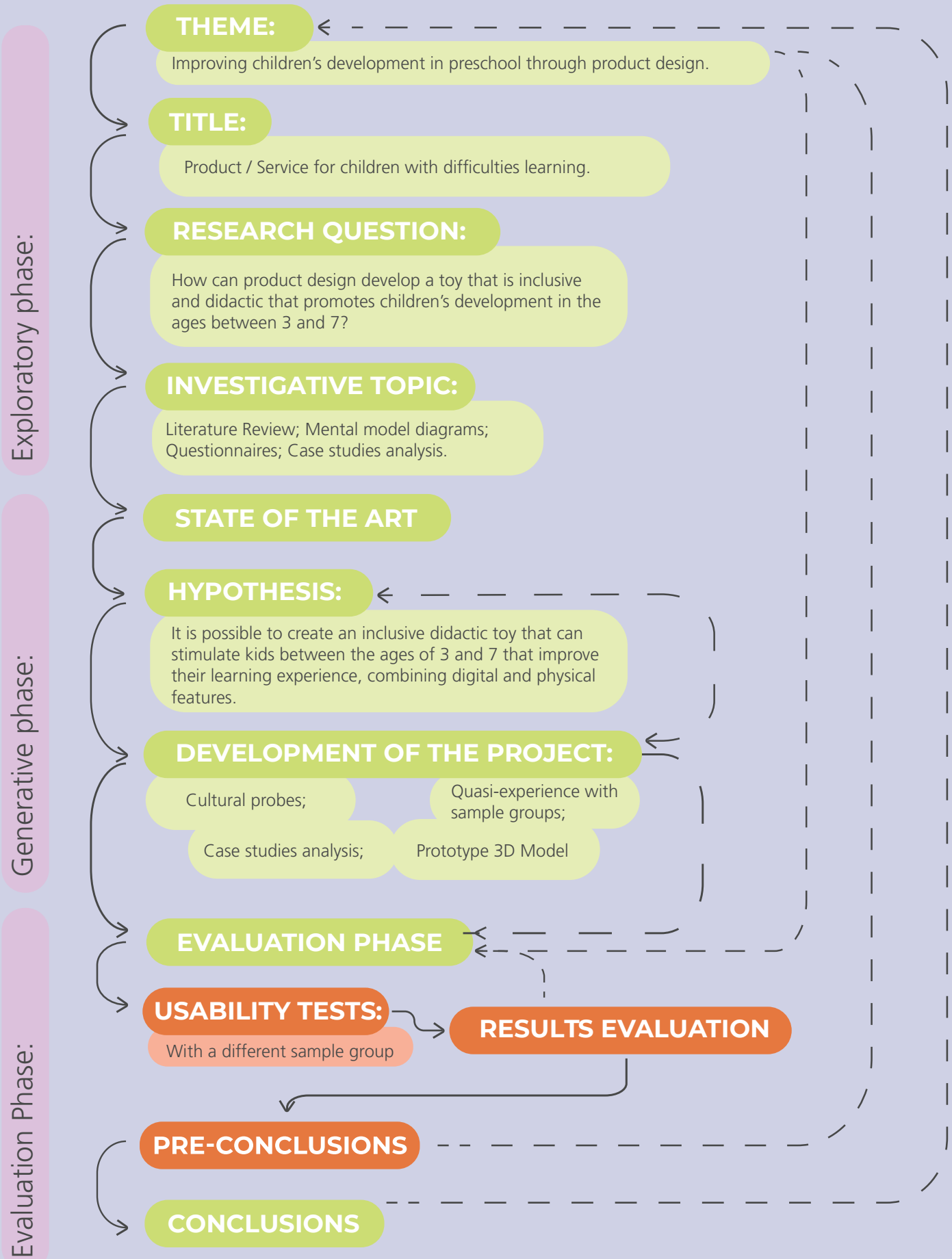


Figure 1 - Investigation organogram. (Source: Researcher, 2021.)

Chapter 2 – Theoretical contextualization

In this chapter we will talk about inclusion, emotional design, toys and video games and how all this can help produce a product that will help children, in the age of 3 to 7, develop and acquire new skills by playing and having fun, creating a connection with the user and the product and the parents, helping develop their independence and also an even bigger connection with friends, family and caregivers.

In the second part we will talk about children's development, psychology and how to help them develop their different skills, and what are those skills and how they can be stimulated.

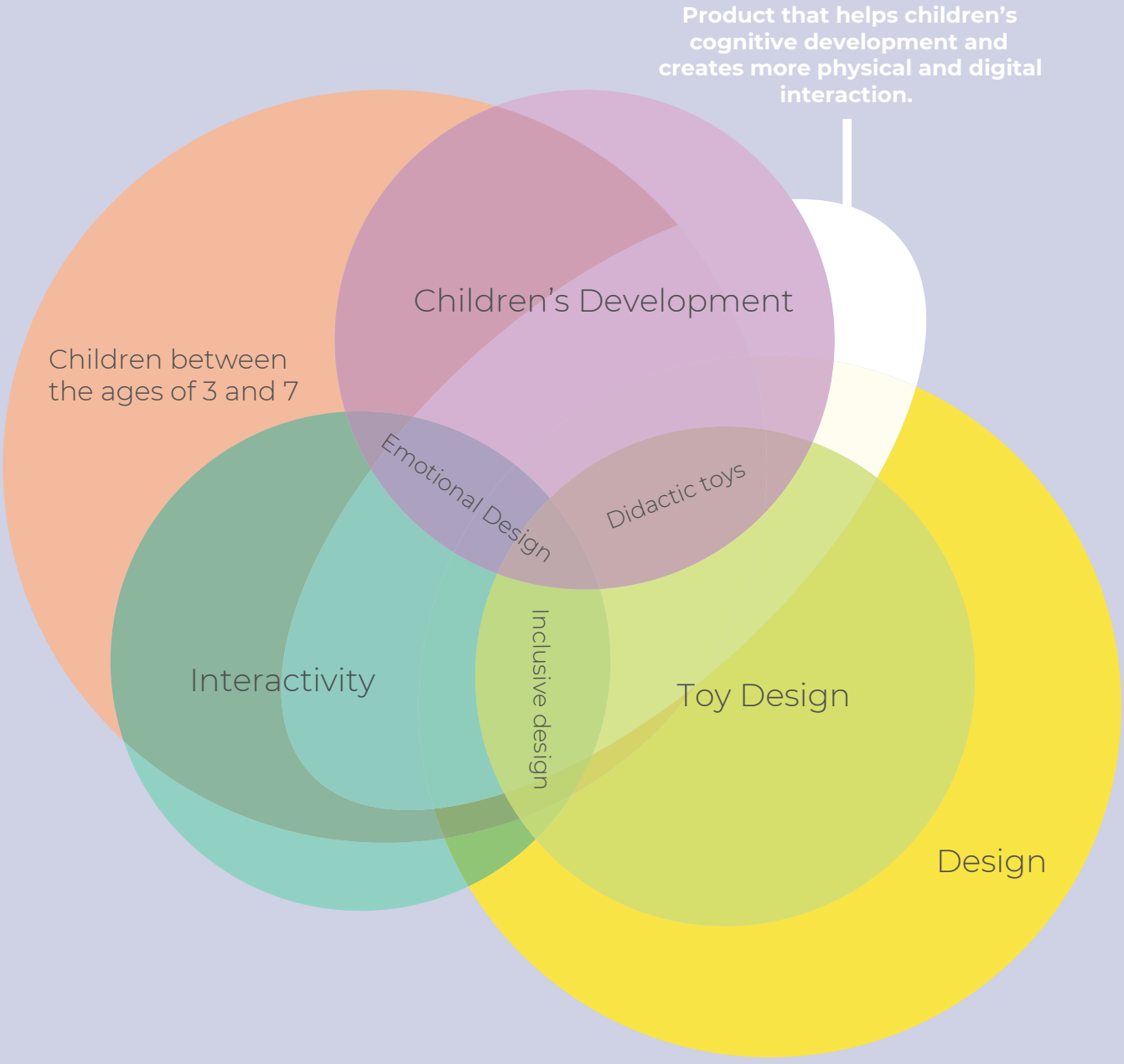


Figure 2 - Diagram of theoretical contextualization. (Source: Researcher, 2021.)

2.1 Toys

2.1.1 Inclusive design

When making design decisions we must always have in mind the user. It's in the designer's hands to include or exclude certain users (University of Cambridge,nd.). The goal would be to include as many people as possible, or in this case as many children as possible.

According to Hans Perssonl (2014) et al. there are different design approaches and or groups of design thinking that have made a great impact in designing for accessibility.

Starting with the inclusive design that implies that you must do as much as possible to create a product that is appropriate to all the population. The goal was to create products that are mainstream and make them also usable for other marginalized users. There are also tools that can be used to help create this connection.

Then we have design for all, that defends that no one should be excluded, having in consideration their functional difficulties and disabilities. But in Sweden it was also connected to sustainability making it a movement not only about politics and design but also about sustainable development. Combining a good strategy of growth inclusion and sustainability.

Universal design is a connection with environment and needs regardless of the user's abilities, status or age. It goes almost hand in hand with design for all but it acknowledges the idea that to build something good for one, the designer should create the greatest possible solutions that don't have the need for adaptations or something specialized to correct the design.

Other names and concepts can be used to define the design for all approach, but the various groups have essentially the same motives and objectives.

As Kat Holmes (2019) says that inclusion is not just about including people inside and out of the design, but also about how we can design for a broader group of people, placing not only big disabilities but also small ones in focus. For example we can have someone without an arm, or we just simply have someone that cannot use one arm at the moment because they are maybe grabbing a child. The idea is to implement this thinking idea of making not only one solution but maybe various solutions that can help different users, since we cannot just make a product that will fit everyone let us make it to fit the most people we can.

That's why whatever name we are using, inclusive design, design for all or any other they all have the same purpose: to make a product that everyone can use without a problem.

2.1.2 Emotional design

When talking about toys we have to connect them with emotions, as in what a child is feeling while playing and how the toy can have a different connection with the kid creating a special type of interaction, a bond.

First, we need to understand the emotions and their different levels and how they are translated through objects and how to use them to our advantage when creating the object and its experience.

According to Pieter M.A. Desmet, from Delft University, emotions are always present in our daily life. As we use products during the day we develop emotions with the interaction with them, positive or negative emotions. These emotions can influence the use of the product creating different experiences for different users.

Russel in 1980 created the circumplex model of affect that later Desmet (2002) adapted it into this circumplex model of core affect with product relevant emotions, (Desmet, 2012) We change our emotions because of inevitable reasons such as hormonal changes but also because of other interactions with people, objects and conditions, some of them last longer and some last brief moments. And this circumplex helps us describe these emotions in core effects that describe the interaction with objects, reporting the emotional state and what we need to avoid and change in the object to better the experience of the user.

Now we know how to categorise the emotions we now must focus on what those emotions are, and how we can use them to our advantage in product designing.

By creating a product that is associated with comfort and other happy emotions we can create a better connection with the user, making it more enjoyable and so being more "addictive" to stay with the product because it provides happiness and good memories.That's what makes people feel connected to the object making it stay in their homes for a longer period of time then if they wouldn't have a connection. As Jordan (2000) says it's about the pleasure that the user feels

when using the product. A sensory, a social connection, and a task are all important points to have in mind for the product development and to activate the user's emotional connection with the product.

Differing from the user goals the product can stimulate their emotions and help achieving the goals easily and enjoying while doing it.

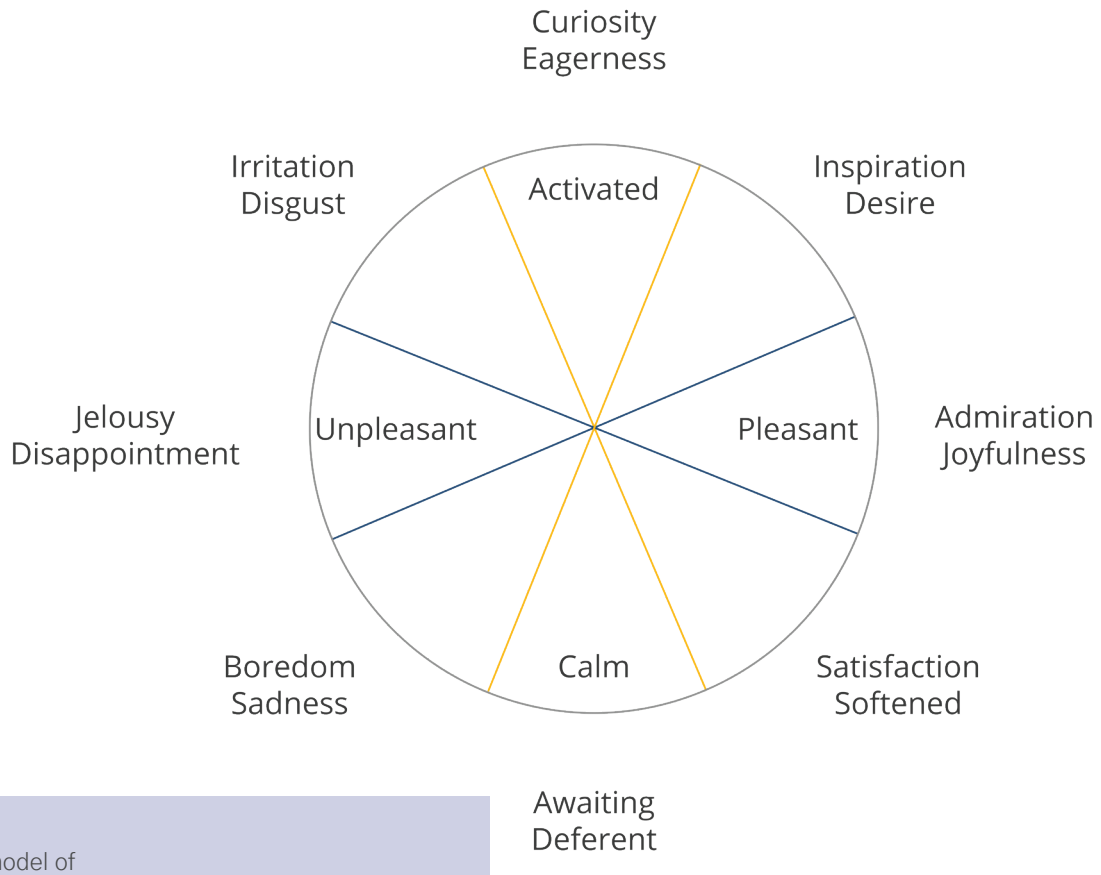


Figure 3 - Circumplex model of affect (Source: Adapted from Product Experience, Schifferstein and Hekkert,2007).

2.1.3 Toy design – How to design for kids.

To design this product we need to connect these 3 types of design: communication, interaction and product. To stimulate kids' education and skill development today they need more stimulation to engage and maintain their interest in the activities.

When creating an App and the interface for children it is important to have in mind the different types of thinking they have. To start, we should think of the game or app as a story, and it should also be taken very literally, thinking about it in a more emotional point of view, creating big shapes that they understand and want to use, but make it more difficult as the story goes on to get a more challenging interaction. Children learn fast, so to keep them interested we must do fast paced activities. (Molnát, 2018, s.p.)

As we have referenced before, nowadays children need more stimulation in their activities, fast paced stories and exercises, due to the technology and content available (tv, computers, mobile phones, tablets) and studying using a classical approach can be challenging as children are used to have things fast, appealing and with strong action narratives. Sometimes it can be challenging in school to be quiet for 90 minutes straight without any other stimulation besides listening and writing. That is exactly where design can help children get more motivated for the classes and have a lot more enjoyment while studying.

Finding a way to mix technology, for more stimulation, and physical connection and interaction would be great for the children and for their education, being more captivating.

"The preoperational phase of children between 2–7 years marked with a lot of pretend play, egocentrism [7] and a love of stories [8] reflects from the survey results with children in this age bracket preferring a mixture of devices, other children and physical toys [10]." (Kitungulu, 2019, s.p.)

As we can see with Kitungulu, children have different needs at different ages and when they reach 7 and beyond, they need more stimulation, and they have a more complex understanding of the environment. When they are confined to a not so stimulating place and being forced to learn in a way that can be boring and stressful for children

that are starting to have a lot of questions, they can get frustrated and overwhelmed.

So for a more stimulating activity we must connect with more technology creating new methods of thinking and learning, applying engineering knowledge with product design and design of interaction, combining different areas to create the best for children development and learning experiences.

According to the "Artificial intelligence and life in 2030" from the Stanford University (Grosz, et al., 2016, p. 16), education is evolving to become more and more personalised for each student, changing the methodologies of the teachers. Right now, they use the same method for every student, which is not very adaptable, but using new technology like AI, to help receive data and study the children, that information can be sent to the teachers and they can change their classes and adapt them to each and every kid, providing a more captivating experience for every student.

But when we involve technology with education, we need to pay attention to the social and cultural differences between every child. That is why we need to use technology and make it accessible to every kid in the class, providing them with the same opportunities.

"According to OECD data, in Denmark, Slovenia, Norway, Poland, Lithuania, Iceland, Austria, Switzerland and the Netherlands, over 95% of students reported having a computer to use for their work. Only 34% in Indonesia did. In the US, virtually every 15-year-old from a privileged background said they had a computer to work, but nearly a quarter of those from disadvantaged backgrounds did not." (Anderson, 2020, s.p.)

Providing designs that can be affordable for a lot of children, helping all of them, not letting the social differences change anything for them.

Helping each child in their different backgrounds can change their outcomes and their motivation a lot for the years to come and create different goals and different dreams. Education should always provide this to every child equally.

2.1.5 Digital and physical toys and their advantages and disadvantages.

Digital toys: Video games

Video games were created with the intent to be entertainment and it has grown to a point where we can also use it as an educational purpose, and now we also see it as a competition, almost like a sport.

This type of entertainment has been studied to understand its differences with the more traditional forms of entertainment like literature. We come to realise that it works very differently from those traditional ones but its efficiency may be the same. Books and television are very different entertainment properties, comparing video games with them can be difficult because of their different ways of use. If we use books or TV for example, we see that we do not interact with them, we just absorb the information they have to give us and that creates the entertainment, when it comes to video games however, we must interact with the interfaces to make the entertainment go on and make it endure for longer. The difference is in how to use them and how the entertainment is applied to the user. (Neiva, 2007)

The way we interact with video games can vary depending on the output. We can use different consoles and or a computer, but now we can also use gaming on smartphones, tablets or toys for kids and other types of portable devices that will have the game on their own. Video games are defined as the user operating an electronic interface using a product to interact with that electronic.

When we are designing for kids according to Amanjot Kaur Sand hu and Kanika Bhardwaj 2013, we should have in mind these three stages: the first encounter with the field, the behaviour, and the exit. First being when the children are interacting with the game or activity for the first time and the imagination, interest and motivation need to be activated by the product to the children. The second one is to let children explore, manipulate, and experience the product in their own way, being simple and easy to understand while maintaining the interest in the product activity. And the third being how the children can apply this information in the day-to-day activities developing and learning something.

How can we implement these educational methods?

- Gamification: implementing the game thinking strategies to different subjects that they must learn in different stages, applying rewards and fun game time to boring school subjects.
- Interaction: let the child interact with the product being a dig-

ital or physical component to learn through the motor skill, to stimulate their brain for more activities, and making them more interesting and fun.

- Augmented reality: By combining the virtual world with the real world we can make the technology and the school activities more fun. Applying it to books or math problems where a virtual friend only appears on the phone or other device to help them get more engaged in the exercises that normally feel long and boring.
- Assistive technology: Is a technology that can help with different types of learning difficulties like writing, reading etc. For example: The technology can write the words while the user is saying them to a microphone, allowing for the child to see what they are saying being typed in front of them in real time, helping the user assimilate the words in a more direct and interactive manner.

As designers, when engaging with children should have in consideration the message that we want to convey, for that reason we should always have in consideration what the user is going to think about and how to make it more engaging and interactive for the children involved. One of the situations would be to connect with the activity making it interesting for the user, as Jeremy Lee et al. say that by making students create their own character in a video game it helps them connect with the exercise almost like writing the name in an exercise paper. Placing the problem by letting the children solve the problem by themselves is something that sometimes, if the problem is too hard, the child will lose interest in the activity, so placing them with the possibility of asking for help inside the game is a way to make it more fun playing and engaging.

2.1.5 A) Game characters development and how the story progresses:

It is important to categorise the different types of games for a variety of reasons being the sellers knowing how to communicate about the games and how to sell them, but also for the buyer and all the others involved in the video game industry.

Narratology defends that the story and the theme and also the characters are what defines the game, but the ludology says that it is the interactivity, and the playability of the game that matters, creating a boundary between the different types of entertainment like books and television, because of the interaction.

Contradicting the academic information, the different selling platforms use a way to categorise all the games with very useful and simple definitions: action, adventure, racing, RPG (role playing games), shooter, simulator, strategy, sport and MMO (massive multiplayer online). Most of these categories are also used for children's games; they only have a different feel to them, comparing them to other games produced for older generations.

"Today's kids want to be engaged, and their games not only engage them, but teach them valuable lessons in the process—lessons that we want them to learn. Video and computer games, in fact, are an important way that our kids are learning to prepare themselves for their 21st century lives to come." – Marc Prensky "Don't Bother Me Mom—I'm Learning ", 2003.

Today kids need more stimulating and engaging activities then the other generations used to need, it's for that reason that video games are an exciting activity that also makes learning fun for them, the opposite of school and classes that have way less excitement and interactivity.

As Marc Prensky says some kids will develop important skills for the work field in the next years with video games, some can learn with the development of a guild all the organization and time management or could develop their fine motor skill to one day use as a doctor to use different operation machines. All of this can be developed passively while they "play" and have fun instead of hours of reading and studying. Adapting these new technologies to schools and other learning stages of children will benefit them in the new 21'st century work world.

Games have also been categorised by different ratings and are submitted to a test to place that in this age appropriateness. It's called ESRB rating, it's being used since 1994 and has suffered some changes throughout the years.

E – Everyone, anyone older than 3-year-old can play. Can contain mild violence and/or mild language.

E10+ – Everyone 10+, anyone 10 or up is suitable for this game and can contain mild language, violence, and suggestive themes.

T – Teen, it's suitable for 13-year-olds and up and can contain blood, simulated gambling, strong language, crude humour, suggestive themes, and violence.

M – Mature 17+, suitable for 17 years older and up, can contain intense violence, blood, sexual content, gore, and strong language.

A0 – Adults only 18+, suitable only for 18 and up, use prolonged scenes of intense violence, gambling with real currency, and graphic sexual content.

RP – Rating pending, its when a final rating is yet to be assigned, normally used in marketing and promotional materials. This rating is supposed to be replaced by one of the above after it has been rated.

Figure 4 - ESRB Rating (Source: https://www.esrb.org/ratings-guide/ Retrieved: 3 May 2021).

Next, we have a list of games as examples that are suitable for children. We use the ESRB rating as a guide to choose the games. Most of them are E rated (everyone), so are suitable for children between the ages of 3 and 7 but should be played with the aid of an adult:

Action – RATCHET & CLANK: Rift Apart E10+

Figure 5 - Ratchet & Clank: Rift Apart (Font: https://www.playstation.com/pt-pt/games/ratchet-and-clank-rift-apart/ Retrieved: 5 May 2021).

Adventure – Forager action adventure E

Figure 6 - Forager action adventure (Font: https://store.steampowered.com/app/751780/Forager/ Retrieved: 29 April 2021).

Fighting – Fuzzball family E

Figure 7 - FuzzBall (Font: https://www.xbox.com/en-ie/games/store/fuzzball/9n9z4ggbn0zc?cid=rodr72 Retrieved: 4 May 2021).

Flight – Microsoft Flight Simulator E

Figure 8 - Flight Simulator (Font: https://www.flightsimulator.com/ Retrieved: 5 May 2021).

Massively Multiplayer – Wakfu T

Figure 9 - Wakfu (Font: https://www.wakfu.com/pt/prehome Retrieved: 5 May 2021).

Music/Rhythm – Taiko no Tatsujin: Drum ‘n’ Fun! E

Figure 10 - Taiko no Tatsujin: Drum ‘n’ Fun! (Font: https://www.nintendo.pt/Jogos/Nintendo-Switch/Taiko-no-Tatsujin-Drum-n-Fun--1455739.html Retrieved: 4 May 2021).

Party – Clubhouse Games™: 51 Worldwide Classics E

Figure 11 - Clubhouse Games (Font: https://www.nintendo.com/games/detail/clubhouse-games-51-worldwide-classics-switch/ Retrieved: 4 May 2021).

Platformer – Super Mario 3D World E

Figure 12 - Super Mario 3D World (Font: https://www.nintendo.pt/Jogos/Nintendo-Switch/Super-Mario-3D-World-Bowser-s-Fury-1832228.html Retrieved: 5 May 2021).

Puzzle – Captain Toad: Treasure Tracker Platform E

Figure 13 - Captain Toad (Font: https://www.nintendo.com/games/detail/captain-toad-treasure-tracker-switch/ Retrieved: 5 May 2021).

Indie – Untitled Goose Game E

Figure 14 - Untitled Goose Game (Font: https://goose.game/ Retrieved: 5 May 2021).

Racing/Driving – Rocket League Racing E

Figure 15 - Rocket League Racing (Font: https://www.rocketleague.com/ Retrieved: 4 May 2021).

RPG – Pokémon™ Sword and Pokémon™ Shield Double Pack adventure E10+

Figure 16 - Pokémon™ Sword (Font: https://www.nintendo.com/games/detail/pokemon-sword-and-pokemon-shield-double-pack-switch/ Retrieved: 6 May 2021).

Simulation – Animal Crossing New Horizons Simulation E

Figure 17 - Animal Crossing (Font: https://www.animal-crossing.com/new-horizons/ Retrieved: 5 May 2021).

Sports – Mario Golf™: Super Rush: Sports E

Figure 18 - Mario Golf (Font: https://www.nintendo.com/games/detail/mario-golf-super-rush-switch/ Retrieved: 5 May 2021).

Strategy – Overcooked Simulation E

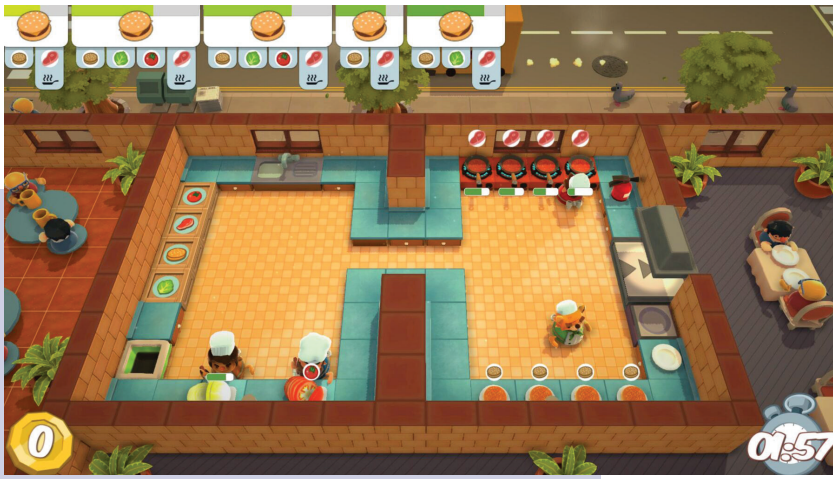


Figure 19 - Overcooked (Font: https://www.team17.com/games/overcooked/ Retrieved: 5 May 2021).

2.1.6 Book Stories.

Stories for children that can be used for adaptations in the game.

In this chapter we have a selection of book stories that can be applied to the game, giving different educational ideas and different lessons, some about collaboration, math, colours and others that were thought to be a good variety. It is expected that by combining the stories in "classical" media, such as books, into digital / multimedia narratives, the children can be more engaged in the learning activities.

Figure 20 - O Leão que temos cá dentro (Font: https://www.wook.pt/livro/o-leao-que-temos-ca-dentro-rachel-bright/20140054 Retrieved: 2 April 2021).

"O Leão que temos cá dentro" The lion we have inside, is a story about a small rat and a lion that become friends. Teaching character and that the differences don't matter, that if we help each other we will always have something to win with it.

Figure 21 - A que sabe a lua (Font: https://www.wook.pt/livro/a-que-sabe-a-lua-michael-grejniec/120779 Retrieved: 4 April 2021).

"A que sabe a lua" What does the moon taste like, it's a story of repetition, to help learn the animals and distinguish them, it's good for children that need to hear more time to assimilate information, helping them repeat the names and seeing the animals help them in the learning of who they are.

Figure 22 - O Grúfalo (Font: https://www.wook.pt/livro/o-grufalao-julia-donaldson/16045886 Retrieved: 4 April 2021).

"O Grúfalo" The Grúfalo, it's about a small rat that tricks the animals along the forest to not get eaten by them, creating a fictional animal that he will enjoy a meal with, what he doesn't know is that the mythical creature actually existed and at the end wants to eat him. To not get eaten by the Grufálo the rat tricks him into thinking he is a very feared animal in that forest which works, because when the other animals see small rat with the Grúfalo they get scared and run away, making the Grúfalo thing the rat is really scary and leaving him alone. This story is more about the rhythm and the repetition that will help the children with the words and starting to read on their own with how easy they can assimilate the information.

Figure 23 - O nabo gigante (Font:https://www.wook.pt/livro/o-nabo-gigante-alexis-tolstoi/79353 Retrieved: 2 April 2021).

"O nabo gigante" The giant turnip is also a story about repetition where an old couple is trying to harvest their turnip from the dirt but they can't, so they keep calling for help from more animals each time. It helps teach the numbers, while also promoting the idea of cooperation.

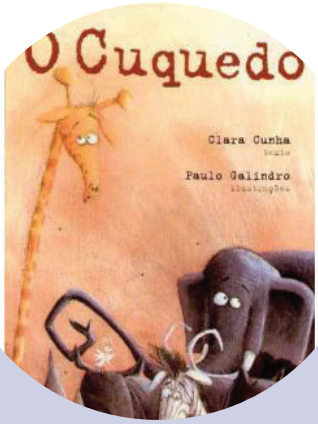


Figure 24 - O Cuquedo (Font: https://www.wook.pt/livro/o-cuquedo-e-um-amor-que-mete-medo-clara-cunha/20914103 Retrieved: 2 April 2021).

"O cuquedo" The Cuquedo its a story also about repetition of words and it is about the animals on the savanna that are scared of this animal that is new in there and they say that if you stay in the same spot for too long he comes and scares you so they must keep moving, more animals are added to the group and they keep running when the Cuquedo appears at the end and scares them all. The idea here is just to repeat the same words and the same sounds to help them assimilate the words and train their reading and speaking.

Figure 25 - O monstro das cores (Font: https://www.wook.pt/livro/o-monstro-das-cores-anna-llenas/17001754 Retrieved: 2 April 2021).

" O monstro das cores" The monster of colours, it's a story about a monster that has his colours all messed up and a kid is going to help him sort his colours, as the story goes the kids will learn different colours and also emotions attached to those same colours and subconsciously understand a little more about emotions and that we can ask for help to sort our problems just like the monster.

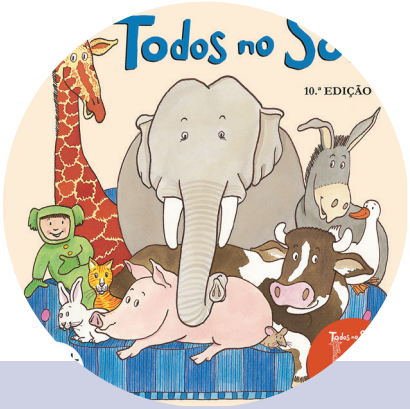


Figure 26 - Todos no Sofá (Font: https://www.wook.pt/livro/todos-no-sofa-luisa-ducla-soares/196410 Retrieved: 3 April 2021).

"Todos no sofá" All in the couch, it's a story to help children count and learn numbers with, again, the use of repetition of words and numbers in this case. It's about a group of animals that are laying on the couch and are leaving because they get seduced by something they like outside of the couch, so they are going one by one away from the couch while we read and learn the numbers.

All of these seven stories have some similarities and something to teach the kid, reading these stories and also adapting them to the game would be a fun experience for the children that is not just a normal book, it's an interaction with the characters from the book in their hands, creating more engagement for the children's in the activity.

2.2 CHILDREN

2.2.1 Children development and education.

Education needs to improve to create a better environment for children, bettering their learning experience. For that to happen we need to understand where we can improve it and how to create a better environment for children in their classroom, bettering their education.

To innovate in education we need to start from somewhere, and starting from understanding how innovation happens is probably the best place to start, Richard Culatta and Sandy Speicher, (Bright, 2015, s.p.) say that to innovate we need to use different areas of study, people that are not actually directly involved with education are the ones who will find ways to innovate, and also different collaborations, with a group of teachers and technologists and designers, that can find new ways to change the education.

Connecting different areas is the best we can do to improve education. In this situation, combining teachers, psychologists, but also engineers, and designers, could be a great combination. Creating a team with this variety of degrees could create different approaches to help children and parents. Each one has a different contribution to the education in specific, understanding how all of them can work together and create new methods and new services for an improvement of children's education is the best way, especially for their future.

"It is a stark reminder of the critical importance of school not just as a place of learning, but of socialization, care and coaching, of community and shared space — not things tech has hacked too well. (…)" (Anderson, 2020, s.p.)

When improving it we need to understand children's behaviour, that's why having psychologists is so important, to not only understand their mental health, but also to understand their way of communication and how they act with each other. This is something very important to create communication and interaction between the children, not only to solve the education problem but to better their mental health.

2.2.2 Skills – Cognitive skills; Fine motor skills; Gross motor skills.

We will only be talking about children preschool development because this is the group we will be focusing more on our product, this is the phase where they start to explore the world more independently and make small decisions that will help them learn.

Preschoolers will learn by how things look, the literal state of looks, as Amy Halliburton from the University of Missouri (2005) "For example, if a child breaks her graham cracker into four pieces while her brother breaks his in half, she thinks that she has more graham cracker than her brother because she has four pieces, and he only has two pieces."

For this reason, adults still play a big role in helping the kids explore. Their attitudes, behaviours and thinking styles are crucial to determine how they react and interact with other kids and society around them.

This creates a big play time for children this age, play pretend, that is also very important for their understanding of the world, creating and imagining these new events and different realities where they can learn by playing.

All children grow in different ways but there are certain states in their process of growing up that the parents should be alert to. It is also important to know if the child's development is falling behind in a lot of these milestones. Parents should keep a closer eye on them because some undetected learning deficiency can begin there.

Children's skills are divided into two: fine motor skills and gross motor skills. Both of them will help the children's development making them more independent. Fine motor skills being the ones that are more meticulous, the ones where they use the hands, fingers, and wrists, for smaller meticulous movements.

Gross motor skills being the ones less precise involving the bigger muscles like arms, legs, making them walk and other activities.

At certain ages we get what literature call milestones, according to Terry Mauro (2021) at different ages children should be able to do certain activities, in gross and fine motor skills, just like it's shown in this table:

	Fine motor skills	Gross motor skills	Cognitive development
Age 3	• Fold a paper in half. • Draw circles after being shown how to do it. • Fasten large buttons and unfasten.	• Ride tricycles using pedals alone. • Runs without falling. • Throws a ball to an adult at least 1 meter away.	• Knowing their own name and age. • Follow 2 to 3 step instructions. • Understand the concept of the number two. • Memorise a sequence of letters and numbers but cannot recognize them. • Enjoy puzzles with 3 or 4 pieces. • Active imagination. • Understand the concept of "mine" and "yours". • Ask why and what. • Understand most of what they hear and knows common objects names.
Age 4	• Gets dressed and undressed without help. • Touches the tips of each finger. • Uses a fork correctly.	• Catches a ball with the body and arms. • Runs easily with speed change. • Walks straight alternating the feet.	• Can say fist and last name. • Understands the concept of counting, has a small notion of time. • Can name some colours. • Understands the difference in things. • Can understand some events and the logic behind them but not always. • Knows the difference between fantasy and reality. • Can cooperate with other children. • Can make sentences of 5 or 6 words. • Can describe events. •
Age 5	• Cuts out a circle. • Copies a triangle shape. • Grasps a pencil correctly. • Ties their shoelaces.	• Catches a ball with two hands. • Jumps in one foot. • Performs jumping jacks and can touch the toes. • Walks up and down the stairs with objects.	• Recognizes most letters of the alphabet. • Can count to 10 or more. • Knows the name of at least four colours. • Knows the basic concept of time. • Agrees to rules. • Wants to please and be liked by friends. • Can carry meaningful conversations. • Can tell stories and knows how to use the future tense.
Age 6	• Builds a small structure with blocks. • Solves a puzzle of 16 to 20 pieces. • Cuts well with scissors. • Uses a knife.	• Kicks a ball that is coming towards them. • Jumps at least 25 cm high. • Rides a bicycle with training wheels. • Throws with accurate placement.	• Can count and understand the concept of numbers until 10. • Can express themselves well through words. • Can understand cause and effect relationships. • Learning how to write. • Parents are the most wanted company and affection, that is gradually changing for friends. • Are developing sense of humour. • Can describe stories, games, shows and movies. • Speaks with correct grammar most of the time. • Can spell their first name and can write some letters and numbers. • Can read some simple words.

Figure 27 - Table of contents about motor skill and cognitive evolution of children in the ages of 3 and 7. (Source: Researcher, 2021.)

It is also in preschool where it is found that children can have some developmental delays that could not be detected sooner, it's very important to detect these issues as soon as possible so they can be diagnosed and get more help if needed. The goal is to combine the activities for all the kids to be able to play together and still be entertained even if some of them need more help, more time or even doing the same exercise more times to develop their skills.

Children can develop Dysgraphia or developmental coordination disorder that could need occupational therapy or other assistive technologies. About cognitive development, literature also refers to some milestones to help keep track of the child's development. This cognitive development involves thinking, reasoning, playing, emotions, and social and language development. All of this together plus the other 2 motor skills make children's development easy to follow and to understand the different stages. In the table we can see some relevant milestones from CDC (nd).

2.2.3 The importance of play in children's development

The activity of playing has always been of great importance to children, this is how they learn to deal with everyday situations and learn to distinguish right from wrong, either among themselves or alone. Playing with parents also helps the child to learn better from situations.

Children have to play for various reasons, such as excess energy, but also as it helps them understand their emotions and learn behaviors.

There are 2 types of toys: unstructured and structured. The structured ones are the ones that are manufactured in factories, already made and ready to play, i.e. the toys of the 20th century. While the unstructured toys are the "alternative" toys that are sticks or other objects that can be manipulated by children to create different play, which were the most commonly used in Portugal in the 1930s and earlier.All this puts children to exercise their creativity and intellectuality, once again helping their development.

"The importance of play goes through the exploration and learning of the outside world, using and stimulating the senses, sensory function, motor function, and emotional function. Play has an important social function, develops the intellectual side, and mainly creates opportunities for the child to elaborate and experience emotional situations and conflicts felt in everyday life." (Margarete Moscow, The importance of toys in child development, November 8, 2019)

F.T. "A importância do brinquedo passa pela exploração e pela aprendizagem do mundo exterior, utilizando e estimulando os sentidos, a função sensorial, a função motora e a função emocional. As brincadeiras têm uma importante função social, desenvolvem o lado intelectual, e principalmente criam oportunidades para a criança elaborar e vivenciar situações emocionais e conflitos sentidos no dia-a-dia." (Margarete Moscovo, A importância dos brinquedos no desenvolvimento infantil, 8 de Novembro 2019)

2.3 Case studies analysis

2.3 Case studies analysis

2.3.1 Didactic toys for kids: Case studies analysis

In this chapter we will be analysing the first stages of the creation of the project. We will analyse case studies that are similar to the project idea, understanding what is better and what important information to retain from each one.

With the objective of better understanding the types of games and toys that exist that are similar and can be relevant to understand for further development of the product, we looked at some case studies. The comparison was made with a list of criteria that was then summarized in a web chart. The key points to analyse were: Aesthetics – Texture; Geometry (shape); Emotional connection; Physical characteristics – Material; Weight; Moving parts; Social integrity – Security; Prices; Sustainability; Information – How it works; What makes it better; Functionality. All the information was obtained in the stores' websites, reviews and technical papers online.

2.3.1.A) LEGO HIDDEN SIDE

Aesthetics:

Texture – Smooth as all the Lego toys, having a small sensory stimulation associated with it.

Geometry (shape) – It's based on rectangular shapes and small pieces that are developed to give more details to the rest of the game.

Emotional connection – Small emotional connection, besides the idea of Legos as an important toy and the building experience. It gives adicional emotion to the toy when they create the interactivity with the digital phone or tablet, creating some new emotional connection.

Physical characteristics:

Material – Plastic is the main material, soft and shiny.

Weight – Very light weight 180 pieces of lego.

Moving parts – Has 180 moving parts and some of them are really tiny, could be dangerous for some kids.

Social integrity:

Security – Could be dangerous for some kids because of the amount of small moving parts.

Prices – Around 20 to 30 euros.

Sustainability – The pieces are made of ABS, they can be seen as not so eco-friendly but are very safe and durable as it is needed for a kids' toy.

Information:

How it works – This is a different set then the normal Lego, this one has a connection to the game on the phone, providing a new experience by interacting with the game in the app and in real life, combining the digital with the physical. Looks like it has some disabilities that can make it boring fast but it's a new and effective way to mix physical and digital toys.

What makes it better – This toy has at least 3 types of interaction, assembling the game, playing with it physically and also by playing with it with the phone. That makes it a new and very different way to interact making it special for that reason.

Functionality– The App is easy to navigate in and to work with. You may encounter some problems, but in the end it is easy to use and play with, it's really functional.

Enjoyment– Children seem to enjoy playing with it. Some enjoy the building more than the digital, but they also get captivated by the dig–ital game.

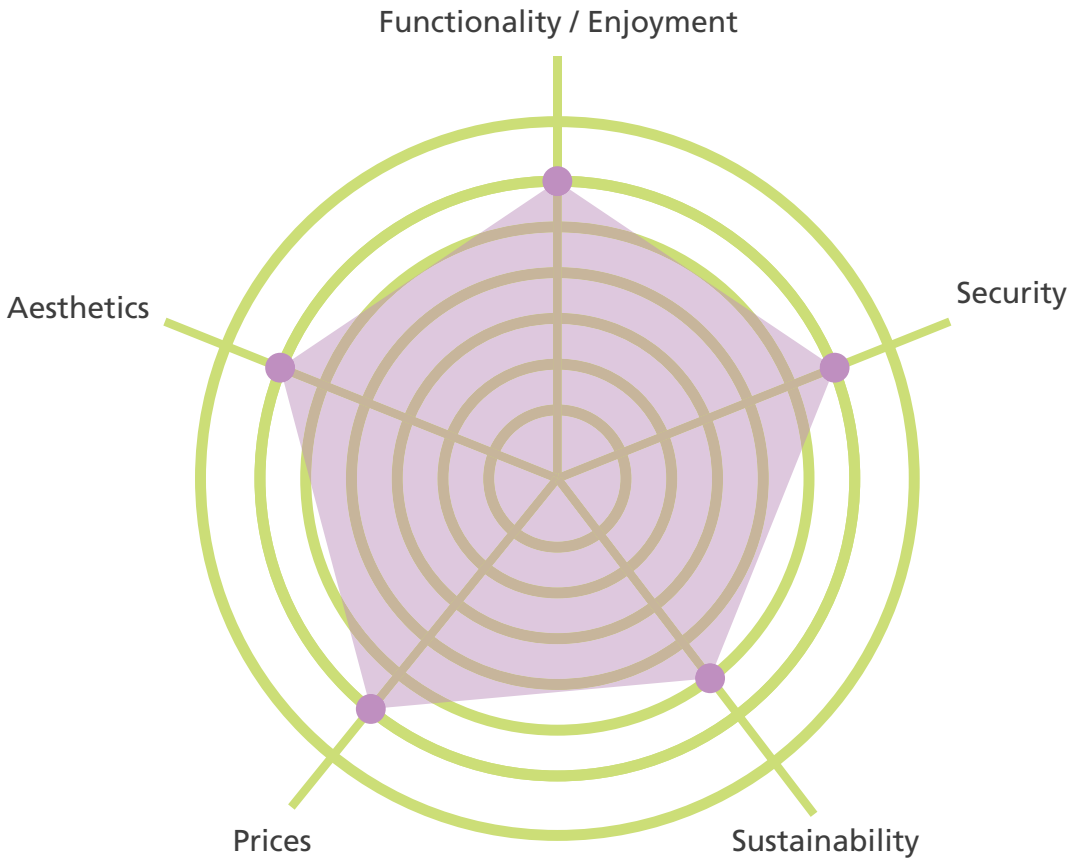


Figure 28 - Lego hidden side (Font: https://www.lego.com/en–us/service/help/bricks–building/brick–facts/what–lego–bricks–are–made–from–408100000007855 Retrieved: 27 April 2021).
Figure 29 - Radar chart about Lego hidden side (Source: Re–searcher, 2021).

2.3.1.B) PLUGO

Aesthetics:

Texture – There are two types of textures, the soft textile from the pad and the shiny plastic from the pieces that children use to play.

Geometry (shape) – Has different shapes for different games, most of them are rounded and soft for children to safely handle it.

Emotional connection – It doesn't establish a deep emotional connection. It's used to play simple games for cognitive development on the screen, it uses just games and normal characters to help the kids progress on the games.

Physical characteristics:

Material – It's made in ABS mostly and uses a textile on the support pad.

Weight – Depending on the amount of expansions that are acquired the weight will change but never being too much besides the tablet. About 50 g max.

Moving parts – It has a lot of different moving parts, the more expansions the more parts will have, they are all relatively small but not small enough to be sold.

Social integrity:

Security – Looks very secure, rounded parts and easy to use for the children no harm is seen in general using this game.

Prices – Around 50 euros at the beginning and then every expansion goes for 30 euros each.

Sustainability – As the other toys it's made in ABS, showing again durability and being able to resist time being used more.

Information:

How it works – It has different pieces, a pad and the tablet, the game will be shown on the tablet and the game will be played only using the pieces. These pieces are placed in the specific place on the pad and with the different symbols reading on the different backs of the toys being read by the tablet's camera, it creates an action on the screen.

What makes it better – It can be used without grabbing the tablet and only using the toys is different from the others and the fact that it reads the different meanings from all the others makes this an interactive toy.

Functionality – Looks functional and easy to learn and connect, the only problem being the carrying of all the accessories that the game has, having to carry the pad and the tablet and the pieces is not easily portable.

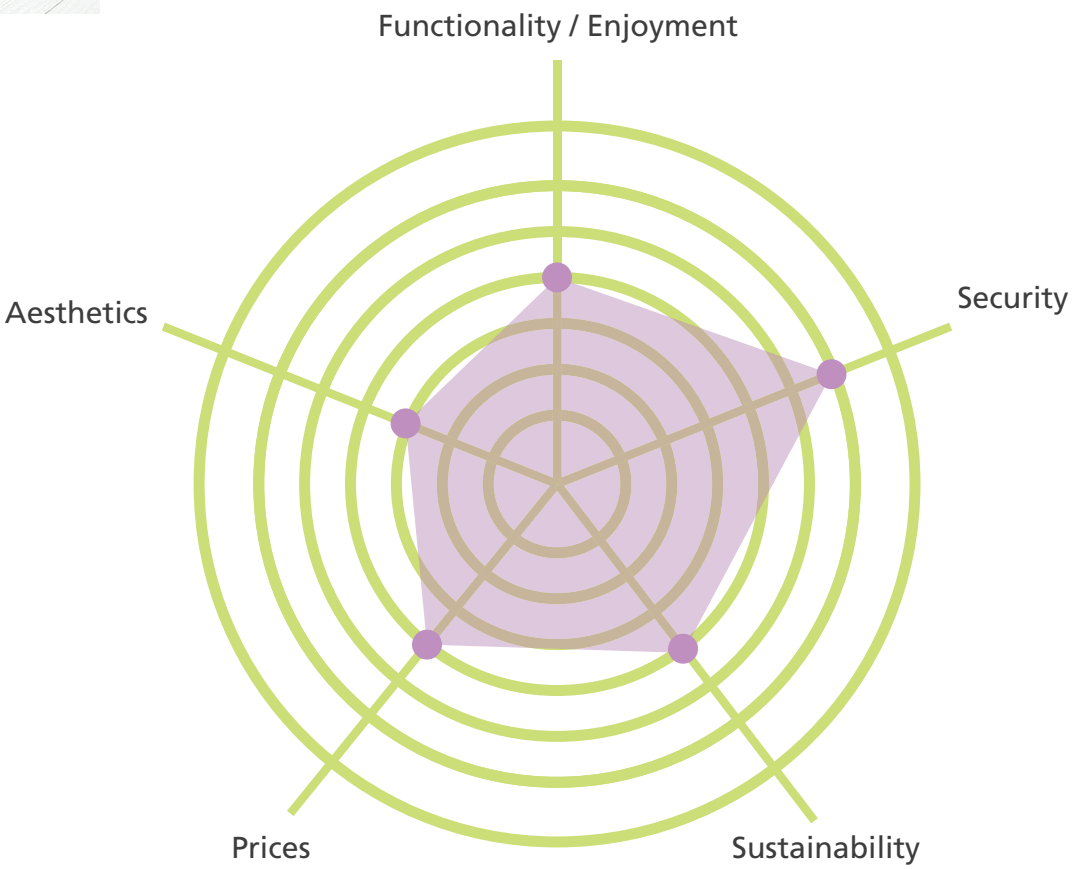


Figure 30 - Plugo (Font: https://www.playshifu.com/plugo Retrieved: 27 April 2021).
Figure 31 - Radar chart about Plugo (Source: Researcher, 2021).

2.3.1.C) LUMOPLAY

Aesthetics:

Texture – A plastic case, just like a normal projector.

Geometry (shape) – Simple, rectangular projector, showing no creativity on the product itself, only planning the interaction.

Emotional connection – No emotional connection with the game, just simple games for entertainment and interaction.

Physical characteristics:

Material – Plastic and electrical components.

Weight – Heavy, about 3 kg.

Moving parts – Has 3 different parts installed and stays in the same place. It's not advised to assemble and disassemble it often.

Social integrity:

Security – Can be dangerous, when multiple children are playing at the same time. Also if the device is not well installed it can be dangerous if it falls from the ceiling.

Prices– It's very pricey at 1700 euros.

Information:

How it works – It's a projection assembled on the ceiling, that projects the game and a sensor equipment installed to read the movement and send the information to the computer on the base, creating the game with the physical movement of the children, being able to play a lot of different interaction games with movement.

What makes it better – The ability to play with a projection and having a more gross motor skill worked on, creating physical and digital games.

Functionality – Difficult to install and heavy and can be dangerous and does not have mobility at all. Can be used in a fun park or in a restaurant for children's temporary entertainment, the price can be unexecutable.

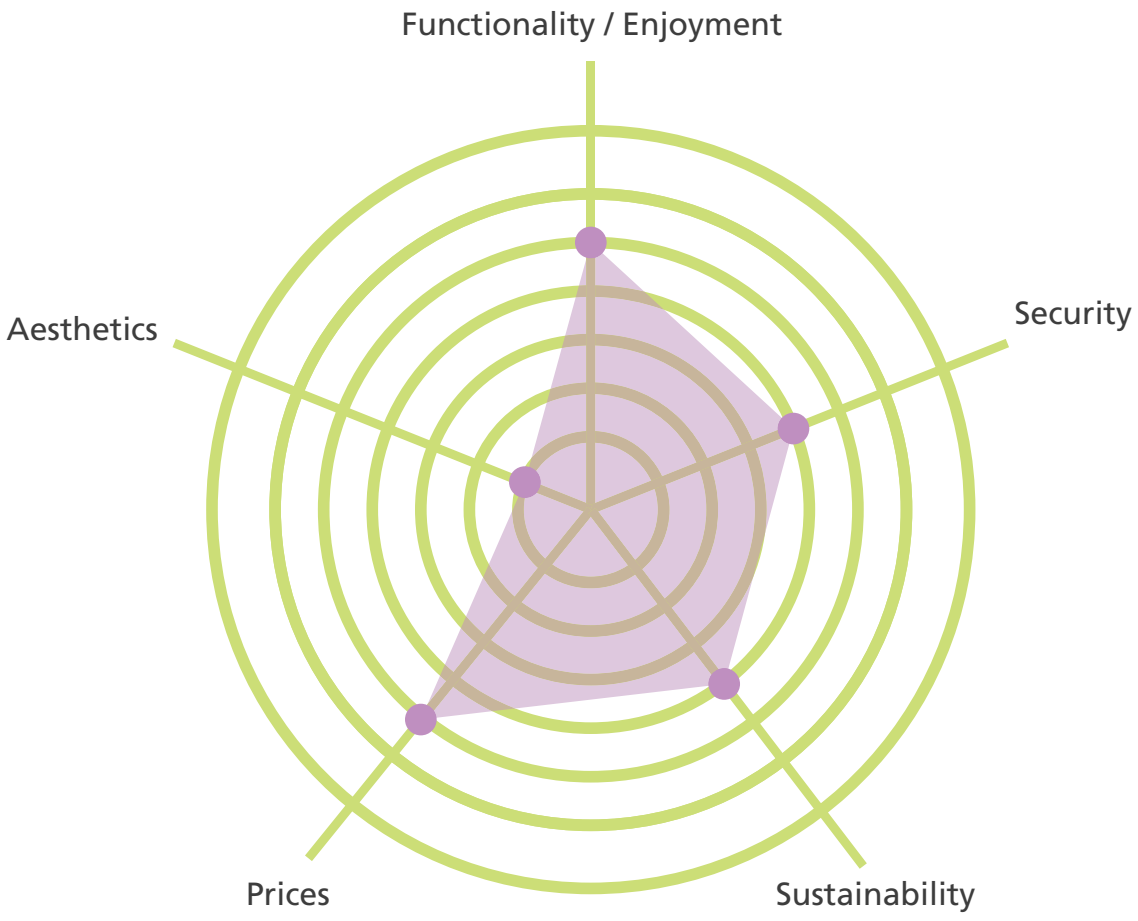


Figure 32 - Lumoplay (Font: https://www.lumoplay.com/hardware/interactive-floor-projector Retrieved: 26 April 2021).
Figure 33 - Radar chart about Lumoplay (Source: Researcher, 2021.)

2.3.1.D) DASH

Aesthetics:

Texture – Plastic smooth and shiny.

Geometry (shape) – Round and fun looking a combination of various spheres creating his body.

Emotional connection – It as a big round eye in the centre of the sphere that looks like the head of the body, appearing that he has an eye, creating a more friendly-looking appearance, like a small friend, and also being able to do stuff on his own making him feel more human and more connected emotionally to the children, which is helpful to teach children to use it with care.

Physical characteristics:

Material – ABS plastic, motor parts, wheels, LED lights and batteries.

Weight – Around 1 kg

Moving parts – Has accessories that are removable and add to the moving parts.

Social integrity:

Security – There are no sharp ends or any harmful engines for kids fingers, the only precaution would be to be aware of the toy when being played on the floor, avoiding tripping over the toy.

Prices – High price in comparison to some of the others going around 140 euros, and this is only before buying all the accessories associated.

Sustainability – There is not much information about its sustainability, but from the evaluation around it we can understand that they want the product to have a long life, that's also why they create the emotional connection with the different features of the toy.

Information:

How it works – It is a tiny robot that you can connect to a tablet and play games, it can also react to different sounds and commands and can move freely.

What makes it better – It expands kids' creativity with different expectations, it can also be kind of a friend or a pet for children to play with, also evolving their codding capability and can be enjoyed with a group of friends and also an adult.

Functionality – It's easy to program, can have some difficulties with the Bluetooth connection but the activities are smooth and easy to understand but they can also be a little bit challenging if they want it.

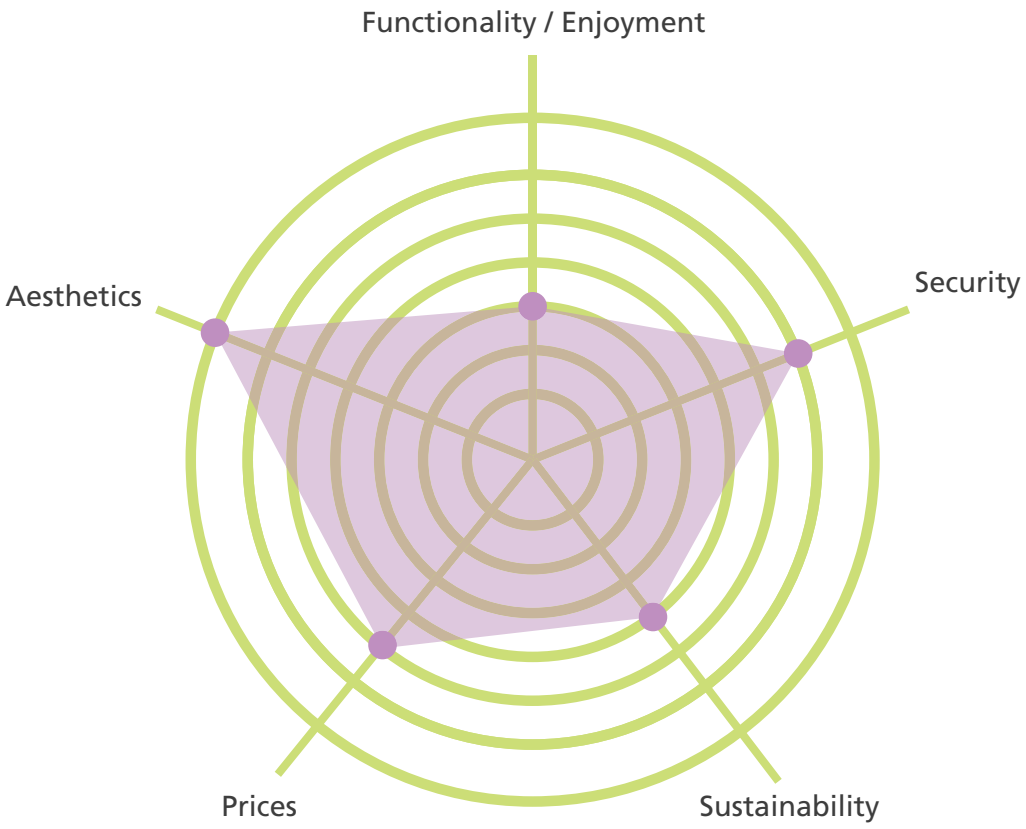


Figure 34 - Dash (Font: https://www.makewonder.com/robots/dash/ Retrieved: 27 April 2021).
Figure 35 -Radar chart about Dash (Source: Researcher, 2021.)

2.3.1.E) TORI

Aesthetics:

Texture – Cardboard and plastic, smooth and not sensory over-loaded.

Geometry (shape) – The shape varies in what piece is being used but is based in geometrical shapes.

Emotional connection – Can create a deeper connection with the toy because of the ability to personalize the game as you play it and innovate on it being way more emotionally stimulating and giving something more than the games. It doesn't give a lot of learning skills, instead it helps more on fine motor skills.

Physical characteristics:

Material – ABS and cardboard.

Weight– Light max 10g

Moving parts – It has various moving parts but only one of them is small and that could cause harm, the other parts are in plastic and long and the rest is made out of cardboard and mounted by the children after decoration.

Social integrity:

Security – Looks secure with nothing to complain about its use besides the size of the small controller pointer.

Prices – High, compared to some others. It's around 110 euros, but after that you don't have to buy more accessories or expectations.

Sustainability – Can be more sustainable than the others, this one has mostly paper or cardboard pieces and only some with plastic on the pen/controler point and the base.

Information:

How it works – This is a small toy connected to a tablet with a pad where the sensors connect to the small parts and make it interactive in the air with the games having different games connected to the tablet. They also have small cardboard pieces where the child can decorate and assemble to use it during the game being a lot more personalised and creative.

What makes it better – The ability to decorate and assemble the other pieces with the cardboard molds gives it a more creative interaction than the other ones making it more fun to use.

Functionality – From the reviews it works well with no problems, the connections are very easy to use and assemble.

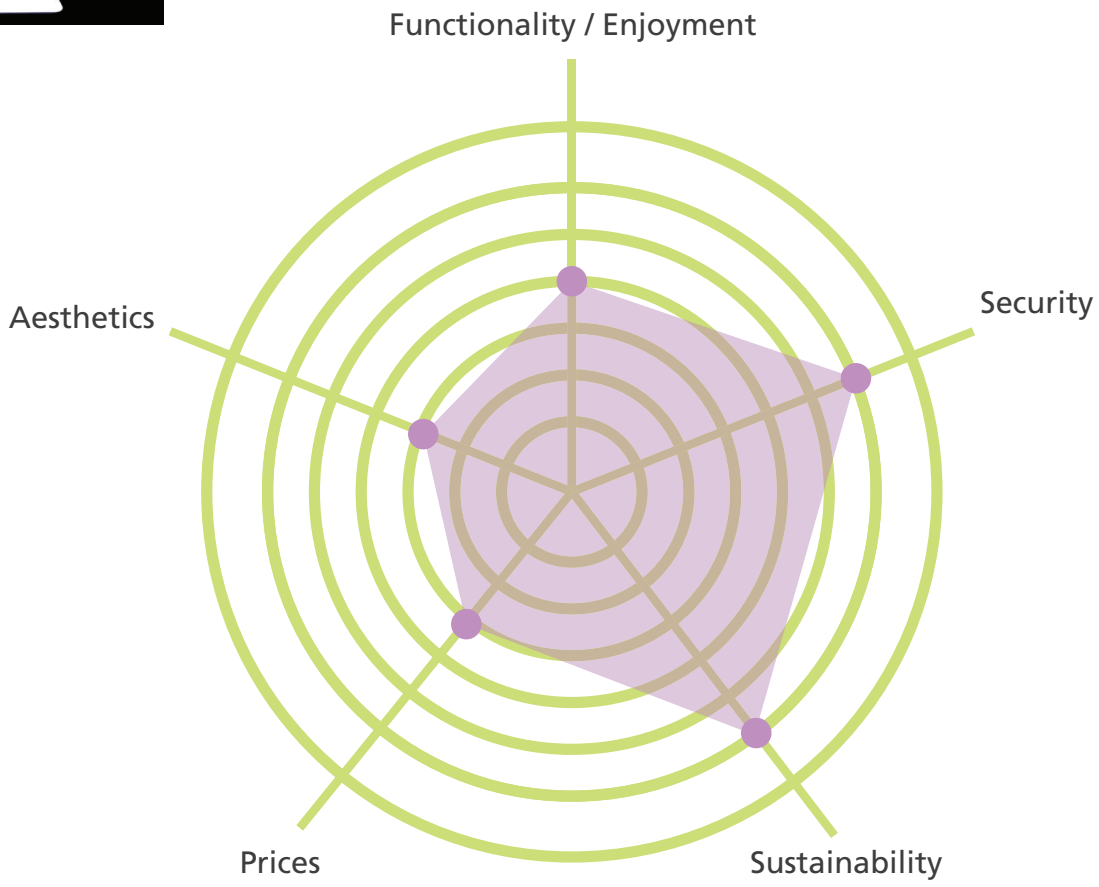


Figure 36 - Tori (Font: https://www.playstation.com/pt-pt/games/ratchet-and-clank-rift-apart/ Retrieved: 27 April 2021).
Figure 37 - Radar chart about Tori (Source: Researcher, 2021.)

2.3.1.F) MELBITS POD

Aesthetics:

Texture – Plastic with a matte finish feeling like velvet, fuzzy and soft.

Geometry (shape) – It's a long oval shape just like an egg.

Emotional connection – This can have a big emotional connection, the foundation of the game is to have a "baby" that is created inside the egg and it grows, you take care of him and then you get to have the baby inside your tablet. Just like the old school Tamagotchis.

Physical characteristics:

Material – ABS plastic, motor components, LED lights.

Weight – Light and easy to carry

Moving parts – No moving parts.

Social integrity:

Security – Nothing in it indicates unsafe use of the toy for children.

Prices – Can be expensive for the amount of play possibilities that it brings, rounding the 60 euros.

Sustainability – No added information about their sustainability approach. From the research we can say that the product does not appear sustainable at all in their choices of use, even if we talk about its emotional connection, the gameplay is not interesting enough to be a game to keep around for a long time.

Information:

How it works – This is a Pod, an egg, that you connect to a tablet and you get to virtually attach "babies" that will be the characters that you will play with on the tablet games. The idea is to conserve the egg in different places and with different feeding times creating different characters.

What makes it better – That it is small and obligates the child to create a sense of care for the object to care for their characters while they grow, but can become boring really fast.

Functionality – Easy to use, it only has to be turned on and connected to a tablet and the playtime is normal just like any other game. Easy to use and interact.

Figure 38 - Melbits Pod (Font: https://melbitspod.com/ Retrieved: 5 May 2021).
Figure 39 - Radar chart about Melbits Pod (Source: Researcher, 2021.)

2.3.1.G) PUPPY CUBE: INTERACTIVE TOUCH-SCREEN PROJECTOR

Aesthetics:

Texture – Soft and shiny looking and with holes on the sides.

Geometry (shape) – Just a simple parallelepiped shape. Boring and serious-looking doesn't feel like a game for kids.

Emotional connection – There is no actual emotional connection with the product because we interact more with the projection than with the product.

Physical characteristics:

Material – ABS and glass or acrylic (not specified), projection engines and other additional materials for a projection mechanism.

Weight – Around 2 kg.

Moving parts – There are no moving parts or accessories added.

Social integrity:

Security – Its security for children can feel not safe at all, it is heavy and can be knocked by the children breaking some pieces that can hurt them, or even just by falling on their small hands, definitely needs adult supervision.

Prices – It is around 900 euros, expensive for a product to just be used for kids

Sustainability – It is not presented as a preoccupation in the team, the overall view is that it's not a sustainable product.

Information:

How it works – It's a projector that can be connected anywhere and can be used in various positions, it is also touch and interactive. Creating a projector that works also as a tablet.

Functionality – It is functional for a projector it's well thought to be used straight or on the side, it can change and focus in any position. But evaluating it for kids, it can only be used if they are being supervised by an adult while playing.

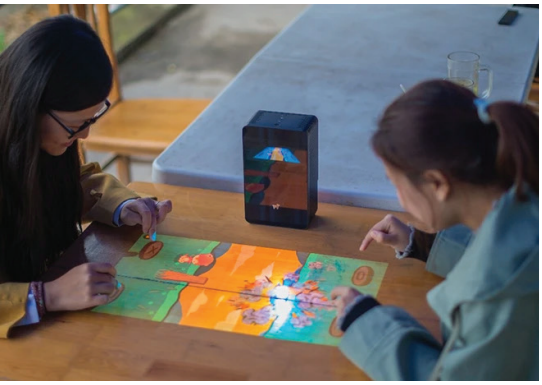


Figure 40 - Puppy Cube (Font: https://store.puppyrobot.com/products/puppy-cube-purchase-page Retrieved: 27 April 2021).
Figure 41 - Radar chart about Puppy Cube (Source: Researcher, 2021.)

Chapter 3 – Hypothesis

Chapter 3 – Hypothesis

It is possible to create an inclusive didactic toy that can stimulate kids between the ages of 3 and 7 that improve their learning experience, combining digital and physical features.

Chapter 4 – Active investigation and development

Chapter 4 - Active investigation and development

4.1.1. Online questionnaires made in a first attempt to understand the problematic:

4.1.1.A) TEACHERS

Questionário para professores do 1º Ciclo.
Este questionário foi realizado com o objetivo de recolher informação para o desenvolvimento de um projeto/serviço para ajudar crianças com mais dificuldades de aprendizagem.
Este projeto está a ser desenvolvido por uma aluna da Faculdade de Arquitetura de Lisboa no Mestrado de Design de Produto.
Muito obrigada pela colaboração,
Ema Reaes Rodrigues
*Obrigatório

1- Idade *
2- Qual a disciplina em que as crianças demonstram mais interesse? *
Português
Matemática
Educação Artística
Estudo do Meio
Inglês
Educação Musical
Educação Física
Outra:
3- Sente que as aulas são personalizadas o suficiente para as crianças? *
Sim
Não
4- Tem tempo e/ou flexibilidade suficientes para personalizar as aulas? *
Sim
Não
5- Precisa de mais apoio na sala de aula? *
Sim

Não
6- O que sente que poderia melhorar na sala de aula? *
Mais tempo de acompanhamento com cada aluno.
Aplicar um ajudante na sala de aula (robô, IA, professores em formação)
Aplicar menos matéria obrigatória.
Atividades mais lúdicas (jogos de tabuleiro, teatros, jogos eletrónicos)
Outra:
7- Em qual/quais desta/destas situação/situações considera mais importante acompanhamento psicológico a um aluno? *
Falta de atenção.
Mau comportamento.
Baixo aproveitamento.
Dificuldade em comunicar com outros.
Outra:
8- Que estratégias aplica aos seus alunos com mais dificuldades? *
Dedicar mais tempo de acompanhamento.
Adotar abordagens diferentes para os estimular.
Explicar várias vezes a mesma matéria.
Fazer um maior acompanhamento no final da aula.
Outra:
9- Acha que a implementação de novas tecnologias pode beneficiar os alunos e aumentar o seu aproveitamento escolar? *
Sim
Não
10- Estaria disposto a experimentar novas tecnologias na sala de aula? *
Sim
Não
Talvez
10.1- Se sim, quais?
Tablets individuais
Robô interativo
Smart boards
Realidade aumentada
Realidade virtual
Outra:
10.2- Se não, porquê?

4.1.1.B) ANALYSIS: TEACHERS

23 respostas

1- Idade *

Idades entre os 20 e os 59.

2- Qual a disciplina em que as crianças demonstram mais interesse? *

Português – 0%

Matemática –5,9%

Educação Artística – 29,4%

Estudo do Meio – 47,1%

Inglês – 0%

Educação Musical – 5,9%

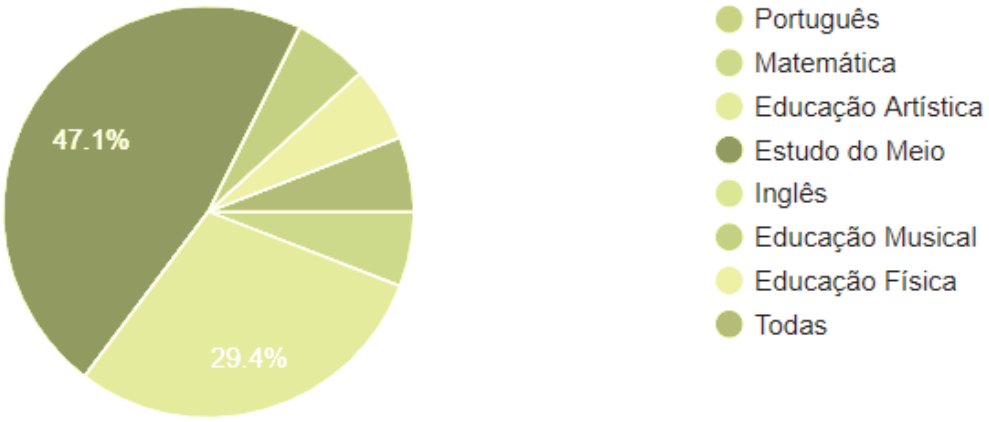
Educação Física – 5,9%

Outra: Todas – 5,9%

3- Sente que as aulas são personalizadas o suficiente para as crianças? *

Sim – 82,4%

Não – 17,6%

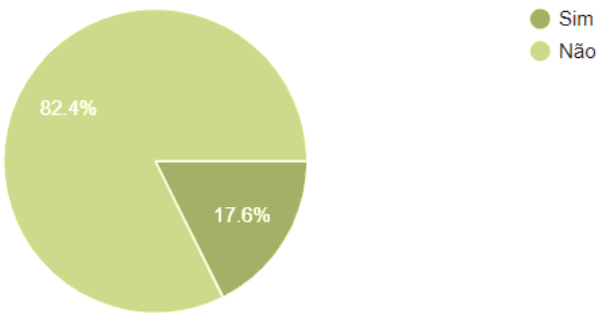


Graphics 1 - Analysis: Teachers – answer to question 2 (Source: Researcher, 2021).

4- Tem tempo e/ou flexibilidade suficientes para personalizar as aulas? *

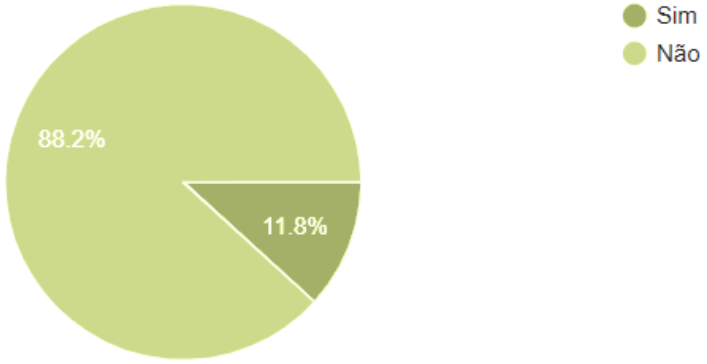
Sim – 88,2%

Não – 11,8%



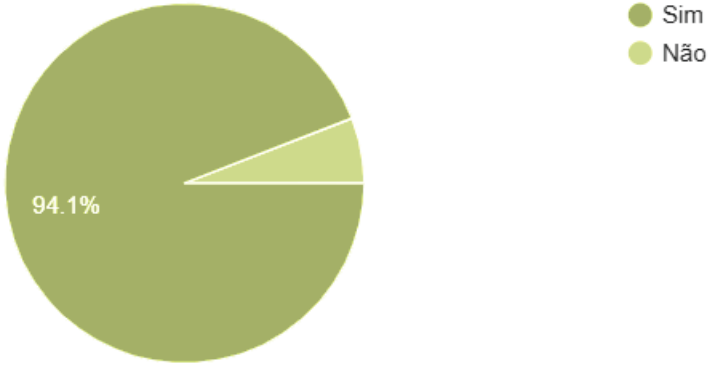
Graphics 2 - Analysis: Teachers – answer to question 3 (Source: Researcher, 2021).

5– Precisa de mais apoio na sala de aula? *
Sim – 94,1%
Não – 5,9%



Graphics 3 - Analysis: Teachers – answer to question 4 (Source: Researcher, 2021).

6– O que sente que poderia melhorar na sala de aula? *
Mais tempo de acompanhamento com cada aluno. – 76,5%
Aplicar um ajudante na sala de aula (robô, IA, professores em formação) – 52,9%



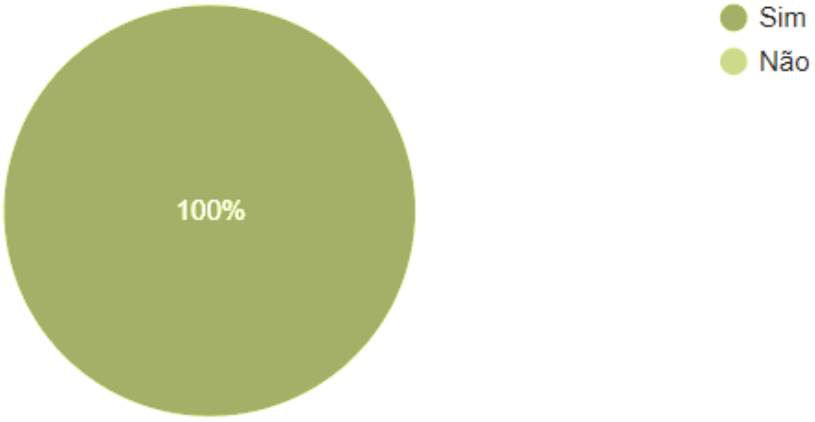
Graphics 4 - Analysis: Teachers – answer to question 5 (Source: Researcher, 2021).

Aplicar menos matéria obrigatória. – 52,9%
Atividades mais lúdicas (jogos de tabuleiro, teatros, jogos eletrónicos) – 41,2%
Outra: Turmas com número de alunos mais reduzido – 5,9%

7– Em qual/quais desta/destas situação/situações considera mais importante acompanhamento psicológico a um aluno? *
Falta de atenção. – 47,1%
Mau comportamento. – 47,1%
Baixo aproveitamento. – 58,8%
Dificuldade em comunicar com outros. 58,8%
Outra:
8– Que estratégias aplica aos seus alunos com mais dificuldades? *
Dedicar mais tempo de acompanhamento. – 64,7%
Adotar abordagens diferentes para os estimular. – 94,1%

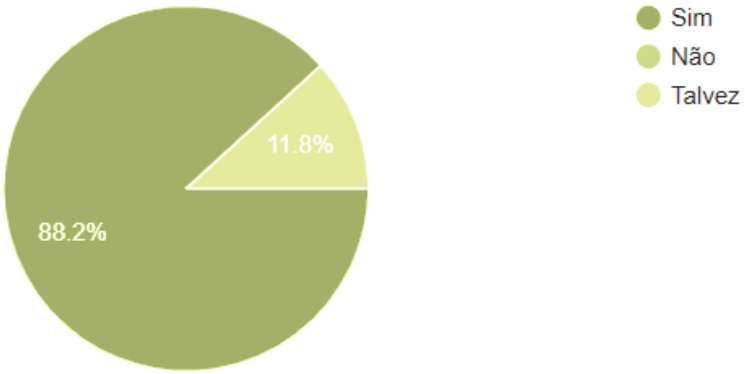
Explicar várias vezes a mesma matéria. – 47,1%
Fazer um maior acompanhamento no final da aula. 17,6%
Outra: Adaptar a planificação e usar o trabalho a pares –5,9%
Outra: Trabalhos de casa adaptados. – 5,9%

9– Acha que a implementação de novas tecnologias pode beneficiar os alunos e aumentar o seu aproveitamento escolar? *
Sim – 100%
Não – 0%
10– Estaria disposto a experimentar novas tecnologias na sala de aula? *
Sim – 88,2%



Graphics 5 - Analysis: Teachers – answer to question 9 (Source: Researcher, 2021).

Não – 0%
Talvez – 11,8%
10.1– Se sim, quais?
Tablets individuais – 88,2%



Graphics 6 - Analysis: Teachers – answer to question 10 (Source: Researcher, 2021).

Robô interativo – 47,1%
Smart boards – 35,3%
Realidade aumentada – 17,6%
Realidade virtual – 35,3%
Outra:

10.2– Se não, porquê?

4.1.1.C) PARENTS AND CHILDREN

Questionário a pais de crianças entre os 6 e os 10, ou com filhos que tiveram dificuldades na escola nessas idades. Este questionário é destinado a encarregados de educação cujo os educandos têm/ tiveram dificuldades na escola entre os 6 e os 10 anos. Este questionário foi realizado com o objetivo de recolher informação para o desenvolvimento de um projeto/ serviço para ajudar crianças com dificuldades de aprendizagem. Este projeto está a ser desenvolvido por uma aluna da Faculdade de Arquitetura de Lisboa no Mestrado de Design de Produto.

Muito obrigada pela colaboração,

Ema Reaes Rodrigues

*Obrigatório

1-Idade *

2-Idade do seu educando *

3-Qual a disciplina que o seu educando mais gosta/gostava? *

Português

Matemática

Educação Artística

Estudo do Meio

Inglês

Educação Musical

Educação Física

Outra:

4-O seu educando teve dificuldades na adaptação à escola, na transição de jardim de infância para o 1º

ciclo? *

Sim

Não

5-O seu educando sente/sentiu dificuldade em tirar dúvidas na sala de aula? *

Sim

Não

6-O seu educando foi acompanhado por um psicólogo durante algum período do 1º ciclo? *

Sim

Não

6.1- Se sim que tipo de comportamentos foram detetados no seu educando?

Dificuldade de aprendizagem.

Recusa escolar.

Hiperatividade ou agitação em excesso.

Ansiedade, medo ou preocupação em excesso.

Dificuldade em adormecer e pesadelos frequentes.

Agressividade e violência.

Dificuldade em socializar.

Outra:

7-Consegue ajudar o seu educando com trabalhos de casa? *

Com muita dificuldade

1 2 3 4 5

Sem dificuldades

8-Tem tempo para ajudar o seu educando com trabalhos de casa?

Não tenho tempo

1 2 3 4 5

Muito tempo

9-O seu educando frequenta/frequentou aulas online? (relativamente ao 1º ciclo) *

Sim

Não

Educação na pandemia.

10-Em situação de pandemia foi difícil a adaptação ao online?

Pouco difícil

1 2 3 4 5

Muito difícil

11-Que tipo de aulas prefere o seu educando? *

Aulas presenciais.

Aulas online.

12-Tendo em conta o potencial retorno às aulas online. Considera a disciplina de tecnologias importante para o desenvolvimento do seu educando? *

Pouco importante

1 2 3 4 5

Muito importante

Utilização de novas tecnologias na educação.

13-Apoiaria a utilização de novas tecnologias para auxiliar o seu educando na escola? *

Sim

Não

Talvez

13.1-Se sim, qual destas tecnologias acharia mais eficaz?

Tablets

Robô interativo

Smart boards

Realidade aumentada

Realidade virtual

Outra:

Se não, porquê?

4.1.1.D) ANALYSIS: PARENTS AND CHILDREN

32 Respostas

1-Idade *

Entre os 25 e os 54 anos.

2-Idade do seu educando *

Maioria entre os 6 e os 12 e alguns mais velhos, ajudam na compreensão das situações que não mudaram com o passar dos anos.

3-Qual a disciplina que o seu educando mais gosta/gostava? *

Português - 12,5%

Matemática - 16,7%

Educação Artística - 4,2%

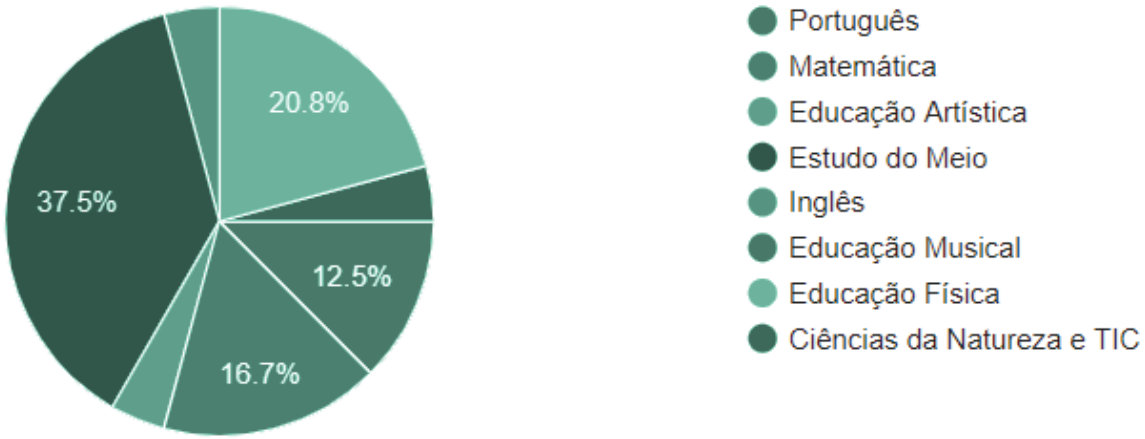
Estudo do Meio - 37,5%

Inglês - 4,7%

Educação Musical - 0%

Educação Física - 20,8%

Outra: TIC -4,2%

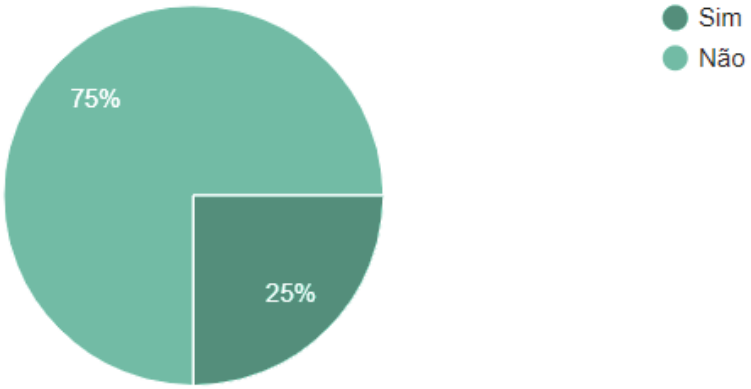


Graphics 7 - Analysis: Parents and children - answer to question 3 (Source: Researcher, 2021).

4–O seu educando teve dificuldades na adaptação à escola, na transição de jardim de infância para o 1º ciclo? *

Sim – 75%

Não – 25%

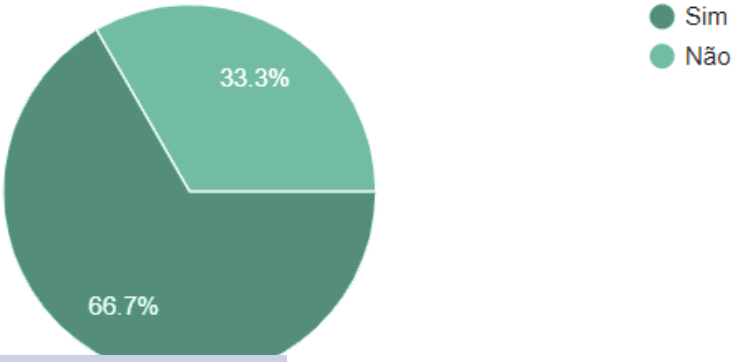


Graphics 8 - Analysis: Parents and children – answer to question 4 (Source: Researcher, 2021).

5–O seu educando sente/sentiu dificuldade em tirar dúvidas na sala de aula? *

Sim – 66,7%

Não – 33,3%

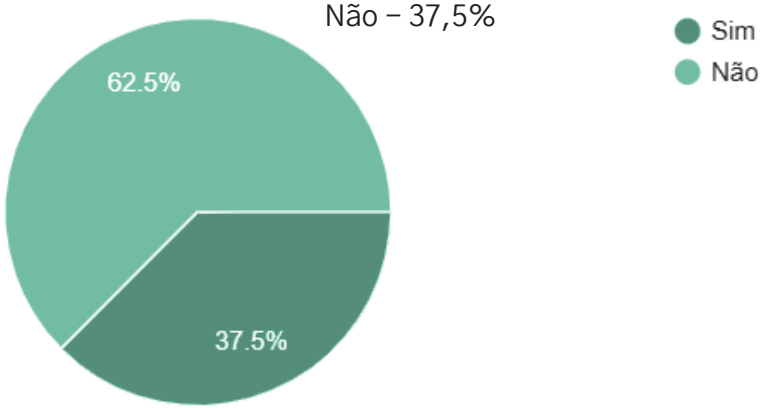


Graphics 9 - Analysis: Parents and children – answer to question 5 (Source: Researcher, 2021).

6–O seu educando foi acompanhado por um psicólogo durante algum período do 1º ciclo? *

Sim – 62,5%

Não – 37,5%



Graphics 10 - Analysis: Parents and children – answer to question 6 (Source: Researcher, 2021).

6.1–Se sim que tipo de comportamentos foram detetados no seu educando?

Dificuldade de aprendizagem. – 60%

Recusa escolar. – 20%

Hiperatividade ou agitação em excesso. – 10%

Ansiedade, medo ou preocupação em excesso. – 20%

Dificuldade em adormecer e pesadelos frequentes. – 0%

Agressividade e violência. – 0%

Dificuldade em socializar. – 60%

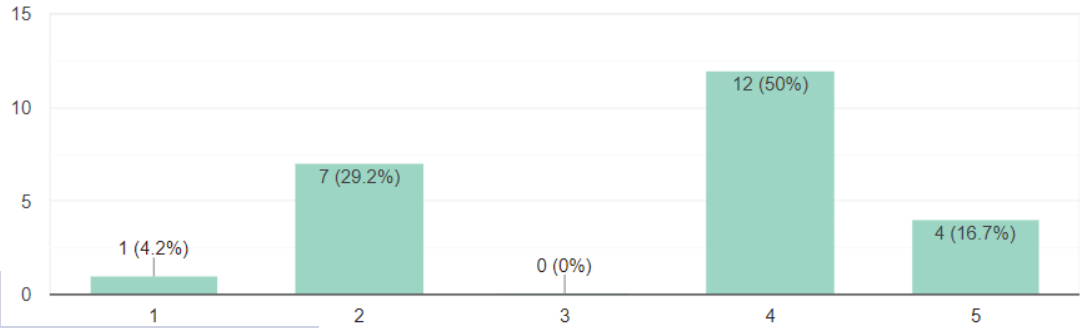
Outra: Dificuldade em concentração – 10%

7–Consegue ajudar o seu educando com trabalhos de casa? *

Com muita dificuldade

1– 4,2%2– 29,2% 3– 0% 4– 50% 5– 16,7%

Sem dificuldades



Graphics 11 - Analysis: Parents and children – answer to question 7 (Source: Researcher, 2021).

8–Tem tempo para ajudar o seu educando com trabalhos de casa?

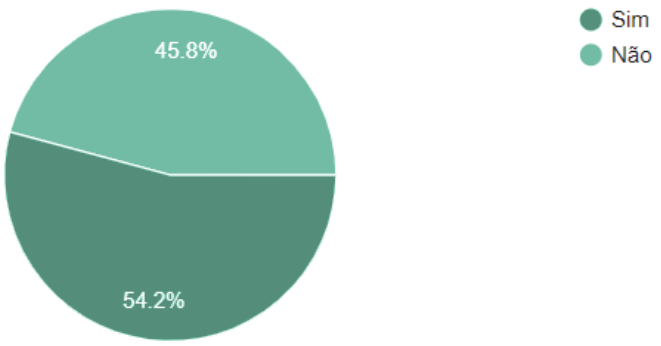
Não tenho tempo

1– 0% 2– 16,7% 3– 37,5% 4– 33,3% 5– 12,5%

Muito tempo

9–O seu educando frequenta/frequentou aulas online? (relativamente ao 1º ciclo) *

Sim– 45,8%



Graphics 12 - Analysis: Parents and children – answer to question 9 (Source: Researcher, 2021).

Educação na pandemia.

10–Em situação de pandemia foi difícil a adaptação ao online?

Pouco difícil

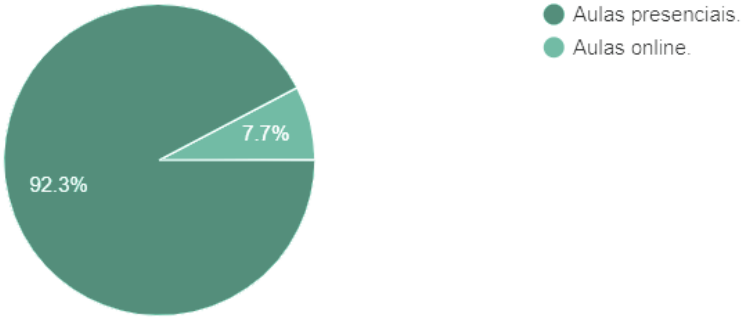
1–15,4% 2–15,4% 3– 7,7% 4– 46,2% 5– 15,4%

Muito difícil

11–Que tipo de aulas prefere o seu educando? *

Aulas presenciais. – 92,3%

Aulas online. – 7,7%



Graphics 13 - Analysis: Parents and children – answer to question 11 (Source: Researcher, 2021).

12–Tendo em conta o potencial retorno às aulas online. Considera a disciplina de tecnologias importante para o desenvolvimento do seu educando? *

Pouco importante

1– 7,7% 2– 0% 3– 7,7% 4– 38,5% 5– 46,2%

Muito importante

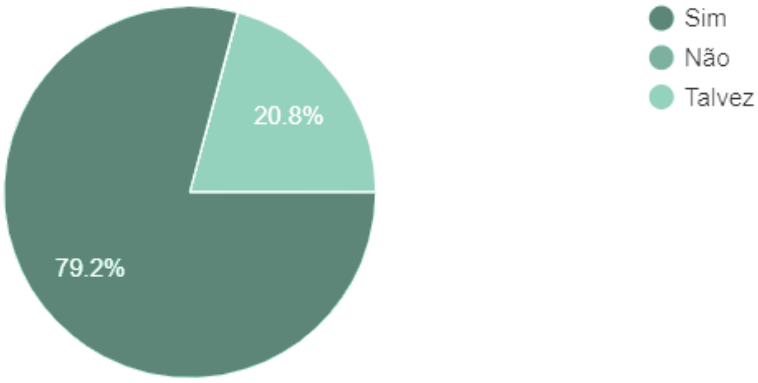
Utilização de novas tecnologias na educação.

13–Apoiaria a utilização de novas tecnologias para auxiliar o seu educando na escola? *

Sim– 79,2%

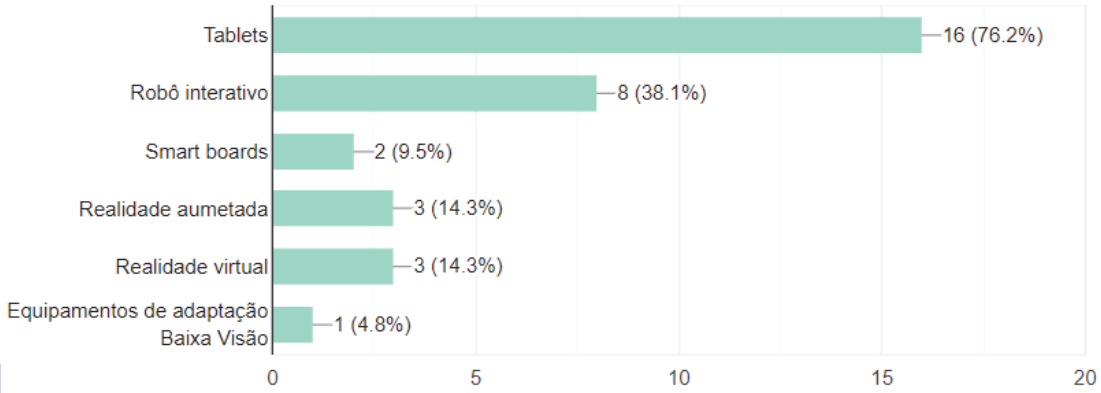
Não– 0%

Talvez– 20,8%



Graphics 14 - Analysis: Parents and children – answer to question 13 (Source: Researcher, 2021).

13.1Se sim, qual destas tecnologias acharia mais eficaz?
Tablets– 76,2%
Robô interativo– 38,1%
Smart boards– 9,5%
Realidade aumentada– 14,3%
Realidade virtual– 14,3%
Outra: Equipamentos de adaptação Baixa Visão – 4,8%
Se não, porquê?



Graphics 15 - Analysis: Parents and children – answer to question 13.1 (Source: Researcher, 2021).

4.1.1.E) PSYCHOLOGIST

Questionário a Psicólogos

Este questionário foi desenvolvido para psicólogos que lidam com o contexto escolar, especificamente com crianças dos 6 aos 10 anos, apesar de também se poder aplicar a outros psicólogos. O objetivo do questionário é recolher informação para o desenvolvimento de um projeto/serviço para ajudar crianças com dificuldades de aprendizagem. Este projeto está a ser desenvolvido por uma aluna da Faculdade de Arquitetura de Lisboa no Mestrado de Design de Produto.

Muito obrigada pela colaboração,

Ema Reaes Rodrigues

*Obrigatório

1-Idade *

2-Qual a sua área de especialização? (Se aplicável)

3-Na sua opinião as crianças têm um bom acompanhamento escolar? *

Sim

Não

4-Quais os comportamentos encontrados em crianças que precisam de apoio psicológico? *

Dificuldade de aprendizagem.

Recusa escolar.

Hiperatividade ou agitação em excesso.

Ansiedade, medo ou preocupação em excesso.

Dificuldade em adormecer e pesadelos frequentes.

Agressividade e violência.

Dificuldade em socializar.

Outra:

5-Como são encaminhadas essas crianças para o seu acompanhamento psicológico?

6-Com o início da pandemia conseguiu acompanhar todos os seus pacientes? *

Sim

Não

Apenas alguns

7-Houve um agravamento da saúde mental das crianças que acompanha? *

Pouco ou nada

1 2 3 4 5

Grande agravamento

8-Que exercício considera eficaz para o melhoramento dos seus pacientes com mais dificuldades escolares?

9-Existe algum produto (jogo, brinquedo, objeto) que ache eficaz para o melhoramento de alguns pacientes? *

Sim

Não

Outra:

10-Na sua opinião a incorporação de novas tecnologias podia ser relevante no melhoramento dos seus pacientes?

Sim (como a utilização de tablets com jogos interativos; a utilização de robôs; quadros interativos...)

Não

Outra:

11-Sentir-se-ia à vontade para experimentar novos projetos ou produtos que pudessem melhorar o estado psicológico dos seus pacientes? *

Sim

Não

Talvez

11.1-Se sim, gostaria de acompanhar o crescimento deste produto/serviço e/ou ajudar no seu desenvolvimento?

Pode deixar um e-mail e entraremos em contacto consigo com mais detalhes sobre o projeto.

4.1.1.F) ANALYSIS: PSYCHOLOGIST

7 respostas

1-Idade *

Entre os 23 e os 41.

2-Qual a sua área de especialização? (Se aplicável)

Psicologia clínica de saúde e infanto juvenil

3-Na sua opinião as crianças têm um bom acompanhamento escolar? *

Sim - 0%

Não – 100%

4–Quais os comportamentos encontrados em crianças que precisam de apoio psicológico? *

Dificuldade de aprendizagem. – 100%

Recusa escolar. – 60%

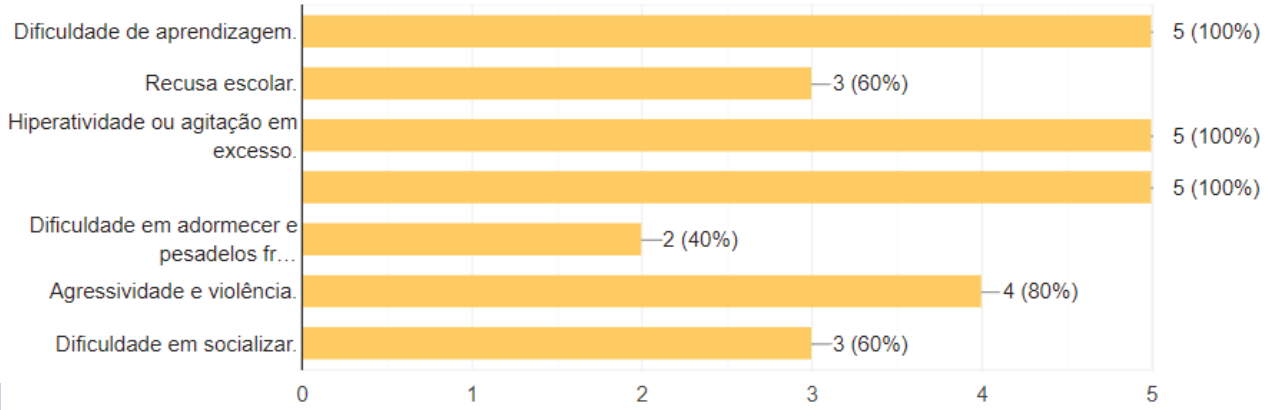
Hiperatividade ou agitação em excesso. – 100%

Ansiedade, medo ou preocupação em excesso. – 100%

Dificuldade em adormecer e pesadelos frequentes. – 100%

Agressividade e violência. – 40%

Dificuldade em socializar. – 80%



Graphics 16 - Analysis: Psychologist – answer to question 4 (Source: Researcher, 2021).

5–Como são encaminhadas essas crianças para o seu acompanhamento psicológico?

Pais, médicos de família, professores.

6–Com o início da pandemia conseguiu acompanhar todos os seus pacientes? *

Sim – 0%

Não – 0%

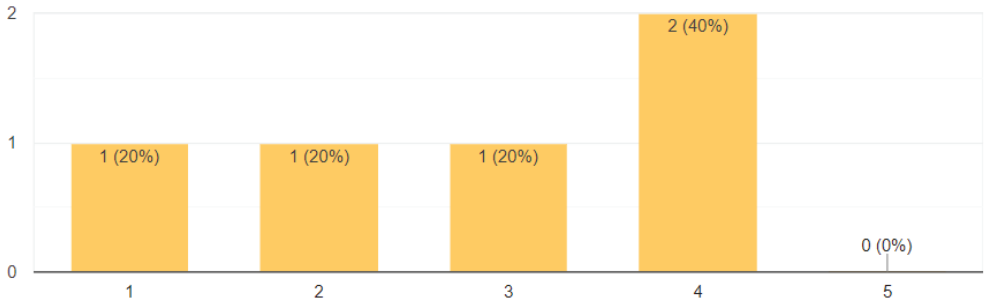
Graphics 17 - Analysis: Psychologist – answer to question 6 (Source: Researcher, 2021).

7–Houve um agravamento da saúde mental das crianças que acompanha? *

Pouco ou nada

1– 20% 2– 20% 3– 20% 4–40% 5– 0%

Grande agravamento



Graphics 18 - Analysis: Psychologist – answer to question 7 (Source: Researcher, 2021).

8–Que exercício considera eficaz para o melhoramento dos seus pacientes com mais dificuldades escolares?

Sem Respostas.

9–Existe algum produto (jogo, brinquedo, objeto) que ache eficaz para o melhoramento de alguns pacientes? *

Sim – 80%

Não – 20%

Outra: 0%

10–Na sua opinião a incorporação de novas tecnologias podia ser relevante no melhoramento dos seus pacientes?

Sim (como a utilização de tablets com jogos interativos; a utilização de robôs; quadros interativos...) 100%

Não– 0%

Outra:

11–Sentir-se-ia à vontade para experimentar novos projetos ou produtos que pudessem melhorar o estado psicológico dos seus pacientes? *

Sim – 100%

Não– 0%

Talvez– 0%

11.1–Se sim, gostaria de acompanhar o crescimento deste produto/serviço e/ou ajudar no seu desenvolvimento? Pode deixar um e-mail e entraremos em contacto consigo com mais detalhes sobre o projeto.

4.1.1.G) RELEVANT CONCLUSIONS FOR THE PROJECT

TEACHERS

With the teachers' analysis of the questionnaires, we can see that they think kids prefer "Estudo do Meio", and agree that the classes need more help, more personalisation and more time for attendance. Also it's difficult to detect when a kid needs more psychological help, the symptoms are not clear and it may be difficult to define when a kid needs professional help except when they have distinct situations. Also when asked if they would like new and different technologies applied to their class room they say yes and ask for tablets (probably the safe answer) and also ask for robots in second place so we can see some acceptance for this type of technology from the teachers.

PARENTS AND CHILDREN

Once again parents and children say that their favorite subject is "Estudo do Meio", most of them had difficulties in adapting to school, and also feel difficulties in expressing doubts, and also more than half were accompanied by a psychologist because of difficulties learning and socialising. There are a lot of parents that can help their kids but don't have time to help them with school homework. A lot of them say that they prefer presential classes and would also be happy with the implementation of tablets and robots in second place just like with the teachers.

PSYCHOLOGIST

Psychologists claim that the kids don't have a good support system from the schools just like the teachers. They also say that some of their patients started to have more health problems during the quarantine. They also agree in using new technologies to help the kids, stating that they would like to try them. In an informal conversation with one psychologist from AET, she claimed to be really interested in new ways to interact with kids and to understand data from schools to facilitate their work. She confirmed they al-

ready use dome sensory exercises on some of their patients, and that sometimes they even advise the parents to try and buy some for their children. She stated that the use of pets and other types of companions can help some children feel more secure with themselves and combat stress and anxiety.

4.1.2. NEW QUESTIONNAIRE

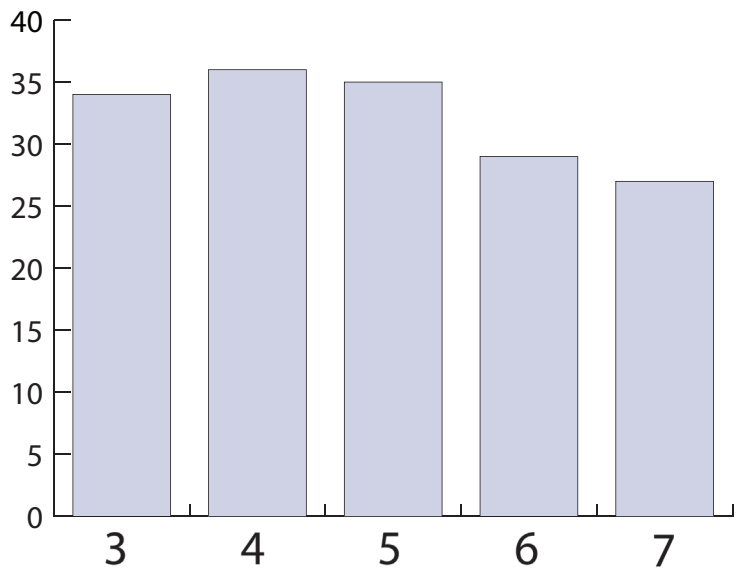
Questionário a encarregados de educação de crianças entre os 3 e os 7.

Este questionário é destinado a encarregados de educação com educandos nas idades entre os 3 e os 7 anos.

Este questionário foi realizado com o objetivo de recolher informação para o desenvolvimento de um projeto/serviço para ajudar crianças com dificuldades de aprendizagem, défice de atenção e mesmo crianças sem qualquer dificuldade, desenvolvendo um brinquedo que pudesse ajudar mais crianças no futuro e proporcionar diversão para os mais novos.

Este projeto está a ser desenvolvido por uma aluna da Faculdade de Arquitetura de Lisboa no Mestrado de Design de Produto.

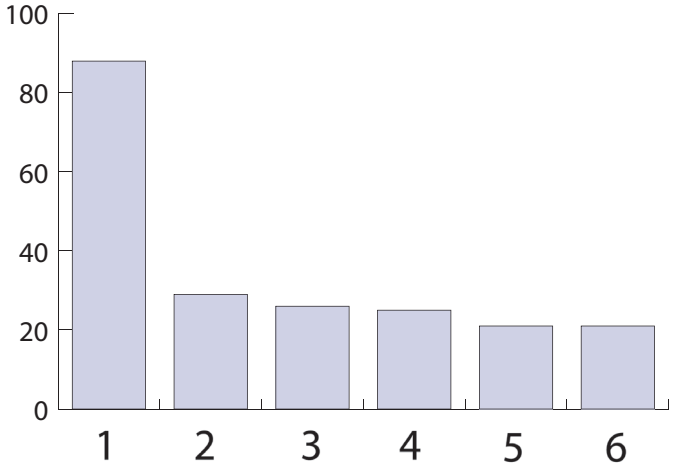
Muito obrigada pela colaboração,
Ema Reaes Rodrigues
165 respostas
1-Idade do seu educando*



Graphics 19 - Analysis: New Questionnaire to question 1 (Source: Researcher, 2021).

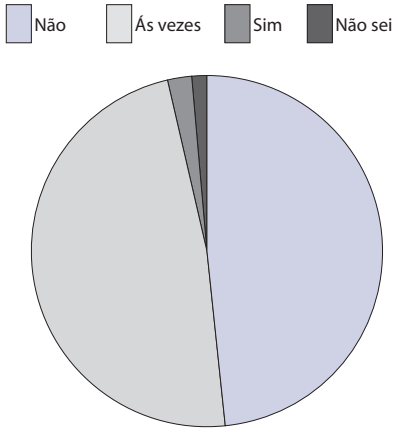
2–Qual destas atividades o seu educando mais gosta de fazer:*
Favorito:
Segundo favorito:
Outros menos relevantes:

1– Ouvir histórias contadas pelos pais
2– Brincar com os amigos
3– Ver bonecos animados na televisão
4– Jogar no tablet/telemóvel/consolas/PC
5– Ver vídeos no tablet/telemóvel
6– Brincar com brinquedos/jogos de tabuleiro



Graphics 20 - Analysis: New Questionnaire to question 2 (Source: Researcher, 2021).

3–O seu educando sente frustração quando tenta fazer atividades com ele?*
Sim
Às vezes
Não
Não sei



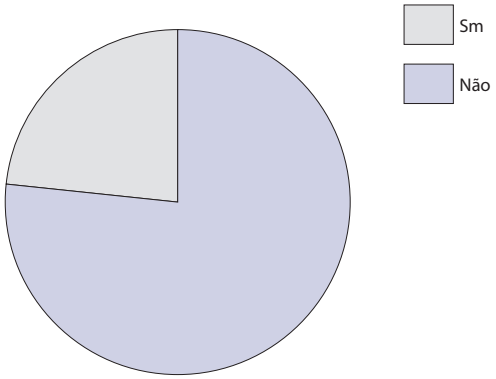
Graphics 21 - Analysis: New Questionnaire to question 3 (Source: Researcher, 2021).

Dificuldades

4–O seu educando tem algum tipo de dificuldade em aprendizagem?*

Sim

Não

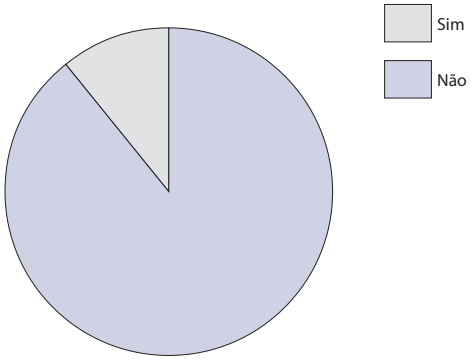


Graphics 22 - Analysis: New Questionnaire to question 4 (Source: Researcher, 2021).

5–Se sim, o seu educando está a ser acompanhado por algum profissional para o ajudar a melhorar?

Sim

Não



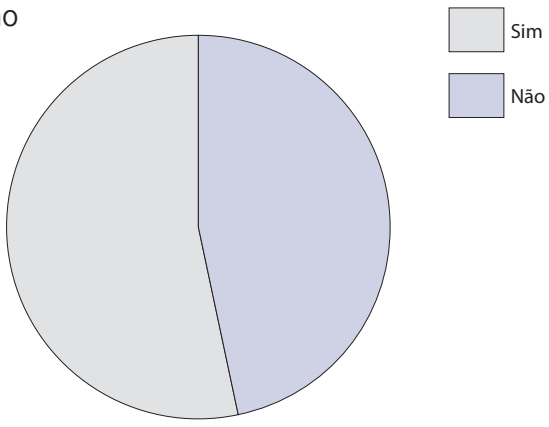
Graphics 23 - Analysis: New Questionnaire to question 5 (Source: Researcher, 2021).

Atividades online

6–O seu educando frequentou aulas online (relativamente ao pré-escolar)?*

Sim

Não



Graphics 24 - Analysis: New Questionnaire to question 6 (Source: Researcher, 2021).

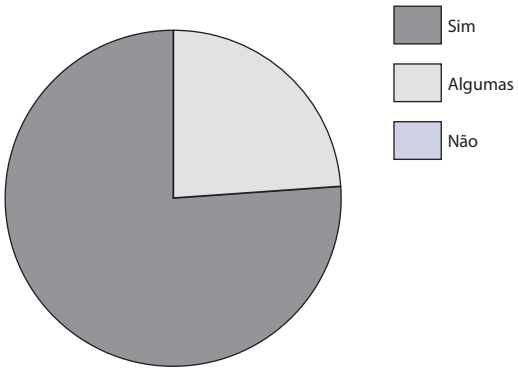
Atividades online continuação

7–Participaram nas atividades propostas?*

Sim

Algumas

Não



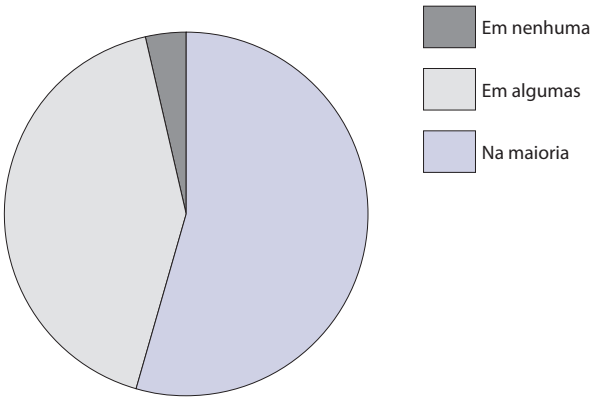
Graphics 25 - Analysis: New Questionnaire to question 7 (Source: Researcher, 2021).

8–Se sim, o seu educando mostrou interesse nessas atividades?

Na maioria

Em algumas

Em nenhuma



Graphics 26 - Analysis: New Questionnaire to question 8 (Source: Researcher, 2021).

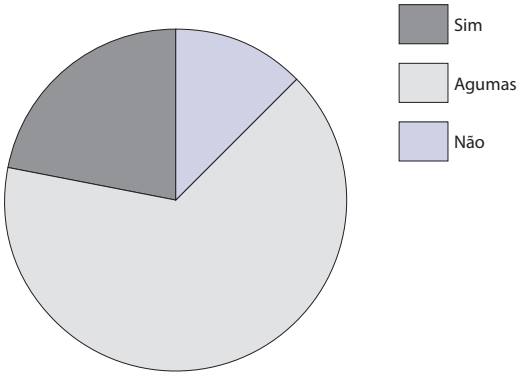
Brinquedos e tecnologias

9–Acha a utilização de novas tecnologias por crianças entre os 3 e os 7 apropriada?*

Sim

Algumas

Não



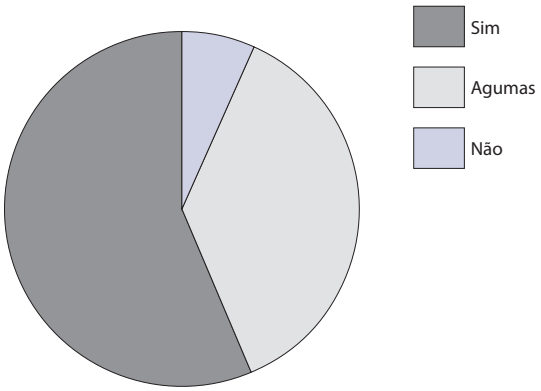
Graphics 27 - Analysis: New Questionnaire to question 9 (Source: Researcher, 2021).

10-Acha que essas tecnologias poderiam ajudar o desenvolvimento de algumas crianças?*

Sim

Talvez

Não



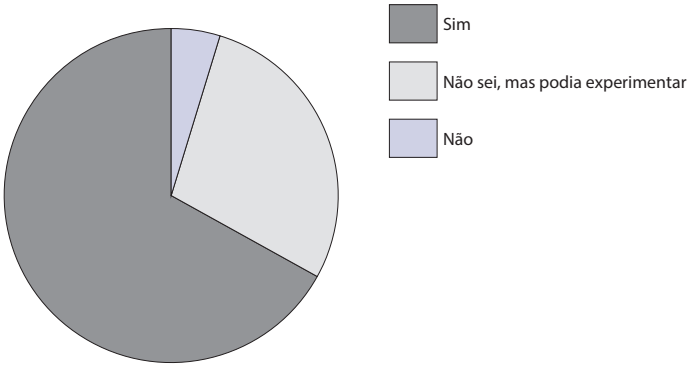
Graphics 28 - Analysis: New Questionnaire to question 10 (Source: Researcher, 2021).

11-Acha que o seu educando ia mostrar interesse num brinquedo que é ao mesmo tempo físico e digital?*

Sim

Não sei, mas podia experimentar.

Não



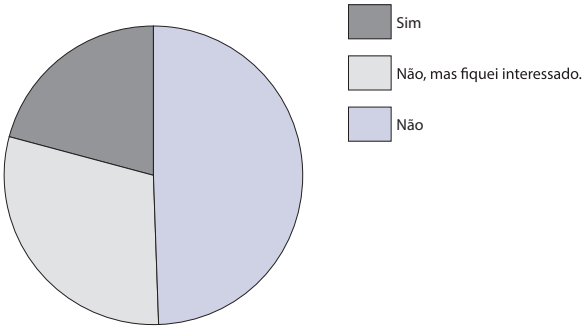
Graphics 29 - Analysis: New Questionnaire to question 11 (Source: Researcher, 2021).

12-O seu educando tem brinquedos que são ligados a um telemóvel ou tablet? Ex: Robô que se pode interagir com aplicação; Legos que projetam imagens numa aplicação.*

Sim

Não, mas fiquei interessado.

Não



Graphics 30 - Analysis: New Questionnaire to question 12 (Source: Researcher, 2021).

4.1.2.A) ANALYSIS OF THE LAST QUESTIONNAIRE.

With this last questionnaire we acquired relevant information about children between the ages of 3 and 7.

From analysing the information we understand that the three favorite activities for kids these ages are playing with other kids that are the same age as them, watching cartoons and listening to parents telling them stories, and also playing on the tablet earns a place on this list.

The majority of parents said that their kids didn't or rarely had problems while doing some activities with them.

When it came to online activities, the answers were mixed. A lot of them did activities with their kids, these parents also said that their kids demonstrated interest in the activities.

Most of the parents agree that new technologies can be used with kids and also think that they could help their kids' development. The majority agrees that a digital and physical toy would be fun for their kids and almost half of them have and are interested in different styles of toys for their kids, like a robot (used with an app, teaching them coding) or interactive Legos.

This shows that half of the parents who answered the questionnaire show interest in the project being developed, showing interest in digital and physical toys, telling stories and watching cartoons and playing with their friends and parents are the most used forms of play and entertainment for children.

4.1.3. CULTURAL PROBES

With this probes the objective was to understand how children would react to the game, to prove that our investigation and concept idea were valid, and also help the creation of the activities that could be implemented in Lory.

For this probes we used a tale well known for children, "O Nabo Gigante", and created the activity around that, simulating the game that would be played with the toy.

The activity consists in the adult reading the story to the kid and have him place the different characters in the right spots as the story keeps going.

We realised the activity with 11 children from the "O Jardim de infância o Farol", we separated them in 4 diferent groups, one group with three six year olds,another with three four year olds, another with three five year olds and another one with two five year olds. This activity was captured in video and photos without the children's faces.

During the activity most of the children had no difficulties in understanding the game and were concentrated during the activity. They showed interest in playing the game and were understanding and paying attention to the story.

Only one of the five-year-olds had difficulties understanding the game, he was not recognising, and not understanding the story, showing some difficulties that the other kids didn't have. But nothing that playing it one more time couldn't solve. Also, he showed interest in trying to play the game even with the difficulties.

In the appendix we can see all the preparations that were made for the realization of the activity and collecting the information.

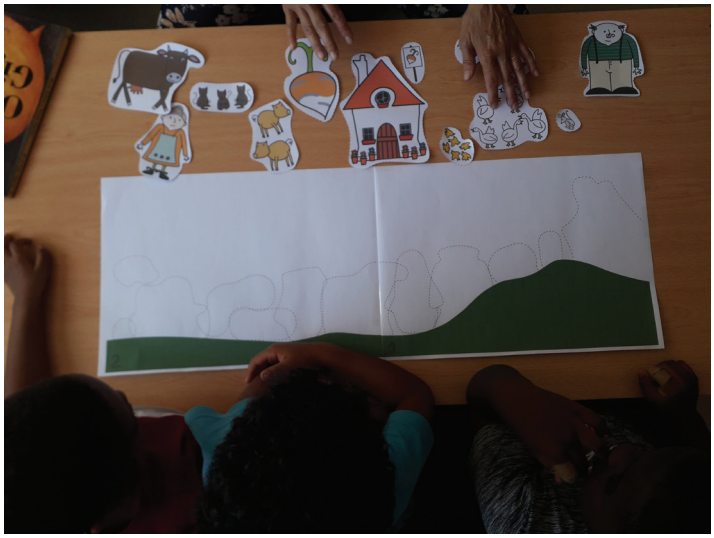


Figure 42, 43, 44 - Children from "O Jardim de infância o Farol" (Source: Researcher, 2021).

4.1.4 USER JOURNEY

First, we had a user journey adapted for older children. Now the journey was adapted for kids that go to preschool. I outlined what could be the day of a 3 to 7 year old kid, with all the different activities throughout the day, where they would feel more difficulties, and how the toy could help them during their day to day activities.

As we can see on the second user journey, we can analyse the way the toy could help in increasing motivation for certain activities and making them more appealing for some of the children, motivating learning and creating new development habits.

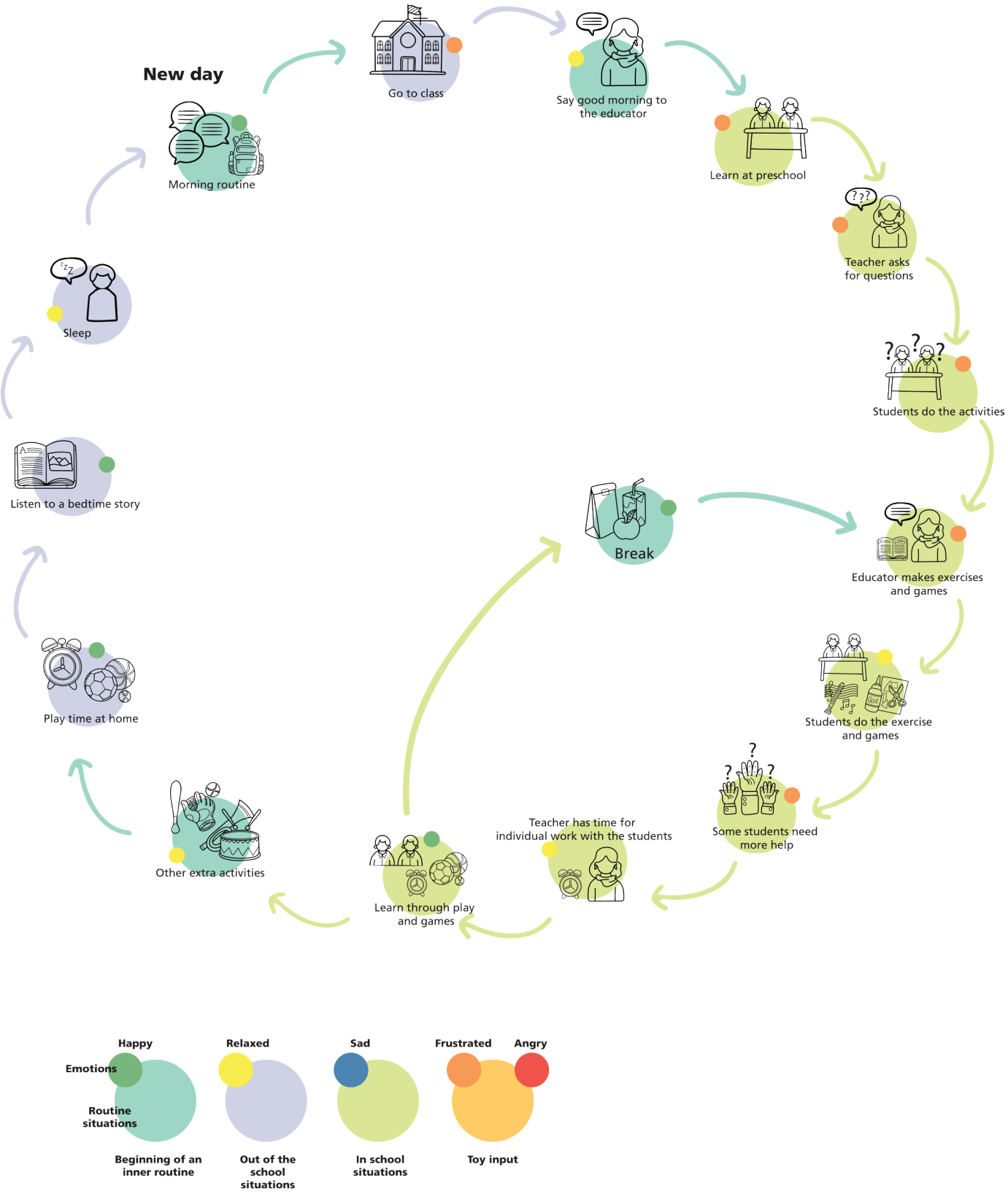


Figure 45 - First user Journey (Source: Researcher, 2021).

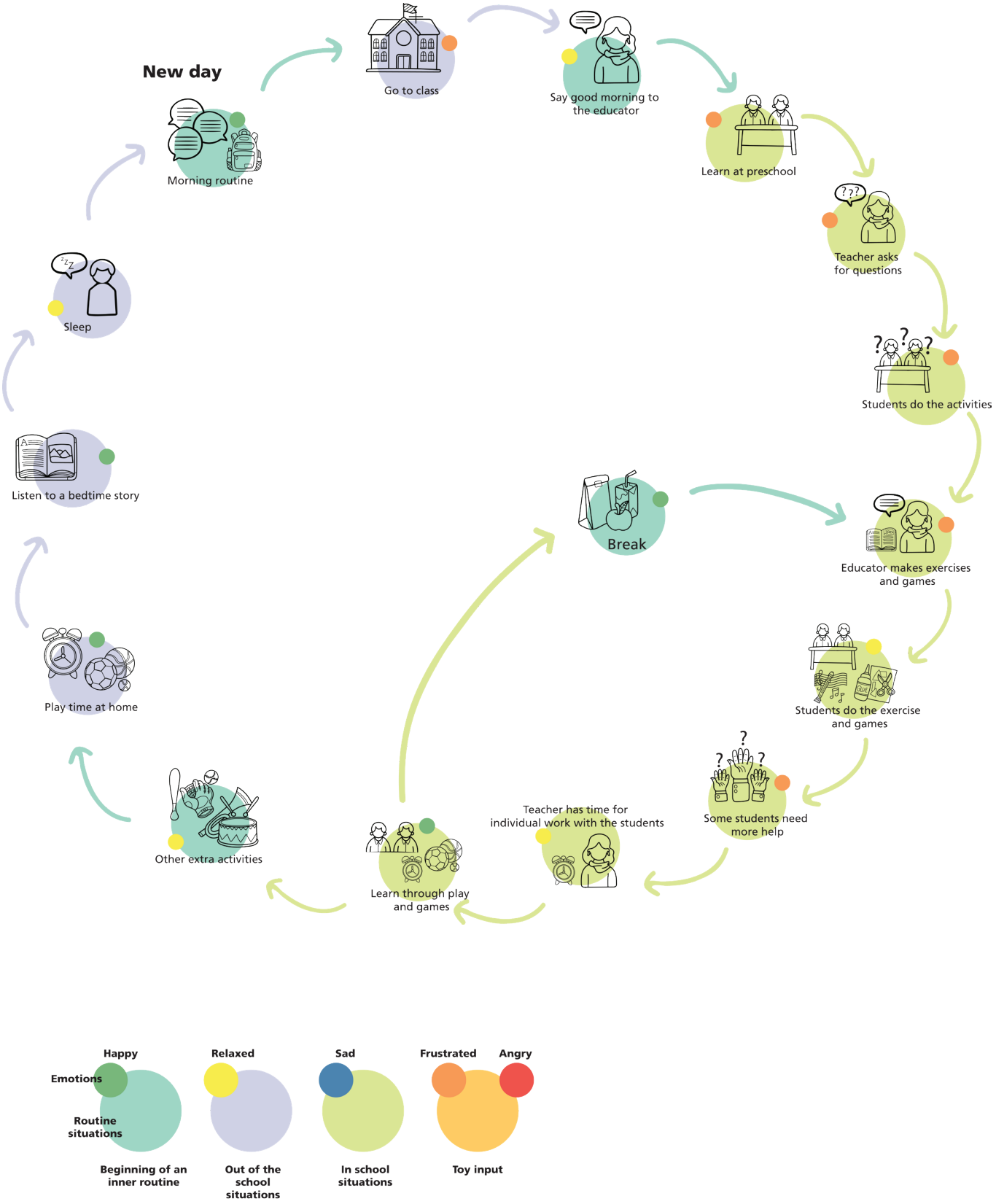


Figure 46 - New user Journey (Source: Researcher, 2021).

4.1.5. MENTAL MODEL DIAGRAM

We also created a mental model diagram where we started organizing all the important information we already had and what we needed to collect to finish the product and also to know what exactly we were going to create.

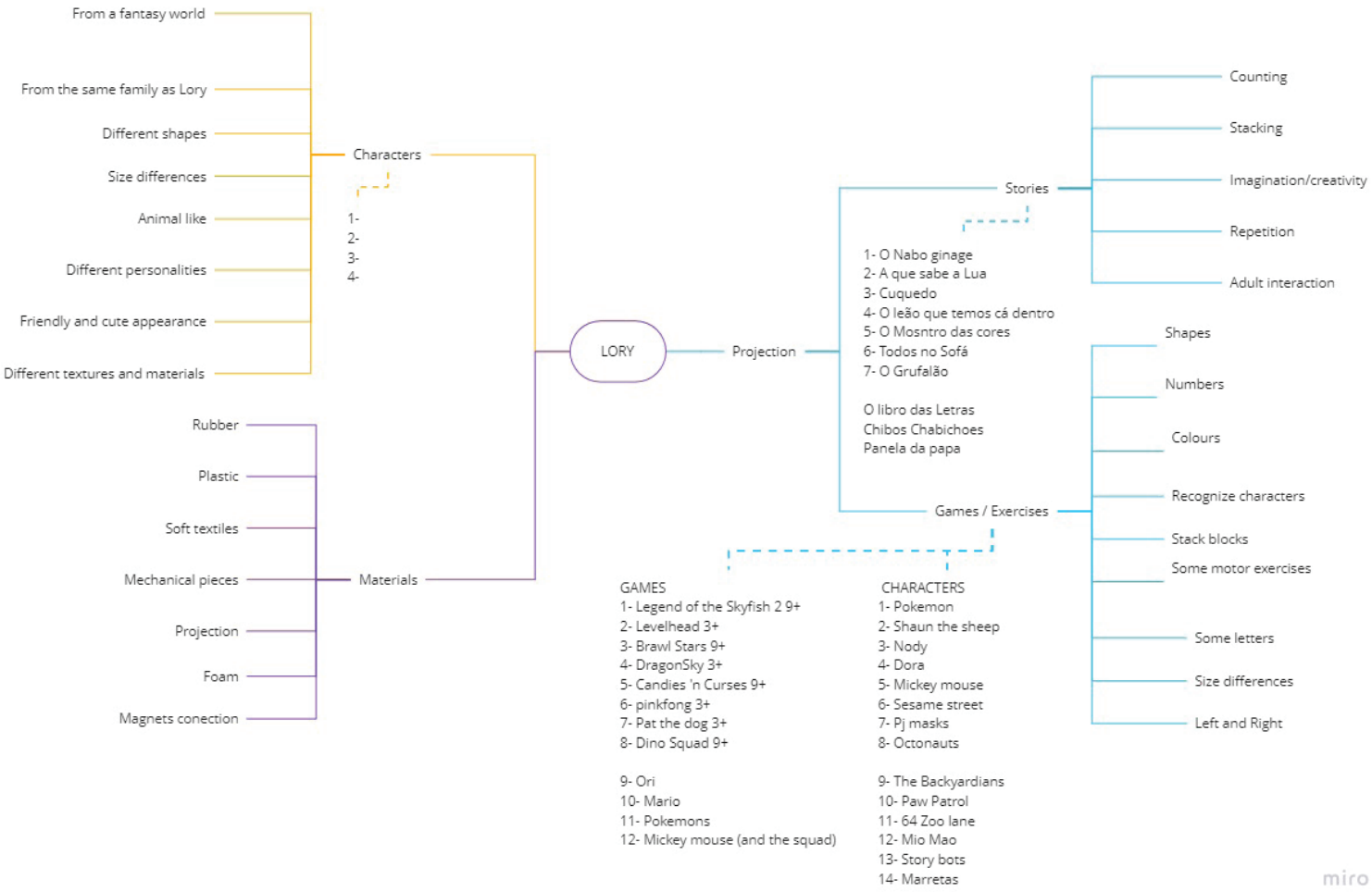


Figure 47 - Mental model diagram 1 (Source: Researcher with Miro, 2021). Also in Apendix.

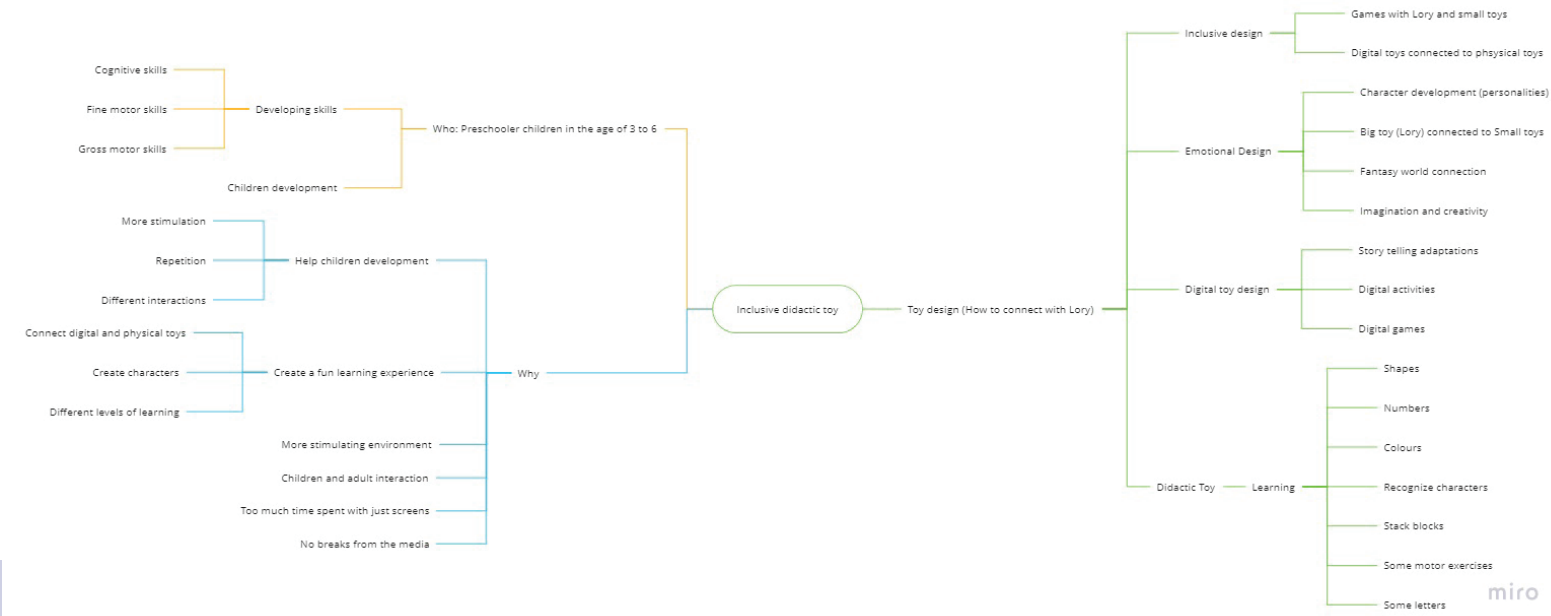


Figure 47 - Mental model diagram 2 (Source: Researcher with Miro, 2021). Also in Apendix.

4.1.6. DRIVERS

CREATE YOUR NARRATIVE

"Create your narrative" is something to build around the product that you're making. In this case, we have a product for children so it only makes sense to create a story or a narrative that is magical and captivating for them, forging a whole imaginary universe where Lory and his friends could be real and have personalities and feelings. The idea is to establish a very emotional connection with the user, becoming more aware of what the customer needs and wants and adapting it accordingly. Having people helping in changing and bettering the product during its making and in future use. This is also connected to circular design, having a more adapted and caring environment for the product, where we care about the materials and the product as if it was part of the community that is going to use it, and at the same time creating a better investment for the clients and users.

By creating a story around the product where children can connect and bond through games is the most important outcome we need. The creation of small characters, giving them names and empathising with them is very important. Also, the different stories that are told in the games are a plus to create that connection with the toys, pretending that they are small beings that actually had those stories happen to them. Creating the whole fantastic environment for them to live and for children to imagine.

CIRCULAR DESIGN

With the development of a product for children there will be some very important demands when it comes to the strength and durability of the product. This is where this product needs help, not only in choosing the ideal materials, but also in the maintenance that should be part of the product service. Having a cradle-to-cradle approach is the most important part in this project. There must be a way to easily have access to the product and easily replace or fix the parts that can be broken, having a good assistant manager for the problems, and a team specialised for that. A team will be assembled for this occasion, for the distribution and the preparation. It could be a movable experience for schools where kids could learn how to fix the product by themselves, while learning and caring about their products. Not seeing it as only one more toy but seeing it as a companion and a helper. Creating this empathy is also connected to the idea of creating a narrative, a "friend", a story. This helps not only mentally, formalizing their studying skills, but also emotionally, creating more ability to communicate, care and understand feelings and ideas about other kids. This obviously would have to be made with the supervision of adults and provide a professional or a technician to help with the technicalities. This could all be made by creating a "toy doctor" approach where someone could approach the preschool and make a small program for them to help them fix their toy or even a workshop for parents and kids, stimulating their motor and cognitive skills during one day a year or so. This would help reutilize pieces and be able to collect the toys to be reused if needed.

4.2 Toy specifications

Technology research

These are some examples of products that use different technologies and are also similar to this project and could also serve as an example. Some of them referring to mental health, others about education and robotics, gamification and also flipped learning, showing some examples of technologies and uses for them that could also be eventually implemented or are already implemented in the project, creating new value and also new interactions. It was thought that this could be something additional that could also compliment the work that has already been done.

Figure 48, 49 - Psious (Font: https://psious.com/Retrieved: 21 Jan 2021).

4.2.1. MENTAL HEALTH AND VIRTUAL REALITY – PSIOUS

Description:

Mental health is a problem that has been aggravated during quarantine, being forced to be at home for long periods of time was something that a lot of people couldn't handle according to WHO. With Covid there has been an increase of 60% in the amount of people reporting to have had disturbances related to their mental health in which 72% are children and teenagers (World Mental Health, 2020, s.p.).

The use of VR has been one of the ways to help with mental health. This technology already exists and has been used, but in 2020 it made even more sense to start using it, due to a lot of people being stuck at home and the aggravated state of their mental health combined is the perfect combination for the VR technology to be used.

Conceptual information:

Conceptually it is simple, it's a headset, normal shape for VR glasses, the difference from the others is on the inside, on the experience that the user is feeling. The experience is emerging and calming. We could see it as a kind of meditation. When before the user would have to imagine the sounds and places to calm down, now the user has the experience creat-

ed for them, without having to use their imagination and without getting stressed about not being able to do it. So, in a conceptual view, we must look at the idea and the objective of this product and wonder how the development of this technology and its adaptation to deal with mental health is. This leap was something inevitable to happen, it was obvious that this type of technology could be used for this purpose, but the fact that they created it is what makes it unique.

Advantages:
Portable
Accessible to a lot of people
Can be used from home for a special health treatment
Accessible for different ages
Can be adaptable for different places

Disadvantages:
No physical interaction
Can be difficult to understand at first
Dangerous to use at home alone

Possible applications:

Virtual reality applied to health is still in expansion, right now it is used in different kinds of health problems. For example, with people that are in the hospital with terminal diseases, allowing them to have more connections with other people outside of the hospital. It is also helpful when it comes to phobias, like being scared of flying and even addiction disorders.

Technical information:
Room-scale tracking
True RGB display 4k
3060º tracking controllers
Built-in eye-tracking
Wireless PC VR streaming
Ergonomic counterweight design
Built-in spatial stereo speakers

"Instead of prescribing another pill through a traditional in-person session, we might recommend a virtual beach vacation at home to ease aches and pains, or prescribe a course of cognitive behavioral therapy for people suffering from anxiety or depression." – (Spiegel, 2020)

Figure 50 - NAO (Font: https://www.softbankrobotics.com/emea/en/nao Retrieved: 29 Dec 2020).

4.2.2. ROBOTICS IN EDUCATION – NAO

Description:

Robots are no news on education for kids in Japan, they are being used more and more each day. We have been developing this new technology not just for education but as a companion for older people. This year we started having the use of robots not specifically at schools, but as a companion at home for people that work at home. We are also starting to see robots in day-to-day activities, just like the example we will see in the chapter of social innovation. This will be something very beneficial, especially in schools. Now with this new adaptation with less physical contact, children will need more emotional support so maybe robots can be a good answer to this problem and even help in the practice of exercises and taking doubts. NAO is a robot that is being used in different parts of the globe, he is one of the first robots being used in the classroom, so it is the perfect example of the robot that is trying to revolutionise the school system, and they are going to be on the trend for education for quite some time.

Use in design:

In design it is also a big opportunity not just for engineers, this is a perfect combination of design and many other professionals. Designers have the opportunity not only to work with something challenging technically, ergonomically and also challenging in the interaction of the robot. They shouldn't only be done in collaboration with engineers so that they don't look scary for children to play with them. This is the perfect challenge for a designer and a very relevant topic.

Advantages:

Interactive.

Dynamic.

Challenging to make.

Works for different professionals.

Helps to improve the classroom.

Creates more dynamism in the classroom.

It is fun and interactive for the kids.

Disadvantages:

Can be invasive.

Difficult adaptation.

Distraction in the class.

4.2.3. GAMIFICATION CODE GAMES FOR KIDS

Description:

Gamification is also growing, maybe not as big as the first ones presented, but it is the direction education should grow towards. More and more kids need stimulation, and learning through games will help them in their attention deficit and change their perspective about school. It helps reduce the idea that many kids have that school is boring, and makes it more playful and interactive, like a game.

Use in design:

The use can be varied, not only in the department of coding and learning code but also to many others where they can be adapted to physical products that can help make the connection between games and school, interacting in games in the classroom with all their friends. Creating a big group of attack for designers not only on the product but also on the service, game, and interaction.

Advantages:

More stimulating.
Can be physical or digital.
Fun and interactive.
Different learning experience.
Similar to what kids do for fun, while learning at the same time.

Disadvantages:

Can be distracting from other forms of education.
Could be addictive.
Difficult to implement in schools.

4.2.4. FLIPPED LEARNING

Description:

Flipped learning is a new way to apply education. Instead of learning in class and applying the exercises at home after the class, in flipped learning, it is the other way round. They learn at home and then apply in group exercises in the class. This is something that is not already being applied this year, but it is being tested in some schools and some subjects. This is a mix with video learning

and gamification, learning online or through technology and applying it to the other classroom what they have learned in groups and in physical presence and more interactive situations.

Use in design:

How can we implement this in design, first as a methodology, design is the ability to problem-solve and in this situation it is a methodology that can help students in their learning experiences. Also, we can associate it not just to these new ideas of making, but also to the idea of applying this methodology more efficiently in the classroom and at home. This will change the dynamic that we have right now in the classroom, providing more opportunities for designers to rethink classroom management, the way the products are used in class, and also at home, how it can be more efficient, and how can designers help in this new methodology of teaching.

Advantages:

More group work.

More personalised time with each group of students.

Easier to understand at your own rhythm.

More collaborative.

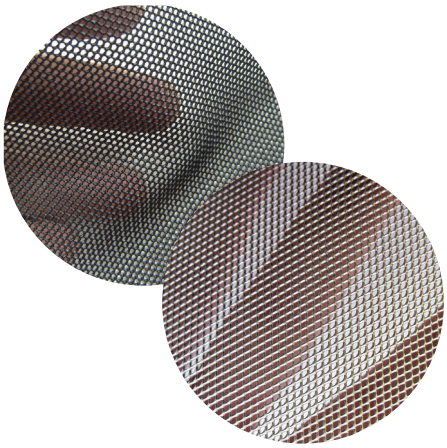
Interactive.

Fun.

Disadvantages:

Could be confusing.

Difficult to implement.



4.2.5. RELEVANT TECHNOLOGIE

1 – A mesh preferably with the holes in the shape of triangles and as small as possible. This is used to protect the inside of the projector from crumbs or other small debris while also allowing for good airflow circulation on the top and on the bottom of the toy.

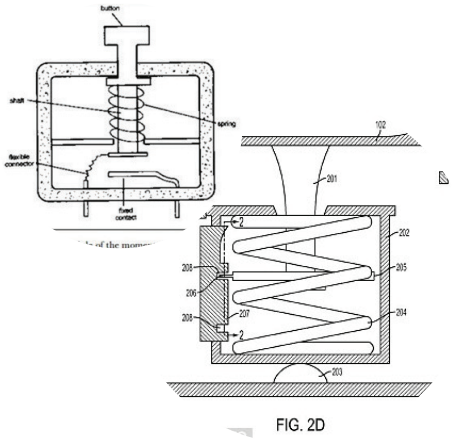
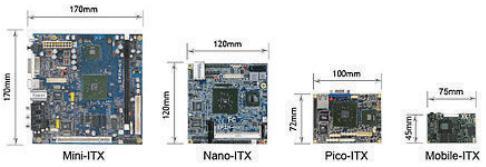


FIG. 2D

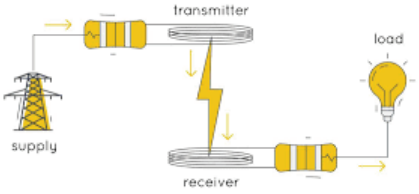
4 – This is how the pushing of the buttons works for the side buttons and for the nose button, for the on/off. It works with a spring to push it back up and down to connect it with the plate, to avoid pushing it too far in.



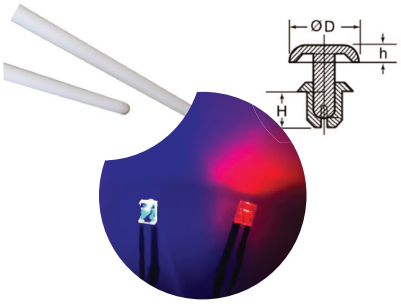
6 – We chose one of these motherboards on the left image due to its size and utility, like the ones used on mobiles and tablets: Mobile–ITX. The second image illustrates how we can apply the Wi–Fi capability to allow for an online connection so that we can keep on sending updates in the future.

8 – This was one of the biggest challenges, to understand how a projector could be used inside a toy that small. It was easy to find one that could be as small as the latest mini projector from LG, but the question of if it was possible to have an even smaller one still remained. So after a bit more research we found a smaller one that was easy to assemble. On old projectors bigger mirrors were used to reflect on to the lense, and that's why the projectors were so big. But now it is made with micromirror windows. This new technique makes reducing the size of projectors a lot easier.

8.1– A small camera was added to read and analyse the environment of the toys and understand if the answers made by the children in the game were the right ones, making it a playable and interactive experience.



9 – There will be wireless chargers that will be used on the paws and on the base. Combined with some lithium batteries in small packages also stored on the base with some bigger batteries.



Extras – There are also plastic pins to connect some parts of the toy like the support for the buttons and some other components. Also LED lights for the eye to convey emotion were added.

4.3 Concept development

4.3.1. MOODBOARD

Colourful; Fun ;Playful; Friendly; Fantasy; Organic / Simple Geometri; Stimulating; Sensory; Biomimicry; Animal-Like.

Figure 57 - MoodBoard collage (Source: Researcher, 2021 Pinterest https://pin.it/3mo3RJF and Pinterest https://pin.it/5WLY-dKl, 8 Dec 2021).

4.3.2. CONCEPT DEVELOPMENT – LORY

Lory is a mystic animal, you choose what he is, a cow, a dear, anything you see is valid.

Lory is made to help you learn while having fun. Itsmade to interact with the horns, with different feelings and textures, and also with the side buttons.

Lory is small and easy to carry with about200 mm.

Figure 58 - Lory sketches (Source: Researcher, 2021).

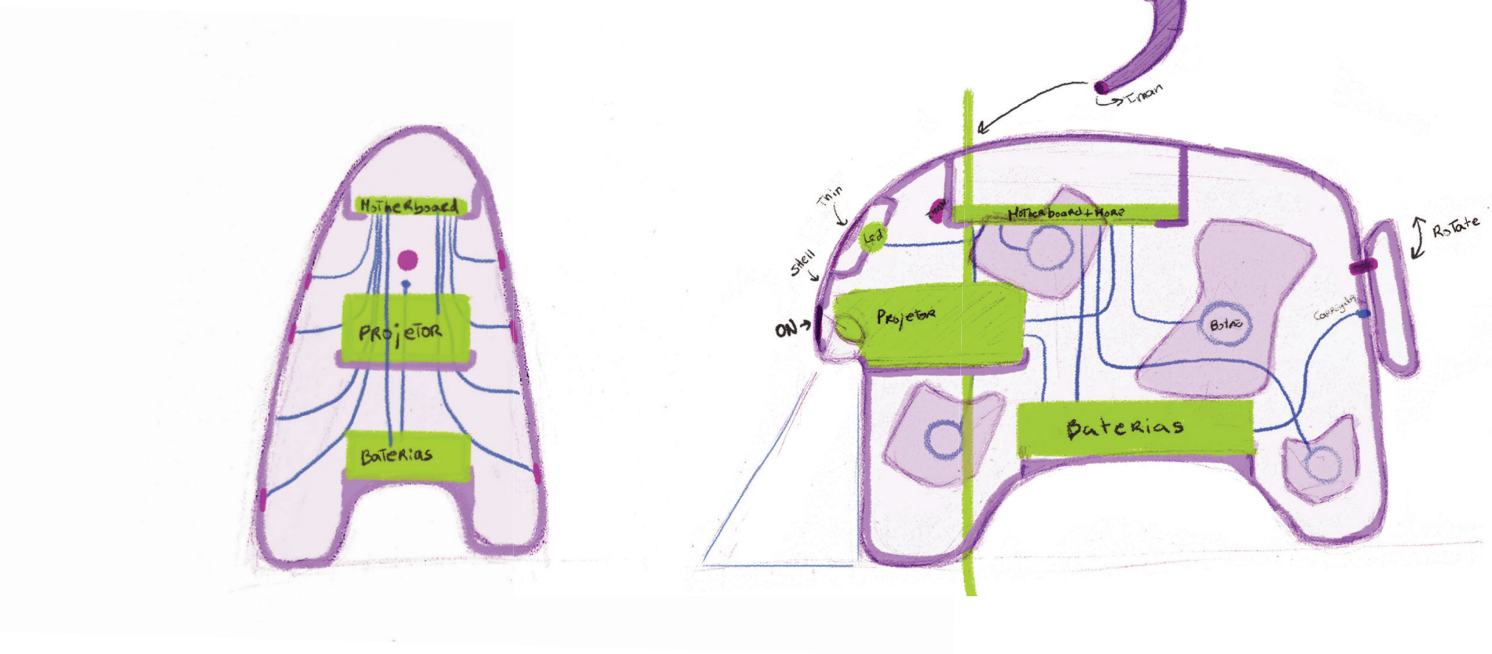
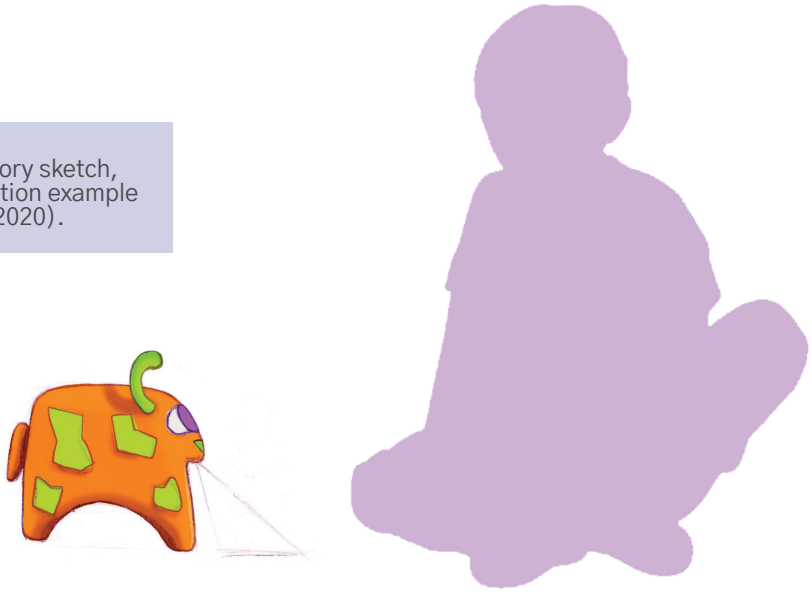
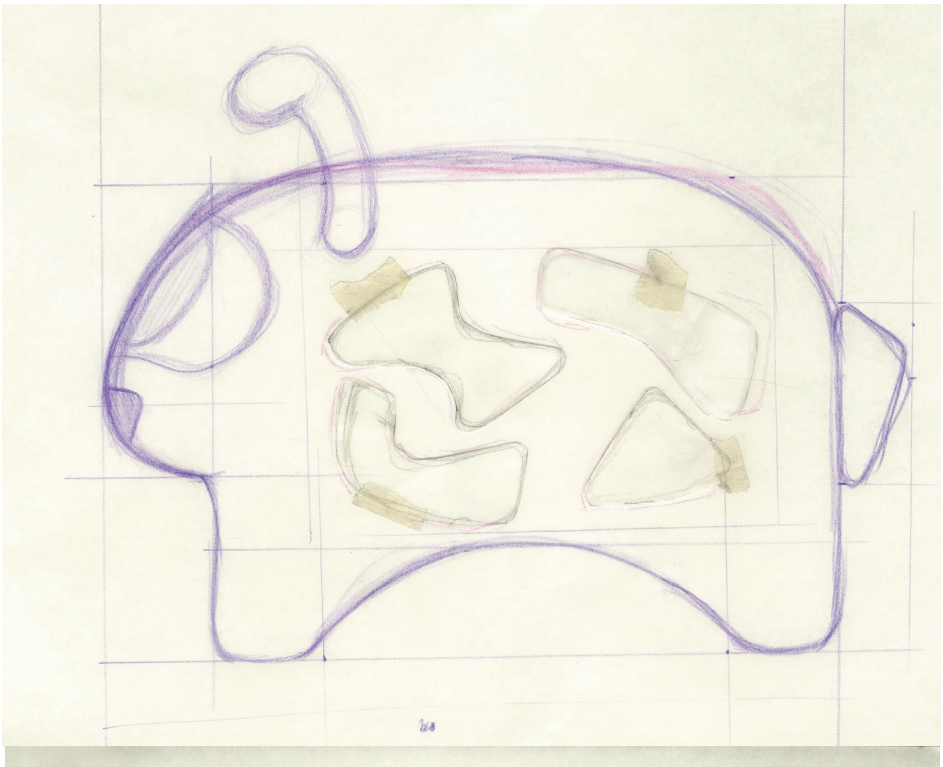


Figure 59, 60, 61 - Lory sketch, Cut sketch and proportion example (Source: Researcher,2020).



The cut explains how the toy would be inside and help in the development of the model. It's important to think about the plastic cut for it to open to get the components inside without disturbing the design of the product, that was one of the trickiest problems to solve. We didn't want Lory to have a line crossing his face and making it look mutilated. So implementing the cut on his image was crucial.



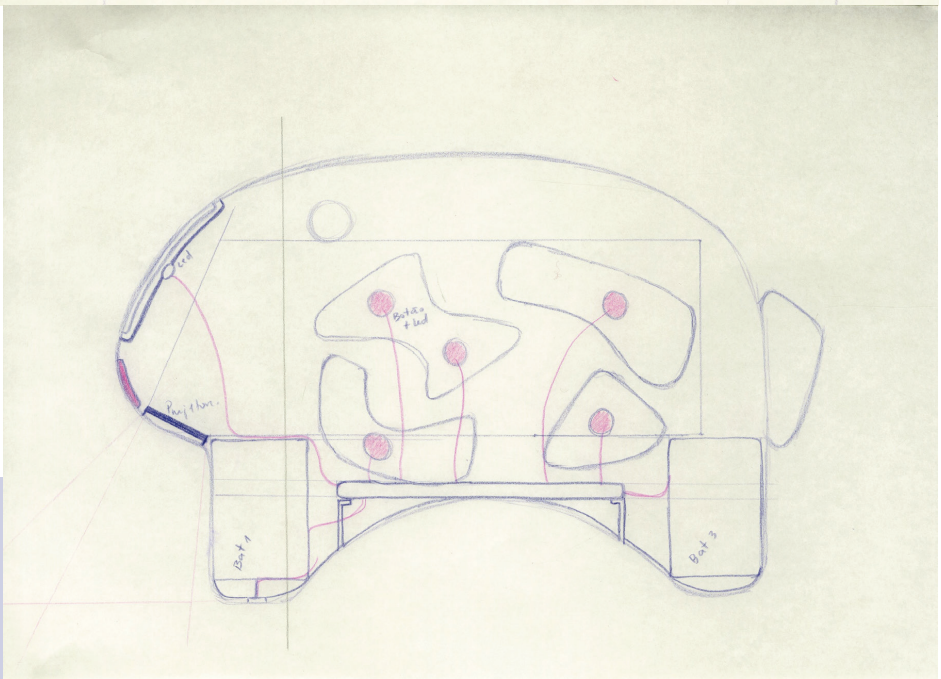


Figure 62, 63 - Lory side view and cut (Source: Researcher,2020).

It's important to retain the eye and the nose shape from the front view angle, as well as the tail placement. The bending on the sides is crucial to preserve the peculiar shape that Lory has.

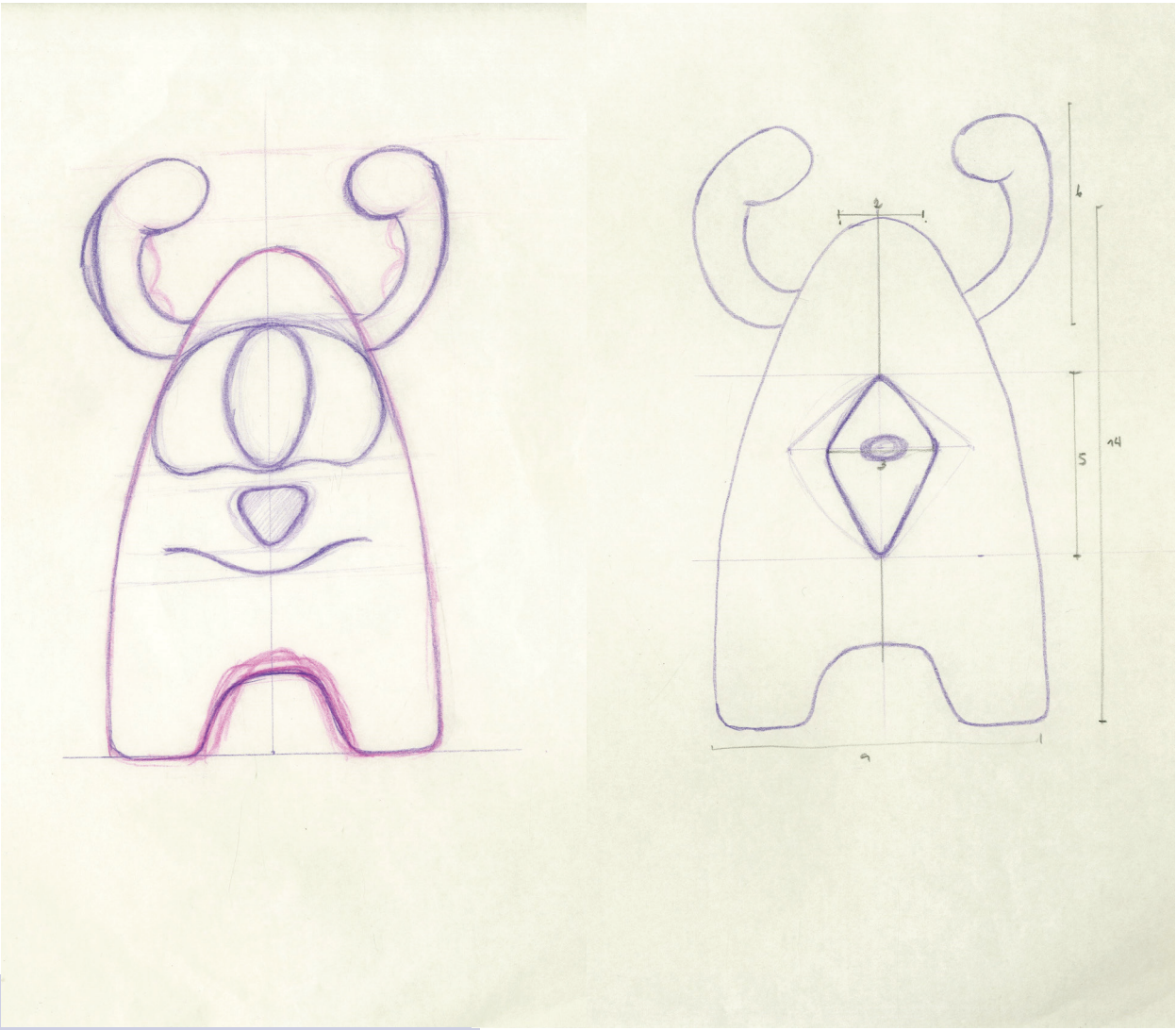
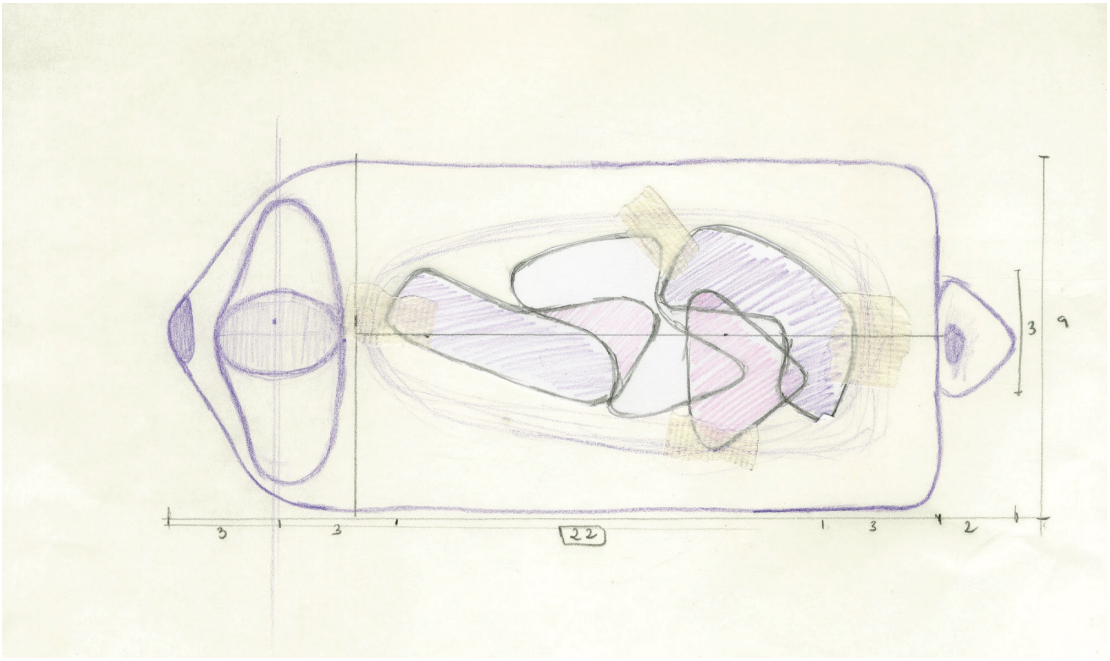


Figure 64, 65 - Lory front and back views (Source: Researcher,2020).

On the top and bottom views it was crucial to understand what the placement should be and what shape the mesh should have to allow for ventilation for the projector and also how to blend the mesh and his body without it looking out of place.



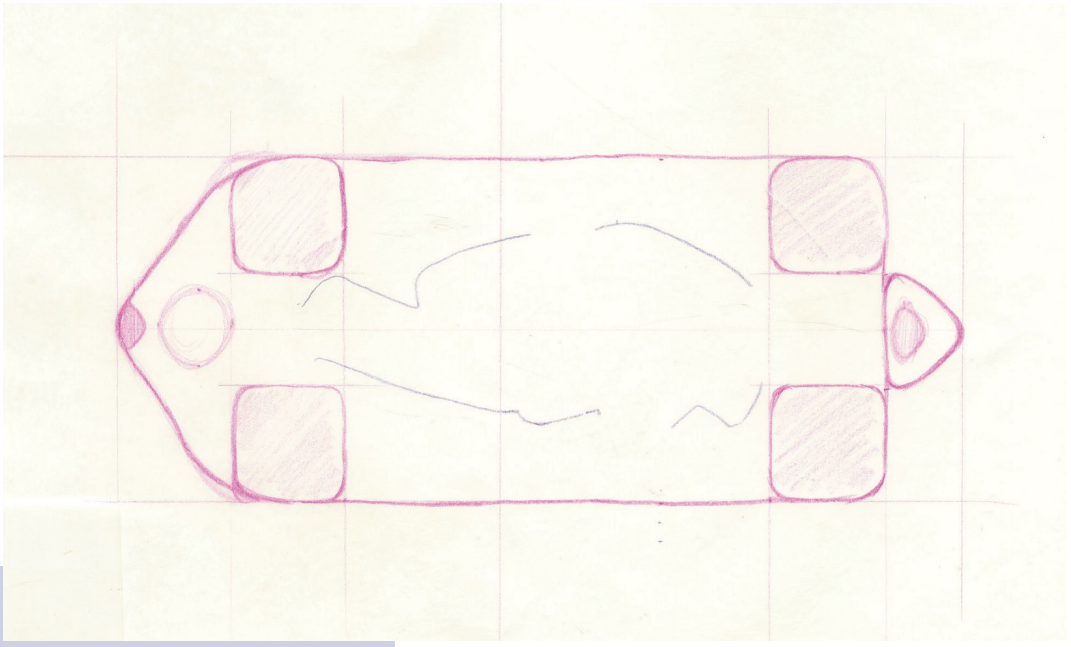


Figure 66, 67 - Lory top and Bottom (Source: Researcher,2020).

4.3.3. CONCEPT DEVELOPMENT – LORY'S FRIENDS

These are the concepts for Lory's Friends. Lory would be projecting different stories with different purposes that will teach the children something new as in: shapes, colours, morals, emotions, behaviours and personalities.

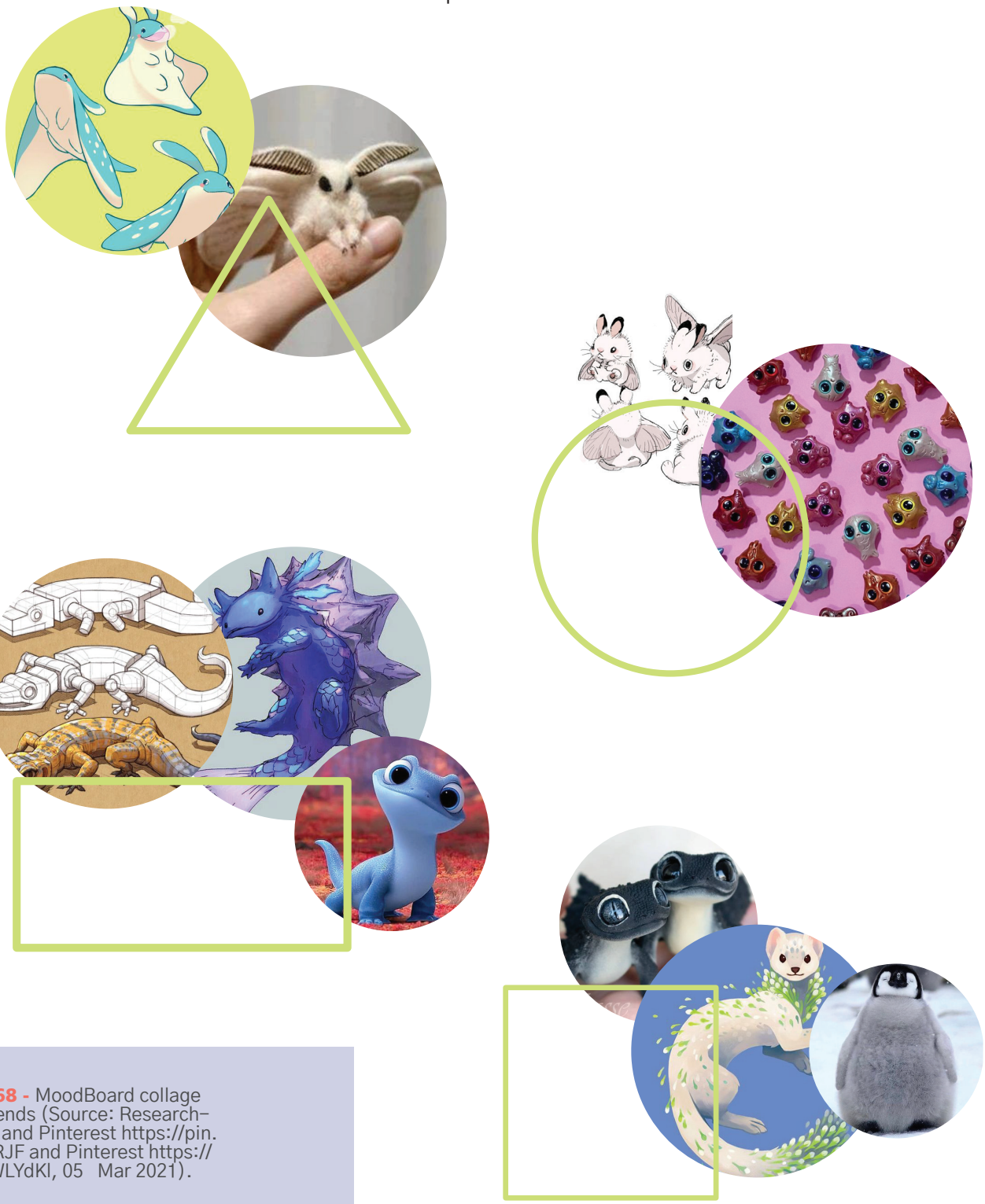


Figure 68 - MoodBoard collage small friends (Source: Researcher, 2021 and Pinterest https://pin.it/3mo3RJF and Pinterest https://pin.it/5WLYdKI, 05 Mar 2021).

The triangular pyramid-shaped toy would help kids learn triangles and associate them with the stories. Colours are still not definitive, they would also help learn colours, by associating their main colour in the progress of the story. Based on animals that also look fantastic, like Lory. They would also have magnets in their backs and paws to help them being stackable in an easy and discreet approach, they would be hidden in small triangles on the back and on the paw, facilitating the assembly of the magnets. Also, their tails would be made out of a different material, a rubbery material for a different sensory experience.

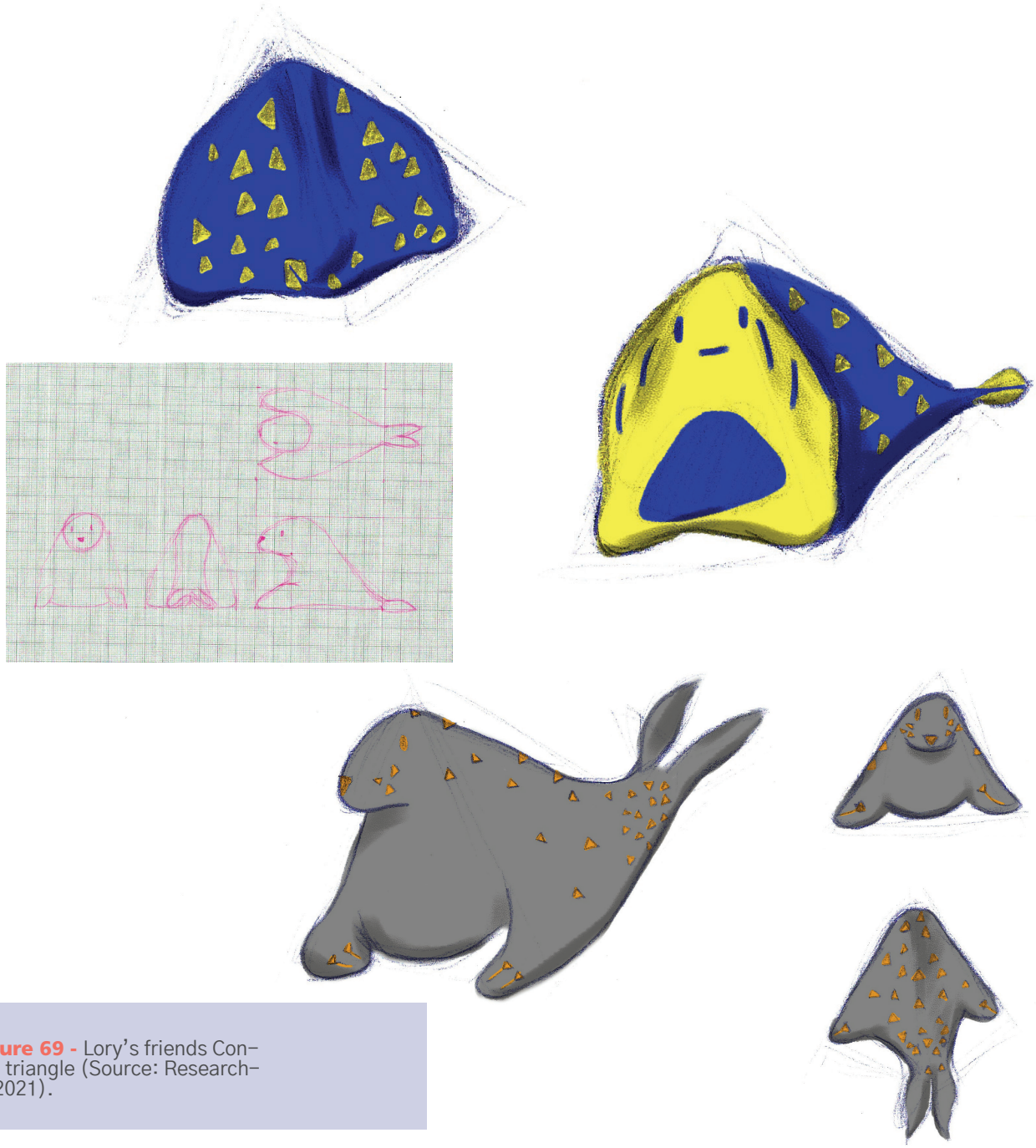


Figure 69 - Lory's friends Consep triangle (Source: Researcher,2021).

Rectangular parallelepiped is adapted for children to learn the rectangles, the idea in the second concept is that it could be a reversible yellow "cover" with spikes on one side and not on the other (for sensory overwhelm). It would also have magnets on the paws and the back.

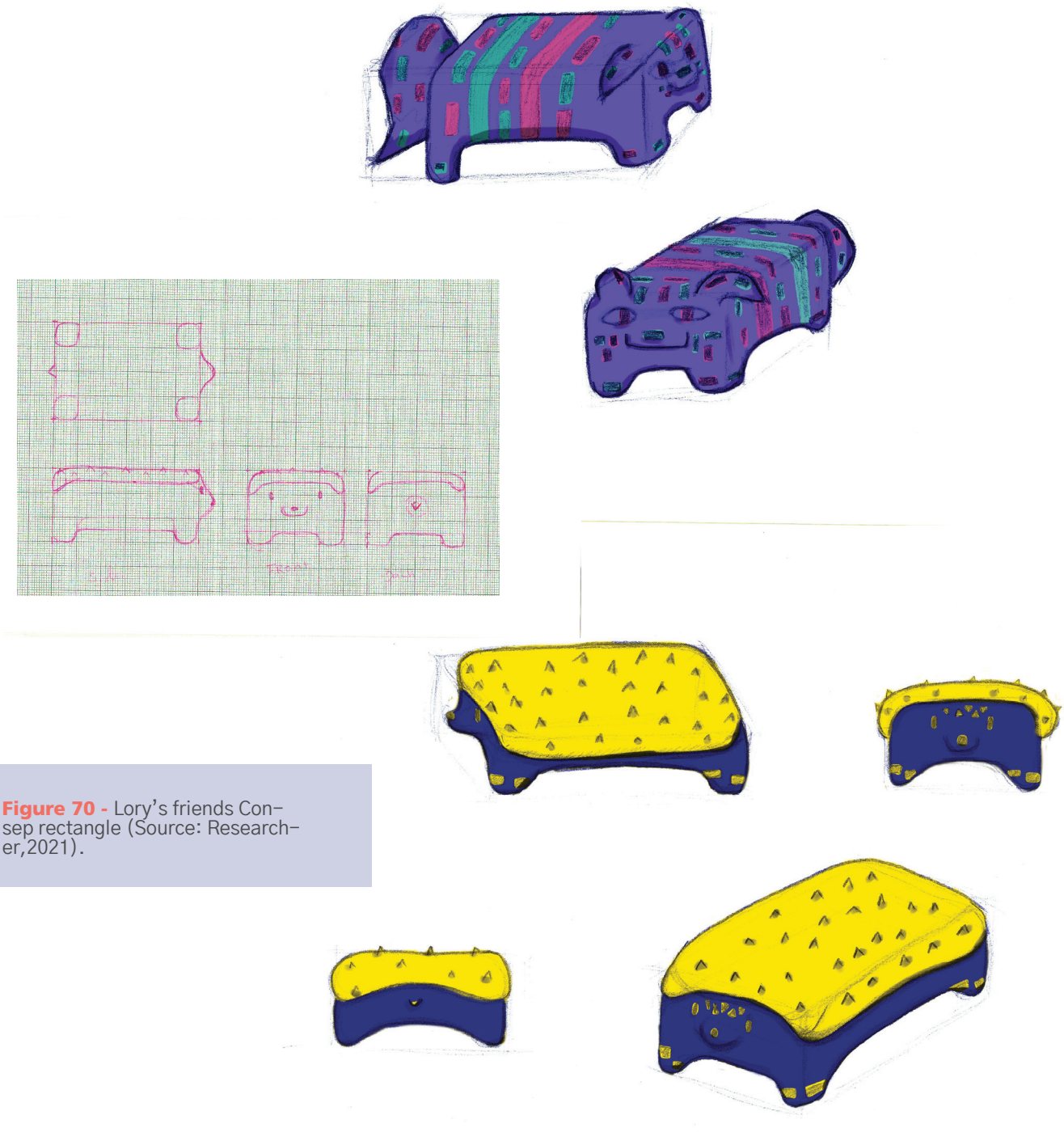


Figure 70 - Lory's friends Consep rectangle (Source: Researcher,2021).

Sphere shaped so they can learn the circle, they would also have the same approach as the others and have magnets in their back and paws. They all have spots in their paws and sometimes their backs to help figure out which shape they are, helping kids learn the shapes.

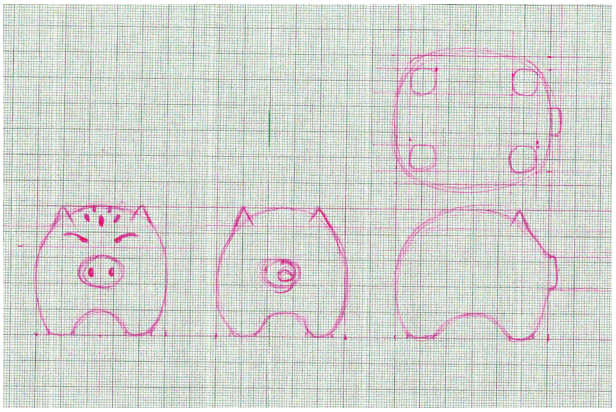
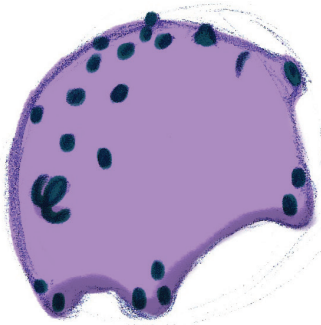
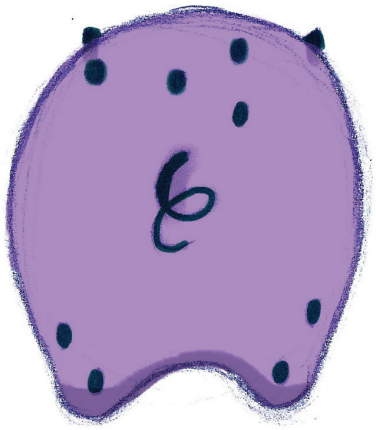


Figure 71 - Lory's friends Consep circle (Source: Researcher,2021).





The cube would help kids learn the square. It would have a soft fluffy body showing another different material, also maintaining the magnets in the paws and the back.

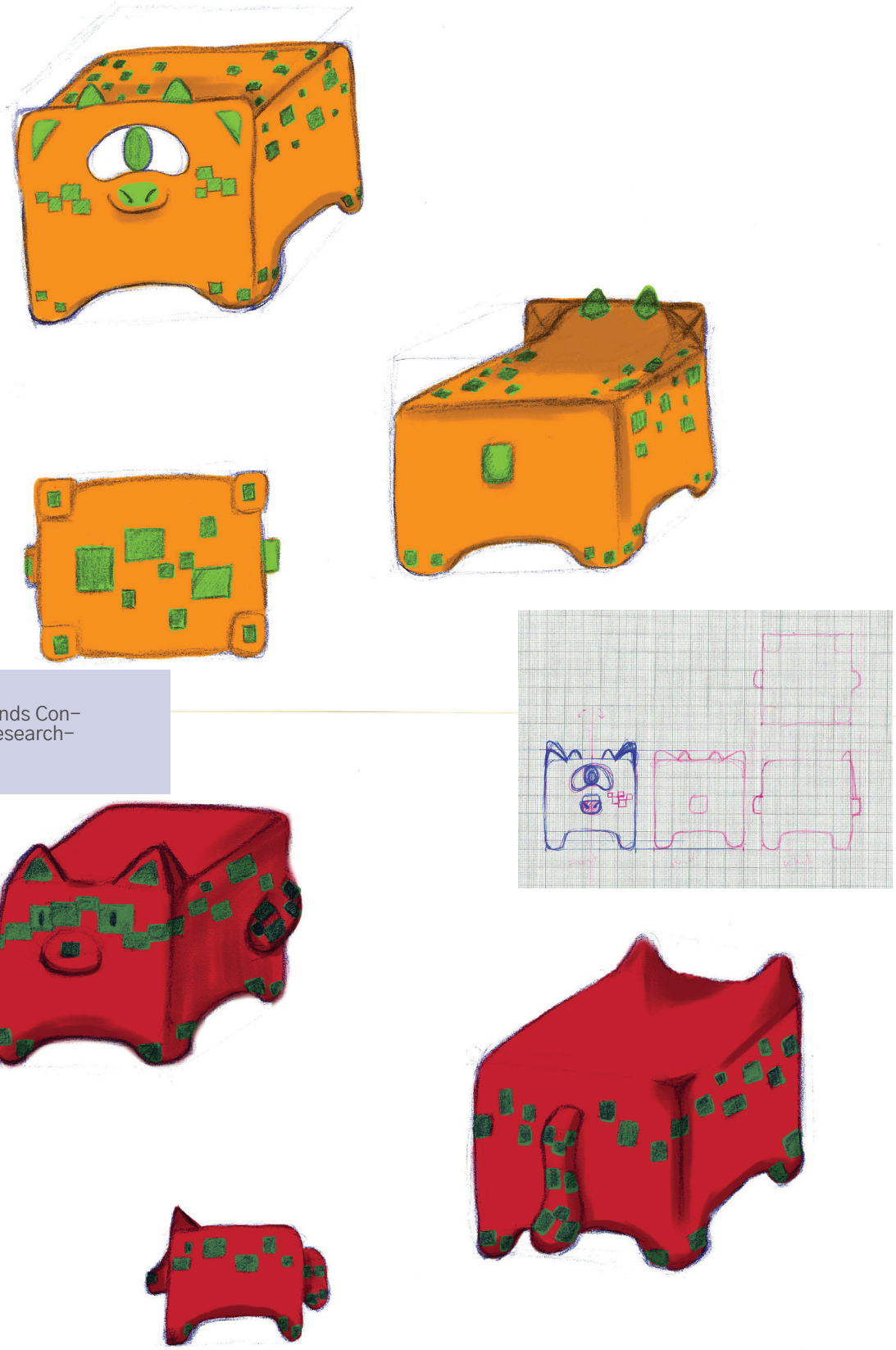


Figure 72 - Lory's friends Consep square (Source: Researcher,2021).

4.3.4. DEVELOPMENT OF THE TOY – LORY

After completing the final views on paper, with the right size and scale between details, we started the 3D moulding. We made several models at the beginning where we ended up with the one shown in grayscale on the pictures.

This same model was altered and bettered during the process. The horns were modified, the body was refined, and the buttons and patterns were tuned.

We can easily see the difference between the two of them in the side-by-side views as the one in grey scale shows the original sketches idea, some changes include the shape of the buttons being all the same and the creation of a pattern with triangles mimicking animal spots, creating a more natural and fantastic animal image.

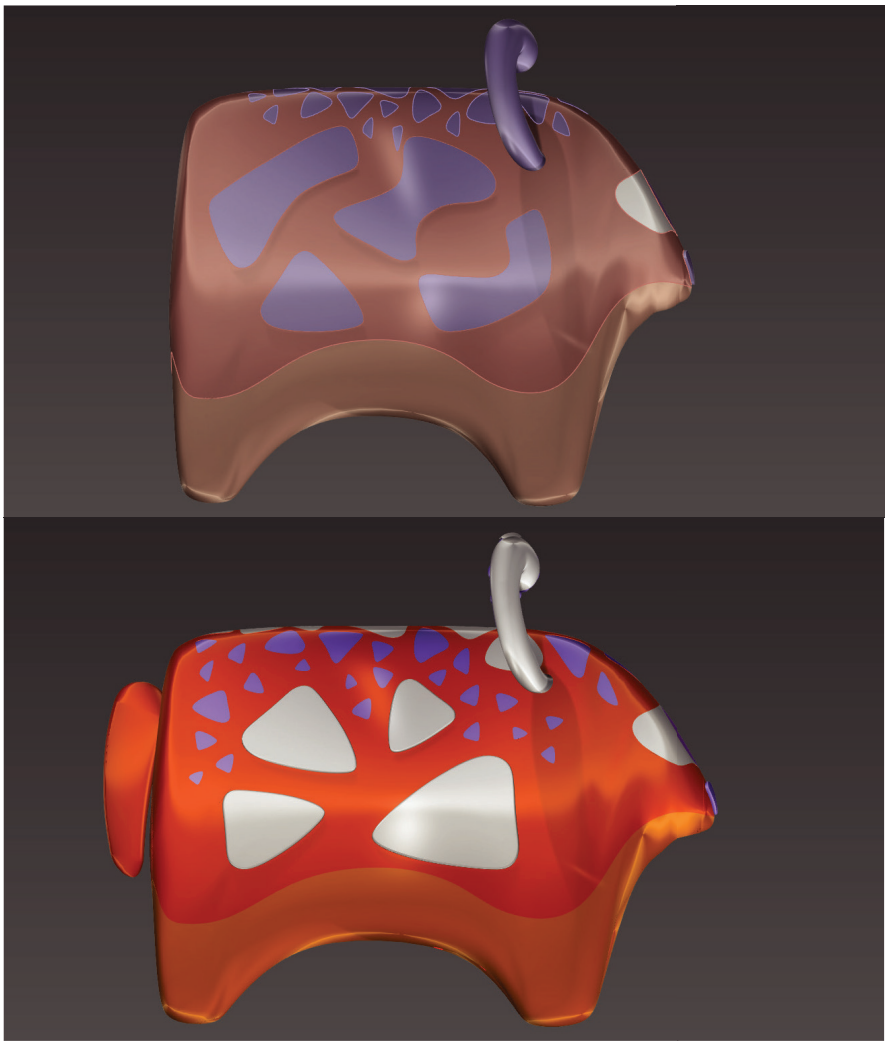


Figure 73 - First 3D Lory lateral view, new 3D Lory lateral view (Source: Researcher,2020).

Figure 74, 75 - First 3D Lory top view, new 3D Lory top view; First 3D Lory front view, new 3D Lory frontal view (Source: Researcher,2020).

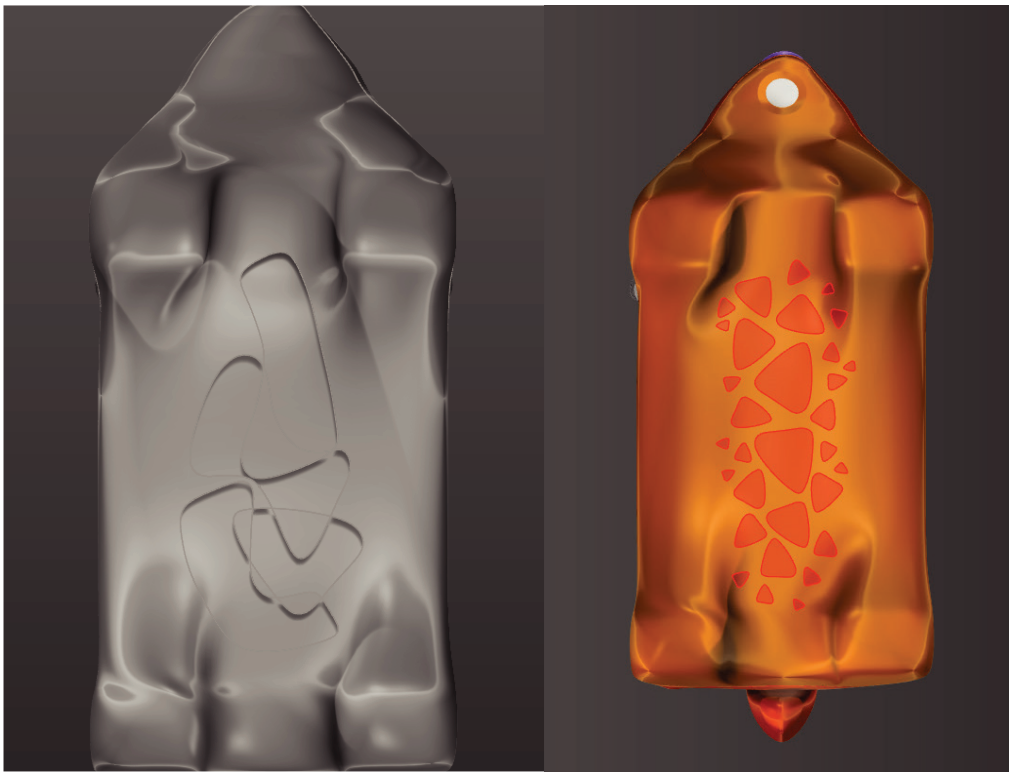


Figure 76, 77 - First 3D Lory bottom view, new 3D Lory bottom view; First 3D Lory back view, new 3D Lory back view (Source: Researcher,2020).

After creating Lory, the base was created, which would help the toy gain some clearance off the ground, allowing for a bigger projection on the table/ground, as well as helping achieve the right angle for projecting on a wall if needed. This would help the interaction with the toy. To avoid wasting material on the base of the product, a drawer was incorporated in the design, helping keep some of the extra toys organized. The base also serves as a charging dock for Lory. It was decorated with triangles to follow the same aesthetic as Lory and to give it more dynamism.

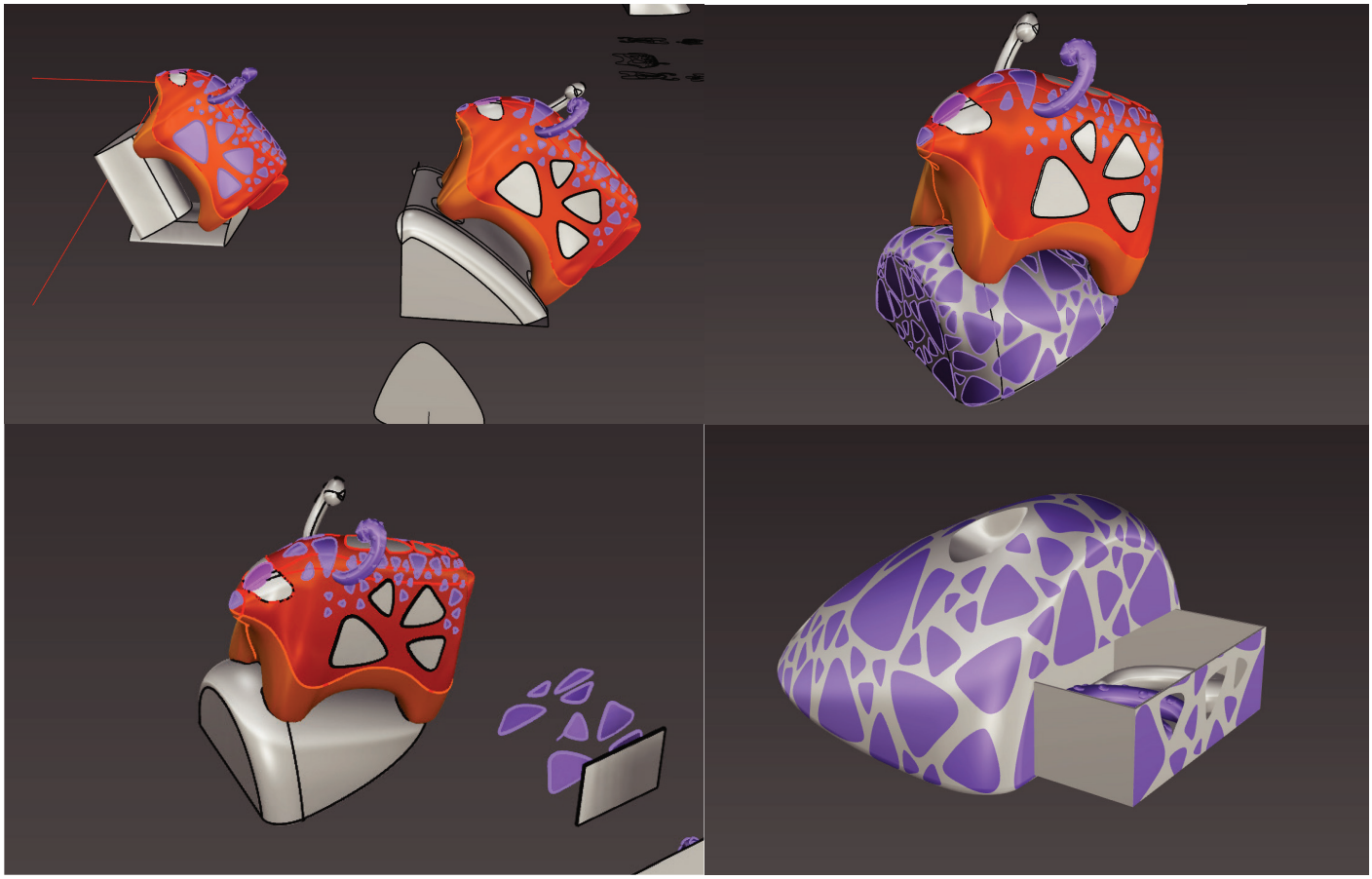
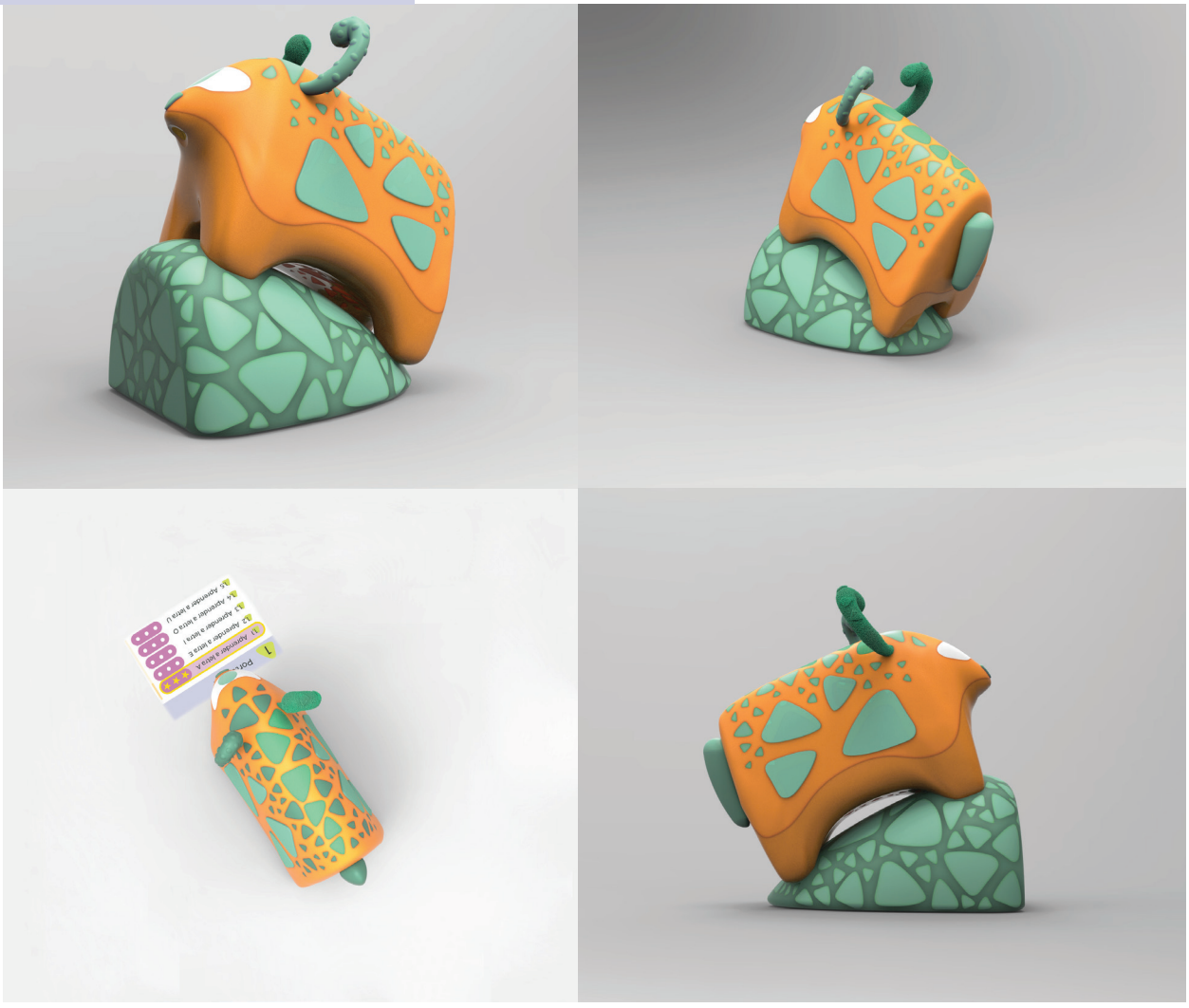


Figure 78 - Evolution of Lory's base. (Source: Researcher,2020).

Some renders were developed to show the actual image of the product. The main idea was to remain with the same two colours and play with the texture of the material. The body would be in a matte finish and the paws with a shiny material. The buttons and the eyes with a translucent finish. The horns were essential to have different textures to

play with the sensorial experience so it was thought that one of them could have a fluffy texture with little triangles for an enjoyable texture and sound. And the second horn would have a rubbery finish and bubbles to pop as many times as they wish. More horns were to be developed and added to the collection to create even more pleasant experiences. They could be stored in the drawer located on the base.

Figure 79 - Renders Lory (Source: Researcher,2020).



There are also some allusive images of the projection and how it works. The buttons on the sides would have different indents to help understand the instructions, as in a square, a triangle, a circle and an X. These would help understand how to interact with the projection and choose the right choices (although they wouldn't be used a lot). Different colours were added to Lory, as others more could also be experimented, the idea maintains and the combinations should be with colours that are not associated with a normal animal. Showing fun and vibrant options for every kid to choose from.

Figure 80 - Renders Lory 2 (Source: Researcher,2020).

4.3.5. DEVELOPMENT OF THE TOY – LORY'S FRIENDS

First we drew the most important views on paper of all four of the toys, with the right size and shape. We started creating the square "cow", first we drew the line from its surrounding shape with curves, creating a historic in the curves so they can be altered various times even after creating an object. These curves were altered various times until we were happy with the shape. Then we added some details such as a tail, horns, and spots just like Lory to try and create a coherent image between them.

The next objects were created with the same technique as the first one, except for the seal.

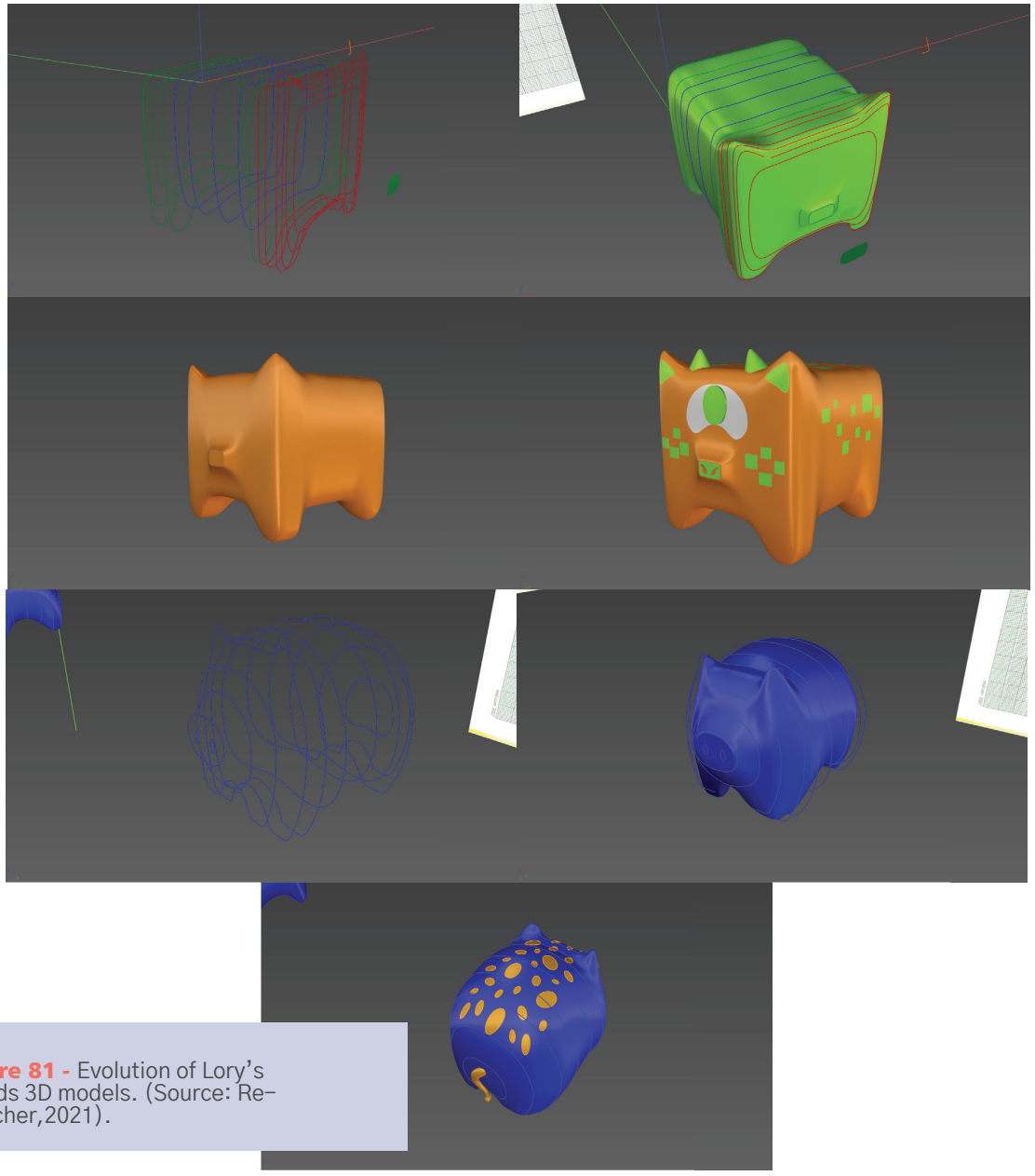
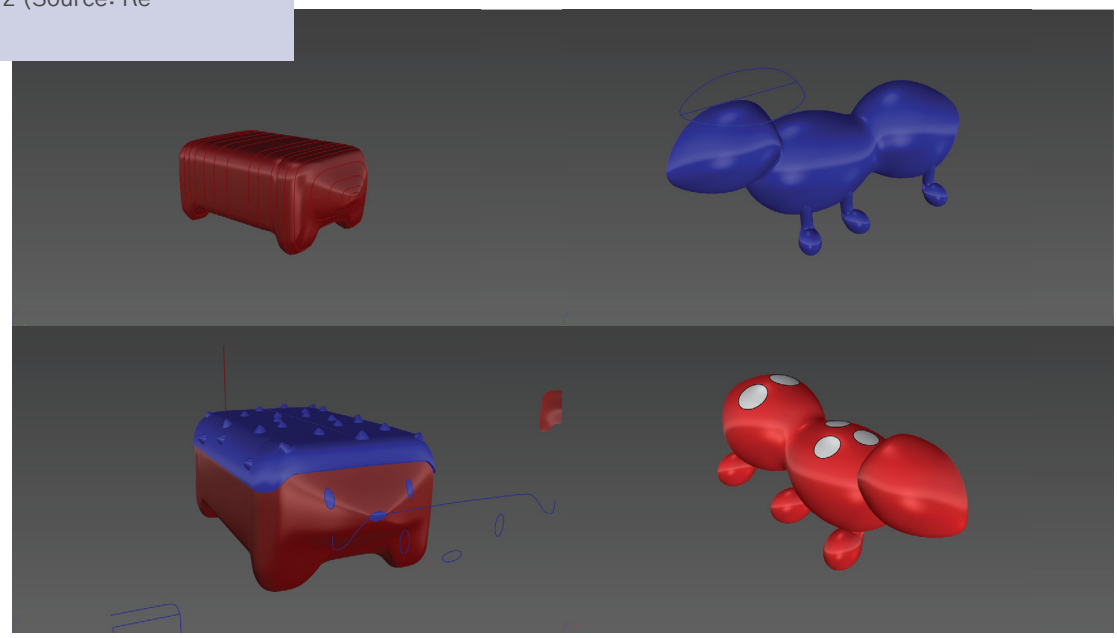


Figure 81 - Evolution of Lory's friends 3D models. (Source: Researcher,2021).

Figure 82 - Evolution of Lory's friends 3D models 2 (Source: Researcher,2021).



The seal was created with a new tool from Rhino 7 called SubD. This allows us to form whatever shape we need to create by "moulding" a 3D shape by moving the points, lines and planes from the object. We first created a shape with 8 divisions and then moulded the shape of the seal by using the point and stretching and flattening whatever lines that were needed in the model to get to the shape we had drawn previously on paper. Finishing it with the same details as the other ones placing the different spots.

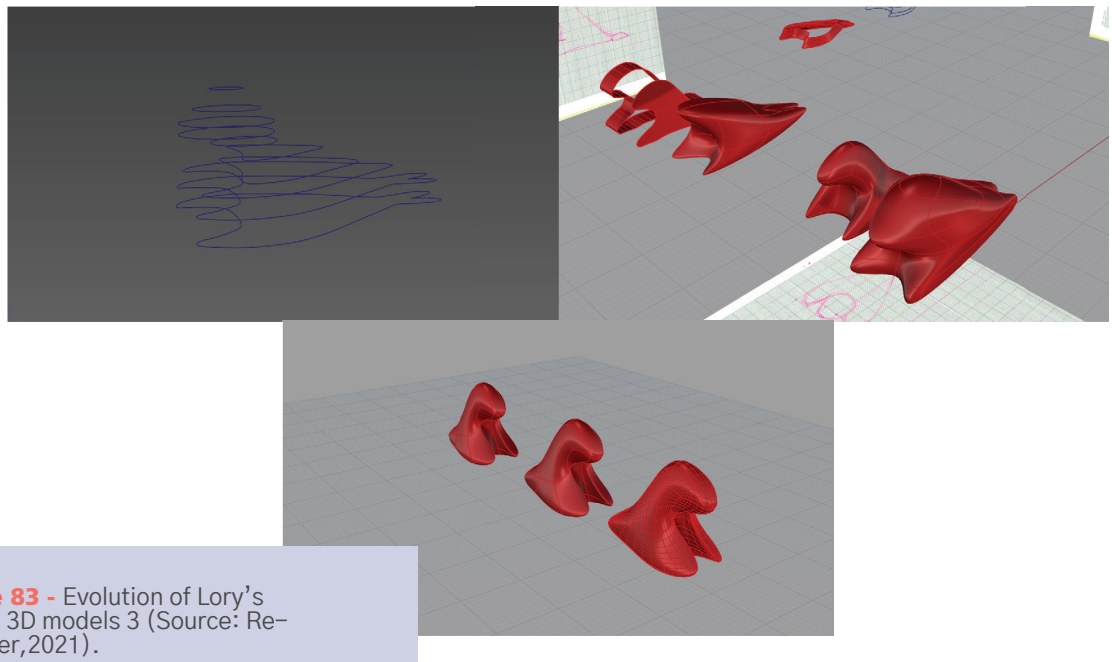


Figure 83 - Evolution of Lory's friends 3D models 3 (Source: Researcher,2021).

After we decided we wanted to make Lory's Friends stackable, we started to analyse how we could place all the shapes in an order where they could be stacked without falling. To solve that situation, small magnets were added.

We analysed the different shapes and ended up with the right order for them all to be able to be stacked and not compromise the shapes. Then we chose where to place the magnets and how the holders should be placed so they wouldn't be noticed by the user.

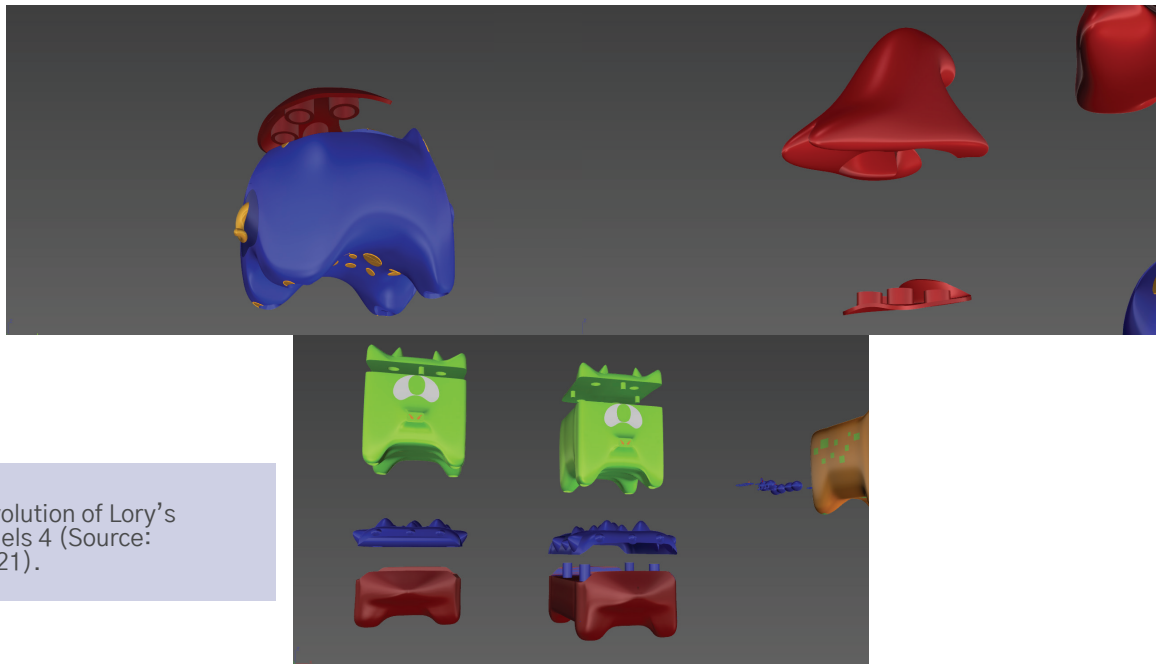


Figure 84 - Evolution of Lory's friends 3D models 4 (Source: Researcher,2021).

To conclude, we made several tests with 3D printed models. The sizing of the toys was adapted several times to be adjusted for kids' hand size and their safety.

The only toys that didn't pass in the ISO tests were the tiny ants. Those were made to be added after, for older kids that are learning to count, and with the supervision of an adult always.

To make the 3D print test first we had to save the 3D model in STL and verify if there were any errors or problems in the model. After we used Cura and imported the STL file in the program, we needed to verify the temperature of the 3D printer, we also needed to choose the right infill and thickness of the walls, and time of the printing. All of this is important for small printings, because this will influence the quality of the print and the capability of it to be printed.

Because the ants were so small we had to lower the time

and speed of the print even more, so that the small paws wouldn't fall out. All these small details were taken into consideration and led to the creation of all the different models printed, shown in the following images.

The renders had in vision the colours of the models, seeing that Lory had the yellow and blue, we decided to have a different colour for each of the new friends. But they had to have some connection between them, so we found two more colours, so that we could play with those four colours and create a bright and fun image and eye-catching for the children to feel affectionate with their toys.

The textures on the small toys were spared so there wouldn't be too much information during play time with the projection. It was made with a resistant, shiny and easy to clean plastic material, for easier maintenance, since the small toys would be the ones to be more used and played with by the kids.

These toys were made with the spots on the back not only to be aesthetically more appealing but also to allow for Lory's camera to recognise their shape and pattern, so that while making the activity the toy would be analysed and recognised by Lory, which in turn would communicate if the answer was correct or not.

Figure 84 - Lory's Friends Renders (Source: Researcher,2021).

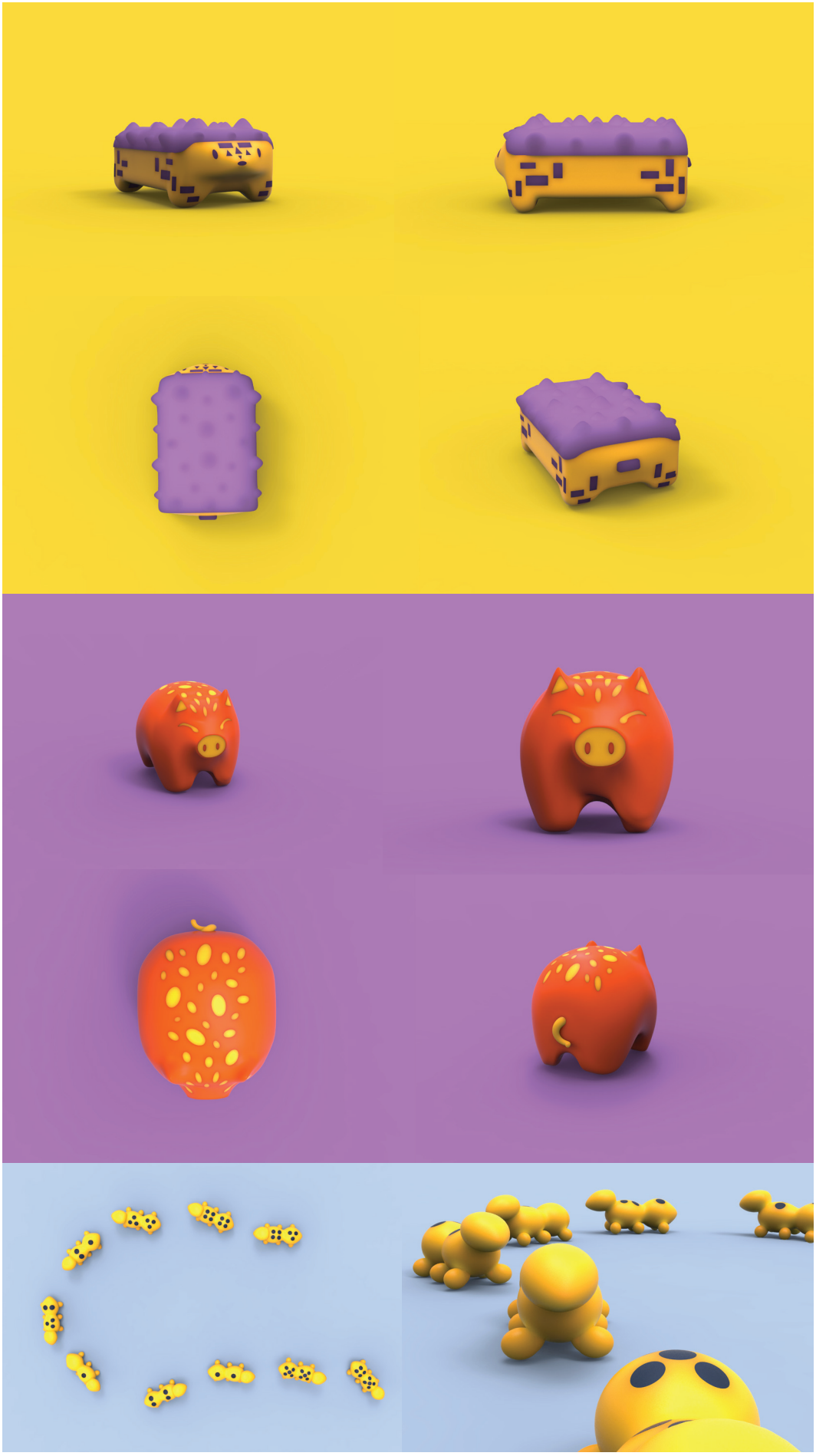
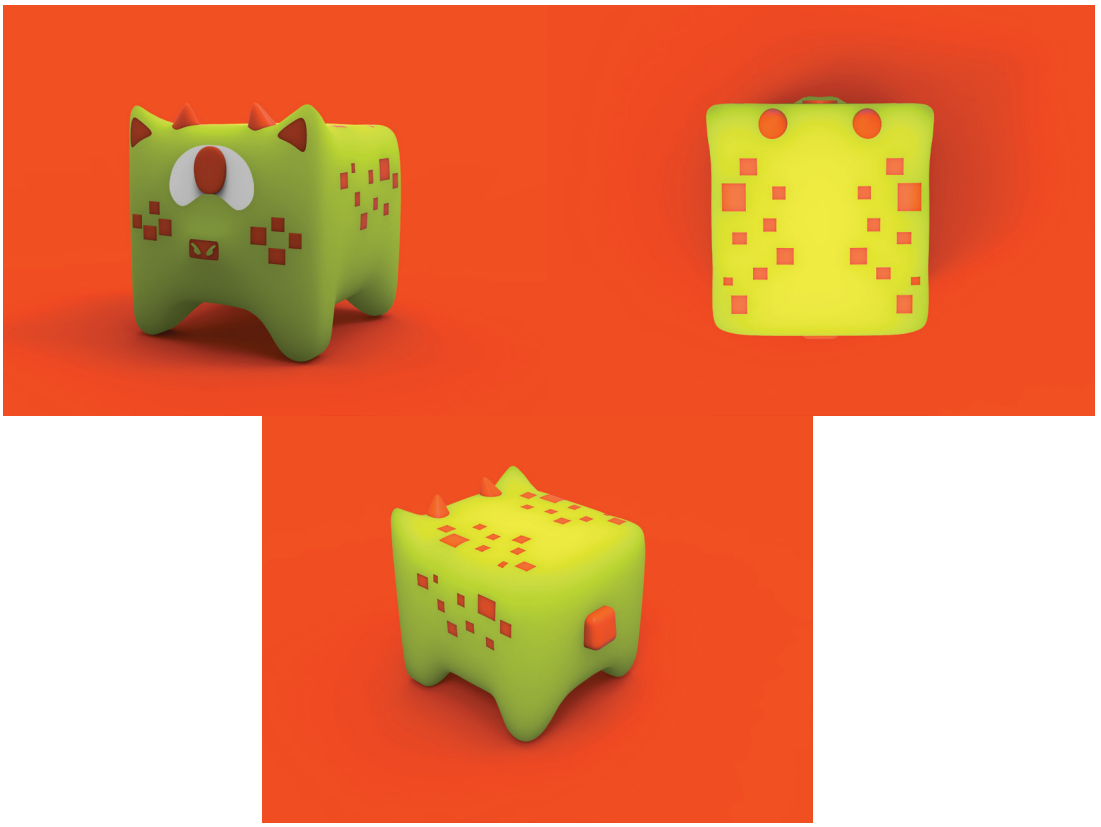


Figure 84 - Evolution of Lory's friends 3D models 4 (Source: Researcher,2020).



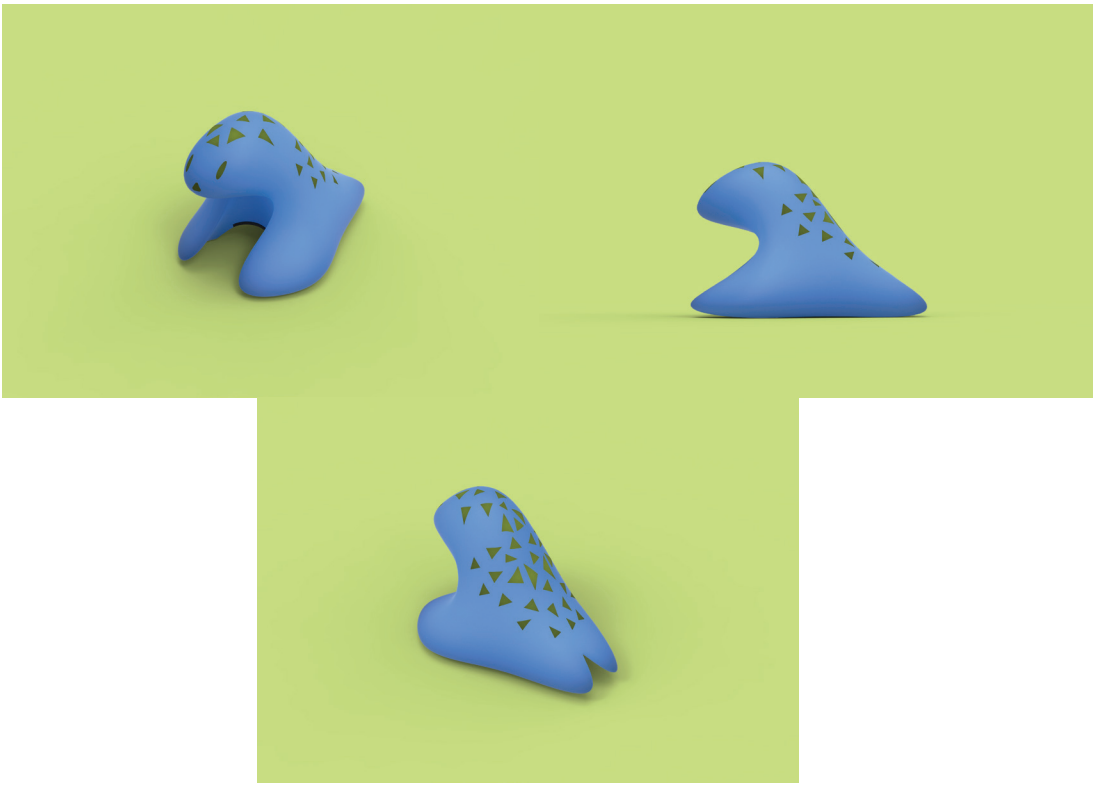


Figure 84 - Evolution of Lory's friends 3D models 4 (Source: Researcher,2020).

4.3.6.A) APP

This app was developed to be used within Lory's projection, it works as the digital interface for the children to play with the physical small toys.

It has 3 main activities which then are divided into more. We have stories, avatar creation and games/activities. We have a group of stories that we talked about before, they are the stories that are adapted to be told and interacted with the toys, but they have the same story and the same intent for the user. How would they work: the story would be interactive, by stopping at times with a small question/challenge for the user, where the game would expect the child to place the correct character in the correct position in the projection. This works because the camera inside the product would read the position of the object and the symbols associated to the character indicating if it is the right answer, if so the story will proceed; if not they will receive a small hint to help them understand what is asked of them and get right on the next try.

We also have the Avatar creation. This is where the child could create their own character that will collect points and help them during the stories/activities that they play. Imagining that the kid is "stuck" in a part of the story where they can't proceed, this character would pop up to help the child with hints.

And finally, we have some more games that will help kids learn letters, colours, shapes, and numbers. All of these activities can be more complex but still fun by using the toys to achieve the right answers and having fun while learning.

This would be the general idea for the app that would have to be further explored and refined by UI and UX experts.

To develop this app concept, we used Figma and first created wireframes, to understand the general idea of the app.

After the wireframes were made, we proceeded to create the visual idea for the app, creating all the buttons and images necessary in Photoshop and Illustrator, finishing by adding all these components together creating the final product. As we can see in the images of the whole process of creating the app.

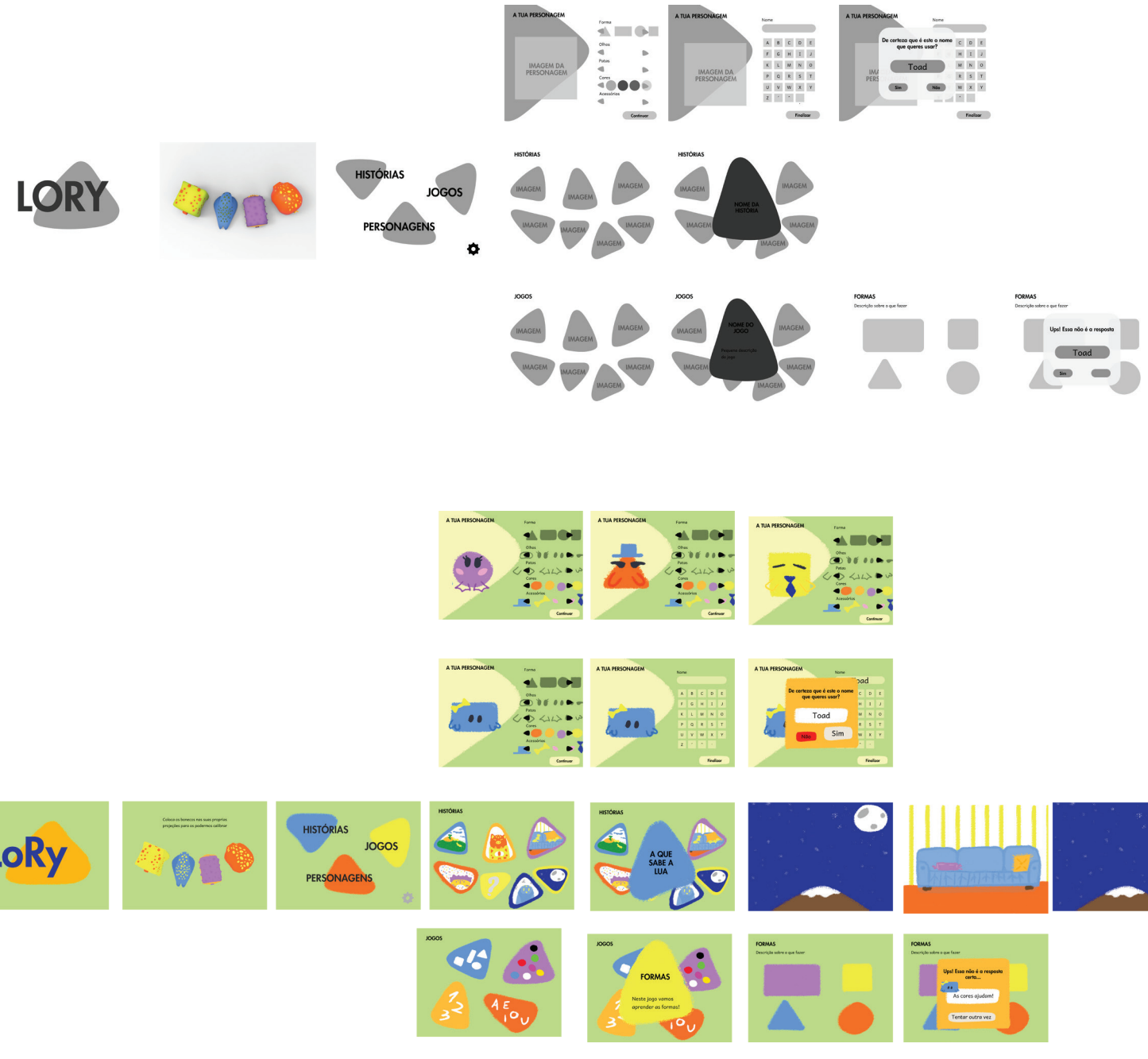


Figure 88 - Wireframes and final visual. (Source: Researcher,2020).

4.3.6.B) LOGO

The name came from the different variables that we had at the beginning. Lanny was the first idea, which then evolved into Lory that is phonetically connected to “learning”, while also sounding like a friendly name resembling a pet. Then the symbol came from the shape of the spots on Lory’s back, in which we applied the two colours used in Lory.

Figure 89 - Logo tests (Source: Researcher,2020).

4.3.6.C) DISSEMINATION

First, a website would have to be created, same as social media and maybe participate in awards.

Since this product is made for children and schools the better way to make the dissemination would be creating demonstrations at pre-schools, to show how the product works and let them utilise it for some time and understand how useful it would be to their institution, and if it would improve their students’ development. If they like it, they could join the program and keep using it in their schools.

Most importantly, we need to show schools and parents that the product will help their children improve, while also bettering their skills.

4.3.7. MOCK-UPS - LORY

The mock-up was made with 3D printing in some pieces. One of the horns was made with felt and small triangles of velcro. The base had small triangles in EVA, in a similar shade of blue to simulate the difference between the shiny and the matte materials. They were sanded, putty was added, sanded again, painted with a primer and then coloured. Shiny finish was added to the yellow paws to try and distinguish them from the rest of its yellow body. On the inside EVA was added on the back of the holes, and a mesh to mimic the mesh that was supposed to be used.

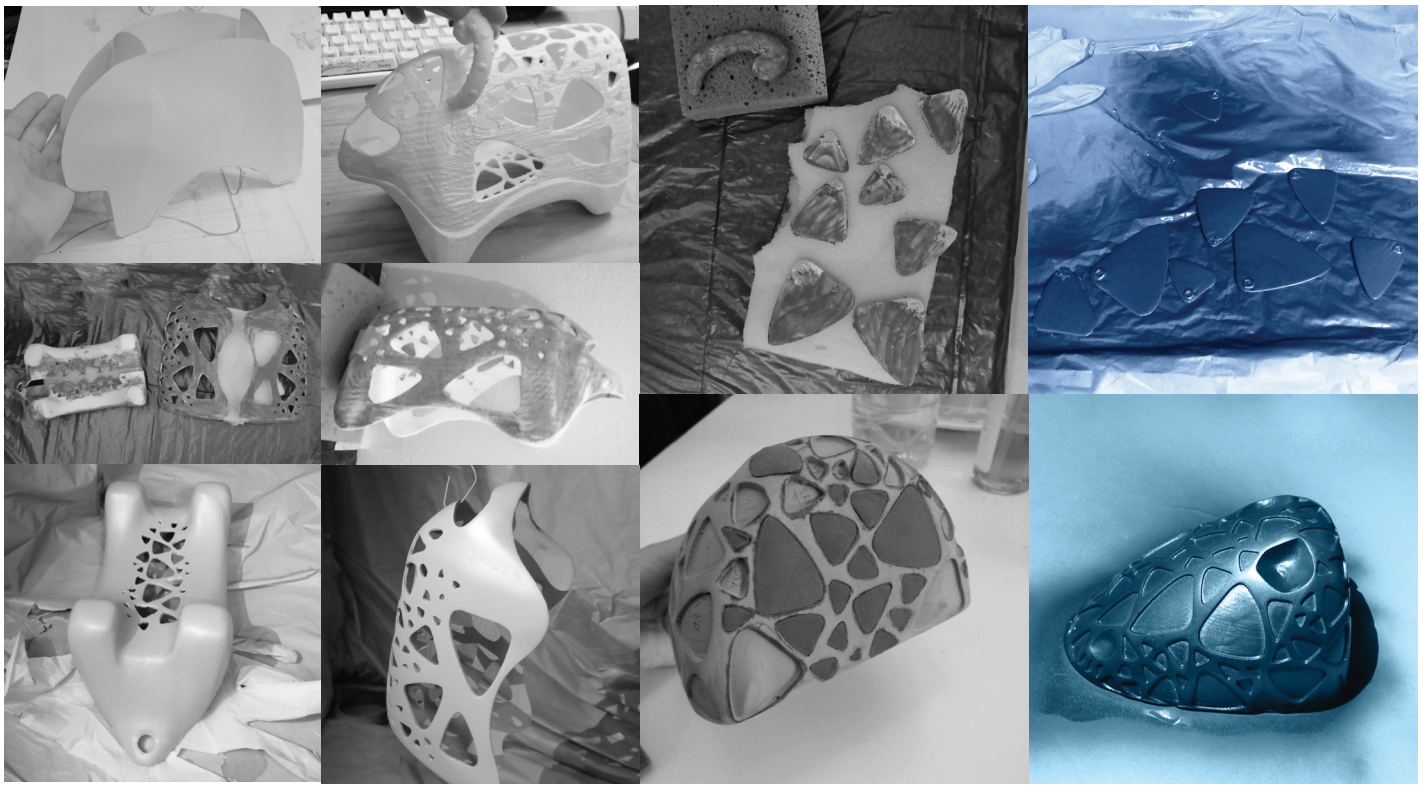
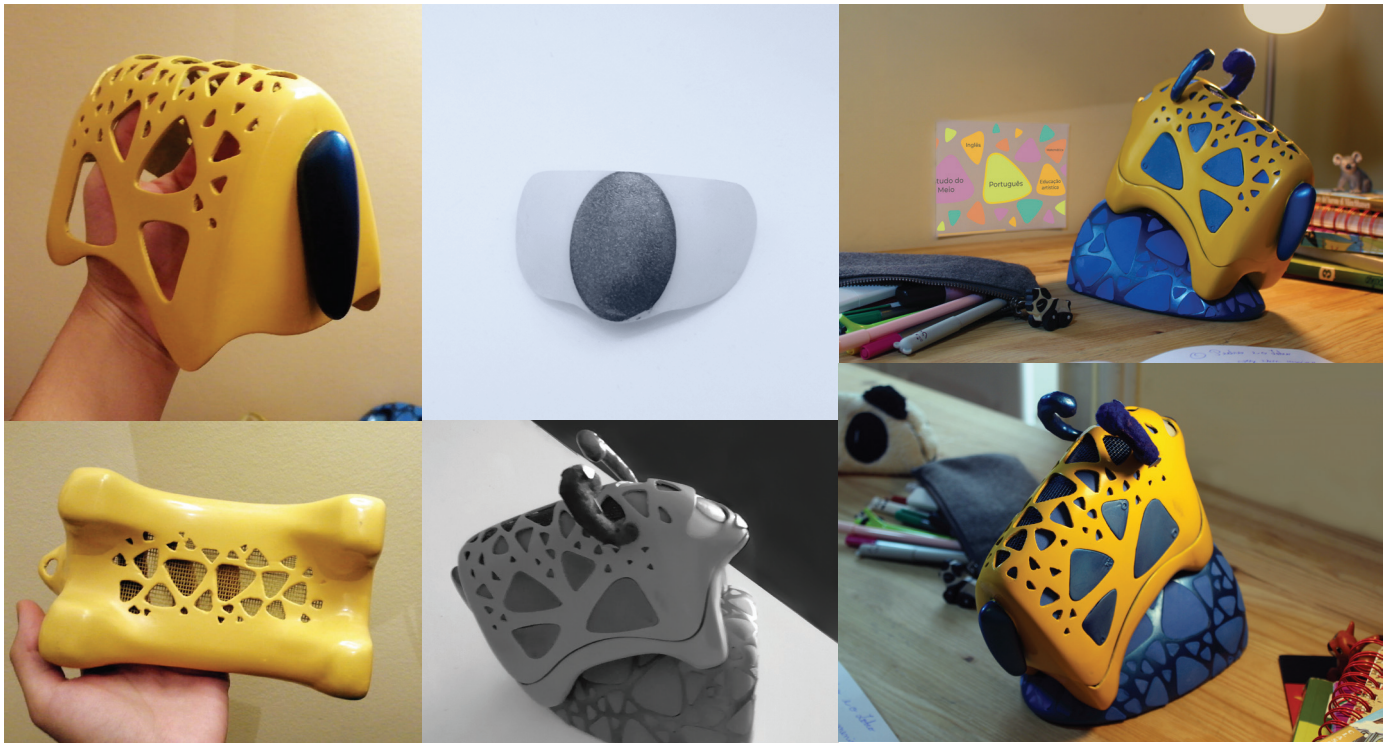


Figure 90 - Lory mock-ups stages. (Source: Researcher,2021).



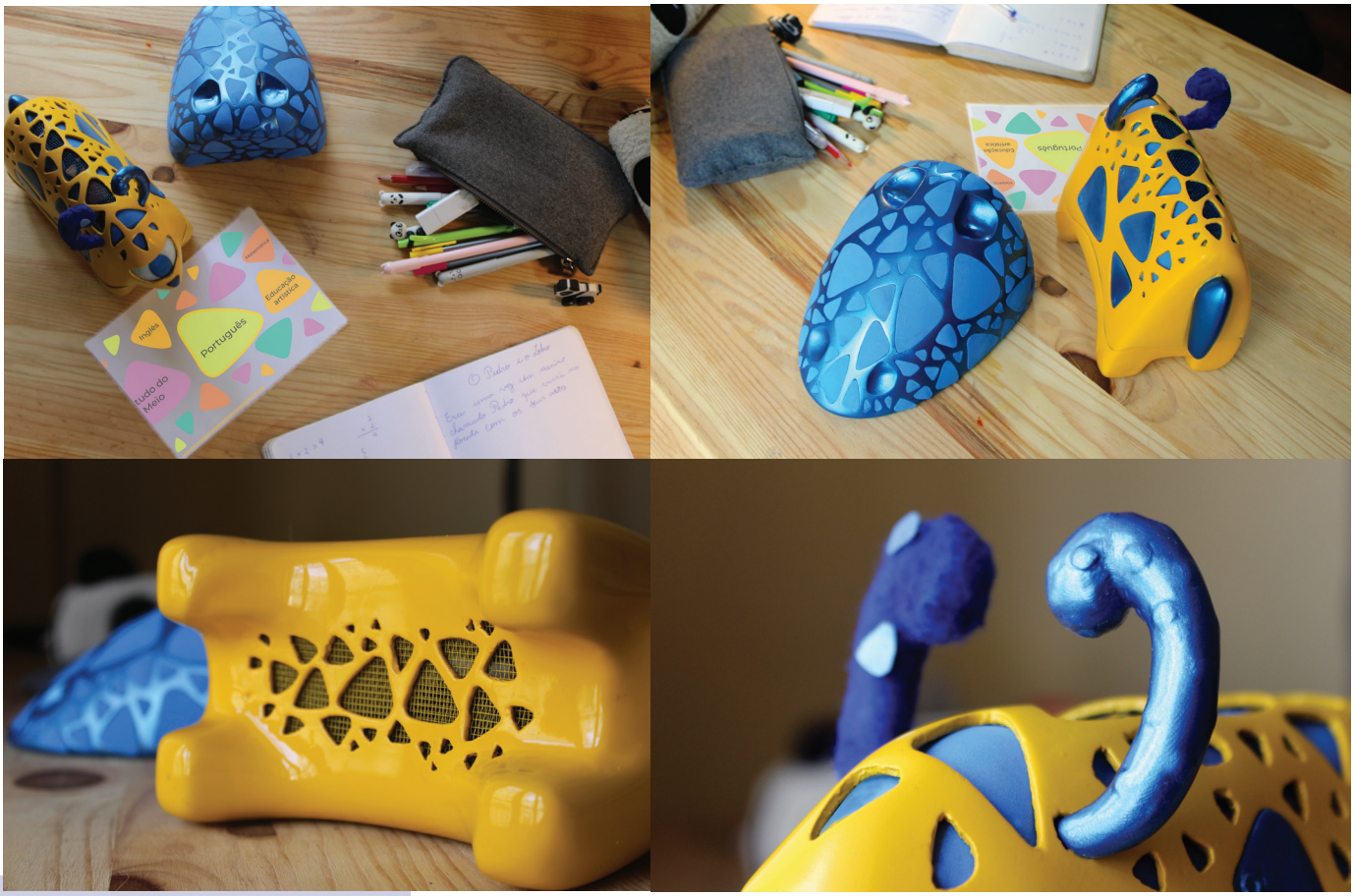


Figure 91 - Lory final mock-ups stages. (Source: Researcher,2021).

4.3.8. MOCK-UPS – LORY'S FRIENDS

The smaller toys were also 3D printed as mentioned before. Magnets were added on the inside of some of them. They were glued and sanded, and then we used putty again to cover any holes and imperfections. We sanded even more and proceeded to the primer, followed by the paint and finally small detailing was added on their backs with the different shapes. Then we applied a final shiny varnish coat to make sure any of the small imperfections disappeared.

Figure 92 – Lory's friends mock-ups stages. (Source: Researcher,2021).

Figure 93 – Lory's friends mock-ups stages 2. (Source: Researcher,2021).

Figure 94 - Lory's friends final mock-ups stages 3. (Source: Researcher,2021).

Chapter 5 – Conclusions and Recommendations

Chapter 5 – Conclusions and Recommendations

5.1. FINAL CONCLUSIONS

During the process of this investigation, we studied children's learning stages, helping us to understand where some of them may have problems developing their skills. We also tried to investigate the literature to find out how product design can help children learn. The investigation started by looking for ways to connect the physical and digital world in children's schooling, trying to promote a more playful learning environment and connecting the technology trends to more traditional ways of learning. By studying various case studies, we found that most of the toys have some kind of 3D interaction but lacked digital interaction, some others also lacked repetitive learning methods but were effective on motor skills development. This guided us to the development of a toy that could perform better and that could also be able to accompany the children during the different stages of learning.

The idea of a narrative that could be used to teach children through repetition and interaction with the physical object could make it easier for kids to learn and also train their skills without always having the help of an adult. This hypothesis was tested through a "cultural probe" methodology tested in a small sample group. In order to reach more people we have complemented it with various questionnaires to get more feedback. The results showed that the kids consider it as some type of video game narrative, so that helped in connecting the physical and digital creating a physical video game.

The strategy was to develop this physical / digital interaction providing a tool for kids to learn from the repetition of the stories / small exercises, and providing children with more learning difficulties the opportunity to take longer understanding the stories, but engaging them through physical and digital interaction.

During the development of the toy, we also had to understand how we could make it unique, memorable and fun for children. The idea that the toy could grow with the child during their different stages of development, led to the development of a set of characters, which could be engaging for children. A toy projector with an odd shape, which is a friendly character and its small friends would create a playful family of characters, which could then help the child play the different games and exercises. These could combine traditional stories but provide a different approach, by using the digital tool

for the settings and the physical characters / small friends for a "hands-on" interaction. The combination of both allows to create different stories, settings and challenges, providing different levels of difficulty according to the child's development. The characters allow the children to play with shapes, colours, numbers, but also engage with a sense of family of characters that mix different animals and morphologies.

It is expected that the combination of physical characters with traditional stories and the combination of digital and physical tools in one product will enrich the children's learning experience and allow for the creation of multiple tools, scenarios and stories for a playful learning environment

The project was developed until physical prototypes of all the characters were developed and manufactured using additive technologies. The digital tools were developed as early prototypes. A final prototype combining both physical and digital was not tested with kids. This would be the next stage for this project, making tests with children to record and analyse their actual reactions to the product and try to improve it.

5.1. FUTURE RECOMMENDATIONS

We understand that some improvements should be made on the digital concept of the toy, creating an actual app with the orientation of experts, making sure the exercises fit all the different development stages of the children from 3 to 7 years old.

A colour study should also be taken more deeply into consideration to create the best combinations as well as best colour coordination for the product.

Regarding the physical characters,some pieces such as the "ants" could be redefined in order to achieve the perfect relation between size and number, considering a future affordable production cost.

As for the development of the Lory product, internal components would also need to have more extensive studies to reduce size and complexity as well as consider pricing. A deeper analysis of all the components would be needed for production purposes even though the researcher was supported by some engineering expertise during the process.

Overall, we consider the research was purposeful and useful in developing a new product which can engage children in a physical / digital learning environment, providing new possibilities to both children and teachers / parents. Further testing and developing will be needed to verify the acceptance of the toy and its production viability.

Chapter 6 – Post textual elements

Chapter 6 – Post textual elements

6.1. BIBLIOGRAPHIC REFERENCES

Anderson, J. (2020, March 31). How coronavirus is changing education. Quartz. Retrieved 23 April 2020, from https://qz.com/1826369/how-coronavirus-is-changing-education/

CDC. (n.d.). What is a Developmental Milestone? Centers for Disease Control and Prevention. Retrieved 2 June 2020, from https://www.cdc.gov/ncbddd/actearly/milestones/index.html

Culatta, R. (2019, June 25). A Proposal For Thoughtful Impatience – BRIGHT Magazine. Medium. Retrieved 15 January 2021, from https://brightthemag.com/a-proposal-for-thoughtful-impatience-5cebc0faa2cb

ESRB. (n.d.). ESRB Ratings. ESRB Ratings. Retrieved 3 May 2021, from https://www.esrb.org/ratings-guide/

Faria, S. (2019, January). Socio-emotional Competences in Children with Intellectual Disability Development and Validation of a Socio-emotional Learning Programme. Universidade da Beira Interior Ciências Sociais e Humanas. https://ubibliorum.ubi.pt/bitstream/10400.6/6976/1/Tese%20definitiva-p%C3%B3s%20defesa-janeiro%202019.pdf

Holmes, K. [99U]. (2019, June 26). Kat Holmes: Rethink What Inclusive Design Means [Video]. YouTube. https://www.youtube.com/watch?v=-iccWRhKZa8

Indiegogo. (n.d.). Puppy cube: Interactive Touchscreen Projector. Retrieved 29 April 2021, from https://www.indiegogo.com/projects/puppy-cube-interactive-touchscreen-projector#/

Kitungulu, C. (2020, December 10). Designing products for kids – Concillier Kitungulu (Coco). Medium. Retrieved 15 March 2021, from https://medium.com/@concillier.coco/designing-products-for-kids-759029f1b9d6

LEGO. (n.d.). Help Topics - Customer Service - LEGO.com US. Retrieved 27 April 2021, from https://www.lego.com/en-us/service/help/bricks-building/brick-facts/what-lego-bricks-are-made-from-408100000007855LumoPlay. (n.d.-a). LUMOplay | Interactive Floor and Wall Games. Retrieved 27 April 2021, from https://www.lumoplay.com/cart

LumoPlay. (n.d.-a). LUMOplay | Interactive Floor and Wall Games. Retrieved 27 April 2021, from https://www.lumoplay.com/cart

MakeWonder. (2020, November 30). Dash. Wonder Workshop – US. Retrieved 27 April 2021, from https://www.makewonder.com/robots/dash/

Mauro, T. (2021, July 17). Are Your Child's Motor Skills on Track? Verywell Family. Retrieved 26 October 2021, from https://www.verywellfamily.com/what-are-motor-skills-3107058

Melbot. (2018, February 27). Melbits Officials [Instagram Profile]. Instagram. https://www.instagram.com/melbitsofficial/

Molnár, D. (2021, January 11). Product Design For Kids: A UX Guide To The Child's Mind. UX Studio. Retrieved 15 March 2021, from https://uxstudioteam.com/ux-blog/design-for-kids/

Neiva, E., & Romano, C. (2007). The Semiotic Immersion of Video Games, Gaming Technology and Interactive Strategies. Public Journal of Semiotics, 1(2), 31-49. https://doi.org/10.37693/pjos.2007.1.8819

Persson, H., ÅHman, H., Yngling, A. A., & Gulliksen, J. (2014, May). Universal design, inclusive design, accessible design, design for all: different concepts—one goal? On the concept of accessibility—historical, methodological and philosophical aspects. Universal Access in the Information Society, 505-526. https://doi.org/10.1007/s10209-014-0358-z

Plugo [PlayShifu]. (2018, August 24). Plugo explained in 90 seconds [Video]. YouTube. https://www.youtube.com/watch?v=9LB-Ta8E9LiU

Prensky, M. (2006). Don't Bother Me Mom--I'm Learning! Vol. Part 11 (1st Edition). Paragon House. https://marcprensky.com/wp-content/uploads/2013/04/Prensky-DONT_BOTHER_ME_MOM_IM_LEARNING-Part1.pdf

Puppyrobot. (n.d.-a). Products. Retrieved 29 April 2021, from https://store.puppyrobot.com/collections/all

Sandhu, A. K., & Bhardwaj, K. (2013). Interfaces for kids. Proceedings of the 11th Asia Pacific Conference on Computer Human Interaction - APCHI '13, 160-166. https://doi.org/10.1145/2525194.2525286

Stanford University. (2016, September). ARTIFICIAL INTELLIGENCE AND LIFE IN 2030 ONE HUNDRED YEAR STUDY ON ARTIFICIAL INTELLIGENCE. https://ai100.stanford.edu/sites/g/files/sbiybj18871/files/media/file/ai100report10032016fnl_singles.pdf

Tavares, N. (2020, September). VERTUS: Desenvolvimento de um periférico de gaming inclusivo. Universidade de Lisboa.

Tori. (n.d.). Dive into the magical worlds of Tori. Retrieved 29 April 2021, from https://www.tori.com/nl/

University of Cambridge. (n.d.). What is inclusive design? Retrieved 15 July 2021, from http://www.inclusivedesigntoolkit.com/whatis/whatis.html

University of Missouri. (2005). Preschool Basics: How Children Develop During the Preschool Years. Missouri. Retrieved 19 February 2021, from https://extension.missouri.edu/publications/gh6122

6.2. BIBLIOGRAPHY

6.2.1. INCLUSIVE DESIGN

Campagnaro, M. (2016). The Function of Play in Bruno Munari's Children's Books. A Historical Overview. Journal of Theories and Research in Education 11, 3, 11(3), 93-103. https://www.researchgate.net/publication/311430889_The_Function_of_Play_in_Bruno_Munari's_Children's_Books_A_Historical_Overview

Clarkson, J., & Coleman, R. (2010, March 22). Inclusive design. Taylor & Francis Online. Retrieved 15 July 2021, from https://www.tandfonline.com/doi/full/10.1080/09544821003693689?scroll=top&needAccess=true

Elmansy, R. (2021, March 21). How to Use Mind Mapping for Better Thinking. Designorate. Retrieved 3 April 2021, from https://www.designorate.com/how-to-use-mind-mapping/

Fernandes, M. (2017, January). Design inclusivo para a infância Descomplicando a Síndrome de Asperger (Master's dissertation). Mariana Frade Alves Torpes Fernandes. https://www.repository.utl.pt/bitstream/10400.5/13522/3/Mariana%20Torpes%20Fernandes.pdf

Hanington, B., & Martin, B. (2019). Universal Methods of Design, Expanded and Revised: 125 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions (Rev. ed.). Rockport Publishers.

Holmes, K. [99U]. (2019, June 26). Kat Holmes: Rethink What Inclusive Design Means [Video]. YouTube. https://www.youtube.com/watch?v=-iccWRhKZa8

Indiegogo. (n.d.). Puppy cube: Interactive Touchscreen Projector. Retrieved 29 April 2021, from https://www.indiegogo.com/projects/puppy-cube-interactive-touchscreen-projector#/

LEGO. (n.d.). Help Topics - Customer Service - LEGO.com US. Retrieved 27 April 2021, from https://www.lego.com/en-us/service/help/bricks-building/brick-facts/what-lego-bricks-are-made-from-408100000007855

LumoPlay. (n.d.-a). LUMOplay | Interactive Floor and Wall Games. Retrieved 27 April 2021, from https://www.lumoplay.com/cart

LumoPlay. (n.d.-b). LUMOplay | Interactive Floor and Wall Games. Retrieved 26 April 2021, from https://www.lumoplay.com/hardware/interactive-floor-projector

MakeWonder. (2020, November 30). Dash. Wonder Workshop - US. Retrieved 27 April 2021, from https://www.makewonder.com/robots/dash/

Melbot. (2018, February 27). Melbits Officials [Instagram Profile]. Instagram. https://www.instagram.com/melbitsofficial/

Melbot. (2020, November 26). Melbits POD – A virtual pet toy. Melbits POD. Retrieved 27 April 2021, from https://melbitspod.com/

Melbot. (2021, April 2). Melbits POD – Hatch Digital Pets. Melbits POD. Retrieved 27 April 2021, from https://melbitspod.com/product/melbits-pod/

Melbots [Tamagotchi Italia]. (2021, February 17). Vi presento il Melbits Pod! [Video]. YouTube. https://www.youtube.com/watch?v=HZuzWhNtVHU

Persson, H., ÅHman, H., Yngling, A. A., & Gulliksen, J. (2014, May). Universal design, inclusive design, accessible design, design for all: different concepts—one goal? On the concept of accessibility—historical, methodological and philosophical aspects. Universal Access in the Information Society, 505-526. https://doi.org/10.1007/s10209-014-0358-z

Plugo [PlayShifu]. (2018, August 24). Plugo explained in 90 seconds [Video]. YouTube. https://www.youtube.com/watch?v=9LB-Ta8E9LiU

Puppyrobot. (n.d.-a). Products. Retrieved 29 April 2021, from https://store.puppyrobot.com/collections/all

Puppyrobot. (n.d.-b). Puppy Cube. Retrieved 29 April 2021, from https://store.puppyrobot.com/products/puppy-cube-purchase-page

Schifferstein, H. N. J., & Hekkert, P. (2007). Product Experience (1st ed.). Elsevier Science.

Tori. (n.d.). Dive into the magical worlds of Tori. Retrieved 29 April 2021, from https://www.tori.com/nl/

University of Cambridge. (n.d.). What is inclusive design? Retrieved 15 July 2021, from http://www.inclusivedesigntoolkit.com/whatis/whatis.html

6.2.2. EMOTIONAL DESIGN

DESMET, P. M. A. (2007). Product Emotion. In H. N. J. Schifferstein & P. Hekkert (Eds.), Product Experience (1st ed., pp. 379-396). Elsevier Science.

Russell, J. A. (1980). A circumplex model of affect. Journal of Personality and Social Psychology, 39(6), 1161-1178. https://doi.org/10.1037/h0077714

Schifferstein, H. N. J., & Hekkert, P. (2007). Product Experience (1st ed.). Elsevier Science.

6.2.3. HOW TO DESIGN FOR KIDS

Anderson, J. (2020, March 31). How coronavirus is changing education. Quartz. Retrieved 23 April 2020, from https://qz.com/1826369/how-coronavirus-is-changing-education/

Kitungulu, C. (2020, December 10). Designing products for kids – Concillier Kitungulu (Coco). Medium. Retrieved 15 March 2021, from https://medium.com/@concillier.coco/designing-products-for-kids-759029f1b9d6

Molnár, D. (2021, January 11). Product Design For Kids: A UX Guide To The Child's Mind. UX Studio. Retrieved 15 March 2021, from https://uxstudioteam.com/ux-blog/design-for-kids/

Neiva, E., & Romano, C. (2007, July). View of The Semiotic Immersion of Video Games, Gaming Technology and Interactive Strategies. The Public Journal of Semiotics. https://journals.lub.lu.se/pjos/article/view/8819/7899

Stanford University. (2016, September). ARTIFICIAL INTELLIGENCE AND LIFE IN 2030 ONE HUNDRED YEAR STUDY ON ARTIFICIAL INTELLIGENCE. https://ai100.stanford.edu/sites/g/files/sbiybj18871/files/media/file/ai100report10032016fnl_singles.pdf

6.2.4. DIGITAL AND PHYSICAL TOYS / GAME CHARACTERS DEVELOPMENT.

Ankama. (n.d.). Wakfu. Wakfu. Retrieved 5 May 2021, from https://www.wakfu.com/pt/prehome

ESRB. (n.d.). ESRB Ratings. ESRB Ratings. Retrieved 3 May 2021, from https://www.esrb.org/ratings-guide/

HopFrog. (n.d.). Forager on Steam. Steam. Retrieved 29 April 2021, from https://store.steampowered.com/app/751780/Forager/

Humble games. (n.d.). Forager – Apps on Google Play. Google Apps. Retrieved 4 May 2021, from https://play.google.com/store/apps/details?id=com.humblebundle.forager&hl=en_AU&gl=US

Lee, J., Luchini, K., Michael, B., Norris, C., & Soloway, E. (2004, April). More than Just Fun and Games: Assessing the Value of Educational Video Games in the Classroom.

Microsoft. (n.d.). FuzzBall|Xbox. Retrieved 4 May 2021, from https://www.xbox.com/en-ie/games/store/fuzzball/9n9z4ggbn0zc?cid=rodr72

Neiva, E., & Romano, C. (2007). The Semiotic Immersion of Video Games, Gaming Technology and Interactive Strategies. Public Journal of Semiotics, 1(2), 31-49. https://doi.

org/10.37693/pjos.2007.1.8819

Nintendo. (n.d.-a). Animal Crossing<sup>TM: New Horizons for the Nintendo Switch</i>. Animal Crossing: New Horizons. Retrieved 5 May 2021, from https://www.animal-crossing.com/new-horizons/

Nintendo. (n.d.-b). Captain Toad: Treasure Tracker for Nintendo Switch. Retrieved 5 May 2021, from https://www.nintendo.com/games/detail/captain-toad-treasure-tracker-switch/

Nintendo. (n.d.-c). Clubhouse Games<sup>TM: 51 Worldwide Classics for Nintendo Switch</i>. Nintendo. Retrieved 4 May 2021, from https://www.nintendo.com/games/detail/clubhouse-games-51-worldwide-classics-switch/

Nintendo. (n.d.-d). Mario Golf<sup>TM: Super Rush for Nintendo Switch - Nintendo Game Details</i>. Retrieved 5 May 2021, from https://www.nintendo.com/games/detail/mario-golf-super-rush-switch/

Nintendo. (n.d.-e). Pokémon Sword & Pokémon Shield Double Pack for Nintendo Switch. Retrieved 6 May 2021, from https://www.nintendo.com/games/detail/pokemon-sword-and-pokemon-shield-double-pack-switch/

Nintendo. (n.d.-f). Super Mario 3D World. Nintendo of Europe. Retrieved 5 May 2021, from https://www.nintendo.pt/Jogos/Nintendo-Switch/Super-Mario-3D-World-Bowser-s-Fury-1832228.html

Nintendo. (n.d.-g). Taiko no Tatsujin: Drum'n'Fun! Nintendo of Europe. Retrieved 4 May 2021, from https://www.nintendo.pt/Jogos/Nintendo-Switch/Taiko-no-Tatsujin-Drum-n-Fun--1455739.html

Panic & House house. (n.d.). Untitled Goose Game. Goose. Retrieved 5 May 2021, from https://goose.game/

PlayStation. (n.d.). RATCHET & CLANK: UMA DIMENSÃO À PARTE. Retrieved 5 May 2021, from https://www.playstation.com/pt-pt/games/ratchet-and-clank-rift-apart/

Posted by: Microsoft Flight Simulator Team. (n.d.). Microsoft Flight Simulator. Microsoft Flight Simulator. Retrieved 5 May 2021, from https://www.flightsimulator.com/

Prensky, M. (2006). Don't Bother Me Mom--I'm Learning! Vol. Part 11 (1st Edition). Paragon House. https://marcprensky.com/wp-content/uploads/2013/04/Prensky-DONT_BOTHER_ME_MOM_IM_LEARNING-Part1.pdf

Psyonix. (n.d.). Rocket League. Rocket League - Official Site. Retrieved 4 May 2021, from https://www.rocketleague.com/

Sandhu, A. K., & Bhardwaj, K. (2013). Interfaces for kids. Proceedings of the 11th Asia Pacific Conference on Computer Human Interaction - APCHI '13, 160-166. https://doi.

org/10.1145/2525194.2525286

Tavares, N. (2020, September). VERTUS: Desenvolvimento de um periférico de gaming inclusivo. Universidade de Lisboa.

Team17. (n.d.). Overcooked | Cooking Video Game | Team17. Team17 Digital LTD – The Spirit Of Independent Games. Retrieved 5 May 2021, from https://www.team17.com/games/overcooked/

6.2.5. BOOK STORIES

Bright, R. (n.d.). O Leão que Temos Cá Dentro. Editorial Presença.

Cunha, C. (n.d.). O Cuquedo. Livros Horizonte.

Donaldson, J. (n.d.). O Grúfalo. Brinque book.

Grejniec, M. (2002). A que sabe a lua? Kalandraka.

Llenas, A. (n.d.). O Monstro de Cores (1st ed.). Nuvem de letras.

Soares, L. D. (n.d.). Todos no Sofá. Livros Horizonte.

Tolstoi, A. (n.d.). O Nabo Gigante (Portuguese Edition). Livros Horizonte.

6.2.6. CHILDREN DEVELOPMENT AND EDUCATION

Anderson, J. (2020, March 31). How coronavirus is changing education. Quartz. Retrieved 15 January 2021, from https://qz.com/1826369/how-coronavirus-is-changing-education/

BBC. (n.d.). Activities for babies, toddlers and children. BBC Tiny Happy People. Retrieved 15 July 2020, from https://www.bbc.co.uk/tiny-happy-people

CDC. (n.d.). What is a Developmental Milestone? Centers for Disease Control and Prevention. Retrieved 2 June 2020, from https://www.cdc.gov/ncbddd/actearly/milestones/index.html

Culatta, R. (2019, June 25). A Proposal For Thoughtful Impatience – BRIGHT Magazine. Medium. Retrieved 15 January 2021, from https://brightthemag.com/a-proposal-for-thoughtful-impatience-5cebc0faa2cb

Demetriou, A., Kazali, E., Kazi, S., & Spanoudis, G. (2020). Cognition and cognizance in preschool predict school achievement in primary school. Cognitive Development, 54. https://doi.org/10.1016/j.cogdev.2020.100872

Faria, S. (2019, January). Socio-emotional Competences in Children with Intellectual Disability Development and Validation of a Socio-emotional Learning Programme. Universidade

da Beira Interior Ciências Sociais e Humanas. https://ubibliorum.ubi.pt/bitstream/10400.6/6976/1/Tese%20definitiva-p%C3%B3s%20defesa-janeiro%202019.pdf

Fraser Health. (n.d.). Intellectual development in children. Fraser Health Authority. Retrieved 23 October 2021, from https://www.fraserhealth.ca/health-topics-a-to-z/children-and-youth/intellectual-development-in-children#.YdMq0WjP3QW

Ginsburg, K. R. (2007, January 1). The Importance of Play in Promoting Healthy Child Development and Maintaining Strong Parent-Child Bonds. American Academy of Pediatrics. Retrieved 5 April 2021, from https://publications.aap.org/pediatrics/article/119/1/182/70699/The-Importance-of-Play-in-Promoting-Healthy-Child

Hattie, J., & Yates, G. (2014). Visible Learning and the Science of How We Learn (Vol. 1). Routledge. https://www.readpbn.com/pdf/Visible-Learning-and-the-Science-of-How-We-Learn-Sample-Pages.pdf

Kaneshiro, N., & Zieve, D. (2020, February 10). Preschooler development. MedlinePlus. Retrieved 25 June 2021, from https://medlineplus.gov/ency/article/002013.htm

Kemp, G., Smith, M., & Segal, J. (n.d.). Learning Disabilities and Disorders. HelpGuide.Org. Retrieved 20 April 2021, from https://www.helpguide.org/articles/autism-learning-disabilities/learning-disabilities-and-disorders.htm

Lieberman, D. A., Fisk, M. C., & Biely, E. (2009). Digital Games for Young Children Ages Three to Six: From Research to Design. Computers in the Schools, 26(4), 299-313. https://doi.org/10.1080/07380560903360178

Liu, F. (2018, December 16). Designing for Kids: Cognitive Considerations. Nielsen Norman Group. Retrieved 20 April 2021, from https://www.nngroup.com/articles/kids-cognition/

Marks, H. (2010, November 9). 4- to 5-Year-Olds: Developmental Milestones. WebMD. Retrieved 2 April 2021, from https://www.webmd.com/parenting/4-to-5-year-old-milestones#1

Mauro, T. (2021, July 17). Are Your Child's Motor Skills on Track? Verywell Family. Retrieved 26 October 2021, from https://www.verywellfamily.com/what-are-motor-skills-3107058

Mead, S. (n.d.). 9 Classic Preschool Games That Secretly Teach Life Skills. WHITBY. Retrieved 20 March 2021, from https://www.whitbyschool.org/passionforlearning/9-classic-preschool-games-that-secretly-teach-life-skills

Mecca, T. (2011, December). Desenvolvimento da inteligência em pré-escolares: implicações para a aprendizagem. Rev. Psicopedagogia. http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S0103-84862012000100009

Molnár, D. (2021, January 11). Product Design For Kids: A UX Guide To The Child's Mind. UX Studio. Retrieved 14 March 2021, from https://uxstudioteam.com/ux-blog/design-for-kids/

O'Connell, K. (n.d.). What Is Uncoordinated Movement? Healthline. Retrieved 10 May 2021, from https://www.healthline.com/health/movement-uncoordinated

O'Connell, K. (2019, September 19). What Is Uncoordinated Movement? Healthline. Retrieved 15 February 2021, from https://www.healthline.com/health/movement-uncoordinated

Pietrangelo, A. (2020, August 13). What You Need to Know About Developmental Delay. Healthline. Retrieved 14 April 2021, from https://www.healthline.com/health/developmental-delay

Raising Children. (n.d.). Preschoolers: development. Raising Children Network. Retrieved 30 March 2021, from https://raisingchildren.net.au/preschoolers/development

Reporter, G. S. (2018, September 24). Ten books every teacher should read. The Guardian. https://www.theguardian.com/teacher-network/2017/aug/15/ten-books-every-teacher-should-read

Sarikas, C. (n.d.). Vygotsky Scaffolding: What It Is and How to Use It. PrepScholar. Retrieved 23 June 2021, from https://blog.prepscholar.com/vygotsky-scaffolding-zone-of-proximal-development

SickKidks. (n.d.). AboutKidsHealth. About Sick Kids Health. Retrieved 23 October 2021, from https://www.aboutkidshealth.ca/Article?contentid=711&language=English

Somerville Hub. (n.d.). Growth & Development in Preschoolers | Early Childhood Development. Retrieved 19 February 2021, from https://somervillehub.org/early-childhood-hub/preschool/my-developing-preschooler

University of Missouri. (2005). Preschool Basics: How Children Develop During the Preschool Years. Missouri. Retrieved 19 February 2021, from https://extension.missouri.edu/publications/gh6122

6.2.7. CASE STUDIES

Indiegogo. (n.d.). Puppy cube: Interactive Touchscreen Projector. Retrieved 29 April 2021, from https://www.indiegogo.com/projects/puppy-cube-interactive-touchscreen-projector#/

LEGO. (n.d.). Help Topics - Customer Service - LEGO.com US. Retrieved 27 April 2021, from https://www.lego.com/en-us/service/help/bricks-building/brick-facts/what-lego-bricks-are-made-from-408100000007855

LumoPlay. (n.d.-a). LUMOplay | Interactive Floor and Wall Games. Retrieved 27 April 2021, from https://www.lumoplay.com/cart

LumoPlay. (n.d.-b). LUMOplay | Interactive Floor and Wall Games. Retrieved 26 April 2021, from https://www.lumoplay.com/hardware/interactive-floor-projector

MakeWonder. (2020, November 30). Dash. Wonder Workshop – US. Retrieved 27 April 2021, from https://www.makewonder.com/robots/dash/

Melbot. (2018, February 27). Melbits Officials [Instagram Profile]. Instagram. https://www.instagram.com/melbitsofficial/

Melbot. (2020, November 26). Melbits POD – A virtual pet toy. Melbits POD. Retrieved 27 April 2021, from https://melbitspod.com/

Melbot. (2021, April 2). Melbits POD – Hatch Digital Pets. Melbits POD. Retrieved 27 April 2021, from https://melbitspod.com/product/melbits-pod/

Melbots [Tamagotchi Italia]. (2021, February 17). Vi presento il Melbits Pod! [Video]. YouTube. https://www.youtube.com/watch?v=HZuzWhNtVHU

Plugo by PlayShifu- AR-powered interactive STEM toys for 4-10 year old kids. (n.d.). PlayShifu. Retrieved 27 April 2021, from https://www.playshifu.com/plugo

Plugo [PlayShifu]. (2018, August 24). Plugo explained in 90 seconds [Video]. YouTube. https://www.youtube.com/watch?v=9LB-Ta8E9LiU

Puppyrobot. (n.d.-a). Products. Retrieved 29 April 2021, from https://store.puppyrobot.com/collections/all

Puppyrobot. (n.d.-b). Puppy Cube. Retrieved 29 April 2021, from https://store.puppyrobot.com/products/puppy-cube-purchase-page

Tori. (n.d.). Dive into the magical worlds of Tori. Retrieved 29 April 2021, from https://www.tori.com/nl/

6.2.8. TECHNOLOGIE

Google. (n.d.). Interland. Be Internet Awesome. Retrieved 20 January 2021, from https://beinternetawesome.withgoogle.com/en_us/

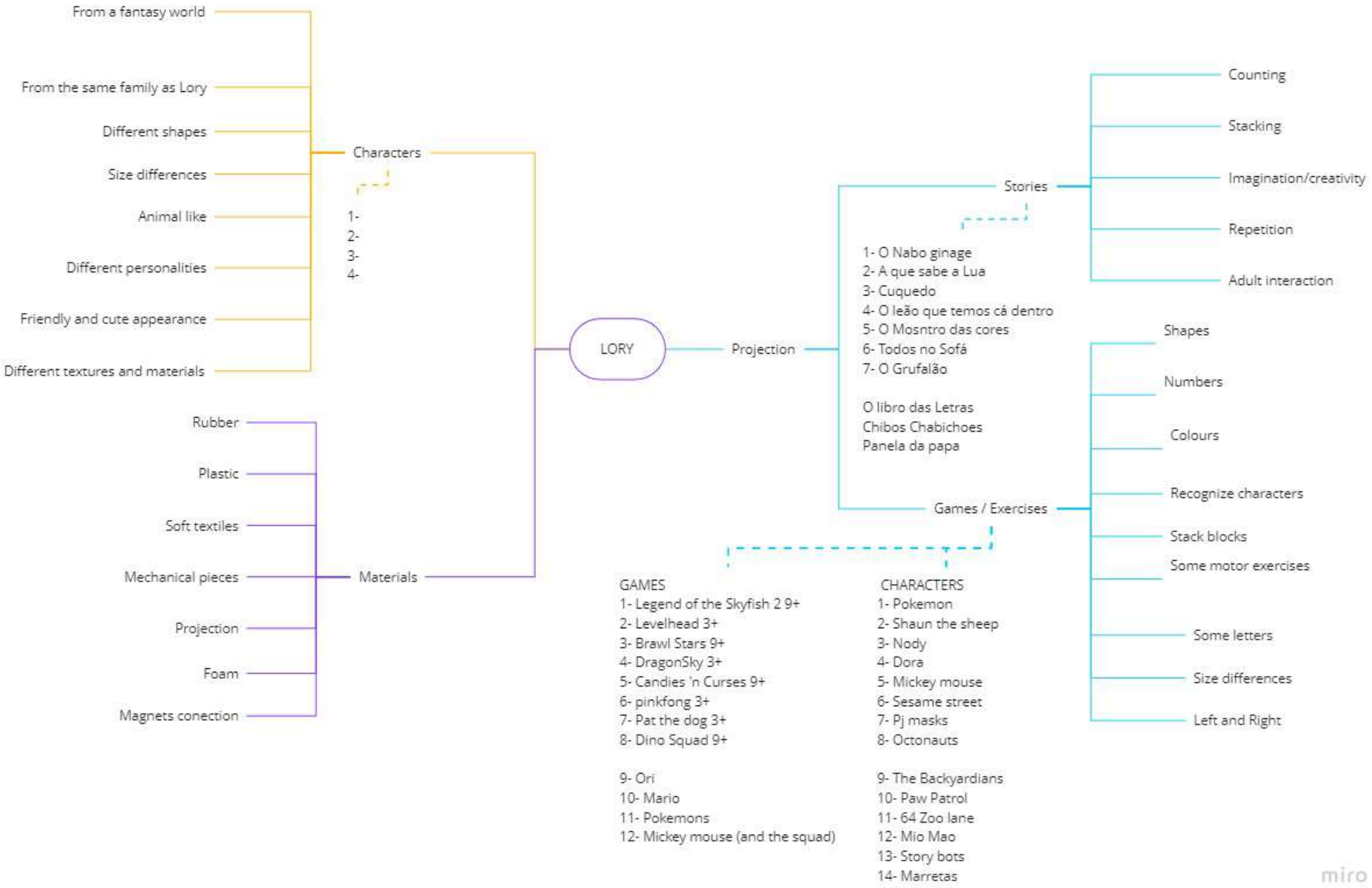
Harvard Business Review. (2021, July 14). How Does Augmented Reality Work? Retrieved 29 May 2021, from https://hbr.org/2017/11/how-does-augmented-reality-work

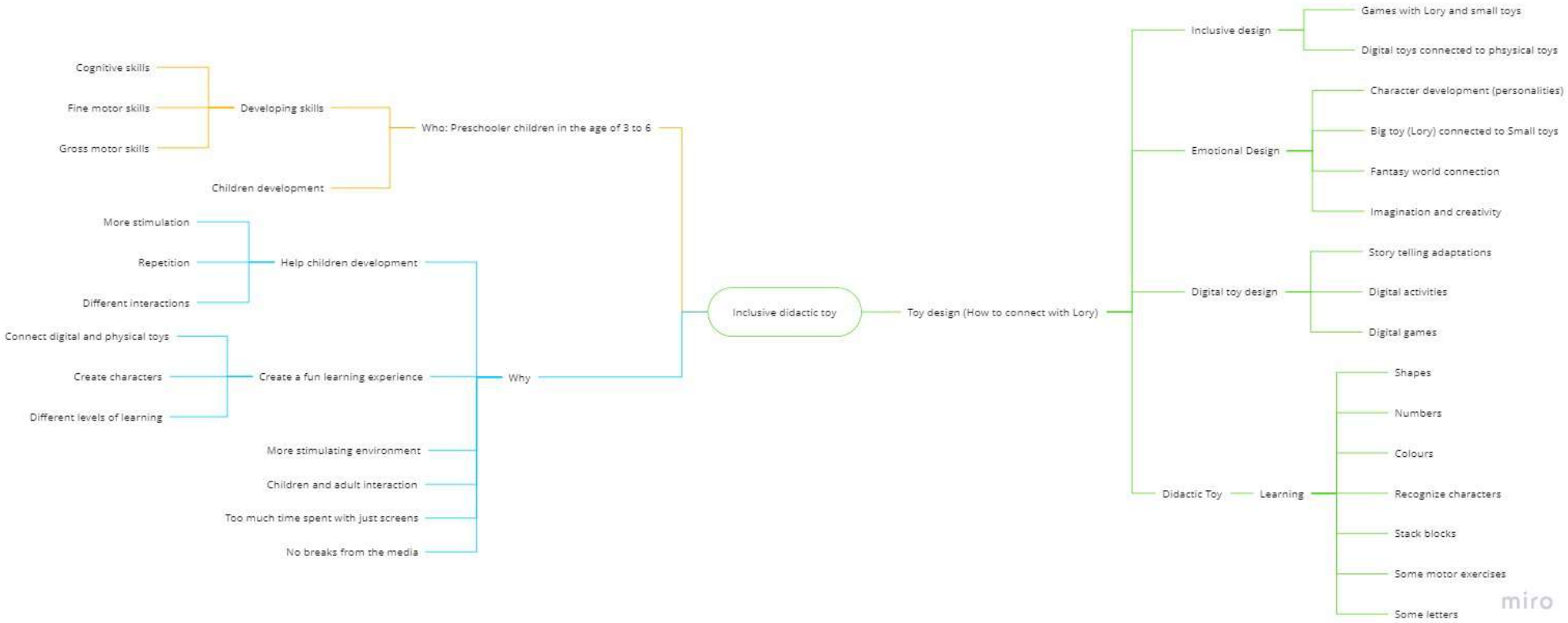
Psious. (n.d.). Psious | Virtual Reality Platform for Mental Health Professionals. Retrieved 21 January 2021, from https://psious.com/

SoftBank Robotics. (n.d.). NAO | SoftBank Robotics. Retrieved 29 December 2021, from https://www.softbankrobotics.com/emea/en/nao

Vaudel, C. (n.d.). Pepper Robot for Research. Robot LAB. https://www.robotlab.com/store/pepper-robot-for-research-and-coding

6.2. Appendix


From a fantasy world
From the same family as Lory
Different shapes
Size differences
Animal like
Different personalities
Friendly and cute appearance
Different textures and materials
Characters
1-
2-
3-
4-
Rubber
Plastic
Soft textiles
Mechanical pieces
Projection
Foam
Magnets conection
Materials
LORY
Projection
Stories
Counting
Stacking
Imagination/creativity
Repetition
Adult interaction
1- O Nabo ginage
2- A que sabe a Lua
3- Cuquedo
4- O leão que temos cá dentro
5- O Mosntro das cores
6- Todos no Sofá
7- O Grufalão
O libro das Letras
Chibos Chabichoes
Panela da papa
Games / Exercises
Shapes
Numbers
Colours
Recognize characters
Stack blocks
Some motor exercises
Some letters
Size differences
Left and Right
GAMES
1- Legend of the Skyfish 2 9+
2- Levelhead 3+
3- Brawl Stars 9+
4- DragonSky 3+
5- Candies 'n Curses 9+
6- pinkfong 3+
7- Pat the dog 3+
8- Dino Squad 9+
9- Ori
10- Mario
11- Pokemons
12- Mickey mouse (and the squad)
CHARACTERS
1- Pokemon
2- Shaun the sheep
3- Nody
4- Dora
5- Mickey mouse
6- Sesame street
7- Pj masks
8- Octonauts
9- The Backyardians
10- Paw Patrol
11- 64 Zoo lane
12- Mio Mao
13- Story bots
14- Marretas


Inclusive didactic toy
Who: Preschooler children in the age of 3 to 6
Developing skills
Cognitive skills
Fine motor skills
Gross motor skills
Children development
Why
Help children development
More stimulation
Repetition
Different interactions
Create a fun learning experience
Connect digital and physical toys
Create characters
Different levels of learning
More stimulating environment
Children and adult interaction
Too much time spent with just screens
No breaks from the media
Toy design (How to connect with Lory)
Inclusive design
Games with Lory and small toys
Digital toys connected to phsysical toys
Emotional Design
Character development (personalities)
Big toy (Lory) connected to Small toys
Fantasy world connection
Imagination and creativity
Digital toy design
Story telling adaptations
Digital activities
Digital games
Didactic Toy
Learning
Shapes
Numbers
Colours
Recognize characters
Stack blocks
Some motor exercises
Some letters
miro

Probe's plan

Duration time:
7 days

General objectives:

- Understand how children react to the game and how they interact with it.

Specific objectives:

- Complement the work with the information that we will collect to test the final product general idea.
- Plan the games and interactions with the rest of the product.

Game materials: 6 A4 papers; printed and cut.

Questions for the parent/caretaker after finishing the activity:

- Children's age
- Does the child have any kind of cognitive difficulties?
  Evaluating the cognitive capabilities.

- Was it easy to understand the activity?
  Understand if the activity was well made and well planned.

- Was the child interested in the activity?
  Understand if the activity was engaging and fun for the children.

- Could they choose, with no difficulties, the right answer to proceed with the story?
  Understand the cognitive ability of the children by solving the game using it to compare between the others.

- Was it fun for the children or was it frustrating and difficult?
  Understand if the child was relaxed and enjoying the activity to understand if the game would be something to repeat and seen as fun instead of an obligation and stressful event.

- Would you like to have a version of this activity in a toy with digital interaction?
  Prove that the project we are developing could be something useful and more fun for the children.

- Do you find the activity to help children learn?
  Understand the capacity of this game for a more cognitive development for the children.

Study plan

Objectives:

- Understand the way children interact with the game.
- Understand if children find the game interesting and captivating.
- Understand if children with some difficulties find it helpful.

Evaluation factors:

- Game idea functionality.
- Utility of the project concept.
- Entertainment and comprehensive provider.

Questions for the parent/caretaker after finishing the activity:

- Children's age
- Does the child have any kind of cognitive difficulties
- Was it easy to understand the activity?
- The child was interested in the activity?
- Could they tell with no difficulties the right answer to proceed with the story?
- Was it fun for the children or was it frustrating and difficult?
- Would you like to have a version of this activity in a toy with digital interaction?
- Do you find the activity good to help children learn?

Subject characteristics:

- Children from the ages of 3 to 7.
- Some children with learning difficulties or small attention span.
- Adults to help in the activity and answer some final questions.

Methodology:

- This study will try to evaluate the concept of the project, understanding if it would work in entertaining and helping children understand the story and develop their cognitive capability. There will be an email delivered to the adults with all the instructions on how to do the exercise.
- This study will have the duration of about 30 minutes. First part will be the reading of the exercise and the setting up of the activity. Around 10 minutes to print and cut all the pieces and assemble the characters. After the assembly the YouTube link should be opened or the slide share with the story if they don't own the story and provide to start reading the story for the kid while following the pieces and placing them on the right spots as the story proceeds.
- During the session, the work should be documented with pictures or videos in the process of the activity.
- At the end there should be all the characters in the board and a compilation of photos or a video with the exercise being made by the child, sending it to the email again.

Structure of the activity:

- Introduction to the activity:
  - What's the purpose of this study?
  - Explanation of the game.
  - The importance of the children's participation.
  - The consent to the participation in the activity and its analysis.
- Activity plan:
  - Explanation on how to make the exercise.
  - Making and documenting of the exercise.
- Final questions and delivery of the project.

Place for the activity:

- It is advised to do the activity on a table or on the floor depending on the space available to spread 3 A4 papers. With the use of a computer, tablet, phone or real book to watch or read the story.

Data collection:

- The activity should be documented with pictures and or videos (that would be sent to the email) and also by answering some questions after the activity is over.
- Understanding if the use of the characters during the story makes children more interested in the activity.
- Understanding the story and if it could be planned to be more complex depending on the level of cognition of the child.

O Nabo Gigante

https://pt.slideshare.net/emeicantinhodoceu/o-nabo-gigante-15065849

https://www.youtube.com/watch?v=YrvzyAvjqH4

CONSENTIMENTO INFORMADO PARA PARTICIPAR NUMA INVESTIGAÇÃO

NA ÁREA DE DESIGN

"Product service for children with difficulties learning" (Título provisório)

[*Crianças entre os 3 e os 7 anos de idade.*]

É-lhe solicitada a participação num estudo de investigação conduzido pela Licenciada Ema Reaes Rodrigues da Faculdade de Arquitetura da Universidade de Lisboa. Esta investigação integrará a Tese de Mestrado acima indicada.

Foi selecionado como possível participante deste estudo pois o seu educando encontra-se no pré-escolar com a idade entre os 3 e os 7 anos. O facto de o seu educando estar neste momento no pré-escolar é o fator decisivo na caracterização de uma das amostras desta investigação.

Deverá ler a informação abaixo apresentada e formular as perguntas que lhe ocorrem sobre tudo o que não perceber antes de decidir participar ou não nesta investigação.

Participação e desistência

A sua participação neste estudo é completamente voluntária e é livre de escolher participar ou não no mesmo.

Se escolher fazer parte deste estudo pode subsequentemente deixar de participar em qualquer altura sem que isso sofra algum tipo de penalização.

Propósitos do estudo

O presente estudo pretende entender se este tipo de atividades é relevante para o desenvolvimento cognitivo das crianças e se o faz sem causar frustrações. A ideia é promover as atividades que ajudam no desenvolvimento cognitivo de uma maneira mais positiva e divertida para as crianças nos seus primeiros anos de aprendizagem.

Procedimentos

Se se voluntariar a participar neste estudo ser-lhe-á pedido que faça uma das seguintes opções A – Versão em papel, B- Versão digital.

A- Versão em papel:

Abrir o documento com as instruções requeridas no interior e proceder à impressão de 6 folhas ou apenas as 3 primeiras folhas A4 para a realização da atividade com o seu educando. Também será pedido que efetue a documentação do processo através de vídeos ou fotografias (Não obrigatório). Também será necessário acesso a um computador/tablet/telemóvel para a visualização da história e para a realização do inquérito final sobre o exercício.

O exercício consiste em 4 partes:

1- Imprimir e recortar as 3/6 folhas A4.
2- Abrir o link de Youtube ou slide share com a história disponível online.
3- Contar a história e prosseguir com o exercício ao mesmo tempo descrito no manual.
4- Prosseguir para o preenchimento do questionário final apenas para os educandos.

Pode documentar a realização do exercício com fotos ou vídeos, não é obrigatório.

B- Versão digital:

Transferir o documento do e-mail "Nabo gigante – Exercício digital" abrir o documento PowerPoint e ativar edição. Se não tiver Powerpoint apenas clique no anexo no seu email:

- Se for Hotmail ou Outlook- clique em "editar no browser".
- Se for Gmail- clique no documento e "abrir com Google slides".

Tem que manter os slides em modo de edição para poder mover as imagens com as personagens para o local certo no fundo.

Depois apenas tem que seguir para a fase 3 e 4 iguais à versão anterior.

3- Contar a história e prosseguir com o exercício ao mesmo tempo descrito no manual.

4- Prosseguir para o preenchimento do questionário final apenas para os educandos.

Pode documentar a realização do exercício com fotos ou vídeos, não é obrigatório.

Potenciais riscos e desconfortos

Não se prevêem riscos de qualquer natureza associados a esta investigação e os inconvenientes previsíveis prendem-se com o tempo associado à tarefa a executar (que poderá ser percecionado como longo) bem como à possibilidade eventual de ser necessária alguma paciência acrescentada com o educando durante a execução da tarefa.

Benefícios potenciais

Considera-se como benefício potencial para os participantes uma experiência enriquecedora com o educando.

São benefícios potenciais para a sociedade e para o ensino pré-escolar e seguinte como por exemplo:

1- Atividade cognitiva mais interativa com as crianças.
2- Pesquisa sobre o desenvolvimento cognitivo das crianças e da aplicação no design de produto.

Pagamento pela participação

Os sujeitos desta investigação não receberão qualquer tipo de remuneração.

Confidencialidade

Qualquer informação obtida que tenha relação com este estudo e que possa ser identificada consigo permanecerá confidencial e só será disponibilizada após a sua permissão para tal.

Haverá lugar para um registo fotográfico da sessão e o seu visionamento por outras pessoas que não o investigador só acontecerá após a sua permissão. A estes 'documentos' terão eventual acesso técnicos de imagem que se encontram obrigados ao sigilo e confidencialidade.

Estes testemunhos poderão vir a ser utilizados num contexto de ensino, com objetivos pedagógicos caso tal seja por si autorizado.

Estes testemunhos serão apagados logo após o mestrado da investigadora.

Identificação do investigador

Se tiver alguma questão ou preocupação relativa a esta investigação e à sua participação por favor sinta-se livre de contactar o investigador responsável:

Ema Reaes Rodrigues

Telemóvel: 966997804

Email : ema.r.rodrigues1@hotmail.com / ema.r.rodrigues1@gmail.com

ASSINATURA DO SUJEITO DA INVESTIGAÇÃO

Eu compreendo os procedimentos acima descritos. As minhas questões foram respondidas de forma satisfatória e aceito participar neste estudo. Foi-me dada uma cópia deste documento.

_____ _____

Nome do Educando e do encarregado de educação

_____ _____

Assinatura do encarregado de educação Data

ASSINATURA DO INVESTIGADOR

No meu julgamento o sujeito é voluntário e possui capacidade legal para, após análise e subscrição deste consentimento informado, participar neste estudo de investigação.

_____ _____

Assinatura do investigador Data

MANUAL DE INSTRUÇÕES

PASSO 1:

1. Fazer download dos 2 PDF's anexados no email.
2. Imprimir as 4 folhas A4 (Se não poder imprimir as 4 imprima apenas o PDF1-Personagens, mas aconselhamos a utilização das 6 folhas, ou no mínimo o PDF1- Personagens, a cores e o PDF2-Tabuleiro a preto e branco)
3. Recortar as personagens todas, do PDF1-Personagens, pelo picotado. Pode cortar com a ajuda do seu educando, se ele já puder usar tesouras (aconselhamos sempre tesoura de pontas redondas).
4. Colar as folhas do PDF2-Tabuleiro, com fita cola com os números em ordem 1, 2. (se não tiver o PDF2-Tabuleiro passe esta fase).

Assim tem todas as peças que necessita para começar o exercício.

PASSO 2:

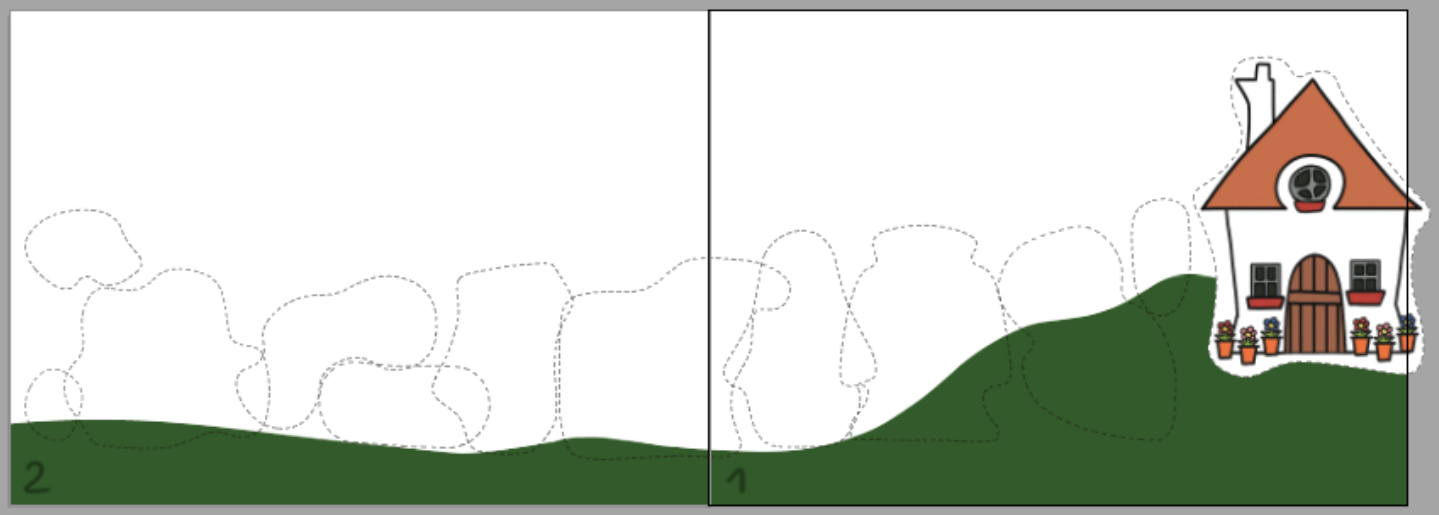
Agora que temos todas as peças prontas precisamos de:

1. Abrir o link do Youtube (https://www.youtube.com/watch?v=YrvzyAv-jqH4) ou o link do slide share (https://pt.slideshare.net/emeicantinhodo-ceu/o-nabo-gigante-15065849) com a história "O Nabo Gigante". Se já tiver essa história em livro em casa também a pode usar.
2. Pretende-se que vá tirando fotografias do processo ou um vídeo.

Agora, com as personagens já recortadas, nas seguintes partes da história terá que incentivar o seu educando a colocar a personagem ou figura no local certo do tabuleiro, e só depois de ter a personagem ou figura no local certo poderá prosseguir com a história. (Quem não tem o tabuleiro, apenas coloque as imagens em ordem da direita para a esquerda como se tivesse o tabuleiro.)

1

Quando aparece na primeira parte da história a descrição da casa, deve ser colocada a casa no primeiro espaço (no interior do picotado como na imagem 1 abaixo).

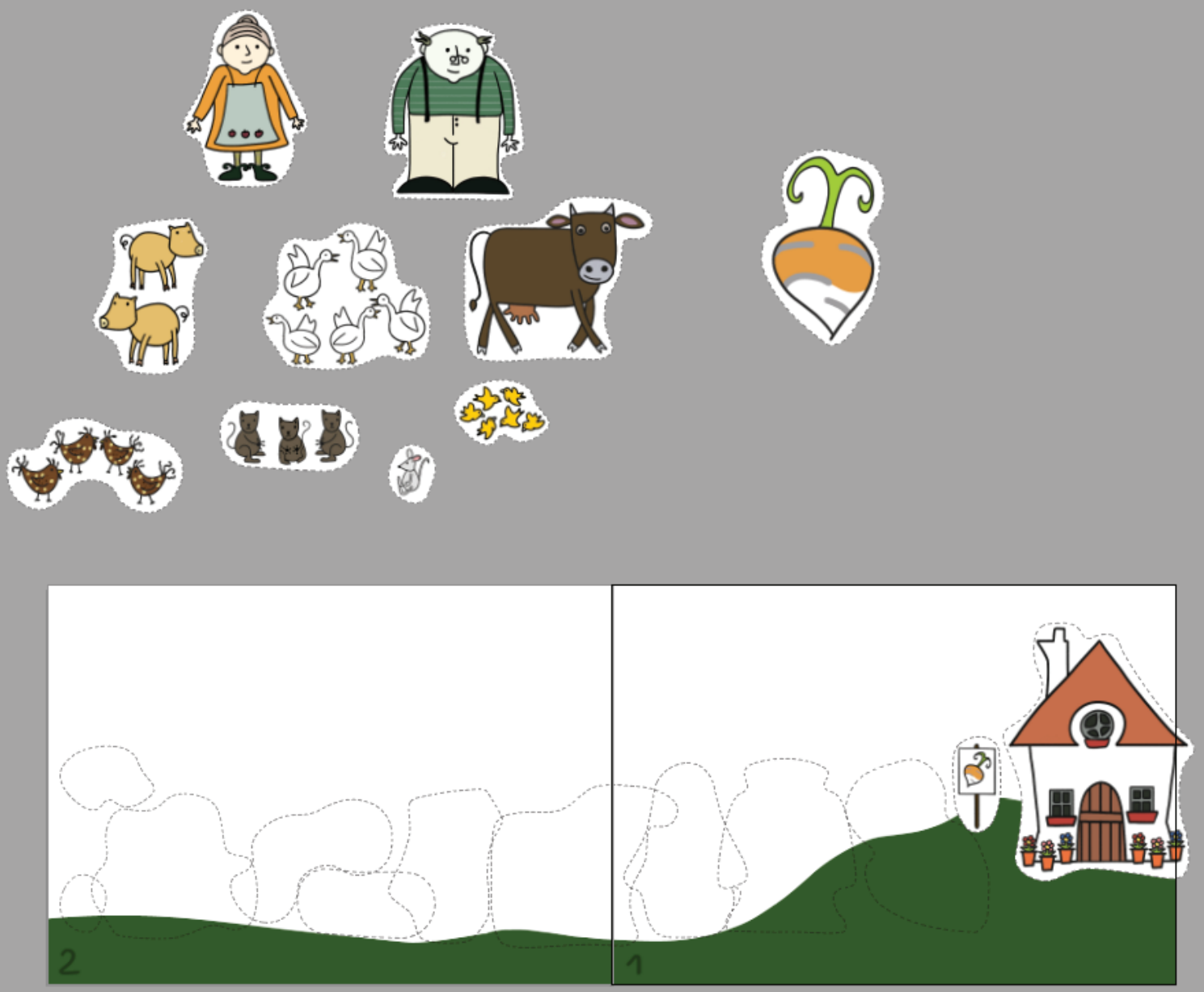


2

Na página seguinte, na apresentação das personagens, pretende-se que faça uma pequena apresentação das mesmas à criança. Enquanto lê a introdução de uma personagem segure a ilustração correspondente, ou deixe a criança escolher a personagem certa e coloque as mesmas distribuídas na mesa, como representado na imagem 2.

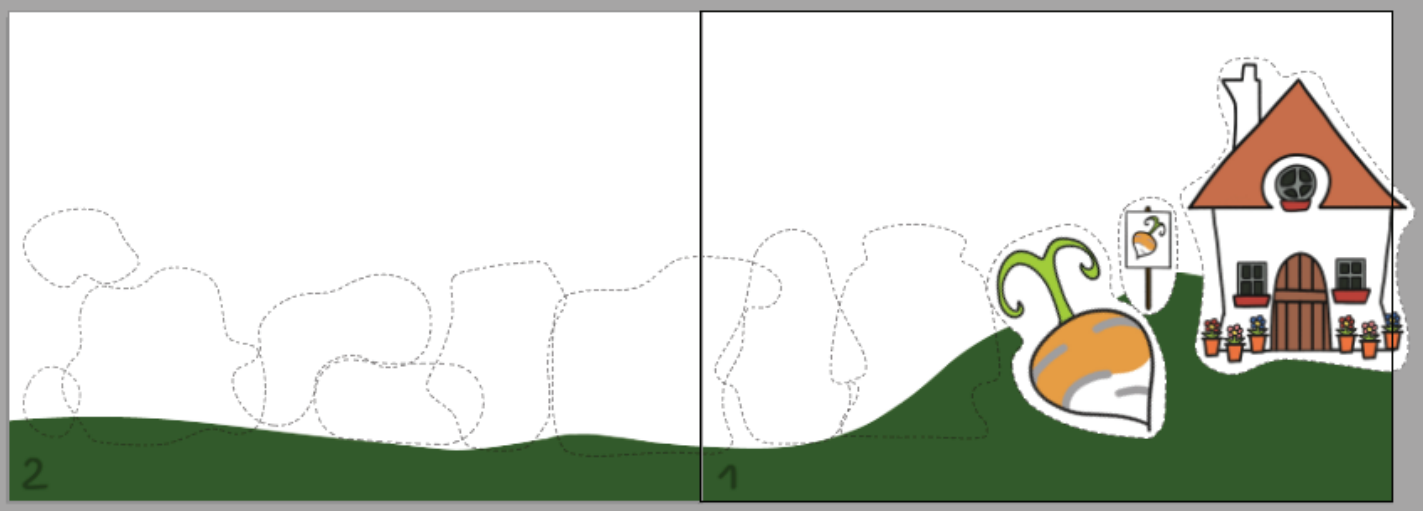
3

Na seguinte página pretende-se que a criança coloque a ilustração da placa de plantação do nabo no tabuleiro, de acordo com as imagens do livro, colocando a placa como na imagem 3.



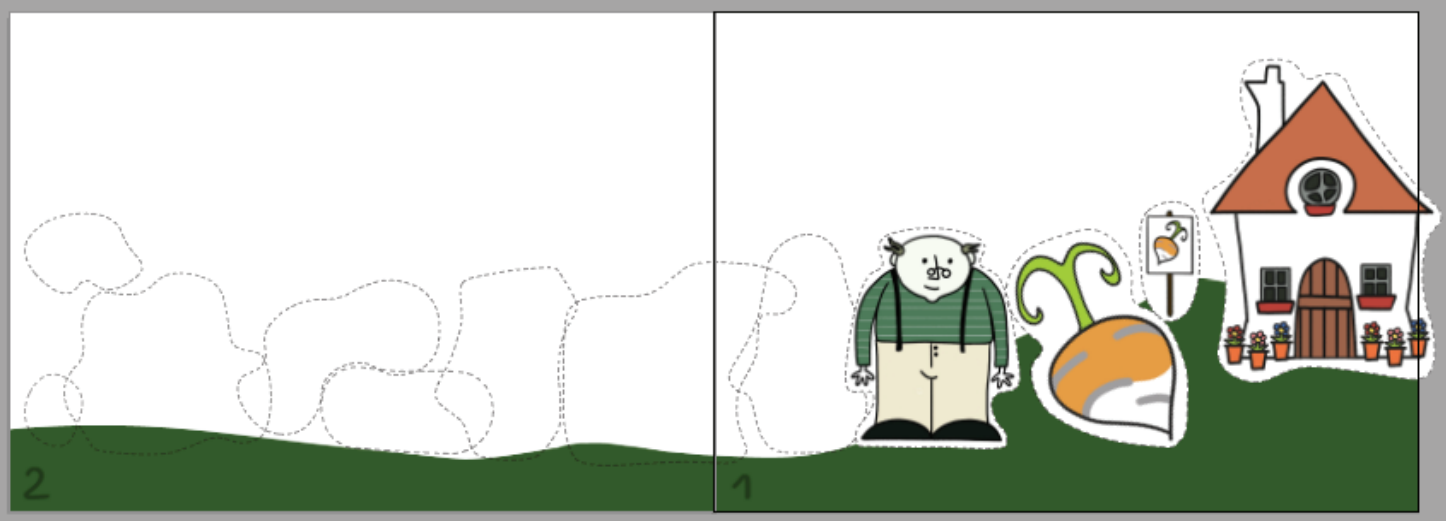
4

Duas páginas à frente o nabo gigante cresce e pretende-se que a criança coloque o nabo no seu devido local no tabuleiro, como representado na imagem 4.



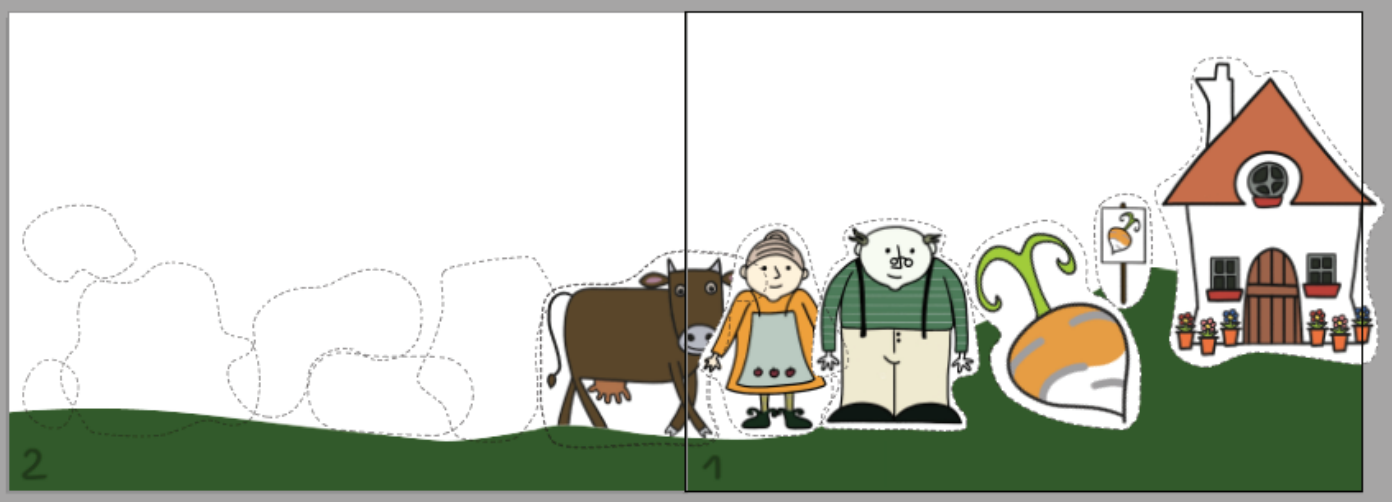
5

Duas páginas depois aparece o velhinho a puxar o nabo, pretende-se que a criança coloque o velhinho no tabuleiro ao lado do nabo como se o fosse puxar, imagem 5.



6

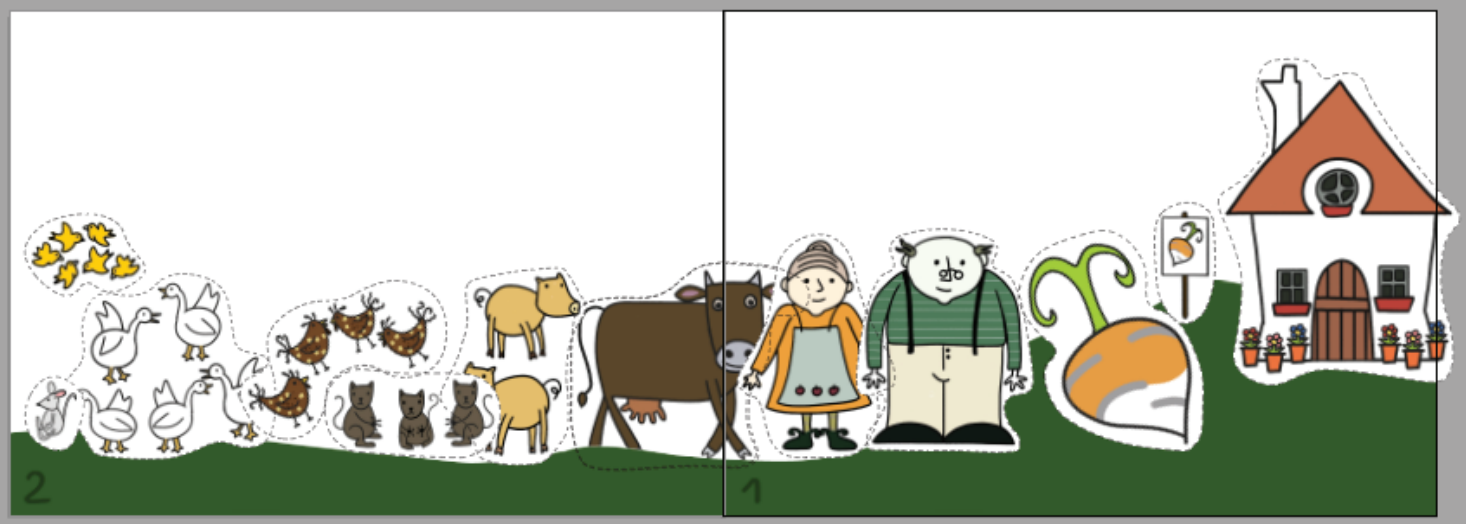
De seguida, à medida que as personagens forem sendo chamadas pretende-se que a criança vá colocando as ilustrações certas a seguir ao velhinho, conforme vão puxando o nabo, imagem 6.



7

Acabando com uma imagem igual á seguinte imagem 7.

Assim termina a história.



PASSO 3:

1. Pede-se ao Encarregado de Educação que vá novamente ao email e preencha o formulário que lhe é pedido, para nos dar um feedback da atividade e sugestões.

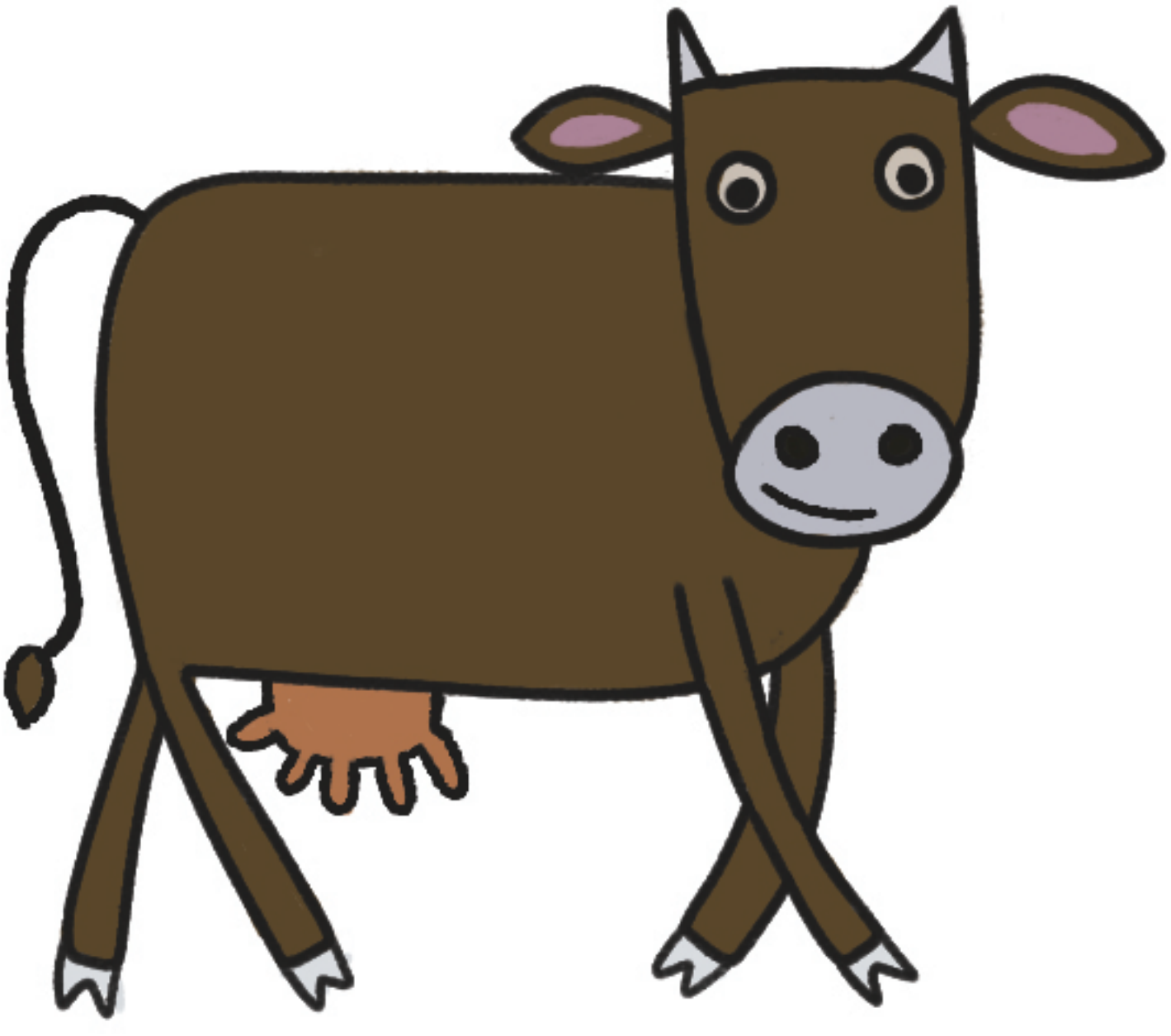
Link do formulário: https://forms.gle/atULqp6epAMqsPph7

2. Por último, pede-se que envie as fotografias ou vídeos tirados durante o decorrer da atividade, por email ou WeTransfer.

Link WeTransfer: https://wetransfer.com/

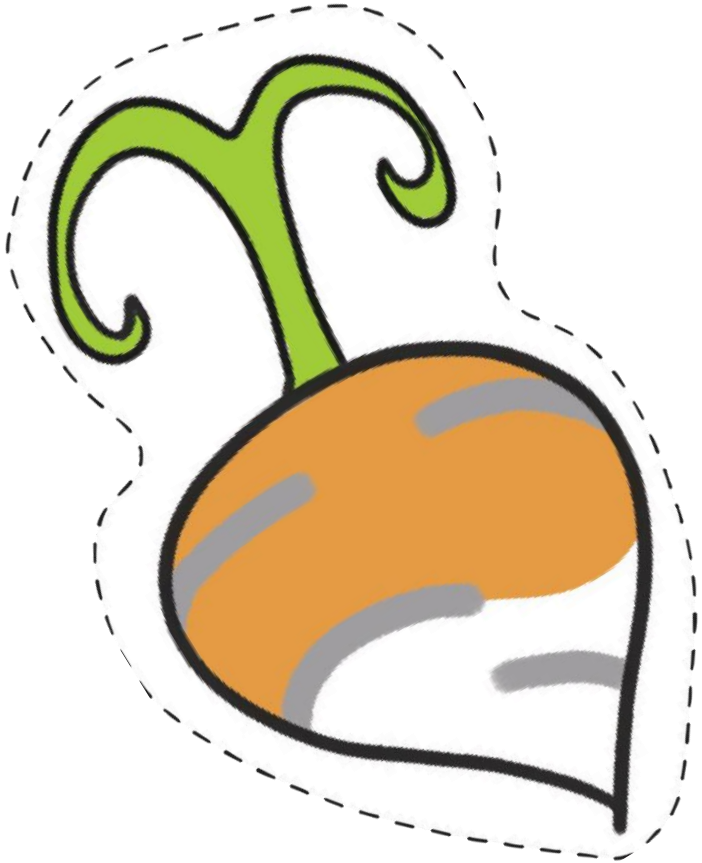
Agradecemos imenso a sua colaboração e esperamos que tenha gostado da atividade!

Muito obrigada!



O Nabo Gigante

Exercício digital

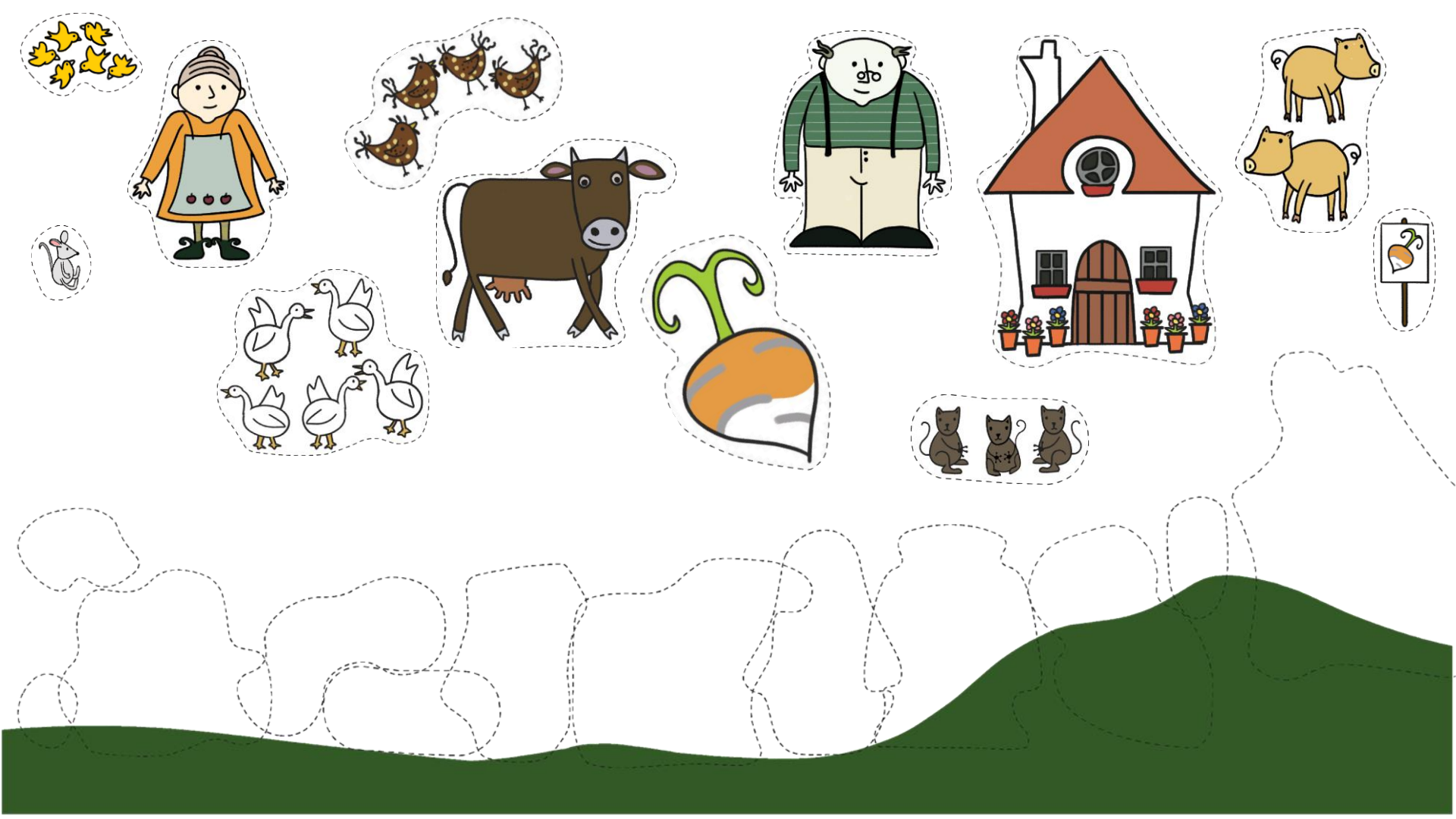


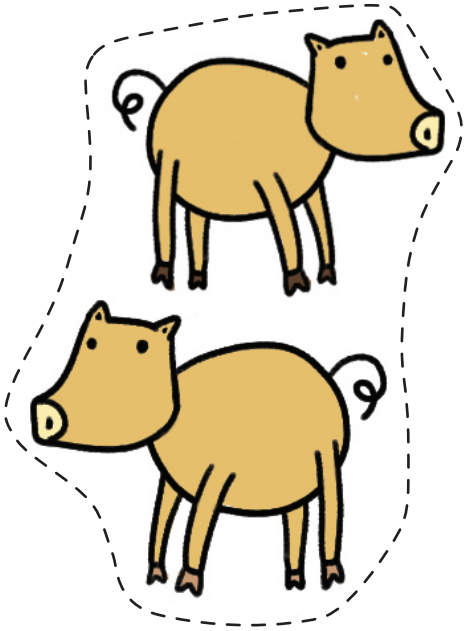
Depois de ler o “Manual de instruções”:

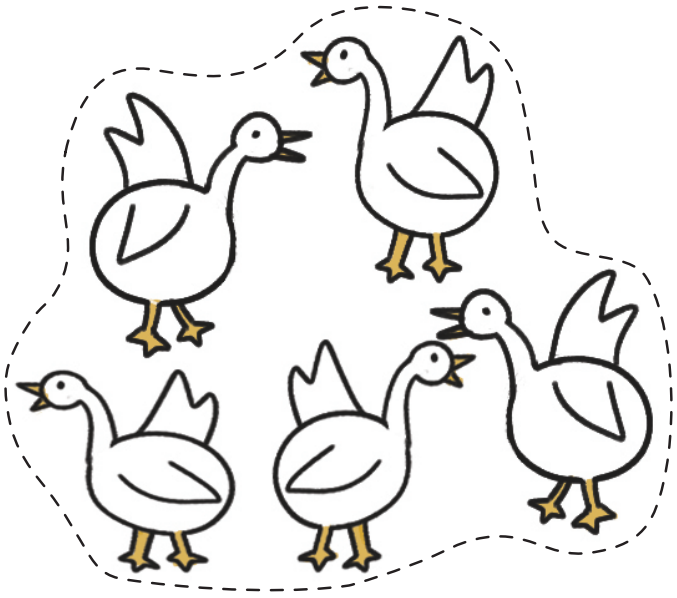
1. Abrir o link do Youtube (https://www.youtube.com/watch?v=YrvzyAvjqH4) ou o link do slide share (https://pt.slideshare.net/emeicantinhodoceu/o-nabo-gigante-15065849) com a história “O Nabo Gigante”. Se já tiver essa história em livro em casa também a pode usar.

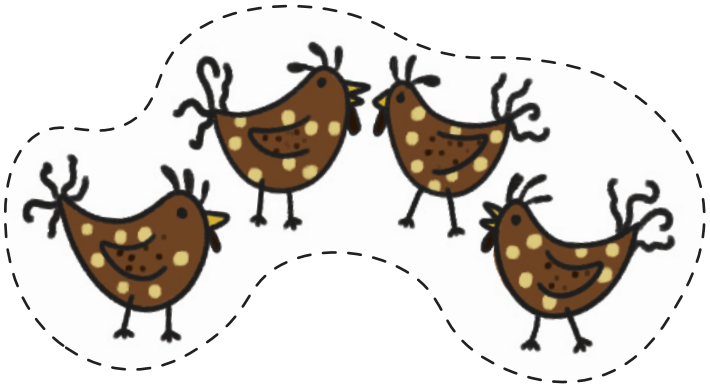
2. Pretende-se que vá tirando fotografias do processo ou um vídeo. Não é obrigatório!

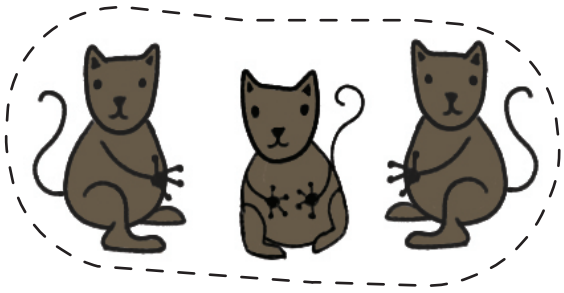
Agora, nas seguintes partes da história terá que incentivar o seu educando a colocar a personagem ou figura no local certo do fundo, e só depois de ter a personagem ou figura no local certo poderá prosseguir com a história. Lembre-se que no PDF do Manual tem mais informação para a realização do exercício.

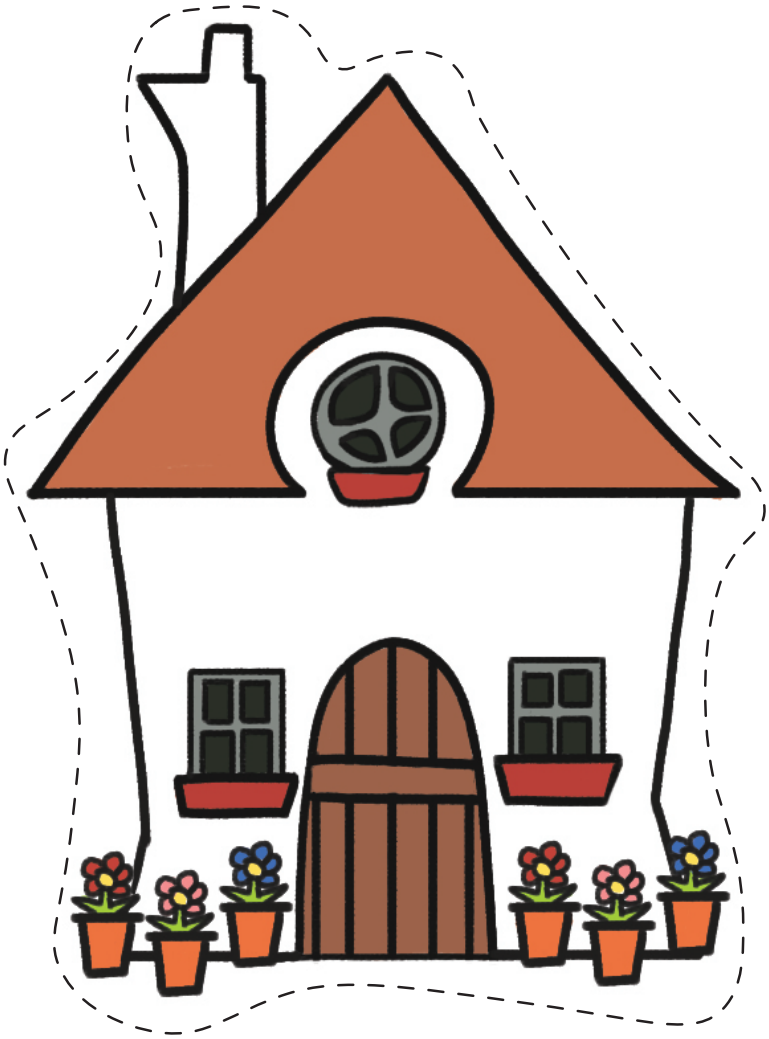


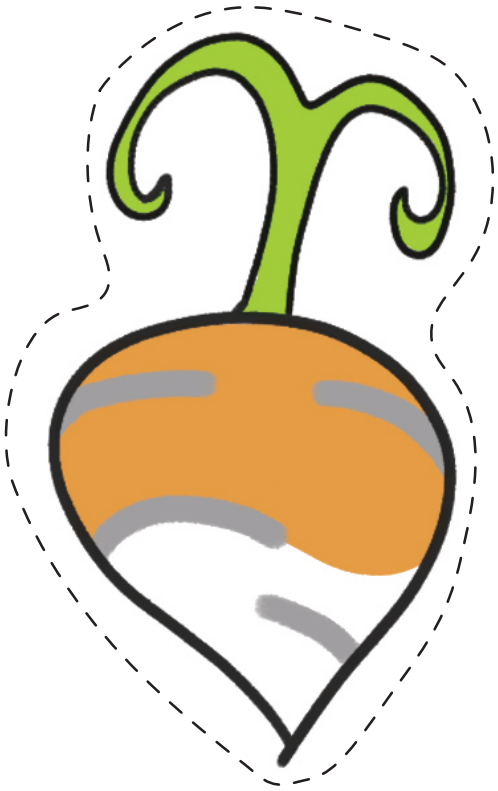


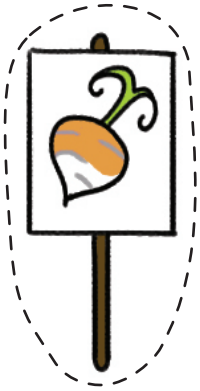


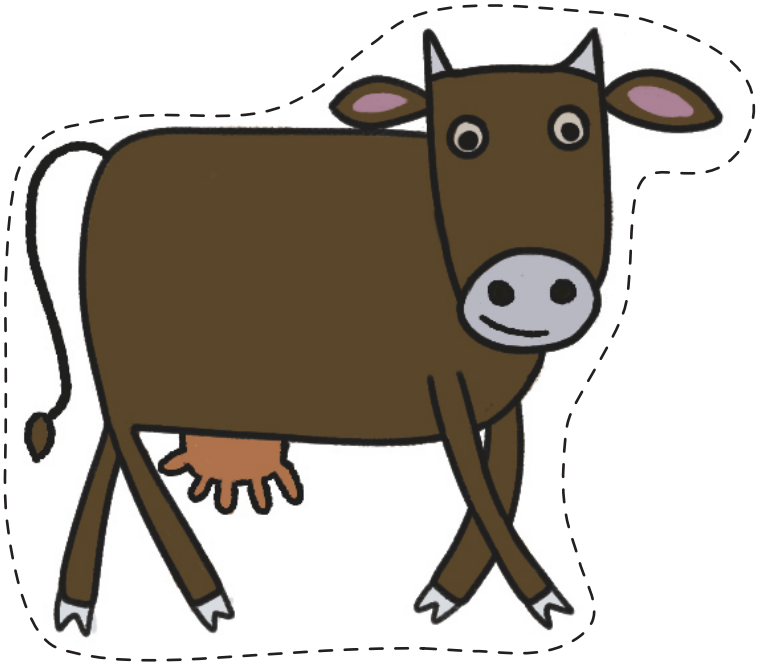


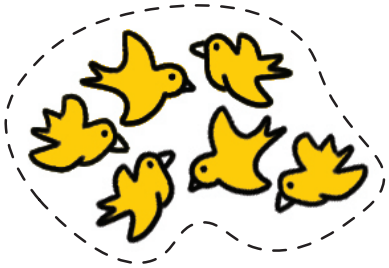


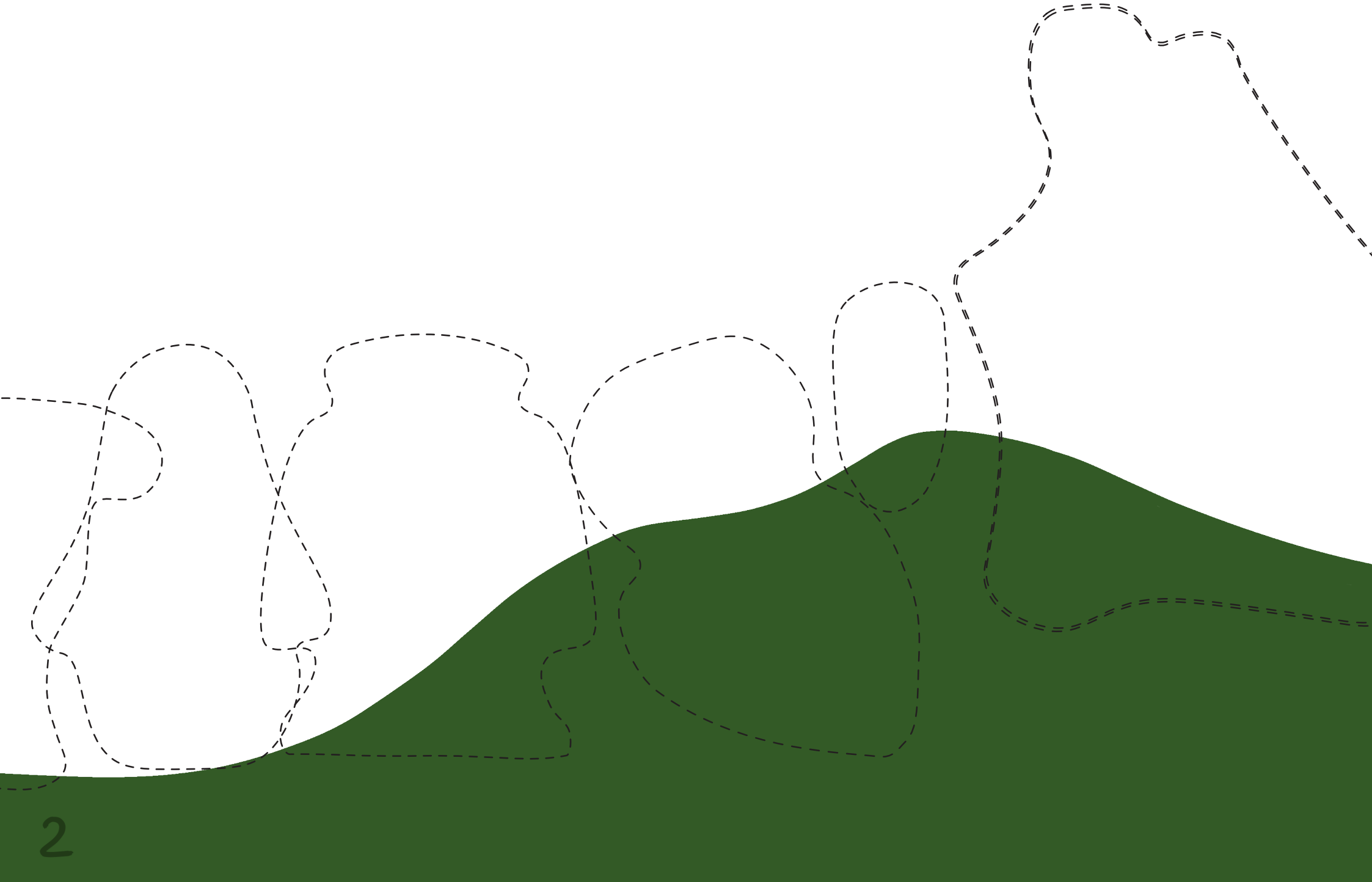


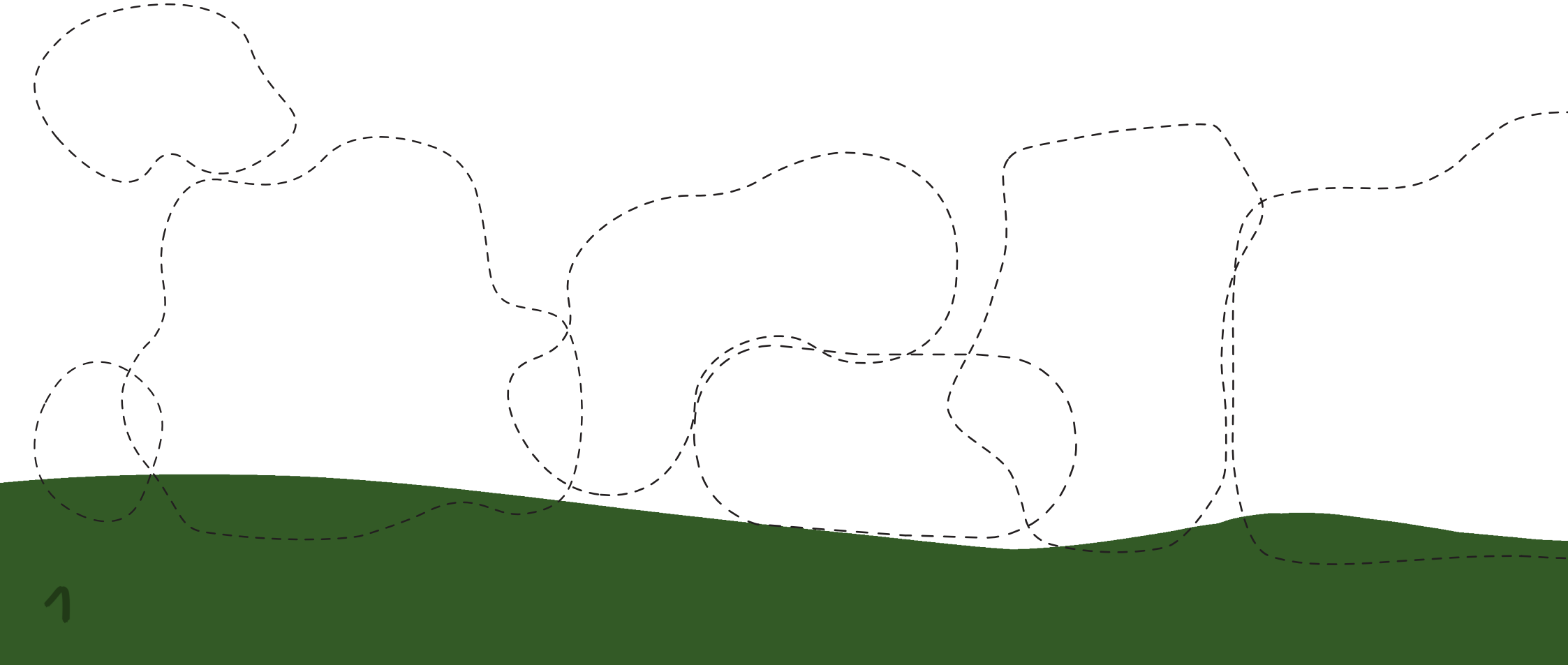












Avaliação do Exercício

*Obrigatório

1. Idade da criança *

_____

2. Foi fácil perceber a atividade? *

Marcar apenas uma oval.

	1	2	3	4	5	
Muito fácil	◯	◯	◯	◯	◯	Difícil

3. A criança estava interessada na atividade? *

Marcar apenas uma oval.

	1	2	3	4	5	
Muito interessada	◯	◯	◯	◯	◯	Nada interessada

4. Foi divertido ou frustrante e difícil? *

Marcar apenas uma oval.

	1	2	3	4	5	
Muito divertido	◯	◯	◯	◯	◯	Muito frustrante

5. Conseguiam dizer sem dificuldades a resposta certa para dar continuidade à história? *

Marcar apenas uma oval.

	1	2	3	4	5	
Muito fácil	◯	◯	◯	◯	◯	Difícil

6. Achou a atividade boa para ajudar no desenvolvimento cognitivo da criança? *

Marcar apenas uma oval.

	1	2	3	4	5	
Ajudou muito	◯	◯	◯	◯	◯	Não ajuda em nada

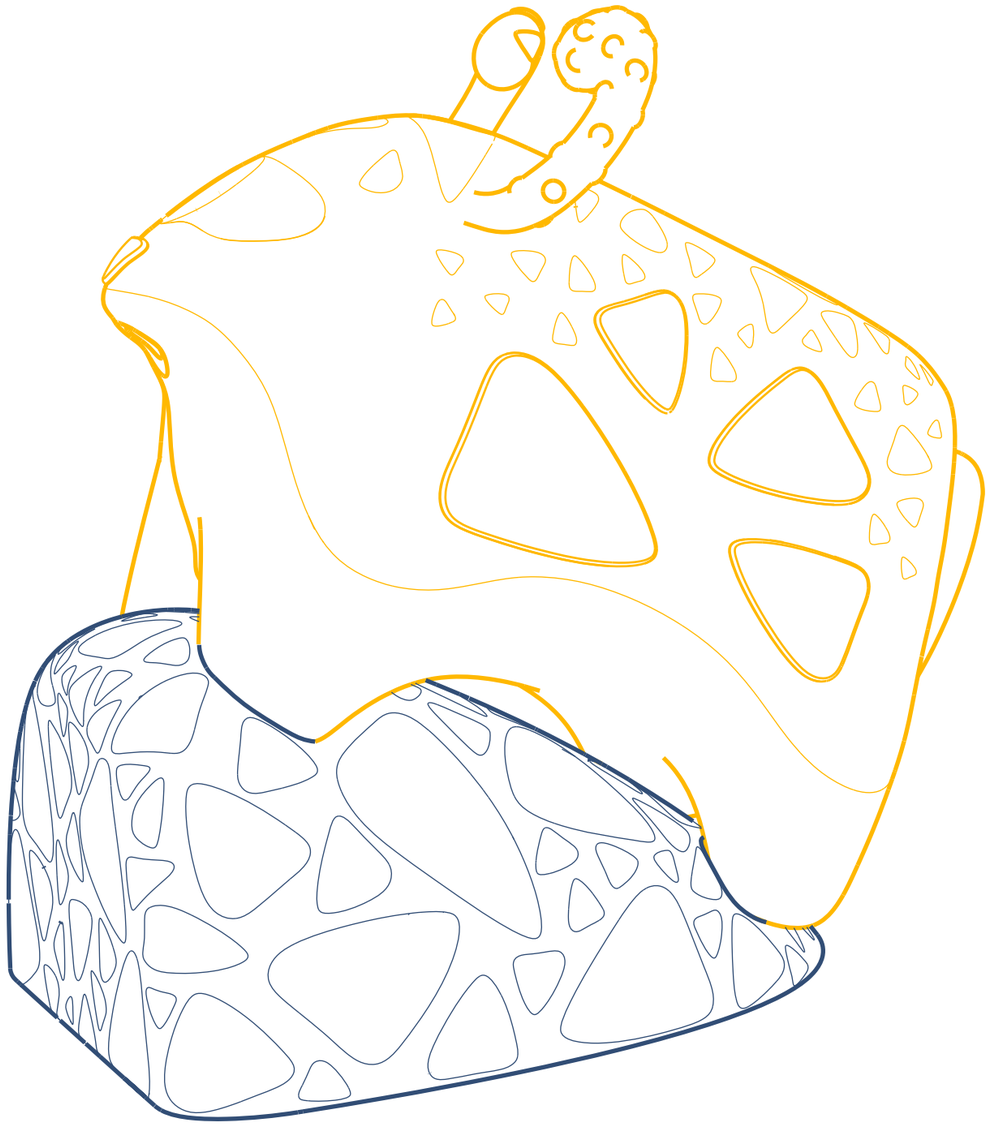
7. Se tiver algumas sugestões ou apontamentos sobre o exercício que ache relevantes comentar, escreva abaixo:

8. Gostaria de ter uma versão desta atividade com brinquedos e interação digital? *

Marcar apenas uma oval.

- ◯ Sim
- ◯ Não
- ◯ Talvez

6.2. Appendix

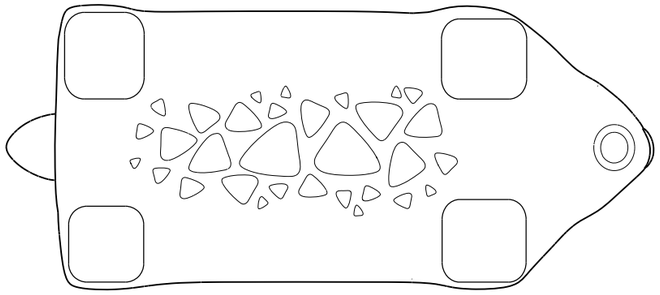


Component	Description
1 Mesh	This is a mesh made in metal to provide the air circulation for bettering the performance of the projector. Continuos and with the triagles relief.
2 Horns	2 different styled horns. Structure made in hard plastic and covered with a soft textile, adding a texture velcro to play with. The second one made with soft plastic and rubber that gives the feeling of "popping bubbles".
3 Eyes	Made with translucid plastic and having an interactive interior light.
4 Buttons	Triangular shaped buttons, 4 of them on both sides and one on the nose, providing interactivity with the projector. They also have different engraved symbols to distinguish them for a better use.
5 Body structure	Body structure made with hard plastic injection molding. With structures on the inside for support of the different components. Attaching them with some plastic pins.
6 Motherboard	All the electric components for the functioning of the interactivity of the toy. For example a mobile size or tablet size motherboard like Mobile-ITX.
7 Buttons plate support	Plate that supports the components for the buttons and the pressure for the buttons.
8 Projector and all the components	These are all the components that make the projector functional, as well as a shape detector.
9 Batteries	These are small size batteries for wireless charging stacked on the paws of the toy.
10 Bottom paws	Paws structure made with hard plastic injection molding. With structures on the inside for support of the Motherboard. Attaching them with some plastic pins just like the Body structure.

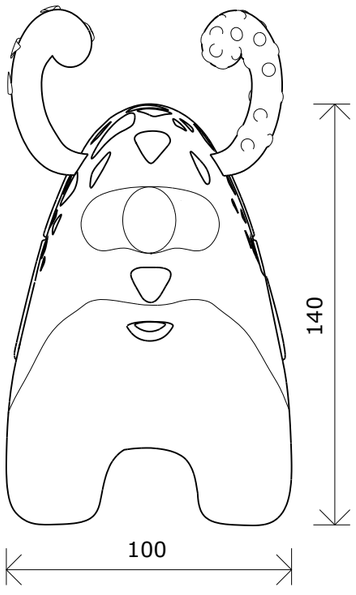
LoRy

Lory - Specifications

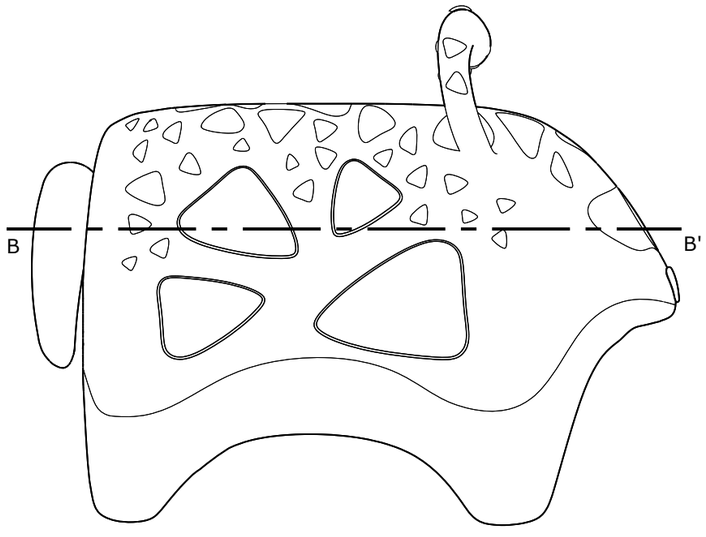
Mestrado de Design de Produto | 2º ano
2020/2021 |19/01/2021
Universidade de Lisboa
Faculdade de Arquitectura
Ema Rodrigues | 20192033



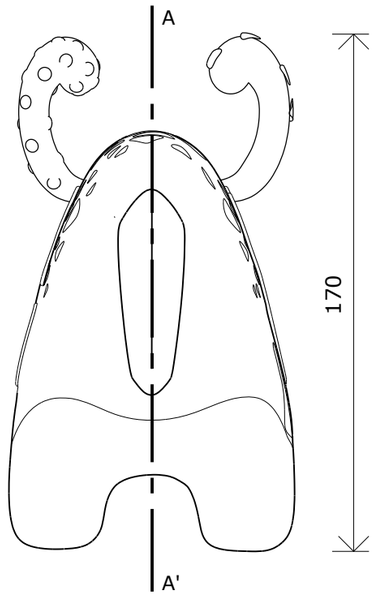
Inferior View



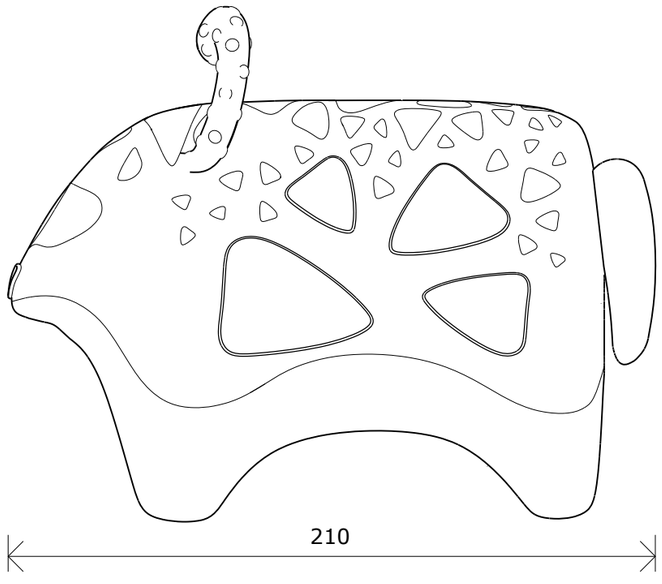
Frontal View



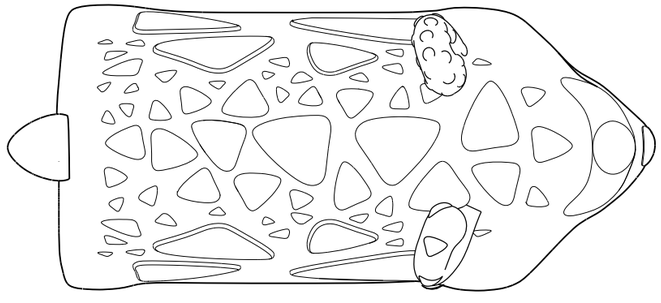
Lateral Left View



Rear View



Lateral Right View



Top View

LoRy

Lory - General Views

Escala 1:2

mm

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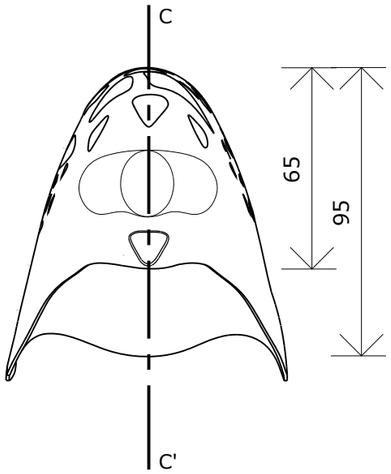
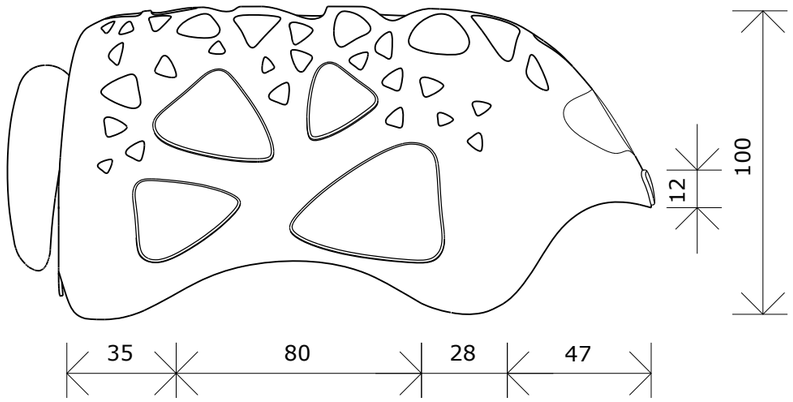
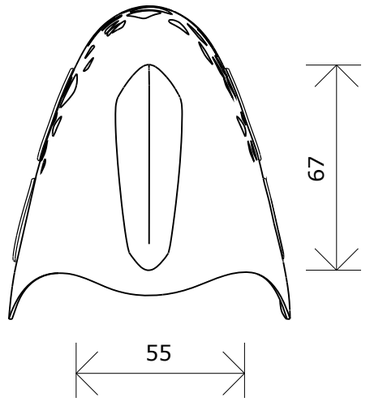


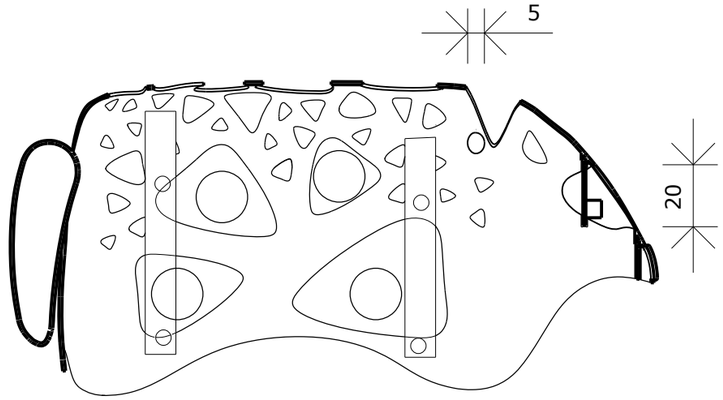
Frontal View



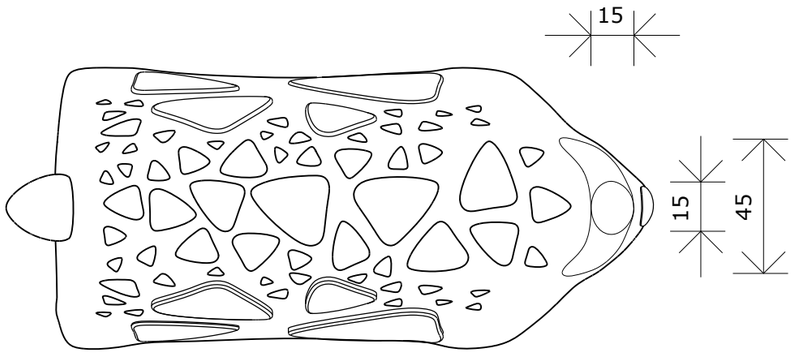
Lateral Left View



Rear View



Cut CC'



Top View

LoRy

3

Lory - Body structure

Escala 1:2

mm

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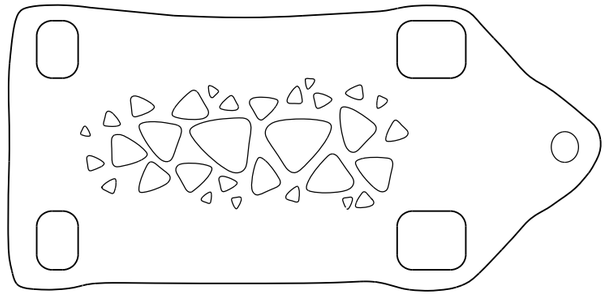
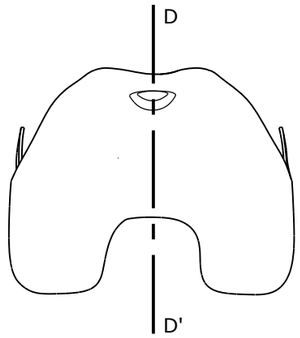
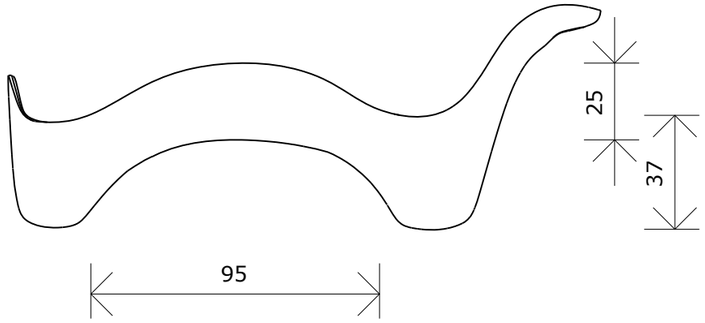


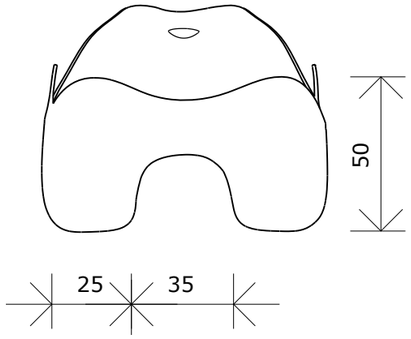
Inferior View



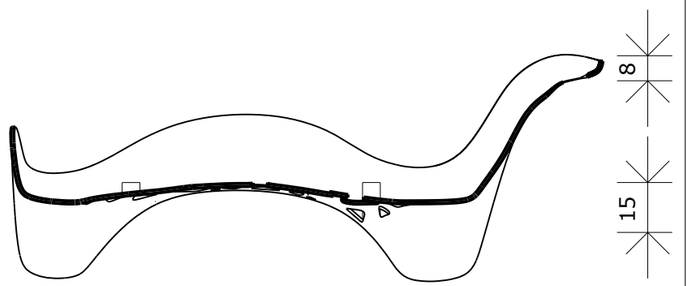
Frontal View



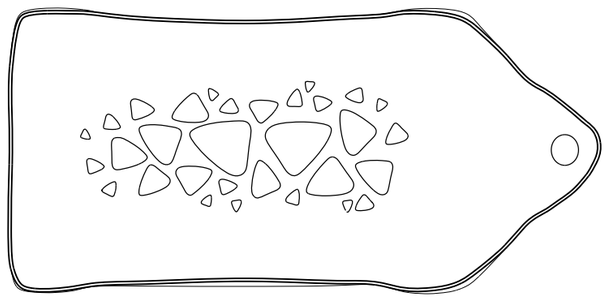
Lateral Left View



Rear View



Cut DD'



Top View

LoRy

4

Lory - Bottom paws

Escala 1:2

mm

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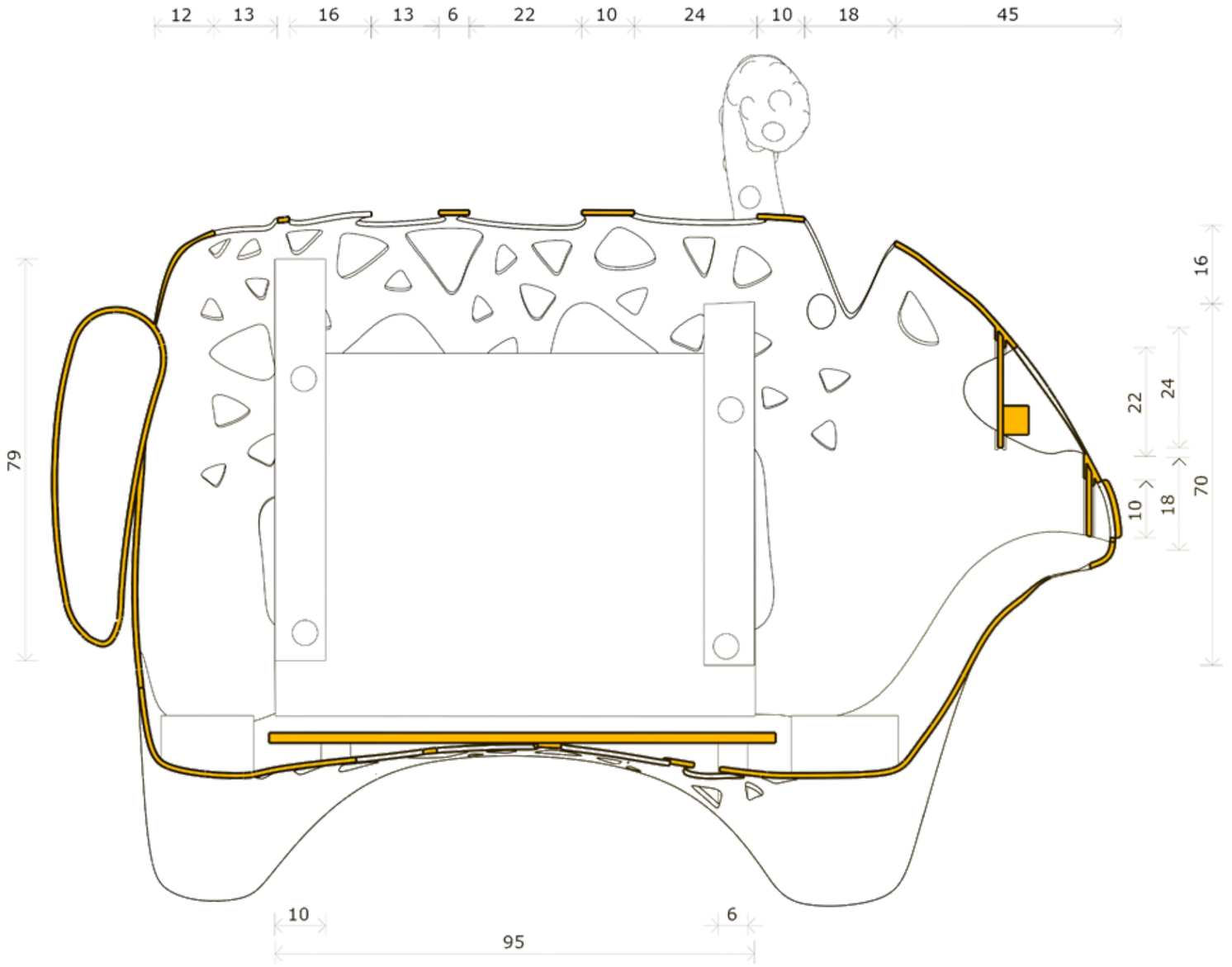
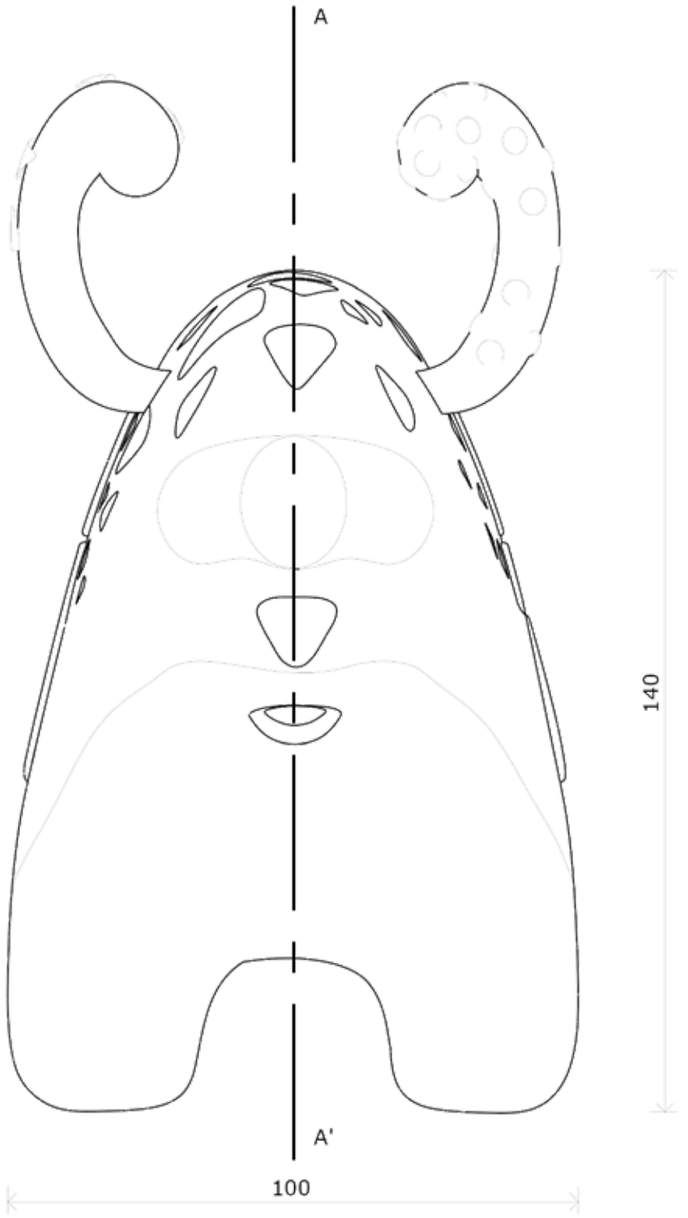


Cut AA'



Frontal View

LoRy

5

Lory - Cut AA'

Escala 1:1

mm

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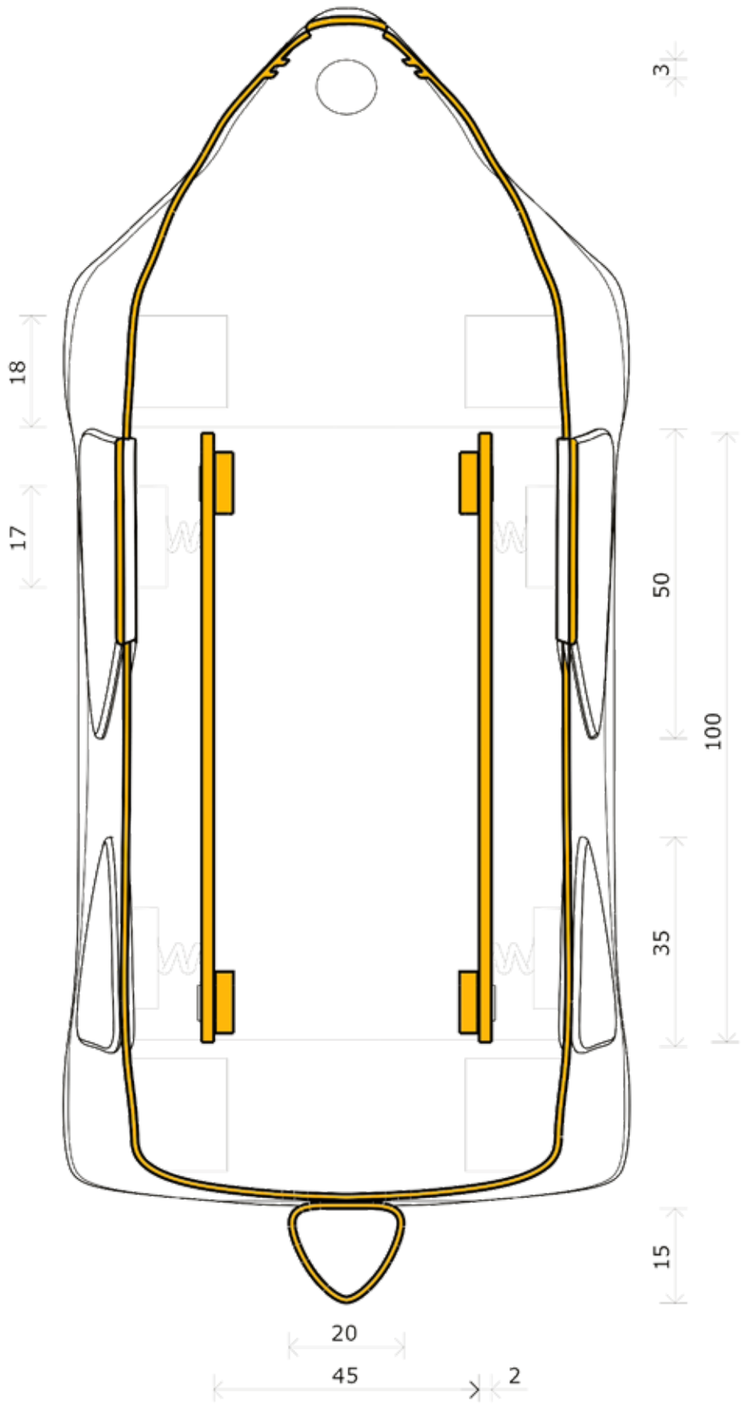
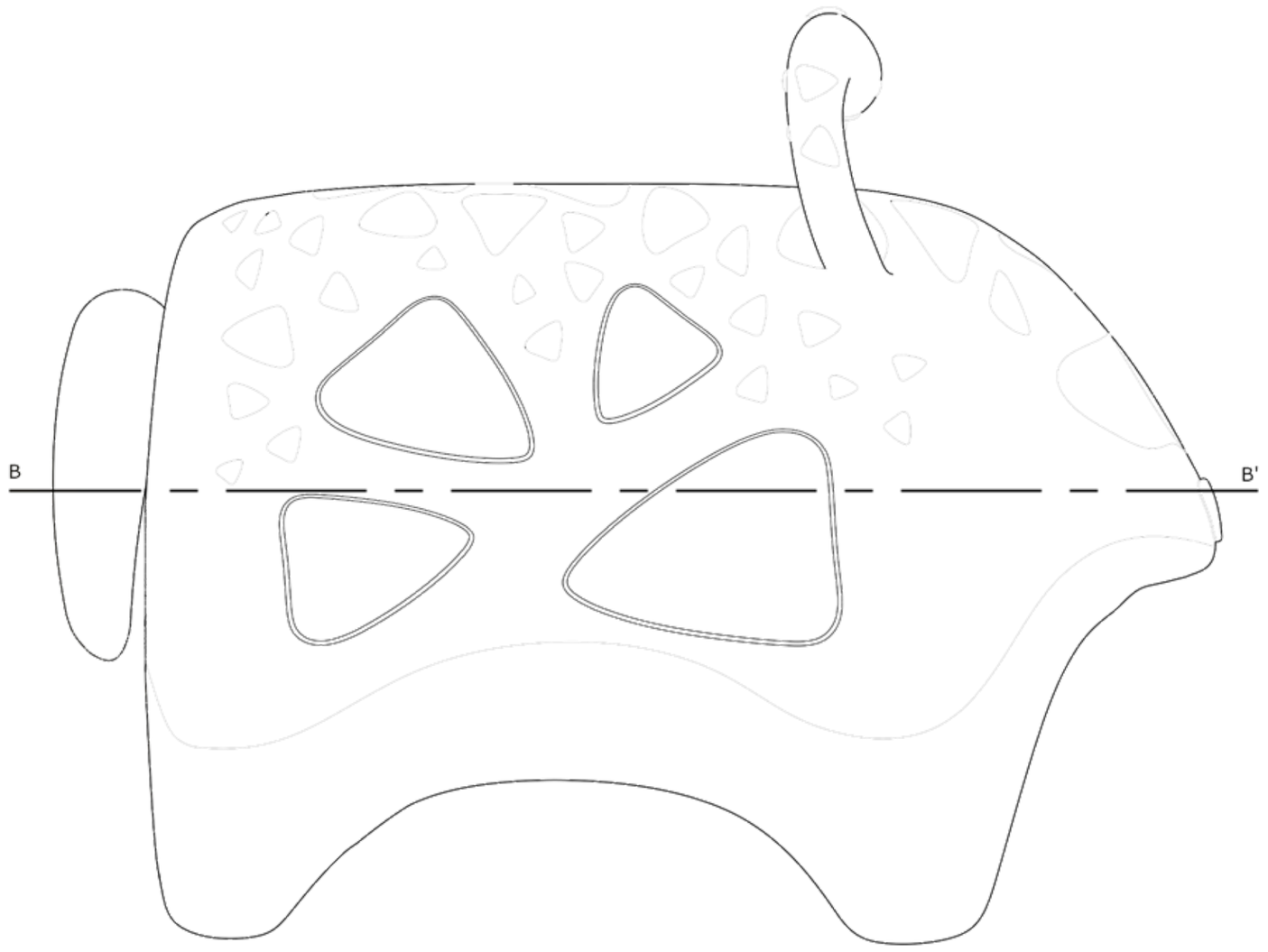


Cut BB'



Lateral Left View

LoRy

Lory - Cut BB'

Escala 1:1

mm

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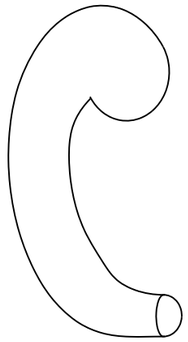
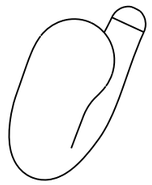
Horn A



Frontal View

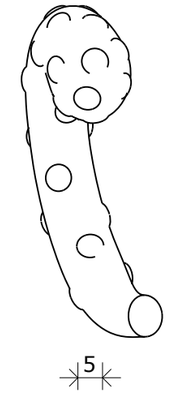
Lateral Left View



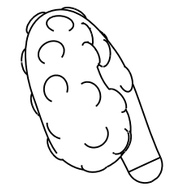
Top View

Horn B

Frontal View



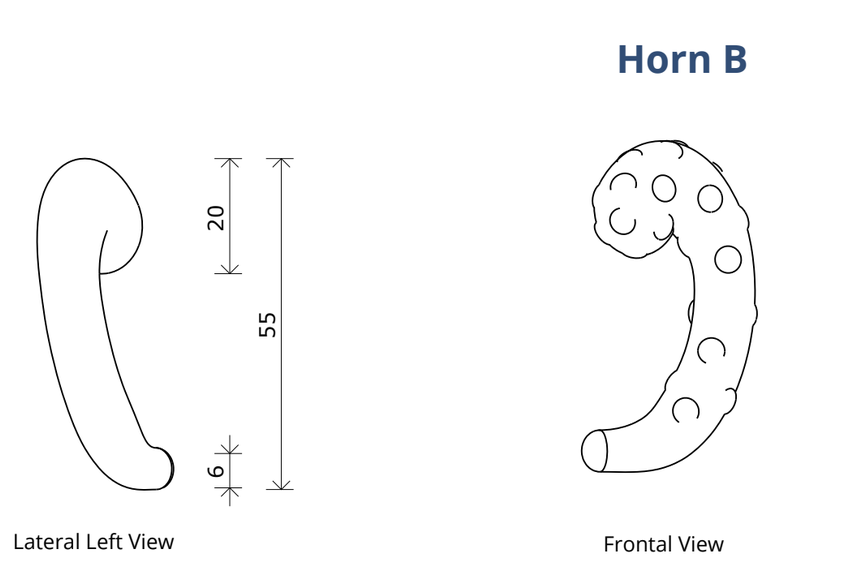
Lateral Left View



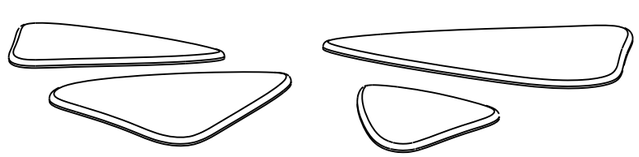
Top View

Buttons

Frontal View



Lateral Left View



Top View

LoRy

Lory - Buttons and Horns A and B

Escala 1:1

mm

Mestrado de Design de Produto | 2º ano
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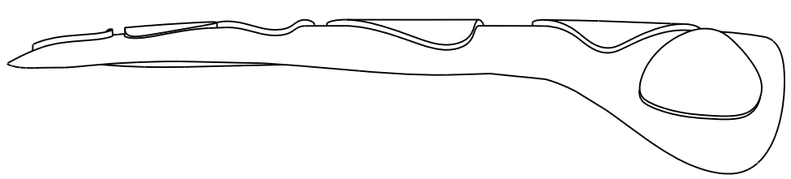
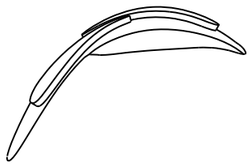
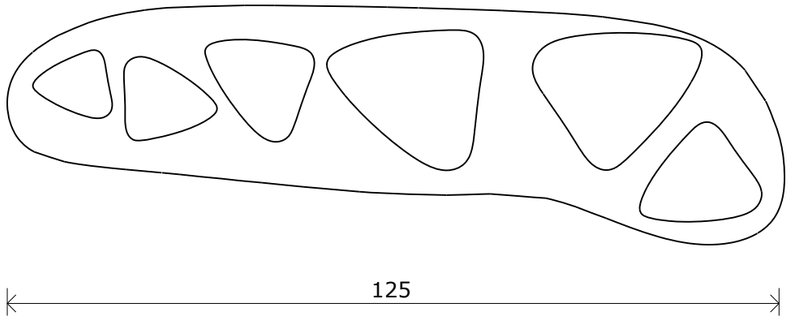
Mesh A



Lateral Right View

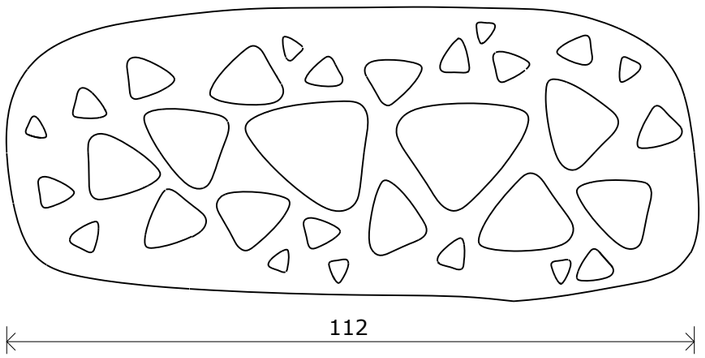


Frontal View

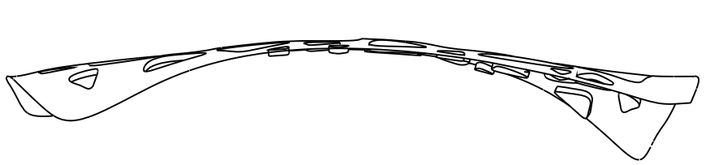


Top View

Mesh B



Inferior View



Frontal View

Lateral Left View

LoRy

Lory - Mesh A and B

Escala 1:1

mm

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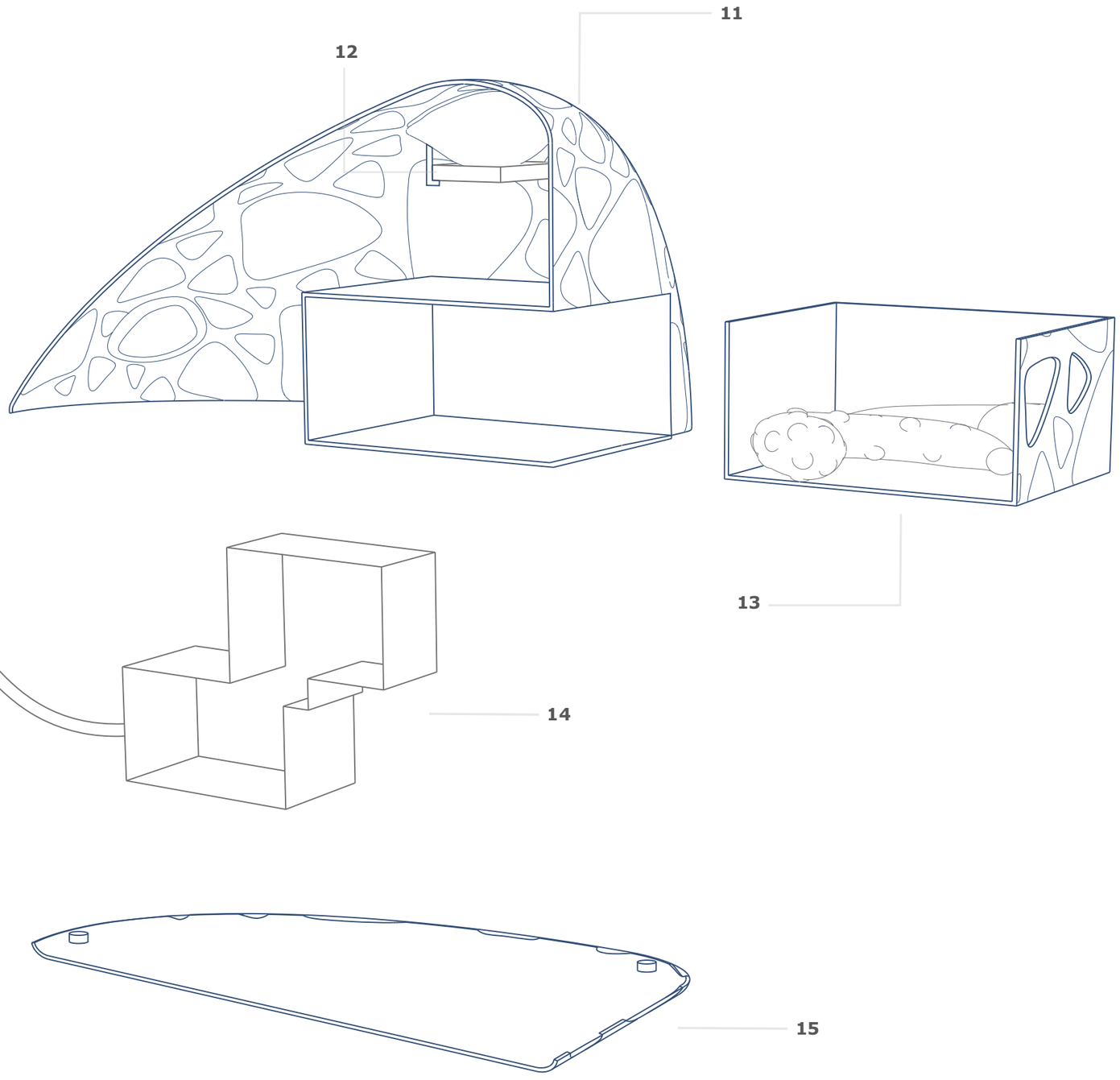

Component	Description
11 Upper shell	Cover made with hard plastic injection molding. With structures on the inside to connect with the Inferior shell. Attaching them with plastic pins. It also has supports on the inside for the wireless charger sensor.
12 Wireless charger	Sensor is situated on the base and on the paws. That is also connected to the batteries.
13 Drawer	Made with hard plastic and has some mechanisms on the side to slide open. This is a drawer to store other types of Horns you may connect.
14 Batteries	These batteries can be charged with more energy that can be used after without it being connected to the source of energy. Being kithium-ion rechargeable Batteries.
15 Inferior shell	Cover made with hard plastic injection molding. With structures on the inside for a connection with the Top Shell. Attaching them with plastic pins.

LoRy

Lory - Specifications Base

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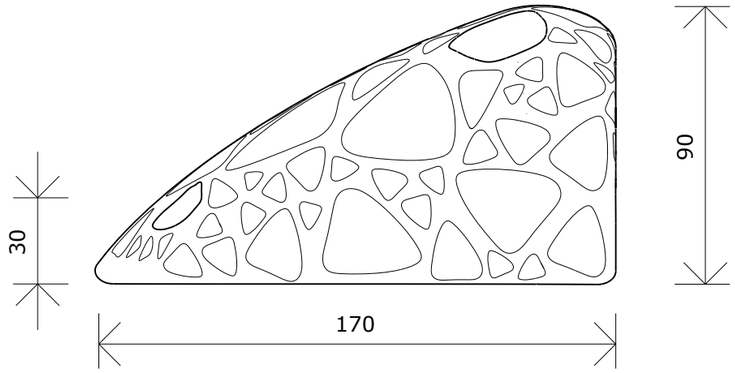
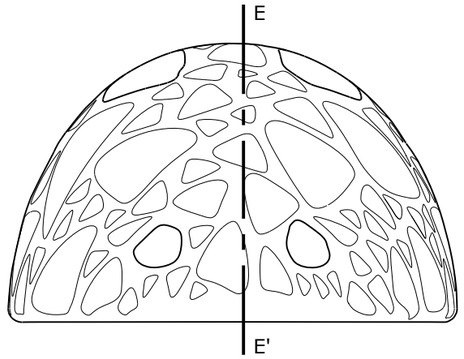
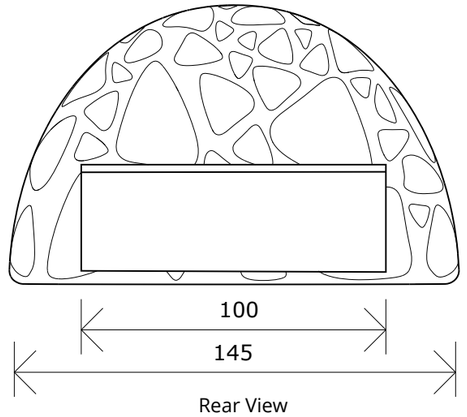


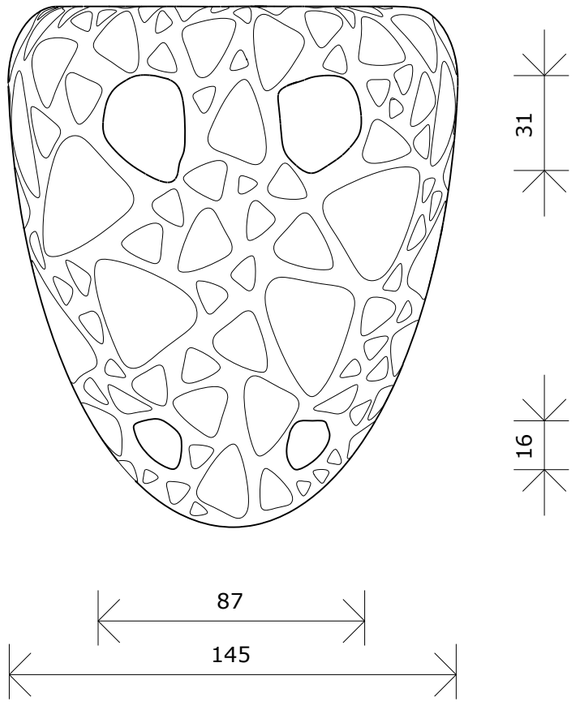
Lateral View



Frontal View



Rear View



Top View

LoRy

10

Lory - Base General View

Escala 1:2

mm

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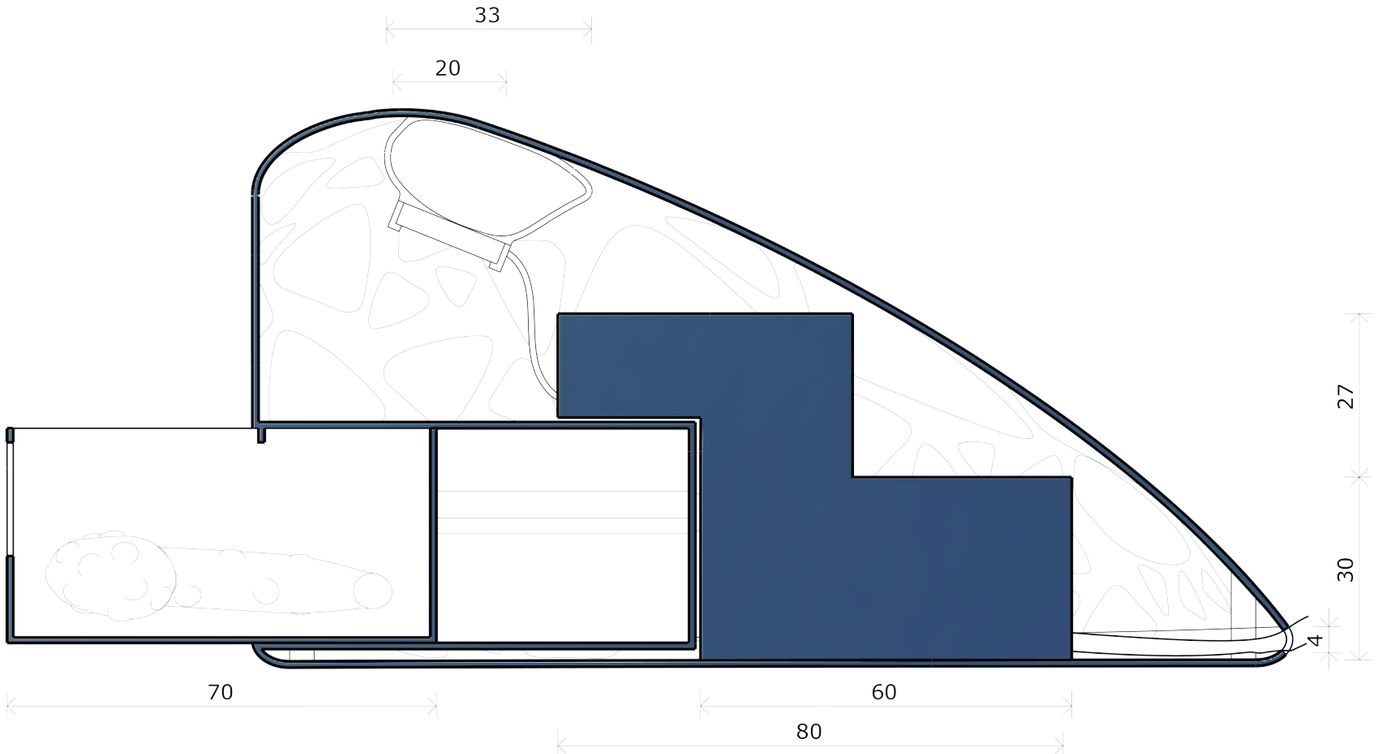
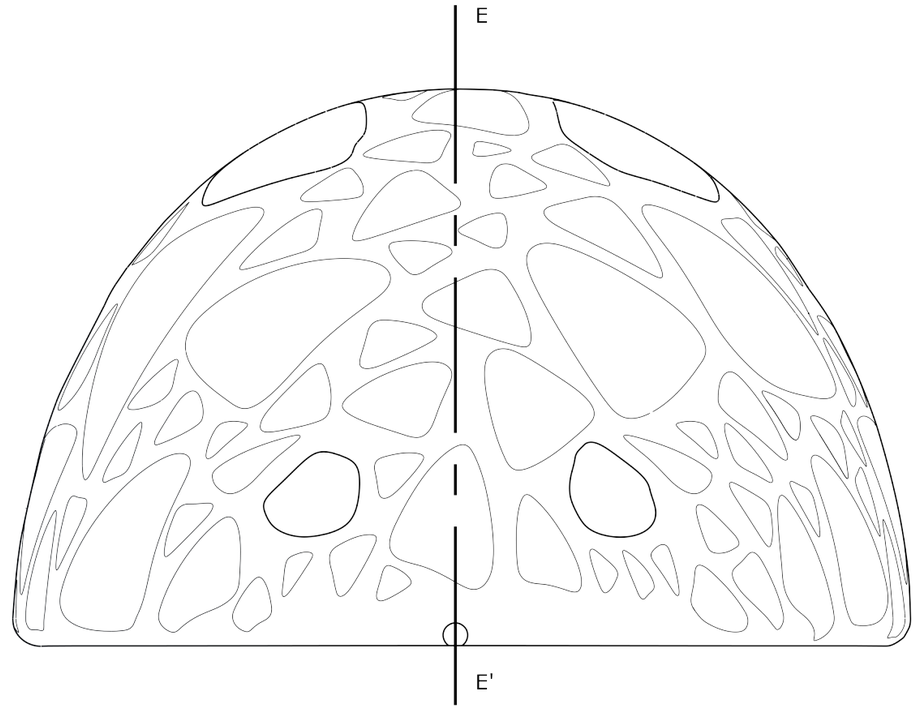


Cut EE'



Frontal View

Lory

Lory - Cut EE'

Escala 1:1

mm

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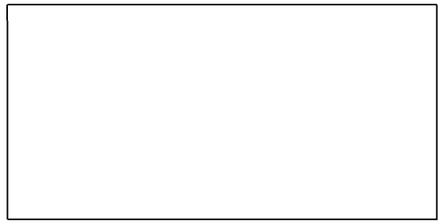
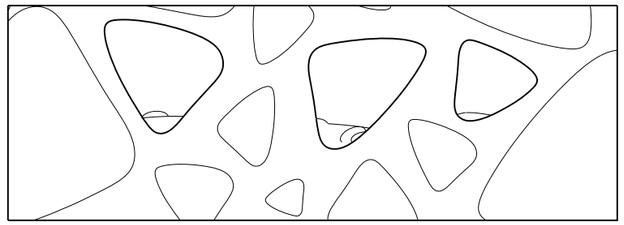


70

Lateral View

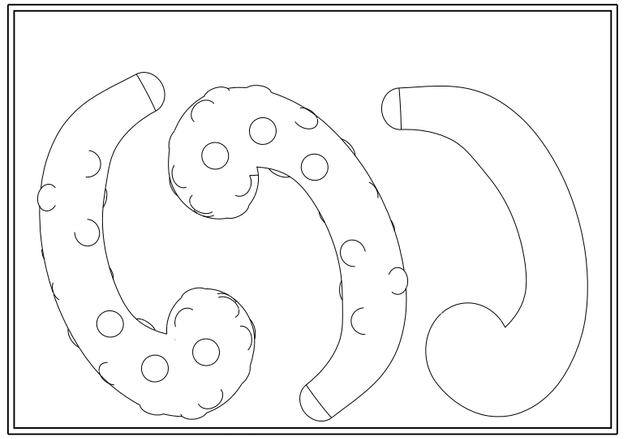


20 18 13

100

35

Frontal View



Top View

LoRy

Lory - Drawer

Escala 1:2

mm

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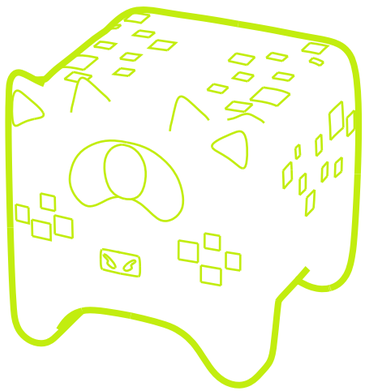
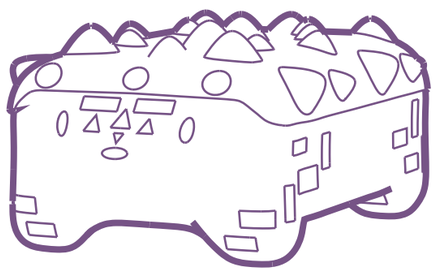
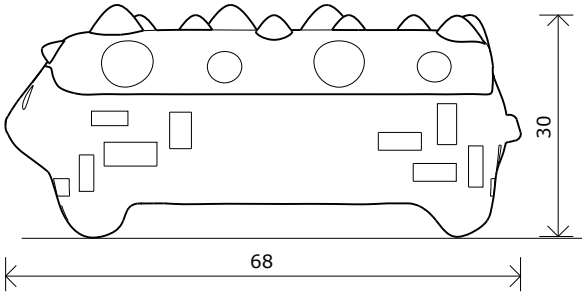
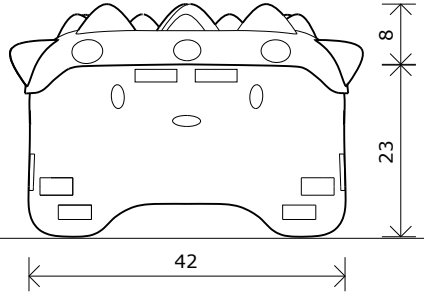


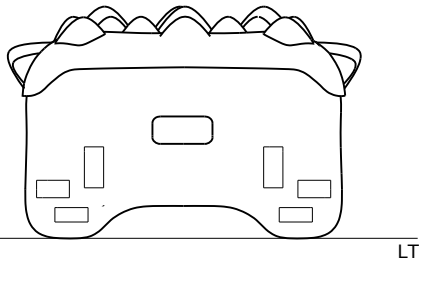




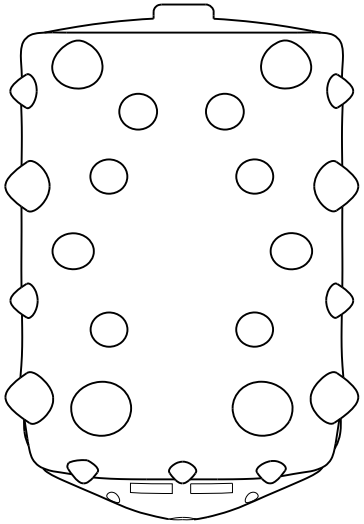
Lateral Right View



Frontal View



Rear View



Top View

LoRy

13

Lory's friends Rectangle - General Views

Escala 1:1

mm

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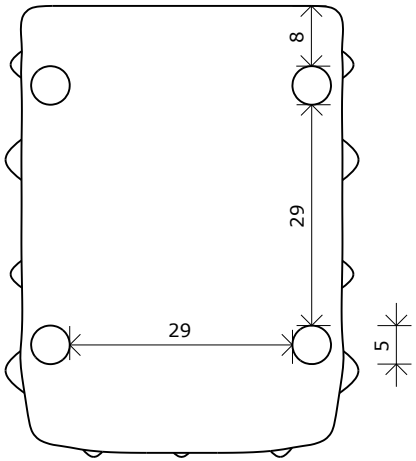
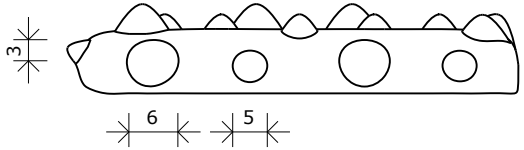
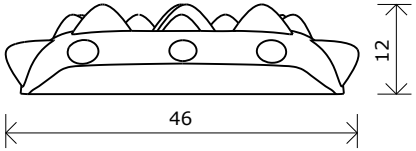


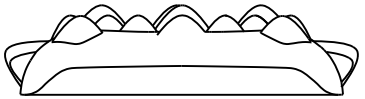
Inferior View



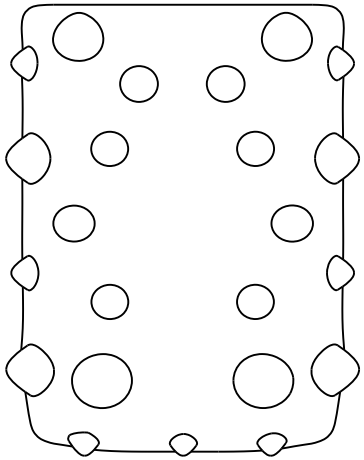
Lateral Right View



Frontal View



Rear View



Top View

LoRy

Lory's friends Rectangle - Top cover

Escala 1:1

mm

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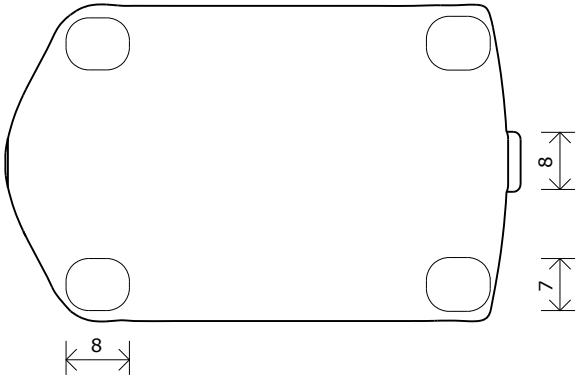
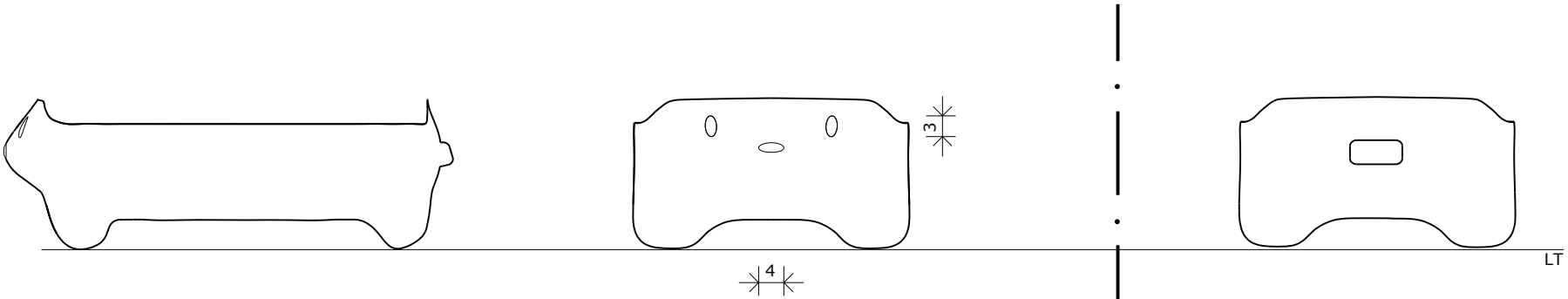


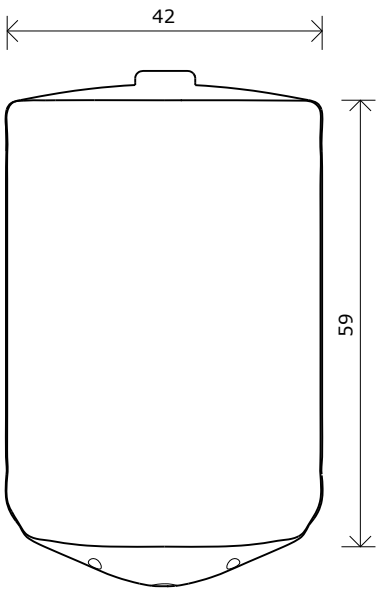
Inferior View



Lateral Right View

Frontal View

Rear View



Top View

LoRy

Lory's friends Rectangle - Inferior cover

Escala 1:1

mm

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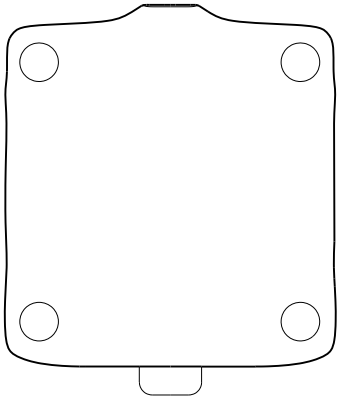
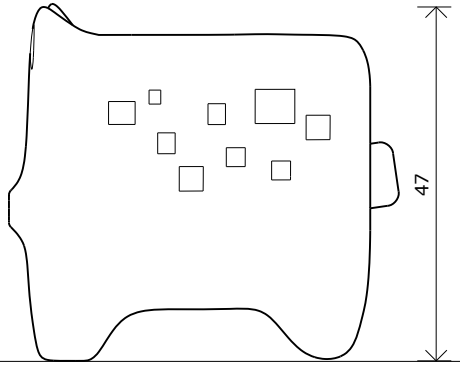
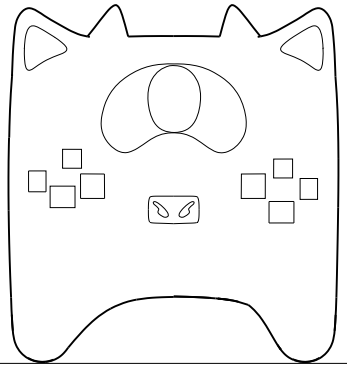


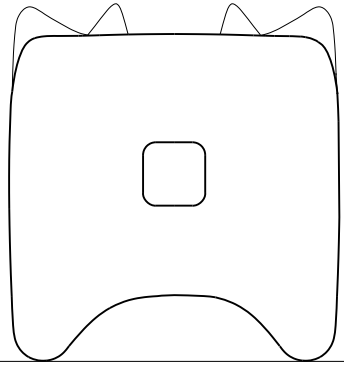
Inferior View



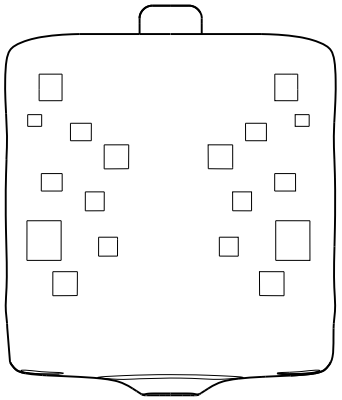
Lateral Right View



Frontal View



Rear View



Top View

LoRy

Lory's friends Square - General Views

Escala 1:1

mm

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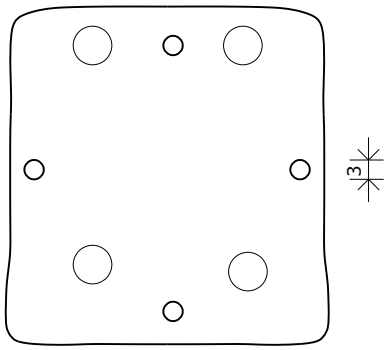
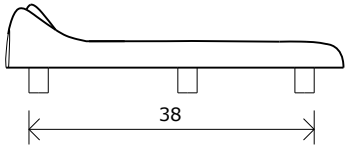
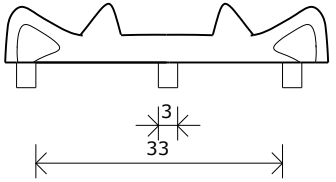


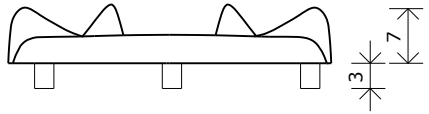
Inferior View



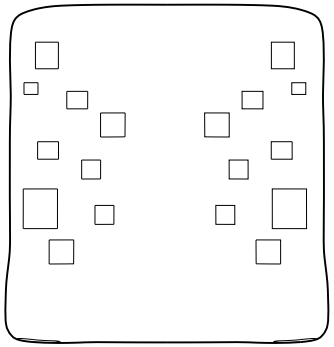
Lateral Right View



Frontal View



Rear View



Top View

LoRy

Lory's friends Square - Top cover

Escala 1:1

mm

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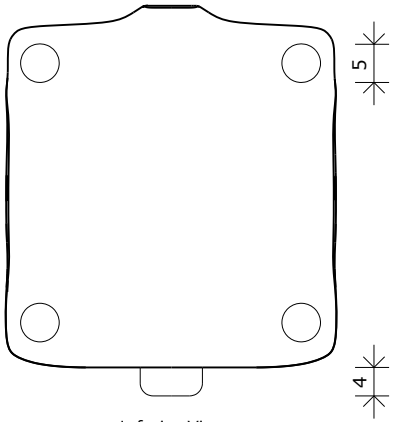
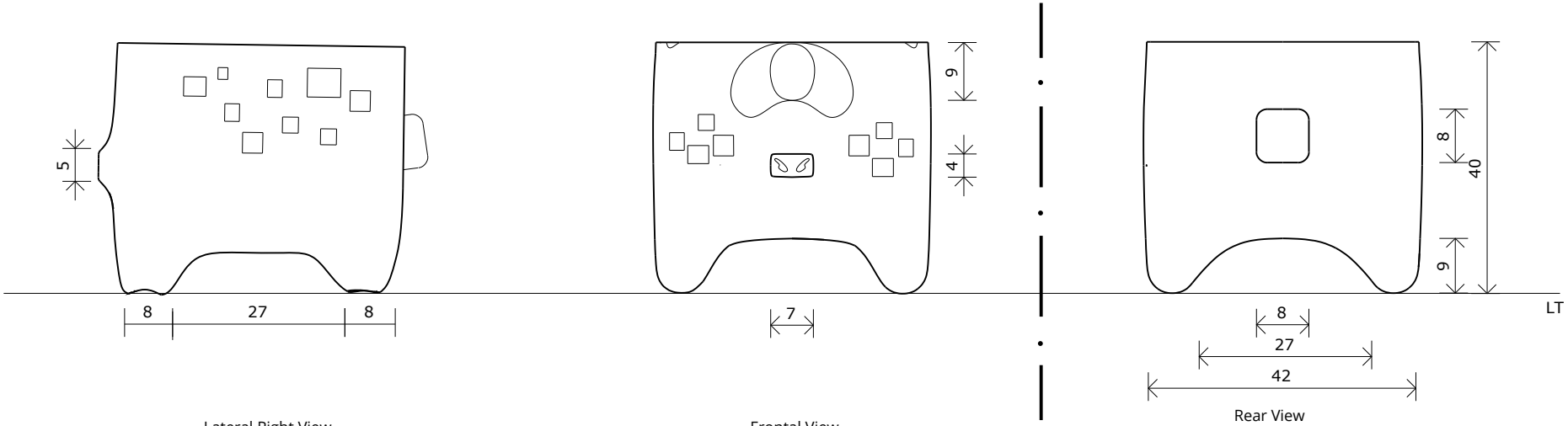


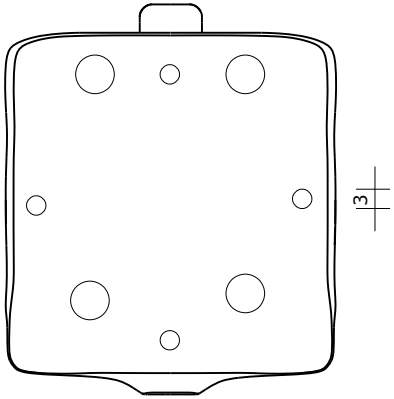
Inferior View



Lateral Right View

Frontal View

Rear View



Top View

LoRy

Lory's friends Square - Inferior cover

Escala 1:1

mm

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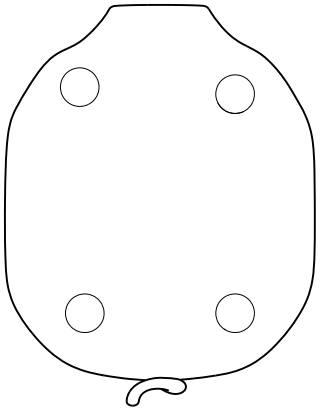
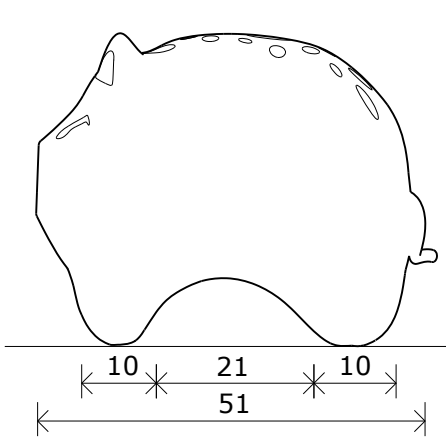
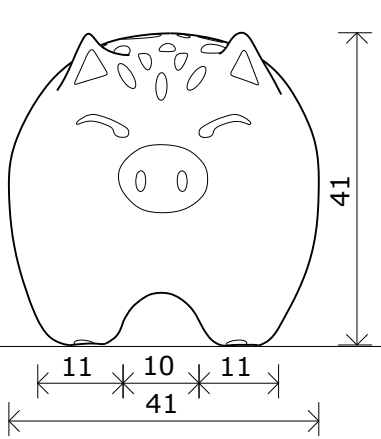


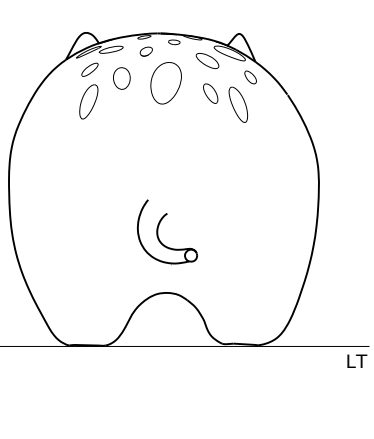
Inferior View



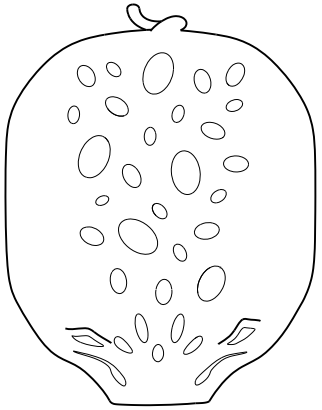
Lateral Right View



Frontal View



Rear View



Top View

LoRy

Lory's friends Circle - General Views

Escala 1:1

mm

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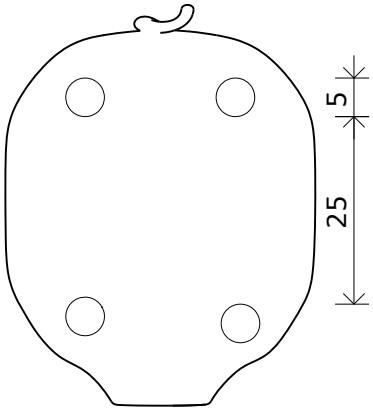
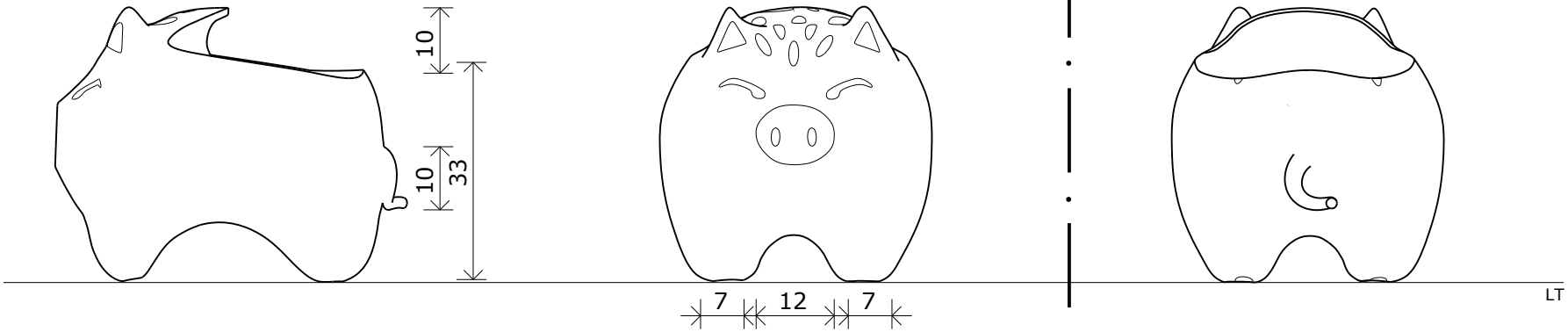


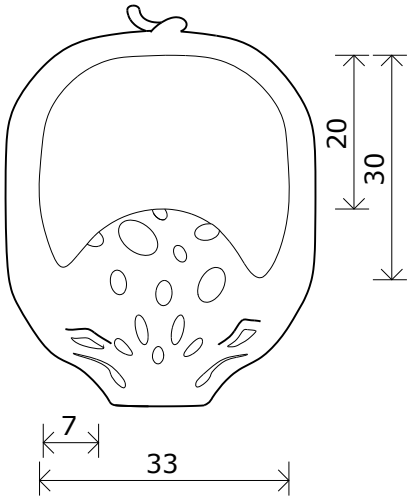
Inferior View



Lateral Right View

Frontal View

Rear View



Top View

LoRy

Lory's friends Circle - Inferior cover

Escala 1:1

mm

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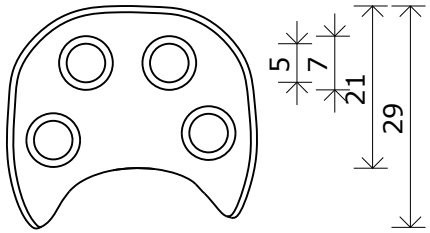
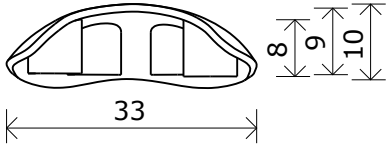
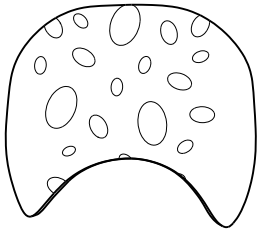


Inferior View

Lateral Right View



Frontal View



Top View

Lory

21

Lory's friends Circle - Top cover

Escala 1:1

mm

Mestrado de Design de Produto | 2º ano
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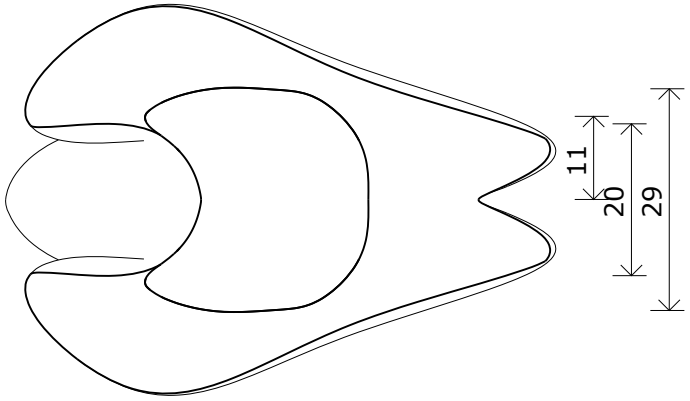
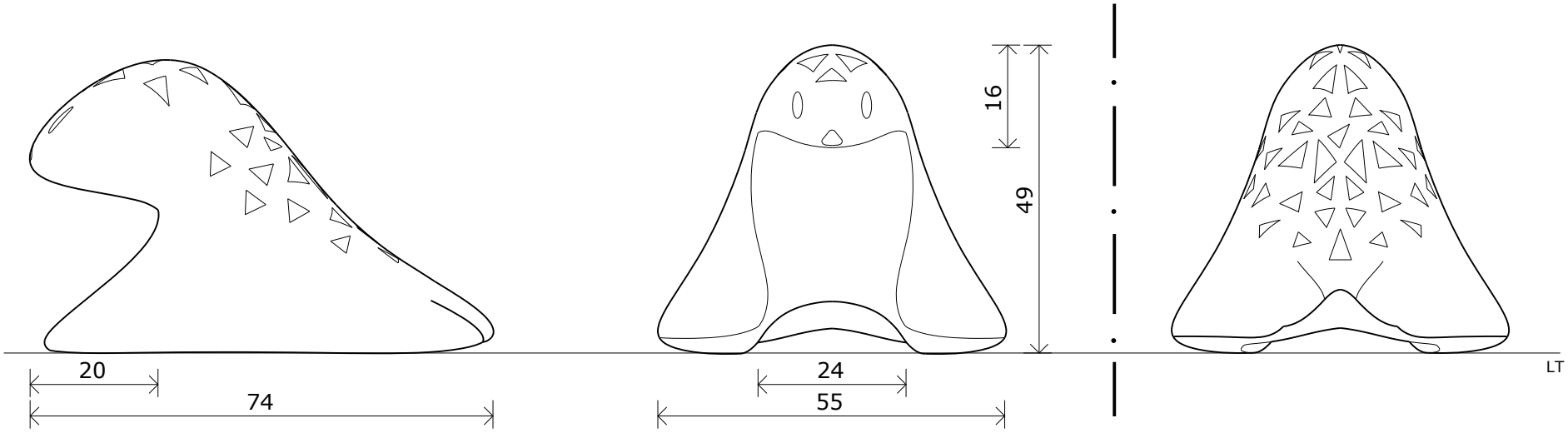


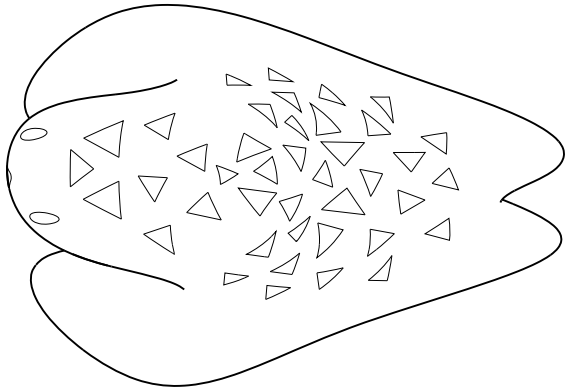
Inferior View



Lateral Right View

Frontal View

Rear View



Top View

LoRy

Lory's friends Triangle - General Views

Escala 1:1

mm

Mestrado de Design de Produto | 2º ano
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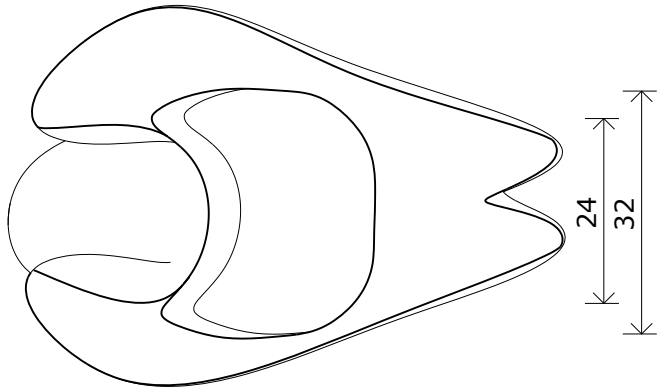
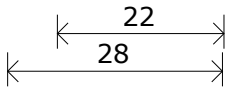
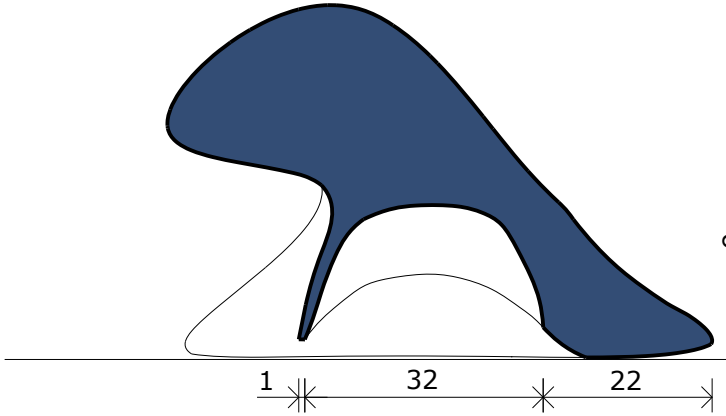
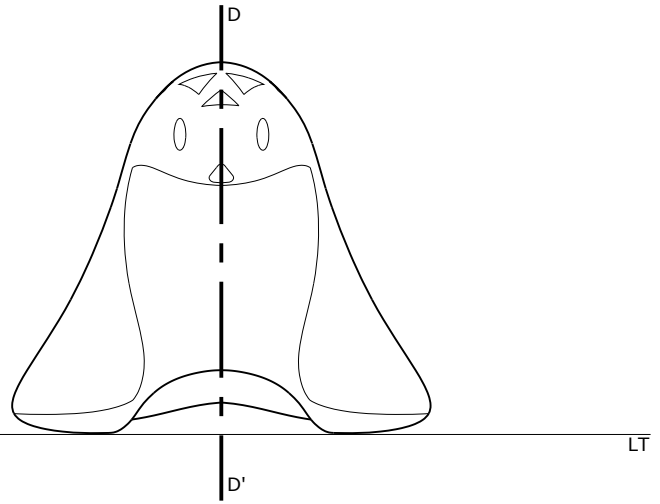




Inferior View



Cut DD'



Frontal View

Lory

Lory's friends Triangle - Top cover, DD' Cut

Escala 1:1

mm

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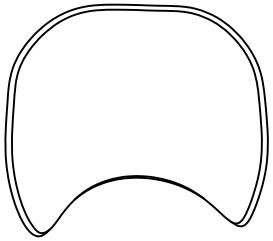
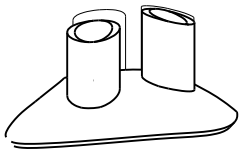
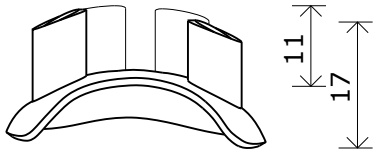
Triangle inferior cover



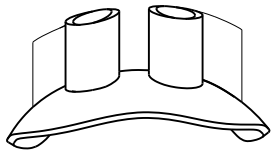
Inferior View



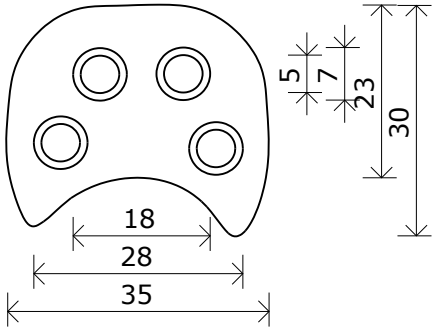
Lateral Right View



Frontal View

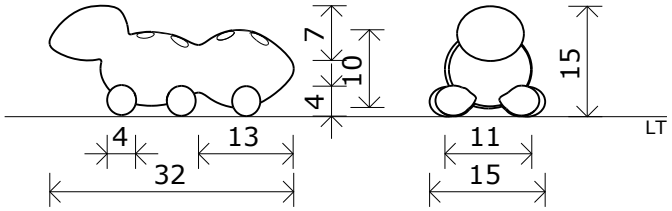


Rear View



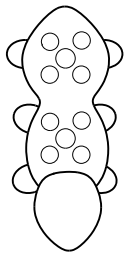
Top View

Ant numbers



Lateral Right View

Frontal View



Top View

LoRy

Triangle inferior cover and Ant numbers - General views

Escala 1:1

mm

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